Scotrenewables Tidal Power Limited

Lashy Sound Tidal Array Scoping Report

July 2014

Document prepared for:

Marine Scotland Licensing Operations Team
Scottish Government
Marine Laboratory
PO Box 101
375 Victoria Road
Aberdeen
AB11 9DB

Document prepared by:

Scotrenewables Tidal Power Ltd.
Hillside Office
Stromness
Orkney
KW16 3HS
Contact: Kirsten Geddes

Email: kirsten@scotrenewables.com

Aquatera Ltd
Stromness Business Centre
Stromness
Orkney
KW16 3AW
Contact: Ian Hutchison

Email: ian.hutchison@aquatera.co.uk

CONTENTS

FIGURES

TABLES

Glossary

Agreement for Lease	An Agreement for Lease (AfL) is granted by The Crown Estate for a limited time period and grants a developer exclusive rights to investigate the possibility of a development (with respect of wave and tidal energy projects) within a defined area, referred to as the AfL area.
Array	Term used to describe a group of tidal energy devices that are part of the same project.
Benthic communities	Multiple species and habitats on the seabed forming communities
Cumulative effects	The overall effects of a number of different proposals of the same type of development.
Environmental Impact Assessment (EIA)	Process to facilitate the identification and assessment of the potential environmental impacts associated with the project.
Environmental Statement	A statutory document (containing the findings of the environmental impact assessment) which is required as part of the consent and licence application processes.
Export cable	A cable that exports electricity generated by the tidal array to shore.
In-combination effects	The effects of an activity or development in combination with other, different projects and activities.
Inter-array cables	Cables that connect each tidal device within the array to one another.
Landfall site	Location at which export cables come ashore.
Natura 2000 Site	Natura is the term given to Special Areas of Conservation (SACs) and Special Protection Areas (SPAs) which are internationally important sites designated under two European Directives (see SAC and SPA).
Offshore Area of Search	Offshore area of search for the development including the Agreement for Lease area and the potential route to shore for the electricity export cables.
Onshore Area of Search	Onshore area of search for the development including the cable landfall site, route of the onshore cable to the substation building and the onshore substation building itself including associated infrastructure such as the access track and laydown area.
Project Briefing Document	A document produced by the Project Team and sent to stakeholders prior to scoping to provide an introduction to the proposed development.
Special Area of Conservation (SAC)	Natural heritage sites designated under the EC Habitats Directive.
Special Protection Area (SPA)	Natural heritage sites classified in accordance with Article 4 of the EC Birds Directive.
Site of Special Scientific Interest (SSSI)	Natural heritage sites designated under the Nature Conservation (Scotland) Act 2004.

Acronyms

AfL	Agreement for Lease
AIS	Automatic Identification System
AoS	Area of Search
EIA	Environmental Impact Assessment
ES	Environmental Statement
HRA	Habitats Regulations Appraisal
LNCS	Local Nature Conservation Site
MPA	Marine Protected Area
NRA	Navigational Risk Assessment
PBD	Project Briefing Document
PMF	Priority Marine Features
PHA	Preliminary Hazard Analysis
SAC	Special Area of Conservation
SLVIA	Seascape, Landscape and Visual Impact Assessment
SPA	Special Protection Area
SRTP	Scotrenewables Tidal Power Limited
SRTT	Scotrenewables Tidal Technology
SSSI	Site of Special Scientific Interest
ZTV	Zone of Theoretical Visibility
VMS	Vessel Monitoring System

1 Purpose of Scoping and How to Respond

Scotrenewables Tidal Power Limited (SRTP) is an Orkney based tidal turbine development company. The company, who employs 22 people in Orkney, is at the forefront of the Scottish and global tidal energy industry and is currently constructing the first of its commercial scale turbines, the SR2000, which once launched in 2015 will be the most powerful tidal turbine in the world.

As part of the ongoing development of the Scotrenewables Tidal Turbine, SRTP propose to develop a tidal array at Lashy Sound between the islands of Eday and Sanday in Orkney. SRTP have an Agreement for Lease with the Crown Estate for a development of up to 15 turbines (30MW). It is proposed to develop the site in two Phases, Phase 1 up to 5 turbines (10MW) and subject to further environmental assessment, Phase 2 for an additional 10 turbines (20 MW).

As part of the development of the project an Environmental Impact Assessment (EIA) will be required, the results of which will to be submitted to the Scottish Ministers (through Marine Scotland) as part of the consent application. The Scoping process, for which this document has been produced, forms an essential part of the EIA in allowing the regulators and their consultees, stakeholders and other interested parties to comment on the proposed scope of the EIA including the methodologies for each assessment. Further consultation will be undertaken throughout the project development, in advance of submission of the consent application, including meetings and public consultation events.

This Scoping Report has been issued to a number of potential stakeholders, a full list of which is provided in Appendix E of this document. If you would like to comment on the Scoping Report and proposed content of the EIA please send any responses to Marine Scotland at the following address:

Marine Scotland Marine Licensing Operations Team
Scottish Government, Marine Laboratory, PO Box 101, 375 Victoria Road, Aberdeen, AB11 9DB

Or by email to: ms.marinelicensing@scotland.gsi.gov.uk

Scotrenewables Tidal Power Limited would also be very grateful if copies of any scoping responses could also be sent to them directly at the following address:

F.A.O. Kirsten Geddes, Environmental Consents Manager
Scotrenewables Tidal Power Ltd, Hillside Office, Stromness, Orkney, KW16 3HS

Or by email to kirsten@scotrenewables.com.

Additional copies of the Scoping Report will also be available to view the following locations:

- **Scotrenewables Tidal Power Ltd, Hillside Office, Stromness, Orkney, KW16 3HS**
- **Orkney Library and Archive, 44 Junction Road, Kirkwall, KW15 1AG**
- **Aquatera Offices, Stromness Business Centre, The Old Academy, Stromness, KW16 3AW**
- **Eday Heritage Centre;**

- **Sanday Heritage Centre.**

If you have received this document and do not wish to be consulted further then please confirm this to SRTP at the address above.

Thank you

Kirsten Geddes, Environmental Consents Manager, Scotrenewables Tidal Power.

2 Introduction

2.1 Project overview

In December 2012, Scotrenewables Tidal Power Limited (SRTP) was awarded an 'Agreement for Lease' (AfL) from the Crown Estate for an area of seabed in Lashy Sound for up to 30MW of installed capacity, as part of a leasing round known as, "Further Scottish Leasing (Saltire Prize projects) and demonstration leases - application window 4".

SRTP propose to develop the Lashy Sound Tidal Array hereafter referred to as "the project" in two phases; Phase 1 up to 10MW (5 turbines) and Phase 2 up to 30MW (15 turbines).

2.2 The applicant

SRTP was founded in 2002 solely to develop the Scotrenewables Tidal Technology (SRTT). Since its inception, the company has grown to employ 22 people locally in Orkney, providing highly skilled jobs in areas such as electrical and mechanical engineering, hydrodynamics and off-shore operations. SRTP is based in Stromness, home to the European Marine Energy Centre (EMEC).

SRTP has been instrumental in developing a strong marine energy supply chain in Orkney and the north of Scotland, particularly in the following areas:

- Component manufacture and fabrication;
- Marine services;
- Environmental services;
- Cabling;
- Control systems;
- Civil engineering;
- Electrical engineering; and;
- Freight transport.

SRTP works closely with Heriot-Watt University through their International Centre for Island Technology (ICIT) in Orkney to develop research programmes to further knowledge gathering in the sector and provides industry placements to its graduates. A number of SRTP employees have come through the ICIT MSc programme.

2.3 Request for a Scoping Opinion

Due to the nature and scale of the proposed tidal array, an Environmental Impact Assessment (EIA) will be undertaken in line with the requirements of the Electricity Works (Environmental Impact Assessment) (Scotland) Regulations 2000 (as amended) and the Marine Works (Environmental Impact Assessment) Regulation 2007 (as amended) (collectively referred to as the EIA Regulations). An Environmental Statement (ES) reporting the results of the EIA will accompany the application for consent under Section 36 of the Electricity Act 1989, to be submitted to Scottish Ministers (through Marine Scotland) for determination.

This Scoping Report is submitted to the Scottish Minsters as the basis of a request for a formal EIA scoping opinion under Regulation 7 of the EIA Regulations. The scoping process allows statutory and non-statutory consultees to comment on the proposed development, the scope of the EIA and the proposed assessment methodologies. It also provides an opportunity for consultees to raise any issues which they consider may be important to the EIA process and provide direction on the topics on which the ES should focus.

The specific aims of the scoping report are to:

- Describe the proposed project;
- Set out the current approach to the EIA and the proposed structure and content of the ES;
- Summarise the existing baseline information in relation to the tidal array development envelope and the surrounding area;
- Identify the issues which are to be assessed as part of the EIA;
- Agree the general approach to the assessment and where appropriate the specific methodologies for each technical discipline; and
- Identify those issues which can be scoped out of the EIA.

Environmental receptors and the potential environmental effects of the project have been identified and assessed under the criteria outlined in Table 2.1. This methodology has been used to determine those aspects which SRTP propose should be scoped into and out of the EIA. A summary of all potentially significant impacts to be assessed during the EIA and within the ES is presented in Section 11 Conclusions.

Table 2.1 Consideration of potential effects

Potential Effect	Description	Scope
Potential beneficial impact	The project may result in potential beneficial impacts to the receptor	Scope out unless there is capacity to demonstrate significant potential benefits.
Effect unlikely to be significant	Baseline information and/or knowledge of the potential impact is sufficient to determine that the project is unlikely to have a significant effect on the receptor.	Scope out unless statutory consultees advise that the impact should be assessed further in the EIA.
Potential significance of impact uncertain	There is uncertainty around the risk to the receptor and/or baseline data is currently insufficient and further investigation is required to inform EIA.	Scope in for further baseline characterisation and impact assessment.

2.4 Phased project development - Survey, Deploy and Monitor

The development of the tidal energy industry is still at an early stage therefore not all of the potential environmental impacts are fully understood. For this reason SRTP propose to adopt the "survey, deploy and monitor" approach to project development as recommended by Marine Scotland[1]. The development of the Lashy Sound Tidal Array will be undertaken using a phased approach allowing the lessons learned from each deployment stage to be applied to the next and to future, larger scale projects. It is proposed that the development would be progressed in two phases as shown in the table below.

Table 2.2 Proposed project phases

Phase	Number of devices installed	Installed capacity	Total capacity of site	Device footprint	Estimated Installation date
Phase 1	Up to five	10 MW	10 MW	Approx. 0.3 km^2	2016 - 2019
Phase 2	Ten	20 MW	30 MW	Approx. 0.8 km^2	2020

2.5 Proposed consenting process

In line with the proposed Phased approach to project build out, a phased approach to consenting is proposed:

- Phase 1 (up to 10 MW) – all necessary consent and licence applications are submitted with regards to the installation and operation of up to 5 SRTT devices, associated equipment and infrastructure;
- Phase 2 (up to 30 MW) – all necessary consent and licence applications are submitted with regards to the installation and operation of the following 10 SRTT devices and associated equipment and infrastructure.

This Scoping Report includes information on the 30 MW project however a Scoping Opinion is sought at this stage for the Phase 1 (10 MW) project only. Any pertinent comments relating to Phase 2 would be welcomed within the Scoping Opinion as these will provide valuable input into project design and future planning activities. Consent for Phase 2 will be sought separately following construction of Phase 1.

[1] Scottish Government Survey, Deploy and Monitor licensing policy guidance, 24th August 2012, available at: http://www.scotland.gov.uk/Topics/marine/Licensing/marine/Applications/SDM

2.6 Report structure

The scoping report is set out in the following sections:

Section 3: Project Boundaries and Approach to EIA, detailing the geographical boundaries to the project and the approach to EIA and Consenting Process;

Section 4: Project Description, detailing the project components including the technology and onshore infrastructure;

Section 5: Key Policy and Legislation Objectives, detailing key marine and terrestrial planning and environmental legislation, policies, consents and licences;

Section 6, 7 and 8: Description of the potential impacts on the Human, Ecological and Physical Environment, identifying the possible receptors, potential impacts and significance and a methodology for addressing information gaps;

Section 9: Cumulative and In-Combination Effects, identifying key projects and receptors to be included and anticipated key issues;

Section 10: Proposed EIA Methodology, detailing the process and proposed layout of the Environmental Statement (ES);

Section 11: Conclusions, summarising the potential impacts on each receptor and what will be carried through to the ES; and

Section 12: Consultation Strategy, summarising the consultation strategy, ongoing stakeholder engagement and how to respond to the Scoping Report.

The Scoping Report is supported by:

Appendix A: ScotMap Fisheries Maps;

Appendix B: Preliminary Hazard Analysis;

Appendix C: Habitats Regulations Appraisal;

Appendix D: Natural Heritage Designations; and

Appendix E: Consultee List.

3 Project Boundaries and Approach to EIA

This section defines the geographical and technical boundaries of the EIA and the approach that SRTP will take with regards to site development and the implications for the EIA process. The boundaries regarding the Navigational Risk Assessment (NRA) process are outlined in Appendix B: Preliminary Hazard Analysis.

3.1 Project components

The project consists of the following components:

- Five offshore tidal generators;
- Inter-array cables;
- Export cable(s) to shore;
- Cable landfall;
- Onshore cabling to substation; and
- Onshore substation.

Full details of these elements are described within this Scoping Report in Section 4 Project Description.

3.2 Geographical boundaries of project components

The project components can be divided into two distinct “Areas of Search” (AoS):

Offshore Area of Search:

- Tidal turbines;
- Inter-array cables; and
- Export cable(s) to shore.

Onshore Area of Search:

- Cable landfall;
- Onshore cabling to substation; and
- Onshore substation.

The offshore tidal generators and inter-array cables will be located within the ‘Agreement for Lease area’ (AfL) as illustrated in Figure 3.1. The export cable route between the AfL area and ‘landfall area of search’ will be identified during the EIA process.

The cable landfall location will be located within the ‘landfall area of search’ and the onshore cabling to substation and onshore substation will be located within the ‘onshore area of search’ as illustrated in Figure 3.1.

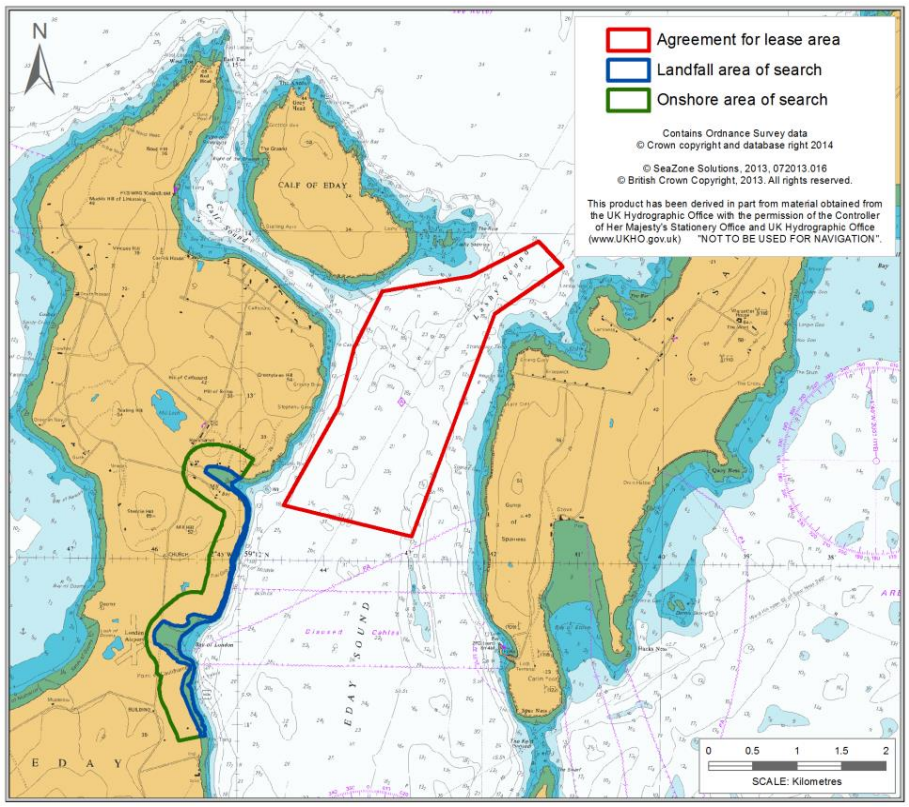

Figure 3.1 Geographical boundaries of project components

3.3 Non-project components

There are a number of technical components associated with the project which are not controlled by SRTP and will therefore not be considered during this consenting process and the Lashy Sound Tidal Array EIA, these include:

- Any port/harbour upgrade/development or associated works used to facilitate construction or operation and maintenance activities; and
- Any upgrade to or addition to the existing electricity transmission or distribution infrastructure or associated works.

Where necessary these components will be the subject of a separate consenting and EIA process.

3.4 Approach to Project Design Envelope

The 'Rochdale Envelope' approach is based on planning case law[2] and has been adopted in connection with a number of offshore renewable consent applications where a degree of flexibility is required in the project design. It provides a set of project design parameters enabling the EIA to consider any potentially significant environmental effects while retaining flexibility within the project design.

It is proposed that the 'Rochdale Envelope' approach will be applied to the EIA process for the offshore and onshore works as outlined in Table 3.1 and Table 3.2 for geographical and technical components respectively.

Table 3.1 Geographical components considered within the project design envelope

Component	Options
Project development area	An Offshore Area of Search (AoS) has been identified within the AfL area within which it is proposed to install the tidal turbines, inter array cables and all offshore ancillary equipment except the export cable(s) to shore. A proposed 'development area' will be identified within the Offshore AoS during the EIA and project design process. This will be largely informed by ongoing resource assessment and stakeholder consultation.
Turbine array configuration	The turbine array configuration will be informed by further resource assessment and hydrographic modelling and by consideration of the results of EIA particularly the Navigational Risk Assessment process and stakeholder consultation.
Export cable corridor	An export cable route will be selected following the development of other project components, consideration of other activities through consultation with stakeholders, technical feasibility and an assessment of physical and environmental constraints.
Cable landfall location	The landfall location will be selected following an assessment of technical feasibility, consideration of environmental constraints and consultation with stakeholders. This will also be dependent on the identification of a suitable export cable route and onshore substation location.
Substation location and onshore cable connection	An Onshore AoS has been identified for the substation location and onshore cable route between the cable landfall and the substation. Further refinement will be informed through stakeholder consultation, consideration of constraints and as information becomes available regarding the likely onward grid connection route.

[2] Infrastructure Planning Commission (2011). Advice note: Rochdale Envelope. Available at: http://infrastructure.independent.gov.uk/wp-content/uploads/2011/02/Advice-note-9.-Rochdale-envelope-web.pdf

Table 3.2 Technical components considered within the project design envelope

Component	Options
Turbine array configuration	The turbine array configuration will be informed by further resource assessment and hydrographic modelling and by consideration of the results of EIA and particularly the Navigational Risk Assessment process and stakeholder consultation.
Rotor diameter	Each rotor will have a minimum diameter of 10m and a maximum diameter of 16m. The rotor diameter may be modified to optimise the capture of the tidal resource at the site and this will be confirmed through ongoing site assessments and array configuration. The EIA will consider this range of rotor diameters.
Anchoring	The following anchors may be used during the project; each will be considered during the EIA and within the ES: Option 1 - gravity anchors; Option 2 - floating gravity anchors; and Option 3 - rock drilled anchors.
Mooring turret position	There are two options for the position of the mooring turrets when the devices are not at the site; each will be considered during the EIA and within the ES: Option 1 - the turret will remain on-site 10m below LAT and be connected to an independently picked up buoy; or Option 2 - the mooring turret will rest close to the seabed and be picked up with an ROV when the devices are connected.
Cable protection method	Cable protection methods will be selected with consideration of the most appropriate route, following the development of other project components, consideration of other activities through consultation with stakeholders, technical feasibility and an assessment of physical and environmental constraints.
Cable landfall installation method	The cable to landfall installation method will be selected with consideration of the most suitable location, technical feasibility, consideration of environmental constraints and consultation with stakeholders. This will also be dependent on the identification of a suitable export cable route and onshore substation location. The following methods will be considered during the EIA and within the ES: Option 1 - trenching through the intertidal zone to a jointing bay onshore; and Option 2 - directional drilling to shore.

Component	Options
Vessel spread	A multi-cat workboat vessel will be used for all installation and maintenance activities at the site. Details of the vessel are provided in Section 4: Project Description. Smaller rigid inflatables or similar may be used to transport staff to and from the device during maintenance operations. If Options 1 or 3 for anchoring are employed additional vessels including a heavy lift crane barge may be required. All vessels will be considered during the EIA and within the ES.
Device size	The maximum overall length of the tidal turbine is 64m with a transport draught of 6m. Rotor diameters will be between 10 and 16m.

4 Project Description

4.1 Site selection

SRTP identified Lashy Sound as a suitable site for a tidal demonstration array after consideration of a number of technical, environmental and economic factors including:

- Available tidal resource;
- Areas with suitable bathymetry for turbine deployment (20-30m depth);
- Low exposure (wind, wave and swell); and
- Logistics (close to EMEC Fall of Warness site, close to SRTP Orkney base; existing relationships with work vessels, university (Heriot-Watt ICIT), suppliers and contractors).

4.2 Agreement for Lease

The Crown Estate manage the rights to the UK seabed out to 12 nautical miles (nm) and the vested rights to lease the generation of renewable energy on the continental shelf within a 'Renewable Energy Zone' out to 200nm. In December 2012, SRTP was awarded an 'Agreement for Lease' (AfL) from the Crown Estate for an area of seabed in Lashy Sound for up to 30 MW of installed capacity, as part of a leasing round known as, "Further Scottish Leasing (Saltire Prize projects) and demonstration leases - application window 4".

4.3 Project design envelope/site location

The AfL area is shown in Figure 4.1 and is located between the islands of Eday and Sanday with the Calf of Eday to the north of the main island of Eday itself. The onshore elements of the development would be entirely located within the Orkney Islands Council local authority area.

The location of the tidal devices within the AfL area will be determined following detailed investigation of the site including technical and environmental surveys, stakeholder consultation and detailed design. SRTP have commenced investigations at the site through the deployment of Acoustic Doppler Current Profilers (subject to separate licences) and wildlife observations which have been underway since March 2013.

Only a small part of the AfL area will be required to locate the tidal array with an indicative footprint for the 10MW array being 1.0 x 0.3 km, i.e. 0.3km^2. The location of this area will be informed through the EIA process and will involve careful balancing of environmental, technical and stakeholder considerations to inform the most suitable site.

A possible stretch of coastline for landing cables has been identified on Eday - see Landfall Area of Search in Figure 4.1. The cable export route will connect these two areas and is likely to consist of a single export cable including protection where necessary. The final choice of route will be determined by the location of the tidal array and the cable landfall location which is subject to technical limitations.

Location of the onshore grid connection point and likely onshore export route will also influence the choice of location.

Onshore, the development will require a small substation building with vehicular access. The location of the onshore facilities will depend on the cable landfall location and the grid connection point which are still to be determined. An "Area of Search" for the onshore aspects of the development is included in Figure 4.1.

The project description presented here therefore includes several options and can be treated as a "project design envelope". This allows for flexibility in the project design allowing it to evolve within set parameters through which the potentially significant environmental effects can be identified and mitigated as far as possible.

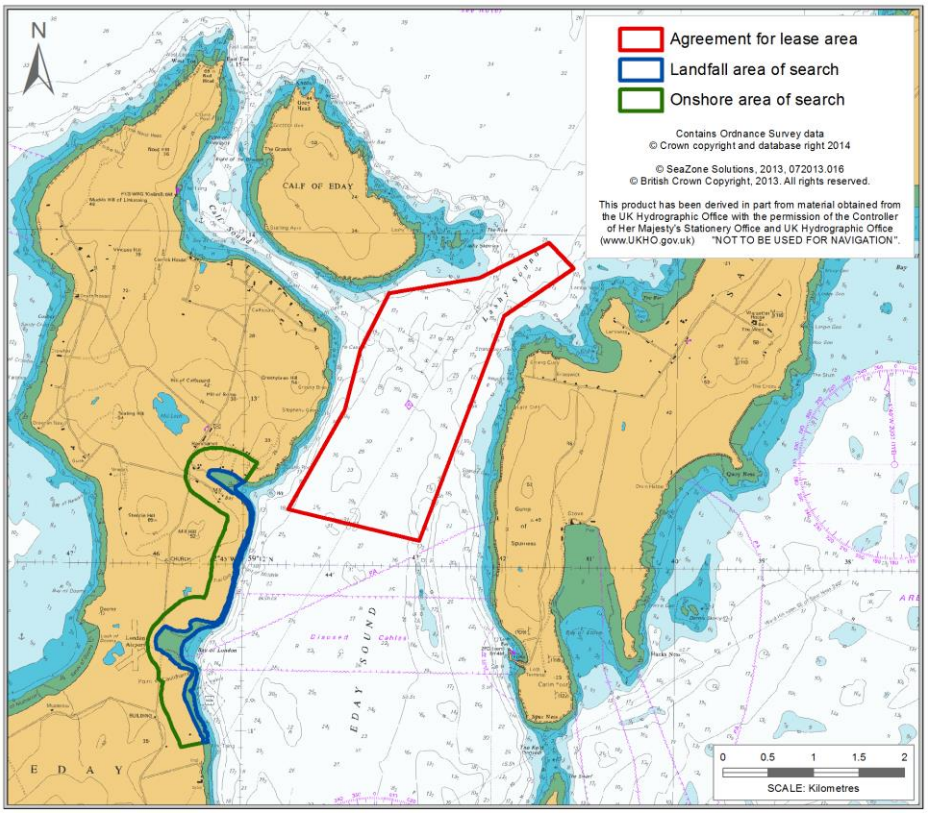

Figure 4.1 Project areas of search

4.4 Project components

The Lashy Sound Tidal Array is likely to comprise of the following main components:

- Five SRTT 2MW floating tidal turbines;
- turbine mooring system including anchors, connection systems, cabling and mooring turrets;

- offshore electrical cabling infrastructure, including inter-array cabling and subsea export cable;
- cable landfall point and onshore grid connection to the substation building;
- onshore substation building and associated infrastructure e.g. access track and laydown area.

Each of these components is described in more detail below.

4.4.1 Scotrenewables Tidal Technology

The tidal technology proposed for the project is the Scotrenewables Tidal Technology (SRTT), SR2000 2MW device (Figure 4.2). A smaller 250kW (SR250) scale device was testing at EMEC between 2011 and 2013 where it passed verification testing. The first full scale device, the SR2000, is currently being constructed and the electrical components will be assembled and tested at the company's new turbine assembly facility based at the Orkney Innovation Centre at Hatston in Kirkwall. It is envisaged that this facility will also become the main equipment assembly point for the SRTT turbines for the Lashy Sound Tidal Array.

The SRTT is a floating tidal stream energy convertor designed to extract energy from the tide via two retractable horizontal axis rotors. The main structure of the device comprises a floating cylindrical tube which floats on the sea surface to which the rotors are attached. The two contra-rotating rotors extract the kinetic energy of the tidal flow which is converted into electricity through the power take off system for export to shore.

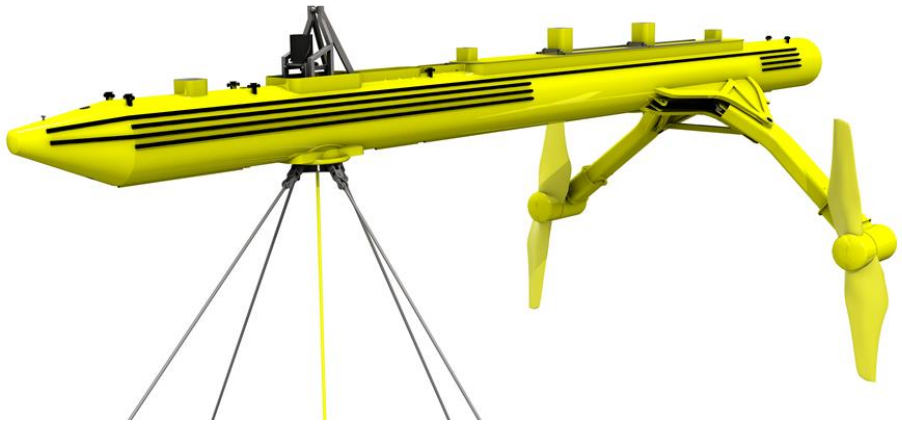

Figure 4.2 Overview of the SR2000 device

It is anticipated that each rotor would have a maximum diameter of 16m and that under normal operating conditions the rotor tips would be 3m below the sea surface. There is the potential that the rotor length will be modified slightly to optimise the capture of the tidal resource at the site, however this can be treated as a maximum.

The hydraulically retractable rotor legs give the SRTT two configurations - operational mode with the rotors down to generate power and transport/survivability mode with rotors retracted to decrease draught allowing the system to be towed into harbour or to reduce loads in heavy seas, see Figure 4.3 and Figure 4.4. In extreme storm conditions power generation will cease automatically and the rotor legs will retract into transport/survivability mode. The device can also be manually shifted between these two modes.

The streamlined design of the turbine superstructure and a catenary-type mooring system allows the floating structure to respond to the dynamic tidal and wave environment rather than having to withstand sudden changes in loading – this philosophy of employing compliant structures has been used in the offshore industry for many years.

The contra-rotating rotors each drive separate gearboxes and variable-speed electrical generators within the sub-surface nacelles. The generator power is then transmitted via cable to the hull for power-conditioning through variable speed drives. A transformer then steps up the voltage to 6.6kV for export to shore via a wet-mate electrical connector and subsea cable. The vast majority of equipment including control system, hydraulic power packs, drives, transformers and switchgear are located within the main hull tube which allows for easy access both alongside while in harbour or on site.

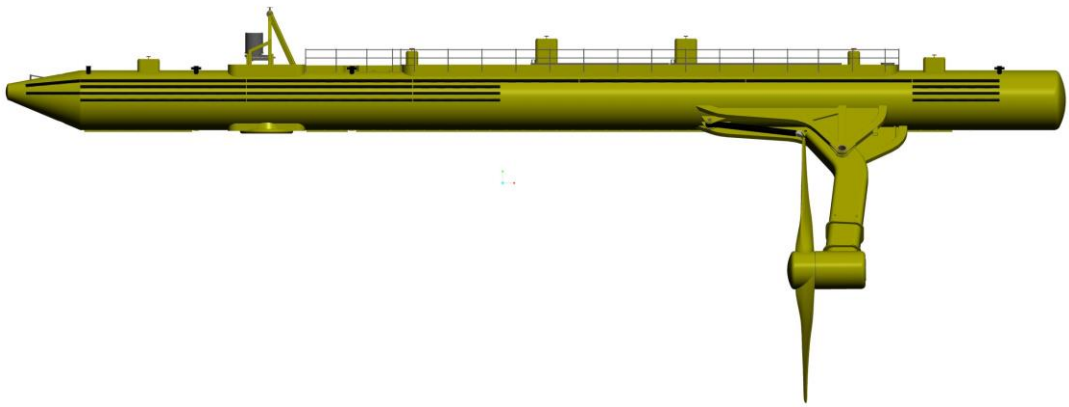

Figure 4.3 SR2000 in operational mode

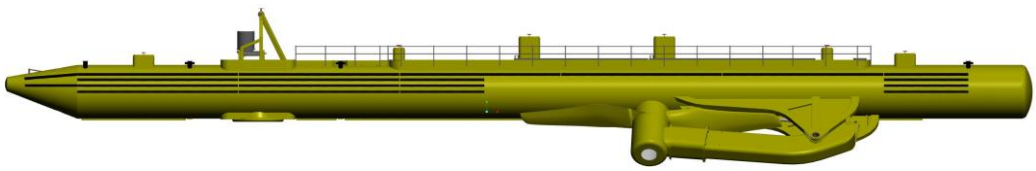

Figure 4.4 SR2000 in transport/survivability mode

Some key technical and economic benefits of SRTT include:

- Floating design - enables turbines to utilise water depths of highest tidal velocity. All installation, maintenance and decommissioning operations can be undertaken using small low cost vessels;
- Compliant mooring system - enabling deployment in deep waters and compliant response to dynamic wave and tidal loadings;
- Passive yaw system - improve energy conversion, simplify design;
- Fixed pitch rotor blades - to reduce design complexity and corresponding reliability and cost;
- High performance, low mass - high power to weight ratio contributes towards cost optimisation;
- Survivability - automatic shutdown in storm conditions;
- Accessibility - majority of maintenance can be carried out onsite;
- Rapid connection/disconnection - 30 minutes (approximately) operation to allow connection and disconnection in slack tide operational windows.

A summary of the device design parameters is provided in Table 4.1.

Table 4.1 SR2000 design parameters

Parameter	SR2000	Unit
Rated power	2000	kW
Rated current speed	3.0 approx.	m/s
Cut-in current speed	1.0	m/s
Shut-down current speed	4.5	m/s
Maximum rotor diameter	16.0	m
Maximum rotor speed	16.0	rpm
Swept area of the rotors	201.0	m^2
Displacement	500.0	Metric tonnes
Hull diameter	3.8 approx.	m
Hull length	64	m
Transport draught	6	m
100 year design wave	12	m
Water depth range	25+	m

SRTP are planning to deploy the first full scale commercial demonstrator SRTT, the SR2000, at the EMEC Fall of Warness tidal test site, Orkney in early 2015 where it will undergo a full range of

assessments including connection/disconnection testing, device performance, mooring installation and performance and environmental studies and assessments. Results of environmental monitoring undertaken at the Fall of Warness will be available to inform the proposed monitoring plan for the Lashy Sound site.

4.4.2 Mooring system

The SRTT is connected to the seabed via a catenary mooring system. Each device is connected to the mooring system through a single point mooring turret which contains all the electrical, mechanical and communications connections to the onshore control building. This mooring turret is designed to allow a quick connection and disconnection procedure without the requirement for personnel onboard the SRTT. The turret also allows the SRTT to orientate itself into the tidal stream for efficient energy capture and to respond to dynamic changes in the current and wave conditions rather than having to withstand them as fixed structures do.

The catenary mooring system consists of either two fore and aft lines or a cruciform layout with one line fore and aft and two much shorter lines port and starboard. The mooring lines are likely to be composed primarily of studless chain with some element of synthetic mooring line material at the riser sections.

When the SRTT devices are not at the site there are two options for the mooring turret. The turret will either remain 10m below LAT and be connected to an independently lit pick up buoy (as at the EMEC test site) or the mooring turret will rest close to the seabed and be picked with an ROV when the devices are connected. Further design work and stakeholder consultation will be undertaken to determine the preferred option. Both options will be considered during the EIA process.

The cruciform catenary mooring system is illustrated in Figure 4.5 below.

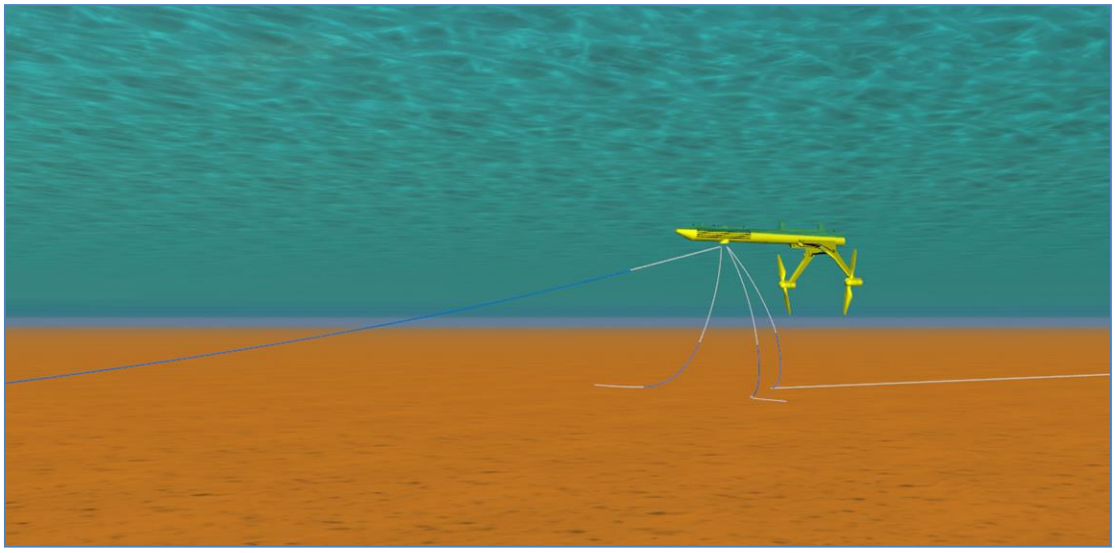

Figure 4.5 Schematic of SR2000 mooring system

4.4.3 Anchoring

There are three main options for anchoring the SRTT devices at Lashy Sound, the choice of which will depend on the specific environmental conditions encountered at the site.

Option 1 would be a traditional gravity anchor constructed from poured concrete and deployed using a heavy lift crane barge.

Option 2 would be a self-buoyant floating gravity anchor system in which chambers within the concrete gravity anchor can be flooded with seawater to accurately adjust the ballast of each anchor, allowing for controlled installation at site. The main advantage of this system is that the anchors can be towed to site using a smaller lower cost vessel removing the requirement for a heavy lifting barge.

Option 3 would employ rock-drilled anchors which may be more suitable depending on the seabed conditions at the site.

The mooring and anchoring system will be further refined during testing of the SRTT at the EMEC Fall of Warness site including consideration of the potential environmental effects of each option. Each option will be considered fully in the EIA process for the Lashy Sound Tidal Array.

4.4.4 Turbine array configuration

Further resource modelling of the Lashy Sound AfL area will be required to inform the turbine array configuration and to produce an optimised layout for energy extraction. The final layout and location of the array will be influenced by the EIA and NRA processes, including local and national stakeholder consultation.

An indicative array configuration for the development is shown in Figure 4.6. This layout utilises common anchor points and is designed to maximise the concentration of devices while providing sufficient clearance for maintenance vessel manoeuvring.

It is expected that the Phase 1 array (up to 10MW) could cover an area of sea approximately 1.0 x 0.3 km equivalent to an area of 0.3 km^2 on the seabed.

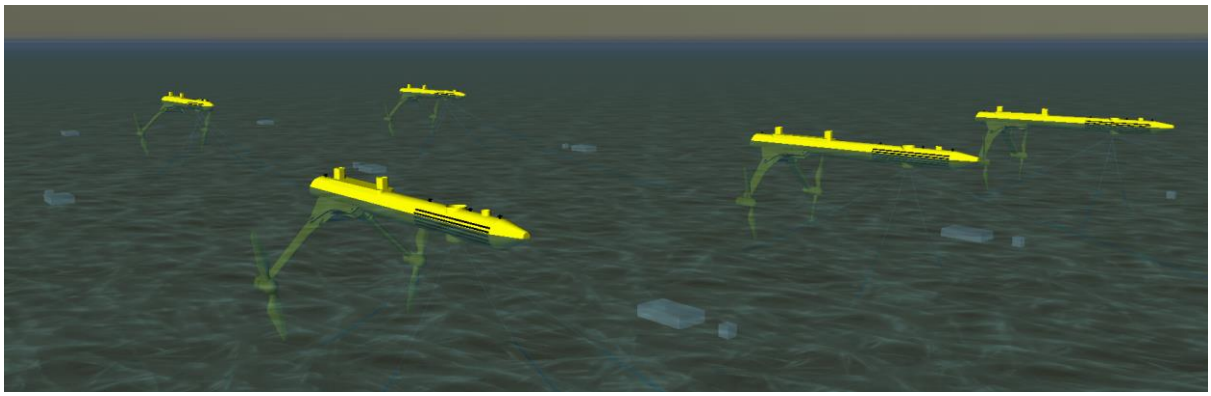

Figure 4.6 Indicative array configuration

4.4.5 Offshore cabling

The offshore cabling requirements will be specified according to the array design and export requirements of the development. The cable routes will be largely dictated by the inter array cabling requirements, the cable landfall location and final grid export route which are still to be determined. Initial investigation of the seabed at Lashy Sound would suggest that burial of the offshore cable infrastructure may not be possible therefore alternative cable protection methods will be investigated.

As further information becomes available about the likely route of the offshore cabling and the number of cables, protection methods etc. further consultation will be undertaken with statutory and non-statutory consultees to ensure that concerns regarding the cabling of the project are fully understood and can be mitigated where possible through effective project design.

4.4.6 Cable landfall point

The area of search for the cable landfall location is shown in Figure 4.1. The final location of the cable landfall will depend on the onward grid connection route, the location of the tidal array within the AfL area and the results of the technical and environmental assessments and consultation with local landowners.

There are two main options for the cable landfall depending on the final choice of location. The preferred option would be to land the cable by creating a trench through the intertidal zone and up the beach to a jointing bay onshore. This method is most suitable in areas of shallow gradient and suitable substrate. Where this option is not available the cable landfall would be created using directional drilling, which is a trenchless method of cable installation, by creating a shallow arc along a prescribed bore path using a surface launched drilling rig.

The potential impacts of both of these options will be considered during the EIA and stakeholder consultation processes.

4.4.7 Substation location and onshore grid connection

The final location of the substation and the onshore cable route will depend on the landfall location and grid connection point which are yet to be determined. As an indication a suitable substation building for a 30MW development would have dimensions in the order of a 14m x 10m x 4.5 m to apex to house all transformers and switchgears associated with the development.

As stated previously, once further information becomes available about the likely ongoing route of the grid connection and cable landfall location further consultation will be undertaken to inform project design of the substation location, dimensions and outdoor finishings.

4.5 Construction phase

4.5.1 Phased installation

As detailed above this scoping report covers Phase 1 of the Lashy Sound Tidal Array which will include the deployment of up to five SR2000 turbines (maximum generating capacity of 10MW). The turbines may be deployed in two stages with a single device deployed initially followed by an additional four devices. All potential build out options will be considered in the EIA and described in full in the Environmental Statement.

4.5.2 Site preparation

The first phase of construction at the site would involve the installation of the mooring system and cabling infrastructure. The final choice of anchoring system will dictate the method of installation. Gravity anchors would likely have to be installed by a heavy lift crane barge while the floating gravity anchors could be towed to site using a small multi-cat vessel. If rock drilled anchors were required a small drilling rig and steel frame system would be used to install these. Details of the options under consideration will be considered during the EIA and included in the ES.

Installation of the electrical cabling infrastructure will also depend on the details of the cabling required, distances involved, methods of protection etc. Again all methods under consideration will be included in the ES.

The planning and design of all marine operations will take into account the potential environmental sensitivities of the site and will be scheduled to avoid disturbance to wildlife where possible while recognising that environmental considerations have to be balanced with the health and safety considerations of working in a high energy tidal environment.

4.5.3 Turbine installation

The SRTT is specifically designed for simplified installation and maintenance due to the restrictions which high tidal velocities put on marine operations. The turbine has been designed to be installed using a small multi-cat workboat vessel eliminating the need for large and potentially expensive vessels such as jack-up barges, anchor handlers and dynamic positioning vessels. A summary and

example of a typical multi-cat workboat is provided in Table 4.2 and Figure 4.7. An example of the vessel towing the SR250 turbine is shown in Figure 4.8. The mooring turret system has been developed to simplify the connection/disconnection procedure as far as possible to minimise the time required on site.

Table 4.2 Main characteristics of multi-cat workboat

Parameter	Typical workboat dimensions
Length over all	24.0 meters
Beam	9.5 meters
Depth at sides	3.2 meters
Draught Aft (approx.)	2.0 meters
Displacement (approx.0	370 tonnes

Figure 4.7 Typical multi-cat workboat vessel

Installation of the SRTT devices will therefore involve towing them to site with the multi-cat vessel in transport/survivability mode. Once in position the mooring turret is connected to the turbine using

the system perfected at EMEC allowing installation to be undertaken in periods of slack tide. It is anticipated that the connection procedure for each device will take approximately 30 minutes.

Figure 4.8 Multi-cat workboat towing SR250 turbine

4.5.4 Onshore works

The construction of the substation building and cable landfall will be undertaken over as short a time period as possible, approximately 3-6 months and will be scheduled to take place out with the breeding season for onshore birds. Activities undertaken during this phase would include:

- Construction of access track and laydown areas;
- Construction of temporary hard standing and site facilities;
- Construction of electrical substation building and compound;
- Excavation of cable trench or directional drilling of cable route;
- Connection of cabling through substation to electrical grid; and
- Commissioning of site equipment.

4.6 Operations and maintenance

The SRTT is designed to DNV offshore standards[3] and has a 20-year design life therefore the operational life-span of the Lashy Sound Tidal Array is anticipated to be 20 years from commissioning.

The turbines are designed to withstand the extremes of 100 year wave and current loadings with the catenary type mooring system allowing the floating structure to respond to the dynamic wave and tidal environment rather than having to withstand sudden changes in loading. This philosophy of employing compliant structures has been used in the offshore industry for many years. In extreme weather the SRTT retracts its legs into survivability mode which makes the device extremely structurally efficient and dramatically reduces loadings. The control system automatically senses when conditions improve and deploys the rotor legs to begin generating again.

[3] DNV Offshore Service Specification DNV-OSS-312; Certification of tidal and wave energy converters, October 2008.

During the operational period of the tidal array, the turbines and ancillary equipment including the cable infrastructure and mooring systems will be inspected on a regular basis and remedial work carried out as necessary. It is anticipated that this work will fall into three categories:

- Periodic overhauls;
- Scheduled maintenance works; and
- Unscheduled maintained and repairs.

The design of the SRTT allows the devices to be serviced and maintained onsite or detached from the mooring turret and towed into harbour for more extensive maintenance. The low draft of the SRTT in 'transport' mode means that a number of local harbour facilities could be utilised for routine maintenance, see Section 4.9 below.

4.7 Decommissioning

A decommissioning programme for the Lashy Sound Tidal Array will be developed in consultation with DECC as required by Section 1.5 of the Energy Act 2004. The preference for the site is to consider repowering after the initial 20 years lease has elapsed. If however repowering is deemed unfeasible then the site would be decommissioned and returned to its original condition as follows:

- Removal of SRTT turbines: removal of the floating turbines to port facilities with the turbine structures being either reused/recycled or scrapped as appropriate;
- Removal of mooring system: the complete mooring system would be recovered using a suitably sized multi-cat work vessel. It is anticipated that the Option 1 concrete gravity anchors will be re-usable, however the turret, mooring lines and shackles are likely to be sold for scrap;
- Removal of cables: the method of dealing with the removal of cables would depend on how they were installed however it is anticipated that any scour protection and cabling would be removed from the site;
- Post decommissioning seabed monitoring to comply with licence conditions; and
- The electrical infrastructure from the onshore substation building will be removed and the building either offered for sale or dismantled as appropriate.

4.8 Waste management

SRTP will identify the best environmental option for re-use, recycling or disposal of all development components taking into account the latest waste management techniques and legislation six months prior to the start of decommissioning activities at the site.

A waste management plan will be developed prior to construction.

4.9 Port and maintenance facilities

The SRTT is designed with low transport draft and can be easily maintained in any harbour with over 6m depth and a suitable length of quayside. To date Hatston Pier in Kirkwall has been the main base for operations however it may also be possible to use Loth ferry terminal on Sanday for some smaller,

non-routine operations. Further consultation with Orkney Island Council Marine Services (Harbours Department) will be undertaken in relation to the project to determine the most suitable berthing facilities.

4.10 Navigational safety

A full NRA will be undertaken as described in Appendix B Preliminary Hazard Analysis. Lashy Sound is within the International Maritime Organisation (IMO) adopted "Area To Be Avoided" which requires all vessels over 5,000 Gross Tonnes (GT) carrying oil or other hazardous cargo to avoid the area designated. Use of the channel by other vessels will be investigated as part of the NRA.

SRTP will install appropriate marking on the device as recommended by the Northern Lighthouse Board (NLB) and Maritime and Coastguard Agency (MCA) and in compliance with IALA 0139 (International Association of Marine Aids to Navigation and Lighthouse Authorities). The topsides of the device will be painted yellow to ensure visibility to other sea users. The device will be lit to a standard pre-agreed with the NLB and will also carry an Automatic Identification System (AIS) and radar reflector.

A Notice to Mariners will be issued through the UK Hydrographic Office prior to the installation of any new moorings at the site. All vessels will comply with the International Regulations for Preventing Collisions at Sea (COLREGS) and display the appropriate lights and markings for a vessel restricted in her ability to manoeuvre.

4.11 Health and safety

The ongoing development of Health and Safety systems has been a priority for SRTP since its inception. Incremental development of Health and Safety systems have been undertaken through the SR250 and the SR2000 testing programmes at EMEC including fire safety, confirmed space training, man overboard training, remote gas detection and a full bilge system. Procedures for all marine operations such as mooring connection, towing procedure and manoeuvring while in harbour have all been developed with Health and Safety considerations at the fore.

4.12 Construction Environmental Management Plan

SRTP will develop a draft Construction Environmental Management Plan (CEMP), particularly for the onshore aspects, as part of the EIA process, which will be agreed with SNH and Marine Scotland and all other relevant stakeholders prior to ES submission.

5 Legislation and Key Policy Objectives

5.1 Renewable energy policy

The UK is a signatory to the EU Renewable Energy Directive, which includes a UK target of 15% of energy from renewable sources by 2020. 30% of this energy is expected to have to come from renewable electricity generation. Scotland's potential to produce marine renewable electricity is vast, with the total wave and tidal resource in Scotland estimated at 14 GW and 7.5 GW respectively (Scottish Government, Undated). In September 2008, the Scottish Government published its future approach to energy policy. This recognises that marine renewable energy has a part to play in future energy supply as part of its strategy to reduce greenhouse gases and tackle global warming.

In 2011, the Scottish Government raised its renewable energy target from 80% to 100% equivalent of Scottish electricity consumption to come from renewable energy sources by 2020[4]. Therefore with such ambitious electricity targets to be achieved from renewable energy sources and a considerable wave and tidal resource in Scotland, marine energy projects such as this have the potential to make a significant contribution and may be crucial to meeting the Government's renewable energy targets.

5.2 The Climate Change (Scotland) Act 2009

The Act introduced binding targets on the Scottish Government to reduce net Scottish greenhouse gas emissions by 80% by 2050 from 1990 levels; with an interim target of 42% by 2020. The Scottish Government's Renewables Action Plan, published in July 2009 and updated in March of 2011 as the Routemap for Renewable Energy in Scotland, reiterates the targets set in 2007[5]. Support for renewable energy developments, including tidal, is contained in National Planning Framework (NPF) 2 and Scottish Planning Policy (SPP).

The development and deployment of tidal energy devices will assist in achieving binding emissions reduction targets by providing a 'green' energy resource, reducing reliance on finite fossil fuels and ensuring Scotland and the UK meet international commitments to reduce greenhouse gases under the Kyoto Protocol.

5.3 Marine (Scotland) Act 2010

The Marine (Scotland) Act provides a framework for the sustainable management of Scotland's seas and one of its key aims is to streamline and simplify the licensing and consenting process for offshore renewable projects.

Projects have historically been required to seek licences and planning consent under several pieces of legislation before the development can proceed. However, with the introduction of the Act, co-

[4] The Scottish Government. *Renewables revolution aims for 100%*. Press release 18 May 2011. Available [online]: http://www.scotland.gov.uk/News/Releases/2011/05/18093247 (accessed January 2014)

[5] The Scottish Government (2011). 2020 Routemap for Renewable Energy in Scotland. Available [online]: http://www.scotland.gov.uk/Publications/2011/08/04110353/2 (accessed January 2014)

ordinated applications for planning consent and associated licenses (under the Electricity Act, the Coastal Protection Act, and the Food and Environment Protection Act) can now be made via a single point of contact, Marine Scotland Licensing Operations Team (MS-LOT), as part of a unified licensing and consenting process.

5.4 Marine planning policy

The Marine (Scotland) Act 2010 and the Marine and Coastal Access Act 2009 (MCAA) have introduced a marine planning regime for the UK marine area. The Scottish Government has responsibility for marine planning within both Scottish Territorial Waters (STW) (0 -12nm), and within the Scottish Renewable Energy Zone (REZ) (12 – 200nm).

In March 2011, the Scottish Government published a draft National Marine Plan which covers both STW and the Scottish REZ. The draft Plan is currently still in development, with the final Plan expected towards the end of 2014. The draft Plan identifies certain key objectives for management of the marine environment and in particular recognises the role offshore renewables could play in promoting economic growth and tackling climate change. The need for offshore renewables developments to be constructed and operated to minimise noise and collision risk to Best Available Technology Not Entailing Excessive Costs (BATNEEC) standards is also stated.

The Scottish Government's Strategic Environmental Assessment (SEA) on Marine Renewables in 2007 concluded that the deployment of new technology, particularly marine renewable devices, would carry a degree of uncertainty regarding potential associated environmental impacts. As a result, a risk-based 'Survey, Deploy and Monitor Policy' is being developed to enable efficient, sustainable deployment of wave and tidal energy devices.

Therefore, marine planning policy in UK waters will facilitate the integration of renewable energy developments within the marine environment. Currently, marine plans are still within draft formation but identify the key role offshore renewable energy will play in increasing economic growth and reducing the effects of climate change. Best Available Technologies will ensure that disturbance by noise and collision risk is minimised, however there still remains a level of uncertainty regarding associated environmental impacts and these are currently being addressed using a risk-based approach.

5.4.1 Marine spatial planning

Under the Marine (Scotland) Act 2010, new statutory marine planning systems were brought into place to manage conflicting demands in the Scottish marine environment. The establishment of Regional Marine Plans will enable planning decisions to be made at a local level. A pilot marine spatial plan for the Pentland Firth and Orkney Waters (PFOW) strategic area was undertaken given the potential resource of wave and tidal power, and outlined different uses in the PFOW area, how such activities may cause interaction and recommendations for avoiding conflict. Such planning systems will enable the integration of marine renewable energies into the marine environment, avoiding conflict where possible, and contributing towards Government targets to achieve 100% of Scottish electricity consumption from renewable energy sources.

Sectoral Marine Plans are in development alongside Regional Locational Guidance (RLG) to facilitate the development of offshore wind, wave and tidal energy in Scottish waters. These plans will explore how marine energy can contribute to meeting Government renewable electricity targets and in achieving a low carbon economy. The Tidal RLG contains information relating to future search areas for tidal energy, such as the PFOW which has been identified as having a significant energy resource, and considers the technical, environmental and socio-economic issues associated with the offshore renewable energy regions of Scotland.

5.4.2 Marine Protected Areas (MPAs)

Under the Marine (Scotland) Act 2010 the Scottish Government, through Marine Scotland, Scottish Natural Heritage (SNH), JNCC, Scottish Environment Protection Agency (SEPA) and Historic Scotland, have been tasked to designate particular features of conservation interest as Marine Protected Areas (MPAs) within Scottish territorial waters. These will include Nature Conservation MPAs, designated for nationally important marine wildlife, habitats, geology and undersea landforms; Demonstration/Research MPAs, to demonstrate or research sustainable methods of marine management or exploitation; and Historic MPAs for features of historic/cultural importance such as shipwrecks and submerged landscapes[6]. The Nature Conservation MPAs designated for habitats and species will together with existing Natura sites and other conservation designations form a network of MPAs. At present the MPA planning process is in a public consultation period, having being approved by Scottish Ministers and are currently referred to as 'possible' MPAs which have not yet been legally designated.

5.5 Terrestrial planning policy

The National Planning Framework (NPF) is prepared by the Scottish Government and subject to the approval of the Scottish Parliament. The NPF provides the long term strategy for development in Scotland over a 25 year period. The NPF provides an important context for renewable energy development and supporting electricity infrastructure.

The current NPF, NPF2, was published in June 2009. The National Planning Framework is supported and underpinned by the Scottish Planning Policy (SPP), Planning Advice Notes (PANs), and a number of Circulars. The consolidated SPP supersedes and replaces the SPPs and National Planning Policy Guidance (NPPG) series (including SPP 6 Renewable Energy). The new SPP includes policies on a range of topics, including renewable energy.

Development plans and statements of policy are a material consideration with regard to the authorisation of electricity generation schemes under Section 36 of the Electricity Act 1989. The draft National Marine Plan states that legislation is to be brought forward to ensure Marine Plans are a material consideration for land use planning decisions.

[6] JNCC (2014). Marine Protected Areas (MPAs) in Scotland's Seas. Available [online]: http://jncc.defra.gov.uk/page-5269 (accessed April 2014)

Therefore, the importance of marine renewable energy developments is of key consideration for terrestrial planning policy as well as marine. The Scottish planning policies incorporate renewable energy developments and are a key consideration for gaining electricity generation consents as well as assisting in the development of the onshore aspects of a marine development.

5.6 The Electricity Works (Environmental Impact Assessment) (Scotland) Regulations 2000

The Electricity Works Regulations implement the European EIA Directive (Council Directive 85/337/EEC as amended by Council Directive 97/11/EC, 2003/35/EC and 2009/31/EC) and outline the requirement for assessment of the effects of certain public and private projects on the environment. Such projects include the construction, extension and operation of a power station or overhead electricity lines under Sections 36 and 37 of the Electricity Act.

As the development is over 1 MW and requires Section 36 Consent, it is considered to be a Schedule 2 development under The Electricity Works (EIA) (Scotland) Regulations 2000; defined as:

> "a generating station, the construction of which (or the operation of which) will require a Section 36 consent but which is not a Schedule 1 development".

To ensure full compliance with the regulations, SRTP will undertake an Environmental Impact Assessment and produce an Environmental Statement (ES) to accompany its Section 36 Consent application.

Under Regulation 7, the developer (SRTP) is entitled to ask the Scottish Ministers, before submitting an application for a Section 36 consent under the Act, to state in writing their opinion as to the information to be provided in the ES (i.e. to provide a 'Scoping Opinion'). In accordance with Regulation 7, SRTP is requesting a formal scoping opinion and this report provides a summary of relevant information on the proposed development including:

- A plan which identifies the site which is the subject of the proposed development;
- A brief description of the nature and purpose of the proposed development and its possible effects on the environment; and
- Further information or representations the developer may wish to provide.

EIA regulations guidance states that the developer should also submit a draft outline of the ES giving an indication of what they consider to be the main issues.

Once they have all the information they require, the Scottish Ministers are required to consult and obtain the views of the Consultative Bodies (the Planning Authorities of the area in which the development is planned, Scottish Natural Heritage (SNH) and the Scottish Environment Protection Agency (SEPA), the developer and other organisations (as they see fit). When the Scottish Ministers issue a Scoping Opinion, they must state what information should be included in the ES, giving their reasons why.

5.7 The Marine Works (Environmental Impact Assessment) Regulations 2007

The Marine Works (Environmental Impact Assessment) Regulations 2007 (as amended) transpose some of the requirements of the EIA Directive 85/337/EC as amended in terms of Marine Licences. The EIA procedures apply to certain works undertaken in the marine environment including activities which require a marine licence under the Marine (Scotland) Act 2010. The Regulations apply to regulated activities including deposits in the sea, works to ensure navigational safety, and harbour works.

SRTP will consider the requirements of both the Marine Works Regulations and the Electricity Works Regulations in the development of the EIA and ES.

5.8 Consents and licensing

In order to permit the construction and operation of all components of the proposed tidal array, it is anticipated that the following consents and agreements may be required:

Section 36 (Electricity Act, 1989) Consent

Section 36 consent will be required for both phases of the project, the installation of inter-array cables and subsea cables to landfall area. The landfall area may be covered by either the Section 36 or the Town and Country Planning (Scotland) Act 1997.

Marine Licence (Marine (Scotland) Act 2010 Consent

Marine Licenses under Section 16 of the Marine (Scotland) Act 2010 Marine Licence (replacing Section 5 Part II of the Food and Environment Protection Act (FEPA), 1985 and Section 34 of Coast Protection Act, 1949) will be required for the marine project components up to the Mean High Water Spring tide zone (MHWS), as per Section 36 of the Electricity Act.

Planning permission under the Town and County Planning (Scotland) Act 1997

Planning permission will be required from Orkney Islands Council (OIC) through the Town and Country Planning (Scotland) Act 1997 for the onshore cable corridor, the substation and possibly the cable landfall area should it not be covered within the Section 36 consent.

The terrestrial planning application will cover project components in the terrestrial and intertidal zone down to the Mean Low Water Spring tide (MLWS), with associated overlap with the Section 36 and Marine Licence where applicable. It is expected that one of either Marine Scotland or OIC will take responsibility for the intertidal region of the application.

The Orkney Local Development Plan, adopted in April 2014, sets out the vision and strategy for the development of land in Orkney over the subsequent 10-20 years[7]. Determination of a development

[7] OIC (2014). Orkney Local Development Plan 2014

proposal will be made 'in accordance with the Plan unless material considerations indicate otherwise' under Section 25 of The Town and Country Planning (Scotland) Act 1997.

In principle, Policy SD6 of the Plan states that upgrades and infrastructure for marine renewable energy developments will be supported by OIC provided that an appropriate assessment is made and mitigation measures are put in place to ensure that the proposal does not have any significant effects[7]. Supplementary guidance is still to be developed by OIC[8] with regard to the appropriate location, siting and design considerations of onshore infrastructure requirements for marine renewables and will be reviewed during the EIA process when this information becomes available.

Pre Application Consultation (PAC)

Pre Application Consultation (PAC) is a statutory requirement under the Marine Licensing (Pre-Application Consultation) (Scotland) Regulations 2013 for the construction of a renewable energy structure in or over the sea or on or under the seabed, where the total area in which the structure is to be located exceeds 10,000 square metres[9]. Applicants must engage communities in advance of a formal application being made.

SRTP have carried out pre-scoping consultation and are continuing with ongoing consultation throughout the application process (See Section 12 Consultation).

Other licences

Other licences which will be required for planning consent include:

- Lease of the seabed from The Crown Estate;
- Wayleaves and leases for onshore infrastructure development areas;
- Appropriate Assessment, under The Conservation of Habitats and Species Regulations 2010 (as amended) and The Offshore Marine Conservation (Natural Habitats, &c.) Regulations 2007/1842 (as amended);
- Approval of a decommissioning programme under the Energy Act 2004;

The following licences may be required for planning consent:

- A Controlled Activities Regulations (CAR) Licence from Scottish Environment Protection Agency (SEPA) under Section 20 of the Water Environment and Water Services (Scotland) Act 2003 and Water Environment (Controlled Activities) (Scotland) Regulations 2005 for activities liable to pollute or significantly affect the water environment;
- Harbour Works Licences from Orkney Islands Council Marine Services. This may be required for works within the statutory Harbour Authority limits, and where authority has Works Licensing Powers (ability to regulate right of navigation and fishing within area);
- Licences to disturb protected species may be required including those for:

[8] OIC (2014). Newsletter: reviewing the Orkney Local Development Plan (February 2014). The Development Plan Scheme 2014

[9] Marine Scotland (2014). Guidance on Marine Licensable Activities subject to Pre-Application Consultation. The Scottish Government.

- species under the Wildlife and Countryside Act (1981) as amended and the Wildlife and Natural Environment (Scotland) Act 2011;
- European Protected Species (EPS) protected under Annex IV of the Habitats Directive;

A licence for cetaceans and basking sharks will be obtained from Marine Scotland if necessary. Licenses for otters or bats, if expected to occur within the terrestrial environment in the vicinity of the onshore activities, will be obtained from SNH; and the requirement for licenses for nesting birds, depending on the location and route of onshore workings will be assessed in consultation with SNH.

6 Potential Impacts on the Human Environment

This section considers the potential impacts of the proposals on the following receptors:

- Local communities and socio-economics;
- Commercial fisheries and aquaculture;
- Shipping and navigation;
- Land use;
- Landscape, seascape and visual amenity;
- Archaeology and cultural heritage;
- Recreation and tourism;
- Ports and harbours; and
- Other users.

An overview of the relevant baseline environment is provided for each potential receptor along with the anticipated impacts, a baseline characterisation strategy, impact assessment strategy and where applicable, possible mitigation and monitoring measures.

6.1 Local communities and socio-economics

This section discusses local communities and the socio-economics of the area and identifies potential interactions with the proposed development.

6.1.1 Baseline

Population

The population of Orkney is relatively stable with a slow increase in recent years. The population in 2002 was estimated at 19,210 increasing to an estimated 21,530 in 2012[10]. Approximately 80% of the population lives on the Orkney mainland and 20% on the other islands. The northern isles of Orkney are generally sparsely populated; the population of Eday, as published in the Scottish National Census Statistical Bulletin, has risen from 121 in 2001 to 160 in 2011, while the population of Sanday has also increased from 478 to 494 in the same period[11].

Employment

Orkney has a high rate of economic activity with figures for 2012 showing that approximately 86% of the working age population of Orkney are economically active; 10% more than in Scotland and the UK overall.[10] The main sectors of employment include public administration, education and health; primary industries such as farming and fishing; tourism; construction; transport and

[10] Orkney Island Council. 2013. Orkney Economic Review.

[11] National Records of Scotland. (2013). 2011 Census: First Results on Population and Household Estimates for Scotland - Release 1C (Part Two). Available [online]: http://www.scotlandscensus.gov.uk/documents/censusresults/release1c/rel1c2sb.pdf (accessed 17/06/14)

communications[12]. National statistics for 2012-13 indicate that Orkney has a considerable proportion of individuals in skilled trades compared to Scotland (17.2% compared to 11.1%)[13].

The Orkney economy has traditionally been reliant on agriculture and fisheries, while the past 20 years have seen a growth in other sectors including tourism and manufacturing and more recently renewables. Orkney Renewable Energy Forum (OREF) estimated that in 2013 over 250 jobs in Orkney were focussed on the development of marine renewable energy across a wide range of sectors including manufacturing and engineering, marine operations, and research and consultancy services[14].

Income

The Orkney Islands have seen the highest increase in Gross Disposable Household Income (GDHI) from 1997 to 2012 by 141%, compared to 75% in Scotland overall. Average GDHI per head in Orkney was £17,950 in 2012, approximately 10% above the national average and 7% above the UK average[15].

Education

Academic standards are above the national average and teacher/pupil ratios in Orkney are among the lowest in Scotland. Orkney also has amongst the highest proportion of school leavers going into higher and further education in Scotland. In addition to primary and secondary education facilities on the Orkney mainland, Eday and Sanday each have local community schools based on the islands. The Sanday community school is a Junior high school, providing education for pupils between 3 and 16 years of age, while the Eday community school provides primary education.

Orkney has further education facilities including Orkney College UHI, a partner college of the University of the Highlands and Islands which is based in Kirkwall and Heriot-Watt University has a campus based in Stromness, the International Centre for Island Technology (ICIT) which specialises in MSc courses and research in marine renewable energy.

Public services

Orkney enjoys high levels of public services, many of them provided and managed by Orkney Islands Council. Eday and Sanday are served with a daily inter-island ferry service from Kirkwall twice a day on average throughout the year.

---

[12] Highlands and Islands Enterprise (2011). Area profile for Orkney. Available [online] http://www.hie.co.uk/regional-information/area-information/orkney/economic-profile.html (accessed 17/06/14)

[13] NOMIS (2014). Official labour market statistics. Available [online] http://www.nomisweb.co.uk/reports/lmp/la/1946157427/report.aspx#tabempocc (accessed 17/06/14)

[14]Orkney Marine Renewables (2013). Orkney Marine Renewables Supply Chain Directory. Available [online] http://www.orkneymarinerenewables.com/userfiles/file/ENERGY-OF-ORKNEY-DIRECTORY.pdf (accessed 17/06/14)

[15] Scottish parliament Briefing Note (2014). Financial Scrutiny Unit Briefing Disposable Household Income in Scotland 2012. A briefing on the Office for National Statistics' publication Regional Household Income. Available [online]: http://www.scottish.parliament.uk/ResearchBriefingsAndFactsheets/S4/SB_14-48.pdf (accessed 03/07/14)

6.1.2 Potential impacts

Possible impacts along with the potential significance of effect on local communities are considered in the following table. Impacts on visual amenity are considered in Section 6.5 Landscape, seascape and visual amenity.

Potential impact	Phase	Potential significance	Comment
Local employment and business opportunities	All phases	Potential beneficial impact	SRTP will use local contractors where possible to ensure that opportunities for local supply chain involvement are maximised.
Pressure on utilities and services (transport, health services etc.)	All phases	Effect unlikely to be significant	An increase in population caused by an influx of workers associated with the project could lead to an increase in demand for services. Such an effect may be more pronounced on the smaller islands. However, a development of this scale is not expected to result in any significant impacts on utilities and services.
Visual impact from presence of devices and vessels	All phases	Potential significance of impact uncertain	Potential effects on local residents and visitors are addressed in Section 6.5 Landscape, seascape and visual amenity. This will be considered further during the EIA.
Changes to navigation	All phases	Potential significance of impact uncertain	Any impacts on local ferry routes may affect existing ferry services, island residents and businesses. Any possible effects will be fully considered during the EIA and NRA.

Please note that potential cumulative impacts are considered in Section 9 Cumulative and In-Combination Effects.

6.1.3 Baseline characterisation strategy

It is proposed that baseline conditions regarding local communities can be further defined to sufficient detail by obtaining data from the following sources:

Data sources:

- Labour market, economic activity, population, housing data and statistics: Orkney Islands Council; Highlands and Islands Enterprise; NOMIS official labour market statistics;
- Quality of life indicators - Scottish Neighbourhood Statistics;
- Enabling Actions Report: A socio-economic methodology and baseline for Pentland Firth and Orkney waters wave and tidal developments.

Fields surveys:

- None proposed.

Consultation:
The following stakeholders will be consulted with regards to local communities and socio-economics:

- Eday Community Council;
- Eday Partnership;
- Highlands and Island Enterprise;
- Kirkwall Community Council;
- Orkney Ferries;
- Orkney Islands Council;
- Northlink Ferries;
- Papa Westray Community Council;
- Sanday Community Council;
- Sanday Development Trust; and
- Westray Community Council.

6.1.4 Impact assessment strategy

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

Potential impact	Assessment topics and methodology
Local employment and business opportunities	The possible number and type of jobs created and support required at each stage of the proposed development will be defined. Opportunities for the local, regional and national supply chain will also be defined. Possible gaps in the local and regional workforce and supply chain will be identified and considered.
Visual impact from presence of devices and vessels	An SLVIA will be undertaken as described in Section 6.5 Landscape, seascape and visual amenity.
Changes to navigation	A Navigational Risk Assessment will be undertaken as described in the PHA (refer to Appendix B). Any potential impacts on local ferry services will be fully considered with regards to the possible effect on island residents and businesses. This will be informed by targeted consultation with key stakeholders (as listed above).

6.1.5 Possible mitigation and monitoring measures

The following possible mitigation and monitoring measures will be considered during the ongoing EIA and project development activities:

- Investigate measures which can help to facilitate local business involvement and employment opportunities and use local contractors and service providers where possible;
- Monitor the level and type of investment in infrastructure and facilities; and
- Ongoing consultation with Orkney Ferries will be undertaken to ensure that any potential effects on local ferry services are minimised as far as practically possible.

6.2 Commercial fisheries and aquaculture

The local commercial fishing industry is discussed in this section. The impacts to navigation with regards to fishing vessels are discussed in Section 6.3 Shipping and navigation and Appendix B Preliminary Hazard Analysis. Potential impacts on commercial fish and shellfish species are presented in Section 7.1 Seabed communities and 7.2 Fish ecology.

6.2.1 Baseline

Orkney fishery

Sea fishing from vessels is a long established and important commercial activity in Orkney which also has important social and cultural implications.

The number of active fishing vessels based in Orkney was 142 in 2012, which accounts for 7% of the Scottish fleet. The majority of active fishing vessels (102 of the 142 vessels) are 10m or under in overall length (72%), with 22% between 10m and 15m and 6% between 15m and 40m[16].

Shellfish accounted for the majority of landings in Orkney in 2012, at 3,440 tonnes with a value of £6,418,000, compared to 40 tonnes (at £52,000) and 13 tonnes (at £20,000) of demersal and pelagic species respectively. Of the 142 fishing vessels based in Orkney and overall 3,492 tonnes of fish landed, creel fishing represented almost 84% (119 vessels) of vessels and 87% (3024 tonnes) of landings in 2012 and is recognised as a nationally important industry[16]. The sector supports a range of associated activities including gear suppliers, marketing, processing, local tourism and restaurants.

The predominant fishery in Orkney is a mixed creel fishery in inshore waters targeting European lobster *Homarus gammarus*, brown crab *Cancer pagurus*, velvet crab *Necora puber* and to a lesser extent green crab *Carcinus maenas*. Some fishermen switch their efforts between species depending on the seasonal availability of stocks, market prices and weather conditions. The larger vivier vessels fish for brown crab all year round further offshore in the Papa Bank and Sule Skerry. The offshore area supports just a few demersal and pelagic trawling vessels, and whilst such vessels do operate within Orkney waters, the majority of catch is taken outside the area.

Scallop diving is also a significant local fishery in terms of landing value and the number of individuals employed. Hand diving for king scallops *Pecten maximus* may be carried out by least 10 vessels operating as scallop dive boats and will support numerous individual divers. Landings have increased year on year, more than doubling from 145 tonnes in 2008 to 316 tonnes in 2012[16]. Some of these

[16] Marine Scotland. (2013). Scottish Sea Fisheries Statistics 2012. The Scottish Government.

landings may be attributed to scallop dredgers or trawls of which there are at least six vessels operating in Orkney waters.

Given the nature of the Orkney inshore fishing fleet, it is suggested by fisheries representatives that individual vessels should be considered as standalone, functioning businesses. Fishermen in Orkney are largely engaged in well-established traditional practices, operating under long standing agreements relating to spatial management and organisation.

Lashy Sound

The proposed project lies in a region of strong, complex tidal currents with heavy tidal races in places. Within strong and moderate current swept areas the seabed is predominantly infralittoral rock and low energy areas of silted kelp on infralittoral rock (see Section 7.1 Seabed communities and Section 8.1 Physical processes for a description of seabed conditions). Water depths vary between 15m and 30m in the centre of the Sound.

Potters (creel boats) and stern trawlers have been recorded within Eday Sound and Lashy Sound by Marine Scotland surveillance sightings during 2005 – 2010 and represent the two most significant gear types used around the Orkney Islands[17].

Marine Scotland Analytical Unit provides landings data for species by ICES rectangle[18]. The offshore AoS and wider Lashy Sound lie within ICES rectangle 47E7 (Figure 6.1). The ICES rectangles cover an area of 0.5° latitude by 1° longitude (approximately 30 x 30 nautical miles), therefore only a small proportion of these species are likely to have been caught within the offshore AoS. Consultation with local fishermen and representatives is required to identify the type and level of fishing activity within the offshore AoS.

Shellfish species of which more than ten tonnes were landed in ICES 47E7 in any year within the last reported five years (2008-2012) are shown in

[17] ABPmer. (2012). Pentland Firth and Orkney Waters Enabling Actions Report: A socio-economic methodology and baseline for Pentland Firth and Orkney waters wave and tidal developments

[18] The International Council for the Exploration of the Sea (ICES) has developed a grid system derived from degrees latitude and longitude that divides the seas into statistical rectangles to make simplified analysis and visualisations of marine data.

Table 6.1[19]. Brown crab, velvet crab and scallops are the most significant species in terms of landings by live weight in this particular area of Orkney, indicating that creel fishing and scallop diving or dredging is likely to be predominant.

Commercial fisheries landings of demersal and pelagic fish species in ICES rectangle 47E7 are presented in Table 7.1 in Section 7.2 Fish ecology.

[19] Marine Scotland Science. (2013). Fishing Effort and Quantity and Value of Landings by ICES Rectangle. Available [Online]: http://www.scotland.gov.uk/Topics/Statistics/Browse/Agriculture-Fisheries/RectangleData (accessed 19/12/13)

Table 6.1 Commercial landings of shellfish in ICES 47E7

Shellfish (by live weight/tonnes) 2008 to 2012	2008	2009	2010	2011	2012
Brown/edible crab *Cancer pagurus*	220	271	336	413	381
Velvet swimming crab *Necora puber*	473	557	467	336	241
Scallops *Pecten maximus*	94	99	152	169	176
Green shore crab *Carcinus maenas*	64	81	68	67	60
European Lobster *Homarus gammarus*	41	54	47	54	38
Razor clam *Ensis spp.*	0	3	1	1	32
Periwinkles *Littorina spp.*	19	29	21	14	7
Whelk *Buccinum undatum*	9	40	0.4	0	0.1

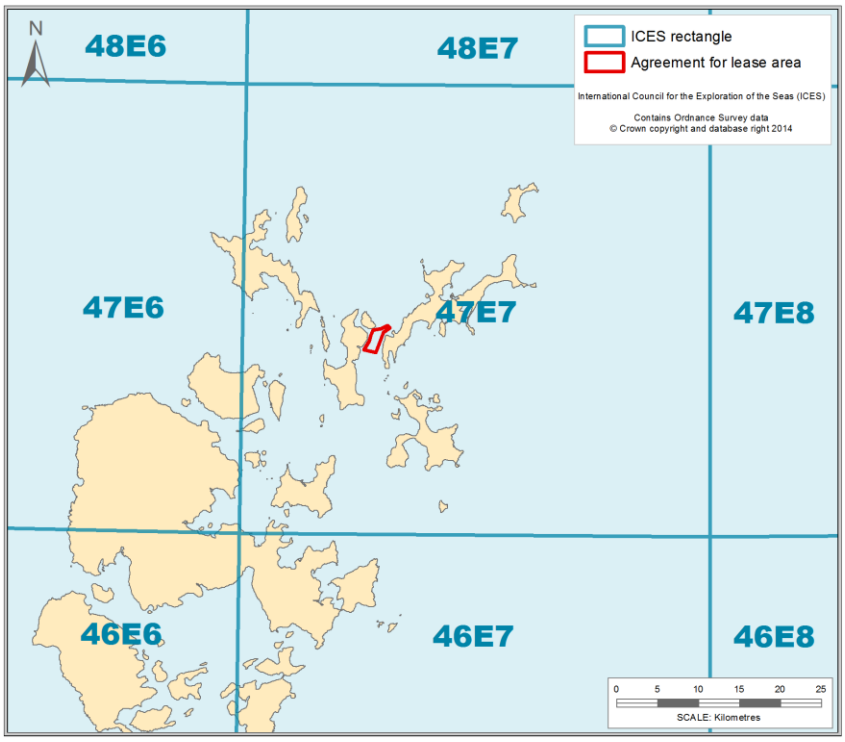

Figure 6.1 Offshore AoS position within ICES rectangle 47E7.

Creel fishery

Creel fishing activities are most likely to occur along the coastal fringes of the Eday Sound and Lashy Sound given the complex tidal conditions and the need for safe passage for other vessels navigating

through the area (see Section Shipping and navigation). However, velvet crab for example can be targeted within moderate tidal areas.

ScotMap[20] data, presented in Appendix A, shows that creel fishing occurs across much of the extent of Orkney's inshore waters and that the number of vessels fishing around Lashy sound is consistent with the wider area of the northern isles. ScotMap suggests that there may be between 11-15 vessels operating in the area, indicating a medium level of activity compared to the high intensity identified between Rousay and the mainland (Figure 1 in Appendix A). The value of this fishing area is indicated by ScotMap to be relatively high and consistent with the wider Orkney waters (Figure 2 in Appendix A).

Scallop diving

Scallop diving is likely to occur in shallower waters, utilising the near shore areas of Lashy Sound. ScotMap indicates that 6-10 vessels may operate in the Sound, representing a medium level of activity within the context of the wider Orkney waters (Figure 3 in Appendix A). The area has a potentially high monetary value per vessel given that each vessel is likely to involve numerous individual divers and the high value per kilo of product (Figure 4 in Appendix A). It is not clear whether divers utilise the offshore AoS although the tidal flow may be too strong for diving in this area of Lashy Sound. There is potential for the cable landfall area of search and chosen route of subsea cables from the devices to landfall to interact with scallop diving sites. This potential impact will be considered during the EIA and clarification of the use of the area by scallop divers will be determined through stakeholder.

Scallop dredging

Scallop dredging or trawling is expected to occur in deeper waters and will target particular substrates suitable for scallops and the use of gears. ScotMap indicates that 1 - 3 vessels may operate to the north of Lashy Sound (Figure 5 in Appendix A). The majority of dredging activity appears to be concentrated to the south east of Orkney. The value of the north of Lashy Sound for scallop dredging is relatively low compared to the significant value from the north east to the south east coast of Orkney waters (Figure 6 in Appendix A).

The results of the ScotMap data will be reviewed through stakeholder consultation to ensure fishing activity data are current and relevant to the offshore AoS area and associated project boundaries.

Aquaculture

There are no aquaculture sites within or directly adjacent to the offshore AoS. The nearest development is a salmon farm, approximately 10km south of the offshore AoS area in the Bay of Backaland in the Eday Sound which is operated by Scottish Sea Farms Ltd (SSF). SSF are currently submitting an application for an extension to the existing site which would increase the extent of its footprint further northwards.

[20] Interview-based inshore fisheries mapping study to identify fishing activity and economic value for local vessels <15m overall length to inform Marine Spatial Planning.

Existing pressures on commercial fishing in Orkney

In recent years, there has been increased pressure in terms of disruption to activities and competition for sea space upon the local indigenous inshore fishing industry in Orkney from other sea users including aquaculture companies, marine renewable energy developers, cable laying and seaweed harvesting.

6.2.2 Potential impacts

Possible impacts along with the potential significance on commercial fisheries are considered in the following table.

Potential impact	Phase	Potential significance	Comment
Loss of access to fishing grounds.	All phases	Potential significance of impact uncertain	Current distribution of existing fishing activity may be affected by the proposed development. Disturbance to existing fishing activity also may occur during cable installation. This will be considered further during the EIA.
Increased pressure on other fishing grounds resulting from any displacement of existing fishing activity.	All phases	Potential significance of impact uncertain	Any displacement of existing fishing activity from the area may result in increased pressure on other existing grounds; affecting those fishing locally and in other areas. This has the potential to impact existing local fishing management practices and relationships between existing sea users. This will be considered further during the EIA.
Obstruction of regular fishing vessel transit routes.	All phases	Potential significance of impact uncertain	The development may result in changes to local navigation and transit routes for fishing vessels. This will be considered further during the EIA.
Change in abundance or distribution of targeted species.	Construction and Operation	Potential significance of impact uncertain	The addition of new structures at the seabed may provide suitable shelter and habitat for some commercial species, increasing abundance. Disturbance to some fish species may occur during construction and operation. This is further considered in

Potential impact	Phase	Potential significance	Comment
			7.1 Seabed communities and 7.2 Fish ecology.
Potential impacts on shore-based industries dependent on commercial fishing in Orkney.	Construction and Operation	Potential significance of impact uncertain	Possible impacts on dependent shore based industries (i.e. processors) will be considered in the EIA.
Change in water flow or quality at aquaculture sites.	Construction, Operation and Decommissioning	Effect unlikely to be significant	No existing sites are located within 10km of the offshore AoS. However SRTP will continue to liaise with local operators throughout the project to ensure no issues arise.

Please note that potential cumulative impacts are considered in Section 9 Cumulative and In-Combination Effects.

6.2.3 Baseline characterisation strategy

It is proposed that baseline conditions regarding commercial fisheries can be further defined to sufficient detail by obtaining the following data:

Data sources:

- Information through consultation with local fishermen, their organisations and representatives;
- Marine Scotland Compliance - VMS data detailing vessel type, location and speed (vessels > 15m);
- NRA vessel traffic survey (AIS) identifying fishing vessels and transit routes;
- Marine Scotland ScotMap study to provide an overview of activity and economic value (vessels < 15m) in an Orkney-wide context;
- Benthic ecology seabed survey data; and
- The Crown Estate Succorfish Shellfish Project data to identify geographical footprint of vessels under 10m in the Pentland Firth and Orkney Waters[21].

Note: should any baseline surveys that may displace existing fishing activity be required during the EIA and site design process, SRTP would seek to work with the Memorandum of Cooperation which has been developed by Orkney Fisheries Association.

Field surveys:

[21] The Crown Estate and Orkney Sustainable Fisheries project to capture fishing activity of PFOW fleet in terms of vessel location and speed (a voluntary project capturing up to 20 vessels in the region).

- None proposed.

Consultation:

- Fisheries mapping in consultation with local fishermen and representatives to identify commercially important and sensitive areas specific to the proposed project development area.
- The following stakeholders will be consulted with regards to commercial fisheries and aquaculture:
    - Association of Salmon Fishery Boards/District Salmon Fishery Board;
    - Marine Scotland Science;
    - Orkney Fisheries Association;
    - Orkney Fisherman's Society Limited;
    - Orkney Inshore Fisheries Group;
    - Orkney Islands Sea Angling Association;
    - Orkney Skate Trust;
    - Orkney Sustainable Fisheries (OSF);
    - Orkney Trout Fishing Association;
    - Rivers and Fisheries Trusts of Scotland (RAFTS);
    - Scottish Fisherman's Federation;
    - Scottish Fishermen's Organisation;
    - Scottish Anglers National Association;
    - Scottish Pelagic Fisherman's Association Ltd;
    - Scottish Salmon Producers Association;
    - Scottish Sea Farms Ltd;
    - Scottish White Fish Producers Association;
    - Sea Fish Industry Authority (Seafish).

6.2.4 Impact assessment strategy

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

Potential impact	Assessment topics and methodology
Loss of access to fishing grounds.	Local consultation to: • Identify fishing grounds which overlap with offshore AoS; • Determine the relative economic and social value of offshore AoS; and • Identify the availability and use of alternative suitable fishing grounds.

Potential impact	Assessment topics and methodology
Increased pressure on other fishing grounds resulting from any displacement of existing fishing activity.	A displacement study will be undertaken. The scope of this study will be developed in consultation with Marine Scotland and relevant stakeholders. This study will include consideration of in-combination and cumulative effects in reduction of fishing grounds as a result of other proposed developments and existing pressures as appropriate. The scope of such a study will be dependent upon the degree of activity in the area and will be proportionate to the proposals of the project. Application of redistributed effort models developed by Professor J. Side of ICIT, Heriot-Watt University may be used to facilitate this process.
Obstruction of regular fishing vessel transit routes.	Transit routes in terms of navigational hazards will be considered in the NRA process and the potential economic impact of obstructed transit routes will be considered through consultation with local industry. See Appendix B Preliminary Hazard Analysis.
Change in abundance or distribution of targeted species	Habitat creation and population enhancement opportunities: • Consider design options available for structures and materials which could promote enhancement; and • Liaise with local experts in shellfish behaviour and attributes of artificial habitats. Detailed impacts on the abundance of target species are discussed in Section 7.1 Seabed communities and 7.2 Fish ecology.
Potential impacts on shore-based industries dependent on commercial fishing in Orkney	Through consultation, an assessment of the potential direct, cumulative and in-combination impacts on dependent shore based industries will be undertaken. This will follow on from the fishing displacement study. The scope of such a study will be proportionate to the proposals.

6.2.5 Possible mitigation and monitoring measures

The following possible mitigation and monitoring measures will be considered during ongoing EIA and project development activities:

Loss of access to fishing grounds:

- Liaison with local fishing associations, fishermen's organisations and fishermen prior to establishing a deployment plan to reach the best possible solutions for all stakeholders, collating the best available information with regard to fishing activities and possible interactions with the proposed development; and
- Post-deployment monitoring through liaison with local fishing associations and fishermen to quantify the extent of any effects which may be linked to the development.

Increased pressure on other fishing grounds resulting from any displacement of existing fishing activity:

- Liaison with local fishing associations and fishermen prior to establishing a deployment plan to reach the best possible solutions for all stakeholders, collating the best available information with regard to fishing activities and possible interactions with the proposed development.

Obstruction of regular fishing transit routes:

- Evaluate options to minimise disruption through ongoing consultation with fishing associations and local fishermen through the NRA process.

Change in abundance of target species:

- Liaise with local experts on potential future/ongoing studies in regard to habitat creation and associated changes in abundance which may also be incorporated into a post-deployment monitoring strategy.

6.3 Shipping and navigation

This section discusses shipping and navigation. A Preliminary Hazard Analysis (PHA) has been completed and is presented in Appendix B.

Non-navigational impacts for commercial fisheries, recreation and tourism receptors in relation to the offshore area are discussed in Section 6.2 Commercial fisheries and aquaculture and 6.7 Recreation and tourism. Impacts relating to ports and harbours are presented in Section 6.8 Ports and harbours.

Full details of shipping movements within the offshore AoS and adjacent waters are presented in the PHA in Appendix B.

6.3.1 Baseline

AIS data

Twelve month AIS data analysis (December 2012 to November 2013) indicates that approximately 0.05 - 0.5 vessels per day pass through the AfL area. The data confirms that few vessels (carrying AIS) pass through Lashy Sound and Calf Sound. A total of 13 different vessels were observed making a total of 48 transits of the area, equivalent to approximately one vessel transit per week over a one year period.

A total of three cargo vessels, *Burhoui*, *Gripfisk Helliar* and *Ronja Skye* were observed making a total of 26 transits. *Helliar* (a NorthLink cargo ferry) is the largest vessel recorded at 122m length and 5.5m draught and would be passing between Lerwick and Kirkwall. Ronja Skye was the most frequent visitor, on 16 occasions, carrying fish from aquaculture sites for processing, probably between Shetland and Orkney or the West Coast.

The 12 month AIS survey observed Orkney Ferries vessels *Varagen*, *Earl Thorfinn* and *Earl Sigurd* making a total of 16 transits through the AfL. In addition, the passenger ship *Hebridean Princess*, a small cruise ship frequently seen in PFOW made a single transit of the AfL in the 12 month period.

VMS

VMS data from Marine Scotland Compliance are available for fishing vessels greater than 15m overall length. In 2012 the requirement for VMS extended to cover vessels greater than 12m overall length, however the percentage of Scottish-registered vessels between 12-15m fitted with VMS was approximately 18% in September 2013 and 71% mid-2014[22]. VMS data for 2013 identify 16 vessel sightings which include eight where the vessel is probably fishing, three where it may be fishing and five where the vessel is travelling > 6 knots. The level of activity involving vessels greater than 15m and potentially a small proportion of 12-15m overall length in and around the AfL area is relatively low in comparison to the wider PFOW area.

ScotMap

Vessels <15m overall length have not been required to use VMS with the exception of vessels >12m overall length since 2013. ScotMap[23] indicates that approximately 11-15 creel vessels and 6-10 scallop dive boat vessels may utilise the offshore AoS. Between one and three scallop dredgers may utilise the northern edge of the AfL area (see Appendix A ScotMap - Inshore Fisheries Mapping Study).

Recreational vessels

The 12 month AIS survey noted a single sailing vessel passing through the AfL, the James Cook, which is an Ocean Youth Trust North sail training vessel. In general however, relatively few sailing and recreational vessels carry AIS and information on their movements must be gathered from other sources. The RYA Coastal Atlas indicates Lashy Sound and Calf Sound as a 'light use' routes. As the RYA notes, the routes shown are indicative only and not precise and traffic is affected by seasonality and weather[24].

Consultation

As part of the written response to the Lashy Sound Project Briefing Document, OICMS (Orkney Ferries) had noted that Lashy Sound and Calf Sound were used as bad weather alternatives to the usual routes running from Loth Harbour. A further consultation meeting was held with Orkney Ferries where senior personnel explained the nature of the bad weather routing. Essentially, ferries on the Kirkwall-Westray route may use Lashy Sound/Calf Sound to shelter from strong westerly weather. Ferries from Sanday/Eday/Stronsay to Kirkwall may occasionally head north through Calf Sound and then pass southwards down the west side of Eday to shelter from heavy weather from the south east.

In addition, Orkney Ferries noted that in early 2014, during a prolonged period of strong winds from the south east, the NorthLink passenger ferry from Lerwick to Kirkwall (Hatston) had transited Lashy Sound on one occasion. Similarly, NorthLink cargo vessels also use the route for shelter from severe south easterly weather.

---

[22] Fisheries Monitoring Centre Manager, Marine Scotland Compliance (personal communication, 15 July 2014)

[23] Interview-based inshore fisheries mapping study to identify fishing activity and economic value for local vessels <15m overall length to inform Marine Spatial Planning.

[24] RYA (2009). Royal Yacht Association. UK Coastal Atlas of Recreational Boating, Recreational Cruising Routes, Sailing and Racing Areas around the UK Coast. 2nd Edition, 2009.

6.3.2 Potential impacts

Possible impacts along with the potential significance of effect on shipping and navigation are considered in the following table.

Potential impact	Phase	Potential significance	Comment
Disruption to navigation created by presence of devices and any 'area to be avoided'.	Operation	Potential significance of impact uncertain	Surface piercing structures will present navigational hazard and will be addressed in the NRA and EIA.
Disruption to navigation created by presence of support vessels and any safety zone required.	Construction, Maintenance and Decommissioning	Potential significance of impact uncertain	Support vessels required during installation, maintenance and decommissioning will present additional, although temporary obstacles to navigation and will be addressed in the NRA and EIA.
Loss of or change to traditional navigation routes.	Operation	Potential significance of impact uncertain	Any potential changes to navigational routes will require consultation and consideration as part of the NRA and EIA.

Please note that potential cumulative impacts are considered in Section 9 Cumulative and In-Combination Effects.

6.3.3 Baseline characterisation strategy

It is proposed that baseline conditions regarding shipping and navigation can be further defined to sufficient detail be obtaining data from the following sources. For additional baseline characterisation measures, refer to the PHA in Appendix….

Data sources:

- Vessel Traffic Survey – AIS, VMS;
- Fishing vessel movements – Crown Estate (Succorfish study);
- ScotMap;
- RYA Coastal Atlas;
- Admiralty Charts;
- Admiralty Sailing Directions.

Consultation:

The following stakeholders will be consulted with regards to shipping and navigation:

- Fisheries associations and organisations including:

- Orkney Fisheries Association;
- Scottish
- Fishermen's Federation;
- Orkney Fishermen's Society Limited;
- Orkney Inshore Fisheries Group;

- Local fishermen;
- Local Sailing Clubs;
- Northern Lighthouse Board
- Orkney Harbours (Marine Services);
- Royal National Lifeboat Institution (RNLI); and
- RYA.

6.3.4 Impact assessment strategy

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

Potential impact	Assessment topics and methodology
Disruption to navigation created by presence of devices and any 'area to be avoided'.	A full Navigational Risk Assessment will be carried out in consultation with appropriate stakeholders. Details of a proposed NRA methodology are discussed in Appendix B PHA. Consultation with fisheries organisations and ferry operators will be a key aspect of the NRA.
Disruption to navigation created by presence of support vessels and any safety zone required.	
Loss of or change to traditional navigation routes.	

6.3.5 Possible mitigation and monitoring measures

Possible mitigation and monitoring measures will be considered during ongoing EIA and project development activities and through the NRA process.

6.4 Land use

6.4.1 Baseline

The majority of land on the island of Eday is used or has historically been used for grazing. Eday is predominantly covered in improved grassland and heather moorland through the centre of the island, interspersed with patches of blanket bog and peatland basins. Parts of the north coast host maritime grasslands and heath. The east coast heading south is covered with inclined coastal pastures, gentle sloping bays to lowland island pastures with farmland and estates of improved grassland, rough

grazing and machair. The onshore area of search encompasses areas of improved grassland and heather moorland (Figure 6.2), where some areas partially overlap with local nature conservation sites (LNCS) (discussed in Section 7.5 Coastal and terrestrial communities) and others may be utilised for livestock.

The population of Eday was 160 in 2011[25] and the urban extent is therefore limited on the island. Residential properties are distributed across much of the island with most concentrated in the north and south, along the coast and by the main road network running from north to south through the island. London Airport is situated at the centre of the island at the Bay of London which connects the island with mainland Orkney. The ferry terminal is based to the south of the island at the Bay of Backaland. Backaland pier is described further in Section 6.8 Ports and harbours.

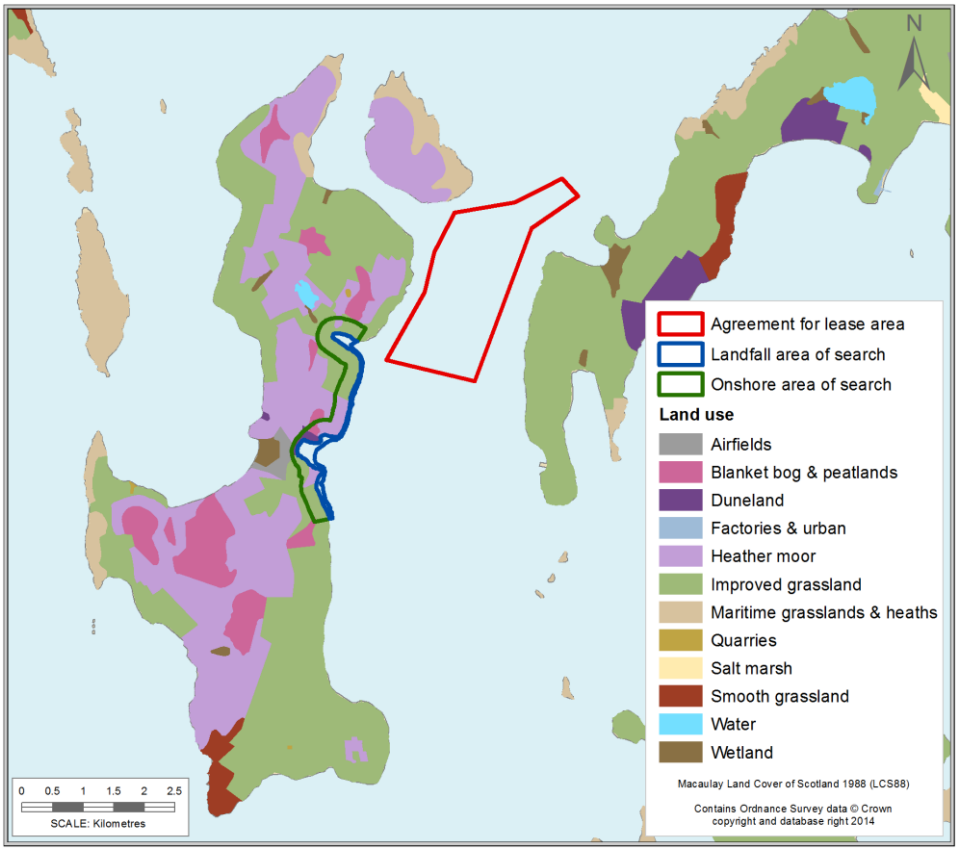

Figure 6.2 Land use types in onshore Area of Search

[25] National Records of Scotland. (2013). 2011 Census: First Results on Population and Household Estimates for Scotland - Release 1C (Part Two). Available [online]: http://www.scotlandscensus.gov.uk/documents/censusresults/release1c/rel1c2sb.pdf (accessed 17/06/14)

Traffic and transport

The existing onshore transport infrastructure is considered in terms of access routes for materials and personnel to the project site as well as the potential receptors for impacts to the existing network.

There are no trunk roads on Orkney, however the mainland has several A-roads connecting the main towns and villages of the county, with many B-roads and unclassified roads branching to connect smaller settlements and dwellings to the network. Eday has one B-road (B9063), two C-roads and numerous unclassified roads. The A965 is a key transit route for plant and heavy goods vehicles transiting from ports in Hatston and Kirkwall to connect with inter-island ferries. The B9063 on Eday connects the ferry terminal with the onshore Area of Search. The use of unclassified roads may be necessary for the installation of onshore cables associated with the project.

It is not expected that there will be significant existing traffic on the island of Eday given its relatively low population. Most traffic is likely to be local residential and agricultural; there is no public transport service on the island. Small peaks in traffic would be expected around ferry arrival and departure times, particularly during peak tourist season.

It is anticipated that the majority of materials for the project will be transported to the project site via sea and that the use of road networks will therefore be minimal.

6.4.2 Potential impacts

Possible impacts along with the potential significance of effect on land use are considered in the following table.

Potential impact	Phase	Potential significance	Comment
Disturbance or obstruction to land use from construction activities and presence of onshore cable route and substation	Construction and Operation	Potential significance of impact uncertain	Selection of onshore cable route and location of substation will consider land use options and sensitive areas however the onshore development footprint is expected to be limited in scale. Cable routes may also depend on future availability and location of grid connection. This will be considered further during the EIA.
Temporary increase in traffic	Construction	Effect unlikely to be significant	Onshore construction activities will be very limited in scale and duration. The majority of materials are likely to be transported via sea.

Potential impact	Phase	Potential significance	Comment
Grid connection route crossing roads	Construction	Effect unlikely to be significant	The onshore cables will potentially cross some roads. Above ground lines will cause little or no disruption to normal conditions, other than temporary disturbance during construction.
Movement of abnormal (cable drums, transformers etc.) and heavy loads	Construction	Effect unlikely to be significant	Movement of abnormal loads may require Special Order authorisation under Section 44, 1988 Road Traffic Act, however the majority of transportation will be by sea rather than by land.

Please note that potential cumulative impacts are considered in Section 9 Cumulative and In-Combination Effects.

6.4.3 Baseline characterisation strategy

It is proposed that the baseline conditions regarding land use can be further defined to sufficient detail by obtaining data from the following sources:

Data Sources:

- OIC Local Plan;
- Ordnance Survey and GIS mapping

Field surveys:

- Field survey to identify detailed distribution of land use activities and ownership

Consultation:

The following stakeholders will be consulted with regards to land use:

- BT
- Eday Community Council;
- Local residents and businesses;
- OIC Engineering Division;
- OIC Planning ;
- Scottish Water;
- SHEPD; and
- SHETL.

6.4.4 Impact assessment strategy

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

Potential interactions	Assessment topics and methodology
Disturbance or obstruction to land use from construction activities and presence of onshore cable route and substation	Assessment of potential access routes, noise, lighting and any other activities associated with the development which could affect baseline land use.

6.4.5 Possible mitigation and monitoring measures

The following possible mitigation and monitoring measures will be considered during ongoing EIA and project development activities:

- Employment of a land agent who will seek to secure appropriate landowner agreements to permit construction of the grid connection.

6.5 Landscape, seascape and visual amenity

This section discusses the proposed development in terms of landscape, seascape and visual amenity. Cultural heritage also form an important aspect of the landscape context in terms of the setting of archaeological features within the wider landscape. Potential impacts on the setting of cultural heritage assets and features are discussed further in Section 6.6 Archaeology and cultural heritage.

Consideration of seascape and visual amenity is equally important on Sanday as it is on Eday with respect of the design and setting of the tidal array in the offshore AoS.

6.5.1 Baseline

Orkney

The traditional way of life and quality of life in Orkney is intrinsically linked to coast and sea. The Orkney archipelago of around 70 islands generally consists of low lying coasts with open flat pastures. The seascape character of the east of Orkney is characterised as Deposition Coasts of Islands. The

islands have a strong rural character and although modified by agriculture, farming across the region is perceived as being traditional and non-intensive[26].

Study area

The Study Area (Figure 6.3) includes the geographical boundaries of the project and an additional provisional 10km radius[27] from the boundary of the AfL area. A precise Zone of Theoretical Visibility (ZTV) will be established through scoping and during the EIA.

The island of Eday has a seascape characterised as an 'inter-island associated with outer island chains' and has an 'open character with strong horizontal form'[28]. Such areas are characterised as low lying land masses with a submerged quality associated with the relationship between neighbouring land mass, interspersed by sea which create a seascape with a large, flat scale. The landscape character of Eday is mostly of moorland hills with inclined coastal pastures and coastal or peatland basins, is very rural in character and largely unsettled. The few settlements on the island are spread throughout the island, although mostly concentrated along the coast and to the north and south with individual dwellings and farming settlements. There are numerous archaeological features across the island in the form of chambered cairns, standing stones, burnt mounds and other archaeological remains of settlements since the early prehistoric period, mostly concentrated to the northern part of the island.

On Sanday, the north and north western coast closest to the offshore AoS is characterised as a 'low lying agricultural coastal fringe' and to the south west, an 'inter-island associated with outer island chains' and is comprised of landscapes of low and undulating island pastures and coastal sand landscapes[28].

The experience qualities of the landscape of Eday and the seascape character of Eday and Sanday are expressed as remote, exposed and unique.

The types and distribution of land use are discussed in Section 6.3 Land Use and important cultural and archaeological features of interest which influence the character of the island are discussed in Section 6.6 Archaeology and Cultural Heritage.

Designated landscapes

There are no national landscape designations within the Study Area. Local Landscape Areas (LLAs) are areas of land and water that are recognised as having high landscape value and are designated by Local Authorities as part of Local Development Plans. LLAs include Areas of Great Landscape Value (AGLV), Sites of Local Landscape Character and Areas of Attractive Settled Landscape Areas. Supplementary Guidance on LLAs is currently in development as part of the Orkney Local Development Plan[29] and will be reviewed during the EIA process when the information becomes available.

---

[26] Scott, K.E., Anderson, C., Dunsford, H., Benson, J.F. and MacFarlane, R. (2005). An assessment of the sensitivity and capacity of the Scottish seascape in relation to offshore windfarms. Scottish Natural Heritage Commissioned Report No.103

[27] 10km radius as a precautionary boundary however likely to be significantly shorter given nature of the proposed project and setting of tidal devices. Scottish Natural Heritage (2006) Visual Representation of Wind Farms Good Practice Guidance suggests 30km for wind turbines.

[28] Land Use Consultants (1998). Orkney landscape character assessment. Scottish Natural Heritage Review No 100.

[29] OIC (2014). Newsletter: reviewing the Orkney Local Development Plan (February 2014). The Development Plan Scheme 2014.

Visual amenity

The Study Area for visual amenity can be defined by the area in which the development will be visible (indicated by a preliminary 10km buffer), the different groups of people who may experience views within that area and the nature of those views. The most likely to be impacted are those people living within sight of the development, but people visiting, moving through and spending recreational time in the area should also be identified as key visual receptors.

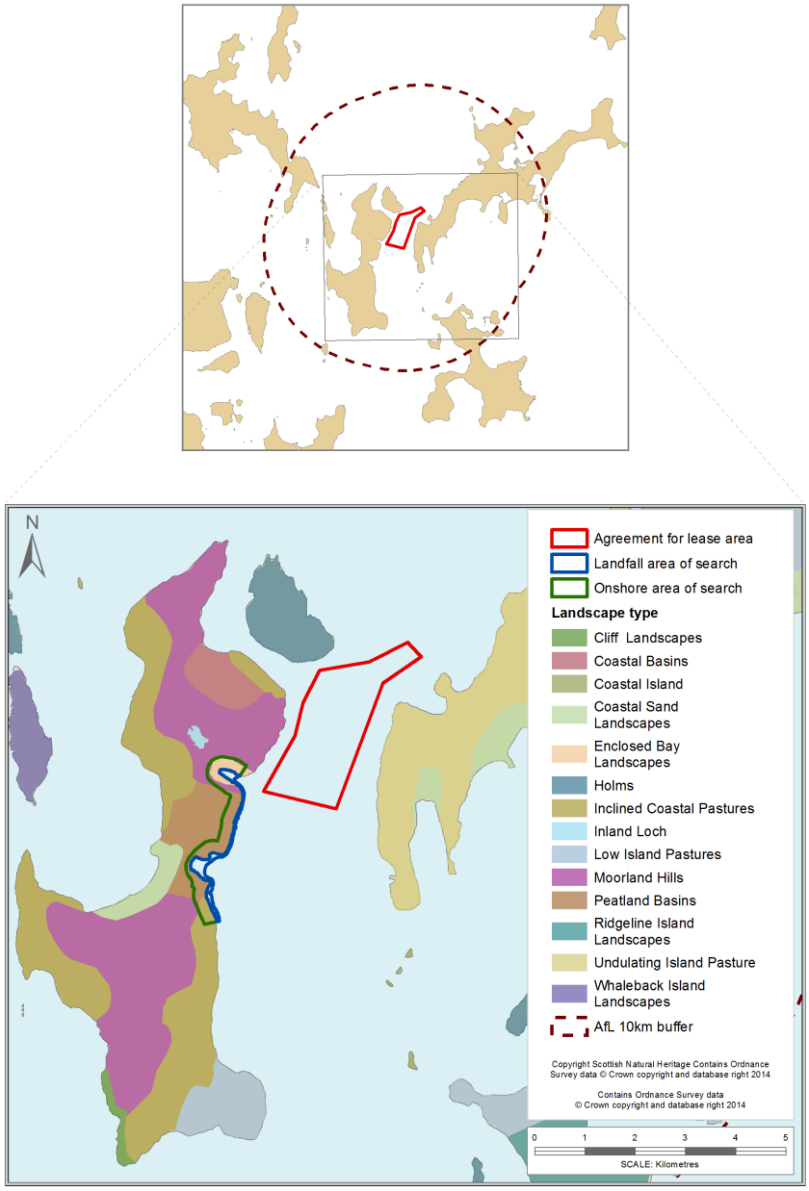

Figure 6.3 Landscape types in relation to the AfL area

Visual amenity

The Study Area for visual amenity can be defined by the area in which the development will be visible (indicated by a preliminary 10km buffer), the different groups of people who may experience views within that area and the nature of those views. The most likely to be impacted are those people living within sight of the development, but people visiting, moving through and spending recreational time in the area should also be identified as key visual receptors.

6.5.2 Potential impacts

Possible impacts along with the potential significance of effect on landscape and seascape are considered in the following table.

Potential impact	Phase	Potential significance	Comment
Changes to landscape character	All phases	Potential significance of impact uncertain	Dependent on sensitivity of landscape and magnitude of change in terms of onshore substation and alterations to landforms as a result of excavation or surface preparation. This will be considered further during the EIA.
Changes to seascape character	All phases	Potential significance of impact uncertain	Dependent on sensitivity of seascape and magnitude of change in terms of surface piercing structures, navigational lighting and temporary increase in vessel traffic. This will be considered further during the EIA.
Changes to visual amenity	All phases	Potential significance of impact uncertain	Dependent on the sensitivity of visual receptors to change and the value attached to views experienced by receptors, the magnitude of change and consequence and significance of effect. This will be considered further during the EIA.

Please note that potential cumulative impacts are considered in Section 9 Cumulative and In-Combination Effects.

6.5.3 Baseline characterisation strategy

It is proposed that baseline conditions regarding landscape and seascape can be further defined to sufficient detail by obtaining data from the following sources:

Data sources:

- Seascape character types: An assessment of the sensitivity and capacity of the Scottish seascape in relation to wind farms. SNH Commissioned Report No. 103 (2005);
- Coastal Character Areas (CCAs): Landscape/seascape carrying capacity for aquaculture. SNH Commissioned Report No. 215 (2007);
- Landscape character types: Land Use Consultants 1998, Orkney Landscape Character Assessment. SNH Review No. 100; and
- Orkney Local Development Plan 2014 and Supplementary Guidance (when available).

Field surveys:

- Seascape Landscape and Visual Impact Assessment (SLVIA).

Consultation:

The following stakeholders will be consulted with regards to landscape, seascape and visual amenity:

- Eday Community Council;
- Eday Partnership;
- OIC Planning Department;
- Sanday Community Council;
- Sanday Development Trust; and
- SNH.

6.5.4 Impact assessment strategy

It is proposed that the impact assessment strategy, outlined in the following table, is applied to address the potentially significant impacts identified and those impacts for which the potential significance is uncertain.

Potential impact	Assessment topics and methodology
Changes to landscape character	An SLVIA will be carried out and will consider alternative sites and designs where feasible. To do this, the Rochdale envelope approach will be implemented, defining a maximum turbine and array size and considering several options, only one of which will be assessed by the SLVIA: • Viewpoints identified by a landscape architect in consultation with SNH and OIC; • Establish baseline, identify coastal character areas; • Establish Zones of Theoretical Visibility (ZTV); • Carry out survey to define character types and sensitivities; • Determine how technology requirements will affect baseline character and the impacts on character, scenery/views; • Consider physical form of development - layout and design options and requirements;
Changes to seascape character	
Changes to visual amenity	
Cumulative impact with other marine renewable developments	

Potential impact	Assessment topics and methodology
	• Assess residual impacts on seascape, landscape and visual amenity and magnitude of change; • Consider cumulative effects in relation to other proposed developments as part of SLVIA. Key guidance documents include: • Offshore renewables – guidance on assessing the impact on coastal landscape and seascape[30] • Guidelines for landscape and visual assessment 3rd edition[31]

6.5.5 Possible mitigation and monitoring measures

The following possible mitigation and monitoring measures will be considered during ongoing EIA and project development activities:

- Best practice will be followed with respect of device and infrastructure layout, design and siting; and
- Consultation with stakeholders will inform project design activities.

6.6 Archaeology and cultural heritage

Historic Scotland is responsible for nationally important onshore Scheduled Monuments and for the preservation of the marine archaeological resource within Scottish Territorial Waters (STW).

The installation of the tidal devices, cable routing, substation, and other ancillary works have the potential to cause disturbance to any features of archaeological significance located within the vicinity of the scheme.

The archaeological and cultural heritage assessment will cover both marine and terrestrial archaeological features. The final assessment will also consider impacts upon the setting of archaeological features.

6.6.1 Baseline

Marine archaeology

There are no Marine Scheduled Ancient Monuments or sites protected under the Military Remains Act or the Protection of Wrecks Act within the vicinity of or surrounding the AfL area. There are two 'general wrecks' outside the AfL are, one north of the proposed development area and one south west

[30] SNH. (2012). Offshore renewables – guidance on assessing the impact on coastal landscape and seascape. Guidance for Scoping an Environmental Statement

[31] Landscape Institute and Institute of Environmental Management and Assessment. (2013). Guidelines for landscape and visual assessment 3rd edition

near Mill Bay, which was a 20th Century steam tug, and lies within the potential subsea cable route to the landfall area (Figure 6.4).

A submerged Palaeolithic feature has been identified in Lashy Sound off the west coast of Sanday by the Orkney Research Centre for Archaeology[32]. This may be an example of a terrestrial landscape which has been submerged by rising sea levels as ice sheets melted since the last glacial period and although primarily a natural formation, (i.e. peat deposits) may contain evidence of past environmental conditions or human settlement. Although not subject to an official designation, this site could be of particular interest to archaeologists for further investigation. The export cable is intended to connect to a landfall site on Eday and therefore not expected to cross this potential feature.

Onshore archaeology

There are numerous sites of archaeological and cultural importance around Eday, many of which are concentrated in the north of the island (Figure 6.4). There are 21 recorded Scheduled Monuments including chambered cairns, standing stones and burnt mounds and two Listed Buildings. Given Orkney's archaeological heritage and recent discoveries, there may be further unidentified or unscheduled sites present on the island.

The indicative onshore area of search includes one identified scheduled monument, a mound on the north side of the Bay of London. This site is thought to be a chambered cairn and would likely have been constructed during the Neolithic period [33]. There are several unclassified ruins and fragmentary remains from previous settlements or structures from Mill Bay to the Bay of London and include farm steadings and enclosures. These sites are not scheduled.

6.6.2 Potential impacts

Possible impacts along with the potential significance of effect on archaeology and cultural heritage are considered in the following table.

Potential impact	Phase	Potential significance	Comment
Physical disturbance of submerged historic and prehistoric land surfaces and archaeological finds (known and unknown).	Construction and Decommissioning	Potential significance of impact uncertain	Depends on cable route, type of moorings and the presence of unknown features. Identified features will be avoided where possible through site design. This will be considered further during the EIA.

[32] ORCA (2012). Project Adair: Mapping marine heritage sites in Orkney and the Pentland Firth.

[33] RCAHMS (2014). Canmore. Available [Online] http://canmore.rcahms.gov.uk/en/site/3208/details/eday+bay+of+london/ Accessed 17/06/14

Potential impact	Phase	Potential significance	Comment
Physical disturbance of terrestrial (onshore) sites and finds (known and unknown).	Construction and Decommissioning	Potential significance of impact uncertain	Depends on onshore cable route and siting of substation and the presence of unknown features. Identified features will be avoided where possible through site design. This will be considered further during the EIA.
Indirect disturbance of submerged historic and prehistoric land surfaces and archaeological finds as a result of changes to the hydrodynamic flow and sedimentary regime.	Operation	Potential significance of impact uncertain	Impact will depend on the location of historic features and predicted changes to hydrodynamic flow and sedimentary regime. Section 8.1 Physical processes will discuss changes to flow and sediment regime. This will be considered further during the EIA.
Effects on the setting of Scheduled Monuments and Listed Buildings and effects on historic landscape character (both within and outwith the area of search).	Construction and Operation	Potential significance of impact uncertain	Construction activities, permanent surface piercing structures and the substation may lead to impact on the historic setting. An SLVIA will be undertaken (refer to Section 6.5 Landscape, seascape and visual amenity). This will be considered further during the EIA.

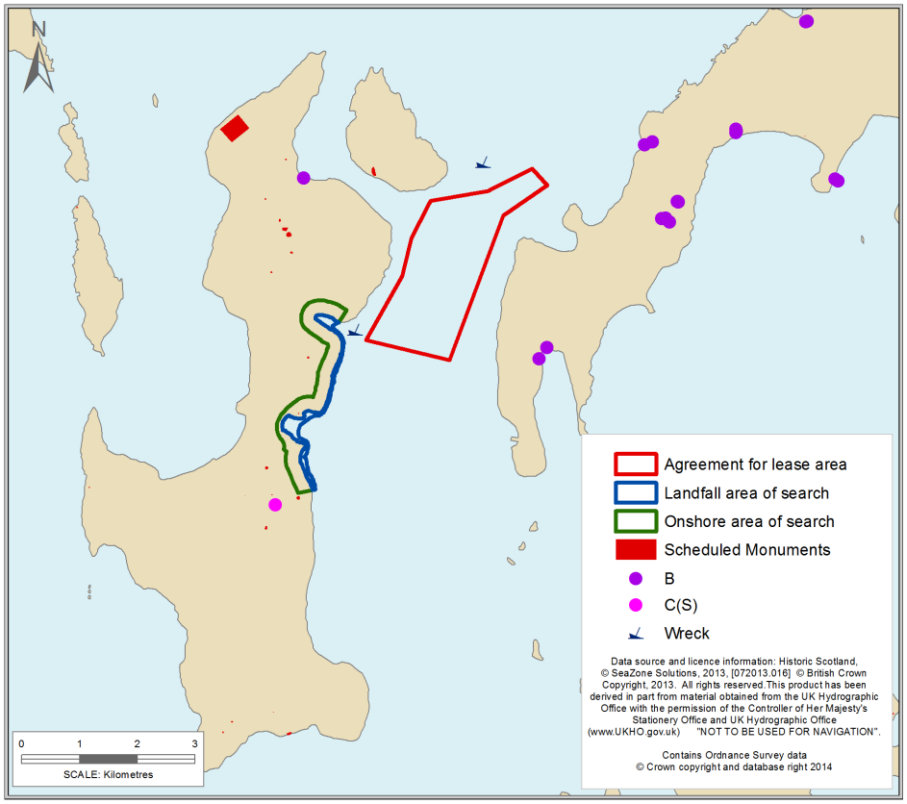

Figure 6.4 Onshore and offshore archaeological features

Please note that potential cumulative impacts are considered in Section 9 Cumulative and In-Combination Effects.

6.6.3 Baseline characterisation strategy

It is proposed that baseline conditions regarding Archaeology and Cultural Heritage can be further defined to sufficient detail by obtaining data from the following sources:

Data sources:

- Archaeological desk-based assessment (ADBA);
- Royal Commission on the Ancient and Historical Monuments of Scotland (RCAHMS) GIS database;
- OIC Local Development Plan 2014 and Supplementary Guidance (when available);
- OIC Archaeological Sites and Monuments Record;
- National Monuments Records;
- Joint Nautical Archaeology Policy Committee (JNAPC) Code of Practice for Seabed Development;
- The Crown Estate Protocol for Archaeological Discoveries;

- COWRIE Historic Environment Guidance for the Offshore Renewable Energy Sector and Guidance for the Assessment of Cumulative Impacts on the Historic Environment from Offshore Renewable Energy; and
- Review of existing bathymetric and geophysical data in the offshore AoS.

Field surveys:

- Unknown submerged features may be identified from geophysical surveys carried out to inform Section 7.1 Seabed communities and 8.1 Physical processes; and
- Walkover survey of the onshore site (when identified) to confirm the location and condition of any known artefacts and identify any additional cultural heritage artefacts within the development area.

Consultation:

The following stakeholders will be consulted with regards to archaeology and cultural heritage:

- OIC Archaeological Service;
- Historic Scotland;
- Receiver of Wreck, Maritime and Coastguard Agency; and
- UK Hydrographic Office.

6.6.4 Impact assessment strategy

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

Potential impact	Assessment topics and methodology
Physical disturbance of submerged historic and prehistoric land surfaces and archaeological finds (known and unknown)	Desk-based assessment: review of available bathymetric and geophysical data (from RCHAMS GIS database), stakeholder consultation, site walkovers. Assess potential for submerged features within development footprint, landfall and offshore cable route.
Physical disturbance of terrestrial (onshore) sites and finds (known and unknown)	
Indirect disturbance of submerged historic and prehistoric land surfaces and archaeological finds as a result of changes to the hydraulic flow and sedimentary regime	This impact will be considered as part of the Archaeological and Cultural Heritage Assessment.
Effects on the setting of Scheduled Monuments and Listed Buildings and effects on historic	This impact will be considered as part of the Archaeological and Cultural Heritage Assessment. Photomontages will be created where necessary.

Potential impact	Assessment topics and methodology
landscape character (both within and outwith the area of search)	

6.6.5 Possible mitigation and monitoring measures

The following possible mitigation and monitoring measures will be considered during ongoing EIA and project development activities:

- Avoidance of identified designated, significant or sensitive features; and
- All archaeological features and potential archaeological features will be identified through site walkover and avoided where possible through the design of the onshore infrastructure. Where this is not possible a watching brief may be required.

6.7 Recreation and tourism

This section discusses recreation carried out within the onshore and offshore AoS and surrounding area and is split into onshore and offshore recreation. Navigation with regards to recreational vessels is discussed further in Section 6.3 Shipping and navigation and Appendix B Preliminary Hazard Analysis.

It also considers the economic impact of the proposed development on the activities which drive tourism in Orkney.

Activities associated with recreation and tourism are discussed in further detail in associated sections such as: 6.5 Landscape, seascape and visual amenity and 6.6 Archaeology and cultural heritage.

6.7.1 Baseline

Onshore recreation

The scenery, coastline, history and wildlife of Orkney provide a major focus for much of the outdoor recreation in the county. Clubs and associations for wildlife, angling, archaeology and photography exist although much of the recreation in Orkney, such as walking, is on an informal basis.

The islands have an established network of coastal footpaths implemented by OIC as part of the Core Paths initiative, prepared as a requirement of the Land Reform Scotland Act 2003. Figure 6.5 illustrates the footpath network in the north, south and on the west coast of Eday, none of which overlap with the onshore area of search.

Wildlife watching and sites of archaeological interest are an attraction for recreational activities on Eday. Many outdoor activities including guided walks and bird watching are organised by the local Eday Ranger. Such activities are likely to be seasonal with greater activity during the spring and summer months and little or no activity through winter. It can be assumed that most areas are used for at least one type of recreation and that user groups will exist for most sites in Orkney.

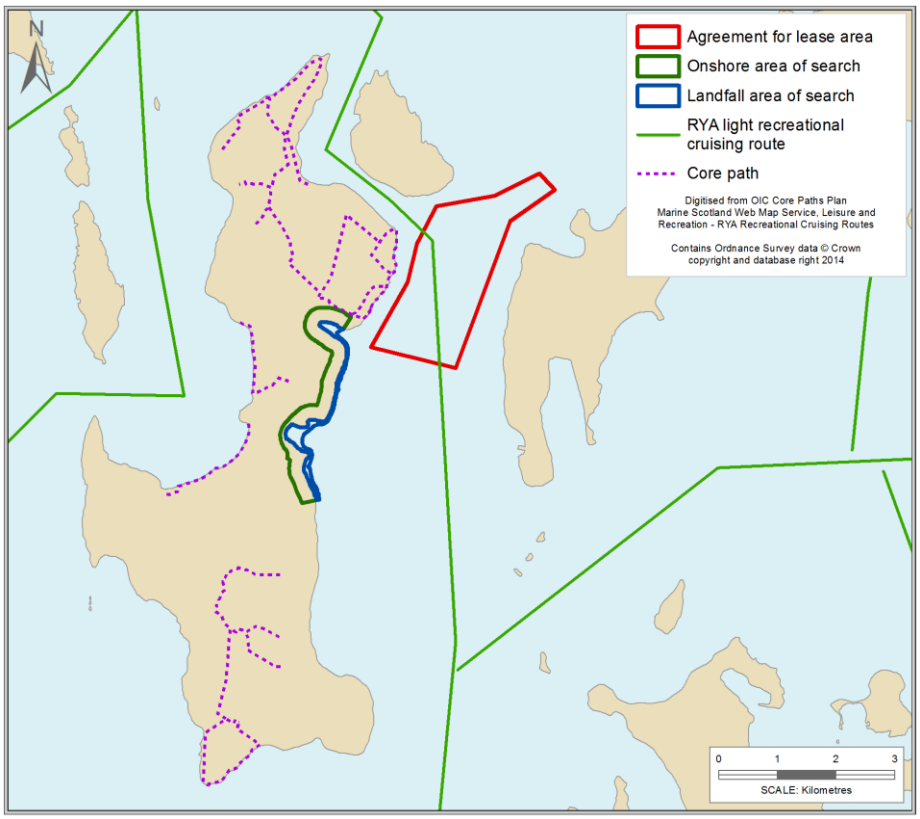

Figure 6.5 Core Path networks on Eday and recreational cruising routes.

Offshore recreation

The waters around Orkney are regularly utilised for various types of recreation, particularly sailing, sea kayaking, surfing, kite boarding, angling, diving, power boating and other boat based activities. Sailing, diving and angling are important contributors to the local economy and draw large numbers of visitors to the Islands throughout the year.

There are three marinas in Orkney (Kirkwall, Stromness and Westray) and two on the north coast of Scotland (Scrabster and Wick). All are popular with visiting and local boats (particularly yachts) and it is common for vessels to travel between them. There is one RYA Light Recreational Cruising Route through the AoS area (Figure 6.5) via Calf Sound, while the whole offshore AoS (and surrounding areas between the North Isles) is noted as a General Sailing Area.

Most recreational diving in Orkney occurs in Scapa Flow around wreck sites. There are no known recreational dive sites within the offshore AoS which, based on its tidal conditions is unlikely to be suitable for extensive diving activities. Inshore waters adjacent to the site may be utilised by recreational divers. There is a local dive facility based on the island of Eday which offers diving activities in the surrounding waters, precise details of sites visited will be determined through stakeholder consultation during the EIA.

Consultation with relevant stakeholders will be undertaken to determine the level of activity associated with sea angling and other recreational fishing within the offshore AoS, the wider area and at sites along the adjacent coastline. It is expected that small craft may be used for sea angling in the majority of inshore waters at some point throughout the year and that the offshore AoS is transited by recreational fishing vessels. Occasional rod fishing will likely occur at a number of locations around the adjacent coasts; particularly off piers and rocky outcrops. This is an information gap that the team hopes to address through scoping and subsequent stakeholder consultation.

Tourism

Tourism is a mainstay industry in Orkney employing at least 8% of the local workforce in 2012[34]. Orkney received over 142,000 visitors in the period 2012/13 with an estimated visitor spend of £31 million[35]. Orkney also receives visits from a large number of cruise liners throughout the year; in 2009 an estimated 45,500 cruise line visitors passed through Hatston Pier. On average, 75 cruise ships per year visit Orkney contributing around £1.1 million annually to the local economy[36].

The attraction of Orkney as a tourist destination may be for a number of reasons, however a survey in 2013 indicated that the most common influences on the decision to visit Orkney were for the archaeological and historical interests (51%) and the scenery and landscape (46%). Visiting archaeological sites and beaches/coastal scenery were the most significant activities undertaken during visitors' stay[35].

Tourism on Eday and Sanday is predominantly focussed upon the wildlife, historical and archaeological heritage. Tourism activity is expected to be seasonal with greater numbers of visitors in spring and summer. Access to the islands is restricted due to their remote locations and frequency of ferries and flights, therefore visitor numbers may be limited compared to mainland Orkney. Tourism is likely to be an important source of income for the local communities of these islands.

6.7.2 Potential impacts

Possible impacts along with the potential significance of effect on recreation are considered in the following table.

[34] NOMIS (2014). Official labour market statistics. Available [Online] http://www.nomisweb.co.uk/reports/lmp/la/1946157427/report.aspx#tabempocc Accessed 17/06/14

[35] Visit Scotland (2014). Orkney: Islands Visitor Survey 2012-2013. Prepared by Scotinform Ltd and Reference Economics

[36] AB Associates. (2010). Orkney visitor survey 2008-2009. Available [Online] http://www.orkney.gov.uk/Files/Council/Publications/2010/OrkneyVisitorSurvey_2009_FinalReport.pdf Accessed 04/06/14

Potential impact	Phase	Potential significance	Comment
Disturbance to offshore recreation activities due to restricted access or passage.	All phases	Potential significance of impact uncertain	The level of usage of the offshore AoS by recreational vessels is currently uncertain. Any new structures at or above the sea surface will pose a potential risk to passing vessels. This will be addressed during the NRA and EIA.
Disturbance to onshore recreation due to restricted access or passage.	All phases	Potential significance of impact uncertain	The cable corridor and substation area of search potentially have recreational value; be it as a walking route, visual amenity or other use. This will be considered further during the EIA.
Effects of a change in seascape character on local visual amenity.	All phases	Potential significance of impact uncertain	Effect of vessel presence likely to be minimal and of a temporary nature. A full SLVIA will be undertaken as described in 6.5 Landscape, seascape and visual amenity. This will be considered further during the EIA.
Effects of a change in landscape character on local visual amenity.	All phases	Potential significance of impact uncertain	The installation and presence of any substation may change the visual amenity of the landscape, however is expected to be limited in scale. A full SLVIA will be undertaken as described in 6.5 Landscape, seascape and visual amenity. This will be considered further during the EIA.

Potential impact	Phase	Potential significance	Comment
Increased accommodation occupancy rates.	Construction	Effect unlikely to be significant	Increased project personnel in Orkney during peak tourist season may put pressure on services during these periods. Increased accommodation occupancy outwith peak tourist periods may be beneficial. Neither is anticipated to result in significant impacts on local tourism as a result of the proposals due to the small scale of onshore developments. Offshore construction will mainly be managed from the mainland, hence personnel will only be present in small numbers on Eday at short time periods. Orkney and the local hospitality industry are well experienced in managing any fluxes in trade during local construction projects.
Additional topic of interest creating new draw for tourists	All	Minor beneficial impact	There is already significant interest in the renewables industry in Orkney and it is reasonable to assume that the marine energy industry may be a key area of interest for some visitors to the Islands. A project of this scale is not however anticipated to result in a significant impact on local tourism.

Please note that potential cumulative impacts are considered in Section 9 Cumulative and In-Combination Effects.

6.7.3 Baseline characterisation strategy

It is proposed that baseline conditions regarding recreation can be further defined to sufficient detail by obtaining data from the following sources:

Data Sources:

- NRA Vessel Traffic Analysis;
- RYA Cruising Routes;
- OIC Core Paths Plan N5;

- Baxter et al (2011). Scotland's Marine Atlas: Information for the national marine plan Marine Scotland;
- Visit Scotland (2014). Orkney: Islands Visitor Survey 2012-2013. Prepared by Scotinform Ltd and Reference Economics;
- Clyde Cruising Club Sailing Directions and Anchorages: Part 5 North and North East Scotland and Orkney; and
- NOMIS (2014). *Official labour market statistics: Labour Market Profile Orkney Islands*. Office for National Statistics.

Field surveys:

- None proposed.

Consultation:

The following stakeholders will be consulted with regards to recreation and tourism:

- Eday Community Council;
- Eday Partnership;
- Local landowners;
- Orkney Archaeological Trust;
- Orkney Islands Council;
- Orkney Marinas;
- Orkney Tourism Group;
- Recreational clubs including: Royal Yachting Association Scotland; Orkney Sailing Club; Orkney Sea Kayaking Association; Kirkwall Kayak Club; Orkney Field Club; Ramblers Scotland.
- Sanday Community Council;
- Sanday Development Trust;
- SNH; and
- Visit Orkney.

6.7.4 Impact assessment strategy

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

Potential impact	Assessment topics and methodology
Disturbance to offshore recreation activities due to restricted access or passage.	A full NRA will be undertaken as outlined in Appendix B PHA. Any potential effects on recreational activity that may result from the proposals will be considered appropriately within the socio-economic impact assessment section of the EIA.
Disturbance to onshore recreation due to restricted access or passage.	Mapping of recreational areas and access to inform detailed routing, site planning and EIA. Considered as part of the socio-economic impact assessment.

Potential impact	Assessment topics and methodology
Effects of a change in seascape character on local visual amenity	Assessment of visual amenity will be covered as part of the SLVIA Refer to 6.5 Landscape, seascape and visual amenity. Sanday may also be considered given potential visibility of devices from the island.
Effects of a change in landscape character on local visual amenity	

6.7.5 Possible mitigation and monitoring measures

The following possible mitigation and monitoring measures will be considered during ongoing EIA and project development activities:

- Site design, cable route and the location of onshore structures will be selected with consideration of onshore and offshore recreational use patterns.
- Onshore facilities will be designed to minimise potential visual impact

6.8 Ports and harbours

This section discusses ports and harbours. Impacts associated with road networks connecting to important ports and harbours are discussed in Section 6.4 Land use. Impacts on navigation are considered in Section 6.3 Shipping and navigation and Appendix B Preliminary Hazard Analysis.

6.8.1 Baseline

The nearest ports to the AfL area are Loth on Sanday, Backaland on Eday and Hatston and Kirkwall on the Orkney mainland (Figure 6.6).

Loth terminal

Loth Terminal located approximately 5km to the south of the offshore AoS on the south coast of the island of Sanday has a Ro-Ro berth and conventional access for cargo handling. The terminal has mooring of 62 metres in depths between 2 and 5 metres and 135 meters in depths between 5 and 7 meters[37]. The primary use is for the local inter-island ferry service which has priority access, with additional use by small local fishing vessels and recreational vessels.

Loth Terminal may be used during non-routine operations; however Hatston Pier is likely to be the main base for the majority of activities.

Backaland pier and ferry terminal

Backaland Pier located approximately 10km to the south of the offshore AoS on the south-east coast of Eday has a Ro-Ro berth and conventional access for cargo handling. It has up to 60 metres of

[37] OIC Marine Services (2010). Orkney ports handbook 4th edition

mooring in depths up to 4 metres and 75 metres of mooring in 4 to 6 metres depth. The local ferry service has priority access of the Ro-Ro berth[37].

Backaland Pier may be used to import construction materials required for the onshore aspects of the project.

Hatston pier

At Hatston Pier there is a Ro-Ro facility offering berthing of 385 meters with a maximum depth of 10 meters at LAT. In addition there are three large berth areas. The extension to the pier was completed in May 2013 to provide additional berthing to support marine renewable developments. Hatston has been extensively used by tidal energy developers working at EMEC's tidal test site in recent years. This activity is likely to increase over the next few years. Hatston terminal is home to the SRTP head office and turbine assembly facility therefore it is likely that Hatston will serve as the main base for all operations and maintenance activities associated with Lashy Sound.

The marine renewable energy sector has already provided the incentive for the significant growth of a number of harbour facilities in Orkney including Coplands Dock (Stromness), Lyness (Hoy), Hatston (Kirkwall) and Scrabster. It is anticipated that this growth will continue as the sector becomes increasingly important to Scotland's strategic plans for a low carbon, secure energy future (see Section 5 Legislation and Key Policy Objectives). The improved harbour infrastructure has provided direct employment and led to an increase in the number of tourists visiting the islands and promoted the local area as a centre of renewable energy innovation.

Policy SD6 of the OIC Local Development Plan[38] states that upgrades for marine renewable energy developments will be supported by OIC provided that an appropriate assessment is made and mitigation measures are put in place to ensure that the proposal does not have any significant effects[39].

6.8.2 Potential impacts

Possible impacts along with the potential significance of effect on ports and harbours are considered in the following table.

[38] OIC (2014). Orkney Local Development Plan 2014.

[39] Supplementary guidance for onshore marine energy and electrical infrastructure is yet to be published by OIC.

Potential impact	Phase	Potential significance	Comment
Overcapacity of port infrastructure.	All	Potential significance of effect uncertain	Increased pressure on existing port and harbour facilities may affect other existing users. In reality, this is likely to result in further improvements and expansion to existing facilities and infrastructure. This will be considered further during the EIA.

Please note that potential cumulative impacts are considered in Section 9 Cumulative and In-Combination Effects.

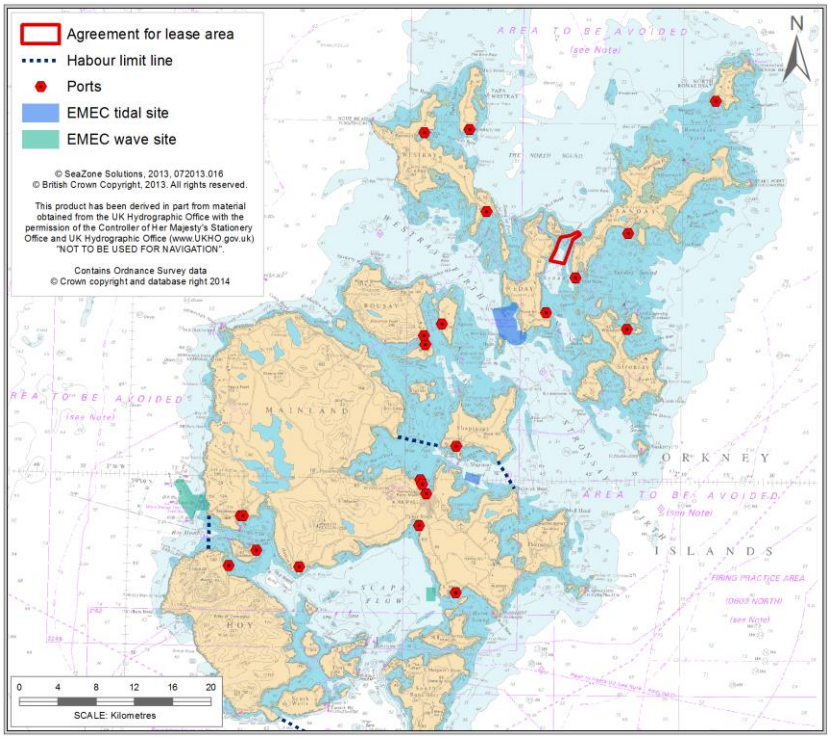

Figure 6.6 Ports and EMEC test sites around Orkney

6.8.3 Baseline characterisation strategy

No further baseline information is required to inform the EIA process at this time. Ongoing consultation with the relevant harbour authorities and port operators will ensure that any relevant updates are included in the EIA.

6.8.4 Impact assessment strategy

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

Potential impact	Assessment topics and methodology
Overcapacity of port infrastructure	An assessment of how much capacity and where and when it will be required will be carried out following detailed project planning and definition of project requirements.

6.8.5 Possible mitigation and monitoring measures

The following possible mitigation and monitoring measures will be considered during ongoing EIA and project development activities:

- To reduce the potential for overcapacity of port infrastructure, proactive forward planning and ongoing liaison with the OIC Marine Services and the Development and Infrastructure Department will be carried out to support the project development activities.

6.9 Other users

This section includes other onshore and offshore receptors which may be impacted by the proposed development and includes: utilities, dredge disposal sites, aviation and the Ministry of Defence.

6.9.1 Baseline

Utilities

Electrical grid

Orkney is connected to the national grid via two 33kV AC subsea cables across the Pentland Firth. The northern isles are connected via a 33kV loop which connects Rousay, Westray, Eday, Sanday, Stronsay and Shapinsay. There are a number of existing 33kV subsea power cables connecting the Islands, one of which passes through the AfL area and connects Eday and Sanday. Disused cables are also identified from OS maps. These cables are shown in Figure 6.7.

This project, along with the other renewable energy generation projects in the PFOW Strategic Area, will require improvements to the existing onshore and offshore transmission grid network. These improvements are currently planned by SHETL and the consents and licensing process is underway.

These improvements will include the construction of a 4.2 hectare 220kV substation just north of the Bay of Skaill, a 70km 220kV subsea cable link between Caithness and Orkney and the installation of a 275/220kV transformer and associated equipment at the existing 275kV Dounreay substation[40].

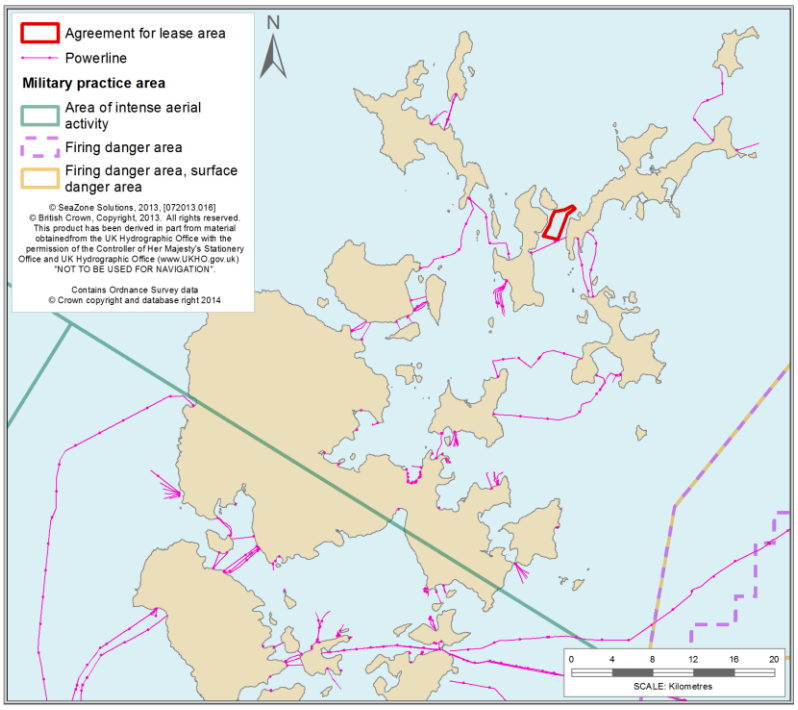

Figure 6.7 Other users in relation the AfL area

Telecoms network

The main subsea telecom link for Orkney lands at Skaill Beach on the west coast of the Mainland. Within Orkney telecoms links are mainly provided by subterranean cables that follow the road network.

Water distribution network

Water pipes typically follow the local road network, however some more isolated properties are served by off grid water, sewerage and electricity systems.

Local telecom networks and water distribution networks are a key information gap which the team will identify through scoping and further consultation where necessary.

[40] SSE Power Distribution (2014). Orkney Caithness. Available [Online] http://www.ssepd.co.uk/OrkneyCaithness/ Accessed 17/06/14

Disposal sites – dredged material

There are five licensed disposal sites for dredged material in Orkney waters[41], one north of Kirkwall, two to the north of Hoy, one in Scapa Flow and one to the south of Scapa Flow between Hoy and South Ronaldsay. The latter site is the largest in terms of average tonnage disposed at the site, with approximately 2,500 – 10,000 tonnes deposited between 2005 and 2009, compared to a combined tonnage of 2,500 at all other sites for the same period[41]. All sites are used for the disposal of silt, sand, gravel or rock whilst two of the sites to the north of Hoy have also historically been used for fish waste.

The closest active dredging disposal site to the proposed project is site FI015, north of Kirkwall. This site is situated approximately 45km from the southern edge of the offshore AoS.

Aviation

Commercial air services into all of the major Scottish city airports, including Sumburgh, Inverness, Glasgow and Aberdeen are available from Kirkwall Airport, Orkney. There are also inter-island flights to the Northern Isles of Orkney including: Stronsay, Sanday, Eday, North Ronaldsay, Westray and Papa Westray. These are lifeline services for remote communities that are supported by regular ferry transport. These inter-island services and the Kirkwall to Sumburgh service may be routed over the offshore and onshore AoS.

In addition to commercial services there are also a number of privately owned aircraft that may overfly the area. Rotary winged aviation may also transit the area on route to North Sea oil platforms. The routing of long distance international air services may on occasion transit the AoS at high altitude.

Ministry of Defence

Scotland's coastal areas and seas are used for military training, surveillance and monitoring of potential threats, as well as testing and evaluation activities.

Figure 6.7 identifies key military training areas and military danger areas (MDA) in the North of Scotland. All identified are outwith the AoS. The MDA is a military practice zone for high altitude Royal Air Force (RAF) training exercises and is also utilised by the Royal Navy for navigational and patrolling exercises.

Any potential interactions with military vessel activity with regards to general rights of navigation will be addressed in the project specific NRA.

6.9.2 Potential impacts

Possible impacts along with the potential significance of effect on other users are considered in the following table.

[41] Baxter, J.M., Boyd, I.L., Cox, M., Donald, A.E., Malcolm, S.J., Miles, H., Miller, B., Moffat, C.F., (Editors) (2011). Scotland's Marine Atlas: Information for the national marine plan. Marine Scotland, Edinburgh. pp. 191er, J.M. (2011). Scotland's Marine Atlas: Information for the national marine plan. Marine Scotland, Edinburgh.

Potential impact	Phase	Potential significance	Comment
Potential upgrade of existing electrical grid infrastructure.	Construction	Indirect Potential Beneficial impact	Depending on the approach taken to developing the project grid connection there is the possibility that this could strengthen the existing grid network.
Potential impacts on electrical grid, telecoms and water network.	Construction	Effect unlikely to be significant	The routing of onshore cables and location of onshore substations will take into account existing facilities and avoid existing infrastructure.
Disruption to utilities provision.	Construction	Effect unlikely to be significant	Any disruption will be localised and temporary with prior notice and alternative supplies provided where appropriate.
Potential disruption to existing disposal site activity or disturbance of disposed material.	All phases	Effect unlikely to be significant	Given the distance (45km) from the proposed development, no impact on existing disposal site activity at site FI015 is anticipated.
Disruption to aviation.	All phases	Effect unlikely to be significant	There is no mechanism for impact on aviation arising from the proposals.
Potential disruption to existing MoD activity.	All phases	Effect unlikely to be significant	There are no exercise areas in the vicinity of the AoS likely to be affected by the proposals. Therefore, no effect on existing activity is anticipated.

No potentially significant impacts have been identified for utilities, disposal sites, aviation or MOD areas and it is therefore proposed that these receptors are scoped out of the EIA.

It is proposed that the relevant stakeholders are consulted during the project design process and EIA, where applicable, to ensure that no changes in baseline conditions have occurred, no potential issues arise and that existing infrastructure is avoided.

Please note that potential cumulative impacts are considered in Section 9 Cumulative and In-Combination Effects.

7 Potential Impacts on the Ecological Environment

This section considers the potential impacts of the proposals on the following receptors:

- Seabed communities;
- Fish ecology;
- Marine mammals and reptiles;
- Marine Birds; and
- Coastal and terrestrial communities.

This section should be considered alongside Appendix C Habitats Regulations Appraisal (HRA) screening report which identifies Natura 2000 sites (Special Protection Areas (SPAs) and Special Areas of Conservation (SACs)) and their qualifying interests that could potentially be affected by the proposed Project.

An overview of the relevant baseline environment is provided for each receptor along with the anticipated impacts, a baseline characterisation strategy, impact assessment strategy and where applicable, possible mitigation and monitoring measures.

7.1 Seabed communities

7.1.1 Introduction

This section primarily covers benthic ecology and includes shellfish. Information regarding marine fish species is discussed in Section 7.2 Fish ecology and intertidal ecology is discussed in Section 7.5 Coastal and terrestrial communities.

7.1.2 Baseline

Habitats

Orkney is situated on the boundary between the North Sea and the Atlantic Ocean. The islands support diverse marine communities, the development of which has been facilitated by the warm waters brought north by the North Atlantic Drift.

Predicted seabed habitats published by JNCC[42] and MESH[43] (Figure 7.1) suggest the area would be predominantly composed of Atlantic moderate energy infralittoral rock with areas of kelp in shallower areas. British Geological Survey shallow geology maps[44] indicate the presence of seabed sediments composed predominantly of gravel and sandy gravels to the north of Lashy Sound.

[42] JNCC, 2011. UK SeaMap 2010 Predictive mapping of seabed habitats in UK waters McBreen, F., Askew, N., Cameron, A., Connor, D., Ellwood, H., Carter, A.

[43] MESH Atlantic web GIS. Available [online]: (www.searchmesh.net/webGIS) (accessed April 2014)

[44] British Geological Survey (BGS). 1984. Orkney, Sheet 59°N-04°W. Sea bed sediments and Quaternary, 1:250,000 geological map

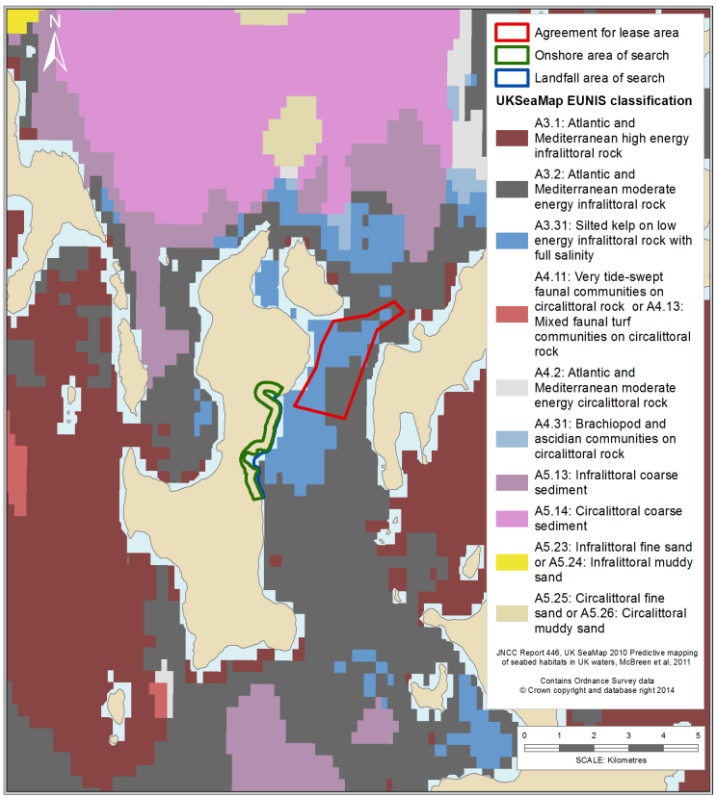

Figure 7.1 Predicted seabed habitats in and surrounding the offshore AoS.

Tide-swept algal communities (kelp forest) have been identified in Lashy Sound[45]. This species-rich and structurally complex habitat has been identified as a potential Priority Marine Feature (PMF) by Scottish Natural Heritage[46] however there are currently no existing or proposed protected areas located within the offshore AoS.

At present there is no detailed site specific seabed information available however a recent video survey of the Westray Firth[47] provides an indication of the types of seabed communities likely to be present in the tidally exposed, Lashy Sound channel. This study found a rocky seabed comprised of patches of cobbles, pebbles, and small boulders scattered over gravel and bedrock. Tidally exposed surfaces were covered with a faunal turf of bryozoans, hydroids, barnacles and other encrusting biota with increased densities of sponge and soft coral colonies and anemones in the sheltered areas

[45] Marine Scotland National Marine Plan Interactive Map. MNCR survey data, 1997. Available [online]: http://marinescotland.atkinsgeospatial.com/nmpi/ (accessed April 2014)

[46] Howson, C. M., Steel. L., Carruthers, M. and Gillham, K. (2012). Identification of Priority Marine Features in Scottish territorial waters. Scottish Natural Heritage Commissioned Report No. 388.

[47] Moore, C.G. (2009). Preliminary assessment of the conservation importance of benthic epifaunal species and habitats of the Pentland Firth and Orkney Islands in relation to the development of renewable energy schemes. Scottish Natural Heritage Commissioned Report No. 319.

between stones and in crevices. This habitat was found to support a range of mobile epifaunal species including echinoderms (starfish and urchins) and crustaceans.

It is possible that the project export cable may be landed in one of the small bay areas located on the east coast of Eday. These areas are likely to be primarily composed of relatively mobile sands and will support species typical of such habitats i.e. a *venus/amphiura* community.

Commercially exploited species

The offshore AoS lies within the wider area of ICES rectangle[48] 47E7 (Figure 6.1 in Section 6.2 Commercial fisheries and aquaculture). Landings data from Marine Scotland Analytical Unit[49] provide a good indication of the commercially exploitable species within the study area, however it must be noted that this data does not represent the full range of species richness or abundance in the area. Species of which more than ten tonnes were landed in any year within the last five years (2008-2012) are shown in

[48] The International Council for the Exploration of the Sea (ICES) has developed a grid system derived from degrees latitude and longitude that divides the seas into statistical rectangles to make simplified analysis and visualisations.

[49] Marine Scotland Science. (2013). Fishing Effort and Quantity and Value of Landings by ICES Rectangle. Available [Online]: http://www.scotland.gov.uk/Topics/Statistics/Browse/Agriculture-Fisheries/RectangleData (accessed 19/12/13)

Table 6.1 in Section 6.2 Commercial fisheries and aquaculture. Brown crab, velvet crab and scallops are the most commonly landed species in this rectangle area and are integral to the local inshore fishery in Orkney.

7.1.3 Potential impacts

Possible impacts along with the potential significance of effect on seabed communities are considered in the following table:

Potential impact	Phase	Potential significance	Comment
Substrate/habitat loss or damage due to placement of anchors on the seabed, cable laying and their eventual removal.	All phases	Potential significance of impact uncertain	Magnitude dependent upon project footprint and the type of anchor used and cable laying methods and species/ habitats present and their sensitivity. However, environmental monitoring at sites of other tidal projects such as Cobscook Bay Tidal Energy Project indicates there to be little evidence, if any, of scouring or disturbance to the benthic or associated faunal community[50]. This will be considered further during the EIA.
Habitat and species loss from scour around devices and other seabed infrastructure.	All phases	Potential significance of impact uncertain	
Damage to habitats from increased suspended sediments, turbidity and smothering from installation of infrastructure.	Construction and Decommissioning	Effect unlikely to be significant	Species/habitats and sensitivity need to be identified, however high tidal swept environment and sediments unlikely to persist in area for significant period.
Disturbance of contaminated sediments, harmful to sensitive benthic species.	Construction and Decommissioning	Effect unlikely to be significant	Limited sources for contaminated sediments in the area, also high tidal swept environment. See Section 8.3 Marine water and sediment quality.

[50] ORPC Maine LLC. (2014). Cobscook Bay Tidal Energy Project: 2013 Environmental Monitoring Report. Report by Ocean Renewable Power Company (ORPC). pp 502.

Potential impact	Phase	Potential significance	Comment
Alteration of hydrodynamic regime, changing benthic habitat.	Operation	Effect unlikely to be significant	The impact of increased turbulence or reduced downstream flow on benthic habitats is expected to be small in scale and highly localised. Results of scour monitoring at Cobscook Bay Tidal Energy Project indicate minimal change in seabed elevation around the foundation piles[50].
Impact on communities from Electro Magnetic Fields (EMF) or thermal discharge from cables.	Operation	Effect unlikely to be significant	No visible changes have been observed at existing power cable routes in Orkney.
Introduction of marine non-natives from foreign vessels, infrastructure and equipment.	All phases	Potential significance of impact uncertain	Use of devices/infrastructure as stepping stones and introduction through vessel movements. This will be considered further during the EIA.
Damage to habitat or species due to pollution from routine and accidental discharges and the use of anti-fouling treatments.	All phases	Effect unlikely to be significant	Industry best practice will be followed for all operations as part of a management plan. The use of suitable anti-fouling treatments will be carefully selected.
Colonisation through habitat creation from infrastructure, scour protection and support structures.	Operation	Possible beneficial impact	Level of effect is currently unknown.

Please note that potential cumulative impacts are considered in Section 9 Cumulative and In-Combination Effects.

7.1.4 Baseline characterisation strategy

The key data gap relates to the habitats and communities present in the offshore AoS. To further define what communities and habitats are present the following information will be required:

Data sources:

- National Biodiversity Network (NBN Gateway), species records;

- JNCC Marine Nature Conservation Review (MNCR) reports;
- Saunders, G., Bedford, G.S., Trendall, J.R., and Sotheran, I. (2011). Guidance on survey and monitoring in relation to marine renewables deployments in Scotland. Volume 5. Benthic Habitats. Unpublished draft report to Scottish Natural Heritage and Marine Scotland;
- UKSeaMap 2010/MESH (EUNIS classification).

Field surveys:

A baseline survey of the benthic environment will be carried out to assess and evaluate the seabed and habitat characteristics and condition. The survey will aim to identify whether there are any notable species or habitats present and their spatial distribution and abundance. An observation class remotely operated vehicle (ROV) fitted with video and digital stills camera systems will be deployed to investigate the seabed conditions of the offshore AoS.

An outline of the survey methodology is given below; however the detailed methodology will be agreed with Marine Scotland and Scottish Natural Heritage.

- Video footage will be collected along a series of stratified transects, within which sampling will be random, to identify habitats present and distribution, following SNH guidelines [51];
- Footage will be collected at various water depths and physical seabed characteristics where different biological communities and seabed types would be expected;
- The collection of grab samples to study infaunal communities may be conducted if sedimentary habitats and potential priority marine features/species are identified;
- A biotope map, based on the seabed observations and the available geophysical information, will be presented within the report. The 2004 JNCC Biotope classification will be used to identify the biotopes present. All survey images and video (overlaid with position and time) will be provided separately on DVD[52].
- The report of the benthic habitat survey will be used to inform the benthic ecology impact assessment as part of the wider EIA.

Consultation:

The following stakeholders will be consulted with regards to seabed communities:

- JNCC;
- Marine Scotland Science;
- Orkney Fisheries Association;
- Orkney Fishermen's Society Limited;
- Orkney Inshore Fisheries Group;
- Orkney Sustainable Fisheries (OSF); and

[51] Saunders, G., Bedford, G.S., Trendall, J.R., and Sotheran, I. (2011). Guidance on survey and monitoring in relation to marine renewables deployments in Scotland. Volume 5. Benthic Habitats. Unpublished draft report to Scottish Natural Heritage and Marine Scotland.

[52] David W. Connor, James H. Allen, Neil Golding, Kerry L. Howell, Louise M. Lieberknecht, Kate O. Northen and Johnny B. Reker (2004). The Marine Habitat Classification for Britain and Ireland Version 04.05 JNCC, Peterborough.

- SNH.

7.1.5 Impact assessment strategy

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

Potential impact	Assessment topics and methodologies
Substrate/habitat loss or damage due to placement of anchors on the seabed, cable laying and their eventual removal.	The evaluation of baseline surveys will inform the sensitivity of identified species and habitats. Desk-based research on potential impacts to benthic communities and monitoring studies from other consented marine energy commercial and demonstration deployments. Impact assessment methodology will be agreed with Marine Scotland, SNH etc. where appropriate.
Habitat and species loss from scour around devices and other seabed infrastructure.	
Introduction of marine non-natives from foreign vessels, infrastructure and equipment.	

7.1.6 Possible mitigation and monitoring measures

The following possible mitigation and monitoring measures will be considered during ongoing EIA and project development activities:

- To reduce the likelihood of the introduction of non-native species into the area, including those colonising subsea infrastructures, best practice will be followed during construction activities as part of a PEMP and IMO regulations will be followed.
- With regard to thermal load and EMFs caused by cable operation no mitigation, apart from following industry standards using shielded cable, is currently available. Post deployment monitoring of the area affected by the cable would be beneficial to future projects.

7.2 Fish ecology

7.2.1 Baseline

Fish species including those of conservation importance, economic value to commercial and recreational fisheries; and those which may be restricted geographically or which are abundant in the local area are discussed in this section. Identification and consideration of spawning, nursery and feeding grounds and migration routes are particularly important. Important shellfish species are addressed in Section 7.1 Seabed communities.

Commercially exploited species

The offshore AoS lies within the wider area of ICES rectangle[53] 47E7 (Figure 6.1 in Section 7.1 Seabed communities). Landings data from Marine Scotland Analytical Unit[49] provide a good indication of the commercially exploitable species within the study area, however it must be noted that this data does not represent the full range of species richness or abundance in the area. Species of which more than ten tonnes were landed in any year within the last five years (2008-2012) are shown in Table 7.1.

Table 7.1 Commercial landings of demersal and pelagic in ICES 47E7[54]

Pelagic (by live weight) **2008 to 2012**	**Landings (live weight/tonnes)**				
	2008	**2009**	**2010**	**2011**	**2012**
Atlantic Herring *Clupea harengus*	2,636	1,907	5,156	5,224	3,754
Atlantic mackerel *Scomber scombrus*	1	951	2	217	395
Demersal					
Haddock *Melanogrammus aeglefinus*	2	14	82	143	85
Cod *Gadus morhua*	0.4	3	14	7	14

Herring is a particularly important fish resource caught in the ICES rectangle area, while other whitefish are not as significant. These species are not likely to have been caught within Lashy Sound given their range and the absence of vessels with associated gear-types utilising the area (see Section 6.2 Commercial fisheries and aquaculture and Section 6.3 Shipping and navigation). The ICES rectangles each cover an area of 0.5° latitude by 1° longitude (approximately 30 x 30 nautical miles), therefore only a small proportion, if any of these species were likely to have been caught within the offshore AoS.

Atlantic herring, cod and Atlantic mackerel are UK Biodiversity Action Plan (UKBAP) species, priority species identified as being under threat or in decline and requiring conservation action; and/or Scottish Priority Marine Features (PMFs), identified by SNH as important species requiring focussed conservation effort[55]. Atlantic herring, cod and haddock are also listed on The World Conservation Union (IUCN) Red List of Threatened Species.

The seabed across the offshore AoS is predominantly composed of sandy, sand scoured rock or mixed sand and stone (see Section 7.1 Seabed communities). The offshore AoS may provide suitable habitat for species which spawn on the seabed, such as herring which have very particular habitat requirements, requiring sandy gravel and water flow[55].

[53] The International Council for the Exploration of the Sea (ICES) has developed a grid system derived from degrees latitude and longitude that divides the seas into statistical rectangles to enable simplified analysis and visualisation of data such as commercial fish landings.

[54] Marine Scotland Science. 2013. Fishing Effort and Quantity and Value of Landings by ICES Rectangle. Available [online]: http://www.scotland.gov.uk/Topics/Statistics/Browse/Agriculture-Fisheries/RectangleData (accessed 19/12/2013)

[55] Howson, C M; Steel, L; Carruthers, M; Gillham, K. 2012. Identification of Priority Marine Features in Scottish Territorial Waters. Scottish Natural Heritage Commissioned Report No. 388.

Low resolution data on spawning and nursery grounds for commercially exploited species are available from Cefas and indicate that the offshore AoS is potentially within spawning grounds for herring, sandeel *Ammodytes tobianus*, lemon sole *Microstomus kitt* and sprat *Sprattus sprattus*[56,57]. Of these species, herring and sandeel spawn on the seabed, while lemon sole and sprat are pelagic spawners. This data gives only a broad indication of likely spawning and nursery grounds, which are temporally and spatially variable and are not exclusive to Orkney waters for any of the species identified. Furthermore, species exploited at a local scale or to which comprehensive information regarding their life history is lacking have also been excluded from the study.

The sandeel is an important food source for commercial fish species such as cod, haddock and whiting, as well as an essential food source for seabirds and marine mammals. It is thought that a decline in the populations of sandeel has contributed to fluctuations in the population of numerous bird species including puffin *Fratercula arctica* within the area.[58] This species is closely associated with sandy substrates with a low silt/clay fraction as they spend the majority of time buried. Marine Scotland Science identified such grounds along the northern coast of Sanday and further north towards Westray and Papa Westray[59], however none were identified in the Lashy Sound area.

Elasmobranchs

Marine Scotland catch data indicates that dogfish, skates and rays are all present in Orkney waters and are found within ICES rectangle 47E7. Skate sightings have been recorded throughout Lashy Sound off the east coast of the Calf Sound and down the west coast of Sanday and egg laying sites have also been identified near the Bay of London[60].

The basking shark *Cetorhinus maximus* is known to inhabit Orkney waters[61]. This species is listed as a UKBAP and OSPAR species and is protected under CITES[62] and requirements of the Wildilfe and Countryside Act 1981 (as amended) and the Wildlife and Natural Environment (Scotland) Act 2011. A basking shark sighting was recorded off Red Head, Eday in August 2013 by the Shark Trust and one sighting from the SRTP wildlife monitoring surveys in September 2013.

Diadromous fish

Several species of diadromous fish (those which migrate between fresh and marine waters) may migrate through Orkney waters. Atlantic salmon (*Salmo salar*), sea trout (*Salmo trutta*) and European

[56] Coull, K A; Johnstone, R; Rogers, S I. 1998. Fisheries Sensitivity Maps for British Waters. Cefas

[57] Ellis, J R; Milligan, S P; Readdy, L; Taylor, N; Brown, M J. 2012. Spawning and nursery grounds of selected fish species in UK waters. Cefas Lowestoft, 147: 56 pp

[58] Marine Scotland. 2010. Pentland Firth and Orkney Waters Marine Spatial Plan Framework and Regional Locational Guidance for Marine Energy. The Scottish Government, Aecom and Metoc

[59] SNH, 2013. Report on sand eel distribution in support of proposed MPAs. Available [online]: http://www.snh.gov.uk/docs/B989125.pdf

[60] Orkney Skate Trust, 2014. Skate Database. Sightings 2006 – 2008

[61] Evans, P.G.H., Baines, M.E. and Coppock, J. (2011). Abundance and behaviour of cetaceans and basking sharks in the Pentland Firth and Orkney Waters. Report by Hebog Environmental Ltd and Sea Watch Foundation. Scottish Natural Heritage Commissioned Report No.419.

[62] CITES (the Convention on International Trade in Endangered Species of Wild Fauna and Flora) is an international agreement between governments. Its aim is to ensure that international trade in specimens of wild animals and plants does not threaten their survival.

eel have all been recorded in the wider coastal waters of Orkney[63] and sea lamprey (Petromyzon marinus) may also be present but is considered rare.

Recent studies commissioned by Marine Scotland[64] and The Crown Estate[65] concluded that although broad scale patterns of migration can be identified, specific migratory routes for Atlantic salmon, European eel and sea trout cannot be identified with any certainty. Information for these species is limited and therefore it is not possible to specifically describe the variation in migratory routes or duration and extent to which they depend on near-shore and offshore areas. Marine Scotland Science advised in the PBD response that the Pentland Firth may be a key migratory route for adult salmon returning to at least major Scottish north and east coast rivers and it may be possible that some enter Orkney waters. It should be noted that Lashy Sound lies to the north of the Orkney Mainland, distant from the Pentland Firth and that there is no evidence to date to suggest that Lashy Sound is an important migratory route for diadromous fish.

Atlantic salmon

Atlantic salmon is an anadromous fish (migrates from sea to freshwater to spawn) which has conservation importance and is designated as an Annex II and V species of the Habitats Directive, a PMF and UKBAP priority species. Migrating salmon traveling to their natal rivers on Scottish coasts from offshore locations have been found to return from a variety of different directions and are likely to pass through the Pentland Firth. Some fish traveling to the east coast of Scotland may pass between Orkney and Shetland, however the lack of recorded salmon fisheries in Orkney and Shetland, and the lack of Scottish salmon caught in the Norwegian fishery suggests that this may not be a common route[64]. There are no salmon rivers in Orkney.

Sea trout

Sea trout are an anadromous species found in Orkney waters and are classed as both a PMF and UKBAP species. After approximately two years in a fresh water environment, sea trout migrate away from their natal trout burn and out to sea where they feed on the rich marine resources and become much larger than brown trout. Like salmon, these fish return to their natal rivers to spawn. They do not appear to undertake the same long distance migrations as salmon, and are known to stay within 7km of the coast during their first year at sea[66]. A declining population of sea trout has been observed throughout Scotland, most noticeably between 1998 and 2004 in Orkney waters. Between 2007 and 2009 however the population of sea trout in Orkney appeared to increase, providing some of the best catch reports in many years[64]. Further and more recent population data is being collected by the Orkney Trout Fishing Association (OTFA) who began a catch-return programme in spring 2010, however this data is not yet available. Several challenges face sea trout populations of Orkney, those that are relevant to the proposed Project are:

- The loss of spawning grounds through burn straightening and clearing;

[63] NBN Gateway (National Biodiversity Network). Available [online]: https://data.nbn.org.uk/

[64] I.A. Malcolm, J. Godfrey and A.F. Youngson. 2010. Review of migratory routes and behaviour of Atlantic salmon, sea trout and European eel in Scotland's coastal environment: implications for the development of marine renewables.

[65] Slaski, R.J, Hirst, D and Gray, S (2013). PFOW wave and tidal stream projects and migratory salmonids.

- pollution;
- obstruction to migration; and
- construction near burns.

There are twenty four identified trout burns in Orkney, located on three islands. The Mainland supports the most burns with sixteen identified sites. Hoy has six identified trout burns and there are two on Rousay. There are a further nine potential burns (six on the mainland and three on Hoy) that sustain brown trout but have not yet been found to contain sea trout. Burns leading into Harray Loch, Stenness, Boardhouse/Hudland, Swanney and Wester Loch (Rousay) have all been identified as important spawning grounds. For conservation purposes the OTFA defined an area of 7km radius around the mouth of all trout burns in Orkney in which potentially harmful activities should be avoided[66]. No trout burns are located on or near Eday and the closest is at least 23km west of the offshore AoS on Rousay and is therefore some distance away from the boundary of the sea trout sensitive area.

European eel

The European eel (*Anguilla Anguilla*) is a catadromous fish (migrates from fresh water to sea to spawn) and is a PMF, IUCN Red List and UKBAP species. Limited understanding of the migration patterns and behaviour of European eels in Scottish waters limits the extent to which impact predictions can be made. Adult eels may migrate out of the North Sea and into the Atlantic via Scottish waters, or by migrating up the Scandinavian coast and around Shetland, completely avoiding Scottish waters. It is just as possible that the migration route of European eels is not geographically confined[66]. Migrating eels have been found to be present in all levels of the water column, however display negative phototaxis and are therefore rarely found within the top few meters of the water column. The species was proposed as a potential feature for four Marine Conservation Zone sites but were later removed due to evidence suggesting that after spawning they migrate into any suitable estuary; hence protection of specific areas would most likely be ineffective[67]. As a result, there are no sites designated for the protection of European eels at present.

Sea lamprey

The sea lamprey is an anadromous species that migrates toward freshwater between May and June where they spawn upon pebble and cobble substrate. Sea lampreys are classed as an Annex II and UKBAP species[68]. Sea lampreys are the largest species of lamprey in the UK and are regarded as 'very rare' in Orkney[69]. They are a qualifying interest of River Spey SAC which is situated 171km to the south of the AfL area. The River Spey represents the sea lamprey in the northern part of its range in the UK.

---

[66] Malcom, I.A., Godfrey, J., Youngson, A.F. 2010. Review of migratory routes and behaviour of Atlantic salmon, sea trout and European eel in Scotland's coastal environment: implications for the development of marine renewables. Scottish Marine and Fresh Water Science.

[67] DEFRA 2013, Marine Conservation Zones: Site designations and summary of site-specific consultation responses. Available [Online]: https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/259856/mcz-site-specific-responses-20131121.pdf Accessed 03/06/2014

[68] SNH. Lampreys. Available [online]: http://www.snh.gov.uk/about-scotlands-nature/species/fish/freshwater-fish/lamprey/ (accessed 03/06/2014)

[69] Booth C. 2010. Fish records- Orkney. OFA. Available [online]: http://www.orkneycommunities.co.uk/FIELDCLUB/documents/Records/2010.02%20fish%20Orkney%20list.xls (accessed 03/06/2014)

It is absent from rivers north of the Great Glen, and the River Spey is virtually at the northern limit for this species.

Designated sites

Special Areas of Conservation for fish which may need to be considered as part of any Habitats Regulations Appraisal (HRA) under the Habitats Directive include rivers on the Scottish north coast and east coast where Atlantic salmon are returning from sea to spawn.

Marine Scotland Science (MSS) recommend in their response to the PBD that a broad geographical area should be considered due to the wide potential for connectivity for migrating salmon. Each of these SACs for Atlantic salmon is identified in Figure 7.2. SACs for freshwater pearl mussels (*Margaritifera margaritifera*) are also included as Atlantic salmon and other salmonids are integral to their life cycle and any impact on these fish could indirectly impact the population of mussels.

There is little evidence of significant numbers of salmon passing through the Orkney Isles. It is theoretically possible that Atlantic salmon from these SACs could pass through the offshore AoS. However, given the distance to the site and the availability of other routes between the SACs and the offshore waters utilised by Atlantic salmon, any potential impact from disturbance during migration is likely to be so minimal that the conservation objectives of these sites will not be undermined.

An HRA Screening report is provided in Appendix C.

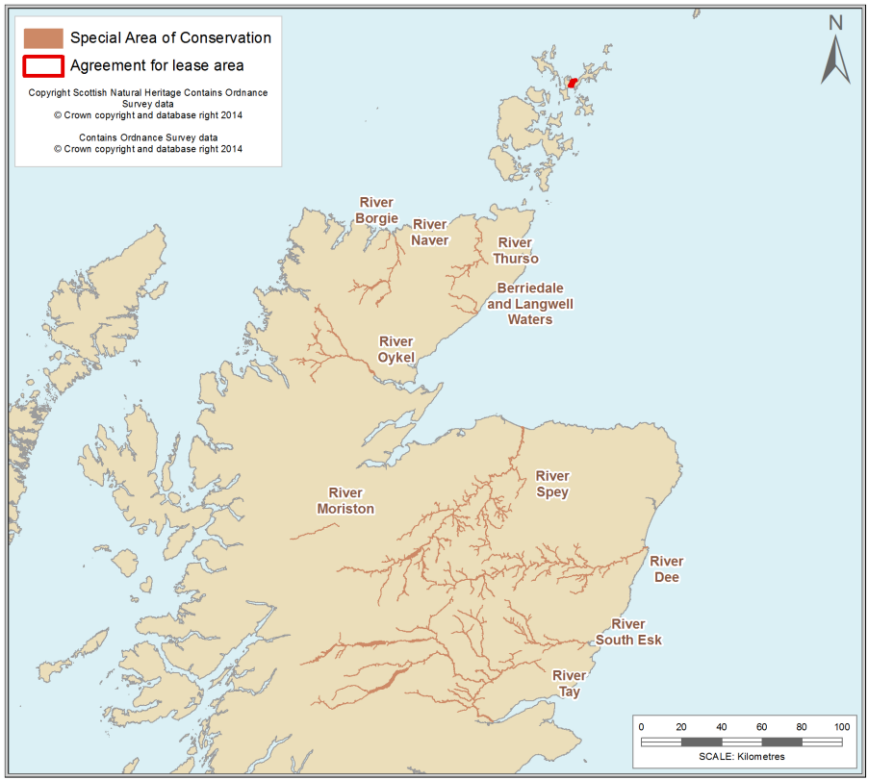

Figure 7.2 SAC designated rivers with potential connectivity with project.

7.2.2 Potential impacts

Possible impacts along with the potential significance of effect on fish are considered in the following table.

Potential impact	Phase	Potential significance	Comment
Loss of habitat due to placement of structures on the seabed	All phases	Effects unlikely to be significant	Placement of structures on the seabed may result in the loss of important habitat (e.g. spawning / nursery habitat) for some species. Impacts are likely to be small in scale and highly localised.
Creation of habitat (e.g. biofouling and FAD effects) due to placement of structures in the water column /on the seabed.	Operation	Possible beneficial impact	Placement of structures in the water column or on the seabed may result in the creation of habitat (i.e. through FAD or reef effects). Impacts are likely to be small in scale and highly localised.

Potential impact	Phase	Potential significance	Comment
Effects of noise and vibration (from vessel traffic, construction / decommissioning activities and operational noise) on migratory fish	All phases	Effects unlikely to be significant	Noise levels from vessels, drilling for rock anchors and operational noise are not anticipated to be significantly above background noise levels or at levels likely to cause injury or significant behavioural changes. Given the physical nature of Lashy Sound (ambient noise levels) and the expected low presence of species in the area, effects are unlikely to be significant.
Effects of noise and vibration (from vessel traffic, construction / decommissioning activities and operational noise) on basking shark	All phases	Potential significance of impact uncertain	Vessel noise and noise from installation activities may have the potential to result in behavioural changes. Noise levels from operating devices are not anticipated to be significantly above background noise levels or at levels likely to cause injury or significant behavioural changes. This will be considered further during the EIA.
Risk of collision with devices for basking shark.	Operation	Potential significance of impact uncertain	There is uncertainty around the possibility, likelihood and consequence of basking shark colliding with moving turbine blades. There is potential for collision to possibly result in injury or fatality. However, there is a general lack of understanding of the behaviour of basking shark in the vicinity of operating tidal turbines and it is not known whether animals would take avoidance action. This will be considered further during the EIA.

Potential impact	Phase	Potential significance	Comment
Risk of collision with devices for migratory fish	Operation	Effect unlikely to be significant	Lashy Sound is not considered to be an area of key importance for migratory fish species. Given the small footprint of the development and the availability of other routes through Orkney waters, the Project is not anticipated to cause a significant risk of collision to migratory fish species. Given its distance from Lashy Sound, the project is not anticipated to affect the Pentland Firth, a possible migratory route for Atlantic salmon.
Effects of electromagnetic fields (EMF) from export and inter-array cables on basking shark	Operation	Potential significance of impact uncertain	Basking shark and other elasmobranch species can detect electric and magnetic fields therefore there is the potential that EMF from subsea cables could result in behavioural changes. This will be considered further during the EIA.
Effects of electromagnetic fields (EMF) from export and inter-array cables on migratory fish.	Operation	Effect unlikely to be significant	Lashy Sound is not considered to be an area of key importance for migratory fish species. Migratory fish species are less sensitive to EMF than elasmobranchs. Impacts are likely to be small in scale and highly localised.
Barrier to movement	All phases	Effect unlikely to be significant	Given the small footprint of the development and the availability of other routes through Orkney waters, the Project is not anticipated to cause a significant barrier to movement for migratory fish species. The Project is not anticipated to affect the Pentland Firth, a possible migratory route for Atlantic salmon

Potential impact	Phase	Potential significance	Comment
			given its distance (at least 50-60km) from Lashy Sound. The Project Area is outwith sea trout sensitive areas, there are no sea trout burns on or near Eday with the nearest located at a distance of 23km to the west of the offshore AoS on the island of Rousay therefore the proposed Project is considered unlikely to affect the sea trout population of Orkney.
Pollution impact from accidental spillage from vessels.	All phases	Effect unlikely to be significant	An accidental event has the potential to result in the release or spillage of fuel or other contaminants from vessels. Industry best practice and safety measures will be followed to ensure such incidents are avoided therefore the likelihood of accidental spillage is considered extremely unlikely.

Please note that potential cumulative impacts are considered in Section 9 Cumulative and In-Combination Effects.

7.2.3 Baseline characterisation strategy

It is proposed that baseline conditions regarding fish and shellfish can be further defined to sufficient detail by obtaining data from the following sources:

Data sources:

- Evans, P.G.H., Baines, M.E. and Coppock, J. (2011). Abundance and behaviour of cetaceans and basking sharks in the Pentland Firth and Orkney Waters. Report by Hebog Environmental Ltd and Sea Watch Foundation. Scottish Natural Heritage Commissioned Report No.419;
- Malcolm, I.A, Godfrey, J. and Youngson, A.F. (2010). Review of migratory routes and behaviour of Atlantic salmon, sea trout and European eel in Scotland's coastal environment: implications for the development of marine renewables;
- Slaski, R.J, Hirst, D and Gray, S (2013). PFOW wave and tidal stream projects and migratory salmonids.

Field surveys:

- Sightings of basking sharks will be logged as part of SRTP marine mammal and bird surveys.

Consultation:

The following stakeholders will be consulted with regards to fish ecology:

- Association of Salmon Fishery Boards/District Salmon Fishery Board;
- Marine Scotland Science;
- Orkney Fisheries Association;
- Orkney Inshore Fisheries Group;
- Orkney Islands Sea Angling Association;
- Orkney Skate Trust;
- Orkney Trout Fishing Association;
- Rivers and Fisheries Trusts of Scotland (RAFTS);
- Scottish Fishermen's Federation;
- Scottish Fishermen's Organisation;
- Scottish Anglers National Association;
- Scottish Pelagic Fisherman's Association Ltd ;
- Scottish Salmon Producers Association;
- Scottish White Fish Producers Association;
- Sea Fish Industry Authority (Seafish).

7.2.4 Impact assessment strategy

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

Potential impact	Assessment topics and methodology
Effects of noise and vibration (from vessel traffic, construction / decommissioning activities and operational noise) on basking shark	All sources of potential acoustic disturbance arising from construction and vessel activities will be defined as far as possible using existing information and results from any acoustic characterisation of the device to inform a project specific noise impact assessment. Results of monitoring around test deployment of the SR2000 at EMEC may provide useful data.

Potential impact	Assessment topics and methodology
Risk of collision with devices for basking shark.	The potential risk and consequence of collision will be considered during the EIA. This will include consideration of the likely level of effect based on information relating to operational mode of devices and knowledge of species and behaviour. • Analysis and evaluation of species data from baseline studies; • Review of other developers approach to collision risk; • Review of current methodologies for collision risk modelling i.e. SRSL adapted model from Wilson et al, (2007). Collision risks between marine renewable energy devices and mammals, fish and diving birds; • Development of a collision risk assessment approach with MSS and SNH appropriate for the project and proportionate to the potential risk. Results of monitoring around test deployment of the SR2000 at EMEC may provide useful data in terms of avoidance behaviour.
Effects of electromagnetic fields (EMF) from export and inter-array cables on basking shark	The properties of the cable(s) to be used will be fully described in the ES. This will include details of the protection method (shielded, buried, protected etc.) and the EMF properties of the planned cables in the marine environment.

7.2.5 Possible mitigation and monitoring measures

The following possible mitigation and monitoring measures will be considered during ongoing EIA and project development activities:

- An acoustic study of the SR2000 device will be undertaken as part of the testing programme at EMEC which will allow the potential noise impacts if the device to be better understood;
- Collision risk monitoring will be undertaken of the SR2000 at EMEC including vibration sensors, hydrophones and cameras which will allow a better understanding of the likely effects of the device; and
- A suitable Project Environmental Monitoring Plan (PEMP) will be developed in consultation with SNH and Marine Scotland.

7.3 Marine mammals and reptiles

7.3.1 Introduction

The marine mammals and reptiles assessment considers cetaceans (whales and dolphins), pinnipeds (seals) and marine reptiles (turtles). It does not consider otters, which are discussed in Section 7.5 Coastal and terrestrial communities. This section should be considered alongside Appendix C Habitats Regulations Appraisal (HRA) screening report which identifies Natura 2000 sites (Special Areas of Conservation (SACs)) and their qualifying interests that could potentially be affected by the proposed Project.

SNH is responsible for ensuring that the marine mammal populations are maintained within Scottish Waters. However, licensing of commercial activities such as installing renewable energy devices in inshore waters, and the determination of imperative reasons of overriding public interest (IROPI) which might affect cetaceans, is the responsibility of Marine Scotland[70].

7.3.2 Baseline

Legal protection

All marine mammals are protected species and there are a number of legislative requirements that must be met by developers. Grey seal *Halichoerus grypus*, harbour (common) seal *Phoca vitulina*, bottlenose dolphin *Tursiops truncatus* and harbour porpoise *Phocoena phocoena* are protected under European legislation (Annex II of the European Habitats Directive). Annex V (a) of the Habitats Directive provides restrictions on methods for taking or killing seals. All cetaceans are also protected under Annex IV of the Habitats Directive, Appendix II of the Bern Convention, and small cetaceans are protected by the terms of the international agreement ASCOBANS (Agreement on Conservation of Small Cetaceans of the Baltic and North Seas).

All cetaceans are further protected under the Wildlife and Countryside Act 1981 (as amended) and it is an offence to intentionally kill, injure or take cetaceans; and to cause damage or destruction to certain areas used by cetaceans for shelter and protection, or to intentionally disturb animals occupying such areas. A number of marine mammals which are regularly sighted in Scottish waters and/or known to have significant populations in Scottish waters are included in SNH's list of Priority Marine Features (PMFs)[71].

Section 117 of the Marine (Scotland) Act 2010 (the Act) enables Scottish Ministers to designate seal haul out sites to protect seals from harassment through an order in the Scottish Parliament. The Protection of Seals (Designation of Haul-Out Sites) (Scotland) Act 2014 was established in Scottish

[70] SNH (2013). Marine mammals and Licensing. Available [online]: http://www.snh.gov.uk/protecting-scotlands-nature/species-licensing/mammal-licensing/marine/

[71] Identification of Priority Marine Features in Scottish territorial waters. Commissioned Report No. 388. Available online: http://www.snh.org.uk/pdfs/publications/commissioned_reports/388.pdf Accessed 30/05/14

Parliament on 26 June 2014 and identified 194 sites for designation. The Act will come into force from 29 September 2014 and it will be an offense to intentionally or recklessly harass seals at these sites.

The leatherback turtle is protected under UK legislation as well as being of international conservation significance under CITES.

Cetaceans

A review carried out for SNH has utilised a number of data sources, including Sea Watch Foundation, European Seabirds at Sea, SCANS, SCANS-II, Cetacean Stranding Investigation Programme and local reports to identify the behaviour and abundance of cetacean species (and basking shark) found in the Pentland Firth and Orkney Waters Strategic Area[72]. From this review, it is expected that the following cetacean species may utilise the offshore AoS:

- Harbour porpoise *Phocoena phocoena*;
- Minke whale Balaenoptera acutorostrata;
- Bottlenose dolphin *Tursiops truncatus*;
- Killer whale *Orcinus orca*;
- Risso's dolphin *Grampus griseus*;
- White-beaked dolphin *Lagenorhynchus albirostris*;
- Long-finned pilot whale *Globicephala melas*;
- Atlantic white-sided dolphin *Lagenorhynchus acutus*; and
- Short-beaked common dolphin *Delphinus delphis*.

Of these, harbour porpoise and long-finned pilot whale occur throughout the year in Orkney waters, whereas the other species have a seasonal occurrence. A number of other species have been observed in Orkney waters since 1980 but are considered to be rare. These include fin whale *Balaenoptera physalus*, humpback whale *Megaptera novaeangliae*, sperm whale *Physeter macrocephalus*, Sowerby's beaked whale *Mesoplodon bidens* (stranded only), Cuvier's beaked whale *Ziphius cavirostris*, northern bottlenose whale *Hyperoodon ampullatus* (stranding only), false killer whale *Pseudorca crassidens*, and beluga whale *Delphinapterus leucas*. In addition, three species have been recorded prior to 1980: blue whale *Balaenoptera musculus*, Sei whale *Balaenoptera borealis* and narwhal *Monodon monoceros*[72].

Lashy Sound could potentially be used for passage by a number of the species recorded in Orkney waters. Marine mammal surveys commissioned by SRTP have been underway since March 2013. During these surveys very low numbers of cetaceans have been recorded with only one sighting of a killer whale and four sightings of harbour porpoise. This sighting rate is similar to that of the EMEC wildlife observations in the Fall of Warness further south.

[72] Evans, P.G.H, Baines, M.E. and Coppock, J. (2011). Abundance and behaviour of cetaceans and basking sharks in the Pentland Firth and Orkney Waters. SNH Commissioned Report No. 419.

Pinnipeds

Both grey seal *Halichoerus grypus* and harbour (common) seal *Phoca vitulina* regularly occur in the Pentland Firth and Orkney Waters Strategic Area. The latest available survey data on population estimates in Orkney are for 2010 and indicate that grey seal numbers have remained relatively unchanged in recent years, with pup production[73] estimates at 20,300[74], while harbour seal numbers have declined by as much as 75% between 2000 and 2010 with the population estimated at 2,799[74].

Grey seal haul outs and breeding colonies are found on the Calf of Eday, Holms of Spurness and Point of Spurness. Small numbers of harbour seal haul out at Braeswick on Sanday and at various sites spread further north across the Sanday SAC (Figure 7.3). Grey seal were recorded during marine mammal surveys commissioned by SRTP throughout 2013, while harbour seal were recorded less frequently.

Grey seal may travel large distances between haul-out regions (over 100km[74]) outwith the breeding season and may not necessarily breed in the same area as they haul out. Harbour seal movements tend to remain relatively local (within 40-50km foraging range[74]) and there is less movement between haul-outs than that of grey seal. Seals within the designated sites and at proposed designated haul outs, particularly for grey seal, could potentially utilise the offshore AoS as part of their foraging range.

Natura sites

A screening process for a Habitats Regulations Appraisal (HRA) was carried out in accordance with The Conservation (Natural Habitats &c.) Regulations 1994 to identify whether any qualifying interests of Natura 2000 sites (SACs and SPAs) may be impacted by the proposed Project. Details and the results of this screening process are presented in Appendix C. There are no designated sites identified for cetaceans or pinnipeds within the offshore AoS. The closest site where cetaceans are a qualifying feature is Moray Firth SAC where bottlenose dolphins are a qualifying interest. However, despite photo-identification studies[75], there is no evidence that the Moray Firth bottlenose dolphins use Orkney waters as far north as Lashy Sound; therefore the Moray Firth SAC has been scoped out of the Project EIA/HRA.

SACs where pinnipeds are a qualifying interest and should be considered in relation to HRA for the proposed Project are identified in Figure 7.3 and include:

- Sanday SAC for harbour seals; and
- Faray and Holm of Faray SAC for grey seals.

Sanday SAC covers an area of approximately 10,970 ha around the eastern coast of the island, and is also referred to as a European Marine Site. The extensive intertidal and shallow subtidal bedrock reefs

[73] Pup production estimates are generally used for grey seals because of the uncertainty in overall population estimates.

[74] SCOS (2013). Scientific advice on matters related to the management of seal populations: 2013. Report of the UK Special Committee on Seals. Available [online]: http://www.smru.st-andrews.ac.uk/pageset.aspx?psr=411

[75] Thompson, P.M., Cheney, B., Ingram, S., Stevick, P., Wilson, B. and Hammond, P.S. (2011). Distribution, abundance and population structure of bottlenose dolphins in Scottish waters. Scottish Natural Heritage Commissioned Research Report No. 354

that surround the island qualify as an Annex I Habitat and are a primary reason for site selection. Other qualifying habitat features include subtidal sandbanks and intertidal mudflats and sandflats. Harbour seal is a qualifying Annex II Species and of primary importance for site selection. A large colony of harbour seal haul out along the coast on the intertidal reefs of Sanday to pup, molt and rest and represent approximately 89% of the Orkney population and 4% of the UK population[76]. The population is considered to be in decline; however the rate of decline appears to be slowing[74].

Faray and Holm of Faray SAC covers an area of approximately 785 ha encompassing both islands. The site holds one of the largest breeding groups of grey seal in the British Isles and grey seal is the primary qualifying interest of Annex II species present in the SAC. The numerous sea inlets provide access from the shore, and freshwater pools on the islands which appear to be particularly important for the seals. The population is considered to be stable[74].

National designated sites

There are a number of Sites of Special Scientific Interest (SSSI) relevant to the proposals (Figure 7.3). SSSIs are designated under the Nature Conservation (Scotland) Act 2004 and comprise areas of land and water which represent features of some of Scotland's best natural heritage. It is proposed that the following SSSIs are considered during the EIA:

- East Sanday Coast SSSI for harbour seal;
- Faray and Holm of Faray SSSI for grey seal;
- Muckle and Little Green Holm SSSI for grey seal; and
- Eynhallow SSSI for harbour seal.

Haul out sites

The Sea Mammal Research Unit (SMRU), on behalf of Marine Scotland, has compiled a list of high-use grey and harbour seal haul-out sites for consideration as potential sites for designation under the Marine (Scotland) Act 2010 (Figure 7.4). The sites in Figure 7.4 have recently been designated through The Protection of Seals (Designation of Haul-Out Sites) (Scotland) Act 2014. This Order will come into force on 29 September 2014 where it will be an offense to intentionally or recklessly harass seals when they are hauled out at these sites[77].

There are no identified sites within the onshore or offshore AoS that could be subject to potential disturbance during construction or operations. The Calf of Eday is a designated as a seasonal haul out for grey seal and is adjacent to the north east corner of the AfL area. SRTP will consult with Marine Scotland throughout project development and the EIA process to ensure these sites are considered appropriately during the EIA.

[76] SNH (2006). Sanday SAC. Available [Online]: http://www.snh.gov.uk/docs/B16612.pdf

[77] Marine Scotland (2014). Seal Haul Out sites. Available [online]: http://www.scotland.gov.uk/Topics/marine/marine-environment/species/19887/20814/FAQs (accessed 01/07/14)

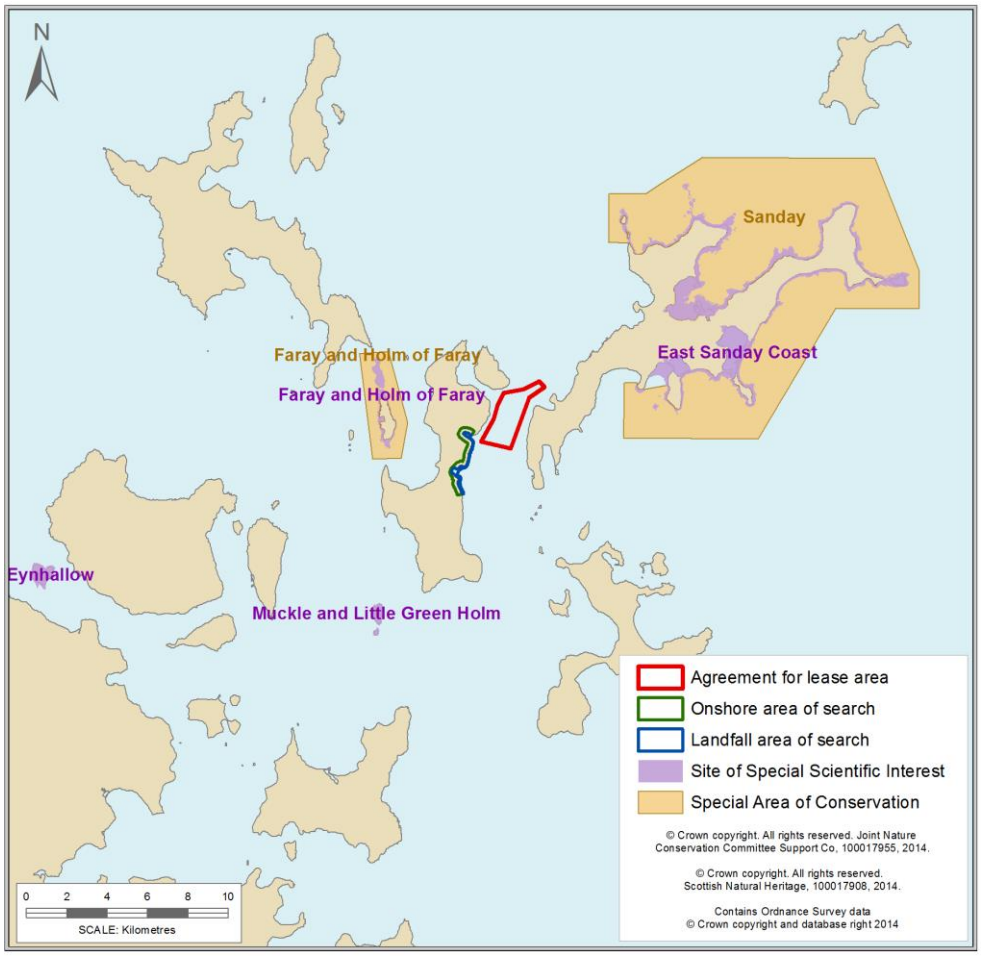

Figure 7.3 SACs and SSSIs designated for marine mammals.

Marine reptiles

Between 1970 and 1997 thirteen leatherback turtle *Dermochelys coriacea*, seven alive and six dead, were recorded either swimming at sea or stranded on the shores of Orkney. Since this time there have been a further six live sightings around Orkney in 1999, 2001, 2008 and 2010[78]. The leatherback turtle is now thought to be resident in Scottish waters at certain times of the year; where previously they were considered to be vagrants[79,80]. Their presence here, and around the UK in general, is thought to be related to the availability of jellyfish in the summer and autumn months which they feed on.

[78] NBN Gateway (2014). Available [online]: http://data.nbn.org.uk/imt/?mode=SPECIES&species=NBNSYS0000188646 (accessed March 2014)

[79] Barne, J.H., Robson, C.F., Kaznowska, S.S., Doody, J.P., Davidson, N.C., and Buck, A.L., eds. (1997). Coasts and seas of the United Kingdom. Region 2: Orkney. Peterborough, Joint Nature Conservation Committee. (Coastal Directories Series.)

[80] Langton, T.E.S., Beckett, C.L., King, G.L. and Gaywood, M.J. (1996). Distribution and status of marine turtles in Scottish Waters. SNH Research, Survey and Monitoring Report No.8. SNH, Battleby.

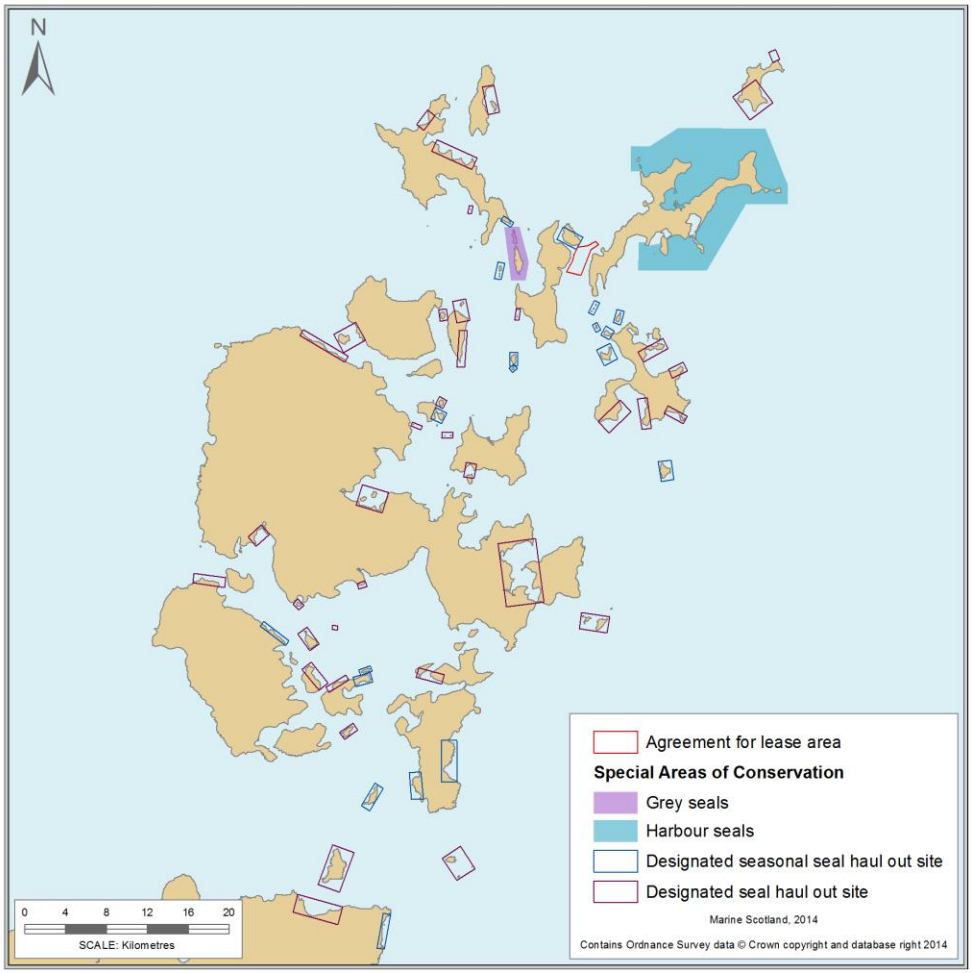

Figure 7.4 High use seal haul outs.

7.3.3 Potential impacts

Possible impacts along with the potential significance of effect on marine mammals are considered in the following table.

Potential impact	Phase	Potential significance	Comment
Disturbance (noise and visual presence) to marine mammals from vessel traffic.	All phases	Potential significance of impact uncertain	Levels of vessel traffic are expected to be greatest during the construction phase. Noise from vessel traffic may cause changes in marine mammal behaviour which may reduce foraging

Potential impact	Phase	Potential significance	Comment
			success or cause temporary avoidance. Disturbance from vessel traffic may lead to flushing of seals at haul out sites which could potentially affect energy expenditure or breeding success. Impacts may be reduced by mitigation measures. This will be considered further during the EIA.
Noise disturbance to marine mammals from installation activities	Construction	Potential significance of impact uncertain	Depending on the method of installation, installation activities may generate noise levels that have the potential to result in injury or changes in behaviour. This will be considered further during the EIA.
Disturbance to marine mammals from operational noise generated by the devices.	Operation	Potential significance of impact uncertain	Noise levels from operating devices are not anticipated to be significantly above background noise levels or at levels likely to cause injury or significant behavioural changes. This will be considered further during the EIA.
Spiral injuries to seals from vessel propulsion systems (e.g. ducted propellers)	All phases	Potential significance of impact uncertain	If vessels with ducted propellers are utilised, there may be a risk of spiral injuries to seals. It is not yet clear to what extent or under what circumstances these injuries occur. This will be considered further during the EIA. Impacts may be reduced by mitigation measures.
Risk of collision with tidal devices	Operation	Potential significance of impact uncertain	There is uncertainty around the possibility, likelihood and consequence of marine mammals colliding with moving turbine blades. Collision could possibly result in injury or fatality.

Potential impact	Phase	Potential significance	Comment
			However, there is a general lack of understanding of the behaviour of marine mammals in the vicinity of operating tidal turbines and it is not known whether marine mammals would take avoidance action. This will be considered further during the EIA.
Barrier to movement due to presence of the development	All phases	Potential significance of impact uncertain	The presence and operation of devices and associated moorings / support structures could potentially result in a barrier to movement to marine mammals. The significance of any impact will depend on whether the development is perceived as a barrier to movement and if an important route is affected e.g. a frequently travelled route or between foraging sites and breeding sites, etc., and if there are alternative routes available. This will be considered further during the EIA.
Displacement of essential activities due to the presence of the development	All phases	Potential significance of impact uncertain	Potential displacement of essential activities of marine mammals due to the presence of the development. The impact of displacement will depend on the relative importance of the habitat from which an animal is displaced, what essential activity is being displaced and the availability of suitable alternative habitat elsewhere. Displacement may reduce foraging success and increase energy expenditure and may lead to avoidance of an area which could potentially affect breeding success. This will be considered further during the EIA.

Potential impact	Phase	Potential significance	Comment
Pollution impact from accidental spillage from vessels.	All phases	Effect unlikely to be significant	An accidental event has the potential to result in the release or spillage of fuel or other contaminants from vessels. Industry best practice and safety measures will be followed to ensure such incidents are avoided therefore the likelihood of accidental spillage is considered extremely unlikely.
Impact to marine reptiles.	All phases	Effect unlikely to be significant	Impacts likely to relate to potential collision or disturbance to turtles resulting in exclusion of the area. However, there have been no records directly within the offshore AoS and only a small number of sightings were recorded within the last 5-10 years around the Orkney islands. Considered a rare and occasional visitor, therefore the potential encounter risk with a tidal array is very low and no significant impact is anticipated.

Please note that potential cumulative impacts are considered in Section 9 Cumulative and In-Combination Effects.

7.3.4 Baseline characterisation strategy

It is proposed that baseline conditions regarding marine mammals can be further defined to sufficient detail by obtaining data from the following sources:

Data sources:

- APEM (2013a) Year 2: Investigation of the utilisation of sea space by sea birds in the Pentland Firth and Orkney area 2012 / 13. Report to Scottish Government;
- APEM (2013b). Pentland Firth and Orkney Waters aerial bird survey: 2010/11 additional image analysis. APEM Scientific Report 512699. Pentland Firth and Orkney Waters Enabling Actions Report to The Crown Estate;
- Evans, P.G.H., Baines, M.E. and Coppock, J. (2011). Abundance and behaviour of cetaceans and basking sharks in the Pentland Firth and Orkney Waters. Report by Hebog Environmental Ltd and Sea Watch Foundation. Scottish Natural Heritage Commissioned Report No.419;

- Jones, E., McConnell, B., Sparling, C. and Matthiopoulos, J. (2013). Marine Mammal Scientific Support Research Programme MMSS/001/11. Sea Mammal Research Unit report to Scottish Government;
- Macleod, K., Lacey, C., Quick, N., Hastie, G. and Wilson J. (2011). Guidance on survey and monitoring in relation to marine renewables deployments in Scotland. Volume 2. Cetaceans and Basking Sharks. Unpublished draft report to Scottish Natural Heritage and Marine Scotland;
- Marine Scotland (2014). Seal Haul Out sites. Available [online]: http://www.scotland.gov.uk/Topics/marine/marine-environment/species/19887/20814/FAQs (accessed 01/07/14);
- National Biodiversity Network (NBN). National biological records;
- Orkney Biodiversity Records Centre (OBRC). Local biological records;
- Reid, J.B., Evans, P.G.H. and S.P. Northridge. (2003). Atlas of Cetacean distribution in north-west European waters. Joint Nature Conservation Committee, Peterborough.
- Robinson, S.P and Lepper, P.A. (2013) Scoping study: Review of current knowledge of underwater noise emissions from wave and tidal stream energy devices;
- SCOS (2013). Scientific Advice on Matters Related to the Management of Seal Populations : 2013; Report of the UK Special Committee on Seals;
- SMRU Ltd (2011). Utilisation of space by grey and harbour seals in the Pentland Firth and Orkney waters. Scottish Natural Heritage Commissioned Report No. 441;
- Sparling, C., Grellier, K., Philpott, E., Macleod, K., and Wilson, J. (2011). Guidance on survey and monitoring in relation to marine renewables deployments in Scotland. Volume 3. Seals. Unpublished draft report to Scottish Natural Heritage and Marine Scotland;
- SRTP monitoring programme of the SR2000 at the EMEC Fall of Warness tidal test site; and
- SRTP Wildlife monitoring project 2013-2014.

Field surveys:

A baseline survey methodology to identify marine mammal and their abundance, spatial distribution and behaviour has been underway since March 2013 by Natural Power Consultants. The methodology for the survey was agreed with Marine Scotoand and Scottish Natural Heritage prior to the commencement of the survey and both have been provided with interim reports at regular intervals.

The surveys are being conducted over an 18 month period, with significant effort taking place from March to August months when marine mammal activity is expected to be at its highest. The outline methodology includes:

- A survey area covering the offshore AoS area plus a 1km buffer;
- Four vantage points, two on Eday and two on Sanday;
- Survey effort covers 8 hours per VP per month in summer (March to August) and 6 hours in winter (September to February), covering both peak flow and slack tide periods;
- Marine mammal specific survey carried out for 15 minutes per hour (alongside bird surveys), i.e. 2 hours in each 8 hour period summer and 1.5 hours in each 6 hour period in winter;

- A record of species, number, behaviour, angle from observer, distance from observer and time of day is made, a record of behaviour and map of movement is made if possible;
- A total of 84 hours of dedicated marine mammal scans were undertaken March 2013 to February 2014.

Providing enough sample data is obtained, distance analysis will be used to estimate density and abundance of species present. This method is used where point transect sampling along linear features is used to gather survey data. This approach is non-random and can be biased and the distance analysis methodology is used to mitigate this to provide estimated density gradients.

Consultation:

The following stakeholders will be consulted with regards to marine mammals and reptiles:

- JNCC;
- Marine Conservation Society;
- Marine Scotland;
- Scottish Association for Marine Science (SAMS);
- Sea Mammal Research Unit (SMRU);
- SNH; and
- Whale and Dolphin Conservation Society.

7.3.5 Impact assessment strategy

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

Potential impact	Assessment topics and methodology
Disturbance (noise and visual presence) to marine mammals from vessel traffic.	All sources of potential acoustic disturbance arising from construction and vessel activities will be defined as far as possible using existing information and data and results from any acoustic characterisation of the device to inform a project specific noise impact assessment. Results of monitoring around test deployment of the SR2000 at EMEC may provide useful data.
Noise disturbance to marine mammals from installation activities	
Disturbance to marine mammals from operational noise generated by the devices.	An acoustic assessment of the SR2000 will be undertaken at EMEC which will be available to inform the Lashy Sound EIA.
Spiral injuries to seals from vessel propulsion systems (e.g. ducted propellers)	A corkscrew injury risk assessment will be undertaken during the EIA. The scope of this assessment will be discussed and agreed with Marine Scotland and SNH. This will focus on the type and frequency of vessel usage throughout the project.

Potential impact	Assessment topics and methodology
Risk of collision with tidal devices	The potential risk and consequence of collision will be considered during the EIA. This will include consideration of the likely level of effect based on information relating to operational mode of devices and knowledge of species and behaviour. • Analysis and evaluation of species data from baseline studies; • Review of other developer's approach to collision risk; • Review of current methodologies for collision risk modelling i.e. SRSL adapted model from Wilson et al, (2007). Collision risks between marine renewable energy devices and mammals, fish and diving birds; • Development of a collision risk assessment approach with MSS and SNH appropriate for the project and proportionate to the potential risk. Results of monitoring around test deployment of the SR2000 at EMEC may provide useful data in terms of avoidance behaviour.
Barrier to movement due to presence of the development	Results of monitoring around test deployment of the SR2000 at EMEC and the EMEC wildlife monitoring data may provide useful data in terms of local behaviour. Results of SRTP wildlife monitoring surveys may provide insight into use of AoS for passage, foraging, breeding etc.
Displacement of essential activities due to the presence of the development	Results of monitoring around test deployment of the SR2000 at EMEC and the EMEC wildlife monitoring data may provide useful data in terms of local avoidance behaviour. Results of SRTP wildlife monitoring surveys may provide insight into use of AoS for passage, foraging, breeding etc.

7.3.6 Possible mitigation and monitoring measures

The following possible mitigation and monitoring measures will be considered during ongoing EIA and project development activities:

- A robust Project Environmental Monitoring Plan (PEMP) will be developed in consultation with SNH and Marine Scotland. This will include an Adaptive Management Strategy;
- Monitoring activities at the current tidal demonstration site at EMEC, Fall of Warness may be carried out to help identify marine mammal behaviour in response to the tidal device and inform appropriate monitoring techniques for use at Lashy Sound;

- To reduce potential for collision with vessel hulls the Scottish Marine Wildlife Watching Code will be followed during all operations; and
- Measures will be developed through the engineering design process with the intention to, wherever possible minimise potential for impact.

7.4 Marine birds

This section of the report addresses ornithological interests for marine habitats that could be affected by the proposed Project. This section should be considered alongside Appendix C Habitats Regulations Appraisal (HRA) screening report which identifies Natura 2000 sites (Special Protection Areas (SPAs) and Special Areas of Conservation (SACs)) and their qualifying interests that could potentially be affected by the proposed Project.

The potential effects on birds, including the qualifying interests of SPAs, the notified features of nationally designated sites and species of local importance are considered within this section.

Terrestrial bird species are addressed in Section 7.5 Coastal and terrestrial communities.

7.4.1 Baseline

Protected species

Species of conservation importance protected under international, national or local legislation that could potentially be affected by the proposed Project will be considered within the EIA. All wild birds are protected under the EU Birds Directive (Directive 2009/147/EC). This legislation provides protection of internationally important rare, threatened, or vulnerable species and regularly occurring migratory species (listed in Annex I[81]) through the establishment of SPA networks. These networks are protected areas comprised of particular habitats which support these species and may include terrestrial and marine components.

The Wildlife and Countryside Act 1981 (as amended) gives general protection to nearly all species of wild birds to prevent capture or killing and to prevent damage to, or the destruction of, active nest sites. Protection is extended to certain species under Schedule 1 of this act, so that it is also an offence to cause disturbance to these birds at their nest.

European natural heritage designations – SPAs

All SPAs that have qualifying interests that could potentially be affected by the proposed Project identified by the HRA screening process are listed in Table 2.2, Appendix C and their locations shown in Figure 7.5 below. Many seabird species forage across very large areas during the breeding season therefore SPAs at considerable distances from the AfL area could have qualifying interests that could be affected by the proposed Project. Twenty-nine SPAs identified by the HRA screening process have qualifying interests that could potentially be present in the AfL area. The AfL area partly overlaps the marine component of the Calf of Eday SPA designated for its internationally important populations of

[81] Rare or vulnerable species listed in Annex I of the EU Birds Directive (2009/147/EC)

breeding seabirds (Figure 7.5). This site regularly supports 30,000 seabirds with nationally important populations of Great cormorant *Phalacrocorax carbo carbo*; Northern fulmar *Fulmarus glacialis*; Great black-backed gull *Larus marinus*; Common guillemot *Uria aalge*; and Black-legged kittiwake *Rissa tridactyla*[82].

SPA qualifying interests that are considered relevant to the Project are those where a potential likely significant effect (LSE) from the proposed Project cannot be ruled out. Whilst the screening methodology recommended by SNH has been followed it is worth noting that this process is highly precautionary and many of the sites and qualifying interests identified may not be concluded as having significant effects on SPA conservation objectives when considered in greater detail (i.e. when examined through Appropriate Assessment).

National designations - SSSIs

Sites of Special Scientific Interests (SSSIs) are designated under the Nature Conservation (Scotland) Act 2004 and comprise areas of land and water which represent features of some of Scotland's best natural heritage. Many of these protected areas also form part of the Natura 2000 network for SPAs and SACs.

Thirty five SSSIs that have notified features that could potentially be affected by the proposed Project have been scoped into the assessment (Table 2, Appendix D). All sites that have notified features that may be present in the marine environment, and that could potentially be affected by the proposed Project within the AfL area have been scoped into the assessment using the same criteria as used for sites with international designations i.e. an overlap in mean maximum foraging range of seabird species with the AfL area (see Table 2.4 in Appendix C). The locations of these sites are shown in Figure 7.6. It should be noted that all but two of these SSSIs are also designated in whole or in part as SPAs however in many instances there are differences between the lists of notified and qualifying features of these sites.

Local designations - LNCSs

Local Nature Conservation Sites (LNCSs) are listed in the Orkney Local Development Plan 2014 which has now been adopted by Orkney Islands Council (OIC). LNCSs are non-statutory sites designated for their ornithological, botanical or geological interests that support natural habitats and species that are considered a priority for biodiversity conservation. Development that affects an LNCS will only be permitted where it will not have a significant adverse impact on the integrity of the site, or the qualities for which it has been designated, or any such impact is clearly outweighed by social, environmental or economic benefits and there is no satisfactory alternative. Potential impacts on

LNCSs and the species of interest will be taken into consideration during onshore development design and in the EIA process (Figure 7.7 in Section 7.5 Coastal and terrestrial communities).

Most of the species of interest are wholly terrestrial species, however several species that breed within the LNCSs and are also likely to forage in the marine environment include species such as Great

[82] SNH Sitelink. Available [Online]: http://gateway.snh.gov.uk/sitelink/siteinfo.jsp?pa_code=8478 Accessed 17/06/14

skua *Sterocorarius skua*, Arctic skua *Stercorarius parasiticus* and Arctic tern *Sterna paradisaea* (Table 2 in Appendix D).

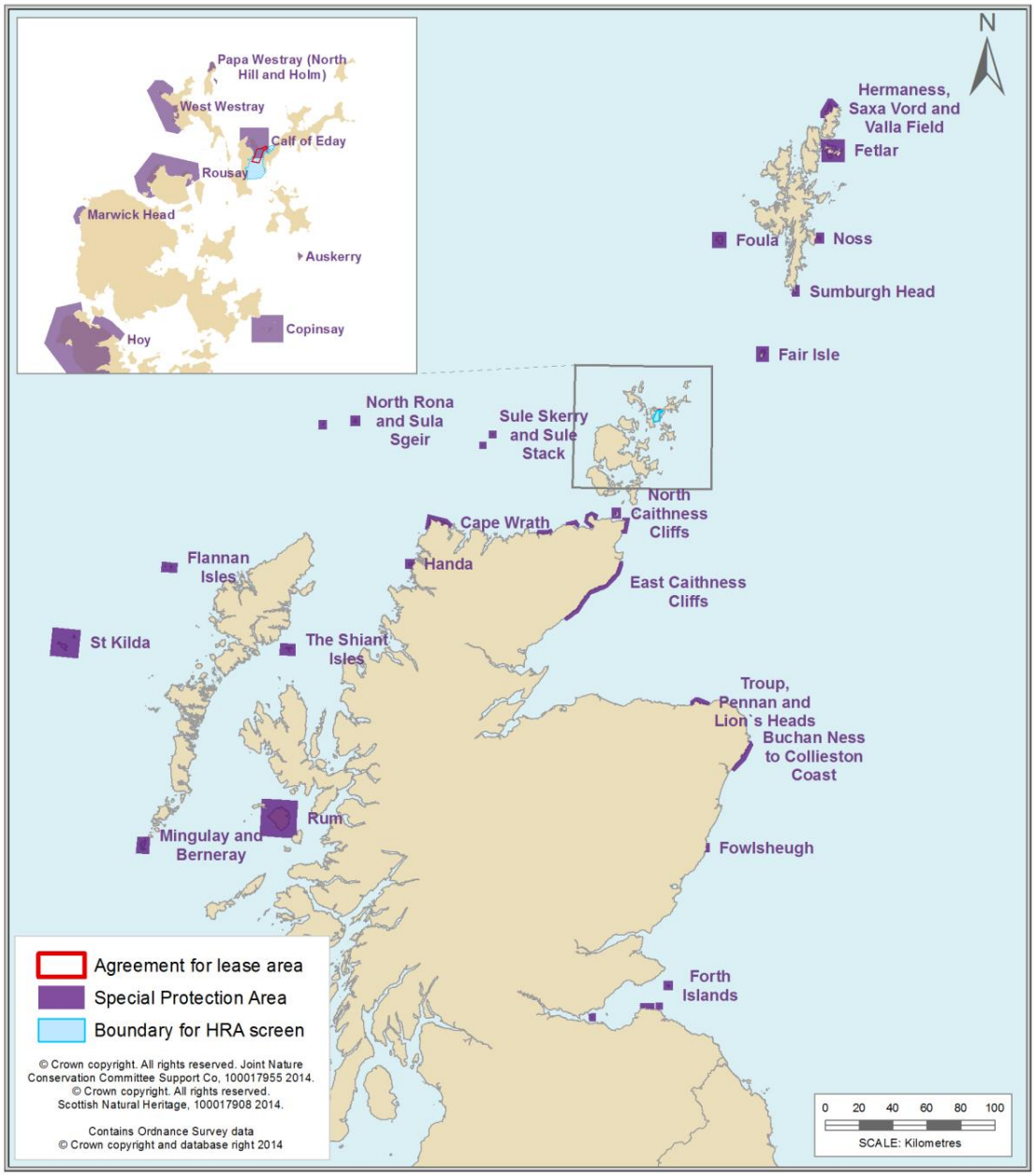

Figure 7.5 SPAs relevant to the project

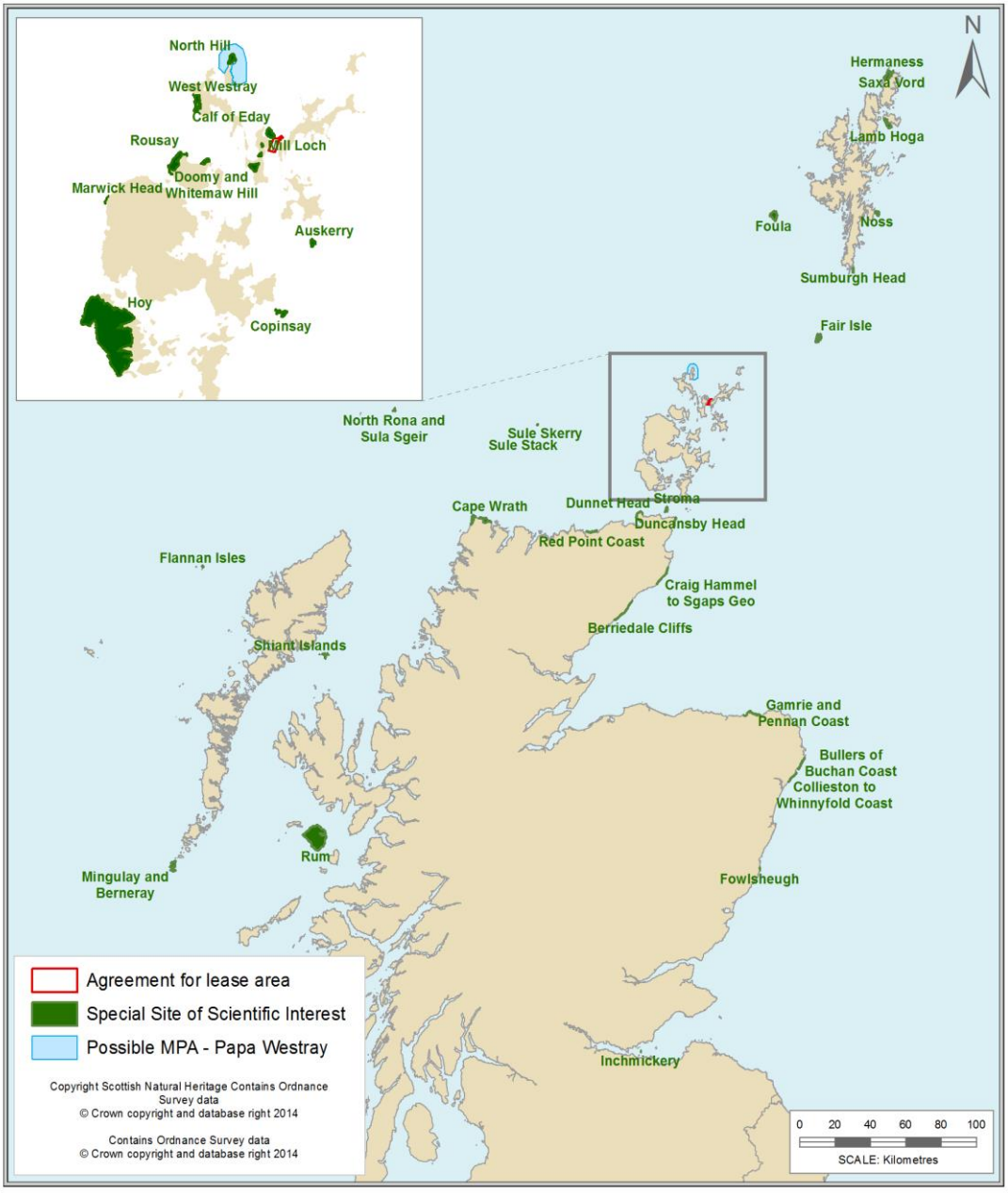

Figure 7.6 SSSIs designated for birds relevant to the Project.

Local designations - LNRs

There are no Local Nature Reserves (LNRs) within the vicinity of the onshore AoS that could be affected by the proposed Project.

Baseline characterisation surveys

A programme of baseline characterisation surveys to determine the seasonal distribution, abundance and behaviour of marine birds using the Lashy Sound area have been underway since March 2013.

These surveys have been managed by Natural Power Consultants (NPC). Survey methodologies were agreed in consultation with SNH and Marine Scotland. Results from the first 12 months of surveys have been provided to Marine Scotland and SNH. Currently the survey work is due to continue until August 2014 (i.e. to provide coverage of two breeding seasons), further consultation will be undertaken with Marine Scotland and SNH regarding whether the survey effort should continue after this time.

The results from these baseline surveys will be used to inform the EIA.

Full details of the survey methodologies used and the preliminary findings following 12 months of surveys are presented in a 12-month Interim report to SRTP. A brief summary is provided here. Surveys were conducted between March 2013 and February 2014 from four vantage points (VPs): two on Eday and two on Sanday. Two different methodologies were used to record the ornithology of the site: one to cover periods of slack tide (one hour either side of high and low water) and one to cover periods of peak flow (during the other four hours of the tidal cycle). During the summer months of March to August 2013, eight hours of observation were completed at each VP, with four hours focussed on peak flow and four hours focussed on slack tide. Survey effort was reduced to six hours at each VP during winter months (September 2013 to February 2014) when bird activity was expected to be lower. For each record, the species, number of birds, location and behaviour were recorded. Only birds on the sea or touching the sea surface (i.e. flying birds engaged in dip-feeding or plunge-diving) were recorded. As there was an overlap in visibility between VPs, surveys from different VPs were not carried out simultaneously. Surveys were carried out in sea states of 3 or less and when visibility was >2 km.

Preliminary findings of baseline surveys

The three most frequently observed species within the Lashy Sound survey area were Northern fulmar *Fulmarus glacialis*, black guillemot *Cepphus grylle* and European shag *Phalacrocorax aristotelis.*

A species vulnerability index for tidal energy devices developed by Furness *et al*, (2012) [83] will be utilised to inform the assessment of vulnerability for all species present within Lashy Sound. The index scores seven vulnerability factors (drowning risk, mean and maximum diving depth, benthic foraging, use of tidal races for foraging, feeding range, disturbance by vessel traffic and habitat specialisation) considered to influence risk at the population level for seabird species.

The index indicates that Northern fulmar have 'low vulnerability', while black guillemot and European Shag have 'high vulnerability'. While this study provides valuable information to inform the impact assessment on birds, the status and trends of the population of the species in question will also be considered in a local and regional context.

[83] Furness, R. W., Wade, H. M., Robbins, A. M. C., and Masden, E. A. (2012). Assessing the sensitivity of seabird populations to adverse effects from tidal stream turbines and wave energy machines. ICES Journal of Marine Science, 69: 1466–1479.

7.4.2 Potential impacts

The potential impacts on marine birds from the onshore and offshore components of the proposed project, along with the potential significance of effect are considered in the following table.

Impact	Phase	Potential significance	Comment
Collision risk to diving birds from operating underwater turbines.	Operation	Potential significance of impact uncertain	There is uncertainty around the possibility, likelihood and consequence of diving birds colliding with moving turbine blades. For species that are capable of diving to depths of the operating turbine blades, there is potential for collision which could result in injury or mortality. However, there is a general lack of understanding of the behaviour of diving birds in the vicinity of operating tidal turbines and it is unknown whether birds would take avoidance action. This will be considered further during the EIA.
Loss / change of habitat due to presence of structures on seabed and in water column.	Construction and Operation	Potential significance of impact uncertain	Direct loss of marine habitat due to the placement of structures on the seabed may result in the loss of foraging habitat for some species. Loss of foraging habitat may increase energy expenditure and reduce breeding success if suitable alternative habitat is not available. Impacts likely to be small in scale and highly localised. This will be considered further during the EIA.
Displacement from vicinity of turbines.	Construction and Operation	Potential significance of impact uncertain	The presence and operation of devices and associated moorings / support structures could potentially result in the

Impact	Phase	Potential significance	Comment
			displacement of birds out of the AfL area. The impact of displacement will depend on the relative importance of the habitat from which an animal is displaced, what essential activity is being displaced (foraging, moulting, maintenance activities, etc.) and the availability of suitable alternative habitat elsewhere. Displacement may reduce foraging success and increase energy expenditure and may lead to avoidance of an area which could potentially affect breeding success. Observations during testing of the SR250 device at EMEC has provided some evidence that some species e.g. black guillemots may use the above surface structures for roosting. This will be considered further during the EIA.
Disturbance from vessel activity and installation activities.	Construction, Maintenance and Decommissioning	Potential significance of impact uncertain	Noise and visual disturbance from increased vessel activity and during installation works is expected to be greatest during the construction phase. Disturbance may lead to increased flushing which may reduce foraging success and increase energy expenditure and may lead to avoidance of an area which could potentially affect breeding success. Impacts may be reduced by mitigation measures. This will be considered further during the EIA.

Impact	Phase	Potential significance	Comment
Onshore habitat loss (breeding) due to land-take for infrastructure.	Construction and Operation	Potential significance of impact uncertain	Impacts likely to be small in scale and highly localised. Impacts may be reduced by mitigation measures e.g. site selection to avoid sensitive areas. This will be considered further during the EIA.
Disturbance from onshore construction works .	Construction	Potential significance of impact uncertain	Impacts likely to be small in scale and highly localised. Impacts may be reduced by mitigation measures e.g. timing works to avoid key periods and site selection to avoid sensitive areas. This will be considered further during the EIA.

Please note that potential cumulative impacts are considered in Section 9 Cumulative and In-Combination Effects.

7.4.3 Baseline characterisation strategy

Information on baseline conditions regarding marine and terrestrial birds sufficient to inform HRA and EIA will be assembled from a combination of existing data sources and data collected during the baseline characterisation surveys.

Existing datasets are valuable in providing a wider context to the baseline survey results, enabling the relative importance of the offshore AoS to a species to be assessed. The relative importance of the AfL area in the context of species distribution in UK and Scottish waters will be analysed using density distribution data presented in Kober *et al*, (2010). This report presents the findings of an analysis of European Seabirds at Sea (ESAS) data which represents the most comprehensive and longest running dataset for the distribution of seabirds at sea. APEM data collected from two years of digital aerial surveys of the Pentland Firth and Orkney Waters (PFOW) strategic area provide the most up to date abundance and distribution information on seabird populations for the region and potentially provide valuable regional context for the baseline characterisation survey data (APEM, 2013a and 2013b).

Existing data sources include:

- APEM (2013a). Pentland Firth and Orkney Waters aerial bird survey: 2010 / 11 additional image analysis. APEM Scientific Report 512699. Report to The Crown Estate. 180pp;

- APEM (2013b) Year 2: Investigation of the utilisation of sea space by sea birds in the Pentland Firth and Orkney area 2012 / 13. Technical Report 511639 Report to Scottish Government. 246 pp;
- BTO Atlas and WeBs data;
- Furness, R. W., Wade, H. M., Robbins, A. M. C., and Masden, E. A., 2012. Assessing the sensitivity of seabird populations to adverse effects from tidal stream turbines and wave energy machines. – ICES Journal of Marine Science, 69: 1466–1479;
- Kober, K., Webb, A., Win, I., Lewis, M., O'Brien, S., Wilson, L.J., Reid, J.B. (2010). An analysis of the numbers and distribution of seabirds within the British Fishery Limit aimed at identifying areas that qualify as possible marine SPAs. JNCC report No. 431;
- Mitchell, I.P., Newton, S.F., Ratcliffe, N., Dunn, T.E., 2004. Seabird Populations of Britain and Ireland. T and A D Poyser, London; and
- Orkney Bird Reports.

Field surveys:

- SRTP Baseline site characterisation surveys of Lashy Sound (March 2013 ongoing)

Consultation:

The following stakeholders will be consulted with regards to marine birds:

- Marine Scotland;
- RSPB; and
- SNH.

7.4.4 Impact assessment strategy

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

Potential impact	Assessment topics and methodology
Collision risk to diving birds from operating underwater turbines	Baseline survey data will be used to assess collision risk taking into consideration species vulnerability , species ecology and behaviour and the relative importance of the proposed Project area using existing data sources .e.g. Kober *et al*, 2010; Furness *et al*, 2012; APEM, 2013a, 2013b, etc.). A qualitative collision risk assessment will be undertaken to identify species that could potentially be at risk e.g. comparison of behaviour (diving depth and duration) / manoeuvring

Potential impact	Assessment topics and methodology
	ability/swimming speed and visual acuity with blade velocity and position in water column. A review of current methodologies for collision risk modelling e.g. Wilson *et al* (2007)[84] / SRSL encounter rate model (ERM) will also be undertaken. Results of monitoring around test deployment of the SR2000 at EMEC may provide useful data.
Loss / change of habitat due to presence of structures on seabed and in water column	An assessment of the scale and extent of loss / change of habitat will be undertaken and the species that could potentially by affected. Results of monitoring around test deployments may provide useful data.
Displacement from vicinity of turbines	Identify species vulnerable to disturbance / displacement from existing literature e.g. Furness *et al*, 2012[83] and quantify numbers of those species predicted to be affected using baseline site characterisation data and the duration and frequency of activities. Results of monitoring around test deployment of the SR2000 at EMEC may provide useful data.
Disturbance from vessel activity and installation activities	
Onshore habitat loss (breeding) due to land-take for infrastructure	Breeding bird survey data will inform site selection and identify areas where development should be avoided.
Disturbance to breeding birds from onshore construction works	Breeding bird survey data can also be used to assess potential impacts on disturbance to breeding birds likely to be present within the vicinity of onshore works.

7.4.5 Possible mitigation and monitoring measures

The following possible mitigation and monitoring measures will be considered during ongoing EIA and project development activities:

- A robust Project Environmental Monitoring Plan (PEMP) will be developed in consultation with SNH and Marine Scotland. An adaptive management approach will be taken;
- Monitoring activities at the current tidal demonstration site and the SR2000 at EMEC, Fall of Warness will be carried out to investigate diving bird behaviour around the tidal device and to inform appropriate monitoring techniques for use at the potential commercial site;

[84] Wilson, B. Batty, R.S. Daunt, F. and Carter, C. (2007) Collision risks between marine renewable energy devices and mammals, fish and diving birds. Report to the Scottish Executive. Scottish Association for Marine Science.

- Avoidance of sensitive areas e.g. breeding birds through project design;
- Where possible, time works to avoid sensitive times of year for any vulnerable species present, e.g. avoid breeding season (April to August inclusive);
- Avoid as far as possible the vicinity of areas used by vulnerable species e.g. implement buffer areas to avoid disturbance.

7.5 Coastal and terrestrial communities

This Section addresses intertidal and terrestrial ecology including intertidal and terrestrial habitats, coastal species such as otter and terrestrial species including birds. It should be noted that marine ornithological interests and designated sites with ornithological interests are addressed within Section 7.4 Marine birds.

7.5.1 Baseline

European designations –SACs and Ramsar sites

Ramsar sites are wetlands of international importance designated under the Ramsar Convention. There is one Ramsar site to the east of the onshore AoS, East Sanday Coast Ramsar site which is designated for its populations of wintering waders. The same area is also designated as an SPA, also for its wintering wader populations. East Sanday Coast Ramsar and SPA are not considered relevant to the proposed Project as at the distance from the onshore AoS there is no potential for any impacts on wintering waders. Hence the onshore AoS is out with any sites of European importance.

National designations

There are no nationally designated sites within the onshore AoS however there are two SSSIs nearby on Eday that could potentially be affected by the proposed Project; these are Doomy and Whitemaw Hill SSSI designated for its breeding populations of Arctic skua *Stercorarius parasiticus* and Whimbrel *Numenius phaeopus* and Mill Loch SSSI designated for its breeding population of Red-throated divers *Gavia stellate* (Figure 7.7 and Table 1 in Appendix D). Red-throated divers breed on inland lochs however they make regular foraging trips each day to feed in nearby coastal waters therefore this species is considered relevant to both the onshore and marine components of the project.

Local designations -LNCSs

There are four Local Nature Conservation Sites (LNCSs) listed for botanical, ornithological and wildlife interests within the onshore AoS on Eday; these are: Bomo LNCS, Loch of London LNCS, Mussetter, Doomy and London LNCS and Skaill LNCS. All of these sites are noted for a range of nationally and locally important habitats and species. Bomo, Loch of London, Mussetter, Doomy and London, and Skaill are listed in part due to their ornithological interests. There are a further two LNCSs adjacent to the onshore AoS these are Ward Hill LNCS and Stennie Hill LNCS.

All of these sites are noted for a range of nationally and locally important species of breeding birds including breeding waders such as Golden plover Pluvialis apricaria, Curlew *Numenius arquata* and Lapwing Vanellus vanellus and small passerines such as Skylark *Alauda arvensis*, Twite *Carduelis flavirostris*, Linnet *Carduelis cannabina* and Songthrush *Turdus philomelos*. The full list of species and

habitats of special interest for each of these sites are listed in Table 2, Appendix D and the location of each LNCS is presented in Figure 7.7.

Bomo LNCS comprises a basin of deep peat and surrounding drier heather moorland. The onshore AoS overlaps a small section at the southern end of the site which is dry dwarf shrub heath.

Loch of London LNCS covers a large area of heather moorland surrounding a central basin occupied by the Loch of London and surrounding bog. The onshore AoS overlaps the eastern and southern parts of the site. The eastern area comprises dry dwarf shrub heath habitat which is dominated by heather *Calluna vulgaris* with few other plants present. Deep peat around the loch supports bog vegetation including bog cotton *Eriophorum vaginatum*, bog asphodel *Narthecium ossifragum* and sphagnum moss *Sphagnum spp*. Round-leaved sundew *Drosera rotundifolia* (a carnivorous plant) also occurs here. Wet conditions with similar vegetation extend southwards on thinner peat towards the Bay of London, where there is an abrupt change to dry grassland and heathland dominated by crowberry *Empetrum nigrum* on windblown sand.

Mussetter, Doomy and London LNCS comprises the Sands of Mussetter, Sands of Doomy, the Loch of Doomy and Bay of London. The onshore AoS overlaps the Bay of London area which has a variety of coastal grassland and dune habitats. This LNCS is also listed for otter.

Skaill LNCS is an area of upland heath and basin bog, with an area composed of deep peat. The onshore AoS overlaps a small area of dry modified bog in the northernmost part of the site. The area sloping upwards to the north is dry heather moorland where bog myrtle *Myrica gale* is found and is the only site in Orkney where this is known to occur. This LNCS is also listed for otter.

Study area

The Local Biodiversity Action Plan for Orkney (OLBAP) has a target action plan to conserve Orkney's biodiversity[85]. Ten targeted habitats have been identified as priority habitats for conservation of which at least four are present in the onshore AoS: basin bogs, coastal sand dunes, burns and canalised burns and possibly intertidal underboulder communities.

Terrestrial habitats

The onshore AoS on Eday is characterised by improved grassland, neutral and acidic grasslands, with a mosaic of heather moorland and lowland or basin peat formations and blanket bog. The features described at the designated sites reflect the wider variety of terrestrial habitats present.

Coastal habitats

Coastal habitats found on Eday include those along cliffs and cliff-tops which include vegetation types strongly linked to the influence of sea spray deposition, soil depth, soil moisture and the influence of grazing; and sand dune systems, particularly bay dunes which have developed upon sand trapped within the shelter of rock headlands such as Mill Bay and the Bay of London which is a bay dune with

[85] Orkney Local Biodiversity Action Plan, 2013 – 2016 (Orkney Biodiversity Steering Group, 2013). Available [Online]: http://www.orkney.gov.uk/Files/Planning/Biodiversity/Orkney_LBAP_with_appendices.pdf Accessed 07/06/14

machair[86]. The dunes differ on Eday compared to others on Orkney as they contain alternating layers of peat and sand forming dune heath habitats.

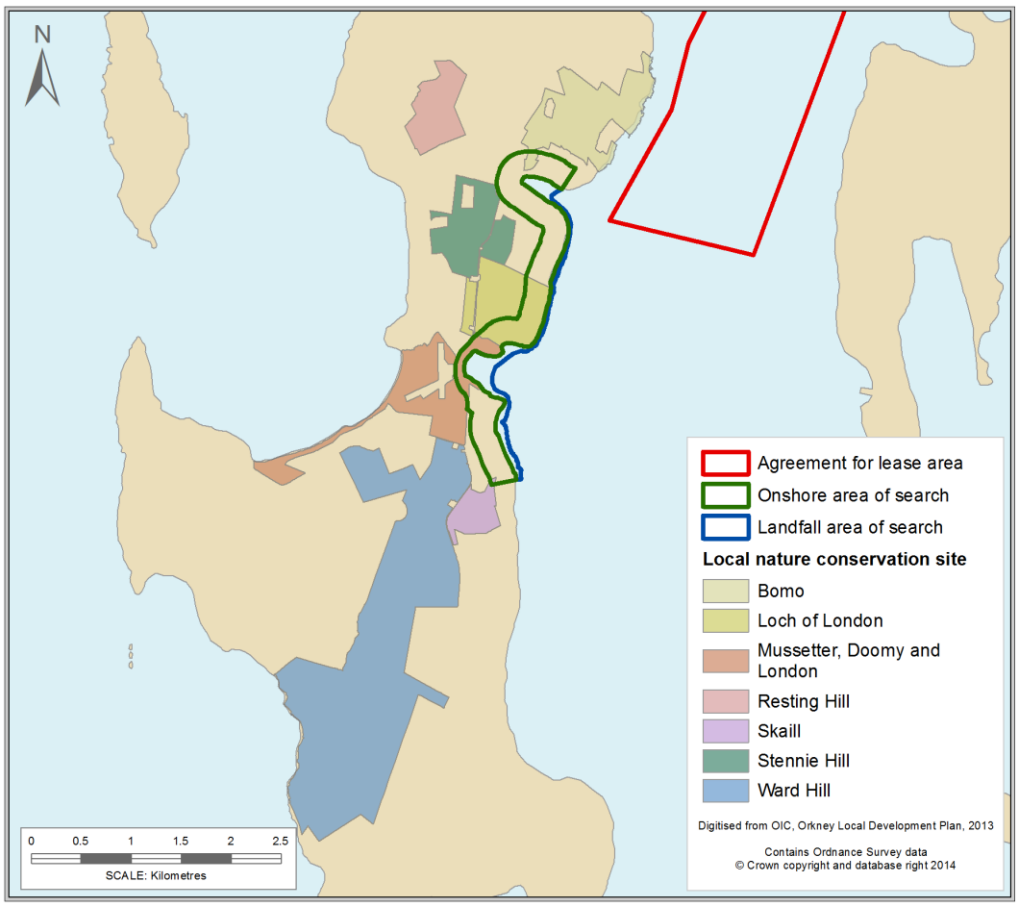

Figure 7.7 LNCSs in relation to the onshore Area of Search.

Mill Bay features wet neutral grasslands, mire, saltmarsh, other semi-natural habitats and improved grassland. Fixed acid dune grassland (*Carex arenaria - Festuca ovina - Agrostis capillaris*) is found from the Sands of Doomy on the west, across to the Bay of London on the east. This type of sand dune habitat is restricted to four sites around Orkney, three of which are on Eday and the other on Hoy at Rackwick. Calcifugous grassland (*Festuca ovina - Agrostis capillaris - Galium saxatile*) is also found at the Bay of London as an intermediate with forms of common rush *Juncus effusus*.

Wet dune heath is extensive across the Bay of London with *Scirpus cespitosus - Erica tetralix* and *Erica tetralix - Sphagnum compactum* dominating areas which merge with heath and blanket mire vegetation. Areas of dry dune heath composed of heather and sand sedge *Carex arenaria* with sub-

[86] Barne, J.H., Robson, C.F., Kaznowska, S.S., Doody, J.P., Davidson, N.C., and Buck, A.L., eds. (1997). Coasts and seas of the United Kingdom. Region 2: Orkney. Peterborough, Joint Nature Conservation Committee. (Coastal Directories Series).

communities of bell heather *Erica cinerea* and crowberry *Empetrum nigrum* are also present on the Sands of Doomy to the Bay of London and represents one of the most northerly localities for this type of habitat[87].

Intertidal habitats

The intertidal zone along the cable landfall AoS is composed predominantly of solid bedrock in exposed locations and sand in the more sheltered environments of Mill Bay and the Bay of London. Lashy Sound has little wave exposure but has significant tidal exposure and these factors will strongly influence the type of biotopes present. The types of habitat expected are likely to be areas of barren shingle, fine gravel and sand on the Bays and upper shores, while bedrock and boulder biotopes dominate much of the coastline and intertidal zone.

JNCC carried out sublittoral and littoral surveys in 1997 as part of the Marine Nature Conservation Review to identify baseline communities and inform future protection and management. Tide-swept algal communities have been identified in the Lashy Sound and are a feature of much of the littoral and infralittoral environment around Scottish Coasts. These communities are species rich and structurally complex habitats. Two important communities surveyed in the wider area were: *Laminaria hyperborea* forest and foliose red seaweeds on tide-swept upper infralittoral mixed substrata (IR.MIR.KR.LhypTX.Ft); and Fucoids in tide-swept conditions, composed of *Fucus serratus*, sponges and ascidians on tide-swept lower eulittoral rock (LR.HLR.FT.FserT)[88].

Tide-swept communities have been identified as recommended Priority Marine Features and some may form part of the future MPA network[89]. SNH have concluded that the known range and geographic variation of tide-swept algal communities in the seas around Scotland is relatively well reflected by the existing range of protection for this habitat through SACs, SSSIs and fishery management areas[90]. There are currently no existing or proposed protected areas located within the Project area.

There is little information available regarding the intertidal zone within the onshore AoS and this is a key information gap which will be addressed through field surveys to identify the types of biotopes and community structure present. The results will inform the selection of the cable landfall area and will be presented within the ES.

Protected fauna

All birds noted in the LNCSs and SSSIs are protected under the EU Birds Directive (Directive 2009/147/EC) and the Wildlife and Countryside Act 1981 (as amended) which gives general protection

---

[87] Dargie, T. (1998). Sand dune vegetation survey in Scotland: Orkney, Volume 1. Scottish Natural Heritage Research, Survey and Monitoring Report 123

[88] Marine Scotland National Marine Plan Interactive Map. MNCR survey data, 1997. Available [Online]: http://marinescotland.atkinsgeospatial.com/nmpi/ Accessed 17/06/14

[89] Howson, C. M., Steel. L., Carruthers, M. and Gillham, K. (2012). Identification of Priority Marine Features in Scottish territorial waters. Scottish Natural Heritage Commissioned Report No. 388.

[90] SNH Information Sheet on tidal-swept communities. Available [Online] http://www.scotland.gov.uk/Topics/marine/seamanagement/nmpihome/healthy/Fuccoids Accessed 17/06/14

to nearly all species of wild birds to prevent capture or killing and to prevent damage to, or the destruction of, active nest sites. Protection is extended to certain species under Schedule 1 of this act, so that it is also an offence to cause disturbance to these birds at their nest.

Other notable species known to occur on Eday include the European otter *Lutra lutra.* Otters are European protected species and are fully protected under the Conservation (Natural Habitats, &c.) Regulations 1994 (as amended). A licence to carry out works which could cause disturbance to otters, if found to occur where onshore activities and are to be located, will be obtained from SNH. Other notable species include the hedgehog *Erinaceus europus*, Great yellow bumble bee *Bombus distinguendus* and Moss-carder bee *Bombus muscorum*. The Orcadian vole *Microtus arvalis orcadensis* is also an identified species on the island and is on the Scottish Biodiversity List. It is a subspecies of the European common vole and is unique to Orkney.

Species of importance within the AoS on Eday will be identified during the extended Phase 1 Habitat Survey, breeding bird survey and further desk-based research of biological records.

7.5.2 Potential impacts

Possible impacts along with the potential significance of effect on coastal and terrestrial communities are considered in the following table.

Potential impact	Phase	Potential significance	Comment
Physical disturbance of intertidal habitats during cable landfall installation.	Construction and Decommissioning	Potential significance of impact uncertain	The level and type of disturbance will depend on the character of the shoreline where the cable is landed and the methods used. This will be considered further during the EIA.
Alteration of intertidal communities from change in physical processes.	Operation	Potential significance of impact uncertain	Dependent on outcome of physical processes assessment. Refer to Section 8.1 Physical processes. This will be considered further during the EIA.
Physical disturbance of terrestrial communities during construction of onshore installations including cable route, access and substation.	Construction and Decommissioning	Potential significance of impact uncertain	Ecological surveys across potential cable corridor and substation area shall inform the route selection process with the aim of avoiding or minimising potential impacts on sensitive habitats and species. This will be considered further during the EIA.
Terrestrial habitat /species loss during and following onshore	Construction and Operation	Potential significance	

Potential impact	Phase	Potential significance	Comment
construction activities.		of impact uncertain	
Disturbance of otters during onshore construction activities.	Construction, maintenance, decommissioning	Potential significance of impact uncertain	Otters are fairly common in Orkney in the vicinity of burns which run down onto beaches and sheltered coasts and along adjacent coastlines. Ecological surveys may indicate presence in the onshore AoS. This will be considered further during the EIA.
Disturbance of breeding and foraging birds during onshore construction activities.	Construction	Potential significance of impact uncertain	Impacts likely to be small in scale and highly localised. Impacts may be reduced by mitigation measures e.g. timing works to avoid key periods and site selection to avoid sensitive areas. This will be considered further during the EIA.

Please note that potential cumulative impacts are considered in Section 9 Cumulative and In-Combination Effects.

7.5.3 Baseline characterisation strategy

It is proposed that baseline conditions regarding coastal and terrestrial communities can be further defined to sufficient detail by obtaining data from the following sources:

Data sources:

- Marine Biology Unit, Orkney Islands Council Harbours Department - database of coastal habitats in Orkney;
- National Biodiversity Network (NBN) - national biodiversity records;
- Orkney Biodiversity Records Centre (OBRC) - local biodiversity records.

Field surveys:

- Extended Phase 1 Habitat Survey;
- Marine Intertidal Phase 1 Biotope Mapping Survey;
- Otter survey if necessary;
- Breeding bird surveys for onshore AoS.

All surveys will be commissioned to experienced ecologists and methodologies will be agreed with SNH where applicable.

Consultation:

The following stakeholders will be consulted with regards to coastal and terrestrial communities:

- RSPB;
- Scottish Wildlife Trust; and
- SNH.

7.5.4 Impact assessment strategy

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

Potential impact	Assessment topics and methodology
Physical disturbance of intertidal habitats during cable landfall installation.	Review of methods of excavation of sites and materials for protection of cables and best practice for recovery of beaches from construction disturbance.
Alteration of intertidal communities from change in physical processes.	Assessment of communities' sensitivity to disturbance and likelihood of change (guided by results of hydrodynamic modelling, addressed in 8.1 Physical processes).
Physical disturbance of terrestrial communities during construction of onshore installations including cable route, access and substation.	Determination of soil excavation footprint, altered drainage issues, spread of dust, area of change and possible mitigation measures. Assessment of sensitivity of surrounding and downstream habitats. Estimation of likely local rates of recovery from Project activities.
Terrestrial habitat /species loss during and following onshore construction activities.	
Disturbance of otters during onshore construction activities.	Identification of presence, assessment of sensitivity to disturbance and likelihood of interaction based on typical behaviour. Predict area and duration of effect.
Disturbance of breeding and foraging birds from onshore construction works	Breeding bird survey data will inform site selection and identify areas where development should be avoided and can also be used to assess potential impacts on disturbance to breeding and foraging birds likely to be present within the vicinity of onshore works.

7.5.5 Possible mitigation and monitoring measures

The following possible mitigation and monitoring measures will be considered during ongoing EIA and project development activities:

- Minimise onshore development footprint;
- Prioritise selection of low sensitivity sites where other constraints allow;

- Identification and protection of any sensitive habitats or species from disturbance during construction;
- Measures to minimise noise and visual disturbance during construction such as seasonal or working hours restrictions;
- Develop a suitable monitoring strategy (if required) in consultation with SNH;
- Where possible, time works to avoid sensitive times of year for any vulnerable species present, e.g. avoid bird breeding season (April to August inclusive); and
- Avoid as far as possible the vicinity of areas used by vulnerable species e.g. implement buffer areas to avoid disturbance.

8 Potential Impacts on the Physical Environment

This chapter considers the potential impacts of the proposals on the following receptors:

- Physical processes;
- Air and climate;
- Marine water and sediment quality; and
- Geology, soils and hydrology.

An overview of the relevant baseline environment is provided for each receptor along with the anticipated impacts, a baseline characterisation strategy, impact assessment strategy and where applicable, possible mitigation and monitoring measures.

8.1 Physical processes

This section presents a summary of the existing baseline understanding relating to the key physical processes, the geomorphology of the seabed and shoreline features which are important to the Project area.

8.1.1 Baseline

The Orkney Islands and inshore waters are underlain by the Shetland platform, which is composed largely of Middle Devonian rocks. These rocks consist of sandstones, flagstones (fissile micaceous sandstones), conglomerates and shales that are comparable to rock sequences found onshore[91].

Seabed sediments found around Orkney are composed of sands and gravels notable for their high biogenic carbonate content. Much of the gravel around the islands, particularly to the north and east, is composed predominantly of shell debris. These carbonate deposits reflect the rich littoral and sub-littoral fauna that exists around the Orkney Islands. Between the main islands the seabed is swept by strong tidal currents. Within these channels, the sediments are thin and patchy, comprising shell-gravels, coarse sand or rock debris; the mud content of the sediments is extremely low. Fine sands are found in sheltered firths or bays. The floor of Scapa Flow is covered by a variety of sediments from mud to rock debris. East of the Orkney Mainland and to the south of the Orkney Islands, bedrock outcrops occur on the seabed[91].

At present there is little detailed information describing the seabed characteristics present in Lashy Sound. The predicted seabed habitats published by JNCC[92] and MESH[93] suggest the area should be

[91] British Geological Survey and Scott Wilson Resource Consultants. (1997). Chapter 2 Geology and physical environment. In: Coasts and seas of the United Kingdom. Region 2: Orkney, ed. by J.H. Barne, C.F. Robson, S.S. Kaznowska, J.P. Doody, Davidson, N.C., and A.L. Buck, 57-59. Peterborough, Joint Nature Conservation Committee. (Coastal Directories Series.)

[92] McBreen, F., Askew, N., Cameron, A., Connor, D., Ellwood, H., Carter, A . (2011). UK SeaMap 2010 Predictive mapping of seabed habitats in UK waters. JNCC.

[93] MESH Atlantic web GIS. Available [online]:www.searchmesh.net/webGIS

predominantly composed of Atlantic moderate energy infralittoral rock and areas of silted kelp on low energy infralittoral rock. British Geological Survey (BGS) shallow geology maps[94] indicate the presence of seabed sediments composed predominantly of gravel and sandy gravels to the north of Lashy Sound.

Geological overview of the shoreline

As indicated in the previous section, the Orkney archipelago is underlain largely by a sedimentary sequence of Devonian age (417-354 million years before present) Middle and Upper Old Red Sandstone rocks. This bedrock has been shaped by sea and ice which gives Orkney its characteristic rolling lowland hill to flat landscapes. The islands of Eday and Sanday are composed predominantly of Middle Old Red Sandstone. The Eday Beds comprise yellow and red sandstone separated by Eday Flags and Eday Marls and exposures of continuous sequences of sandstone and flagstones can be seen along the Eday coastline[95]. The shorelines adjacent to the offshore AoS are predominantly rocky but sandy beaches, backed by dunes, are present on the east coast of Eday (Mill Bay, Bay of London).

At present, no important shoreline geological features have been designated within the Lashy Sound area (i.e. geological SSSI or GCR [Geo Conservation Review] sites). The onshore geology is discussed in greater detail in Chapter 8.4 Geology, soils and hydrology.

Bathymetry

Lashy Sound is a narrow tidal channel dividing the Orkney Islands of Eday and Sanday. High resolution bathymetry data for the channel is available from the Maritime and Coastguard Agency (as part of the Civil Hydrography Programme[96]). In the narrow sections to the north of the channel close to Calf Sound the depths range from 20 to 25m, greater depths of over 35m are found further south as the channel widens, see Figure 8.1. The tidal range in the channel is 3m.

Tidal stream

The Orkney Islands are located close to the boundary between the North Atlantic and the North Sea tidal systems. The incoming North Atlantic tidal wave reaches the islands several hours before the North Sea tidal wave, causing a net flow of water from west to east on the flood tide as a result of which the coastal tidal currents are dynamic and complex.

SRTP have commissioned several hydrodynamic models to understand the complex tidal dynamics of Lashy Sound and have undertaken multiple measurement campaigns to validate the models. Natural Power Consultants built the first hydrodynamic model of Lashy Sound in the MIKE by DHI software the results of which informed the locations of three seabed mounted Acoustic Doppler Current Meter (ADCP) surveys. SRTP have since been working with Heriot-Watt University to build a MIKE model as

[94] British Geological Survey (1984). Orkney, Sheet 59°N-04°W. Sea bed sediments and Quaternary, 1:250,000 geological map.

[95] British Geological Survey and Scott Wilson Resource Consultants. (1997). Chapter 2 Geology and physical environment. In: Coasts and seas of the United Kingdom. Region 2: Orkney, ed. by J.H. Barne, C.F. Robson, S.S. Kaznowska, J.P. Doody, Davidson, N.C., and A.L. Buck, 57-59. Peterborough, Joint Nature Conservation Committee. (Coastal Directories Series).

[96] Civil Hydrography Programme. Available [online]: http://www.dft.gov.uk/mca/mcga07-home/shipsandcargoes/mcga-shipsregsandguidance/mcga-dqs-hmp-hydrography/the_civil_hydrography_programme.htm Accessed 12/06/14

part of the TerraWatt research programme with the aim of investigating the environmental impact of changes to the hydrodynamics of the area which could result from the presence of turbines.

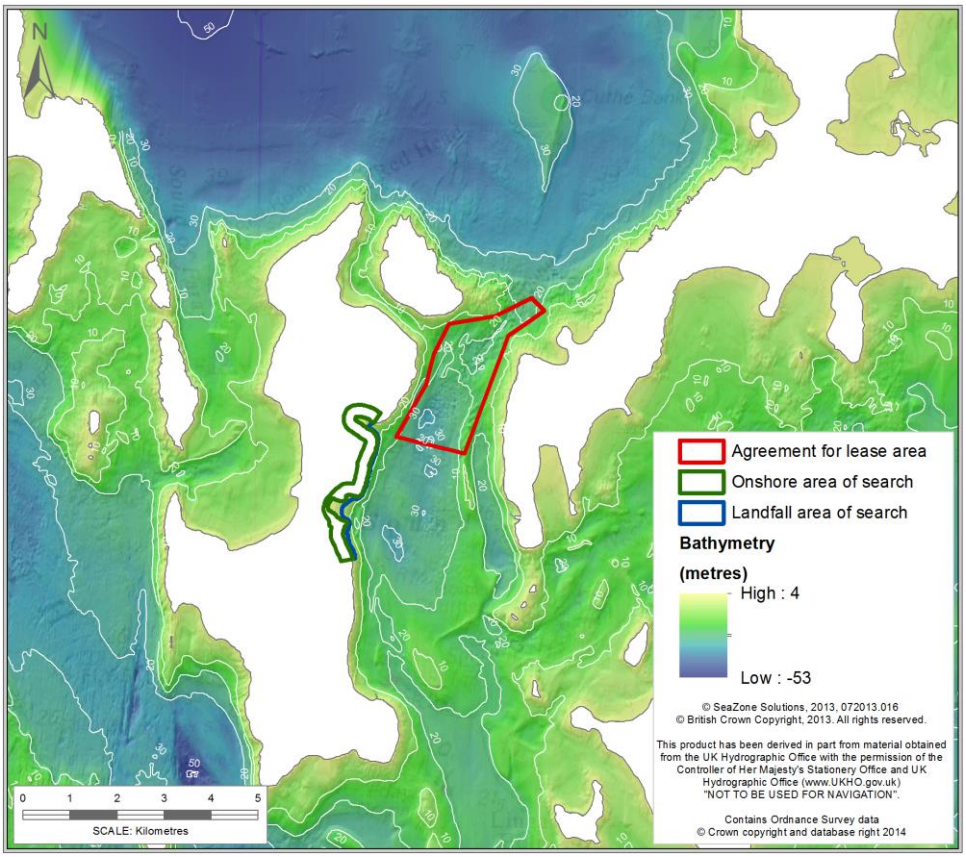

Figure 8.1 Bathymetry in relation to the AfL area

In addition to the "low resolution, time variant" MIKE models ANSYS have also been commissioned to build a "high resolution" Computational Fluid Dynamics (CFD) model of the channel and turbines so that the turbine wake effects can be studied in detail. Going forward the Heriot-Watt MIKE hydrodynamic model, the ANSYS CFD model and further ADCP surveys will be used to design the turbine array layout, predict the energy yield and model the impacts of the turbines on the hydrodynamics of the channel.

There is a significant difference in the tidal speeds in the flood and ebb tides at the site. Peak spring speeds of over 4m/s have been measured on the flood tide (Figure 8.2) whereas speeds rarely exceed 2m/s on the ebb tide.

Wave climate

The wave climate of the Lashy Sound area is dominated by the passage of low pressure systems from west to east across the North Atlantic. In general the highest waves approach the Orkney Islands from a westerly direction and this is also the direction from which waves occur most frequently. Lashy

Sound is very well sheltered from westerly swells and as such experiences the most benign wave climate of any of the commercial tidal test sites in Orkney. Modelled wave data has been purchased from a MIKE model built by DHI on behalf of EMEC. The modelled wave data has not been validated at this stage but suggests the annual maximum waves height to be Hs<4m for the site.

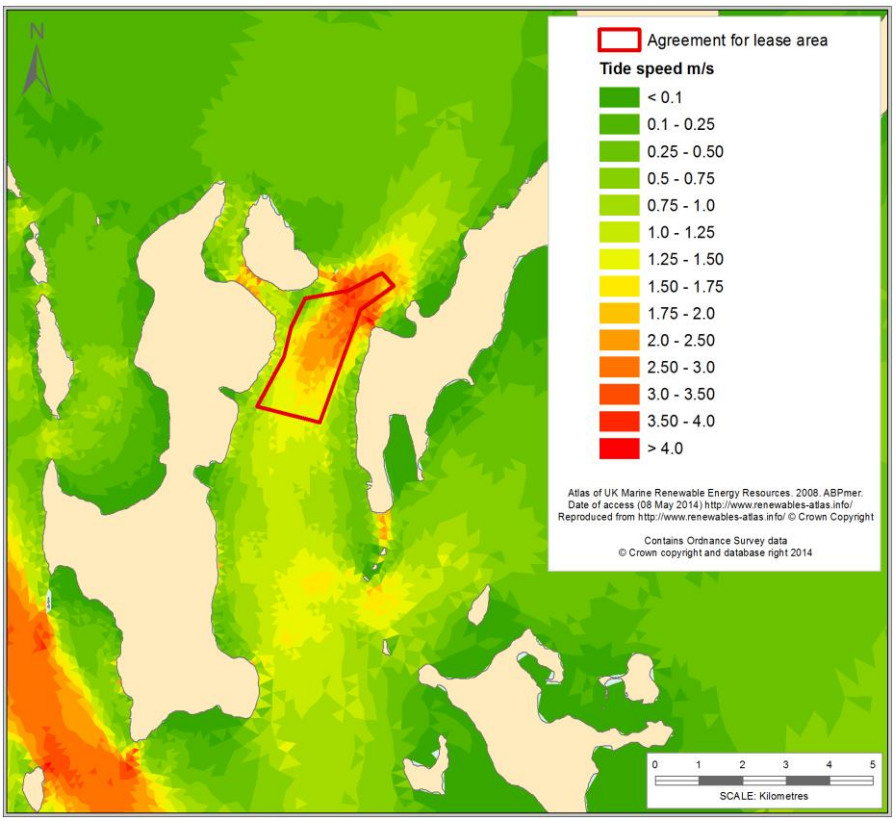

Figure 8.2 Peak spring tide in Lashy Sound

Sediment transport

Sediment transfer and coastal processes around the Orkney Islands is complex due to the number of islands, channels and indented bays and can vary significantly from the southern to the northern isles. Littoral processes in the northern isles are likely to be wave dominated, although longshore drift or beach to beach transfer of sediments may be limited by the alignment of individual islands, providing shelter to other islands, and the orientation of bays. Coastal erosion is unlikely to be significant in the Lashy Sound area[95].

The seabed in the channels of the northern isles, particularly in the Lashy Sound, is swept by strong tidal currents and although unlikely subject to significant erosion, any surface sediment layer is likely to be relatively shallow and patchy, comprising shell-gravels, coarse sand or rock debris with extremely low mud content. There is no evidence of significant accretion of sediments occurring in the area.

8.1.2 Potential impacts

Possible impacts along with the potential significance of effect on physical processes are considered in the following table.

Potential impact	Phase	Potential Significance	Comment
Disturbance of seabed and hydrography during cable laying and mooring installation.	Construction and Decommissioning	Effect unlikely to be significant	Any changes arising from these activities will be small and short term in duration.
Changes to hydrography and sediment regime due to presence of device moorings on the seabed.	Operation	Potential significance of impact uncertain	The effects of physical presence on seabed morphology and sediment transport will largely depend on the eventual siting and methodology for installation of the devices. This will be considered further during the EIA.
Alteration of physical processes (tidal/wave regime, sediment transport processes) due to energy extraction.	Operation	Potential significance of impact uncertain	Once operational, the devices will be extracting energy from the surrounding water which may alter the existing wave regime and potentially influence the sediment erosion/accretion processes occurring in the area. This will be considered further during the EIA.

Please note that potential cumulative impacts are considered in Section 9 Cumulative and In-Combination Effects.

8.1.3 Baseline characterisation strategy

It is proposed that baseline conditions regarding physical processes can be further defined to sufficient detail using the literature sources and site-specific studies outlined below and through consultation with the appropriate stakeholder agencies:

Data Sources:

- Baxter, J.M., Boyd, I.L., Cox, M., Donald, A.E., Malcolm, S.J., Miles, H., Miller, B., Moffat, C.F., (Editors) (2011). Scotland's Marine Atlas: Information for the national marine plan. Marine Scotland, Edinburgh;

- British Geological Survey and Scott Wilson Resource Consultants. (1997). Chapter 2 Geology and physical environment. In: Coasts and seas of the United Kingdom. Region 2: Orkney, ed. by J.H. Barne, C.F. Robson, S.S. Kaznowska, J.P. Doody, Davidson, N.C., and A.L. Buck, 57-59. Peterborough, Joint Nature Conservation Committee. (Coastal Directories Series);
- British Geological Survey (BGS) and UK Hydrographic Office (UKHO) charts;
- Marine Scotland (2010), Pentland Firth and Orkney Waters Marine Spatial Plan Framework and Regional Locational Guidance for Marine Energy;
- Marine Scotland (2014). National Marine Plan Interactive. Available [online]: http://www.scotland.gov.uk/Topics/marine/seamanagement/nmpihome/nmpi; and
- Ramsay, D.L. and Brampton, A.H. (2000). Coastal Cells in Scotland: Cell 10 - Orkney. Scottish Natural Heritage Research, Survey and Monitoring Report No.151.

Field surveys:

- Multi-beam sonar hydrographic and geophysical surveys (e.g. sub-bottom profiling) to establish detailed baseline seabed conditions – bathymetry, sediment type and surface sediment depths;
- ROV seabed imagery survey to ground-truth geophysical survey work and determine seabed characteristics (in combination with habitats survey);
- ADCP surveys at seabed to establish water depths, current velocities, wave regimes etc.; and
- Physical process modelling with MIKE hydrodynamic model software to characterise baseline tidal currents.

Consultation:

The following stakeholders will be consulted with regards to physical processes:

- Marine Scotland; and
- Scottish Environmental Protection Agency (SEPA).

8.1.4 Impact assessment strategy

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

Potential impact	Assessment topics and methodology
Changes to hydrography and sediment regime due to presence of device moorings on the seabed	The impact assessment will use site-specific tidal current measurements and geophysical survey data to generate a hydrodynamic model that will be used to assess the magnitude of any changes. The potential changes will then be compared with natural variations expected at the site to determine significance.
Alteration of physical processes (tidal/wave regime, sediment transport	Potential changes in the hydrographic and sediment transport regime will take into account the expected amount of energy that will be extracted by the devices (established from technical specifications) and the baseline hydrology at the site. This

Potential impact	Assessment topics and methodology
processes) due to energy extraction	assessment will focus on changes in the hydrodynamics at the site and the subsequent potential impacts on the adjacent coastline and sediment transport processes.

8.1.5 Mitigation and monitoring strategy

No mitigation or operational monitoring measures are currently proposed.

8.2 Air and climate

8.2.1 Baseline

Air quality in Orkney is generally good, due to a number of factors including high wind speeds and dispersion rates, low population densities; low volumes of traffic; limited industrial processes and a predominance of agricultural land practices. Orkney currently has no designated Air Quality Management Areas (AQMA)[97].

The climate within Lashy Sound and the surrounding area of the islands Eday and Sanday are influenced by their position on the edge of the North Atlantic Current which delivers warmer water to the western seaboard of Scotland creating a relatively mild and wet climate with strong prevailing south westerly winds.

Meteorological data collected at Kirkwall (approximately 30 km from the study area) between 1970 and 2000 shows yearly average temperatures to range between 5.3 °C and 10.5 °C, with an average of 47.5 days of sunshine, 184.4 days of rain (≥ 1mm) and 29 days where air frost is present over the same period. The monthly average wind speeds at the Kirkwall station are between 10.7 knots in August and 16.8 in January, with a yearly average of 13.6. Wind from the west and south-east is one of the most significant features of the Orkney climate, and gales are frequent, occurring on 29 days in an average year[98].

8.2.2 Potential impacts

Possible impacts along with the potential significance of associated effects on air and climate are considered in the following table.

[97] Ricardo-AEA (2014). Air Quality Management Areas. Available [online]: http://www.scottishairquality.co.uk/laqm/aqma (accessed 17/06/14)

[98] British Geological Survey and Scott Wilson Resource Consultants. (1997). Chapter 2 Geology and physical environment. In: Coasts and seas of the United Kingdom. Region 2: Orkney, ed. by J.H. Barne, C.F. Robson, S.S. Kaznowska, J.P. Doody, Davidson, N.C., and A.L. Buck, 57-59. Peterborough, Joint Nature Conservation Committee. (Coastal Directories Series).

Potential impact	Phase	Potential significance	Comment
Reduction in greenhouse gas emissions from renewable energy source.	Operation	Beneficial Impact	Electricity generation from a renewable energy source, diverting from fossil fuel use and the generation of harmful greenhouse gas emissions.
Vessel emissions, decreasing air quality.	Construction, Maintenance and Decommissioning	Effect unlikely to be significant	Vessels used will emit gasses such as carbon dioxide, sulphur oxides and nitrogen oxides which will have a localised effect on the atmosphere; however there will not be a significant change to current traffic levels. All vessels will operate to IMO standards (refer to MARPOL Annex VI).
Construction of onshore elements for the project resulting in dust impacts.	Construction	Effect unlikely to be significant	May result in release of dust during dry periods, however limited in scale and duration. Construction activities will follow CIRIA best practice guidelines and will include dust suppression measures where necessary as part of the CEMP.

It is proposed that air and climate receptors are scoped out of the EIA process as potential negative impacts are considered unlikely to be significant.

Please note that potential cumulative impacts are considered in Section 9 Cumulative and In-Combination Effects.

8.3 Marine water and sediment quality

Onshore water bodies are considered in Chapter 8.4 Geology, soils and hydrology.

8.3.1 Baseline

Offshore water

The water quality of the seas around Orkney are generally very high due to their location on the edge of the North Atlantic, which facilitates the effective dilution and dispersion of any contaminants or

pollutants entering coastal waters[99]. There are no designated bathing waters in the vicinity of the AfL area or proposed cable route.

Lashy Sound lies within the Westray Firth coastal water body of the Scotland River Basin Management District, which covers an area of approximately 379km^2. The Scottish Environmental Protection Agency (SEPA) has classified this water body as having an overall status of Good (defined as biological, chemical and morphological conditions associated with low human pressure) with Good ecological status and a Pass for chemical status[100]. SEPA state that '*the current status of the water body meets the requirements of the Water Framework Directive, thus we must ensure that no deterioration from good status occurs*'.

Sediment

Due to the relatively strong currents present, sediment coverage in the Lashy and Eday sound area is likely to be sparse and shallow and will mainly consist of sandy gravel components (as discussed in Chapter 8.1 Physical processes).

A recent review of the status of the marine environment around Scotland, covering hazardous substances, eutrophication, radioactivity, oil/chemical spills, algal toxins and microbiology of bathing and shellfish waters[101] indicated no significant concerns for the northern coastal area (including Orkney). A number of localised issues were identified in the region; however these are located well away from the Project site (Shetland, Scapa Flow and Dounreay).

There are five licenced disposal sites for dredged material in Orkney waters and these are discussed in Chapter 6.9 Other users. The closest active dredging disposal site to the proposed project is site FI015, north of Kirkwall. This site is situated approximately 20 km from the southern edge of the AfL area. This site has predominantly been used for the disposal of silt, sand, gravel or rock.

Detailed sedimentology, seabed gradient and associated habitat information will be gathered as part of the EIA.

8.3.2 Potential impacts

Potential Impact	Phase	Potential significance	Comment
Increase in suspended sediment during cable laying and mooring installation.	Construction and Decommissioning	Effect unlikely to be significant	Increased sedimentation or smothering of surrounding habitats is unlikely in high-energy tidal swept

[99] Marine Scotland (2010), Pentland Firth and Orkney Waters Marine Spatial Plan Framework and Regional Locational Guidance for Marine Energy

[100] SEPA (2012). Water body information sheet for water body 200243 in Orkney and Shetland. Available [online]: http://apps.sepa.org.uk/wbody/2012/200243.pdf

[101] Baxter, J.M., Boyd, I.L., Cox, M., Donald, A.E., Malcolm, S.J., Miles, H., Miller, B., Moffat, C.F., (Editors) (2011). Scotland's Marine Atlas: Information for the national marine plan. Marine Scotland, Edinburgh. pp. 191.

Potential Impact	Phase	Potential significance	Comment
			environment due to dilution and dispersion rates.
Pollution of the marine water environment as a result of release of chemical spills from support vessels and/or devices.	All phases	Effect unlikely to be significant	Industry best practice guidelines will be followed at all times and in accordance with PPGs outlined by SEPA. The risk of pollution is not deemed high. The CEMP will take account of potential water and sediment impacts.

It is proposed that marine water and sediment quality receptors are scoped out of the EIA process as potential impacts are considered unlikely to be significant.

Please note that potential cumulative impacts are considered in Section 9 Cumulative and In-Combination Effects.

8.4 Geology, soils and hydrology

8.4.1 Baseline

The planned Project includes the installation of an export cable from the devices located in Lashy Sound to a substation location on Eday. This chapter is therefore focused on a description of the Eday environment.

Superficial geology and land use

The island of Eday has a series of ridges and escarpments, and it differs from many of the northern islands in having large areas of peat-covered hill land. Formed of red and yellow rocks of Middle Old Red Sandstone, there are sheer cliffs at Red Head in the far north of the island, overlooking the small neighbouring island of the Calf of Eday. Much of Eday is flanked by rocky shoreline, but with sandy beaches backed by dunes in small bays such as Mill Bay, Bay of London (on the east coast bordering Eday Sound) and Bay of Greentoft in the south of the island. On the western shore at Sands of Mussetter and Sands of Doomy there are long stretches of fine beaches and sand dunes[102].

Figure 6.2 and Figure 6.3 show the land cover types present on Eday. Improved grassland and heather moors are the dominant land type present but there are also areas classified as blanket bog and peat

[102] British Geological Survey and Scott Wilson Resource Consultants. (1997). Chapter 2 Geology and physical environment. In: Coasts and seas of the United Kingdom. Region 2: Orkney, ed. by J.H. Barne, C.F. Robson, S.S. Kaznowska, J.P. Doody, Davidson, N.C., and A.L. Buck, 57-59. Peterborough, Joint Nature Conservation Committee. (Coastal Directories Series.)

lands. Some of these areas have been designated as being ecologically important, e.g. the Doomy and Whitemaw Hill SSSI (Site of Special Scientific Interest) and these are discussed in more detail in Chapter 7.5 Coastal and terrestrial communities.

Hydrology and hydrogeology

Rivers

There are no rivers, streams or drains classified by SEPA under the Water Framework Directive (WFD) on Eday.

Wetlands

There are no wetlands within the cable search area. There are patches of blanket bog and peatland, none of which are protected under specific international designations. There are however sites designated as Local Nature Conservation Sites (LNCS) based on blanket and basin bog (discussed in Chapter 7.5 Coastal and terrestrial communities).

Groundwater

The Eday groundwater area has been classified by SEPA as overall Good status in 2008, there is no trend for pollutants for this water body and no human pressures have been identified[103].

8.4.2 Potential impacts

Possible impacts along with the potential significance of effect on geology, soils and hydrology are considered in the following table.

Potential Impact	Phase	Potential significance	Comment
Contamination of soils or groundwater from spills during onshore construction works.	Construction	Potential significance of impact uncertain	Any spillage of concrete, lubricants, fuels, oils and other fluids used during construction may adversely affect soils and quality of groundwater. This will be considered further during the EIA.
Interaction with geology if directional drilling is used for cable landfall.	Construction	Potential significance of impact uncertain	At the landfall, geology will be intersected if the connection is made to the subsea cables through directional drilling. Depending on the location it is possible that drilling could pass through important geological features.

[103] SEPA (2014). River basin planning. Area Advisory Groups: Orkney and Shetland. Available [online]: http://www.sepa.org.uk/water/river_basin_planning/area_advisory_groups/orkney_and_shetland.aspx

Potential Impact	Phase	Potential significance	Comment
			This will be considered further during the EIA.
Altered surface and ground water flows due to cable trenching and construction of an onshore substation.	Construction	Potential significance of impact uncertain	Creation of a trench and backfilling with excavated material will inevitably create a higher porosity and permeability channel or ditch through the countryside that will potentially carry precipitation runoff in new directions. The disturbance of natural water flows could divert the natural course of groundwater and result in draining of waterlogged areas or flooding of currently dry areas. Creation of a platform and foundations for an onshore substation could also have similar effects. This will be considered further during the EIA.

Please note that potential cumulative impacts are considered in Section 9 Cumulative and In-Combination Effects.

8.4.3 Baseline characterisation strategy

It is proposed that baseline conditions regarding geology, soils and hydrology can be further defined to sufficient detail by completing the tasks outlined below:

Data sources:

- British Geological Survey (BGS) and UK Hydrographic Office (UKHO) charts;
- Historical maps;
- SEPA flood risk assessment;
- Information from extended Phase 1 Habitat Survey.

Surveys required:

- Topographical characterisation: desk-based study and site visit;
- Geological characterisation of offshore routes and cable landfall: detailed bathymetric survey and geophysical surveys in areas of deeper sediments, trial pits dug on sedimentary shores if required;

- Geology and soil characterisation on land: topographic and geophysical survey of proposed cable landfall route;
- Hydrological characterisation on land: undertaken as part of extended Phase 1 Habitat Survey.

Consultation:

The following stakeholders will be consulted with regards to geology, soils and hydrology:

- Local community through public consultation;
- Local landowners and property owners;
- Orkney Islands Council;
- SEPA; and
- SNH.

8.4.4 Impact assessment strategy

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

Potential impact	Assessment topics and methodology
Contamination of soils or groundwater by spills during onshore construction works	Spill risk assessment for all works and facilities: sources of spillage; type and level of possible contamination; consequences of possible spillage events; likelihood of possible spillage events. Refer to established best practice regarding spill minimisation and management, extensive literature on effects of spill events.
Interaction with geology if directional drilling is used for cable landfall	Drilling risk assessment by experience geologist: trajectory for any drilling; possible hazards in local stratigraphy; amounts of materials generated; materials use to facilitate drilling e.g. drill muds, cements etc. Refer to case studies from other directional drilling works.
Altered surface and ground water flows due to cable trenching and construction of an onshore substation	Hydrological assessment by specialist: identify any activities that could affect flows; location of any sensitive water flows. Refer to case study examples.

8.4.5 Mitigation and monitoring measures

The proposed Project will adhere to current best practice and CIRIA guidance. Any further mitigation required will be developed in consultation with SEPA.

9 Cumulative and In-Combination Effects

9.1 Cumulative impact assessment

This section presents the proposed approach to the Cumulative Impact Assessment (CIA) for Lashy Sound which is based on a recent guidance document '*Cumulative Impact Assessment in Pentland Firth and Orkney waters*' produced by the Crown Estate[104]. It is proposed that a suitable approach to the CIA for the project will be agreed with Marine Scotland, Orkney Islands Council and their advisors prior to submission.

9.2 Projects to include in the Lashy Sound CIA

It is proposed that the following projects will be included in the CIA:

- Relevant projects that have been consented and are yet to be constructed;
- Relevant projects for which an application has been submitted but which are not yet consented;
- Wave and tidal energy projects for which a Scoping Report has been submitted (although any assessment made in relation to such projects is likely to be qualitative). It is suggested that projects for which a Scoping Report has been submitted be reviewed with Marine Scotland Licencing and Operations Team (MS-LOT) and OIC nearer to the time of submission to determine whether or not they remain 'reasonably foreseeable' and therefore relevant to the Lashy Sound CIA.

Note - existing activities, including those not subject to licensing and consent, along with operational projects, will be considered in the main assessment as part of the existing baseline and therefore not in the CIA.

It is proposed that the following types of project will be considered (where relevant) in the initially CIA screening process:

- Tidal energy projects;
- Wave energy projects;
- Offshore wind energy projects;
- Offshore infrastructure projects;
- Oil and gas developments;
- Aquaculture (new applications/reviews);
- Dredging;
- Coastal developments;

[104] The Crown Estate (2013). Final Report Cumulative Impact Assessment in Pentland Firth and Orkney waters. Available [Online]: http://www.thecrownestate.co.uk/media/420420/PFOW-cumulative-impact-assessment.pdf (accessed 04/06/2014).

- Onshore infrastructure projects; and
- Onshore wind energy projects.

It is proposed that the following projects will not be included in the CIA:

- Activities not subject to licensing/consent.

It is understood that Marine Scotland will develop and maintain a catalogue of projects that can be used to determine which developments to include in a project specific CIA. It is not yet known if OIC will be taking a similar role with regards to onshore developments or if this will be covered by Marine Scotland's database. This database will be used to help determine the specific projects/proposals that should be considered in the Lashy Sound CIA during the CIA scoping stage.

It is recommended that the scope of the Lashy Sound CIA be confirmed six months prior to the proposed application submission date.

9.3 Receptors to include in the Lashy Sound CIA

All receptors (human, ecological and physical) considered in the EIA will be initially included in the CIA. During CIA scoping, the following flow chart will be used to determine those that require detailed consideration in the CIA:

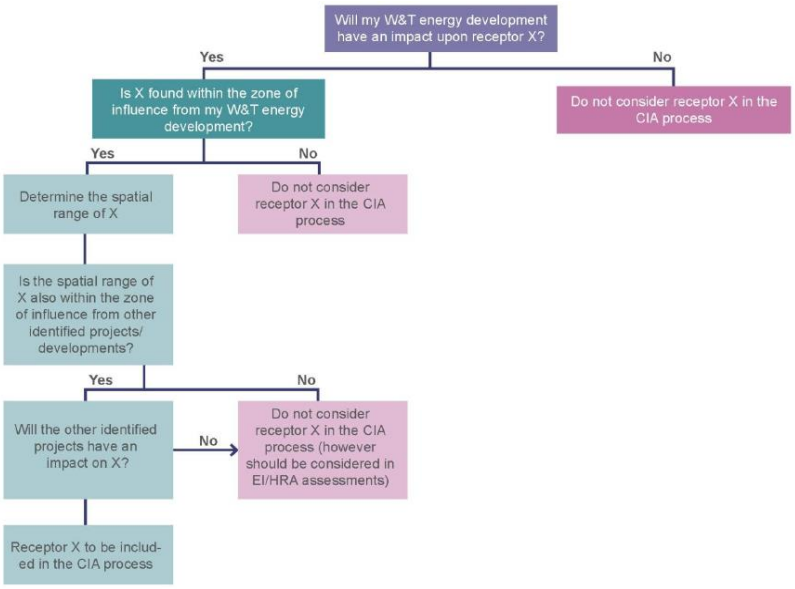

Figure 9.1 Process to determine receptors to include in the CIA process[105]

[105] AMEC Environment and Infrastructure UK Ltd and Aquatera (2013). Pentland Firth and Orkney Waters Enabling Actions Report: Cumulative impact assessment in Pentland Firth and Orkney waters. The Crown Estate.

The EIA process will determine whether or not the proposed development will have an impact on each receptor. This process will also inform decisions with regards to the projects to include and scope out of the CIA.

9.4 Cumulative Impact Assessment

Once the relevant projects (sources) and receptors have been identified, possible pathways linking the two will be identified. Where no pathway exists between a source (other than Lashy Sound) and a receptor, cumulative effects can be ruled out. Possible pathways can be identified using a simple matrix format as shown below:

Receptor	Source				Screening conclusion
	Lashy Sound	Source 1	Source 2	Source 3	
Receptor 1	*Possible pathway*	*No pathway identified*	*No pathway identified*	*No pathway identified*	No CIA required
Receptor 2	*Possible pathway*	*Possible pathway*	*Possible pathway*	*No pathway identified*	CIA required

This screening process will help to refine the relevant projects and receptors and inform the spatial extent of the CIA. This will result in list of key issues for consideration in the Lashy Sound CIA. An outline plan for assessing these key issues will be presented in the CIA scoping document.

Once the scope of the CIA is agreed with MS-LOT and OIC, a proportionate assessment will be undertaken and the results presented in the ES.

9.5 Anticipated key issues

At this stage, it is anticipated that the Lashy Sound CIA will focus on a number of key issues including:

- Impacts on shipping and navigation, including constriction of shipping routes, increased navigational risk and disruption, increased travel and running costs from increased numbers of vessels serving various developments;
- Impacts on local residents, including employment opportunities, improvements to local infrastructure, increased industrial activity and increased demand on social services during construction, with benefits to the wider UK economy;
- Impacts on commercial fisheries, including impacts from displacement and the 'ripple effect' into other areas, increased steaming times, increased running costs and conflict between users of different gear because of construction activities, use of seabed and increased vessels, impacts on dependent shore based industries;
- Cumulative loss of benthic habitat from particular developments with impacts on important species;
- Cumulative impacts on birds from disturbance during construction, loss of feeding grounds, noise etc.;

- Cumulative impacts on marine mammals from disturbance during construction, loss of feeding grounds, noise etc.;
- Contributions to achieving the Scottish and UK renewable energy targets and promotion of marine renewable energy technology.

9.6 Next steps

A CIA scoping letter will be produced based on the approach outlined above and feedback from stakeholders throughout the EIA process. The document will be developed in consultation with Marine Scotland and OIC, their advisors and key stakeholders. The cumulative impact scoping letter to will include the following:

- Draft list of projects/proposals to be considered in the Lashy Sound CIA;
- List of projects/proposals scoped out of the Lashy Sound CIA and justifications as required;
- List of relevant receptors based on the results of the Scoping Report (main document), the Scoping Opinion and other feedback received;
- The approach to the CIA for key topics such as marine birds, marine mammals and other users of the area;
- Initial screening of potential cumulative impacts (using the table format presented previously);
- List of potential key cumulative effects with proportionate outline assessment plans; and
- Update on project timescales and CIA schedule.

10 Proposed EIA Methodology

10.1 EIA process

Environmental Impact Assessment (EIA) is a process which identifies the potential environmental effects of a development and then seeks to avoid, reduce or offset any adverse effects through mitigation measures where possible. The EIA process is both iterative and cyclic and runs in tandem with project design. As potential effects are identified, the design of the project can be adjusted and mitigation measures proposed. Consultation, a vital component of the EIA process, continues throughout each stage and contributes both to the identification of potential effects and the development of mitigation measures.

As stated in Section 5 Legislation and Key Policy Objectives an EIA will be required to support the consent applications associated with the proposed Lashy Sound Tidal Array. Table 10.1 below identifies the main stages of the EIA process that the Project will follow.

Table 10.1 Stages of the EIA process

Stage	Task	Aim/objective	Work/output (examples)
Pre-scoping	Project Briefing Document	To initiate consultation with stakeholders, providing preliminary information on the scheme to date.	Non-technical introductory documents. ***Complete***
Scoping	Scoping study	To identify the potentially significant direct and indirect impacts of the proposed development.	Targets for specialist studies (e.g. hydrodynamic studies, sediment quality). ***Underway***
EIA	Baseline data collection	To characterise the existing environment.	Background data including existing literature and specialist studies.
	Specialist studies	To further investigate environmental parameters that may be subject to potentially significant effects.	Specialist reports.

Stage	Task	Aim/objective	Work/output (examples)
	Impact assessment	To evaluate the existing environment, in terms of sensitivity. To evaluate and predict the impact (i.e. magnitude) on the existing environment. To assess the significance of the predicted impacts. To assess the significance of cumulative and in-combination effects.	Series of significant adverse and beneficial impacts. Identification of those impacts not assessed to be significant.
	Mitigation and optimisation measures	To identify appropriate and practicable mitigation measures and enhancement measures.	The provision of solutions to minimise adverse impacts and maximise opportunities as far as possible. Feedback into the design process, as applicable.
	Environmental Statement	Production of the Environmental Statement in accordance with EIA guidance including a Non Technical Summary (NTS).	Environmental Statement Four main volumes: NTS; Written statement; Appendices and Figures. A draft Project Environmental Monitoring Plan will be included as part of the ES submission.
	Pre-Application Consultation	Advertising of application for licensing must occur at least 12 weeks prior to submission of joint s36 Application.	Joint 36/Licence Application (if applicable).
	Post submission	Liaison and consultation to resolve matters or representations/objections.	Addendum to ES i.e. finalised Project Environmental Monitoring Plan (PEMP).
Consent Decision			

10.2 EIA guidance

The EIA is undertaken with reference to the Electricity Works (Environmental Impact Assessment) (Scotland) Regulations 2000, the Marine Works (Environmental Impact Assessment) Regulations 2007 (as amended), the Town and Country Planning (Environmental Impact Assessment) (Scotland)

Regulations 2011 and Circular 03/2011[106], as well as guidance provided by The Scottish Government in PAN 1/2013[107] and by the Institute of Environmental Management and Assessment (IEMA): Guidelines for Environmental Impact Assessment[108].

10.3 Assessment methodology

The EIA Regulations and Circular 03/2011 outline the information that is required to be presented in the ES which includes the following:

- Description of the development;
- Outline of the main design and layout options studied by the applicant;
- Description of the aspects of the environment likely to be significantly affected by the development;
- Description of the likely significant effects of the development on the environment, which should cover the direct effects and any indirect, secondary, cumulative, short, medium and long-term, permanent and temporary, positive and negative effects of the development; and
- Description of the measures envisaged to prevent, reduce and where possible offset any significant adverse effects on the environment.

10.4 Environmental Statement (ES)

The findings of the EIA will be presented in an Environmental Statement (ES). It is proposed that the ES will comprise of four volumes with a Written Statement, Figures, Appendices and a Non-Technical Summary of the information contained in the ES. Detailed specialist reports will be available as Technical Appendices where appropriate.

It is proposed the text of the Environmental Statement will be structured as follows.

10.4.1 Introductory chapters

Introduction and overview of renewable energy policy
Provides an introduction to the project and applicant as well as the context of renewable energy development and tidal development in Scotland.

EIA process and methodology
Will include an overview of the impact assessment methodology used for the EIA process including scoping and consultation and the identification of key environmental effects.

---

[106] Planning Circular 3/2011. The Town and Country Planning (Environmental Impact Assessment) (Scotland) Regulations 2011. Scottish Planning Series.

[107] Planning Advice Note 1/2013: Environmental Impact Assessment. Scottish Planning Series

[108] IEMA (2004). Guidelines for Environmental Impact Assessment. Institute of Environmental Management and Assessment.

Site selection and design

A description of the site selection process for the tidal array, offshore cable route, cable landfall location and onshore infrastructure will be outlined. It will describe the main alternatives studied, and the reasons for the choice of this site, taking into account the environmental effects. It will describe the way in which embedded mitigation of environmental effects has been considered during project design, layout, cable route and substation.

Project description

A detailed description of the planned project will be given including all project components and covering the construction, installation, operation and maintenance and the decommissioning phases.

Planning and energy policy

This section will present an overview of the relevant statutory planning guidance and Development Plan policies which apply to the proposed development with particular reference to renewable and energy policy.

10.4.2 EIA results

Separate chapters will be included for each of the relevant subjects covered by the EIA and may be undertaken by individual consultants with expertise in different areas. The exact chapter structure will be developed on receipt of the Scoping Opinion and through further consultation with stakeholders.

To ensure consistency each chapter will be coordinated to follow a systematic approach as set out below:

- Introduction;
- Legislative framework and guidance;
- Assessment methodology including summary of consultation undertaken;
- Description of baseline conditions;
- Prediction of environmental effects and assessment of significant effects including cumulative effects;
- Identification of appropriate mitigation measures and monitoring proposals; and
- Assessment of residual environmental effects.

10.4.3 Baseline description

Information relating to the existing environmental conditions at the site will be gathered through desk based assessments, consultation and site surveys. Using this information the sensitivity of environmental receptors will be predicted for the lifetime of the project. Survey methodologies will be discussed and agreed with the relevant consultees and the data collection process and sources described in each ES chapter.

10.4.4 Prediction of potential environmental effects

The prediction of effects will be made using the known parameters of the project and through experience of similar projects. The prediction of effects includes consideration of the construction, operation and decommissioning phases of the project.

10.4.5 Assessment of effects

In assessing the significance of any identified impacts a number of factors will be considered including:

- The sensitivity of the environmental resource to change including the capacity of the resource to absorb change;
- The magnitude of the impact, i.e. the timing, scale, size and duration of the impact;
- The likelihood of the impact occurring;
- The certainty with which the potential impacts have been identified; and
- Comparison with the do nothing alternative, i.e. consideration of the possible changes in the environmental receptor was the project not to take place.

Individual methodologies for assessing effects will be explained in each of the technical assessments however the impact significance is generally considered in the following terms:

- Negligible: no detectable change to a location, environment, species or sensitive receptor;
- Minor: a detectable but non-material change to a location, environment, species or sensitive receptor;
- Moderate: a material, but non-fundamental change to a location, environment, species or sensitive receptor;
- Major: a fundamental change to a location, environment, species or sensitive receptor.

Effects identified as being moderate or major are considered to be “significant” in terms of the EIA Regulations.

10.4.6 Mitigation

This scoping phase identifies potential direct and indirect impacts associated with the potential development prior to the implementation of appropriate mitigation. Mitigation measures will be identified during the next stages of the EIA process and will be informed through stakeholder consultation and specific surveys and studies, along with best practice industry guidance for renewable and marine and coastal developments. SRTP are committed to considering current best practice to minimise the risk of adverse impact to the physical, biological or human environments both within the Project area and in the wider receiving environment. These include, but are not limited to:

- Timings of works to avoid sensitive times, such as breeding or migratory seasons of important species, unsociable hours for local residents;
- Siting of development to avoid sensitive or protected areas, species or habitats in both marine and terrestrial environments; and

- Use of low toxicity compounds during construction, operation and maintenance.

The proposed development will also draw on key knowledge from the marine renewable industry and the studies (such as underwater noise, onshore noise and wildlife interaction) completed on existing industry knowledge of tidal devices, including those types under consideration for the development, to inform potential effects and possible mitigation.

10.4.7 Project Environmental Monitoring Plan

Where elements of uncertainty remain regarding predicted effects from the EIA process a Project Environmental Monitoring Plan (PEMP) may be required. Any requirements for monitoring will be discussed and agreed with Marine Scotland, SNH and the relevant stakeholders.

11 Conclusions

The ES of the EIA will assess the magnitude of all likely impacts and will identify appropriate mitigation to reduce impacts to an acceptable level. Table 11.1 and Table 11.2 identify the consideration of effects on potential receptors and summarise the potential impacts that have been outlined in the Scoping Report and are to be considered further during the EIA.

Table 11.1 Consideration of potential effects

Potential Effect	Description	Scope
Potential beneficial impact	The project may result in potential beneficial impacts to the receptor	Scope out unless there is capacity to demonstrate significant potential benefits.
Effect unlikely to be significant	Baseline information and/or knowledge of the potential impact is sufficient to determine that the project is unlikely to have a significant effect on the receptor.	Scope out unless statutory consultees advise that the impact should be assessed further in the EIA.
Potential significance of impact uncertain	There is uncertainty around the risk to the receptor and/or baseline data is currently insufficient and further investigation is required to inform EIA.	Scope in for further baseline characterisation and impact assessment.

Table 11.2 Summary of potential effects of the proposed project

Potential Effect	Construction and Installation	Operation	Maintenance	Decommissioning
Human Environment				
Local communities and socio-economics				
Local employment and business opportunities				
Pressure on utilities and services				
Visual impact from presence of devices and vessels				
Changes to navigation				
Commercial fisheries and aquaculture				
Loss of access to fishing grounds.				
Increased pressure on other fishing grounds resulting from any displacement of existing fishing activity				
Obstruction of regular fishing vessel transit routes				
Change in abundance or distribution of targeted species				
Potential impacts on shore-based industries dependent on commercial fishing in Orkney				
Change in water flow or quality at aquaculture sites				
Shipping and navigation				
Disruption to navigation created by presence of devices and any 'area to be avoided'				

Potential Effect	Construction and Installation	Operation	Maintenance	Decommissioning
Disruption to navigation created by presence of support vessels and any safety zone required				
Loss of or change to traditional navigation routes				
Land use				
Disturbance or obstruction to land use from construction activities and presence of onshore cable route and substation				
Temporary increase in traffic				
Grid connection route crossing roads				
Movement of abnormal (cable drums, transformers etc.) and heavy loads				
Landscape, seascape and visual amenity				
Changes to landscape character				
Changes to seascape character				
Changes to visual amenity				
Archaeology and cultural heritage				
Physical disturbance of submerged historic and prehistoric land surfaces and archaeological finds (known and unknown)				
Physical disturbance of terrestrial (onshore) sites and finds (known and unknown)				
Indirect disturbance of submerged historic and prehistoric land surfaces and archaeological finds as a result of changes to the hydrodynamic flow and sedimentary regime				

Potential Effect	Construction and Installation	Operation	Maintenance	Decommissioning
Effects on the setting of Scheduled Monuments and Listed Buildings and effects on historic landscape character (both within and outwith the area of search)				
Recreation and tourism				
Disturbance to offshore recreation activities due to restricted access or passage				
Disturbance to onshore recreation due to restricted access or passage				
Effects of a change in seascape character on local visual amenity				
Effects of a change in landscape character on local visual amenity				
Increased accommodation occupancy rates				
Additional topic of interest creating new draw for tourists				
Ports and harbours				
Overcapacity of port infrastructure				
Other users				
Potential upgrade of existing electrical grid infrastructure				
Potential impacts on electrical grid, telecoms and water network				
Disruption to utilities provision				
Potential disruption to existing disposal site activity or disturbance of disposed material				
Disruption to aviation				
Potential disruption to existing MoD activity.				

Potential Effect	Construction and Installation	Operation	Maintenance	Decommissioning
Ecological Environment				
Seabed communities				
Substrate/habitat loss or damage due to placement of anchors on the seabed, cable laying and their eventual removal				
Habitat and species loss from scour around devices and other seabed infrastructure				
Damage to habitats from increased suspended sediments, turbidity and smothering from installation of infrastructure				
Disturbance of contaminated sediments, harmful to sensitive benthic species				
Alteration of hydrodynamic regime, changing benthic habitat				
Impact on communities from Electro Magnetic Fields or thermal discharge from cables				
Introduction of marine non-natives from foreign vessels, infrastructure and equipment				
Damage to habitat or species due to pollution from routine and accidental discharges and the use of anti-fouling treatments				
Colonisation through habitat creation from infrastructure, scour protection and support structures				
Fish ecology				
Loss of habitat due to placement of structures on the seabed				
Creation of habitat (e.g. biofouling and FAD effects) due to placement of structures in the water column /on the seabed.				

Potential Effect	Construction and Installation	Operation	Maintenance	Decommissioning
Effects of noise and vibration (from vessel traffic, construction / decommissioning activities and operational noise) on migratory fish				
Effects of noise and vibration (from vessel traffic, construction / decommissioning activities and operational noise) on basking shark				
Risk of collision with devices for basking shark.				
Risk of collision with devices for migratory fish				
Effects of electromagnetic fields (EMF) from export and inter-array cables on basking shark				
Effects of electromagnetic fields (EMF) from export and inter-array cables on migratory fish.				
Barrier to movement				
Pollution impact from accidental spillage from vessels.				
Marine mammals and reptiles				
Disturbance (noise and visual presence) to marine mammals from vessel traffic.				
Noise disturbance to marine mammals from installation activities				
Disturbance to marine mammals from operational noise generated by the devices.				
Spiral injuries to seals from vessel propulsion systems (e.g. ducted propellers)				
Risk of collision with tidal devices				
Barrier to movement due to presence of the development				
Displacement of essential activities due to the presence of the development				
Pollution impact from accidental spillage from vessels.				

Potential Effect	Construction and Installation	Operation	Maintenance	Decommissioning
Impact to marine reptiles.				
Marine birds				
Collision risk to diving birds from operating underwater turbines				
Loss / change of habitat due to presence of structures on seabed and in water column				
Displacement from vicinity of turbines				
Disturbance from vessel activity and installation activities				
Onshore habitat loss (breeding) due to land-take for infrastructure				
Disturbance from onshore construction works.				
Coastal and terrestrial communities				
Physical disturbance of intertidal habitats during cable landfall installation				
Alteration of intertidal communities from change in physical processes				
Physical disturbance of terrestrial communities during construction of onshore installations including cable route, access and substation				
Terrestrial habitat /species loss during and following onshore construction activities				
Disturbance of otters during onshore construction activities				
Disturbance of breeding and foraging birds during onshore construction activities				

Potential Effect	Construction and Installation	Operation	Maintenance	Decommissioning
Physical Environment				
Physical processes				
Disturbance of seabed and hydrography during cable laying and mooring installation				
Changes to hydrography and sediment regime due to presence of device moorings on the seabed				
Alteration of physical processes (tidal/wave regime, sediment transport processes) due to energy extraction				
Air and climate				
Reduction in greenhouse gas emissions from renewable energy source				
Vessel emissions, decreasing air quality				
Construction of onshore elements for the project resulting in dust impacts				
Marine water and sediment quality				
Increase in suspended sediment during cable laying and mooring installation				
Pollution of the marine water environment as a result of release of chemical spills from support vessels and/or devices				
Geology, soils and hydrology				
Contamination of soils or groundwater from spills during onshore construction works				
Interaction with geology if directional drilling is used for cable landfall				
Altered surface and ground water flows due to cable trenching and construction of an onshore substation				

12 Consultation Strategy

12.1 Policy and legislation

The requirements for effective consultation on developments subject to the EIA process are laid out in the EU Directive on Public Participation (Directive 2003/35/EC). The requirement of pre-application consultation has recently been introduced under the Marine Scotland Act 2010 through the Marine Licensing (Pre-Application Consultation) (Scotland) Regulations 2013 (PAC Regulations) which make consultation a statutory requirement for certain licensable activities including; "the construction of a renewable energy structure in or over the sea or on or under the seabed, where the total area in which the structure is to be located exceeds 10,000 square metres"[109]. The purpose of the new regulations is to allow local communities, environmental groups and other interested parties to comment on proposed marine developments at an early stage i.e. before an application is submitted to the Scottish Ministers through Marine Scotland.

The PAC Regulations require applicants to adhere to a set procedure with regard to engaging with communities. As a minimum, applicants are required to:

- Hold at least one public event where local communities, environmental groups, NGOs, regulators and other interested parties have the opportunity to consider and comment on the prospective development;
- Notify the following statutory consultees that and application for a Marine Licence for a prescribed activity is to be submitted;
    - Northern Lighthouse Board;
    - Maritime and Coastguard Agency;
    - The Scottish Environment Protection Agency;
    - Scottish Natural Heritage, and;
    - Any delegate for the relevant marine region or regions, when such delegates have been established under Section 12(1) of the Marine (Scotland) Act 2010;
- Notification of the pre-application consultation event must be made at least 6 weeks in advance of the event;
- Publish a notice in the local newspaper advertising the public event at least 6 weeks prior to the event. The advertisement must contain certain key information laid out in the Regulations;
- Host the event in a suitable venue, physically accessible and close to the subject of the event.

Finally a Pre-Application Consultation Report (PACR) must be submitted with the Marine Licence application including the following information:

- a description of the consultation event;
- a description of the information provided by the prospective applicant at the event;
- comments received by the prospective applicant at the pre-application event;

[109] Marine Scotland (2014). Guidance on Marine Licensable Activities subject to Pre-Application Consultation. The Scottish Government.

- a description of amendments to be made to the Marine Licence application, where applicable, in response to those comments; and
- an explanation for the approach taken where, despite the prospective applicant receiving relevant comments and objections no relevant alterations are proposed to be made to the marine licence application.

Planning Advice Note (PAN) 3/2010 Community Engagement[110] provides advice on how communities can be engaged in the consultation process and how developers can take their views and opinions into account in the EIA and development process.

12.2 Pre-scoping consultation

SRTP issued a Project Briefing Document (PBD) in December 2013 to statutory consultees and stakeholder groups and carried out pre-scoping consultation with several key stakeholders including OIC Planning Department, Marine Scotland, Orkney Islands Council Marine Services (Harbours Department) and Orkney Ferries.

Pre-scoping consultation is not a statutory requirement of the EIA Regulations; however it is good practice to invite comments from regulators, their advisors and wider stakeholders on the potentially significant environmental effects of a proposed development at an early stage. This enables the identification of the elements of the project which may cause significant environment effects, assists with information gathering and allows appropriate targeting for impact assessments before project components are finalised.

A wide range of responses were gathered from the PBD which have been collated and imputed into the context of the EIA Scoping Report. Particular issues were raised with regard to shipping and navigation and a range of impacts on commercial fisheries which, in addition to other comments received, have been considered in the Scoping Report and will be addressed as part of the EIA process.

Responses will be compiled and included in the PAC publication report for submission to Marine Scotland as part of the application for a Marine Licence.

12.3 Consultation strategy

SRTP propose to adopt the following consultation strategy for the Project:

Pre-scoping consultation

Pre-scoping consultation as described above involved the issue of the PBD to initiate the consultation process and engagement through informal meetings with selected stakeholders and

[110] Planning Advice Note (PAN) 3/2010 Community Engagement. Scottish Planning Series.

interested parties to ensure early participation and to obtain information for the development of the Scoping Report.

EIA scoping opinion request

This EIA Scoping Report is submitted to request a formal Scoping Opinion from statutory and non-statutory consultees to gain their views and opinions on the potentially significant environmental effects of the proposed Project. Feedback from this process will inform the identification of potentially significant environmental effects and the targeting of baseline and impact assessment studies.

Ongoing EIA consultation

Following the receipt of Scoping Opinion from statutory and non-statutory consultees and feedback from other stakeholders, meetings will be held with as required to address key issues raised.

An important aspect of the consultations will be to engage with stakeholders to obtain information on key impact receptors and will facilitate stakeholder input into project siting and design where appropriate. Engagement with those bodies and stakeholders concerned with shipping and navigation and commercial fisheries will be of particular importance to ensure appropriate design and siting of project components in the offshore AoS i.e. to ensure export cable routing to shore is appropriately sited; and ensure access and navigation can be maintained.

Public consultation

SRTP regularly attend and participate in local consultation days and events in Orkney. To date the Crown Estate have hosted 2 annual public information days in Kirkwall to provide information on all the Pentland Firth and Orkney Waters projects both of which have been well attended.

SRTP will comply with the PAC Regulations as a minimum and may hold more than one public event (e.g. one event in Eday and one in Kirkwall) both of which will be advertised according to the requirements of the Regulations.

12.4 Project stakeholders

A proposed list of consultees for the project has been compiled for the purposes of the EIA and is presented in Appendix E. Consultees have been organised according to point of contact into the following categories:

Statutory Consultees - includes regulatory bodies and their advisors and will be consulted directly by Marine Scotland throughout the EIA process.

Stakeholder Group 1 - includes stakeholders with a potential interest in the Project that will be contacted directly by Marine Scotland throughout the EIA process unless otherwise stipulated.

Stakeholder Group 2 - includes stakeholders with a potential interest in the Project that will be contacted directly by SRTP and the EIA team throughout the EIA process.

12.5 How to Respond to the Scoping Report

This Scoping Report has been issued to Marine Scotland Licencing and Operations Team (MS-LOT) in support of a request for a Scoping Opinion under the Electricity Works (Environmental Impact Assessment) (Scotland) Regulations 2000 and the Marine Works (Environmental Impact Assessment) Regulations 2007 (as amended) .

Responses to this Scoping Report will inform the detailed methodology for each aspect of the environmental impact assessment in conjunction with ongoing consultation with statutory and non-statutory consultees throughout the development process.

This Scoping Report has been issued to a number of potential stakeholders, a full list of which is provided in Appendix E. If you would like to comment on the Scoping Report and proposed content of the EIA please send any responses to Marine Scotland at the following address:

Marine Scotland Marine Licensing Operations Team
Scottish Government, Marine Laboratory, PO Box 101, 375 Victoria Road, Aberdeen, AB11 9DB

Or by email to: ms.marinelicensing@scotland.gsi.gov.uk

Scotrenewables Tidal Power Limited would also be very grateful if copies of any scoping responses could also be sent to them directly at the following address:

F.A.O. Kirsten Geddes, Environmental Consents Manager
Scotrenewables Tidal Power Ltd, Hillside Office, Stromness, Orkney, KW16 3HS

Or by email to kirsten@scotrenewables.com.

Additional copies of the Scoping Report will also be available to view at the following locations:

- **Scotrenewables Tidal Power Ltd, Hillside Office, Stromness, Orkney, KW16 3HS**
- **Orkney Library and Archive, 44 Junction Road, Kirkwall, KW15 1AG**
- **Aquatera Offices, Stromness Business Centre, The Old Academy, Stromness, KW16 3AW**
- **Eday and Sanday Community Schools and through Community Council.**

If you have received this document and do not wish to be consulted further then please confirm this to SRTP at the address above.

13 References

AB Associates (2010). Orkney visitor survey 2008-2009. Available [Online]: http://www.orkney.gov.uk/Files/Council/Publications/2010/OrkneyVisitorSurvey_2009_FinalReport.pdf (accessed 04/06/14).

ABPmer (2012). Pentland Firth and Orkney Waters Enabling Actions Report: A socio-economic methodology and baseline for Pentland Firth and Orkney waters wave and tidal developments.

AMEC Environment and Infrastructure UK Ltd and Aquatera (2013). Pentland Firth and Orkney Waters Enabling Actions Report: Cumulative impact assessment in Pentland Firth and Orkney waters. The Crown Estate.

Barne, J.H., Robson, C.F., Kaznowska, S.S., Doody, J.P., Davidson, N.C., and Buck, A.L., eds. (1997). Coasts and seas of the United Kingdom. Region 2: Orkney. Peterborough, Joint Nature Conservation Committee. (Coastal Directories Series).

Baxter, J.M., Boyd, I.L., Cox, M., Donald, A.E., Malcolm, S.J., Miles, H., Miller, B., Moffat, C.F., (Editors) (2011). Scotland's Marine Atlas: Information for the national marine plan. Marine Scotland, Edinburgh. pp. 191.

Booth, C. (2010). Fish records - Orkney. Orkney Field Club. Available [online]: http://www.orkneycommunities.co.uk/FIELDCLUB/documents/Records/2010.02%20fish%20Orkney%20list.xls (accessed 03/06/2014).

British Geological Survey (1984). Orkney, Sheet 59°N-04°W. Sea bed sediments and Quaternary, 1:250,000 geological map.

Civil Hydrography Programme (2014). Available [online]: http://www.dft.gov.uk/mca/mcga07-home/shipsandcargoes/mcga-shipsregsandguidance/mcga-dqs-hmp-hydrography/the_civil_hydrography_programme.htm (accessed 12/06/14)

Connor, D.W., Allen, J.H., Golding, N., Howell, K.L., Lieberknecht, L.M., Northen, K.O. and Reker, J.B. (2004). The Marine Habitat Classification for Britain and Ireland Version 04.05. JNCC, Peterborough.

Coull, K. A., Johnstone, R. and Rogers, S. I. (1998). Fisheries Sensitivity Maps for British Waters. Cefas.

Dargie, T. (1998). Sand dune vegetation survey in Scotland: Orkney, Volume 1. Scottish Natural Heritage Research, Survey and Monitoring Report 123.

DEFRA (2013). Marine Conservation Zones: Site designations and summary of site-specific consultation responses. Available [Online]: https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/259856/mcz-site-specific-responses-20131121.pdf (accessed 03/06/2014).

Ellis, J. R., Milligan, S. P., Readdy, L., Taylor, N. and Brown, M. J. (2012). Spawning and nursery grounds of selected fish species in UK waters. Cefas Lowestoft, 147: 56 pp.

Evans, P.G.H., Baines, M.E. and Coppock, J. (2011). Abundance and behaviour of cetaceans and basking sharks in the Pentland Firth and Orkney Waters. Report by Hebog Environmental Ltd and Sea Watch Foundation. Scottish Natural Heritage Commissioned Report No.419.

Furness, R. W., Wade, H. M., Robbins, A. M. C., and Masden, E. A. (2012). Assessing the sensitivity of seabird populations to adverse effects from tidal stream turbines and wave energy machines. ICES Journal of Marine Science, 69: 1466–1479.

Highlands and Islands Enterprise (2011). Area profile for Orkney. Available [online] http://www.hie.co.uk/regional-information/area-information/orkney/economic-profile.html (accessed 17/06/14).

Howson, C. M., Steel. L., Carruthers, M. and Gillham, K. (2012). Identification of Priority Marine Features in Scottish territorial waters. Scottish Natural Heritage Commissioned Report No. 388.

IEMA (2004). Guidelines for Environmental Impact Assessment. Institute of Environmental Management and Assessment.

Infrastructure Planning Commission (2011). Advice note: Rochdale Envelope. Available [online]: http://infrastructure.independent.gov.uk/wp-content/uploads/2011/02/Advice-note-9.-Rochdale-envelope-web.pdf (accessed 21/04/14).

JNCC (2014). Marine Protected Areas (MPAs) in Scotland's Seas. Available [online]: http://jncc.defra.gov.uk/page-5269 (accessed 21/04/14).

Landscape Institute and Institute of Environmental Management and Assessment (2013). Guidelines for landscape and visual assessment 3rd edition.

Land Use Consultants (1998). Orkney landscape character assessment. Scottish Natural Heritage Review No 100.

Langton, T.E.S., Beckett, C.L., King, G.L. and Gaywood, M.J. (1996). Distribution and status of marine turtles in Scottish Waters. SNH Research, Survey and Monitoring Report No.8. SNH, Battleby.

Malcom, I.A., Godfrey, J., Youngson, A.F. (2010). Review of migratory routes and behaviour of Atlantic salmon, sea trout and European eel in Scotland's coastal environment: implications for the development of marine renewables. Scottish Marine and Fresh Water Science.

Marine Scotland (2010). Pentland Firth and Orkney Waters Marine Spatial Plan Framework and Regional Locational Guidance for Marine Energy. The Scottish Government, Aecom and Metoc.

Marine Scotland (2013). Scottish Sea Fisheries Statistics 2012. The Scottish Government.

Marine Scotland (2014). Guidance on Marine Licensable Activities subject to Pre-Application Consultation. The Scottish Government.

Marine Scotland (2014). Seal Haul Out sites. Available [online]: http://www.scotland.gov.uk/Topics/marine/marine-environment/species/19887/20814/FAQs (accessed 01/07/14)

Marine Scotland National Marine Plan Interactive Map (2014). MNCR survey data, 1997. Available [online]: http://marinescotland.atkinsgeospatial.com/nmpi/ (accessed 20/04/14).

Marine Scotland Science (2013). Fishing Effort and Quantity and Value of Landings by ICES Rectangle. Available [online]: http://www.scotland.gov.uk/Topics/Statistics/Browse/Agriculture-Fisheries/RectangleData (accessed 19/12/13).

McBreen, F., Askew, N., Cameron, A., Connor, D., Ellwood, H., Carter, A . (2011). UK SeaMap 2010 Predictive mapping of seabed habitats in UK waters. JNCC, Peterborough.

MESH Atlantic web GIS (2014). Available [online]: www.searchmesh.net/webGIS (accessed 06/04/14).

Moore, C.G. (2009). Preliminary assessment of the conservation importance of benthic epifaunal species and habitats of the Pentland Firth and Orkney Islands in relation to the development of renewable energy schemes. Scottish Natural Heritage Commissioned Report No. 319.

National Records of Scotland (2013). 2011 Census: First Results on Population and Household Estimates for Scotland - Release 1C (Part Two). Available [online]: http://www.scotlandscensus.gov.uk/documents/censusresults/release1c/rel1c2sb.pdf (accessed 17/06/14).

NBN Gateway (National Biodiversity Network) (2014). Available [online]: https://data.nbn.org.uk/ (accessed 21/04/14).

NOMIS (2014). Official labour market statistics. Available [online]: http://www.nomisweb.co.uk/reports/lmp/la/1946157427/report.aspx#tabempocc (accessed 17/06/14).

OIC (2014). Newsletter: reviewing the Orkney Local Development Plan (February 2014). The Development Plan Scheme 2014.

OIC Marine Services (2010). Orkney ports handbook 4th edition

ORCA (2012). Project Adair: Mapping marine heritage sites in Orkney and the Pentland Firth. Available [online]: http://www.orkney.uhi.ac.uk/studying-at-oc/departments/archaeology/archaeology-files/mapping-marine-heritage-sites-in-orkney-and-pentland-firth (accessed 17/06/14).

Orkney Biodiversity Steering Group (2013). Orkney Local Biodiversity Action Plan, 2013 – 2016. Available [Online]: http://www.orkney.gov.uk/Files/Planning/Biodiversity/Orkney_LBAP_with_appendices.pdf (accessed 07/06/14).

Orkney Island Council (2013). Orkney Economic Review.

Orkney Marine Renewables (2013). Orkney Marine Renewables Supply Chain Directory. Available [online]: http://www.orkneymarinerenewables.com/userfiles/file/ENERGY-OF-ORKNEY-DIRECTORY.pdf (accessed 17/06/14).

Orkney Skate Trust (2014). Skate Database. Sightings 2006 – 2008.

Planning Advice Note (PAN) 1/2013: Environmental Impact Assessment. Scottish Planning Series.

Planning Advice Note (PAN) 3/2010: Community Engagement. Scottish Planning Series.

Planning Circular 3/2011. The Town and Country Planning (Environmental Impact Assessment) (Scotland) Regulations 2011. Scottish Planning Series.

RCAHMS (2014). Canmore. Available [Online]: http://canmore.rcahms.gov.uk/en/site/3208/details/eday+bay+of+london/ (accessed 17/06/14).

Ricardo-AEA (2014). Air Quality Management Areas (2014). Available [online]: http://www.scottishairquality.co.uk/laqm/aqma (accessed 17/06/14).

RYA (2009). Royal Yacht Association. UK Coastal Atlas of Recreational Boating, Recreational Cruising Routes, Sailing and Racing Areas around the UK Coast. 2nd Edition, 2009.

Saunders, G., Bedford, G.S., Trendall, J.R., and Sotheran, I. (2011). Guidance on survey and monitoring in relation to marine renewables deployments in Scotland. Volume 5. Benthic Habitats. Unpublished draft report to Scottish Natural Heritage and Marine Scotland.

SCOS (2013). Scientific advice on matters related to the management of seal populations: 2013. Report of the UK Special Committee on Seals. Available [online]: http://www.smru.st-andrews.ac.uk/pageset.aspx?psr=411 (accessed 17/06/14).

Scott, K.E., Anderson, C., Dunsford, H., Benson, J.F. and MacFarlane, R. (2005). An assessment of the sensitivity and capacity of the Scottish seascape in relation to offshore windfarms. Scottish Natural Heritage Commissioned Report No.103.

Scottish Government (2012). Scottish Government Survey, Deploy and Monitor licensing policy guidance, 24th August 2012. Available [online]: http://www.scotland.gov.uk/Topics/marine/Licensing/marine/Applications/SDM (accessed 17/06/14).

Scottish parliament Briefing Note (2014). Financial Scrutiny Unit Briefing Disposable Household Income in Scotland 2012. A briefing on the Office for National Statistics' publication Regional Household Income. Available [online]: http://www.scottish.parliament.uk/ResearchBriefingsAndFactsheets/S4/SB_14-48.pdf (accessed 03/07/14)

SEPA (2012). Water body information sheet for water body 200243 in Orkney and Shetland. Available [online]: http://apps.sepa.org.uk/wbody/2012/200243.pdf (accessed 17/06/14).

SEPA (2014). River basin planning. Area Advisory Groups: Orkney and Shetland. Available [online]: http://www.sepa.org.uk/water/river_basin_planning/area_advisory_groups/orkney_and_shetland.aspx (accessed 17/06/14).

Slaski, R.J, Hirst, D. and Gray, S. (2013). PFOW wave and tidal stream projects and migratory salmonids.

SNH (2006). Sanday SAC. Available [Online]: http://www.snh.gov.uk/docs/B16612.pdf (accessed 17/06/14).

SNH. (2012). Offshore renewables – guidance on assessing the impact on coastal landscape and seascape. Guidance for Scoping an Environmental Statement.

SNH (2013). Marine mammals and Licensing. Available [online]: http://www.snh.gov.uk/protecting-scotlands-nature/species-licensing/mammal-licensing/marine/ (accessed 17/06/14).

SNH (2013). Report on sand eel distribution in support of proposed MPAs. Available [online]: http://www.snh.gov.uk/docs/B989125.pdf (accessed 17/06/14).

SNH (2014). Lampreys. Available [online]: http://www.snh.gov.uk/about-scotlands-nature/species/fish/freshwater-fish/lamprey/ (accessed 03/06/2014).

SNH (2014). SNH Information Sheet on tidal-swept communities. Available [Online]: http://www.scotland.gov.uk/Topics/marine/seamanagement/nmpihome/healthy/Fuccoids (accessed 17/06/14).

SNH (2014). SNH Sitelink. Available [Online]: http://gateway.snh.gov.uk/sitelink/siteinfo.jsp?pa_code=8478 (accessed 17/06/14).

SSE Power Distribution (2014). Orkney Caithness. Available [Online]: http://www.ssepd.co.uk/OrkneyCaithness/ (accessed 17/06/14).

The Crown Estate (2012). Pentland Firth and Orkney Waters Enabling Actions Report: A socio-economic methodology and baseline for Pentland Firth and Orkney waters wave and tidal developments.

The Crown Estate (2013). Final Report Cumulative Impact Assessment in Pentland Firth and Orkney waters. Available [Online]: http://www.thecrownestate.co.uk/media/420420/PFOW-cumulative-impact-assessment.pdf (accessed 04/06/2014).

The Scottish Government (2011). Renewables revolution aims for 100%. Press release 18 May 2011. Available [online]: http://www.scotland.gov.uk/News/Releases/2011/05/18093247 (accessed January 2014).

The Scottish Government (2011). 2020 Routemap for Renewable Energy in Scotland. Available [online]: http://www.scotland.gov.uk/Publications/2011/08/04110353/2 (accessed January 2014).

Thompson, P.M., Cheney, B., Ingram, S., Stevick, P., Wilson, B. and Hammond, P.S. (2011). Distribution, abundance and population structure of bottlenose dolphins in Scottish waters. Scottish Natural Heritage Commissioned Research Report No. 354.

Visit Scotland (2014). Orkney: Islands Visitor Survey 2012-2013. Prepared by Scotinform Ltd and Reference Economics.

Wilson, B. Batty, R.S. Daunt, F. and Carter, C. (2007) Collision risks between marine renewable energy devices and mammals, fish and diving birds. Report to the Scottish Executive. Scottish Association for Marine Science.

14 Appendices

The Scoping Report is supported by the following Appendices:

Appendix A: ScotMap Fisheries Maps;

Appendix B: Preliminary Hazard Analysis;

Appendix C: Habitats Regulations Appraisal;

Appendix D: Natural Heritage Designations; and

Appendix E: Consultee List.

Appendix A - ScotMap Inshore Fisheries Mapping Study

Creel fishery

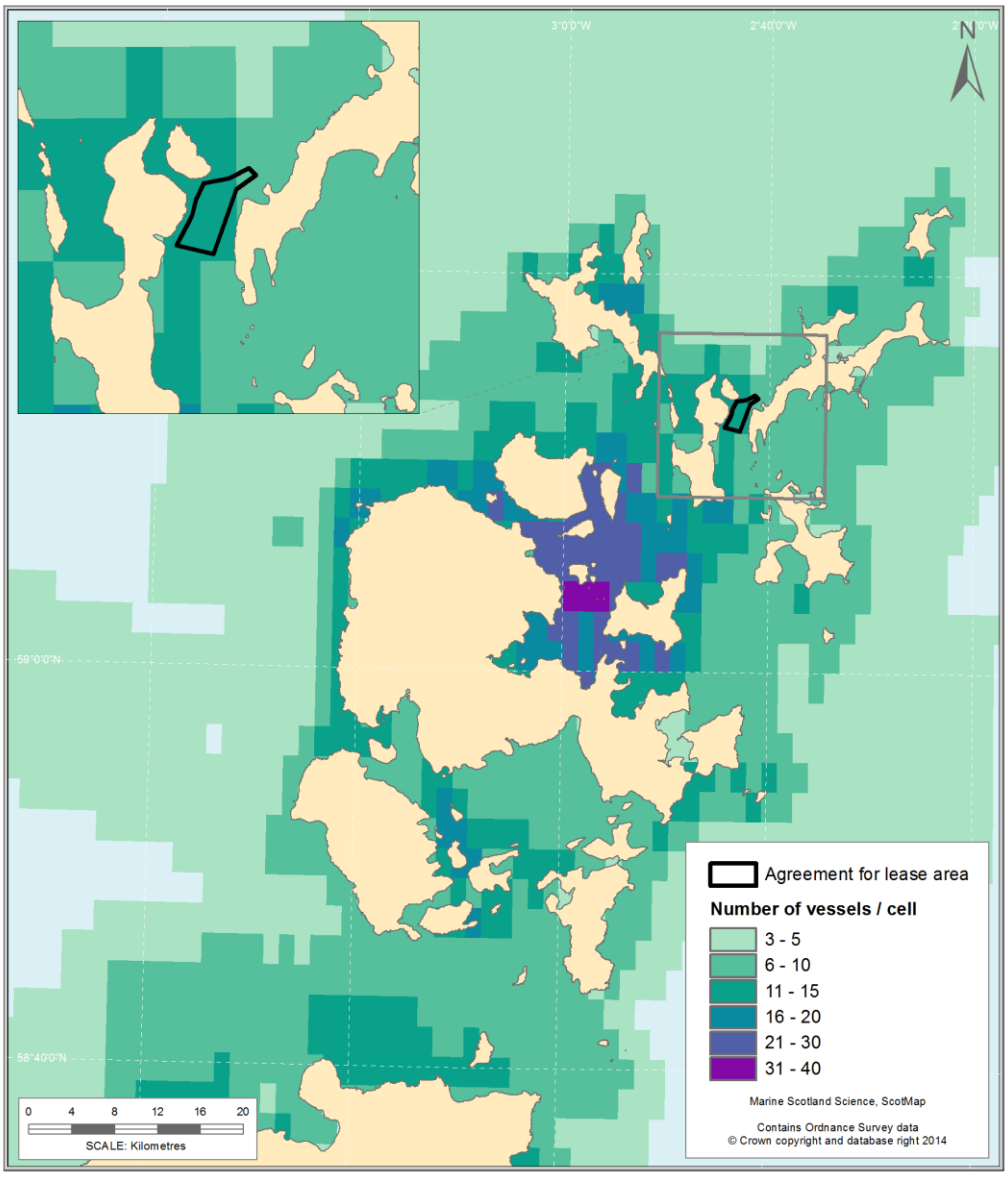

Figure 2 **Distribution of creel fishery in Orkney waters**

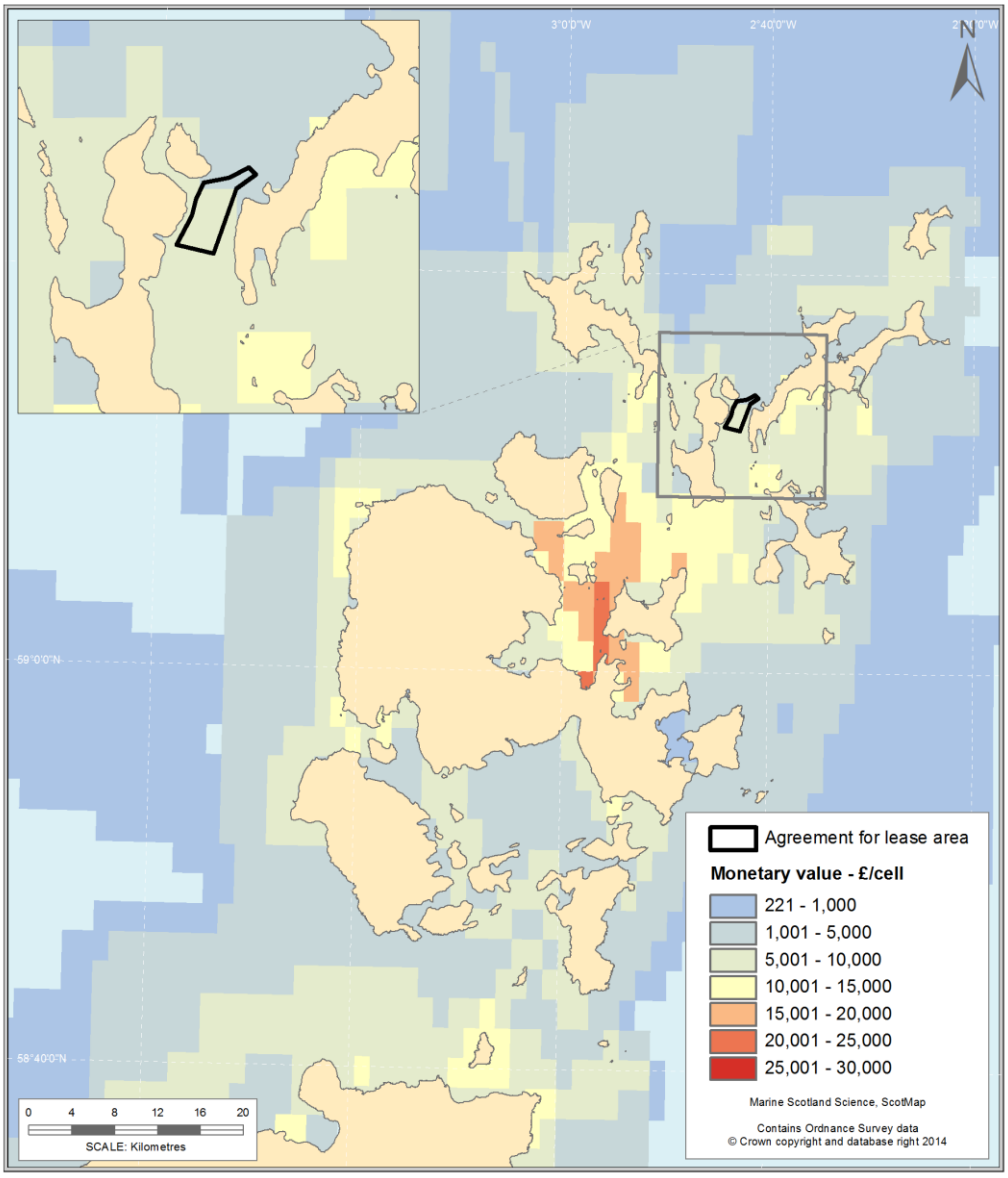

Figure 3 **Monetary value of creel fishery in Orkney waters.**

Scallop diving

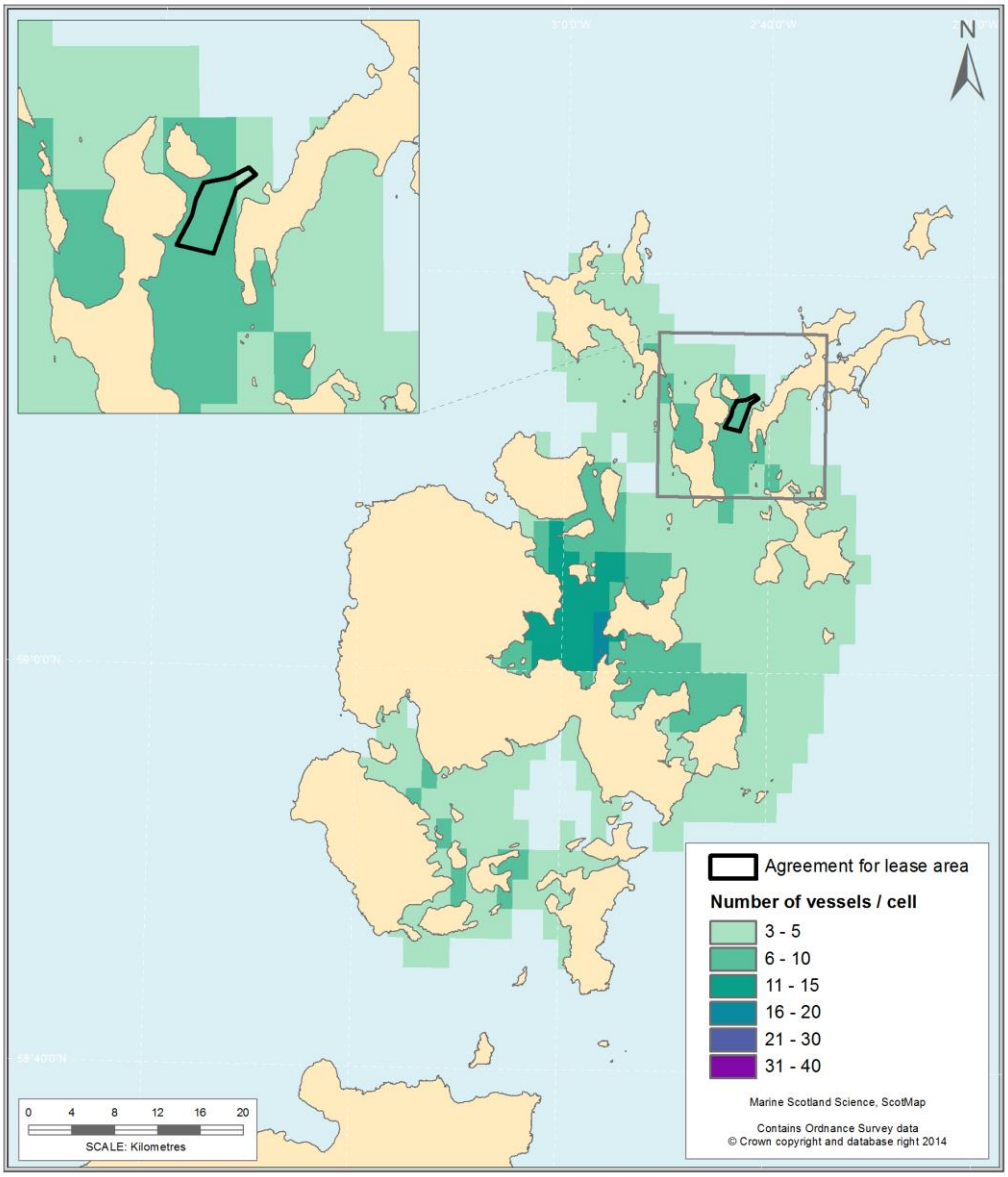

Figure 4 **Distribution of scallop diving fishery in Orkney waters.**

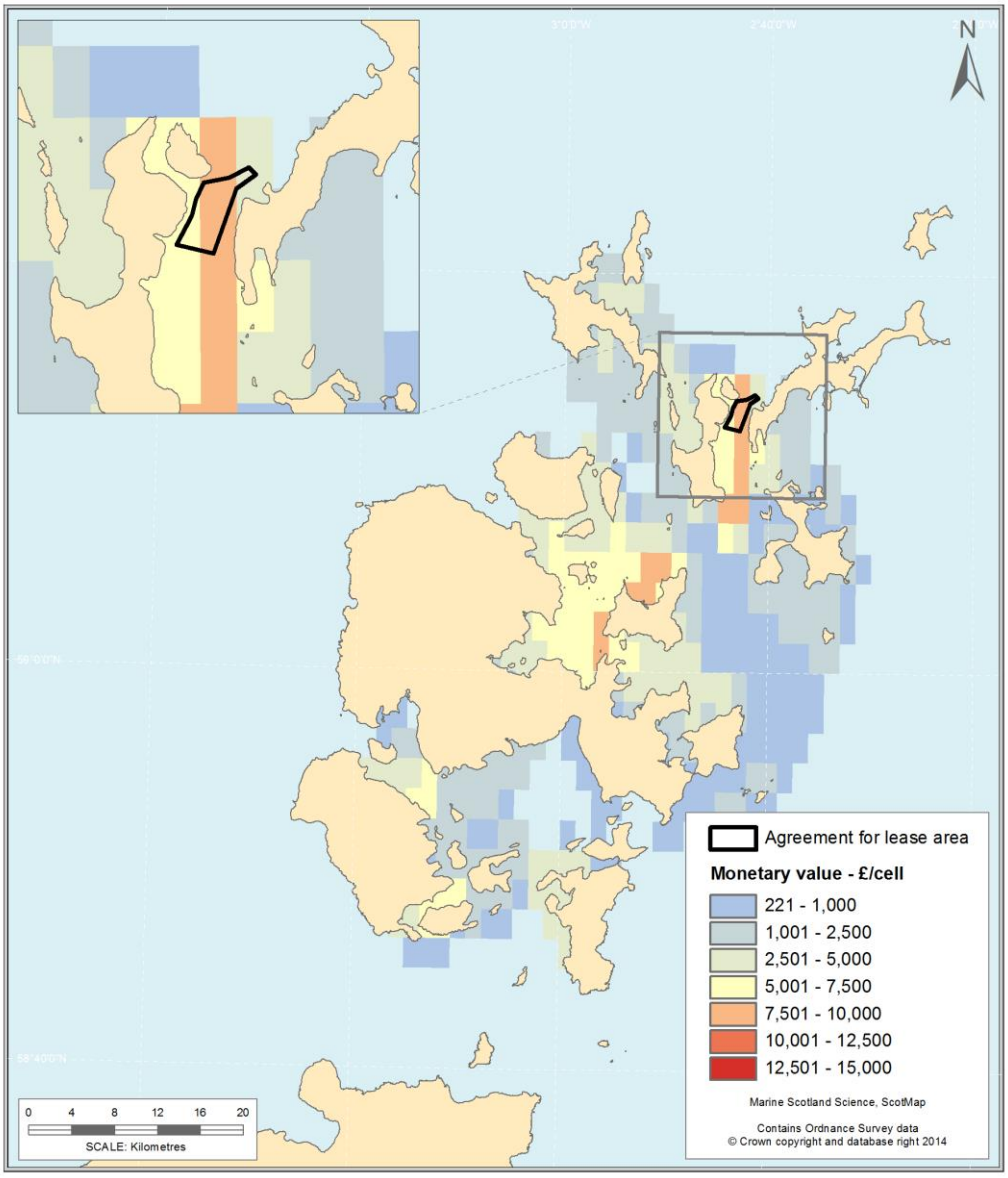

Figure 5 Monetary value of scallop diving fishery in Orkney waters

Scallop dredgers

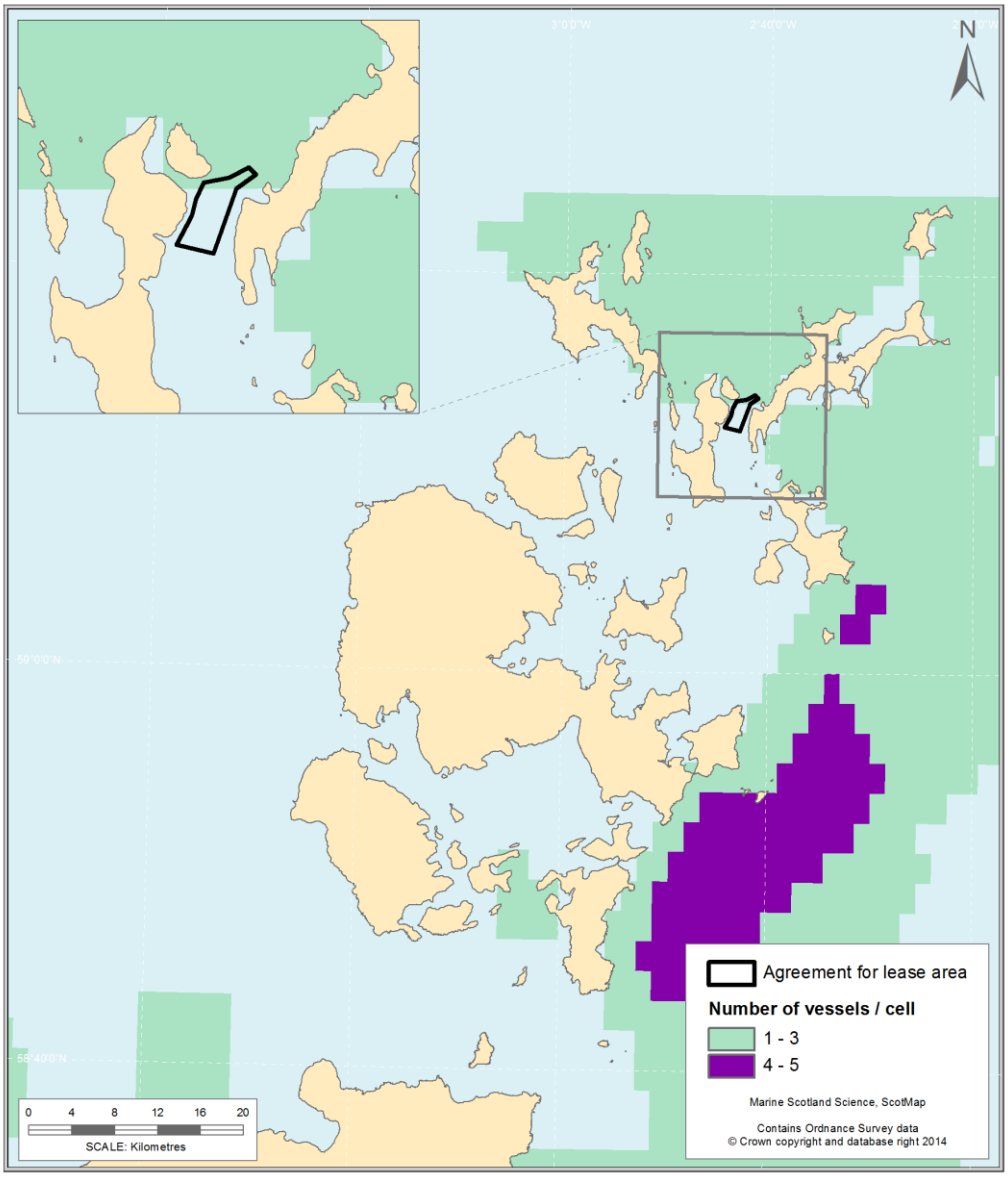

Figure 6 **Distribution of scallop dredging fishery in Orkney waters.**

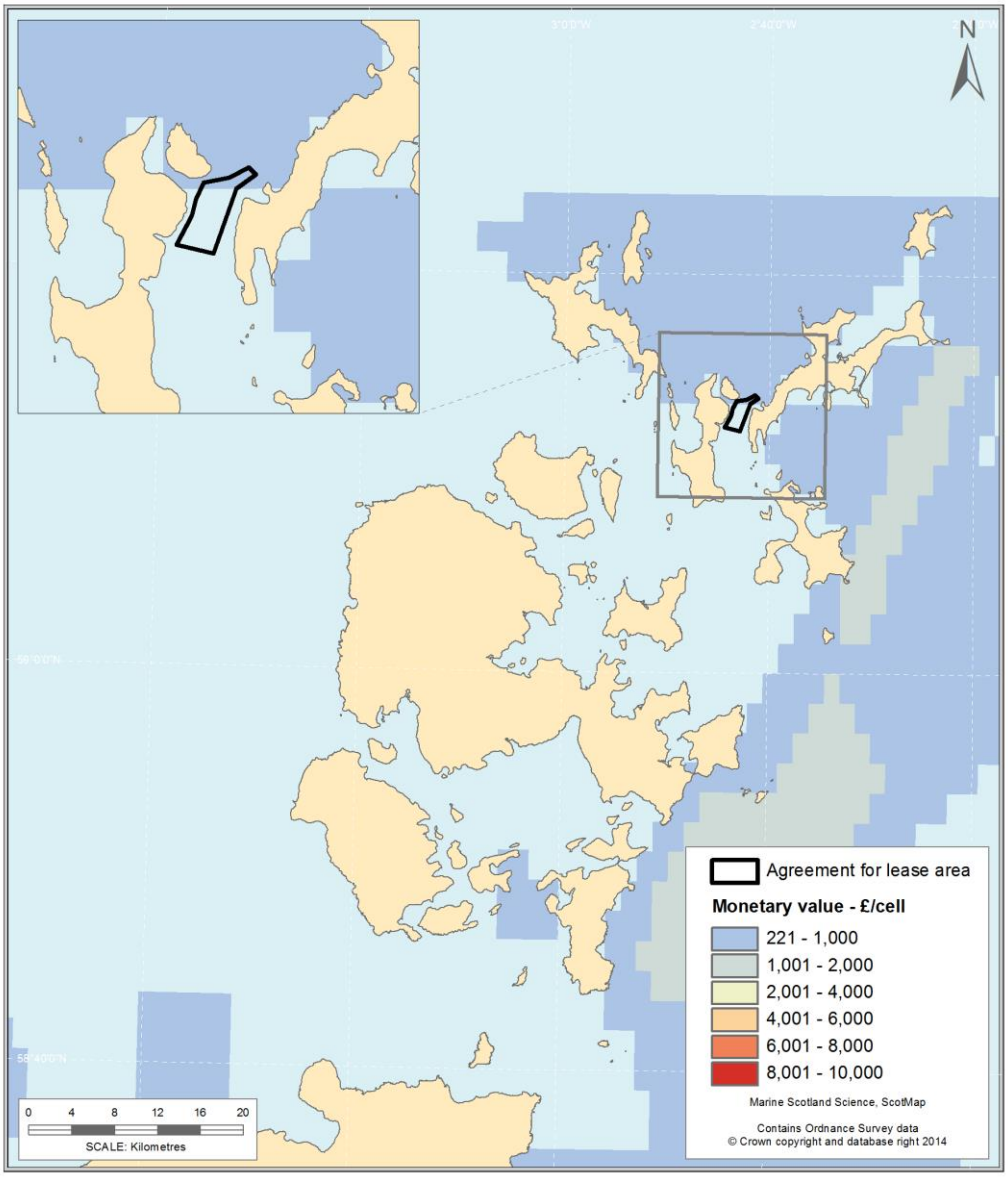

Figure 7 **Monetary value of scallop dredging fishery in Orkney waters**

Appendix B - Preliminary Hazard Analysis

Preliminary Hazard Analysis

Lashy Sound Tidal Array

Report to Scotrenewables Tidal Power Ltd

Issued by Orcades Marine and Aquatera Ltd

July 2014

This study was prepared for:

Scotrenewables Tidal Power Ltd.
Hillside Office
Stromness
Orkney
KW16 3HS
Contact: Kirsten Geddes
Email: kirsten@scotrenewables.com

By:

Orcades Marine Management Consultants Ltd
Scott's House
Hatston
Kirkwall
Orkney
KW15 1FL

Aquatera Ltd
Stromness Business Centre
Stromness
Orkney
KW16 3AW
Contact: Ian Hutchison
Email: ian.hutchison@aquatera.co.uk

Revision Number	Issue Date	Revision Details
Rev 1.0	12/05/2014	Draft for Client First Review
Rev 1.1	14/06/2014	Response to Client Review
Rev 2.0	08/07/2014	Final Draft

Contents

List of Figures

List of Tables

Acronyms

AfL	-	Agreement for Lease
ADCP	-	Acoustic Doppler Current Profiler
AIS	-	Automatic Identification System
ALARP	-	As Low As Reasonably Practicable
AoS	-	Area of Search
ATBA	-	Area To Be Avoided
DECC	-	Department of Energy and Climate Change
DfT	-	Department for Transport
EMEC	-	European Marine Energy Centre
GRT	-	Gross Registered Tonnes
GT	-	Gross Tonnes
HAT	-	Horizontal Axis Turbine
IALA	-	International Association of Lighthouse Authorities
ICES	-	International Council for the Exploration of the Seas
IMO	-	International Maritime Organisation
Km	-	Kilometre
MAIB	-	Marine Accident Investigation Branch
MaRS	-	Marine Resource System
MCA	-	Maritime and Coastguard Agency
MGN	-	Marine Guidance Note
MMO	-	Marine Management Organisation
MS LOT	-	Marine Scotland Licensing Operations Team
MW	-	Mega Watts
nm	-	Nautical Mile (1,852 metres)
NRA	-	Navigation Risk Assessment
ODBOA	-	Orkney Dive Boat Operators' Association
OFA	-	Orkney Fisheries Association
OFS	-	Orkney Fishermen's Society
OICMS	-	Orkney Islands Council Marine Services
OREI	-	Offshore Renewable Energy Installation
PHA	-	Preliminary Hazard Analysis
PLN	-	Port Letter Number

RNLI	-	Royal National Lifeboat Institution
RYA	-	Royal Yachting Association
SRTA	-	Scotrenewables Tidal Array Ltd
SRTP	-	Scotrenewables Tidal Power Ltd
SRTT	-	Scotrenewables Tidal Turbine
UKHO	-	United Kingdom Hydrographic Office
VMS	-	Vessel Monitoring System
VTS	-	Vessel Traffic Services (by OICMS)

1 Introduction

Orkney-based Scotrenewables Tidal Power Ltd (SRTP) has secured from The Crown Estate an Agreement for Lease (AfL) to develop a 30MW tidal array in Lashy Sound, between the islands of Eday and Sanday in Orkney. The project will be developed in two Phases: Phase 1 up to 5 turbines (10MW) and Phase 2 up to 15 turbines (30MW). Orcades Marine and Aquatera have been commissioned to carry out a Preliminary Hazard Analysis (PHA) as part of the scoping process for Phase 1 of the Project.

This PHA is a precursor to the full Marine Safety Navigational Risk Assessment (NRA), required under the Electricity Works (Environmental Impact Assessment) (Scotland) Regulations 2000 (as amended) and the Marine Works (Environmental Impact Assessment) Regulation 2007 (as amended), which will be carried out as part of the full Environmental Impact Assessment for the project. An outline of the current guidance is set out below:

For guidance on the NRA process and reporting:

- DECC/MCA 'Methodology for Assessing the Marine Navigational Safety & Emergency Response Risks of Offshore Renewable Energy Installations (OREI)' (Ref: DECC/MCA 2013).

For guidance from MCA on navigational safety issues:

- MGN 371 "Offshore Renewable Energy Installations – Guidance on UK Navigational Practice, Safety and Emergency Response Issues". (Ref MCA 2008a)

For guidance on hazard identification and risk assessment:

- Health & Safety Executive Offshore Technology Report on Marine Risk Assessment (H&SE 2001).
- DNV RP-H101- Risk Management in Marine and Subsea Operations (DNV 2003).

The PHA process includes the following key components:

- An outline project description (refer also to the Project Description provided in Section 3 in the main body of the Scoping Report).
- Navigational features:
    - Designated routes;
    - Ports and harbours;
    - Cables;
    - Preliminary baseline vessel traffic survey in and around the AfL area;
    - Preliminary assessment of commercial shipping movements;
    - Preliminary assessment of fishing activity; and
    - Preliminary assessment of recreational vessel activity.
- Review of historical maritime incidents;
- Stakeholder consultation relating to navigational issues;
- Preliminary navigational hazard assessment listing potential key marine safety issues; and;
- Outline an appropriate process for the full NRA.

2 Description of Project

The current project description is presented in Section 4 of the Scoping Report. Only those features particularly relevant to navigational risk are included here.

2.1 Location

Lashy Sound was selected as an excellent site to progress the development of a commercial array of Scotrenewables tidal turbines (SRTT).

Figure 2.1 View of Lashy Sound from the north

Figure 2.1 shows Lashy Sound from the north with the Calf of Eday on the right and the narrow entrance to Calf Sound with Eday beyond. Lashy Sound is approximately 1.5km wide.

A chart of the location of the Agreement for Lease (AfL) area awarded to SRTP is given in Figure 2.2 with an inset showing its location within the Orkney Isles. As outlined in the Scoping Report the AfL can be considered as an offshore Area of Search (AoS) for the project.

The proposed development area within the AfL area will be refined through further study. The AfL area, Figure 2.2, is approximately 4km^2. Within this area it is anticipated that the Phase 1 development of up to 5 turbines (10MW) would occupy an area of approximately 1.0 c 0.3 km i.e. 0.3km^2.

The charted water depths within the AfL area are in the range 10-35m (chart datum, approximately Lowest Astronomical Tide). This is confirmed by recent Maritime and Coastguard Agency survey data available as part of the as part of the Civil Hydrography Program.

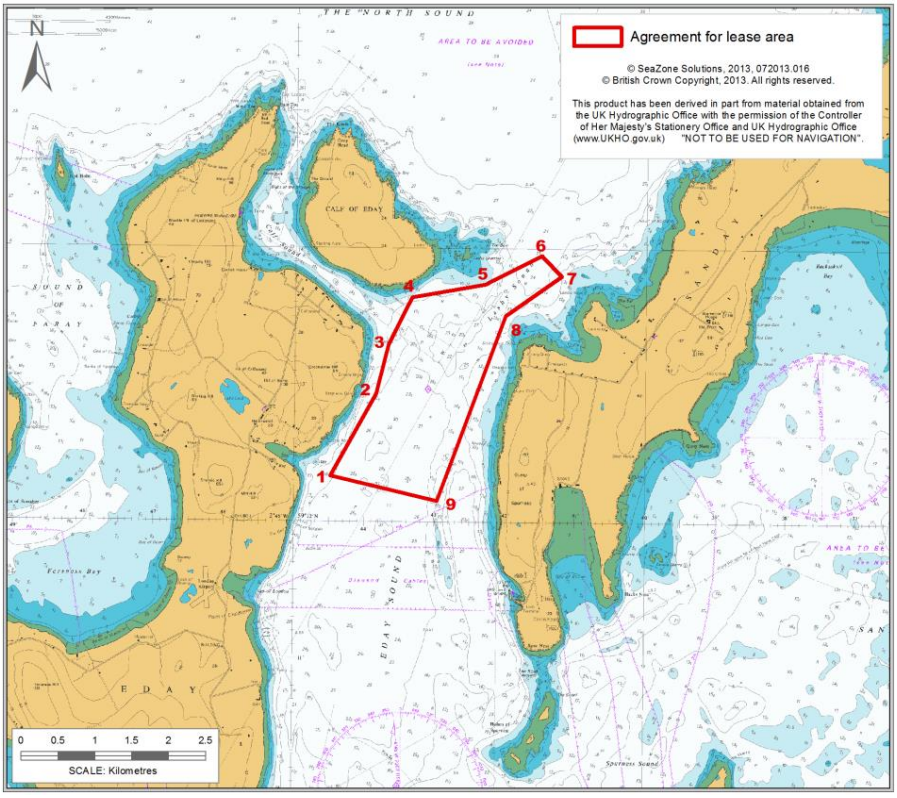

Figure 2.2 Chart of Lashy Sound AfL area

The coordinates of the positions noted on the chart are noted in Table 2.1.

Table 2.1 Coordinates of AfL limits

Location Number	Easting/Westing	Northing/Southing
1	2.741W	59.206N
2	2.731W	59.216N
3	2.728W	59.222N
4	2.722W	59.227N
5	2.705W	59.229N
6	2.692W	59.233N
7	2.687W	59.230N
8	2.700W	59,225N
9	2.716W	59.203N

2.2 Phases of development

The development of the Lashy Sound Tidal Array will be undertaken using a phased approach to allow the lessons learned from each deployment to be applied to the next. It is proposed that the development would be progressed as shown in Table 2.2.

Table 2.2 Proposed project phases

Phase	Number of devices installed	Installed capacity	Total capacity of site	Device footprint	Installation date
Phase 1	Up to five	10 MW	10 MW	Approx. 0.3 km^2	2016 - 2019
Phase 2	Ten	20 MW	30 MW	Approx. 0.8 km^2	2020

The current Scoping Report is a request for Scoping Opinion on Phase 1 for 10 MW (i.e. up to a total of 5 x 2 MW devices). Any pertinent comments relating to Phase 2 would be welcomed within the Scoping Opinion as these will provide valuable input into project design, future planning activities and the NRA process. Consent for Phase 2 will be sought separately following construction of Phase 1. This will be subject to a separate NRA.

2.3 Project components

The project components are summarised in this section, a full description of the components is presented in Section 4 Project Description of the Scoping Report.

2.3.1 Scotrenewables Tidal Technology

The tidal technology proposed for the project is the Scotrenewables Tidal Technology (SRTT), SR2000 2MW device (Figure 2.3). A smaller 250kW (SR250) scale device was testing at EMEC between 2011 and 2013 where it passed verification testing. The first full scale device, the SR2000, is currently being constructed in Scotland and the electrical components will be assembled and tested at the company's new turbine assembly facility based at the Orkney Innovation Centre at Hatston in Kirkwall, Orkney. It is envisaged that this facility will also become the main equipment assembly point for the SRTT turbines for the Lashy Sound Tidal Array.

The SRTT is a floating tidal stream energy convertor designed to extract energy from the tide via two retractable horizontal axis rotors. The main structure of the device comprises a floating cylindrical tube which floats on the sea surface to which the rotors are attached. The two contra-rotating rotors extract the kinetic energy of the tidal flow which is converted into electricity through the power take off system for export to shore.

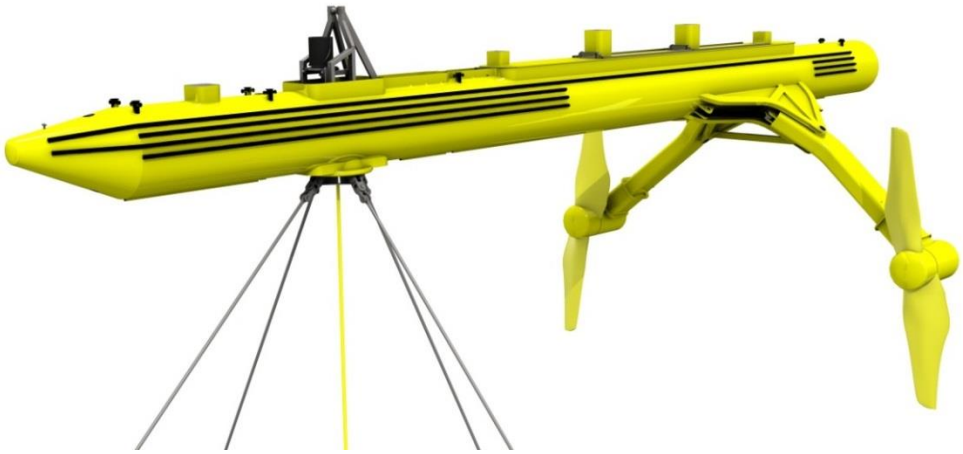

Figure 2.3 Overview of the SR2000 device

It is anticipated that each rotor would have a minimum diameter of 10m and a maximum diameter of 16m and that under normal operating conditions the rotor tips would be 3m below the sea surface. There is the potential that the rotor lengths may be modified slightly to optimise the capture of the tidal resource at the site.

The hydraulically retractable rotor legs give the SRTT two configurations - operational mode with the rotors down to generate power and transport/survivability mode with rotors retracted to decrease draught allowing the system to be towed into harbour or to reduce loads in heavy seas, see Figure 2.4 and Figure 2.5. In extreme storm conditions power generation will cease automatically and the rotor legs will retract into transport/survivability mode. The device can also be manually shifted between these two modes.

The streamlined design of the turbine superstructure and a catenary-type mooring system allows the floating structure to respond to the dynamic tidal and wave environment rather than having to withstand sudden changes in loading – this philosophy of employing compliant structures has been used in the offshore industry for many years.

The contra-rotating rotors each drive separate gearboxes and variable-speed electrical generators within the sub-surface nacelles. The generator power is then transmitted via cable to the hull for power-conditioning through variable speed drives. A transformer then steps up the voltage to 6.6kV for export to shore via a wet-mate electrical connector and subsea cable. The vast majority of equipment including control system, hydraulic power packs, drives, transformers and switchgear are located within the main hull tube which allows for easy access both alongside while in harbour or on site.

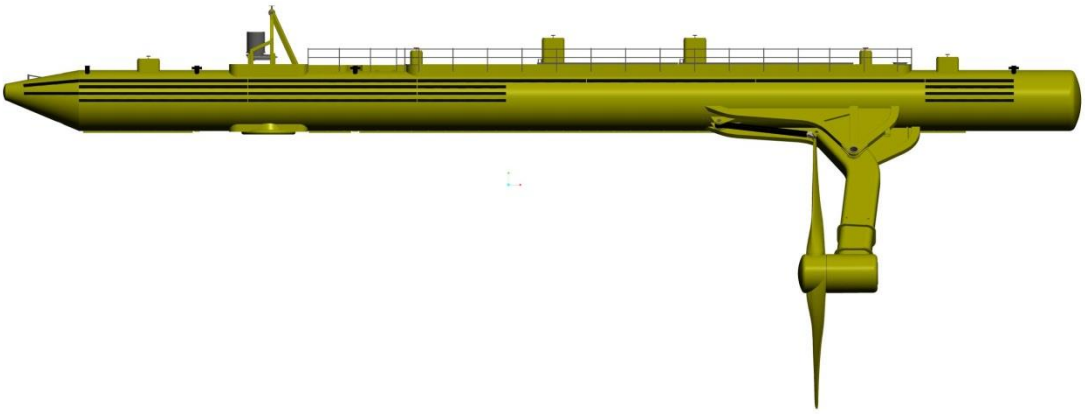

Figure 2.4 SRTT in operational mode

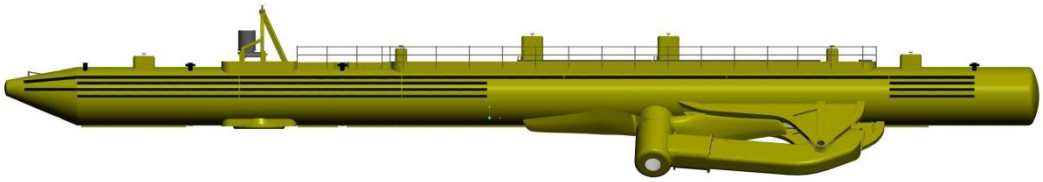

Figure 2.5 SRTT in transport/survival mode

A summary of the device design parameters is provided in Table 2.3.

Table 2.3 SR2000 design parameters

Parameter	SR2000	Unit
Rated power	2000	kW
Rated current speed	3.0 approx.	m/s
Cut-in current speed	1.0	m/s
Shut-down current speed	4.5	m/s
Maximum rotor diameter	16.0	m
Maximum rotor speed	16.0	rpm
Swept area of the rotors	201.0	m^2
Displacement	500.0	Metric tonnes
Hull diameter	3.8 approx.	m
Hull length	64	m
Transport draught	6	m
100 year design wave	12	m
Water depth range	25+	m

2.3.2 Mooring system

The SRTT is connected to the seabed via a catenary mooring system. Each device is connected to the mooring system through a single point mooring turret which contains all the electrical, mechanical and communications connections to the onshore control building. This mooring turret is designed to allow a quick connection and disconnection procedure without the requirement for personnel onboard the SRTT. The turret also allows the SRTT to orientate itself into the tidal stream for efficient energy capture and to respond to dynamic changes in the current and wave conditions rather than having to withstand them as fixed structures do.

The catenary mooring system consists of either two fore and aft lines or a cruciform layout with one line fore and aft and two much shorter lines port and starboard. The mooring lines are likely to be composed primarily of studless chain with some element of synthetic mooring line material at the riser sections.

When the SRTT devices are not at the site there are two options for the mooring turret. The turret will either remain 10m below LAT and be connected to an independently lit pick up buoy (as at the EMEC test site) or the mooring turret will rest close to the seabed and be picked with an ROV when the devices are connected. Further design work and stakeholder consultation will be undertaken to determine the preferred option. Both options will be considered during the EIA process.

The cruciform catenary mooring system is illustrated in Figure 2.6.

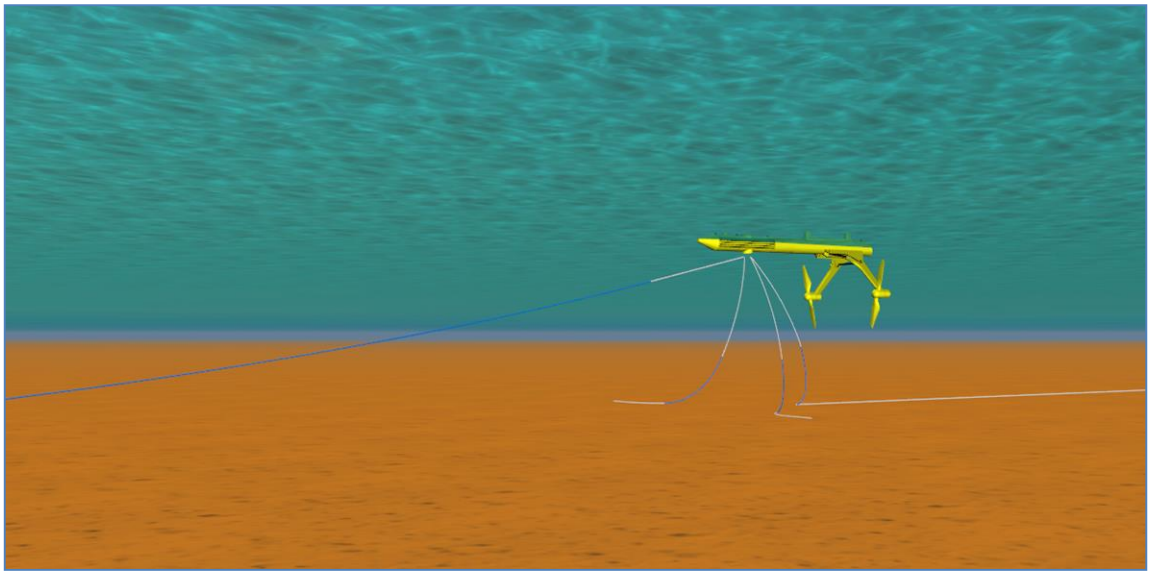

Figure 2.6 Mooring system for SRTT

2.3.3 Anchoring

There are three main options for anchoring the SRTT devices at Lashy Sound, the choice of which will depend on the specific environmental conditions encountered at the site.

Option 1 would be a traditional gravity anchor constructed from poured concrete and deployed using a heavy lift crane barge.

Option 2 would be a self-buoyant floating gravity anchor system in which chambers within the concrete gravity anchor can be flooded with seawater to accurately adjust the ballast of each anchor, allowing for controlled installation at site. The main advantage of this system is that the anchors can be towed to site using a smaller lower cost vessel removing the requirement for a heavy lifting barge.

Option 3 would employ rock-drilled anchors which may be more suitable depending on the seabed conditions at the site.

The mooring and anchoring system will be further refined during testing of the SRTT at the EMEC Fall of Warness site including consideration of the potential environmental effects of each option. Each option will be considered fully in the EIA process for the Lashy Sound Tidal Array

2.3.4 Turbine array configuration

Further resource modelling of the Lashy Sound Agreement for Lease area will be required to inform the turbine array configuration and to produce an optimised layout for energy extraction. The final layout and location of the array will be influenced by the EIA and NRA processes, including local and national stakeholder consultation.

An indicative array configuration for the development is shown in Figure 2.7. This layout utilises common anchor points and is designed to maximise the concentration of devices while providing sufficient clearance for maintenance vessel manoeuvring.

It is expected that the Phase 1 array (up to 10MW) could cover an area of sea approximately 1.0 x 0.3 km equivalent to an area of 0.3 km^2 on the seabed.

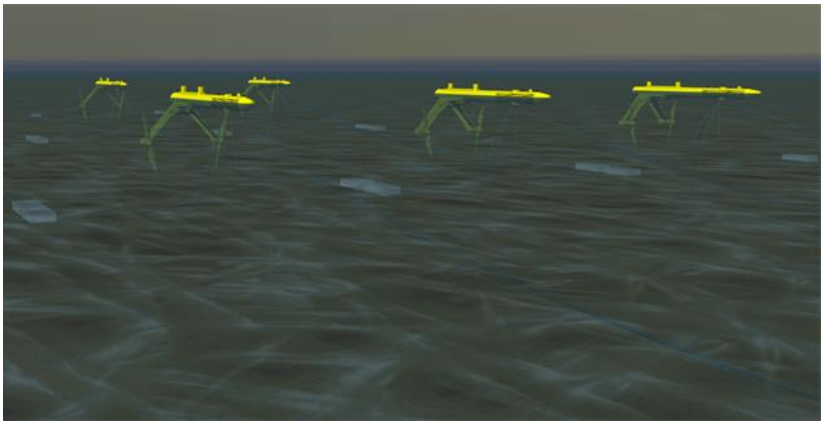

Figure 2.7 Indicative array configuration

2.3.5 Offshore cabling

The offshore cabling requirements will be specified according to the array design and export requirements of the development. The cable routes will be largely dictated by the inter array

cabling requirements, the cable landfall location and final grid export route which are still to be determined. Initial investigation of the seabed at Lashy Sound would suggest that burial of the offshore cable infrastructure may not be possible therefore alternative cable protection methods will be investigated.

As further information becomes available about the likely route of the offshore cabling and the number of cables, protection methods etc. further consultation will be undertaken with statutory and non-statutory consultees to ensure that concerns regarding the cabling of the project are fully understood and can be mitigated where possible through effective project design.

It is likely that the landfall will be within the area hatched in Figure 2.8.

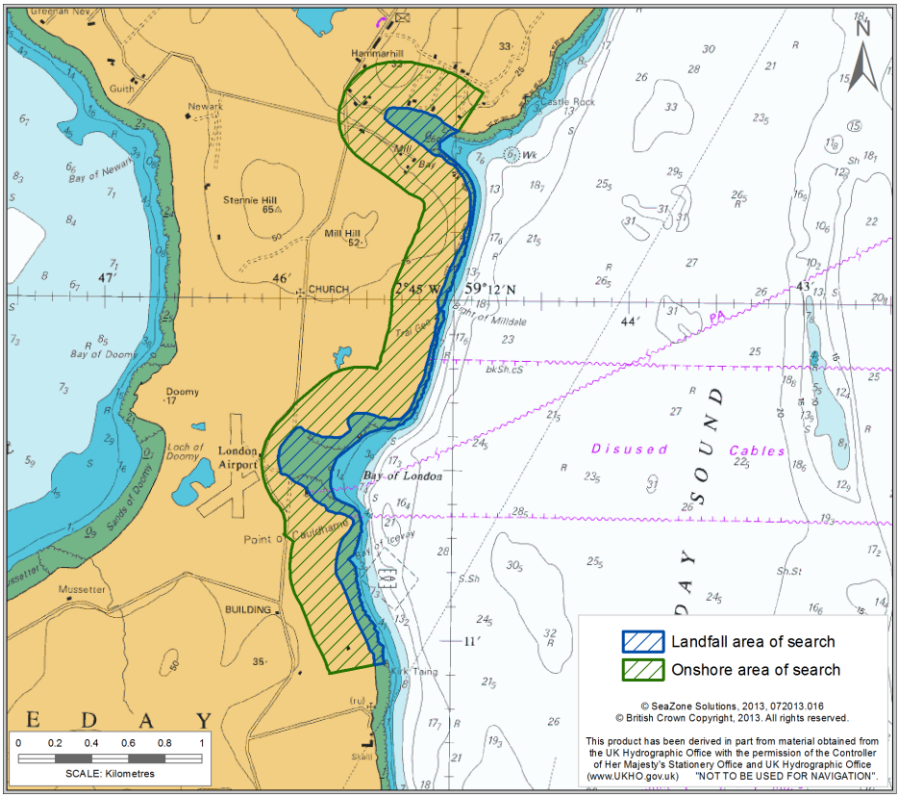

Figure 2.8 Onshore and cable landfall areas of search

Figure 2.8 also shows three existing electric power cables running between Eday and Sanday. Two (running due east-west) are disused. The third running north east from Eday is in use and was surface laid in 1980. These are just to the south of the AfL area.

2.4 Construction, operation and decommissioning activities

2.4.1 Site preparation

The first phase of construction at the site would involve the installation of the mooring system and cabling infrastructure. The final choice of anchoring system will dictate the method of installation. Gravity anchors would likely have to be installed by a heavy lift crane barge while the floating gravity anchors could be towed to site using a small multi-cat vessel. If rock drilled anchors were required a small drilling rig and steel frame system would be used to install these. Details of the options under consideration will be considered during the EIA and included in the ES.

Installation of the electrical cabling infrastructure will also depend on the details of the cabling required, distances involved, methods of protection etc. Again all methods under consideration will be included in the ES.

The planning and design of all marine operations will take into account the potential environmental sensitivities of the site and will be scheduled to avoid disturbance to wildlife where possible while recognising that environmental considerations have to be balanced with the health and safety considerations of working in a high energy tidal environment.

2.4.2 Turbine installation

The SRTT is specifically designed for simplified installation and maintenance due to the restrictions which high tidal velocities put on marine operations. The turbine has been designed to be installed using a small multi-cat workboat vessel eliminating the need for large and potentially expensive vessels such as jack-up barges, anchor handlers and dynamic positioning vessels. The mooring turret system has been developed to simplify the connection/disconnection procedure as far as possible to minimise the time required on site.

Installation of the SRTT devices will therefore involve towing them to site with the multi-cat vessel in transport/survivability mode. Once in position the mooring turret is connected to the turbine using the system perfected at EMEC allowing installation to be undertaken in slack periods of tide. It is anticipated that the connection procedure for each device will take approximately 30 minutes.

2.4.3 Operations and maintenance

The SRTT is designed to DNV offshore standards and has a 20-year design life therefore the operational life-span of the Lashy Sound tidal array is anticipated to be 20 years from commissioning.

The turbines are designed to withstand the extremes of 100 year wave and current loadings with the catenary type mooring system allowing the floating structure to respond to the dynamic wave and tidal environment rather than having to withstand sudden changes in loading. This philosophy of employing compliant structures has been used in the offshore industry for many years. In extreme weather the SRTT retracts its legs into survivability mode which makes the device extremely structurally efficient and dramatically reduces loadings. The control system automatically senses when conditions improve and deploys the rotor legs to begin generating again.

During the operational period of the tidal array, the turbines and ancillary equipment including the cable infrastructure and mooring systems will be inspected on a regular basis and remedial work carried out as necessary. It is anticipated that this work will fall into three categories:

- Periodic overhauls;
- Scheduled maintenance works; and
- Unscheduled maintained and repairs.

The design of the SRTT allows the devices to be serviced and maintained onsite or detached from the mooring turret and towed into harbour for more extensive maintenance. The low draft of the SRTT in 'transport' mode means that a number of local harbour facilities could be utilised for routine maintenance, see 0 Port and maintenance facilities.

2.4.4 Decommissioning

A decommissioning programme for the Lashy Sound Tidal Array will be developed in consultation with DECC as required by Section 1.5 of the Energy Act 2004. The preference for the site is to consider repowering after the initial 20 years lease has elapsed. If however repowering is deemed unfeasible then the site would be decommissioned and returned to its original condition as follows:

- Removal of SRTT turbines: removal of the floating turbines to port facilities with the turbine structures being either reused/recycled or scrapped as appropriate;
- Removal of mooring system: the complete mooring system would be recovered using a suitably sized multi-cat work vessel. It is anticipated that the Option 1 concrete gravity anchors will be re-usable, however the turret, mooring lines and shackles are likely to be sold for scrap;
- Removal of cables: the method of dealing with the removal of cables would depend on how they were installed however it is anticipated that any scour protection and cabling would be removed from the site;
- Post decommissioning seabed monitoring to comply with licence conditions; and
- The electrical infrastructure from the onshore substation building will be removed and the building either offered for sale or dismantled as appropriate.

2.4.5 Port and maintenance facilities

The SRTT is designed with low transport draft and can be easily maintained in any harbour with over 6m depth and a suitable length of quayside. To date Hatston Pier in Kirkwall has been the main base for operations however it may also be possible to use Loth ferry terminal on Sanday for some smaller, non-routine operations. Further consultation with Orkney Island Council Marine Services (Harbours Department) will be undertaken in relation to the project to determine the most suitable berthing facilities.

3 Description of the Marine Environment

3.1 Natural features

3.1.1 Bathymetry and Seabed

Lashy Sound is a narrow tidal channel dividing the Orkney Islands of Eday and Sanday. High resolution bathymetry data for the channel is available from the Maritime and Coastguard Agency (as part of the Civil Hydrography Programme[111]). In the narrow sections to the north of the channel close to Calf Sound the depths range from 20 to 25m, greater depths of over 35m are found further south as the channel widens.

The seabed in the channels of the inner isles, particularly in the Lashy Sound, is swept by the strong tidal current and the sediment layer is generally thin and patchy, comprising shell-gravels, coarse sand or rock debris. The mud content of the sediments is extremely low in these tidal swept areas. There is no significant accretion of sediments occurring in the area.

3.1.2 Wave

The wave climate of the Lashy Sound area is dominated by the passage of low pressure systems from west to east across the North Atlantic. In general the highest waves approach the Orkney Islands from a westerly direction and this is also the direction from which waves occur most frequently. Lashy Sound is very well sheltered from westerly swells and as such experiences the most benign wave climate of any of the commercial tidal test sites in Orkney.

3.1.3 Wind

The monthly average wind speeds at the Kirkwall station are between 10.7 knots in August and 16.8 in January, with a yearly average of 13.6. Wind from the west and south-east is one of the most significant features of the Orkney climate, and gales are frequent, occurring on 29 days in an average year[112].

3.1.4 Tidal range and flows

The Orkney Islands are located close to the boundary between the North Atlantic and the North Sea tidal systems. The incoming North Atlantic tidal wave reaches the islands several hours before the North Sea tidal wave, causing a net flow of water from west to east on the flood tide as a result of which the coastal tidal currents are dynamic and complex.

There is a significant difference in the tidal speeds in the flood and ebb tides at the site. Peak spring speeds of over 4m/s have been measured on the flood tide whereas speeds rarely exceed

[111] Civil Hydrography Programme. Available [online]: http://www.dft.gov.uk/mca/mcga07-home/shipsandcargoes/mcga-shipsregsandguidance/mcga-dqs-hmp-hydrography/the_civil_hydrography_programme.htm Accessed 12/06/14

[112] British Geological Survey and Scott Wilson Resource Consultants. (1997). Chapter 2 Geology and physical environment. In: Coasts and seas of the United Kingdom. Region 2: Orkney, ed. by J.H. Barne, C.F. Robson, S.S. Kaznowska, J.P. Doody, Davidson, N.C., and A.L. Buck, 57-59. Peterborough, Joint Nature Conservation Committee. (Coastal Directories Series).

2m/s on the ebb tide and the impact of eddies which form in the lee of islands can be sudden and extremely variable.

3.1.5 Visibility

Visibility statistics are available for Kirkwall, approximately 15nm to the south, which show an average of 40 days/year with visibility reduced to < 1nm.

3.2 Navigational features

The navigational features of the wider area around Lashy Sound, such as ports and harbours and the existing EMEC test sites for tidal and wave devices are shown in Figure 3.1.

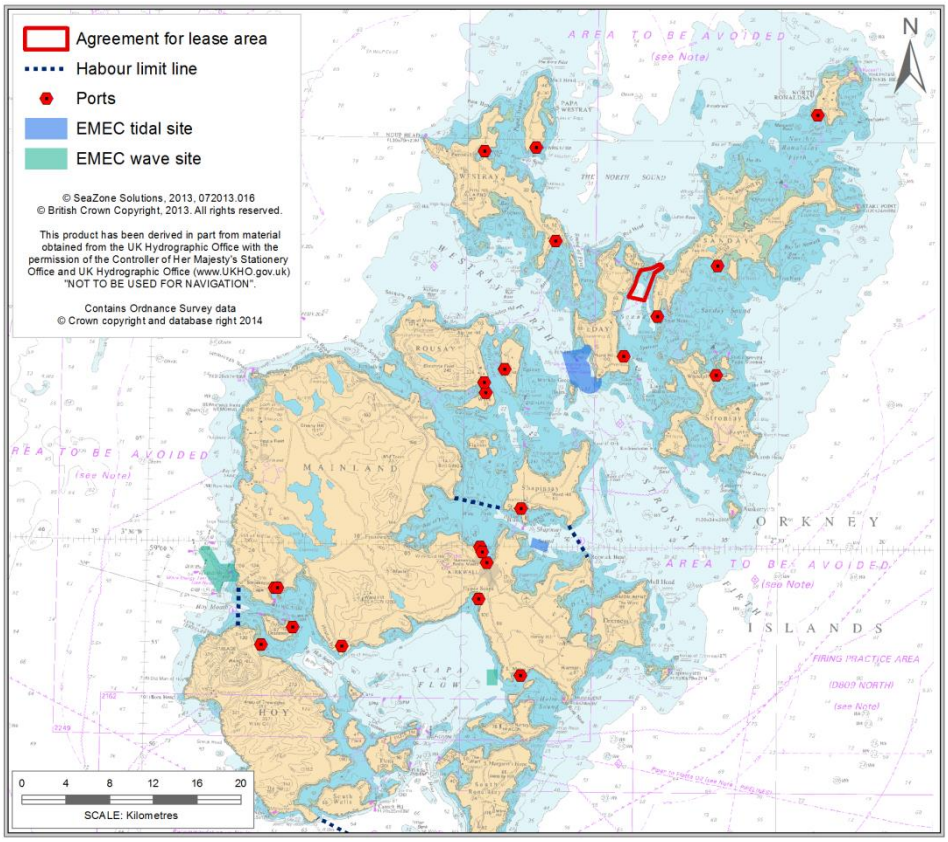

Figure 3.1 Lashy Sound surrounding navigational features

The nearest features are the harbours used by Orkney Ferries, i.e. Loth Harbour in Sanday, Backaland Harbour in Eday, Whitehall Harbour in Stronsay and Rapness Harbour in Westray.

On the west side of Eday lies the EMEC Tidal Test Site.

3.2.1 Navigational routes and services

Routes

Lashy Sound lies within the Orkney 'Area to be Avoided' recognised by the International Maritime Organisation (IMO) and marked on Admiralty charts. This requires all vessels over 5,000 Gross Tonnes (GT) carrying oil or other hazardous cargo to avoid the area designated.

Orkney Ferries operate scheduled services on routes between Kirkwall and Loth Pier on Sanday Backaland Pier on Eday and Whitehall Pier on Stronsay. These routes pass to the south of the AfL area but are subject to change depending on weather conditions (For analysis of ferry traffic refer to Section 4).

In general, vessels transiting from Kirkwall/Hatston to the north east have a choice between using the Westray Firth or Lashy Sound depending on the weather conditions. The majority currently use the Westray Firth.

Services

OIC Marine Services (OICMS) operates a Vessel Traffic Service (VTS) from its HQ at Scapa. This uses six radar sites and provides coverage of traffic through Lashy Sound and within the surrounding area. The VTS tracks vessel positions and also provides a continuous radio watch and broadcasts notices and warnings periodically.

Pilotage

Pilotage is compulsory within the OICMS Harbour Limits for passenger vessels over 65m in length, all vessels with an overall length greater than 80m, all vessels under tow where the combined length of the towing vessel and its tow is over 65m, and all vessels over 300 GRT carrying persistent oils in bulk.

3.2.2 Ports and harbours

The Lashy Sound AfL area lies close to areas under the authority of Orkney Island Council Marine Services (OICMS). OICMS administers 29 Harbour Areas in the Orkney Isles for which it is the Competent Harbour Authority and there are 6 harbours within 5nm of the AfL boundaries: Loth Terminal and Kettletoft Pier on Sanday, Backaland Pier and Terminal on Eday, West Pier and Whitehall Pier and Terminal on Stronsay, and Rapness Pier and Terminal on Westray.

The nearest main ports are Kirkwall Harbour and Hatston Pier approximately 10nm south west of the AfL area.

3.2.3 Existing cables

A 33kV cable connects Eday and Sanday, running just to the south of the AfL area. It can be seen in Figure 2.8. It is 4.3km in length and was surface laid in 1980. Some parts of the cable length may be self-buried.

3.3 Future marine environment

3.3.1 Potential future marine renewable energy developments

Lashy Sound further development

SRTP is currently seeking a Scoping Opinion for Phase 1 i.e. up to 5 SRTT devices and associated infrastructure. Phase 2, for which a separate consent will be sought, will involve the installation and operation of a further 10 SRTT devices.

Other marine renewable energy developments

The Strategic Area Navigation Appraisal (SANAP) report[113] provides a useful overview of traffic in Pentland Firth and Orkney Waters (PFOW). It was commissioned by The Crown Estate as a strategic aid to marine spatial planning in PFOW. It not only reviews vessel traffic and activities in the region but specifically assesses the potential impacts of and on the 12 Areas for Lease issued by The Crown Estate.

Its value for this PHA is in its assessment of vessel activity in Lashy Sound and its assessment of the potential for cumulative and in-combination effects between the potential marine renewable developments for which AfLs have been awarded.

The SANAP report groups together the Westray South and Lashy Sound developments with the existing EMEC tidal energy test site at the Fall of Warness[114]. It notes that a reasonable proportion of the traffic passing between the islands to the north east of Orkney Mainland uses either of the passages of Westray Firth and Lashy Sound. This is influenced by the condition of the tide and prevalent weather. Whilst this will be greatly influenced by the number of surface piercing elements, depth of water and under keel clearance it is possible that the AfL areas in this area may result in a cumulative impact on traffic density.

The SANAP report notes that construction phase traffic, if coincident at two or more sites, might cumulatively affect port traffic levels.

The report notes that whilst the risk of cumulative impact to the safety of navigation is reduced by the separation between the two AFL's, the risk is still present because vessels use the two channels as alternates. Therefore, any impact on navigation by introduction of surface piercing elements (i.e. Lashy Sound) or reduction in under keel clearance (Westray South) would impact across the area.

SANAP notes no cumulative impacts on anchorages, disposal sites, or defence activities. A possible increase (during survey and construction) on demand for emergency response resources is noted.

[113] Anatec Ltd (2014).Pentland Firth and Orkney Waters Enabling Actions Report: Strategic Area Navigational Appraisal (SANAP). The Crown Estate copyright.

[114] Crown Estate (2014). Strategic Area Navigational Appraisal for Pentland Firth and Orkney Waters. Available [online]: http://www.thecrownestate.co.uk/energy-infrastructure/wave-and-tidal/pentland-firth-and-orkney-waters/enabling-actions/projects-and-publications/ (accessed March 2014).

3.3.2 Potential future vessel traffic changes

Orkney has seen a steady increase in the number and size of cruise ships visiting the islands. Over the past 30 years the annual number of visits to Orkney has reached approximately 75. These include extremely large vessels such as *Queen Elizabeth* and *Caribbean Princess* with draughts up to 8.5m. It seems likely that this growth may continue steadily.

Orkney Island Council has a plan for the development of a transhipment hub for container traffic in Scapa Flow. This may be realised in the medium-longer term but its location and approach routes are distant to Lashy Sound.

There is some oil and gas vessel activity routed through Westray Sound to/from the west of Shetland developments. Further development west of Shetland is planned which might result in a modest increase in traffic.

There is occasional discussion within OIC about the feasibility/desirability on inter-island fixed links. One such link could link Eday to Sanday. This would result in considerable changes to ferry routes and vessel traffic in Lashy Sound but is unlikely to proceed in the near term.

4 Baseline Vessel Traffic Analysis

4.1 Methodology and data sources

This PHA Vessel Traffic Analysis is based primarily on data gathered from vessels carrying AIS (Automatic Identification System) equipment. Tracking vessels by AIS is useful but there are limitations. Those vessels required to fit and use AIS are:

- All ships > 300 gross tonnes engaged on international traffic;
- All ships >500 gross tonnes not engaged on international traffic;
- All passenger ships regardless of size;
- All fishing vessels > 24m length by May 2012;
- All fishing vessels > 18m length by May 2013, and;
- All fishing vessels >15m length by May 2014.

Two separate AIS databases are used in this analysis. The Strategic Area Navigation Appraisal (SANAP)[113] provides a useful overview of traffic in PFOW and, in particular, around each of the AFLs areas. The AIS data used for SANAP was gathered over 4 weeks in January/February 2012 and 4 weeks in July 2012. In addition to the SANAP analysis a further 12 months AIS data gathered between December 2012 and November 2013 has been analysed by Aquatera. This is presented in Section 4.2.2.

For observation and monitoring of Scottish fisheries Marine Scotland operates a Vessel Monitoring System (VMS). This is a form of satellite tracking using transmitters onboard fishing vessels. The system is a legal requirement under EC Regulation 2244/2003 and Scottish SI 392/2004. A basic VMS unit consists of a GPS receiver which plots the position of the vessel coupled with a communications device which reports the position at a minimum of every two hours.

The unit automatically sends the following data on a predetermined timescale:

- vessel identification;
- geographical position;
- date/time(UTC) of fixing of position, and;
- course and speed.

All EU, Faroese and Norwegian vessels which exceed 15m overall length must be fitted with VMS units. From 2012, this will change to an overall length of 12m for EU vessels.

Whilst AIS tracking and VMS can provide a good database for vessels >15m they do not provide complete data for smaller fishing vessels or for recreational and sailing vessels where fitting AIS is not mandatory. For the smaller fishing vessels, the main data source is the ScotMap Pilot study of Inshore Fishing Study Pilot[115]. Information on sailing vessels is available (to an extent) from RYA in

[115] Marine Scotland 2012a. 'ScotMap, Draft Report on Fishing Pilot Study in Pentland Firth and Orkney Waters'. Edinburgh: Marine Scotland. Available [online}: http://www.scotland.gov.uk/Resource/0039/00396598.pdf (accessed November 2013)

its UK Coastal Atlas[116] showing sailing routes by density of sailing vessel traffic and from other local yachting organisations.

An analysis of these data is presented in the following sections, considering all traffic density and each of the main vessel categories (commercial, passenger, fishing and recreational). In each case the results from the SANAP analysis is noted first followed by Aquatera's 12-month AIS analysis.

4.2 Overall traffic density

4.2.1 SANAP analysis

SANAP[114] contains 56-day AIS data gathered over 28 days in January/February 2012 and 28 days in July 2012. It tracks vessels passing through an area within 2nm of the Lashy Sound AfL area. (Note that the original AfL area as considered by SANAP was larger than the current area.)

SANAP notes that the average number of vessel tracks was 2 per day. However, this is misleading as the 2nm buffer zone taken around the Lashy Sound AfL area contains a segment of the Sound of Faray (to the west of Eday). This is a route quite separate from Lashy Sound and is used by ferries to Papa Westray and North Ronaldsay.

The SANAP tracking chart also includes the regular ferry traffic into and out of Loth Pier on Sanday. It can be seen that most of this traffic heads south from Loth and does not enter the AfL area. Including such traffic also significantly over-estimates actual traffic through the AfL area.

The SANAP analysis, therefore, overestimates the average number of tracks at 2 per day. However, a few tracks of ferries are recorded as passing through the AfL and an instance of a large cargo ship, *Hildasay* of length 122m and draught 5.5m, destined for Lerwick.

4.2.2 Aquatera 12-month AIS analysis

The more recent 12 month AIS analysis for the area shows the relative traffic densities more accurately. It can be seen in Figure 4.2 that the Lashy Sound AfL averages between 0.05-0.5 AIS tracks per day, much lower than for Westray Firth or through Eday Sound to the south of Loth Pier on Sanday.

In order to obtain more detail of the vessels passing through or close to the Lashy Sound AfL, a zone containing the AfL and the closely surrounding area was defined. All AIS tracks for the 12 month period December 2012-November 2013 were plotted in this zone (Figure 4.3). This analysis focussed on traffic within Lashy Sound and Calf Sound. It does not include any traffic to/from Loth Harbour not heading north to Lashy Sound/Calf Sound. It does include all traffic from Loth Harbour heading into the AfL area.

[116] RYA 2009 Royal Yacht Association. UK Coastal Atlas of Recreational Boating, Recreational Cruising Routes, Sailing and Racing Areas around the UK Coast. 2nd Edition, 2009.

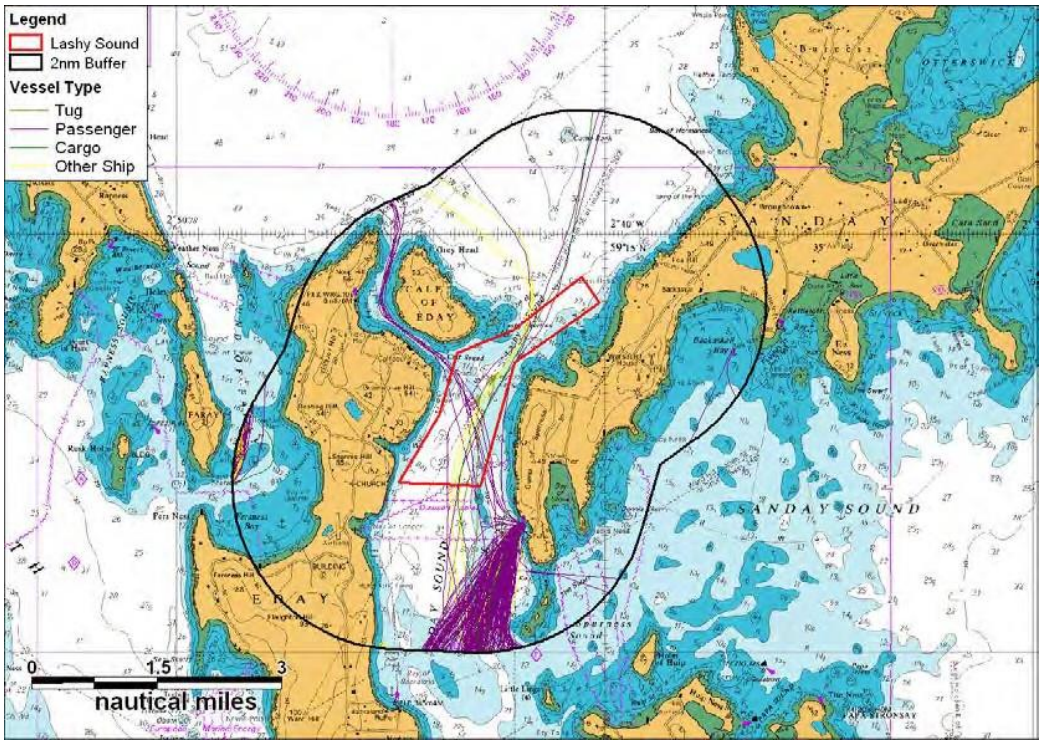

Figure 4.1 SANAP marine traffic survey[113]

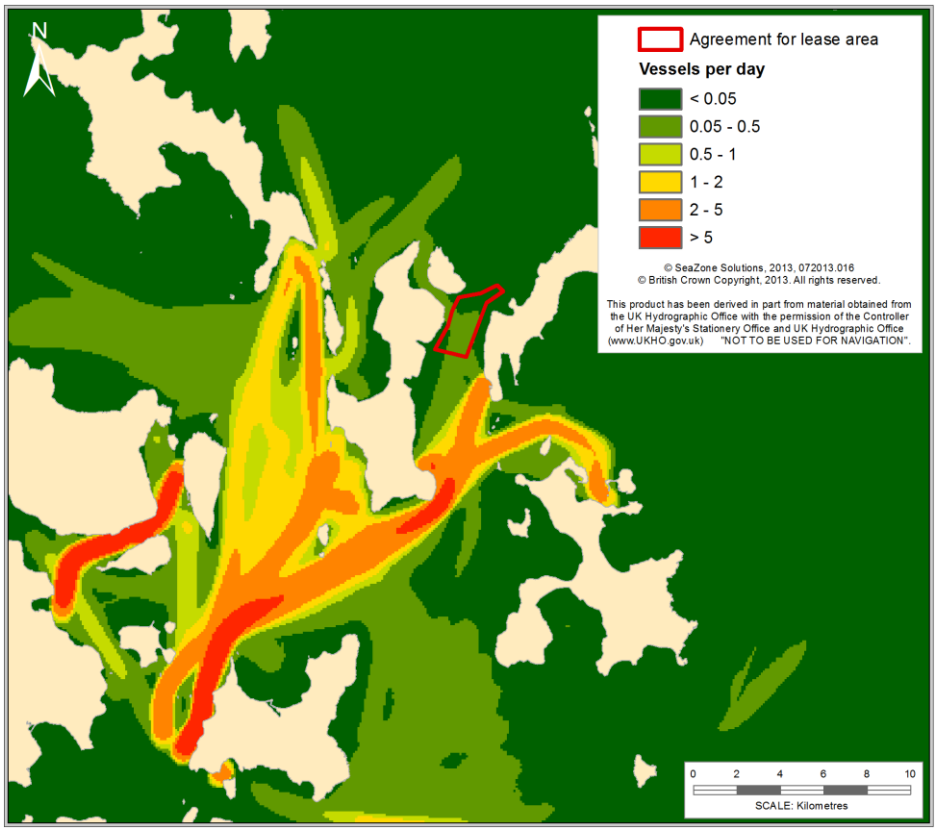

Figure 4.2 Vessel traffic densities for PFOW area and Lashy Sound AfL area

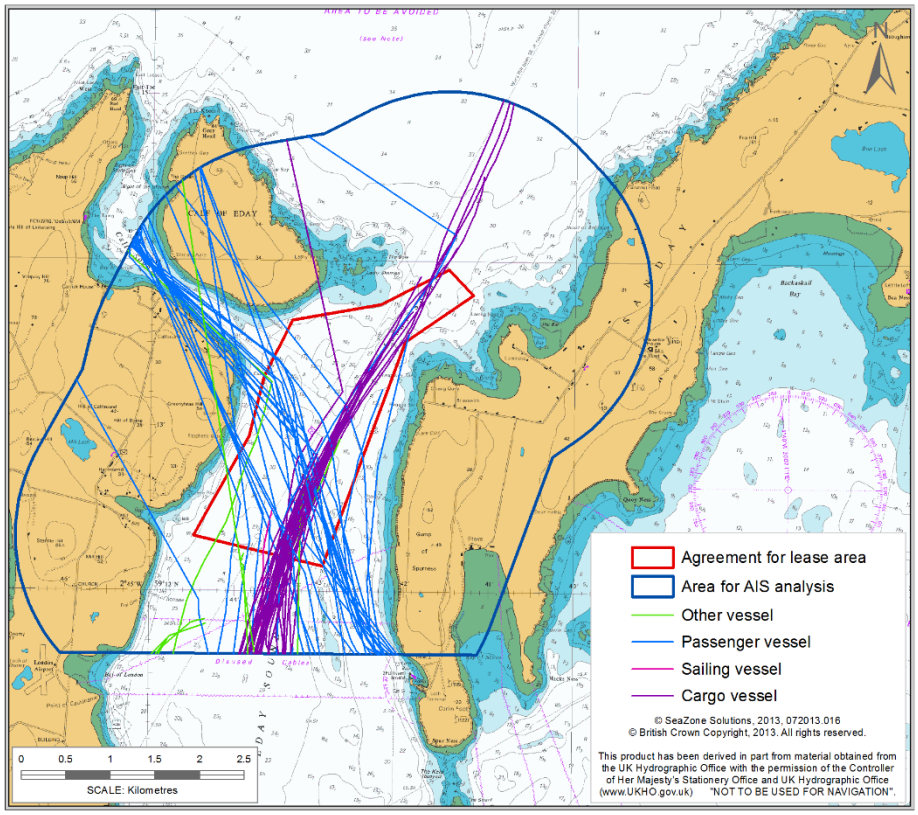

Figure 4.3 Lashy Sound AfL – all vessel AIS tracks. 12 month period

The details of the vessels are provided in Table 4.1.

Table 4.1 Vessels identified by 12-month AIS data set

Ship Name	Draught	Length	Ship type	Total of transits for year
RONJA SKYE	4.0	40	Cargo (fish carrier)	16
VARAGEN	3.0	50	Passenger	8
HELLIAR	5.0	122	Cargo ship (NorthLink)	8
EARL THORFINN	3.2	45	Passenger	6
EARL SIGURD	0.0	45	Passenger	2
BURHOUI	3.0	58	Cargo ship	1
GRIPFISK	5.0	40	Cargo ship (fish carrier)	1
HEBRIDEAN PRINCESS	3.0	72	Passenger	1
JAMES COOK	0.0	21	Vessel: sail	1
JOHN RAE	2.0	23	Pilot boat	1
LODESMAN	0.0	22	Other ship (ROV survey vessel)	1

Ship Name	Draught	Length	Ship type	Total of transits for year
POLE STAR	0.0	51	Other ship (Northern Lighthouse Board)	1
RNLI LIFEBOAT 17-13	0.0	17	SAR vessel	1

The data confirms that few vessels carrying AIS pass through Lashy Sound and Calf Sound. A total of 13 different vessels were observed making a total of 48 transits of the area, equivalent to approximately one vessel transit per week over a one year period.

4.3 Passenger ferry traffic analysis

4.3.1 SANAP data

The SANAP data notes the presence of the Orkney Ferries vessels, *Varagen, Earl Thorfinn* and *Earl Sigurd* and that they were mostly recorded in the south east of the SANAP 2nm buffer zone, i.e. entering and leaving Loth Harbour from the south and therefore not passing through the AfL.

4.3.2 Aquatera 12 month AIS analysis

As shown in Table 4.1 the 12 month AIS survey observed Orkney Ferries vessels *Varagen, Earl Thorfinn* and *Earl Sigurd* making a total of 16 transits through the AfL.

In addition, the passenger ship *Hebridean Princess*, a small cruise ship frequently seen in PFOW made a single transit of the AfL in the 12 month period.

As part of the written response to the Lashy Sound Project Briefing Document, OICMS (Orkney Ferries) had noted that Lashy Sound and Calf Sound were used as bad weather alternatives to the usual routes running south from Loth Harbour. A further consultation meeting was held with Orkney Ferries (April 2014) where senior personnel explained the nature of the bad weather routing (see Section 6.3 below). Essentially, ferries on the Kirkwall-Westray route may use Lashy Sound/Calf Sound to shelter from strong westerly weather. Ferries from Sanday/Eday/Stronsay to Kirkwall may occasionally head north through Calf Sound and then pass southwards down the west side of Eday to shelter from heavy weather from the south east.

In addition, Orkney Ferries noted that in early 2014, during a prolonged period of strong winds from the south east, the NorthLink passenger ferry from Lerwick to Kirkwall (Hatston) had transited Lashy Sound on one occasion. Similarly, NorthLink cargo vessels also use the route for shelter from severe south easterly weather.

4.4 Commercial vessel traffic analysis

4.4.1 SANAP analysis

The SANAP 56 day survey notes that Hildasay transited the area, being a vessel of 122m length and 5.5m draught.

4.4.2 Aquatera 12 month AIS analysis

As shown in Table 4.1a total of 3 cargo vessels, *Burhoui, Gripfisk Helliar* and *Ronja* Skye were observed making a total of 26 transits. *Helliar* (a NorthLink cargo ferry) is the largest vessel recorded at 122m length and 5.5m draught and would be passing between Lerwick and Kirkwall. *Ronja Skye* was the most frequent visitor, on 16 occasions, carrying fish, probably between Shetland and Orkney or the West Coast.

4.5 Fishing vessel traffic analysis

4.5.1 AIS analysis

No fishing vessels carrying AIS were recorded in either data set.

4.5.2 VMS data

Marine Scotland operates a Vessel Monitoring System (VMS) to observe and monitor Scottish fisheries. This is a form of satellite tracking using transmitters onboard fishing vessels. The system records:

- vessel identification;
- geographical position;
- date/time(UTC) of fixing of position, and;
- course and speed of vessel.

All EU, Faroese and Norwegian vessels which exceed 15m overall length must be fitted with VMS units. From 2012, this changed to an overall length of 12m for EU vessels.

The data made available by Marine Scotland does not include the vessel identification or date in order to preserve anonymity.

Data was analysed for the three years 2011, 2012 and 2013 (Figure 4.4, Figure 4.5 and Figure 4.6 respectively).

In 2011, a total of 19 sightings of vessels exceeding 15m overall length are recorded, of which seven show vessel speeds of 0-3 knots, and these are likely to be vessels actually fishing (Figure 4.4). Seven data points show vessel speeds of 3-6 knots and these may be actively fishing. Five data points show speeds > 6 knots and these vessels are likely to be in transit. Of course, it is not possible to determine how many sightings might relate to any individual vessel.

The level of activity is very low compared to other PFOW areas.

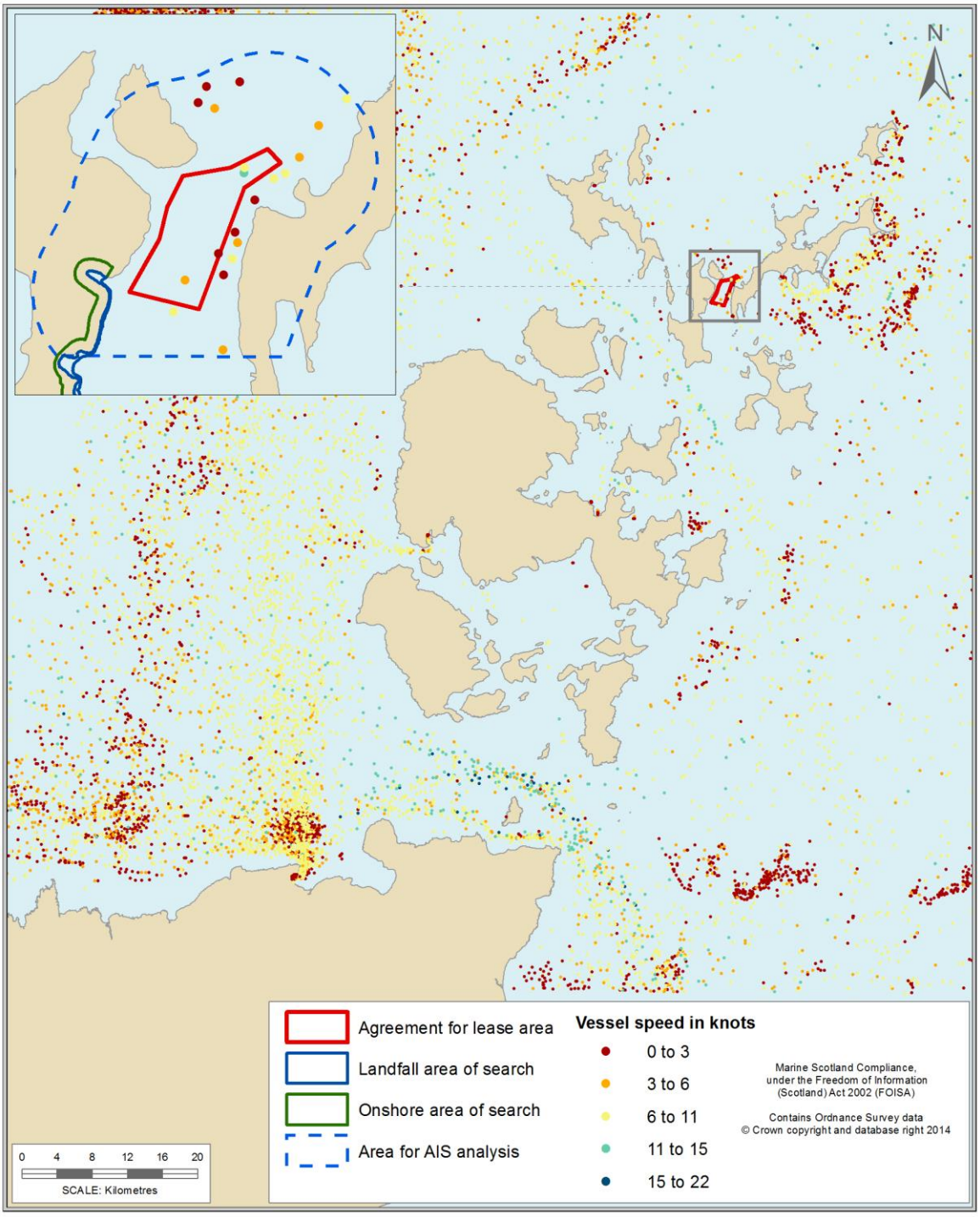

Figure 4.4 VMS data for Lashy Sound/Orkney for 2011

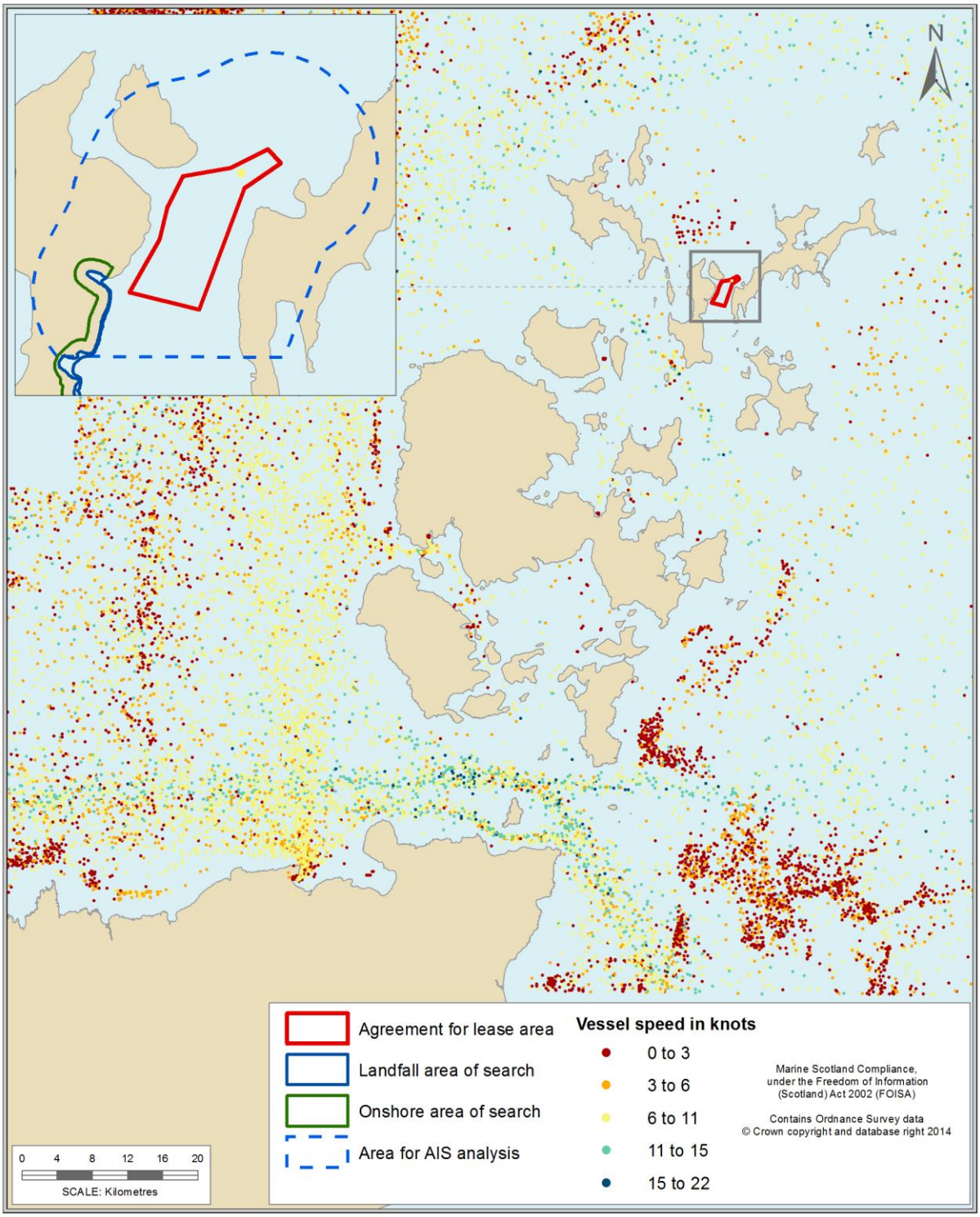

Figure 4.5 VMS data for Lashy Sound/Orkney for 2012

In 2012, the VMS requirement extended to vessels exceeding 12m overall length and just one sighting is recorded for the whole year in Lashy Sound, a vessel moving at 3-6 knots (Figure 4.5).

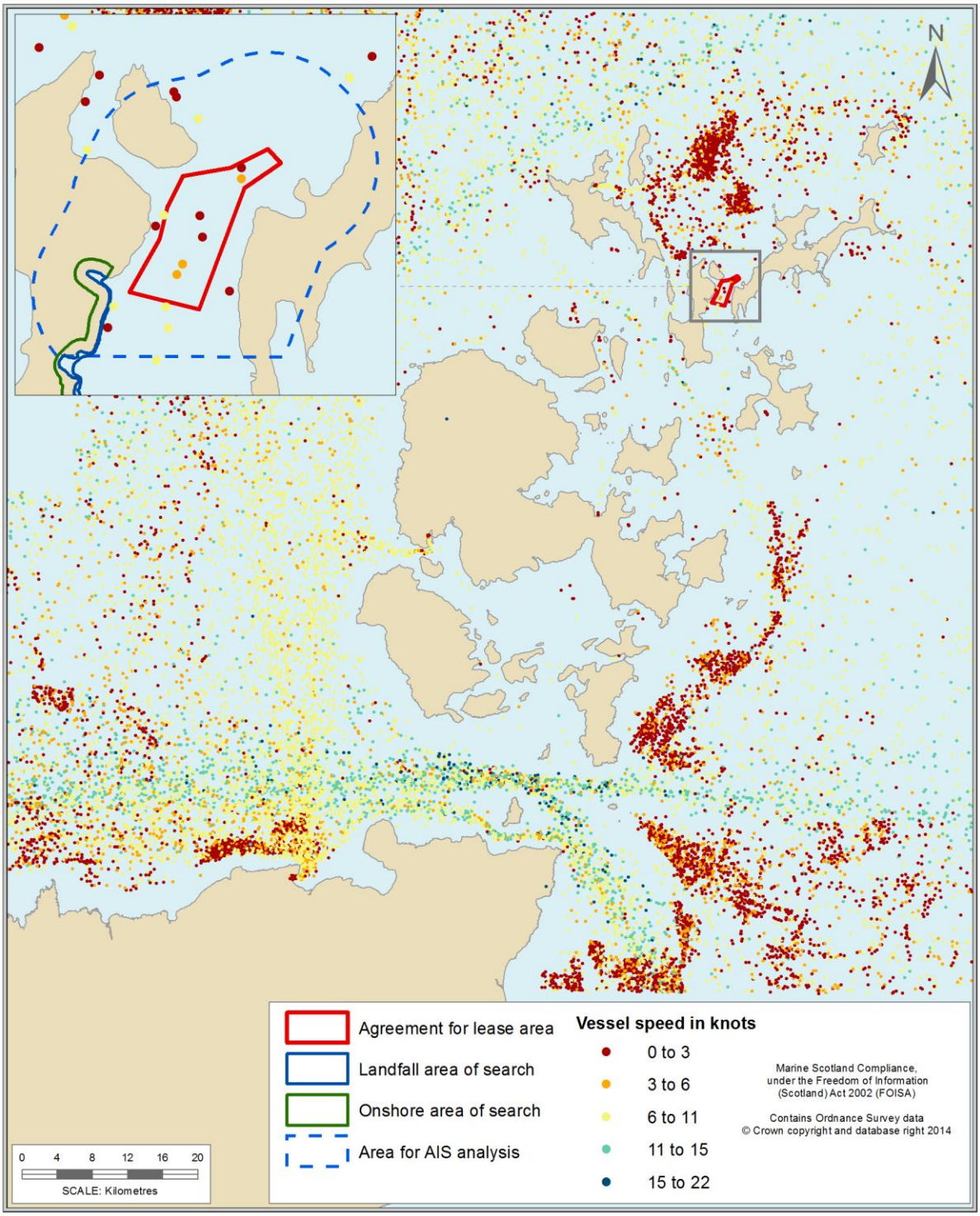

Figure 4.6 VMS data for Lashy Sound/Orkney for 2013

For 2013 there are 16 sightings which include eight where the vessel is probably fishing, three where it may be fishing and five where the vessel is travelling > 6 knots (Figure 4.6).

Again, the level of activity in Lashy Sound is relatively very low compared to PFOW waters.

4.5.3 ScotMap data

Marine Scotland commissioned a study of fishing activity in PFOW (as a pilot for Scottish Territorial Waters) to inform policy making in marine spatial planning. The methodology chosen was to interview locally based fishermen in 2011. This provides information on registered commercial fishing vessels below 15m overall length which are not tracked by AIS and include those below the size limit for VMS.

The data presented in the ScotMap report[115] is anonymised and shows data aggregated for fishing areas or polygons. The data for each of 490 polygons in PFOW includes number and type of vessel/gear and value of landings.

Whilst this does not give information as specific as AIS tracking it does provide a useful view of the intensity of fishing in each area. ScotMap data for the main fishing activity in Lashy Sound are illustrated in Appendix A.

The ScotMap information shows that the study grid square which contains Lashy Sound:

- is within the medium to high category of value of landings in PFOW;
- has between 10-20 fishing vessels under 15m overall length operating; and
- creel fishing may be the main activity.

The importance of the ScotMap data is that it underlines the predominance of small vessel fishing activity, which will not necessarily be tracked by VMS or AIS.

4.5.4 Summary of fishing vessel data

Combining the information from AIS, VMS and ScotMap indicates that:

- No AIS tracks were observed in either data set (vessels >18m);
- VMS records relatively small numbers of sightings of vessels carrying VMS equipment (i.e. >12m in 2013); and
- ScotMap information indicates a relatively high level of activity by value of landings and notes that approximately 10-20 vessels of <15m operate. This is reasonably consistent with the VMS data.

4.6 Recreational vessel traffic analysis

4.6.1 Aquatera 12 month AIS survey data

The 12 month AIS survey noted a single sailing vessel passing through the AfL, the *James Cook,* which is an Ocean Youth Trust North sail training vessel. However, relatively few sailing and recreational vessels carry AIS and information on their movements must be gathered from other sources.

The SANAP 56-day data did not observe any AIS-carrying recreational vessel.

4.6.2 RYA data

The RYA, in conjunction with the Cruising Association, has identified cruising routes around the UK based on extensive consultation with members of both organisations and marina operators. The results are published in 'Sharing the Wind'[117] and GIS layers presented in the UK Coastal Atlas[116].

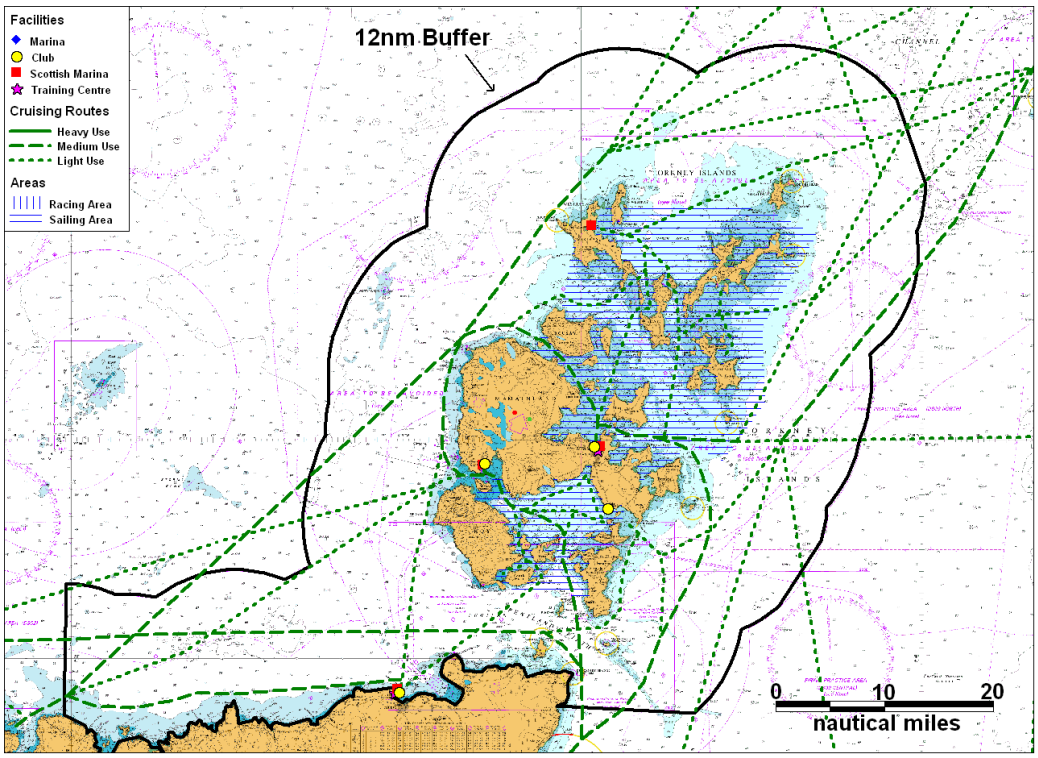

Figure 4.7 RYA Coastal Atlas – routes in PFOW[116]

The RYA Coastal Atlas indicates Lashy Sound and Calf Sound as a 'light use' routes (Figure 4.7). As the RYA notes, the routes shown are indicative only and not precise and traffic is affected by seasonality and weather.

Local guidance on sailing comes from the Orkney Marinas Sailing Guide[118] on sailing 'Kirkwall to Sanday, Stronsay and Eday'. The guide notes that "when sailing from Sanday, Stronsay or Eday to Westray obviously this is better done on the ebb tide, which will carry you through Calf Sound. This is the recommended route and very picturesque. Lashy Sound is best avoided with spring tides running in excess of 9 knots and a very bad roost on the ebb (which runs N) if there is any wind or swell from a N or NW direction".

[117] RYA (2004). Royal Yacht Association 'Sharing the Wind'. 2004

[118] Orkney Marinas (2014). Sailing Guides Available [online]: http://www.orkneymarinas.co.uk/plan-your-trip/local-sailing-guides#.U1kFdK1OXIU (accessed March 2014)

The SANAP Report[113] notes nearby recreational vessel anchorages at Backaland on Eday and in Calf Sound.

4.7 Other vessel types

Other types of vessels not included under registered fishing vessels, passenger ferries, commercial or recreational vessels include marine support vessels, survey vessels and lifeboat services.

4.7.1 Aquatera 12 month AIS analysis

'Other' vessels identified from the AIS analysis were:

- *Lodesman*, an Orkney-based ROV survey vessel;
- *Pole Star,* the Northern Lighthouse board support vessel;
- *John Rae,* OIC Marine Services pilot boat; and
- *RNLI 17-13 Spirit of Orkney* lifeboat based in Kirkwall.

5 Review of Historical Maritime Incidents

5.1 Introduction

It is useful to understand the history of maritime incidents in the area around the proposed development to judge whether it is, in general, a high or low-risk area and to check if there are occurrences or patterns which should be considered when assessing:

- the risks arising from the development; and
- potential future impacts on SAR and emergency response coordination.

5.2 MAIB data

Data has been provided from the Marine Accident Investigation Branch (MAIB)[119]. This was provided as part of MAIB's Freedom of Information service. The Request Number was F0011221 on 17th April 2014.

All UK-registered vessels are required to report accidents to MAIB. Non-UK registered vessels must report incidents occurring within UK territorial waters (which includes the proposed development site). MAIB carried out a search of their database for incidents occurring within 5nm of the proposed development area over the past decade.

Five incidents were logged and are presented in Table 5.1.

Table 5.1 MAIB list of incidents within 10nm of Lashy Sound 2001-2011

Date	Type	Vessel	Latitude	Longitude	Outcome
05/03/2004	Fire/Explosion	UK Trawler 357GRT	59.200N	2.220W	Ship lost. No fatalities/injuries
29/12/2006	Heavy Weather Damage	Gibraltar Container ship 2478GRT	59.092N	2.169W	Minor damage. No fatalities/injuries
11/12/2009	Grounding	UK Scallop dredger 14GRT	59.074N	2.323W	Constructive total loss No fatalities/injuries
03/06/2011	Grounding	Norway Yacht	59.015N	2.350W	No damage or injury
12/2013	Struck wreck	Lady K			No fatalities

The data set from MAIB does not indicate that the area around Lashy Sound is prone to incidents.

[119] MAIB 2014, Marine Accident Investigation Branch Annual Reports. Edinburgh: Marine Scotland. Available [online]: http://www.maib.gov.uk/publications/investigation_reports/reports_by_year.cfm (accessed January 2014)

6 Stakeholder Consultation on Navigation Issues

6.1 Introduction

The Project Briefing Document provided early information about the project to stakeholders so that they could feed into the Scoping process. To ensure that effective consultation is maintained throughout the project a Consultation Strategy is submitted as part of the Scoping process and is presented in Section 12 of the Scoping Report. A register of all communications and comments will be maintained to ensure that actions and comments are incorporated as the project progresses.

6.2 Responses to navigation issues in Project Briefing Document

The list of organisations with a particular interest in navigation that were sent the Project Briefing Document and asked for a response is:

Maritime & Coastguard Agency;
Marine Scotland Science;
Northern Lighthouse Board;
OIC (Planning & Marine Services);
Orkney Fisheries Association;
Orkney Fishermen's Society;
Orkney Sustainable Fisheries;
Scottish Fishermen's Federation;
The Crown Estate;
MOD;
Royal Yachting Association;
British Shipping (Chamber of Shipping);
Association of Salmon Fishery Boards;
Marine Safety Forum;
Canoe Scotland;
Orkney Kayak Club;
Surfers Against Sewage;
Sport Scotland; and
Sea Fish Industry Authority.

A summary of stakeholder responses are presented in

Table 6.1.

Table 6.1 Summary of Stakeholder responses to Project Briefing Document

Stakeholder	Response
RYA	RYA wishes to be involved in NRA to ensure consistency with RYA policy on tidal schemes
RYA	Local boat users quickly gain experience and take appropriate action to deal with new hazards but visitors, especially those from abroad will not have this experience to draw on. This needs to be taken into account when considering siting, marking and lighting.
RYA	The array needs to be sited away from the route normally taken by small craft and the full extent of the danger will need to be marked on the water.
RYA	Recreational craft use Lashy Sound, and those operated by people with local knowledge may choose a route closer to shore.
RYA	Siting of the array will be crucial to avoid an unacceptable risk to navigational safety.
OIC Marine Services	Lashy Sound is an important ferry route to the islands of North Ronaldsay and Papa Westray as this is the only safe route for local ferries under certain conditions of weather and tide. Occasionally the route is also used to access Westray again under certain wind and tide conditions and in some situations such access is via Calf Sound hence entry and exit to Calf Sound should not be impeded. In conditions of strong winds and strong tides, ferries must be able to transit the area, in poor weather, at night and on routes which should not be unduly constrained with regards to planned tracks.
OIC Marine Services	The Sound is also used in extreme weather conditions by the Kirkwall to Lerwick ferry, something which was experienced in the long run of South Easterly gales this winter. On at least one occasion the ferry from Lerwick came west of Sanday in order to avoid conditions down the East side.
OIC Marine Services	The positioning of numerous devices could impede the safe passage of vessels which require sufficient sea room to vary course and sufficient keel clearance in conditions of swell and, north of Lashy Sound, high sea states.
OIC Marine Services	As in Lashy Sound, it cannot be assumed that the ferries can follow a relatively narrow track given that wind and tide conditions will cause ferries to follow a wide range of tracks in order to ensure the safety and comfort of the vessel.
OIC Marine Services	During the construction phase, it should be recorded that movement of ferries across the Sound of Eday to Sanday and Stronsay should not be impeded by devices and/or construction works.
MOD	Responded – no safeguarding concerns
British Shipping (Chamber of Shipping);	Nil return

Stakeholder	Response
BT Radio Network Protection	Responded – no comment
Transport Scotland Ports & Harbours	Responded – no comment
Surfers Against Sewage	Nil return
Scottish Fishermen's Federation	Nil return
The Crown Estate	Responded – no comment
Orkney Fisheries Association	The type of mooring system is the most crucial part of this development in terms of disruption to navigation, fishing, other animals and species. In order for other stakeholders, in particular the fishing industry, to be properly informed and considered throughout the process a much more detailed and firm design choice needs to be evident at this stage.
Orkney Fisheries Association	The mooring system is equal if not or greater design importance in terms of impact and disruption that the elements of the surface device and therefore should be at a completed design point prior to consent starting. It cannot be simply modified as time and conditions dictate.
Orkney Fisheries Association	The large amount of area that will be removed from fishing requires that much clearer and defined plans are prepared for the siting and types of mooring to be used as well as seabed cabling to ensure that others are fairly considered in the process. The subsea structures are of much greater significance in this instance than devices that rely on single fixed piling to the seabed.
Orkney Fisheries Association	The information which is required is: A clearly defined position for the demonstration device, a clear picture of the extent, area, type and construction of the mooring design, the amount of seabed cabling, where it will run and its route to shore, the type of ground over or through which it will go and the full extent of the closure to fishing, navigation and diving.
Orkney Fisheries Association	The design, layout and route of any cabling are of primary importance and the present uncertainty is unacceptable.

Stakeholder	Response
Orkney Fisheries Association	The description does not provide sufficient information in our view for the Regulator to provide a relevant Screening Opinion. The different effects of gravity and piled mooring systems, the routes of cables, whether buried, mattressed or surface laid and the routes and numbers of these cables are of fundamental importance to other users. The mooring structure as inferred by the design drawings will amount to a very large seabed footprint that will in practice eliminate fishing within that zone due to the number of hazardous cables going from the device to the seabed. The nature of the design as proposed will also require an exclusion area in addition to that either imposed by developers or by default through insurance companies.
Orkney Fisheries Association	Given the potential closures and loss of fishing grounds that this development will require OFA envisage that they will object to the development unless agreement can be reached on siting which does not detrimentally affect current fishing activity.
Orkney Fisheries Association	Regarding benthic surveys and disruption to fisheries we would expect at an early stage that like others who have already undertaken work in co-operation with OFA on this matter that Lashy Sound Tidal Array Ltd and or Scotrenewables would like-wise work along with our MOU for co-operation.
Northern Lighthouse Board	Northern Lighthouse Board has no initial objections to the proposed Lashy Sound Tidal Array project as described in the project briefing document dated 3rd October 2013.
Northern Lighthouse Board	We note within the document that a full NRA will be undertaken as part of the EIA and presented in the Environmental Statement. This assessment should be in accordance with the MCA Marine Guidance Notice 371.
Northern Lighthouse Board	We would advise that formal marking and lighting recommendations will be made in response to the Marine Licence application and will be based upon IALA Recommendation O-139, edition two December 2013, following the full NRA.
MCA	The project acknowledges the requirements to conduct a detailed NRA in accordance with the requirements of MGN 371, MCA are therefore content at this stage to consider the proposal going forward, and welcome the opportunity to review the full scoping opinion once presented.
OIC Planning	Orkney Sustainable Fisheries should be on the consultation list as should local aquaculture companies (due to proximity to existing fish farms)
Sport Scotland	The following statement in section 2.2 of the document is confusing and misleading and should be clarified. 'The rotors would be about 3m below the surface of the water. Therefore, the rotors would be 19m below the surface of the water at the tip of their blades.' 3m depth is of particular concern given this is shallow enough to cause a navigational impediment and a potentially significant hazard to some recreational craft.
Sport Scotland	Clearly potential impacts on sport and recreation interests will not just come from the turbines and associated infrastructure themselves but also from the installation, maintenance and decommissioning of such infrastructure. It is

Stakeholder	Response
	crucial to ensure that these impacts are fully considered in addition to the location and operation of the turbines themselves.
Sport Scotland	Consideration should be given to the potential implications of the rotating nature of the turbines and their ability to move with prevailing tide and wave conditions. While anchored in one spot the turbines are not static and the implications of their rotational movement for recreational users need to be assessed.
Sport Scotland	Consideration needs to be given to the final layout and spacing of the array and the area that the array will cover. Will, for example, craft be able to navigate safely through the array or will the array be concentrated to the degree that the whole array will have to be circumnavigated? Will the array be located in the deepest channel of Lashy Sound where it may be more likely to come into contact with sailing boats or can it be located off to a particular side potentially allowing for freer passage of recreational craft?
Sport Scotland	Marking and lighting of arrays and individual turbines will be crucial and detail needs to be provided on this for scoping assessment.
Sport Scotland	We support the proposal for a full marine navigational safety risk assessment to be carried out. It is essential that this assessment considers recreational navigation.
Sport Scotland	Consideration should be given to the impact of the proposal on tidal races/currents which are used by recreational interests as an aid to navigation.
Sport Scotland	In terms of the importance of this stretch of water (and associated land) for sport and recreation it is crucial for you to consult with the relevant Sport Governing Bodies and local sport and recreation interests. In addition it will be important to consult with the Scottish Anglers National Assn, the Ramblers and the Scottish Sub Aqua Club.
Sport Scotland	Recreational interests should be consulted for the physical impact of the development but also for the experiential impact, which will include the impact of the proposal on the land/seascape, and general environment including on birds and marine mammals.
Sport Scotland	In carrying out further consultation it will be important to provide clarity on the nature of works proposed particularly during construction and importantly their duration to properly understand what impacts development may have. Detail on maintenance and decommissioning requirements will also be important.

6.3 Additional consultation - Orkney Island Council Marine Services and Orkney Ferries

A meeting with OICMS, the local Harbour Authority and operator of Orkney Ferries, was held to discuss ferry traffic in the vicinity of the AfL

Valuable input from OICMS explained the nature of ferry traffic in the wider area and in Lashy Sound and Calf Sound:

- In normal weather conditions Orkney Ferries would not usually pass through the AfL;
- Ferries to North Ronaldsay pass either through Westray Firth or to the east of Sanday, even during adverse weather from the west or east;
- Ferries from Kirkwall to Rapness (Westray) normally pass through Westray Firth but during severe weather from the west may choose to route through Lashy Sound/Calf Sound;
- Ferries connecting Sanday, Stronsay and Eday to Kirkwall usually stay south of the AfL. However, in very severe weather with a heavy swell from the south east these ferries may head north through Calf Sound and then southwards to benefit from the shelter of Eday.

Further detailed discussion concerning the adverse weather routes and the size and siting of the proposed development of up to 5 SRTT devices (Phase 1) is planned.

OICMS noted that NorthLink passenger ferries on the Lerwick-Kirkwall route very occasionally transited Lashy Sound and that NorthLink cargo vessels also used the route in severe weather. This had been noted in the AIS traffic analysis but further consultation will be held with NorthLink Ferries.

There was discussion regarding the potential for interference with ferry traffic during construction and maintenance operations. It was agreed that construction and maintenance would normally be scheduled for periods of calm weather when the ferries would have no reason to transit the area.

OICMS noted that the cumulative effects of the EMEC Tidal Test Site, the proposed Westray South development and the proposed Lashy Sound development should be considered together.

7 Preliminary Hazard Analysis

7.1 Overview of vessel risk

The proposed development area in Lashy Sound and the easterly entrance to Calf Sound carries very little vessel traffic relative to much of PFOW, as is shown in Section 4. Over a 12-month AIS survey the Lashy Sound AfL averaged between 0.05-0.5 AIS tracks per day, much lower than for Westray Firth or through Eday Sound to the south of Loth Harbour on Sanday.

No tankers were observed as the area is within an IMO 'Area to be avoided'.

MCA Guidance for mariners operating in the vicinity of OREI's (offshore renewable energy installations) suggests three options:

- Avoid the area completely;
- Navigate around the edge; or,
- Navigate with caution through the array (in the case of a wind farm).

For larger vessels (e.g. those carrying AIS) option 1 is available as alternative route via the Westray Firth or east of Sanday are available and, indeed, are preferred in good weather. However, the cumulative effects of developments at the EMEC Tidal Test Site at the Fall of Warness and that proposed in the Westray Firth should be considered. The route through Lashy Sound/Calf Sound is preferred when shelter from severe westerly or easterly weather is needed. This is particularly important to inter-island ferries.

Complete avoidance of the area of Lashy Sound and Calf Sound is not feasible for inter-island ferries (or smaller local fishing and recreational vessels). Navigation around the edge of the development site containing the array of SRTT devices may however be feasible for these vessels. The area required for a maximum array of 15 SRTT devices is initially estimated to be 1.0km x 0.8km (0.8km^2) and for the initial Phase 1 array of 5 turbines to be 1.0km x 0.3kmm (0.30km^2), however the array is unlikely to be distributed in a uniformly rectangular configuration given the nature if the channel.

These approximate dimensions are based on initial design work only and it should be noted that a number of other potential array configurations are available. Lashy Sound is approximately 1.5km wide at the narrowest point so it should be feasible to fit in an SRTP array and leave adequate room for navigation. Final layout, sizing and location of the development within the AfL area will be determined during the EIA and NRA processes and through consultation with key stakeholders.

The third option of navigating with caution through the array is not recommended as the devices will be free to orientate themselves into the tidal stream and will be spaced as closely together as practicable, so as to minimise the footprint of the array as much as possible.

Small craft, not carrying AIS or recorded by VMS, may include locally-based fishing vessels and some recreational/sailing vessels. The extent of such traffic will be investigated during the NRA through stakeholder consultation. In addition, Project wildlife observers will also record vessel movements observed. A Marine Traffic Survey in accord with MCA guidance will also be carried out.

7.2 Hazard review

Hazards may arise during the installation phase and during the operational phase. It is useful to include decommissioning with installation as the activities are likely to be a reverse of the installation activities. Normal operations include both planned and unplanned inspection and maintenance activities:

- During installation, construction and decommissioning hazards include:
  - Collision between project construction vessel and 3rd party vessel;
  - Collision of 3rd party vessels whilst navigating around the site.

- During normal operations and maintenance hazards include:
  - Collision between project vessel and SRTT device;
  - Collision between 3rd party vessel and SRTT device;
  - Collision between vessels navigating around the development area;
  - Navigational risks arising from vessels navigating around the development area;
  - Snagging of fishing gear on export cable or array mooring/cabling infrastructure
  - SRTT breaking free to become a collision hazard; and
  - Man overboard incident during personnel transfer for maintenance operations at site in strong tidal streams.

7.3 Mitigation measures

A preliminary listing of risk mitigation measures is provided in the following sections which will be further developed during preparation of the full Navigation Risk Assessment (NRA). The responses to the Scoping Report will be taken into account during the development of the NRA. A key objective of the NRA will be to identify all significant navigation risks and develop appropriate risk control/mitigation measures to ensure the risks are reduced to a level of 'As Low as Reasonably Practicable' (ALARP).

7.3.1 Site definition and array layout

The process of selecting the array siting and layout will take into account as far as practicable the minimisation of navigational hazards.

7.3.2 Export cable routing

At present the expected export cable routing is to a landfall location on the east coast of Eday. The cable route will be determined as a result of site survey and stakeholder consultation as part of the EIA process. The detail of how the cable will be installed will be developed during design evolution and considered during the NRA.

It is worth noting the existence of three surface laid cables running between Eday and Sanday just to the south of the AfL. Two are disused (as shown in Figure 2.8). The same mitigation measures as applied for these cables could be applied to the proposed new cable.

7.3.3 Site and device marking and lighting

SRTP will comply with the appropriate marking of the device as recommended by the Northern Lighthouse Board (NLB) and Maritime and Coastguard Agency (MCA) and in compliance with IALA 0139. Currently, the advice from the NLB is to paint the topsides of the device yellow to ensure visibility to other sea users. Each SRTT may be painted an alternative colour below the surface (probably red). The single device will be lit by two yellow lights, synchronised flashing once every three seconds (Fl Y 3s) with a nominal range of three nautical miles and mounted a minimum of three metres above the waterline. Additionally, a radar reflector of such design as to increase the conspicuity of the device to marine radar should be fitted to the device at a similar elevation. The potential use of AIS to mark the presence of the array will be discussed with NLB/MCA.

When the SRTT devices are not at the site there are two options for the mooring turret. The turret will either remain 10m below LAT and be connected to an independently lit pick up buoy (as at the EMEC test site) or the mooring turret will rest close to the seabed and be picked with an ROV when the devices are connected.

Details of the site marking and lighting will be developed further during the development of the NRA with recommendations from NLB and MCA. Statutory sanction from the NLB will be required to display navigation lights.

7.3.4 Marking on charts and notifications

A comprehensive approach to notifying all stakeholders of the presence of the site and of construction and installation activities will be developed. This will include but not necessarily be limited to:

- UK Hydrographic Office marking on charts
- Notification via Kingfisher
- Issuing timely Notice to Mariners for specific activities stating their nature and duration
- Local notification/updating to Orkney Island Council Marine Services VTS system
- Local radio navigation warnings
- Continuing liaison with and notifications to the fishing community
- Continuing liaison with recreational vessel associations and owners

7.3.5 Local liaison with fisheries

Consultation with local fisheries stakeholders will be undertaken as part of the EIA and further design development of export cable routing and installation, array mooring and internal cabling will take into account the results of consultation.

7.3.6 Liaison with recreational and sailing stakeholders

This will be continued during the EIA and through the development of the NRA. This will include further consultation with national and regional organisations concerned with sailing and recreational activities such as sea kayaking.

7.3.7 Device design and testing

The ongoing development of safety systems has been a priority for SRTP since its inception. Incremental development of Health and Safety systems has been undertaken through the testing of the SR250 and will be included as part of the SR2000 testing programmes at EMEC. This includes: fire safety, confined space training, man overboard training, remote gas detection and a full bilge monitoring system.

7.3.8 Device mooring and position monitoring

The integrity of the mooring system will be monitored through the Supervisory Control and Data Acquisition (SCADA) system. Specifically, the tension loadings on the mooring lines are monitored so that, in the event of a line failure, an alarm would be raised.

In addition, each device will be fitted with a GPS monitoring system which will raise an alarm if the device moves outside its normal operating position. On-board CCTV cameras will also be available. Alarms are notified immediately and directly to the SRTP Duty Manager who will organise appropriate intervention.

7.3.9 Application of appropriate Operating Procedures

Through 10 years of incremental development SRTP has gained significant experience of site operations and procedures for all marine operations such as mooring placement, towing procedure, connection and disconnection procedure and manoeuvring while in harbour. All of these procedures have been developed with Health and Safety considerations at the fore. Where necessary additional procedures and risk control measures will be developed and applied.

8 Proposed Methodology for Navigation Risk Assessment

8.1 Guidance

The Navigation Risk Assessment will be carried out following the guidance set out in:

- DECC/MCA 2013. 'Methodology for Assessing the Marine Navigational Safety & Emergency Response Risks of Offshore Renewable Energy Installations (OREI)'; and
- MCA (2008a), Maritime and Coastguard Agency's (MCA) Marine General Notice (MGN 371(M+F)) Offshore Renewable Energy Installations (OREI) - Guidance on UK Navigational Practice, Safety and Emergency Response Issues, 2008.

DECC/MCA requires that the submitted NRA demonstrates that:

- relevant data sources and local information have been assessed;
- proper consultation has been carried out with stakeholders;
- a structured process of risk identification, assessment and management is in place;
- a Hazard Log and Risk Control Register are produced;
- both current 'base case' and predicted 'future case' risk levels have been considered;
- impacts on Search and Rescue and emergency response are considered; and
- sufficient risk controls are in place for the assessed risks to be judged as 'broadly acceptable' or 'tolerable with further actions'.

8.2 Proposed methodology

Importantly, DECC/MCA notes that the scope and depth of the NRA submitted should be proportionate to the scale of the development and the magnitude of risk and that this may usefully be discussed with MCA.

The key elements of the proposed approach are noted in the following sections.

8.2.1 Vessel Traffic Analysis

A thorough understanding of the traffic types (i.e. commercial, fishery and recreational) and their densities will be gained from traffic surveys which include:

- 'Strategic Area Navigational Appraisal for Pentland Firth and Orkney Waters SANAP'(Crown Estate, 2014);
- 'Shipping Study of Pentland Firth and Orkney Waters'. (Marine Scotland, 2012b);
- AIS data collated specifically for the proposed development area and within 24 months of the NRA submission;
- Fisheries activity data, e.g. ScotMap supplied by Marine Scotland (Marine Scotland, 2012a); and
- Local consultation with recreational and fisheries organisations and individuals to determine the vessel traffic for small vessels not fitted with AIS equipment

A robust method for analysing the movements of small fishing vessels of length below the limits for AIS and VMS tracking will be developed. This methodology will combine thorough local consultation to engage with all such vessel operators together with on-site logging of vessel

movements recorded by project wildlife observers during summer 2014. It could also be supplemented by radar surveillance over two periods of 28 days in summer and winter.

8.3 Project description for NRA

The project description will be developed further and will consider the different phases of the development, i.e. installation, operation & maintenance, and decommissioning.

8.3.1 Installation

Details of the installation methodology including:

- Types and numbers of vessels to be used;
- Means of stationing the vessels;
- Likely durations of installation activities;
- Mobilisation from ports;
- Personnel transfer arrangements; and
- Emergency response planning.

8.3.2 Operation and maintenance

Details of the operational phase including:

- Layout of devices and infrastructure within the proposed development area;
- Arrangements for remote monitoring and control;
- Planned intervention strategy and methodologies;
- Estimate of type/number of interventions at site and movements of devices to port;
- Type and number of vessels to be used;
- Proposed routes to support base and home port, and;
- Emergency response planning.

8.3.3 Decommissioning

A decommissioning programme will be developed in consultation with DECC as required by Section 1.5 of the Energy Act 2004. It is likely that the decommissioning method will be a reverse of the installation method:

- Removal of turbines: removal of the floating turbines to port facilities with the turbine structure being recycled or scrapped as appropriate;
- Removal of mooring system: the complete mooring system would be recovered using a suitably sized multi-cat work vessel. It is anticipated that the concrete gravity anchors will be re-usable, however the turret, mooring lines and shackles will be sold for scrap;
- Removal of cables: the method of dealing with the removal of cables would depend on how they were installed however it is anticipated that any scour protection and cabling would be removed from the site; and
- Post decommissioning seabed monitoring to comply with licence conditions.

8.4 Risk assessment

A structured Hazard Identification and Risk Assessment (HIRA) process will be used in accordance with the requirements of the DECC/MCA Guidance[120].

The techniques to be used will be proportionate to the scale of the proposed development and the magnitude of risks and will be discussed with MCA prior to the start of the NRA process.

The NRA methodology will gather quantitative data on the activity of all types of vessel and a vessel traffic analysis will be carried out.

A Formal Safety Assessment is required as part of the NRA but the scope and methodology should be proportionate to the scale of the development and the magnitude of perceived risks. The MCA Guidance invites developers to discuss the methodology of the safety risk assessment before commencing the NRA.

It is suggested (subject to discussion with MCA) that Qualitative Risk Assessment using expert judgement is appropriate for this NRA, given the anticipated low traffic density in the area. The risk assessment will include, but not necessarily be limited to the following risk elements:

- Collision or contact between surface vessels of the different categories (commercial, passenger, fishery, recreational) whilst in transit and the devices and their associated infrastructure;
- Collision between project-related vessels and vessels of all other types in transit (including project-related vessels engaged both at site and engaged in towing the devices to/from the support base);
- Collision (or other navigational risks) involving vessels navigating around the array which have been displaced or concentrated by the presence of the development;
- Entanglement of fishing gear (including creeling) in device mooring/cabling infrastructure including the power export cabling;
- Risks of devices breaking free and presenting a hazard to navigation;
- Risks to vessels in transit from sub-sea infrastructure when the devices are not on site; and
- Future cumulative and in-combination risks arising from potential expansion of the proposed development, or other marine renewable energy projects in the area or predicted changes in vessel traffic in the area.

8.5 Risk control measures

Appropriate risk control measures will be identified to address the hazards identified. These will include:

[120] DECC/MCA (2013). Methodology for Assessing the Marine Navigational Safety & Emergency Response Risks of Offshore Renewable Energy Installations (OREI'.Available [online]: http://www.dft.gov.uk/mca/nra_methodology_2013.pdf (accessed November 2013)

- Marking and lighting of the development in accordance with guidance from International Association of Lighthouse Authorities (Ref IALA 2008) and from consultation with Northern Lighthouse Board;
- A comprehensive approach, both national and local, to informing mariners of all vessel types of the presence and the hazards of the development;
- Liaison with OIC Harbour Authority, local fishermen, recreational vessel associations;
- Consideration of safety/exclusion zones around devices, construction vessels, etc. during the phases of the project;
- Consideration of Search and Rescue (SAR) services and the potential impact of the development on these services. Outline of the developer's own Emergency Response Plan and an Emergency Response Coordination Plan (ERCoP) drawn up in cooperation with the Coastguard and RNLI;
- Outline of the developer's plans for managing risks and safety throughout the life of the development.

8.6 Hazard and Risk Control Log

A structured HIRA process will be applied using guidance from, e.g. DNV, 'Risk Management in Marine and Subsea Operations'[121] and from H&SE, 'Health & Safety Executive Offshore Technology Report on Marine Risk Assessment'[122].

This will include consultation with stakeholders both individually and at a HIRA Workshop for a group discussion of local conditions, risks and risk control measures. A log of identified hazards will be maintained which will include the risk assessment outcomes. These will be presented both in spreadsheet format together with a listing of the risk control measures applied to each hazard.

The outcomes will then be presented on a risk criticality matrix which identifies the tolerability of each risk with the identified control measures applied. Any hazards not controlled to the 'Tolerable' zone will be subject to further, additional control measures to achieve this including, if necessary, project re-design.

8.7 Risk claim

The outcome of this process will be (where this is accurate) a claim to the Regulator, based on reasoned argument and evidence, that the level of navigational risk is tolerable given the application of the proposed controls.

[121] DNV 2003, Risk Management in Marine and Subsea Operations, Report number DNV-RP-H101, Det Norske Veritas, January 2003.

[122] H&SE 2001, 'Health & Safety Executive Offshore Technology Report on Marine Risk Assessment'. Available [online]: http://www.hse.gov.uk/research/otopdf/2001/oto01063.pdf. (accessed November 2013)

9 References

British Geological Survey and Scott Wilson Resource Consultants. (1997). Chapter 2 Geology and physical environment. In: Coasts and seas of the United Kingdom. Region 2: Orkney, ed. by J.H. Barne, C.F. Robson, S.S. Kaznowska, J.P. Doody, Davidson, N.C., and A.L. Buck, 57-59. Peterborough, Joint Nature Conservation Committee. (Coastal Directories Series).

Civil Hydrography Programme. Available [online]: http://www.dft.gov.uk/mca/mcga07-home/shipsandcargoes/mcga-shipsregsandguidance/mcga-dqs-hmp-hydrography/the_civil_hydrography_programme.htm (accessed 12/06/14).

Crown Estate (2014). *Strategic Area Navigational Appraisal for Pentland Firth and Orkney Waters.* Available [online]: http://www.thecrownestate.co.uk/energy-infrastructure/wave-and-tidal/pentland-firth-and-orkney-waters/enabling-actions/projects-and-publications/ (accessed March 2014).

DECC/MCA (2013). *Methodology for Assessing the Marine Navigational Safety & Emergency Response Risks of Offshore Renewable Energy Installations (OREI).* Available [online]: http://www.dft.gov.uk/mca/nra_methodology_2013.pdf (accessed November 2013).

DNV (2003). *Risk Management in Marine and Subsea Operations, Report number DNV-RP-H101,* Det Norske Veritas, January 2003.

H&SE (2001). *Health & Safety Executive Offshore Technology Report on Marine Risk Assessment.* Available [online]: http://www.hse.gov.uk/research/otopdf/2001/oto01063.pdf (accessed November 2013).

IALA (2008). *IALA Recommendation O-139 on the Marking of Man-Made Offshore Structures, Edition 1.* International Association of Marine Aids to Navigation and Lighthouse Authorities, December 2008. Available [online]:

http://www.orga.nl/pdf/IALA%20O-139%20The%20marking%20of%20man-made%20offshore%20structures%20(Dec%2008).pdf (accessed November 2013).

Marine Scotland (2012a). *ScotMap, Draft Report on Fishing Pilot Study in Pentland Firth and Orkney Waters.* Edinburgh: Marine Scotland. Available [online]:

http://www.scotland.gov.uk/Resource/0039/00396598.pdf (accessed November 2013).

Marine Scotland (2012b). *Shipping Study of Pentland Firth and Orkney Waters.* Available [online]: http://www.scotland.gov.uk/Resource/0041/00410623.pdf (accessed November 2013).

MAIB (2014). *Marine Accident Investigation Branch Annual Reports.* Edinburgh: Marine Scotland. Available [online]:

http://www.maib.gov.uk/publications/investigation_reports/reports_by_year.cfm (accessed January 2014).

MCA (2008a). *Maritime and Coastguard Agency's (MCA) Marine General Notice (MGN 371(M+F)) Offshore Renewable Energy Installations (OREI) - Guidance on UK Navigational Practice, Safety and Emergency Response Issues, 2008*. Available [online]:

http://www.dft.gov.uk/mca/mgn_371.pdf **(accessed** November 2013).

MCA (2008b). *Maritime and Coastguard Agency's (MCA) Marine General Notice (MGN 372(M+F)) Offshore Renewable Energy Installations (OREI) - Guidance to mariners operating in the vicinity of UK OREIs, 2008*. Available [online]: http://www.dft.gov.uk/mca/mgn372.pdf (accessed November 2013)

Orkney Marinas (2014). *Orkney Marinas Sailing Guides*. Available [online]:

http://www.orkneymarinas.co.uk/plan-your-trip/local-sailing-guides#.U1kFdK1OXIU (accessed March 2014).

RYA (2004). *Royal Yacht Association 'Sharing the Wind'*. 2004

RYA (2009). *Royal Yacht Association. UK Coastal Atlas of Recreational Boating, Recreational Cruising Routes, Sailing and Racing Areas around the UK Coast.* 2nd Edition, 2009.

UK Hydrographic Office (2011). Cape Wrath to Pentland Firth including The Orkney Islands. Chart 1954.

Appendix C - Habitats Regulations Appraisal (HRA) Screening Report

C.1 Introduction and Regulatory Background

In relation to wildlife and nature conservation, two key Directives have been adopted by the European Community, namely Council Directive 92/43/EEC of 21 May 1992 on the conservation of natural habitats and of wild fauna and flora (the Habitats Directive) and Directive 2009/147/EC of the European Parliament and of the Council of 30 November 2009 on the conservation of wild birds (the Birds Directive; formerly 79/409/EEC).

The Habitats Directive requires Member States to take measures to maintain or restore natural habitats and wild species listed in the Annexes to the Directive at a favourable conservation status and to introduce robust protection for those habitats and species of European importance. There is an obligation to contribute to a coherent European ecological network of protected sites by designating Special Areas of Conservation (SACs) for habitats listed on Annex I and for species listed on Annex II. The Birds Directive gives Member States of the European Union the power and responsibility to classify Special Protection Areas (SPAs) to protect birds which are rare or vulnerable in Europe, as well as all migratory birds which are regular visitors. Together SACs and SPAs make up the Natura 2000 network of sites.

The Habitats and the Birds Directive are transposed into domestic law in Scotland by the 'Conservation (Natural Habitats, &c.) Regulations 1994'; commonly known as the Habitats Regulations. For all onshore elements that may be consented through the Town and Country Planning system these amended Habitats Regulations will apply. Certain provisions of The Conservation of Habitats and Species Regulations 2010, as amended (the "2010 Habitats Regulations") apply to Natura sites in Scotland where they may be affected by activities consented under Section 36 of the Electricity Act 1989.

C.2 Overview of Habitats Regulations Appraisal process

Where a plan or project could affect a Natura site, the Habitats Regulations require the competent authority[123] to consider the provisions of regulation 61. This means that the competent authority has a duty to:

- determine whether the proposal is directly connected with or necessary to site management for conservation; and, if not
- determine whether the proposal is likely to have a significant effect (Likely Significant Effect) on the site either individually or in combination with other plans or projects; and, if so, then

[123] The authority with the power to undertake or grant consent, permission or other authorisation for the plan or project in question. The Local Authority (Orkney Islands Council) is the competent authority for onshore aspects and Marine Scotland for offshore aspects.

- make an appropriate assessment of the implications (of the proposal) for the site in view of that site's conservation objectives

This process is now commonly referred to as Habitats Regulations Appraisal (HRA). HRA applies to any plan or project which has the potential to affect the qualifying features of a Natura site, even when those features may be at some distance from that site. The competent authorities, in this instance Marine Scotland and Orkney Islands Council with advice from SNH, will decide whether an appropriate assessment is necessary and carry it out if so. It is the applicant who is usually required to provide the information to inform the assessment.

This document presents the results of an initial HRA screening process that has been undertaken to identify any Natura 2000 sites that should be considered in relation to HRA for the Project. This screening report is submitted as an Appendix to the request for a Scoping Opinion to seek agreement from the competent authorities that the relevant sites and qualifying interests that should be considered in relation to HRA for the proposed Project have been identified.

There are three possible conclusions for this step in the HRA:

- The likely impacts are such that there is clear potential for the conservation objectives to be undermined – conclude Likely Significant Effect (LSE);
- The likely impacts are so minimal (either because the area affected is not of sufficient value for the qualifying interests concerned or because the risk to them is so small) that the conservation objectives will not be undermined – conclude no LSE, or;
- There is doubt about the scale of the likely impacts in terms of the conservation objectives – conclude LSE.

This screening process was undertaken using Aquatera's 'HRA Screening Tool'.

C.3 HRA screening

Identification of SACs that are relevant to the Project

A 'longlist' of SACs have been identified as being potentially relevant to the proposed Project based on feedback from Marine Scotland and SNH in response to the Project Briefing Document. An initial assessment of the potential effects of the proposals on each of these SACs and the qualifying interests has been carried out and the results of this process are presented in Table C.1. All SACs considered relevant to the Project are shown in Figure C.1. Qualifying interests considered to have no potential for connectivity with the proposed Project have been scoped out.

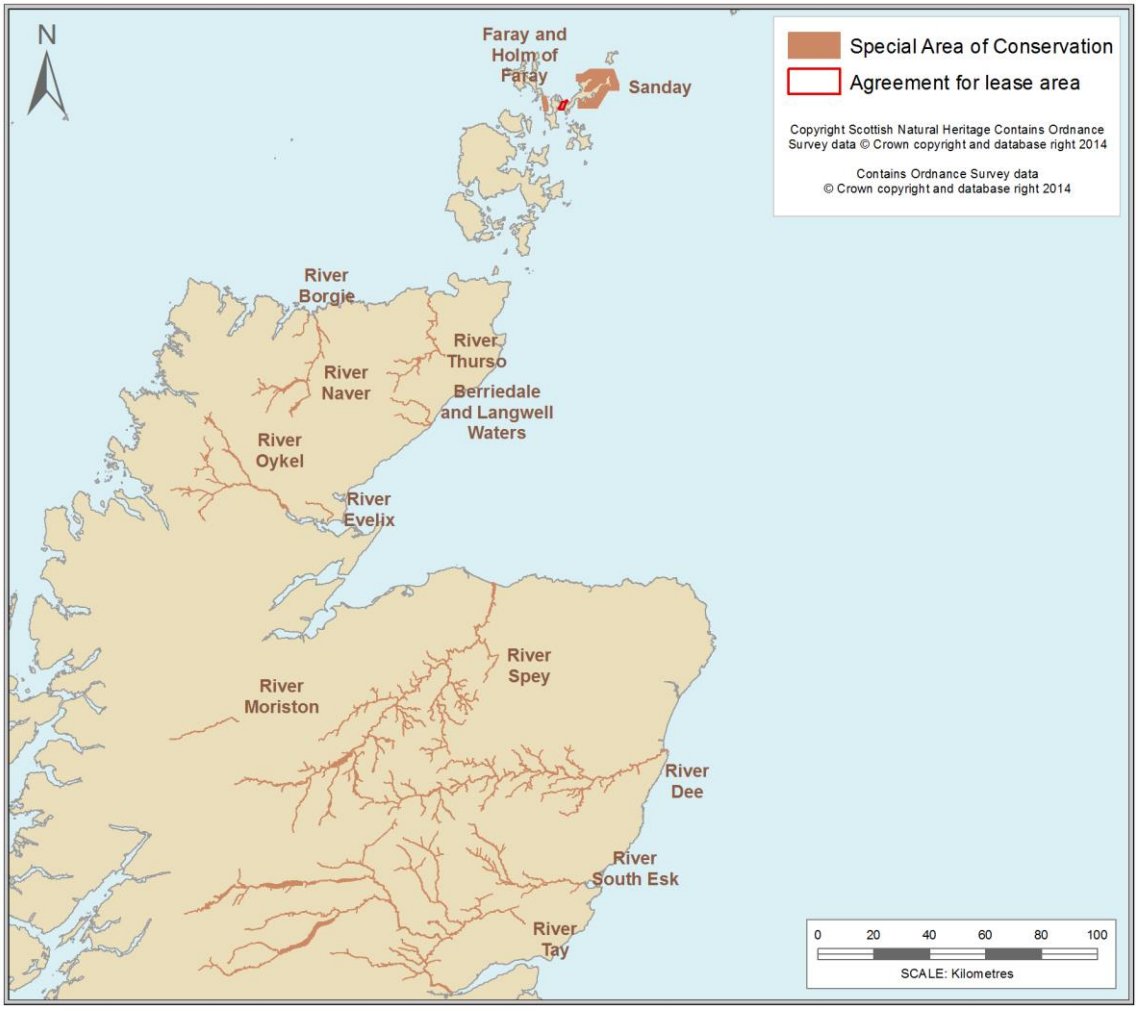

Figure C.1 SACs around Scotland

Table C.1 SACs relevant to HRA for the Project

SAC	Distance from AoS (km)	Qualifying Interest	Screening Conclusion	Comment
Sanday	4	Harbour seal	Potential LSE	It is possible that harbour seals from the SAC may pass through the offshore Area of Search (AoS). There is some uncertainty around the scale of any impacts that may arise from the proposals.
		Reefs	No LSE	No potential for connectivity.
		Subtidal sandbanks	No LSE	No potential for connectivity.
		Intertidal mudflats and sandflats	No LSE	No potential for connectivity.
Faray and Holm of Faray	4	Grey seal	Potential LSE	It is possible that grey seals from the SAC may pass through the offshore AoS. There is some uncertainty around the scale of any impacts that may arise from the proposals.
River Thurso	82	Atlantic salmon	No LSE	It is theoretically possible that Atlantic salmon from this SAC could pass through the offshore AoS. However, given the distance to the site and the availability of other routes between the SAC and the offshore waters utilised by Atlantic salmon, any potential impact from disturbance during migration is likely to be so minimal that the conservation objectives of the site will not be undermined.
River Borgie	115	Atlantic salmon	No LSE	It is theoretically possible that Atlantic salmon from this SAC could pass through the offshore AoS. However, given the distance to the site and the availability of other routes between the SAC and the offshore waters utilised by Atlantic salmon, any potential impact from disturbance during migration is likely to be so minimal that the conservation objectives of the site will not be undermined.

SAC	Distance from AoS (km)	Qualifying Interest	Screening Conclusion	Comment
		Freshwater pearl mussel	No LSE	It is theoretically possible that Atlantic salmon from this SAC could pass through the offshore AoS. However, given the distance to the site and the availability of other routes between the SAC and the offshore waters utilised by Atlantic salmon, any indirect impact on freshwater pearl mussels resulting from potential impacts on Atlantic salmon from disturbance during migration is likely to be so minimal that the conservation objectives of the site will not be undermined.
		Otter	No LSE	No potential for connectivity.
River Naver	115	Atlantic salmon	No LSE	It is theoretically possible that Atlantic salmon from this SAC could pass through the offshore AoS. However, given the distance to the site and the availability of other routes between the SAC and the offshore waters utilised by Atlantic salmon, any potential impact from disturbance during migration is likely to be so minimal that the conservation objectives of the site will not be undermined.
		Freshwater pearl mussel	No LSE	It is theoretically possible that Atlantic salmon from this SAC could pass through the offshore AoS. However, given the distance to the site and the availability of other routes between the SAC and the offshore waters utilised by Atlantic salmon, any indirect impact on freshwater pearl mussels resulting from potential impacts on Atlantic salmon from disturbance during migration is likely to be so minimal that the conservation objectives of the site will not be undermined.
Berriedale and Langwell Waters	117	Atlantic salmon	No LSE	It is theoretically possible that Atlantic salmon from this SAC could pass through the offshore AoS. However, given the distance to the site and the availability of other routes between the SAC and the offshore waters utilised by Atlantic salmon, any potential impact from disturbance during migration is likely to be so minimal that the conservation objectives of the site will not be undermined.

SAC	Distance from AoS (km)	Qualifying Interest	Screening Conclusion	Comment
Moray Firth	132	Bottlenose dolphin	No LSE	No evidence to suggest bottlenose dolphins utilise Orkney waters or as far north as proposed offshore AoS.
		Intertidal sandbanks	No LSE	No potential for connectivity.
River Oykel	165	Atlantic salmon	No LSE	It is theoretically possible that Atlantic salmon from this SAC could pass through the offshore AoS. However, given the distance to the site and the availability of other routes between the SAC and the offshore waters utilised by Atlantic salmon, any potential impact from disturbance during migration is likely to be so minimal that the conservation objectives of the site will not be undermined.
		Freshwater pearl mussel	No LSE	It is theoretically possible that Atlantic salmon from this SAC could pass through the offshore AoS. However, given the distance to the site and the availability of other routes between the SAC and the offshore waters utilised by Atlantic salmon, any indirect impact on freshwater pearl mussels resulting from potential impacts on Atlantic salmon from disturbance during migration is likely to be so minimal that the conservation objectives of the site will not be undermined.
River Evelix	165	Freshwater pearl mussel	No LSE	It is theoretically possible that Atlantic salmon from this SAC could pass through the offshore AoS. However, given the distance to the site and the availability of other routes between the SAC and the offshore waters utilised by Atlantic salmon, any indirect impact on freshwater pearl mussels resulting from potential impacts on Atlantic salmon from disturbance during migration is likely to be so minimal that the conservation objectives of the site will not be undermined.

SAC	Distance from AoS (km)	Qualifying Interest	Screening Conclusion	Comment
River Spey	171	Freshwater pearl mussel	No LSE	It is theoretically possible that Atlantic salmon from this SAC could pass through the offshore AoS. However, given the distance to the site and the availability of other routes between the SAC and the offshore waters utilised by Atlantic salmon, any indirect impact on freshwater pearl mussels resulting from potential impacts on Atlantic salmon from disturbance during migration is likely to be so minimal that the conservation objectives of the site will not be undermined.
		Atlantic salmon	No LSE	It is theoretically possible that Atlantic salmon from this SAC could pass through the offshore AoS. However, given the distance to the site and the availability of other routes between the SAC and the offshore waters utilised by Atlantic salmon, any potential impact from disturbance during migration is likely to be so minimal that the conservation objectives of the site will not be undermined.
		Sea lamprey	No LSE	Very limited potential for connectivity.
		Otter	No LSE	No potential for connectivity.
River Dee	227	Atlantic salmon	No LSE	It is theoretically possible that Atlantic salmon from this SAC could pass through the offshore AoS. However, given the distance to the site and the availability of other routes between the SAC and the offshore waters utilised by Atlantic salmon, any potential impact from disturbance during migration is likely to be so minimal that the conservation objectives of the site will not be undermined.

SAC	Distance from AoS (km)	Qualifying Interest	Screening Conclusion	Comment
		Freshwater pearl mussel	NO LSE	It is theoretically possible that Atlantic salmon from this SAC could pass through the offshore AoS. However, given the distance to the site and the availability of other routes between the SAC and the offshore waters utilised by Atlantic salmon, any indirect impact on freshwater pearl mussels resulting from potential impacts on Atlantic salmon from disturbance during migration is likely to be so minimal that the conservation objectives of the site will not be undermined.
		Otter	No LSE	No potential for connectivity.
River Moriston	247	Atlantic salmon	No LSE	It is theoretically possible that Atlantic salmon from this SAC could pass through the offshore AoS. However, given the distance to the site and the availability of other routes between the SAC and the offshore waters utilised by Atlantic salmon, any potential impact from disturbance during migration is likely to be so minimal that the conservation objectives of the site will not be undermined.
		Freshwater pearl mussel	No LSE	It is theoretically possible that Atlantic salmon from this SAC could pass through the offshore AoS. However, given the distance to the site and the availability of other routes between the SAC and the offshore waters utilised by Atlantic salmon, any indirect impact on freshwater pearl mussels resulting from potential impacts on Atlantic salmon from disturbance during migration is likely to be so minimal that the conservation objectives of the site will not be undermined.
River South Esk	258	Atlantic salmon	No LSE	It is theoretically possible that Atlantic salmon from this SAC could pass through the offshore AoS. However, given the distance to the site and the availability of other routes between the SAC and the offshore waters utilised by Atlantic salmon, any potential impact from disturbance during migration is likely to be so minimal that the conservation objectives of the site will not be undermined.

SAC	Distance from AoS (km)	Qualifying Interest	Screening Conclusion	Comment
		Freshwater pearl mussel	No LSE	It is theoretically possible that Atlantic salmon from this SAC could pass through the offshore AoS. However, given the distance to the site and the availability of other routes between the SAC and the offshore waters utilised by Atlantic salmon, any indirect impact on freshwater pearl mussels resulting from potential impacts on Atlantic salmon from disturbance during migration is likely to be so minimal that the conservation objectives of the site will not be undermined.
River Tay	261	Atlantic salmon	No LSE	It is theoretically possible that Atlantic salmon from this SAC could pass through the offshore AoS. However, given the distance to the site and the availability of other routes between the SAC and the offshore waters utilised by Atlantic salmon, any potential impact from disturbance during migration is likely to be so minimal that the conservation objectives of the site will not be undermined.
		Sea lamprey	No LSE	Very limited potential for connectivity.
		River lamprey	No LSE	No potential for connectivity.
		Brook lamprey	No LSE	No potential for connectivity.
		Otter	No LSE	No potential for connectivity.
		Clear-water lakes or lochs with aquatic vegetation and poor to moderate nutrient level.	No LSE	No potential for connectivity.

Further justifications for the conclusions presented in the HRA Screening table for SACs (Table C.1) are provided in the following sections.

Habitats

There are no onshore or offshore SACs within the Project AoS. The closest SAC with marine habitats listed as qualifying interests is Sanday SAC which is 4km to the east of the offshore AoS. Given the distance from the proposed offshore AoS and the nature of the habitats protected, any predicted hydrographic effects from the tidal array are likely to be very limited in nature and scale and highly unlikely to have any effect on these qualifying interests.

Fish

Atlantic salmon

There are several SACs with Atlantic salmon *Salmo salar* listed as a qualifying interest (Table C.1). A review of migratory routes of Atlantic salmon in Scottish waters has shown that Atlantic salmon return to the Scottish coast from a range of directions and may pass through the Pentland Firth area[124]. It is possible that fish could return directly to the east coast of Scotland travelling between Orkney and Shetland or to the east of Shetland however the lack of recorded salmon fisheries in Orkney or Shetland and the lack of Scottish fish captures in Norwegian fisheries suggest that this would not be common[124].

Although it is theoretically possible that Atlantic salmon returning to any of the Scottish east coast and north coast rivers (Table C.1 and Figure C.1) could pass through the offshore AoS, given the distance to the site and the availability of other routes between the SACs and the offshore waters utilised by Atlantic salmon, it is most likely that only very low numbers of individuals would use this route and therefore any potential impact from disturbance during migration is likely to be so minimal that the conservation objectives of any site would not be undermined. There is very limited potential for connectivity with the offshore AoS therefore Atlantic salmon is not considered relevant to HRA for this Project.

Sea lamprey

Sea lamprey *Petromyzon marinus* is a qualifying interest of River Spey SAC which is 171km to the south of the Agreement for Lease area. The River Spey represents the sea lamprey in the northern part of its range in the UK. It is absent from rivers north of the Great Glen, and the River Spey is virtually at the northern limit for this species. There is very limited potential for connectivity with the offshore AoS therefore sea lamprey is not considered relevant to HRA for this Project.

[124] Malcom, I.A., Godfrey, J., Youngson, A.F. 2010. Review of migratory routes and behaviour of Atlantic salmon, sea trout and European eel in Scotland's coastal environment: implications for the development of marine renewables. Scottish Marine and Fresh Water Science.

Freshwater pearl mussel

Freshwater pearl mussels *Margaritifera margaritifera* would not be directly affected by the proposed Project however as Atlantic salmon and other salmonids are integral to the lifecycle of freshwater pearl mussels, any impacts to Atlantic salmon that prevent them from returning to their natal rivers may have a resulting impact on freshwater pearl mussel populations.

It is theoretically possible that Atlantic salmon returning to any of the Scottish east coast and north coast rivers could pass through the offshore AoS however, given the distance to the site and the availability of other routes between the SAC and the offshore waters utilised by Atlantic salmon, any indirect impact on freshwater pearl mussels resulting from potential impacts on Atlantic salmon from disturbance during migration is likely to be so minimal that the conservation objectives of the sites will not be undermined. It is expected that there would be very limited potential for connectivity with the offshore AoS therefore freshwater pearl mussel is not considered relevant to HRA for this Project.

Seals

Orkney holds important breeding populations of harbour seals *Phoca vitulina* and grey seals *Halichoerus grypus* and there is the potential for either species to be present within the offshore AoS. It is therefore proposed that the following SACs are considered relevant to the Project HRA:

- Sanday SAC for harbour seals; and
- Faray and Holm of Faray SAC for grey seals.

These SACs are shown in Figure C.1.

Otter

Otters *Lutra lutra* are listed as a qualifying interest for a numbers of SACS (Table C.1). However, considering none of these SACs are within close proximity to the project it is highly unlikely that there would be potential for connectivity with the Project and these sites are therefore not considered relevant to the Project HRA.

Cetaceans

Moray Firth SAC, 132km from the Lashy Sound offshore AoS is the only SAC listed for cetaceans in Scotland. This SAC is designated for its population of bottlenose dolphin *Tursiops truncatus*. Despite photo-identification studies, there is little evidence that the Moray Firth bottlenose dolphins use Orkney waters or as far north as Lashy Sound[125]; therefore it is proposed that there

[125] Thompson, P.M., Cheney, B., Ingram, S., Stevick, P., Wilson, B. & Hammond, P.S. (2011). Distribution, abundance and population structure of bottlenose dolphins in Scottish waters. Scottish Natural Heritage Commissioned Research Report No. 354.

is no connectivity with the proposed offshore AoS and the Moray Firth SAC has been scoped out of the Project HRA.

Conclusions

Given these conclusions, two SACs have been identified for consideration in relation to HRA for the Lashy Sound Tidal Array:

- Faray and Holm of Faray SAC; and
- Sanday SAC.

When more detailed information regarding the proposals i.e. installation, operation, maintenance and decommissioning activities becomes available, further advice will be sought to determine whether or not any appropriate assessment is required with regards to these sites.

Identification of SPAs that are relevant to the project

There are no SPAs that could potentially be affected by the onshore components of the project.

The HRA screening process was undertaken for the marine components of the Project using a boundary encompassing the offshore AoS. The offshore AoS which encompasses the whole Agreement for Lease area has been applied as a precautionary measure however the actual development area will be much smaller than the offshore AoS.

Many seabird species forage across very large areas during the breeding season therefore SPAs at considerable distances from the proposed Project site could have potential connectivity for particular qualifying interests.

SPAs with qualifying interests that could potentially be present in the offshore AoS have been identified using mean maximum foraging ranges as recommended by SNH[126] and RSPB[127]. The foraging distances used and their associated references are shown in Table C.4 (see Section C.3 for a full list of sources). This was undertaken using Aquatera's 'HRA Screening Tool'.

SPAs with qualifying interests whose mean maximum foraging ranges overlap with the offshore AoS have been recommended for consideration in the HRA at this stage as there is the potential for connectivity between the SPAs and the Project. As recommended by SNH, an additional buffer of 10% was used to identify any SPAs located just out with any of the mean maximum foraging ranges; and the relevant qualifying interests are also recommended for consideration

[126] Pendlebury, C., Zisman, S., Walls, R., Sweeny, J., McLoughlin, E., Robinson, C., Turner, L. & Loughrey, J. (2011). Literature review to assess bird species connectivity to Special Protection Areas. Scottish Natural Heritage Commissioned Report No. 390.

[127] RSPB (2012). RSPB guidance on the use of bird data in marine planning. Available [online]: http://www.rspb.org.uk/Images/marine_planning_tcm9-338699.pdf (accessed 17/06/14).

in the HRA. This approach produces an extensive list of SPAs considered relevant to the HRA for the Project.

The direct (straight line) distance between the offshore AoS and the closest point of each SPA boundary was determined. There are 29 SPAs with qualifying interests whose foraging ranges overlap with the offshore AoS. The locations of the SPAs relevant to the HRA relative to the offshore AoS are shown in Figure C.2.

The findings of this screening process are presented in Table C.2. Qualifying interests that have been screened in are shaded green in this table and those which are within the 10% buffer are shaded in yellow.

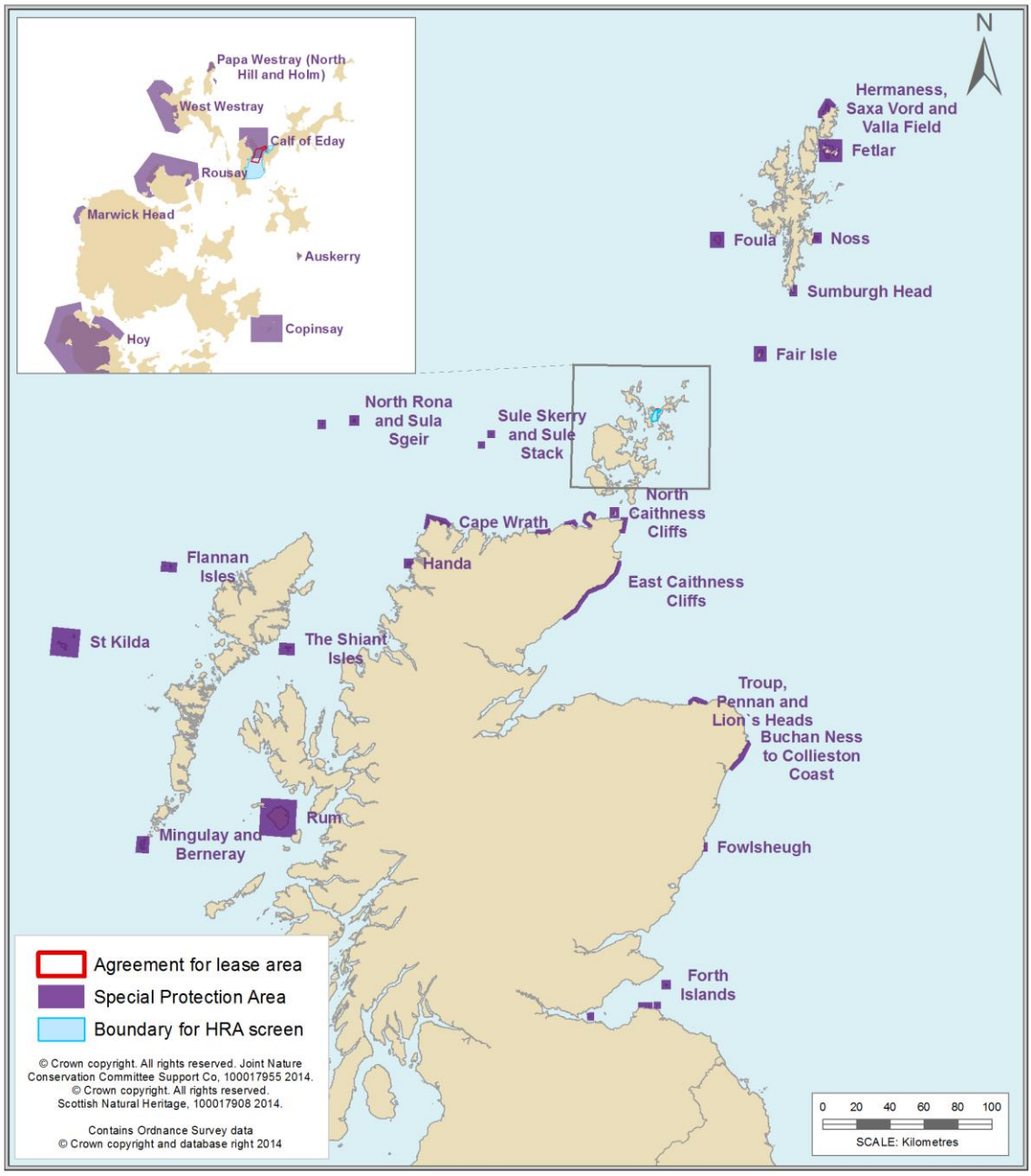

Figure C.2 SPAs around Scotland

Table C.2 SPAs with qualifying interests with mean maximum foraging distances that overlap with the Area of Search

SPA	Direct distance to offshore AfL (km)	Qualifying interest	Mean maximum foraging range (breeding season)[128] (km)	Potential for connectivity with offshore Area of Search?
Calf of Eday	0	Great cormorant	25.0	Yes
		Black-legged kittiwake	60.0	Yes
		Great black-backed gull	61.1	Yes
		Common guillemot	84.2	Yes
		Northern fulmar	400.0	Yes
		Seabird assemblage	NA	Yes
Rousay	9	Arctic tern	24.2	Yes
		Black-legged kittiwake	60.0	Yes
		Arctic skua	62.5	Yes
		Common guillemot	84.2	Yes
		Northern fulmar	400.0	Yes
		Seabird assemblage	NA	Yes
West Westray	14	Arctic tern	24.2	Yes
		Razorbill	48.5	Yes
		Black-legged kittiwake	60.0	Yes
		Arctic skua	62.5	Yes
		Common guillemot	84.2	Yes
		Northern fulmar	400.0	Yes
		Seabird assemblage	NA	Yes
Papa Westray (North Hill and Holm)	15	Arctic tern	24.2	Yes
		Arctic skua	62.5	Yes

[128] See source of foraging ranges in Table C.4 below.

SPA	Direct distance to offshore AfL (km)	Qualifying interest	Mean maximum foraging range (breeding season)[128] (km)	Potential for connectivity with offshore Area of Search?
Auskerry	17	Arctic tern	24.2	Yes
		European storm-petrel	65.0	Yes
Copinsay	28	Black-legged kittiwake	60.0	Yes
		Great black-backed gull	61.1	Yes
		Common guillemot	84.2	Yes
		Northern fulmar	400.0	Yes
		Seabird assemblage	NA	Yes
Marwick Head	34	Black-legged kittiwake	60.0	Yes
		Common guillemot	84.2	Yes
		Seabird assemblage	NA	Yes
Hoy	52	Peregrine falcon	NA	Terrestrial species screened out
		Red-throated diver	9.0	No
		Black-legged kittiwake	60.0	Yes
		Great black-backed gull	61.1	Yes
		Arctic skua	62.5	Yes
		Common guillemot	84.2	Yes
		Great skua	86.4	Yes
		Atlantic puffin	105.4	Yes
		Northern fulmar	400.0	Yes
		Seabird assemblage	NA	Yes
North Caithness Cliffs	55	Peregrine falcon	NA	Terrestrial species screened out
		Razorbill	48.5	No
		Black-legged kittiwake	60.0	Yes
		Common guillemot	84.2	Yes
		Atlantic puffin	105.4	Yes
		Northern fulmar	400.0	Yes
		Seabird assemblage	NA	Yes

SPA	Direct distance to offshore AfL (km)	Qualifying interest	Mean maximum foraging range (breeding season)[128] (km)	Potential for connectivity with offshore Area of Search?
Fair Isle	62	Fair Isle wren	NA	Terrestrial species screened out
		European shag	14.5	No
		Arctic tern	24.2	No
		Razorbill	48.5	No
		Black-legged kittiwake	60.0	Yes (within 10% buffer)
		Arctic skua	62.5	Yes
		Common guillemot	84.2	Yes
		Great skua	86.4	Yes
		Atlantic puffin	105.4	Yes
		Northern gannet	229.4	Yes
		Northern fulmar	400.0	Yes
		Seabird assemblage	NA	Yes
East Caithness Cliffs	85	Peregrine falcon	NA	Terrestrial species screened out
		European shag	14.5	No
		Great cormorant	25.0	No
		Razorbill	48.5	No
		Black-legged kittiwake	60.0	No
		Great black-backed gull	61.1	No
		Herring gull	61.1	No
		Common guillemot	84.2	Yes
		Atlantic puffin	105.4	Yes
		Northern fulmar	400.0	Yes
		Seabird assemblage	NA	Yes
Sule Skerry and Sule Stack	92	European shag	14.5	No
		European storm-petrel	65.0	No
		Common guillemot	84.2	Yes (within 10% buffer)
		Leach's storm-petrel	91.7	Yes

SPA	Direct distance to offshore AfL (km)	Qualifying interest	Mean maximum foraging range (breeding season)[128] (km)	Potential for connectivity with offshore Area of Search?
		Atlantic puffin	105.4	Yes
		Northern gannet	229.4	Yes
		Seabird assemblage	NA	Yes
Foula	100	Red-throated diver	9.0	No
		European shag	14.5	No
		Arctic tern	24.2	No
		Razorbill	48.5	No
		Black-legged kittiwake	60.0	No
		Arctic skua	62.5	No
		Common guillemot	84.2	No
		Great skua	86.4	No
		Leach's storm-petrel	91.7	Yes (within 10% buffer)
		Atlantic puffin	105.4	Yes
		Northern fulmar	400.0	Yes
		Seabird assemblage	NA	Yes
Sumburgh Head	101	Arctic tern	24.2	No
		Black-legged kittiwake	60.0	No
		Common guillemot	84.2	No
		Northern fulmar	400.0	Yes
		Seabird assemblage	NA	Yes
Noss	133	Black-legged kittiwake	60.0	No
		Common guillemot	84.2	No
		Great skua	86.4	No
		Atlantic puffin	105.4	No
		Northern gannet	229.4	Yes
		Northern fulmar	400.0	Yes
		Seabird assemblage	NA	Yes

SPA	Direct distance to offshore AfL (km)	Qualifying interest	Mean maximum foraging range (breeding season)[128] (km)	Potential for connectivity with offshore Area of Search?
Cape Wrath	136	Razorbill	48.5	No
		Black-legged kittiwake	60.0	No
		Common guillemot	84.2	No
		Atlantic puffin	105.4	No
		Northern fulmar	400.0	Yes
		Seabird assemblage	NA	Yes
Troup, Pennan and Lion's Head	164	Razorbill	48.5	No
		Black-legged kittiwake	60.0	No
		Herring gull	61.1	No
		Common guillemot	84.2	No
		Northern fulmar	400.0	Yes
		Seabird assemblage	NA	Yes
Handa	169	Razorbill	48.5	No
		Black-legged kittiwake	60.0	No
		Common guillemot	84.2	No
		Great skua	86.4	No
		Northern fulmar	400.0	Yes
		Seabird assemblage	NA	Yes
North Rona and Sula Sgeir	172	Razorbill	48.5	No
		Black-legged kittiwake	60.0	No
		Great black-backed gull	61.1	No
		European storm-petrel	65.0	No
		Common guillemot	84.2	No
		Leach's storm-petrel	91.7	No
		Atlantic puffin	105.4	No
		Northern gannet	229.4	Yes
		Northern fulmar	400.0	Yes

SPA	Direct distance to offshore AfL (km)	Qualifying interest	Mean maximum foraging range (breeding season)[128] (km)	Potential for connectivity with offshore Area of Search?
		Seabird assemblage	NA	Yes
Fetlar	181	Dunlin	NA	Terrestrial species screened out
		Whimbrel	NA	Terrestrial species screened out
		Red-necked phalarope	20.0	No
		Arctic tern	24.2	No
		Arctic skua	62.5	No
		Great skua	86.4	No
		Northern fulmar	400.0	Yes
		Seabird assemblage	NA	Yes
Buchan Ness to Collieston Coast	195	European shag	14.5	No
		Black-legged kittiwake	60.0	No
		Herring gull	61.1	No
		Common guillemot	84.2	No
		Northern fulmar	400.0	Yes
		Seabird assemblage	NA	Yes
Hermaness, Saxa Vord and Valla Field	197	Red-throated diver	9.0	No
		European shag	14.5	No
		Black-legged kittiwake	60.0	No
		Common guillemot	84.2	No
		Great skua	86.4	No
		Atlantic puffin	105.4	No
		Northern gannet	229.4	Yes
		Northern fulmar	400.0	Yes
		Seabird assemblage	NA	Yes
The Shiant Isles	253	Barnacle goose	NA	Waterfowl species screened out
		European shag	14.5	No
		Razorbill	48.5	No

SPA	Direct distance to offshore AfL (km)	Qualifying interest	Mean maximum foraging range (breeding season)[128] (km)	Potential for connectivity with offshore Area of Search?
		Black-legged kittiwake	60.0	No
		Common guillemot	84.2	No
		Atlantic puffin	105.4	No
		Northern fulmar	400.0	Yes
		Seabird assemblage	NA	Yes
Fowlsheugh	261	Razorbill	48.5	No
		Black-legged kittiwake	60.0	No
		Herring gull	61.1	No
		Common guillemot	84.2	No
		Northern fulmar	400.0	Yes
		Seabird assemblage	NA	Yes
Flannan Isles	294	Razorbill	48.5	No
		Black-legged kittiwake	60.0	No
		Common guillemot	84.2	No
		Leach's storm-petrel	91.7	No
		Atlantic puffin	105.4	No
		Northern fulmar	400.0	Yes
		Seabird assemblage	NA	Yes
Forth Islands	344	Common tern	11.2	No
		European shag	14.5	No
		Roseate tern	16.6	No
		Arctic tern	24.2	No
		Great cormorant	25.0	No
		Razorbill	48.5	No
		Sandwich tern	49.0	No
		Black-legged kittiwake	60.0	No
		Herring gull	61.1	No

SPA	Direct distance to offshore AfL (km)	Qualifying interest	Mean maximum foraging range (breeding season)[128] (km)	Potential for connectivity with offshore Area of Search?
		Common guillemot	84.2	No
		Atlantic puffin	105.4	No
		Lesser black-backed gull	141.0	No
		Northern gannet	229.4	No
		Northern fulmar	400.0	Yes
		Seabird assemblage	NA	Yes
Rum	355	Golden eagle	NA	Terrestrial species screened out
		Red-throated diver	9.0	No
		Black-legged kittiwake	60.0	No
		Common guillemot	84.2	No
		Manx shearwater	330.0	Yes (within 10% buffer)
		Seabird assemblage	NA	Yes
St Kilda	361	Razorbill	48.5	No
		Black-legged kittiwake	60.0	No
		European storm-petrel	65.0	No
		Common guillemot	84.2	No
		Great skua	86.4	No
		Leach's storm-petrel	91.7	No
		Atlantic puffin	105.4	No
		Northern gannet	229.4	No
		Manx shearwater	330.0	Yes (within 10% buffer)
		Northern fulmar	400.0	Yes
		Seabird assemblage	NA	Yes
Mingulay and Berneray	395	European shag	14.5	No
		Razorbill	48.5	No
		Black-legged kittiwake	60.0	No
		Common guillemot	84.2	No

SPA	Direct distance to offshore AfL (km)	Qualifying interest	Mean maximum foraging range (breeding season)[128] (km)	Potential for connectivity with offshore Area of Search?
		Atlantic puffin	105.4	No
		Northern fulmar	400.0	Yes
		Seabird assemblage	NA	Yes

Twenty-nine SPAs and 14 individual qualifying interests are considered relevant to the HRA due to an overlap in species' mean maximum foraging ranges with the offshore AoS (Table C.2). For each of these 14 qualifying interests there is the potential for connectivity between the offshore AoS and one or more SPAs. Table C.3 lists each of the 14 qualifying interests along with the relevant SPAs for which there is potential for 'connectivity'.

Table C.3 Summary of qualifying interests with potential for connectivity

Qualifying interests	Relevant SPAs	Potential connectivity with offshore Area of Search?
Great cormorant	Calf of Eday	Yes
Black-legged kittiwake	Calf of Eday	Yes
	Rousay	Yes
	West Westray	Yes
	Copinsay	Yes
	Marwick Head	Yes
	Hoy	Yes
	North Caithness Cliffs	Yes
	Fair Isle	Yes (within 10% buffer)
Great black-backed gull	Calf of Eday	Yes
	Copinsay	Yes
	Hoy	Yes
Common guillemot	Calf of Eday	Yes
	Rousay	Yes
	West Westray	Yes
	Copinsay	Yes
	Marwick Head	Yes
	Hoy	Yes
	North Caithness Cliffs	Yes
	Fair Isle	Yes
	East Caithness Cliffs	Yes
	Sule Skerry and Sule Stack	Yes (within 10% buffer)
Northern fulmar	Calf of Eday	Yes
	Rousay	Yes
	West Westray	Yes
	Copinsay	Yes
	Hoy	Yes
	North Caithness Cliffs	Yes
	Fair Isle	Yes
	East Caithness Cliffs	Yes
	Foula	Yes
	Sumburgh Head	Yes
	Noss	Yes
	Cape Wrath	Yes

Qualifying interests	Relevant SPAs	Potential connectivity with offshore Area of Search?
	Troup, Pennan and Lion's Head	Yes
	Handa	Yes
	North Rona and Sula Sgeir	Yes
	Fetlar	Yes
	Buchan Ness to Collieston Coast	Yes
	Hermaness, Saxa Vord and Valla	Yes
	The Shiant Isles	Yes
	Fowlsheugh	Yes
	Flannan Isles	Yes
	Forth Islands	Yes
	St Kilda	Yes
	Mingulay and Bernaray	Yes
Arctic tern	Rousay	Yes
	West Westray	Yes
	Papa Westray (North Hill and Holm)	Yes
	Auskerry	Yes
Arctic skua	Rousay	Yes
	West Westray	Yes
	Papa Westray (North Hill and Holm)	Yes
	Hoy	Yes
	Fair Isle	Yes
Razorbill	West Westray	Yes
European storm-petrel	Auskerry	Yes
Great skua	Hoy	Yes
	Fair Isle	Yes
Atlantic puffin	Hoy	Yes
	North Caithness Cliffs	Yes
	Fair Isle	Yes
	East Caithness Cliffs	Yes
	Sule Skerry and Sule Stack	Yes
	Foula	Yes
Northern gannet	Fair Isle	Yes
	Sule Skerry and Sule Stack	Yes
	Noss	Yes
	North Rona and Sula Sgeir	Yes
	Hermaness, Saxa Vord and Valla	Yes
Leach's storm-petrel	Sule Skerry and Sule Stack	Yes
	Foula	Yes (within 10% buffer)
Manx shearwater	Rum	Yes (within 10% buffer)
	St Kilda	Yes (within 10% buffer)

Bird Foraging Distances

SNH currently advise that the preferred source of information that provides parameters on mean maximum foraging ranges for seabird species is Thaxter *et al* (2012)[129] which is the most up to date source of information for foraging ranges and assigns confidence levels (high, moderate and low) to the representative foraging ranges for each species. BirdLife International data from BirdLife International Seabird Wikispace[130] has been used to provide mean maximum foraging ranges for species not included in Thaxter *et al* (2012)[129] with the exception of black-throated diver from Pendlebury et al (2011)[131]. Where no data could be found for a particular species, a conservative estimate based on the mean maximum values for a closely related species with similar ecology has been used e.g. for great black-backed gull, herring gull has been used as a proxy (Table C.4).

Table C.4 Mean maximum foraging distances for seabird species

Species	Common name	Mean maximum foraging range (km)	Source
Stercorarius parasiticus	Arctic skua	62.5	Thaxter *et al.* (2012)
Sterna paradisaea	Arctic tern	24.2	Thaxter *et al.* (2012)
Fratercula arctica	Atlantic puffin	105.4	Thaxter *et al.* (2012)
Cepphus grylle	Black guillemot	12	BirdLife International
Larus ridibundus	Black-headed gull	25.5	Thaxter *et al.* (2012)
Rissa tridactyla	Black-legged kittiwake	60	Thaxter *et al.* (2012)
Gavia arctica	Black-throated diver	10	Pendlebury et al. 2011
Somateria mollissima	Common eider	80	Thaxter *et al.* (2012)
Bucephala clangula	Common goldeneye	20	Estimate
Uria aalge	Common guillemot	84.2	Thaxter et al. (2012)
Larus canus	Common gull	50	Thaxter *et al.* (2012)
Melanitta nigra	Common scoter	8.2	BirdLife International
Sterna hirundo	Common tern	11.2	Thaxter *et al.* (2012)
Phalacrocorax aristotelis	European shag	14.5	Thaxter *et al.* (2012)
Hydrobates pelagicus	European storm-petrel	65	Thaxter et al. (2012)
Larus marinus	Great black-backed gull	61.1	Based on herring gull Thaxter *et al.* (2012)
Phalacrocorax carbo	Great cormorant	25	Thaxter *et al.* (2012)

[129] Thaxter, C.B., Lascelles, B., Sugar, K., Cook, A. S. C. P., Roos, S., Bolton, M., Langston, R. H.; W., Burton, N. H. K. (2012). Seabird foraging ranges as a preliminary tool for identifying candidate Marine Protected Areas. Biological Conservation, doi:10.1016/j.biocon. 2011.12.009.

[130] BirdLife International (2013). Seabird Wikispace. Available [online]: http://seabird.wikispaces.com/ (accessed 14/06/14).

[131] Pendlebury, C., Zisman, S., Walls, R., Sweeny, J., McLoughlin, E., Robinson, C., Turner, L. & Loughrey, J. (2011). Literature review to assess bird species connectivity to Special Protection Areas. Scottish Natural Heritage Commissioned Report No. 390.

Species	Common name	Mean maximum foraging range (km)	Source
Podiceps cristatus	Great crested grebe	20	Estimate
Catharacta skua	Great skua	86.4	Thaxter *et al.* (2012)
Aythya marila	Greater scaup	20	Estimate
Larus argentatus	Herring gull	61.1	Thaxter *et al.* (2012)
Oceanodroma leucorhoa	Leach's storm-petrel	91.7	Thaxter *et al.* (2012)
Larus fuscus	Lesser black-backed gull	141	Thaxter *et al.* (2012)
Sterna albifrons	Little tern	6.3	Thaxter *et al.* (2012)
Clangula hyemalis	Long-tailed duck	20	Estimate
Puffinus puffinus	Manx shearwater	330	Thaxter *et al.* (2012)
Larus melanocephalus	Mediterranean gull	20	Thaxter *et al.* (2012)
Fulmarus glacialis	Northern fulmar	400	Thaxter *et al.* (2012)
Morus bassanus	Northern gannet	229.4	Thaxter *et al.* (2012)
Alca torda	Razorbill	48.5	Thaxter *et al.* (2012)
Phalaropus lobatus	Red-necked phalarope	20	Estimate
Gavia stellata	Red-throated diver	9	Thaxter *et al.* (2012)
Sterna dougallii	Roseate tern	16.6	Thaxter *et al.* (2012)
Sterna sandvicensis	Sandwich tern	49	Thaxter *et al.* (2012)
Podiceps auritus	Slavonian grebe	20	Estimate
Melanitta fusca	Velvet scoter	18	BirdLife International

References

BirdLife International (2013). Seabird Wikispace. Available [online]: http://seabird.wikispaces.com/ (accessed 02/12/13).

Pendlebury, C., Zisman, S., Walls, R., Sweeny, J., McLoughlin, E., Robinson, C., Turner, L. & Loughrey, J. (2011). Literature review to assess bird species connectivity to Special Protection Areas. Scottish Natural Heritage Commissioned Report No. 390.

RSPB (2012). RSPB guidance on the use of bird data in marine planning. Available [online]: http://www.rspb.org.uk/Images/marine_planning_tcm9-338699.pdf (accessed 17/06/14).

Thaxter, C.B., Lascelles, B., Sugar, K., Cook, A. S. C. P., Roos, S., Bolton, M., Langston, R. H.; W., Burton, N. H. K. (2012). Seabird foraging ranges as a preliminary tool for identifying candidate Marine Protected Areas. Biological Conservation, doi:10.1016/j.biocon.2011.12.009.

Thompson, P.M., Cheney, B., Ingram, S., Stevick, P., Wilson, B. & Hammond, P.S. (2011). Distribution, abundance and population structure of bottlenose dolphins in Scottish waters. Scottish Natural Heritage Commissioned Research Report No. 354.

Appendix D - Natural Heritage Designations

Natural Heritage Designations

Statutory sites - Natura sites (SPAs and SACs)

Natura Sites are considered under the Habitats Regulations Appraisal and are considered in Appendix C.

Statutory sites - National (SSSIs)

Table D.1 SSSIs relevant to the project

SSSI	Direct distance to offshore AoS (km)	Qualifying feature	Mean max foraging distance (km)	Relevant to project component (offshore / onshore / both)
Doomy and Whitemaw Hill SSSI	Contiguous boundary (onshore AoS) <2 (offshore AoS)	Arctic skua *(Stercorarius parasiticus)*	62.5	Both
		Whimbrel *(Numenius phaeopus)*	NA	Scoped out
Calf of Eday SSSI Same area as terrestrial component of Calf of Eday SPA	Partial overlap (offshore AoS)	Great cormorant *(Phalacrocorax carbo)*	25	Offshore
Mill Loch SSSI	<0.25 (onshore AoS) <2 (offshore AoS)	Red-throated diver *(Gavia stellate)*	9	Both
Rousay SSSI Rousay SPA forms part of this site	11	Breeding bird assemblage	NA	Scoped out
		Common guillemot *(Uria aalge)*	84.2	Offshore
		Arctic skua *(Stercorarius parasiticus)*	62.5	Offshore
		Black-legged kittiwake *(Rissa tridactyla)*	60	Offshore

SSSI	Direct distance to offshore AoS (km)	Qualifying feature	Mean max foraging distance (km)	Relevant to project component (offshore / onshore / both)
		Arctic tern *(Sterna paradisaea)*	24.2	Offshore
		Seabird colony, breeding	NA	Offshore
West Westray SSSI Same area as terrestrial component of West Westray SPA	16	Common guillemot *(Uria aalge)*	84.2	Offshore
		Arctic skua *(Stercorarius parasiticus)*	62.5	Offshore
		Black-legged kittiwake *(Rissa tridactyla)*	60	Offshore
		Razorbill *(Alca torda)*	48.5	Offshore
		Arctic tern *(Sterna paradisaea)*	24.2	Offshore
		Seabird colony, breeding	NA	Offshore
Auskerry SSSI Same area as terrestrial component of Auskerry SPA	17	European storm-petrel *(Hydrobates pelagicus)*	65	Offshore
		Arctic tern *(Sterna paradisaea)*	24.2	Offshore
North Hill SSSI Same area as terrestrial component of Papa Westray (North Hill and Holm) SPA	18	Arctic skua *(Stercorarius parasiticus)*	62.5	Offshore
		Arctic tern *(Sterna paradisaea)*	24.2	Offshore
Copinsay SSSI Same area as terrestrial component of Copinsay SPA	30	Common guillemot *(Uria aalge)*	84.2	Offshore
		Black-legged kittiwake *(Rissa tridactyla)*	60	Offshore
		Seabird colony, breeding	NA	Offshore
Marwick Head SSSI	34	Common guillemot *(Uria aalge)*	84.2	Offshore

SSSI	Direct distance to offshore AoS (km)	Qualifying feature	Mean max foraging distance (km)	Relevant to project component (offshore / onshore / both)
Same area as terrestrial component of Marwick Head SPA		Black-legged kittiwake *(Rissa tridactyla)*	60	Offshore
		Seabird colony, breeding	NA	Offshore
Hoy SSSI Same area as terrestrial component of Hoy SPA	42	Red-throated diver	9	Scoped out
		Breeding birdse		
		Peregrine *(Falco peregrinus)*	NA	
		Northern fulmar *(Fulmarus glacialis)*	400	Offshore
		Great skua *(Catharacta skua)*	86.4	Offshore
		Common guillemot *(Uria aalge)*	84.2	Offshore
		Arctic skua *(Stercorarius parasiticus)*	62.5	Offshore
		Great black-backed gull *(Larus marinus)*	61.1	Offshore
		Seabird colony, breeding	NA	Offshore
Stroma SSSI This site forms part of the North Caithness Cliffs SPA	57	Sandwich tern *(Sterna sandvicensis)*	49	Scoped out
		Arctic tern *(Sterna paradisaea)*	24.2	
		Common guillemot *(Uria aalge)*	84.2	Offshore
		Seabird colony, breeding	NA	Offshore
Duncansby Head SSSI This site forms part of the North Caithness Cliffs SPA	61	Black-legged kittiwake *(Rissa tridactyla)*	60	Offshore*
		Northern fulmar *(Fulmarus glacialis)*	400	Offshore

SSSI	Direct distance to offshore AoS (km)	Qualifying feature	Mean max foraging distance (km)	Relevant to project component (offshore / onshore / both)
		Common guillemot *(Uria aalge)*	84.2	Offshore
		Seabird colony, breeding	NA	Offshore
Fair Isle SSSI Same area as terrestrial component of Fair Isle SPA	65	Razorbill *(Alca torda)*	48.5	Scoped out
		European Shag *(Phalacrocorax aristotelis)*	14.5	
		Arctic skua *(Stercorarius parasiticus)*	62.5	Offshore*
		Black-legged kittiwake *(Rissa tridactyla)*	60	Offshore*
		Northern fulmar *(Fulmarus glacialis)*	400	Offshore
		Great skua *(Catharacta skua)*	86.4	Offshore
		Common guillemot *(Uria aalge)*	84.2	Offshore
		Seabird colony, breeding	NA	Offshore
Dunnet Head SSSI This site forms part of the North Caithness Cliffs SPA	66	Common guillemot *(Uria aalge)*	84.2	Offshore
		Seabird colony, breeding	NA	Offshore
Craig Hammel to Sgaps Geo SSSI This site forms part of the East Caithness Cliffs SPA	88	Black-legged kittiwake *(Rissa tridactyla)*	60	Scoped out
		Razorbill *(Alca torda)*	48.5	
		Common guillemot *(Uria aalge)*	84.2	Offshore*
		Seabird colony, breeding	NA	Offshore

SSSI	Direct distance to offshore AoS (km)	Qualifying feature	Mean max foraging distance (km)	Relevant to project component (offshore / onshore / both)
Red Point Coast SSSI This site forms part of the North Caithness Cliffs SPA	90	Common guillemot *(Uria aalge)*	84.2	Offshore*
Sule Skerry SSSI This site forms part of the terrestrial component of Sule Skerry and Sule Stack SPA	94	European storm-petrel *(Hydrobates pelagicus)*	65	Scoped out
		European Shag *(Phalacrocorax aristotelis)*	14.5	
		Puffin *(Fratercula arctica)*	105.4	Offshore
		Seabird colony, breeding	NA	Offshore
Sule Stack SSSI This site forms part of the terrestrial component of Sule Skerry and Sule Stack SPA	101	Northern gannet *(Morus bassanus)*	229.4	Offshore
Foula SSSI Same area as terrestrial component of Foula SPA	103	Leach's storm-petrel *(Oceanodroma leucorhoa)*	91.7	Scoped out
		Great skua *(Catharacta skua)*	86.4	
		Common guillemot *(Uria aalge)*	84.2	
		European storm-petrel *(Hydrobates pelagicus)*	65	
		Arctic skua *(Stercorarius parasiticus)*	62.5	
		Black-legged kittiwake *(Rissa tridactyla)*	60	
		Razorbill *(Alca torda)*	48.5	

SSSI	Direct distance to offshore AoS (km)	Qualifying feature	Mean max foraging distance (km)	Relevant to project component (offshore / onshore / both)
		European Shag *(Phalacrocorax aristotelis)*	14.5	
		Northern fulmar *(Fulmarus glacialis)*	400	Offshore
		Puffin *(Fratercula arctica)*	105.4	Offshore
		Seabird colony, breeding	NA	Offshore
Sumburgh Head SSSI Same area as terrestrial component of Sumburgh Head SPA	104	Common guillemot *(Uria aalge)*	84.2	Scoped out
		European Shag *(Phalacrocorax aristotelis)*	14.5	
		Puffin *(Fratercula arctica)*	105.4	Offshore
		Seabird colony, breeding	NA	Offshore
Berriedale Cliffs SSSI This site forms part of the East Caithness Cliffs SPA	112	Common guillemot *(Uria aalge)*	84.2	Scoped out
		Black-legged kittiwake *(Rissa tridactyla)*	60	
		Razorbill *(Alca torda)*	48.5	
		European Shag *(Phalacrocorax aristotelis)*	14.5	
		Northern fulmar *(Fulmarus glacialis)*	400	Offshore
		Seabird colony, breeding	NA	Offshore
Cape Wrath SSSI Same area as terrestrial component of Cape Wrath SPA	135	Puffin *(Fratercula arctica)*	105.4	Scoped out
		Common guillemot *(Uria aalge)*	84.2	
		Black-legged kittiwake *(Rissa tridactyla)*	60	
		Razorbill *(Alca torda)*	48.5	
		Seabird colony, breeding	NA	Offshore

SSSI	Direct distance to offshore AoS (km)	Qualifying feature	Mean max foraging distance (km)	Relevant to project component (offshore / onshore / both)
Noss SSSI Same area as terrestrial component of Noss SPA	136	Great skua *(Catharacta skua)*	86.4	Scoped out
		Common guillemot *(Uria aalge)*	84.2	
		Arctic skua *(Stercorarius parasiticus)*	62.5	
		Black-legged kittiwake *(Rissa tridactyla)*	60	
		Northern gannet *(Morus bassanus)*	229.4	Offshore
		Seabird colony, breeding	NA	Offshore
Gamrie and Pennan Coast SSSI This site forms part of Troup, Pennan and Lion's Head SPA	166	Puffin *(Fratercula arctica)*	105.4	Scoped out
		Common guillemot *(Uria aalge)*	84.2	
		Black-legged kittiwake *(Rissa tridactyla)*	60	
		Razorbill *(Alca torda)*	48.5	
		Northern fulmar *(Fulmarus glacialis)*	400	Offshore
		Northern gannet *(Morus bassanus)*	229.4	Offshore
		Seabird colony, breeding	NA	Offshore
North Rona and Sula Sgeir SSSI Same area as terrestrial component of North Rona and Sula Sgeir SPA	174	Puffin *(Fratercula arctica)*	105.4	Scoped out
		Leach's storm-petrel *(Oceanodroma leucorhoa)*	91.7	
		Common guillemot *(Uria aalge)*	84.2	
		European storm-petrel *(Hydrobates pelagicus)*	65	

SSSI	Direct distance to offshore AoS (km)	Qualifying feature	Mean max foraging distance (km)	Relevant to project component (offshore / onshore / both)
		Great black-backed gull *(Larus marinus)*	61.1	
		Black-legged kittiwake *(Rissa tridactyla)*	60	
		Razorbill *(Alca torda)*	48.5	
		Northern fulmar *(Fulmarus glacialis)*	400	Offshore
		Northern gannet *(Morus bassanus)*	229.4	Offshore
		Seabird colony, breeding	NA	Offshore
Lamb Hoga SSSI This area forms part of Fetlar SPA	178	Great skua *(Catharacta skua)*	86.4	Scoped out
		European storm-petrel *(Hydrobates pelagicus)*	65	
		Arctic skua *(Stercorarius parasiticus)*	62.5	
		Breeding bird assemblage	NA	
		Manx shearwater *(Puffinus puffinus)*	330	Offshore
Bullers of Buchan Coast SSSI This site forms part of the Buchan Ness to Collieston Coast SPA	198	Common guillemot *(Uria aalge)*	84.2	Scoped out
		Black-legged kittiwake *(Rissa tridactyla)*	60	
		European Shag *(Phalacrocorax aristotelis)*	14.5	
		Seabird colony, breeding	NA	
Hermaness SSSI	200	Puffin *(Fratercula arctica)*	105.4	Scoped out
		Great skua *(Catharacta skua)*	86.4	

SSSI	Direct distance to offshore AoS (km)	Qualifying feature	Mean max foraging distance (km)	Relevant to project component (offshore / onshore / both)
This site forms part of Hermaness, Saxa Vord and Valla Field SPA		Common guillemot *(Uria aalge)*	84.2	
		Northern fulmar *(Fulmarus glacialis)*	400	Offshore
		Northern gannet *(Morus bassanus)*	229.4	Offshore
		Seabird colony, breeding	NA	Offshore
Saxa Vord SSSI This site forms part of Hermaness, Saxa Vord and Valla Field SPA	203	Common guillemot *(Uria aalge)*	84.2	Scoped out
		Northern fulmar *(Fulmarus glacialis)*	400	Offshore
		Seabird colony, breeding	NA	Offshore
Collieston to Whinnyfold Coast SSSI This site forms part of the Buchan Ness to Collieston Coast SPA	204	Common guillemot *(Uria aalge)*	84.2	Scoped out
		Black-legged kittiwake *(Rissa tridactyla)*	60	
		Razorbill *(Alca torda)*	48.5	
		Northern fulmar *(Fulmarus glacialis)*	400	Offshore
		Seabird colony, breeding	NA	Offshore
Shiant Islands SSSI Same area as terrestrial component of Shiant Isles SPA	251	Greenland barnacle goose *(Branta leucopsis)*	NA	Scoped out
		Puffin *(Fratercula arctica)*	105.4	
		Common guillemot *(Uria aalge)*	84.2	
		Razorbill *(Alca torda)*	48.5	
		European Shag *(Phalacrocorax aristotelis)*	14.5	
		Northern fulmar *(Fulmarus glacialis)*	400	Offshore

SSSI	Direct distance to offshore AoS (km)	Qualifying feature	Mean max foraging distance (km)	Relevant to project component (offshore / onshore / both)
		Seabird colony, breeding	NA	Offshore
Fowlsheugh SSSI Same area as terrestrial component of Fowlsheugh SPA	252	Puffin *(Fratercula arctica)*	105.4	Scoped out
		Common guillemot *(Uria aalge)*	84.2	
		Black-legged kittiwake *(Rissa tridactyla)*	60	
		Razorbill *(Alca torda)*	48.5	
		Northern fulmar *(Fulmarus glacialis)*	400	Offshore
		Seabird colony, breeding	NA	Offshore
Flannan Isles SSSI Same area as terrestrial component of Flannan Isles SPA	294	Puffin *(Fratercula arctica)*	105.4	Scoped out
		Leach's storm-petrel *(Oceanodroma leucorhoa)*	91.7	
		Common guillemot *(Uria aalge)*	84.2	
		Black-legged kittiwake *(Rissa tridactyla)*	60	
		Razorbill *(Alca torda)*	48.5	
		Northern fulmar *(Fulmarus glacialis)*	400	Offshore
		Seabird colony, breeding	NA	Offshore
Rum SSSI Same area as terrestrial component of Rum SPA	314	Manx shearwater *(Puffinus puffinus)*	330	Offshore
Inchmickery SSSI This site forms part of Forth Island SPA	352	Lesser black-backed gull *(Larus fuscus)*	141	Scoped out
		Herring gull	61.1	

SSSI	Direct distance to offshore AoS (km)	Qualifying feature	Mean max foraging distance (km)	Relevant to project component (offshore / onshore / both)
		European Shag *(Phalacrocorax aristotelis)*	14.5	
		Northern fulmar *(Fulmarus glacialis)*	400	Offshore
Mingulay and Berneray SSSI Same area as terrestrial component of Mingulay and Berneray SPA	387	Common guillemot *(Uria aalge)*	84.2	Scoped out
		Black-legged kittiwake *(Rissa tridactyla)*	60	
		Razorbill *(Alca torda)*	48.5	
		Seabird colony, breeding	NA	Offshore

*within 10% buffer only

Non-statutory sites - Local (LNCSs)

Table D.2 Local Nature Conservation Sites relevant to the project

Name	Proximity to onshore AoS	Special features (*nationally important[132])		
		Habitats	Birds	Other wildlife
Bomo LNCS, Eday	Partially within	Upland heath* Blanket bog* Crowberry heath	Red throated diver *(Gavia stellata)** Curlew *(Numenius arquata)** Snipe *(Gallinago gallinago)* Arctic tern *(Sterna paradisaea)** Skylark *(Alauda arvensis)** Twite *(Carduelis flavirostris)** Linnet *(Carduelis cannabina)**	NA

[132] Nationally important species include those on UKBAP (priority habitats/species) or Scottish Biodiversity List relating to Scottish/UK Biodiversity Indicators

Name	Proximity to onshore AoS	Special features (*nationally important[132])		
		Habitats	Birds	Other wildlife
Loch of London LNCS, Eday	Partially within	Upland heath*; blanket bog*; oligotrophic and dystrophic lochs*; crowberry heath	Red throated diver *(Gavia stellata)** Snipe *(Gallinago gallinago)* Curlew *(Numenius arquata)** Redshank *(Tringa totanus)* Twite *(Carduelis flavirostris)** Linnet *(Carduelis cannabina)**	NA
Mussetter, Doomy and London LNCS, Eday	Partially within	Upland heath*; blanket bog*; oligotrophic and dystrophic lochs*; coastal sand dunes*; burns and canalised burns	Lapwing *(Vanellus vanellus)** Curlew *(Numenius arquata)** Snipe *(Gallinago gallinago)* Redshank *(Tringa totanus)* Shoveler *(Anas clypeata)* Arctic skua *(Stercorarius parasiticus)** Great skua *(Catharacta skua)* Twite *(Carduelis flavirostris)** Skylark *(Alauda arvensis)**	Great yellow bumble bee* Moss carder bee* Otter* Sheep's-bit
Skaill LNCS, Eday	Partially within	Upland heath*; basin bog	Lapwing *(Vanellus vanellus)** Curlew *(Numenius arquata)** Snipe *(Gallinago gallinago)* Redshank *(Tringa totanus)* Stonechat *(Saxicola torquata)* Twite *(Carduelis flavirostris)** Skylark *(Alauda arvensis)** Linnet *(Carduelis cannabina)** Songthrush*	Otter* Bog myrtle
Stennie Hill LNCS, Eday	Contiguous boundary	Upland heath*; blanket bog*	Lapwing *(Vanellus vanellus)** Snipe *(Gallinago gallinago)* Curlew *(Numenius arquata)** Redshank *(Tringa totanus)* Golden plover *(Pluvialis apricaria)** Skylark *(Alauda arvensis)** Twite *(Carduelis flavirostris)**	NA
Ward Hill LNCS, Eday	0.1km	Upland heath*; crowberry heath; blanket bog*	Arctic tern *(Sterna paradisaea)**	NA

Name	Proximity to onshore AoS	Special features (*nationally important[132])		
		Habitats	Birds	Other wildlife
			Arctic skua *(Stercorarius parasiticus)** Great skua *(Catharacta skua)* Golden plover *(Pluvialis apricaria)** Lapwing *(Vanellus vanellus)** Curlew *(Numenius arquata)** Snipe *(Gallinago gallinago)* Skylark *(Alauda arvensis)** Twite *(Carduelis flavirostris)**	

Appendix E - Consultee List

Project Stakeholders

Statutory Consultees

Local Authority (Orkney Island Council)

Marine Scotland Compliance

Marine Scotland Licensing Operations Team (MS LOT)

Marine Scotland Science

Maritime and Coastguard Agency

Northern Lighthouse Board

Scottish Environmental Protection Agency (SEPA)

Scottish Natural Heritage (SNH)

Stakeholder Group 1

Association of Salmon Fishery Boards (District SFB)

BT (Radio Network Protection)

Chamber of Shipping

Crown Estate (Wave and Tidal)

Historic Scotland

Ministry of Defence

Orkney Inshore Fisheries Group

Orkney Islands Council Marine Safety Forum

Rivers and Fisheries Trust of Scotland (RAFTS)

Royal Yachting Association (Scotland)

RSPB Scotland

RSPB Orkney

Scottish Canoe Association

Scottish Fishermen's Federation

Scottish Fishermen's Organisation

Scottish Surfing Federation

Scottish Wildlife Trust

Sport Scotland

Surfers Against Sewage

Transport Scotland (including ports and Harbours)

Visit Scotland

Whale and Dolphin Conservation Society

Stakeholder Group 2

British Marine Aggregate Producers Association

British Ports Association

Cruising Association

Defence Estates

Eday Community Council

Eday Partnership

European Marine Energy Centre

Friends of the Earth Scotland

Health and Safety Executive

Highlands and Islands Airports

Highlands and Islands Enterprise

Joint Nature Conservancy Committee

Joint Radio Company

Kirkwall and St Ola Community Councils

Kirkwall Kayak Club

Kirkwall Small Boat Owners Association

Marine Conservation Society

Northlink Ferries

NATS Safeguarding

Orkney Dive Boat Operators Association

Orkney Ferries

Orkney Fisheries Association

Orkney Fishermen's Society Limited

Orkney Harbours (Marine Services)

Orkney Islands Sea Angling Association

Orkney Marinas Limited

Orkney Renewable Energy Forum

Orkney Sailing Club

Orkney Sea Kayaking Association

Orkney Seal Rescue

Orkney Skate Trust

Orkney Sustainable Fisheries

Orkney Trout Fishing Association

Papay Westray Community Council

Ramblers Scotland

Royal National Lifeboat Institution

Sanday Community Council

Sanday Development Trust

Sail Orkney Yacht Charter

Scottish Aquaculture Research Forum

Scottish Anglers National Association

Scottish Association for Marine Science

Scottish Pelagic Fisherman's Association Ltd

Scottish Salmon Producers Association

Scottish Sea Farms Ltd

Scottish Sub Aqua Club

Scottish Water

Scottish White Fish Producers Association

Sea Fish Industry Authority

Sea Mammal Research Unit

Surfing GB

UK Department for Energy and Climate Change

UK Hydrographic Office

Visit Orkney

Westray Community Council

Westray Development Trust

Westray Sailing Club

Westray Small Boat Owners Association