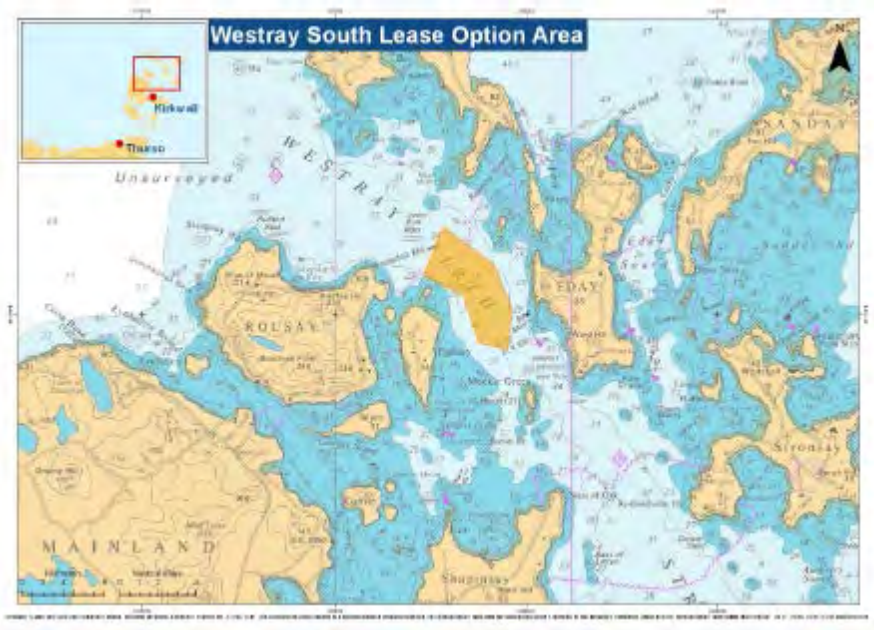

Environmental Scoping Report

Westray South Tidal Array

October 2011

Rev								
0.1	Prepared By	JRT & IH	Checked By	FT, AD, FF, RB	Approved By	RB & JT	Date of Issue	October 2011

CONTENTS

SSE RENEWABLES – REQUEST FOR SCOPING OPINION – WESTRAY SOUTH

SSER is seeking a Scoping Opinion for the proposed Westray South tidal array from the Scottish Ministers under Section 7 of the Electricity Works (Environmental Impact Assessment)(Scotland) Regulations 2000. Comment is also sought and welcomed from other stakeholders with an interest in the proposed development.

This Scoping Report has been produced by Royal Haskoning and Aquatera in line with relevant guidance and recent consultation with Marine Scotland, its advisory bodies and other key stakeholders. A description of the proposed development along with SSER's proposed approach to the EIA and NRA is provided.

Further queries relating to the project should be directed to:

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Glossary of terms

Agreement for Lease	The Agreement for lease 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 to wave and tidal energy projects) within a defined area.
Area of Search	Area covered within the scoping report
Array	A number of tidal energy converter devices that are positioned within close proximity of each other
Benthic Communities	Species that live on the seabed
Cable landfall area of search	Area in which cables that span the marine and terrestrial environment may be installed.
Cumulative effects	The overall effects of a number of different proposals of the same type of development.
Environmental Impact Assessment	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(s) 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 different devices within the tidal array(s) to one another.
Jack-up barges	A jack-up barge is a self-supporting type of vessel that stands on the seabed on a number of supporting legs,

	providing a stable platform.
Landfall site	Location at which subsea cables come ashore.
Natura 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 pieces of European legislation (see SAC and SPA)
Onshore Grid connection corridors	Areas identified as being of most likely potential within which onshore grid connection routes will be identified.
Onshore substation areas of search	Areas identified as being of most likely potential for selecting a preferred site for an onshore substation location.
Project Briefing Document	A document produced and sent to stakeholders prior to scoping to provide an introduction to the proposed development.
Special Area of Conservation (SAC)	Sites designated under the EC Habitats Directive
Scottish Renewable Energy Zone	A zone between 12 and 200nm from the Scottish coast within which the Scottish Government has exclusively devolved powers for marine planning matters
Scottish Territorial Waters	Waters extending 12 nautical miles from the baseline within which the Scottish Government has responsibility for marine planning.
Special Protected Area	Special Protected sites (SPA) classified in accordance with Article 4 of the EC Birds Directive
Subsea cable corridor and offshore substation area of search	Area identified as being of most likely potential for the selection of subsea cable routes and possible offshore substation locations.

Acronyms

AA	Appropriate Assessment
ABDA	Archaeological desk-based assessment
ADCP	Acoustic Doppler Current Profiler
AfL	Agreement for Lease
AIS	Automatic Identification System
ASCOBANS	Agreement on Conservation of Small Cetaceans of the Baltic and North Seas
BATNEEC	Best Available Technology Not Entailing Excessive Costs
BGS	British Geological Survey
BTO	British Trust for Ornithology
CEMD	Construction Environmental Management Document
CITES	Convention on International Trade in Endangered Species
COWRIE	Collaborative Offshore Wind Research Into The Environment
CPA	Coastal Protection Act
DECC	Department of Energy and Climate Change
DfT	Department for Transport
DP (vessel)	Dynamically Positioning (vessel)
DTI	Department of Trade and Industry
EEZ	Exclusive Economic Zone

EIA	Environmental Impact Assessment
EMEC	European Marine Energy Centre
EMP	Environmental Management Plan
EPS	European Protected Species
ES	Environmental Statement
FEPA	Food and Environment Protection Act
FSA	Formal Safety Assessment
GCR	Geological Conservation Review
GIS	Geographical Information systems
GW	Giga Watt (energy)
HAT	Horizontal Axis Turbine
HIE	Highlands and Islands Enterprise
HRA	Habitat Regulation Appraisal
HVCD	High Voltage Direct Current
ICES	International Council for Exploration of the Sea
ICIT	International Centre for Island Technologies
IEEM	Institute of Ecology and Environmental Management
IMO	International Maritime Organisation
IROPI	Imperative Reasons of Overriding Public Interest
IUCN	International Union for Conservation of Nature
JNCC	Joint Nature Conservation Committee
LAT	Lowest Astronomical Tide

LSE	Likely Significant Effect
MCA	Maritime and Coastguard Agency
MCAA	Marine and Coastal Access Act
MESH	Mapping European Seabed Habitats
MGN	Marine Guidance Notice
MLWS	Mean Low Water Spring
MLWS	Mean Low Water Springs
MNCR	Marine Nature Conservation Review
MoD	Ministry of Defence
MPAs	Marine Protected Areas
MS	Marine Scotland
MSL	Mean Sea Level
MS-LOT	Marine Scotland Licensing Operations Team
MW	Mega Watt (energy)
NBN	National Biodiversity Network
NGET	National Grid Electricity Transmission
NLB	Northern Lighthouse Board
NMR	National Monuments Records
NPF	National Planning Framework
NPF	National Planning Framework
NPPG	National Planning Policy Guidance
NRA	Navigational Risk Assessment

OFA	Orkney Fisheries Association
OIC	Orkney Island Council
OREF	Orkney Renewable Energy Forum
OREI	Offshore Renewable Energy Installations
OS	Ordnance Survey
PBD	Project Briefing Document
PFOW	Pentland Firth and Orkney Waters
PFSA	Pentland Firth Strategic Area
PHA	Preliminary Hazard Analysis
RCAHMS	Royal Commission on the Ancient and Historical Monuments of Scotland
ROV	Remotely operated Vehicle
RSPB	Royal Society for the Protection of Birds
RYA	Royal Yacht Association
SAC	Special Area of Conservation
SAMS	Scottish Association of Marine Science
SAR	Search and Rescue
SCADA	Supervisory Control And Data Acquisition
SEA	Strategic Environmental Assessment
SEPA	Scottish Environment Protection Agency
SFF	Scottish Fishermen’s Federation
SHEPD	Scottish Hydro Electric Power Distribution

SHETL	Scottish Hydro Electric Transmission Limited
SLVIA	Seascape and Landscape Visual Impact Assessment
SMRU	Sea Mammal Research Unit
SNH	Scottish Natural Heritage
SPA	Special Protected Area
SPP	Scottish Planning Policy
SSER	Scottish and Southern Energy Renewables
SSSI	Site of Special Scientific Interest
STW	Scottish Territorial waters
TCE	The Crown Estate
THC	The Highland Council
TMP	Traffic Management Plan
TS	Transport Scotland
UK BAP	United Kingdom Biodiversity Action Plan
UKHO	United Kingdom Hydrographic Office
VMS	Vessel Management System
VP	Vantage point
VTS	Vessel Traffic Services
WeBs	Wetland Bird Survey

1 INTRODUCTION

1.1 The Developer

SSE Renewables Developments (UK) Limited (SSER) is a wholly owned subsidiary of the Scottish and Southern Energy (SSE) Group and is responsible for the development of renewable energy projects on behalf of the generation part of the company, SSE Generation Ltd (SSEG). SSEG is likely to be the applicant for any subsequent planning application as it would be the owner and operator of the project described in this document were it to gain consent and be built.

The overall SSE generation portfolio presently has an installed generation capacity of over 11 GW, including almost 2.5 GW of renewables, and supplies energy to 10 million customers across the UK and Republic of Ireland. SSE defines its core purpose as providing the energy people need, in a reliable and sustainable way. SSER is one of the UK's leading offshore renewable energy developers, responsible for 6.6 GW of development projects including an interest in 800 MW of wave and tidal energy projects in the Pentland Firth and Orkney Waters (PFOW).

1.2 Project Overview and Agreement for Lease

SSE Renewables (SSER) has been awarded an Agreement for Lease (AfL) for the Westray South site following The Crown Estates Pentland Firth and Orkney Waters Leasing Round. Based on present knowledge of the site it is proposed that a tidal array of up to 200 megawatts (MW) capacity could be installed which equates to approximately 200 devices. The AfL area covers water depths ranging from 25 – 54m and lies adjacent to the European Marine Energy Centre's (EMEC) Fall of Warness tidal test site, approximately 24km north of Kirkwall which is the closest sizeable port. The AfL area is shown in Figure 1.1

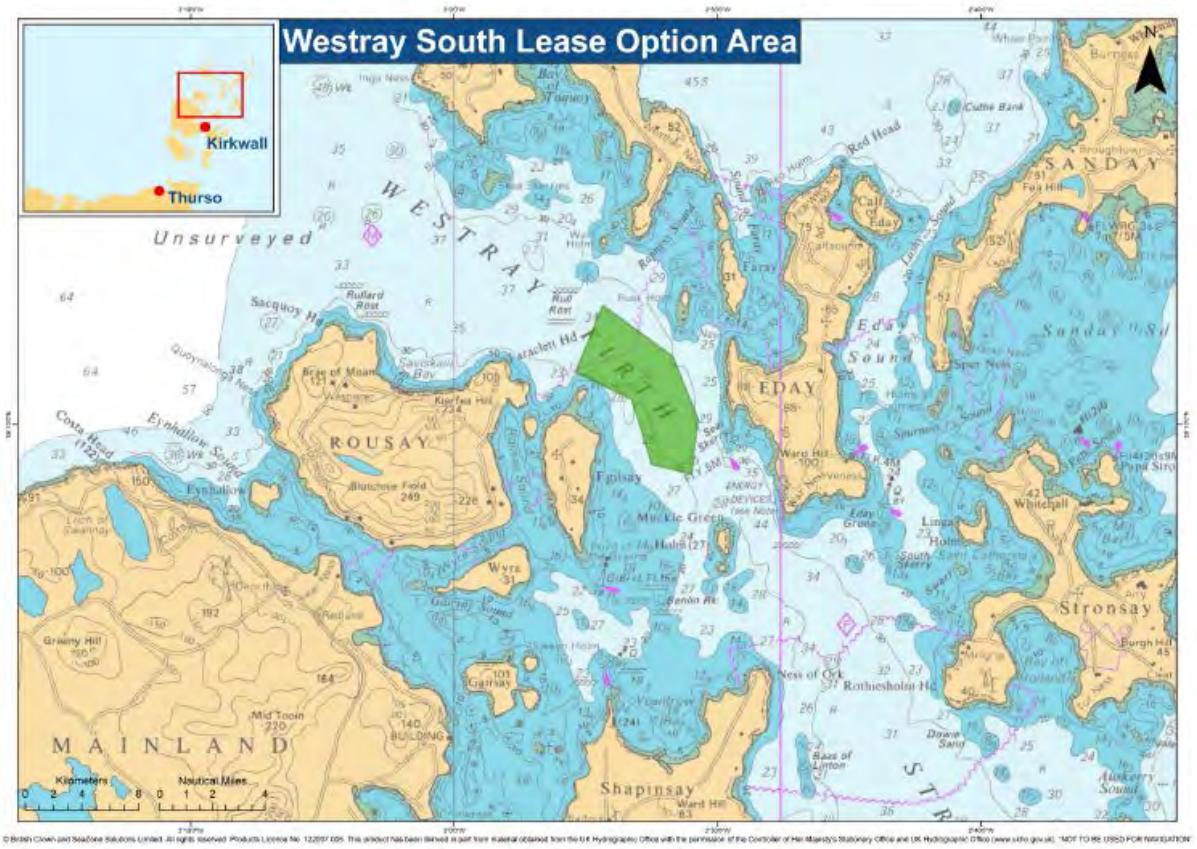

Figure 1.1 Westray South Agreement for Lease Area

The AfL provides SSER with an initial 5 year exclusive development period, in respect of other renewable energy developers, and is not a licence or consent to install tidal energy converters on the site. Securing such a license of consent is a condition imposed by The Crown Estate before a long term lease would be entered into. SSER is currently undertaking site investigation and project development planning activities, while in parallel commencing the Environmental Impact Assessment (EIA) and Navigational Risk Assessment (NRA) processes. These are required as part of the consenting process relevant to a project of this type and scale.

The EIA and NRA processes for the Westray South tidal array will consider the likely impacts of the project which are anticipated to arise through the installation, operation, maintenance and decommissioning phases of the project. At present a specific tidal energy converter and support/foundation structure has yet to be selected. It is anticipated that within the EIA and NRA the potential significance of any effects will be identified and assessed across a range of potentially applicable tidal technology components on a 'worst case' basis whilst

remaining within acceptable limits and ensuring the EIA and NRA complies with legal requirements and relevant guidance.

1.3 Development Process

1.3.1 A phased approach to development

The Agreement for Lease area is effectively an 'area of search' within which SSER hopes to identify a development zone or zones suitable for a commercial scale tidal project, built in two distinct phases. It is proposed that Phase I will be within the range of 30 - 45MW with Phase II potentially bringing the total installed capacity up to 200MW. The proposed installed capacity of Phase I has increased since the circulation of the pre-scoping Project Briefing Document of May 2011 (refer to section 1.4).

1.3.2 Defining the development

In working to identify proposed development zones the following issues are among those which will inform the process:

- Stakeholder consultation;
- Navigational safety;
- Tidal energy resource distribution and power across the AfL area;
- Environmental factors;
- Tidal technology options;
- Foundation options;
- Installation approaches;
- Economic analysis; and
- Grid connection.

The location, footprint and layout of devices and infrastructure will therefore be determined through detailed planning and be informed by the EIA, NRA and stakeholder consultation processes.

In order to identify preferred development areas for each technical component, it is necessary to evaluate a number of key issues relating to technical, environmental, stakeholder and socio-economic aspects. Ultimately this is the purpose of the forthcoming EIA process but based on work carried out to date it is possible to present some initial findings. These are presented below in relation to two of the key parameters that bring together technical and oceanographic influences.

- **Resource** – Without sufficiently strong tidal streams no site will be economically viable. In addition the direction, turbulence and ebb/ flood ratio of tidal flows needs to be within acceptable limits as these factors affect both overall potential energy production and the design (and therefore cost) of the infrastructure. SSER is engaged in a programme of ADCP deployments, the data from which will be used to inform mathematical models of the flow characteristics in and around the AfL area. Outputs from this process are then combined with device manufacturers' data to estimate the electrical productivity of different devices and device arrays. Based on resource modelling and data acquired thus far it appears that the portion of the AfL area which lies approximately north-west of the existing inter-island power cable may have insufficient economically exploitable resource. This can only be confirmed following further resource measurement and analysis.

- **Bathymetry** – For the range of tidal devices and support structures under consideration at this stage a minimum water depth criteria of 28m (LAT) has been assumed, which is based on allowing a minimum of 5m clearance from the device structure to LAT. Therefore all areas with shallower depths than this are not anticipated to be proposed for installation of tidal devices. Areas of less than 28m depth will be considered for other infrastructure such as cables and offshore substations. Applying this criteria to the AfL area excludes some peripheral locations.

There are of course a number of stakeholder and wider EIA issues that will influence the selection and design of the final proposed development zone(s). Further technical considerations will also be of significant importance, not least those aspects relating to array layout design.

1.3.3 Development timescales

It is proposed that as a minimum, the necessary consent and licence applications to build Phase I and its supporting infrastructure will be submitted by late 2013. Subject to consents

being granted, it is anticipated that installation of offshore infrastructure would commence in 2016 with onshore infrastructure works preceding this in late 2014/ early 2015. Depending on further consenting, it is planned to complete the full build out (Phase II) by 2020.

The 2020 date for commissioning Phase II has been identified based on the assumption that the majority of learning that will dictate the Phase II timescales will come from the Phase I process. However, it may be possible to advance the build-out of Phase II if the global tidal technology market advances sufficiently and some of the key operational challenges and uncertainties around potential environmental impacts have been resolved to an appropriate level. As such it is possible that a consent application for Phase 2 may be submitted in parallel or shortly after the Phase I application.

1.3.4 Tidal site development

Figure 1.2 provides a high level overview of the process that it is envisaged will be followed for development of the tidal site infrastructure (excluding grid connection). This outlines a phased approach to post consent build-out but as outlined above whilst there are likely to be separate consent applications for two phases it has not been determined at this stage what, if any, timing interval there would be between these.

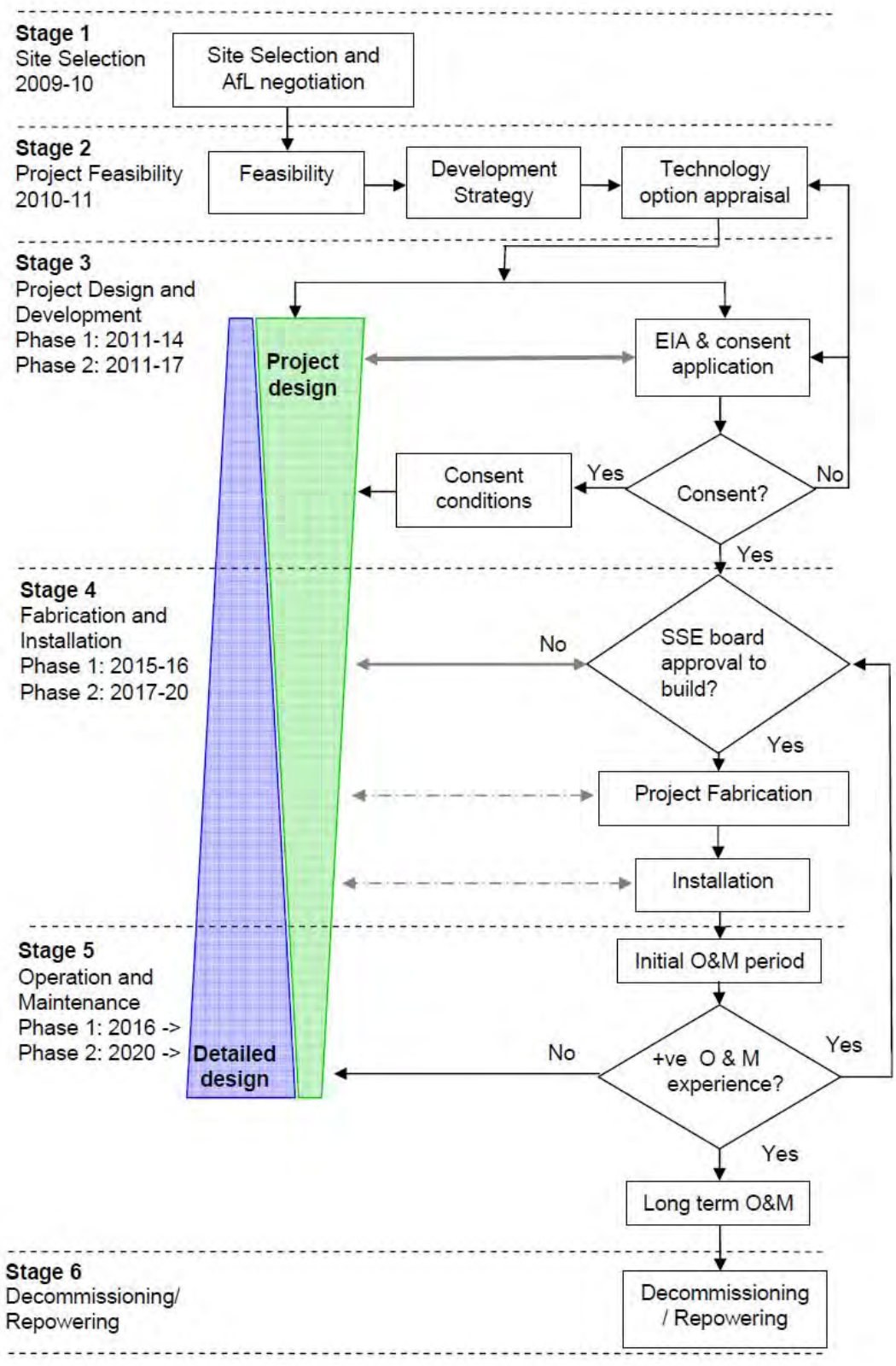

Figure 1.2 Development process and timescales

1.3.5 Grid connection development

SSER has evaluated options relating to both subsea and overland grid connection routes. The key factors which have influenced selection of the options for which a scoping opinion is sought can be summarised as:

1. **Single connection route**: preference for one grid connection asset for the entire project. i.e. consent is likely to be sought for a grid connection within the Phase I process that is capable of accommodating the overall potential project build out of circa 200MW.
2. **Economics**: the cost of the grid connection should not render Phase I of the development economically un-viable.
3. **Integrated**: preference to develop an integrated solution that supports other SSER projects and offers potential to strengthen the wider Orkney grid network.

Taking the above points into account, a primarily onshore connection route has been identified as the preferred option (refer to Figure 2.1). Based on initial internal SSER feasibility studies, it does not appear viable to develop a subsea connection for Phase I.

The required infrastructure and its routing will be informed by factors relating to:

- Westray South installed capacity;
- Environmental appraisal;
- Consultation with local and national stakeholders;
- Potential linkages with other projects and the wider Orkney grid;
- Economics;
- Proximity to site (influenced by connection voltage from site to substation); and
- Access (by sea and road).

Options for the onshore grid connection infrastructure include:

- New overhead lines/ inter-island cables on new routes;

- New overhead lines/ inter-island cables adjacent to existing routes;
- Part new/ part rebuild of existing routes;
- Undergrounding; and
- Combinations of all of the above.

It should be noted that options relating to the rebuilding of grid infrastructure which presently exists on Orkney would not be carried out by SSER as they are neither the owner nor operator of these assets. SHEPD is the owner and operator of the existing Orkney grid which is classified as a distribution network; whilst both SHEPD and SSER have the same parent company (SSE), they are separate entities. In particular, SHEPD is a regulated business which means its investment in new infrastructure and the return earned on its activities is closely controlled by the regulator OFGEM. The new proposed grid connection links from the Scottish mainland to Orkney will be classed as transmission network assets and these are being developed by SHETL which is the part of SSE which owns and operates the transmission network, of which there is presently none in Orkney. As with SHEPD, SHETL is regulated by OFGEM.

1.4 Pre-scoping consultation

A Project Briefing Document (PBD) was circulated to a wide range of stakeholders to initiate, support and inform the full EIA and NRA process. A list of stakeholders who responded to the PBD can be found in Appendix A of this document. The aim of the pre-scoping consultation was to provide an introduction to the proposed development, provide the earliest opportunity for stakeholders' views to influence subsequent parts of the EIA processes and to allow the regulator, stakeholders and the local community to engage with the project development team at an early opportunity.

During the pre-consultation period, SSER held meetings with a number of key stakeholders including Orkney Marine Services, Orkney Fishermen's Association, Orkney Fishermen's Society, the EMEC and a number of community councils and development trusts. Project meetings were also held with Scottish Natural Heritage and Marine Scotland.

2 PROJECT BOUNDARIES, APPROACH TO EIA AND CONSENTING PROCESS

This chapter defines the geographical and technical boundaries of the EIA along with the approach that SSER plans to take with regards to site development and the implications for the EIA process. Please note that the boundaries regarding the NRA process are outlined in the Preliminary Hazard Assessment (PHA) provided in Appendix C.

2.1 Geographical boundaries

Figure 2.1 illustrates the proposed development and areas of search for the on and offshore components of the project as summarised below:

- Agreement for Lease (AfL) area;
- Westray South onshore substation area of search;
- Cable landfall area of search;
- Onshore grid connection corridor search areas; and
- Subsea cable corridor and offshore substation area of search.

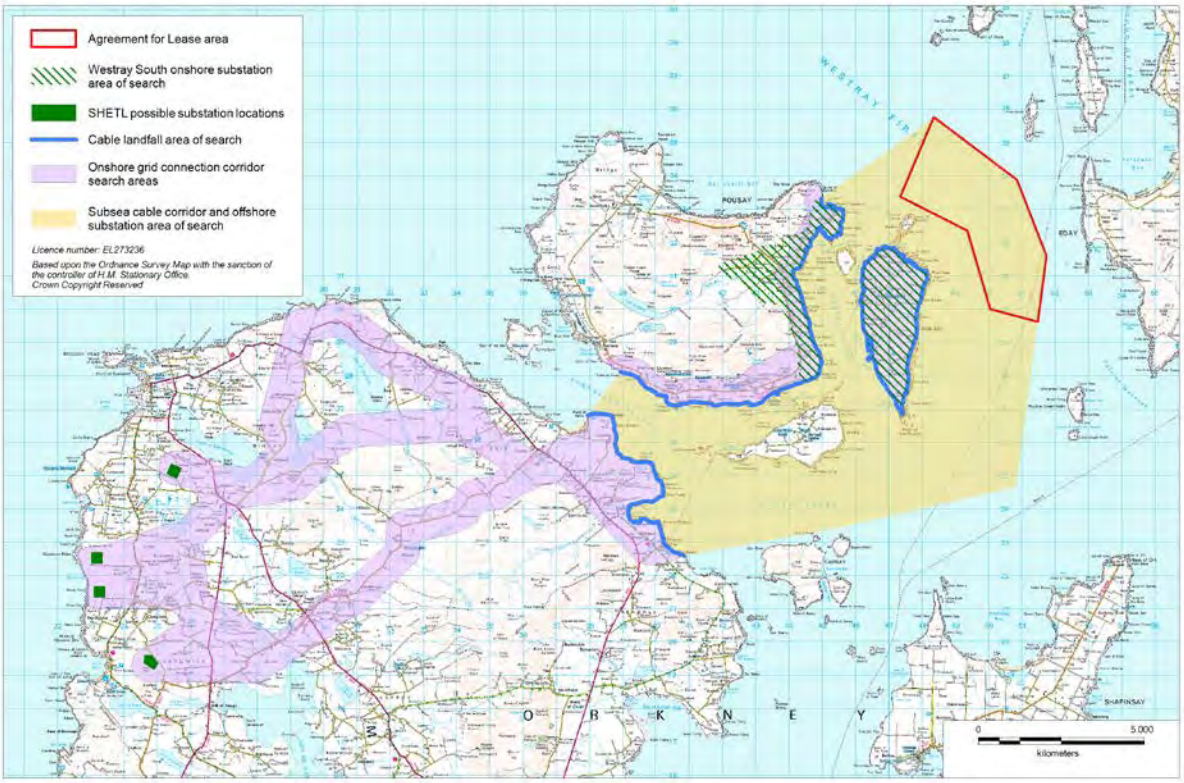

Figure 2.1 EIA geographical boundaries and project components

Figure 2.1 also shows the locations currently being considered by SHETL for a new substation in Orkney. This substation is **not** directly part of SSER's proposed development but it is expected that the Westray South project would connect into this new substation following construction.

2.2 Technical boundaries

As shown, there are a number of components to the proposals that will be considered within the EIA. There are also a number of technical components that would support the proposed development which will not be developed by SSER, and which therefore will not be considered within the EIA. These may include:

- Orkney SHETL substation;
- Any port/harbour upgrade/development or associated works which may be required to facilitate construction or operation and maintenance activities;

- Any upgrade to or addition to the existing electricity transmission or distribution infrastructure (both on and offshore) or associated works. However in the event that SSER proposes a dedicated grid connection purely for use by the Westray South project which does not connect into the existing grid then this infrastructure would be assessed within the EIA; and
- Onshore lay down and maintenance facilities.

Questions to be put forward to reader

Q1. Are the project geographic and technical boundaries outlined both clear and sufficient for what will be included and not included within the EIA?

2.3 Approach to EIA – Rochdale Envelope

The tidal energy sector is an emerging industry with the world's first full scale tidal energy converters only now going through initial testing programmes. Operating vessels, installing equipment and undertaking most works and procedures in high energy tidal areas has traditionally been avoided by mariners and as such, methodologies and procedures are developing alongside the design and installation of technologies. However, the industry is moving at a fast pace and as technology testing progresses, information and data regarding efficiency, performance and the interactions with the receiving environmental is being generated and analysed on a daily basis.

SSER is working closely with the leading technology developers during these initial test deployments and undertaking regular technology evaluations so as to begin to identify those most suitable for deployment within the Westray South site. Given the evolution of a number of technologies, support structures and deployment and recovery methods that have been observed to date, it is likely that new and improved concepts will be developed over the coming years.

SSER is presently examining a number of options with regard to technology selection and as such, it is possible that no specific technology or technologies for deployment within the AfL area will be selected prior to consent and license applications. A number of options are also currently being considered regarding support structures.

This approach requires the balancing of sufficient project definition to allow for a robust assessment, but with sufficient flexibility to allow SSER to consider a range of potential technology options. It is SSER's intention to define a series of parameters within which the technical boundaries of the EIA can be established.; effectively applying the 'Rochdale approach' which would aim to provide *"sufficient information to enable the main, or the likely significant effects on the environment to be assessed...., and the mitigation measures to be described...."*(Infrastructure Planning Commission, 2011).

This approach would involve the definition of a set of development parameters using maximum extents for a number of technical components, for example, turbine diameter, support structure footprint, offshore substation height etc. The potential significance of effects on the receiving environment resulting from the installation, operation, maintenance and decommissioning of these components would then be assessed based on these maximum extents. The 'Rochdale approach' is based in recent planning case law and has been adopted in connection to other offshore renewable consent applications where a level of flexibility is required

This approach to the EIA seeks to provide a 'design envelope' for the project whilst maintaining the integrity and outputs of the EIA process.

Questions to be put forward to MS-LOT

Q2. Do MS-LOT have a clear understanding of the approach being taken with regard to the EIA process for Westray South?

2.4 Consenting approach

SSER plans to submit separate applications for Phase I and II. The timing between these applications has yet to be determined but will be informed by ongoing consultation and dialogue, experience in the wider tidal technology market and the findings from the Westray South EIA process in the coming 12 – 18 months.

It is proposed that the necessary Licence Applications will be submitted based on the approach to EIA and design envelope outlined above. This design envelope would encompass a number of horizontal axis turbine options with defined technical parameters (turbine diameter, nacelle height etc) and a range of support structures.

This is a common approach to large infrastructure development projects as there is an almost continual interaction between the design functions of a project and the overall consenting and development process. Consent conditions are also intrinsically linked to the detailed design phase of a project which occurs post-consent.

Questions to be put forward to MS-LOT

Q3. Are MS-LOT content with the approach for the consenting strategy?

3 PROJECT DESCRIPTION

This chapter provides an overview of the anticipated technical components of the proposed development along with an overview of the associated operations and activities. The project description aims to be as informative as possible and is based on current information; however the project is in the early stages of design and, as the development progresses, some aspects may be subject to change. The following technical components are described:

- Offshore infrastructure;
    - Proposed tidal generation technologies;
    - Proposed support structures;
    - Electrical infrastructure;
        - Subsea cables (inter-array and export to shore);
        - Offshore substation;
- Onshore infrastructure;
    - Landfall;
    - Onshore substation;
    - Connection to the proposed SHETL Substation; and
    - Overhead lines/underground cables.

The following operations are outlined:

- Installation of offshore structures;
- Construction of onshore structures;
- Operation and maintenance; and
- Decommissioning.

.

3.1 Offshore infrastructure

3.1.1 Proposed tidal energy converters

SSER has determined that unless required for navigational marking purposes the technology installed will be a non-surface piercing horizontal axis turbine (HAT) type device.

Phase I may consist of devices from one or a few technology suppliers with potential differences across these in terms of support structure, tidal energy converter design and rotor diameter. For Phase II it is more likely that the entire phase would be constructed based on one technology supplier but support structure type and rotor diameter may still vary depending on the location within the development area. **All devices selected will, however, fall into one of the categories described below and within the design and operational limits defined for the Rochdale Envelope (refer to Section 2.3) during the EIA**.

Based on current understanding and technology evaluation work, devices with a rotor diameter of up to 20m capable of generating at least 1MW will be proposed for installation. Therefore the maximum number of devices proposed may be up to 200, with the limit for Phase I being 45.

Two main groupings of HAT concepts are currently being evaluated by SSER, these groupings are un-shrouded and shrouded devices.

3.1.1.1 Un-shrouded Devices

The design of un-shrouded HATs resembles that of wind turbines with blades rotating around a central nacelle. Devices typically have two or more blades which may be of fixed or variable pitch. Power take-off and generation configurations vary, from utilising direct drive solutions with no gearbox, through to marinised wind turbine nacelles. Some typical examples are shown in Figure 3.1, with their named manufacturers.

Commercial scale devices in development have rotor diameters of up to 18m.

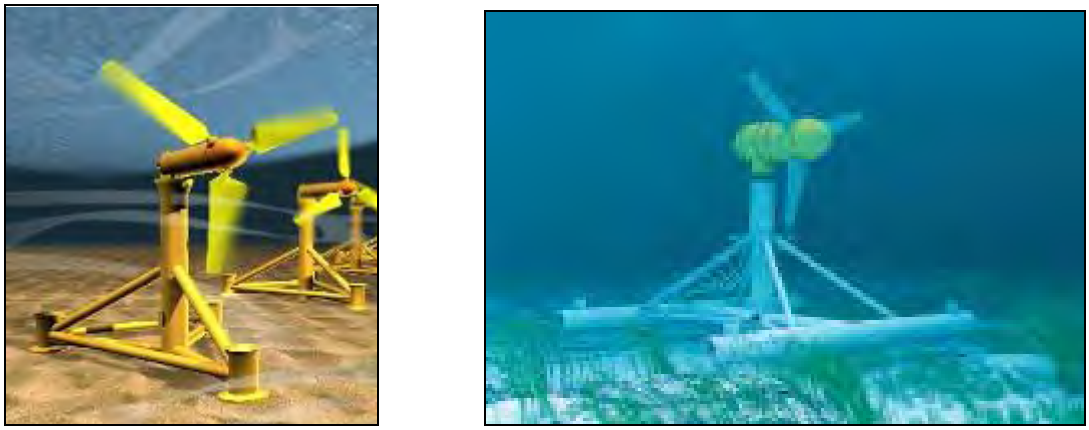

Figure 3.1 Rolls Royce/TGL (left) and Voith Hydro (right)

3.1.1.2 Shrouded Devices

Shrouded devices rotate within a fixed duct. They have fixed pitch blades and typically have an open centre. Power take-off is generally by a direct drive generator. Some typical examples are shown in Figure 3.2, with their named manufacturers. Commercial scale devices presently in development have rotor diameters of up to 20m.

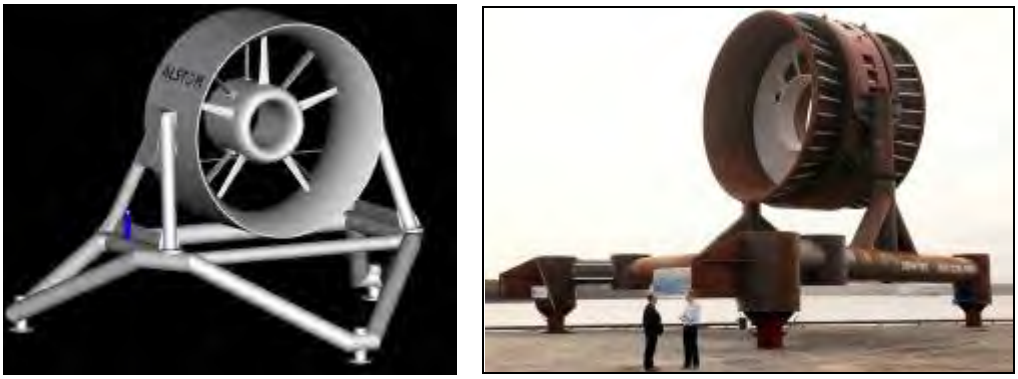

Figure 3.2 Clean Current/Alstom (left) and Openhydro (right)

3.1.2 Support Structures

For each of the above devices it is assumed that there are a range of potential support structures i.e. structures which fix or hold devices to the seabed. The final choice of structure will be made post-consent, at a more advanced stage of the detailed design process. This approach is analogous to established practice for other offshore renewable energy developments. The range of support structures to be considered in the EIA process is listed below:

- Monopile foundation (drilled socket in the seabed);
- Braced monopile (typically three or four legged); and
- Gravity base structure (pinned or unpinned).

The EIA and NRA processes will describe the potential significant effects associated with the proposed range of support structures, based on a worst case scenario for the predicted likely effects.

3.1.3 Electrical Infrastructure

All cables would be armoured to protect against abrasion, and where there is a lack of sediment they would be laid directly onto the seabed. In some areas concrete mattresses or a similar form of protection may also be required on top of the cable. In inshore waters and towards landfall points, where there is sufficient sediment, cables may be buried.

3.1.3.1 Subsea Cables – Inter-array

Devices will be inter-connected in arrays. A number of factors including turbine choice and available technical solutions will influence the number, length, spacing and configuration of inter-array cables. It is anticipated that the majority of the cables would be laid in line with the prevailing tidal flow directions, although clearly there will be a need to inter-connect within the arrays, with cables running across the prevailing flow directions.

3.1.3.2 Subsea Cables – Export to Shore

As with inter-array electrical infrastructure the final proposed design for the export to shore cable(s) will be heavily influenced by available technical solutions and seabed conditions. The number of cables required will be informed in technical terms by the tidal technology selected, the voltage of the cables proposed and whether or not an offshore substation is installed.

Designs with no offshore substation are likely to require significantly more cables to connect to shore than designs which incorporate an offshore substation. This is because present technology limits the voltages at which devices can be connected subsea which in turn limits the size of cable which can be installed. An offshore platform would bring multiple lower voltage cables together, with the power then being exported to shore on fewer, higher voltage cables.

Where multiple cables to shore are proposed, the distance between cables may be substantial depending on the installation method utilised.

3.1.3.3 Offshore Substation

A single offshore substation may be required during Phase I. It may also be possible that a cable connection solution can be designed which does not require an offshore substation for Phase 1. Up to two offshore substations may be required for Phase II. No preferred locations for offshore substations have been identified although it is anticipated that they would need to be within or adjacent to the proposed development areas. The design and onward route of the grid connection would also influence the preferred location(s) identified.

An offshore substation is typically supported on a jacket structure similar to a small offshore rig. The jacket foundation options are typically the same as those for the tidal device support structures i.e. piles and gravity bases. Alternatively a moored floating structure which supports the substation topsides could be utilised. The offshore substation would be a normally unmanned installation with access by helicopter or vessel.

3.2 Onshore Infrastructure

Please note that it is not yet known what road works will be required to support onshore infrastructure. This information will be included within the ES and the impacts of any proposed works will be considered appropriately.

3.2.1 Landfall

A minimum of one, and possibly several, landfall locations will be required depending on the grid connection strategy and route proposed. Figure 2.3 illustrates the areas which have been identified as possible landfall locations.

Post construction there would be a signs erected marking the presence of an electricity cable. Examples of these can be seen at a number of locations on Orkney where the existing subsea inter-island cables are located. At some point close to the landfall location the cable would emerge from the ground and connect to an overhead transmission line.

There may be a need to widen and/ or strengthen some road infrastructure in order to enable delivery of large or heavy loads (e.g. substation transformers). The improvement of road networks required for the proposed scheme will be considered within the EIA where applicable.

3.2.2 Onshore Substation

The basis for design has assumed that a location needs to be identified that is suitable for construction of a 132/33kV substation in the vicinity of the site. In terms of land-take this would require a development area of circa 90 x 50m, within which the following infrastructure would be included:

- Compound to house 132/33kV grid transformer and connection terminations;
- A Control Building compound. This building would be for 33kV switchgear, SCADA etc; and
- The site would require a welfare/operational compound area. This would contain a building for welfare, workshop, offices etc.

Access roads of sufficient width and strength to accommodate transport of the grid infrastructure and construction equipment would be required.

Figure 3.33 below illustrates a examples of both fully enclosed and open substations. At this stage SSER has not determined whether the substation would be of an enclosed or open design.

Figure 2.1 illustrates the areas which have been identified as areas of search for the substation.

Figure 3.3 Example 132kV woodpole overhead lines (top left) and example 33/132kV enclosed substation (top right) and example 33/132kV outside substation (bottom)

3.2.3 Connection to the proposed SHETL Substation

In order to export power from the development a connection needs to be made with the wider national grid. Based on the present proposed grid upgrade for Orkney this connection would be within the proposed SHETL substation in West Mainland.

3.2.3.1 Overhead Lines/ Underground Cables

Overhead lines capable of carrying voltages of up to 132kV can be run on wooden poles of double pole H-type construction which are typically 16m height. An example is shown in Figure 3.3.

Underground cables of 132kV will typically be buried to 1.0m. The corridor of disturbance during construction can be up to 10m wide for a 132kV cable.

Figure 2.1 illustrates the potential grid connection route corridors which have been identified and which will be taken through to the EIA process. The decision for the approach to grid connection will be made later following consultation and design development.

3.3 Installation of offshore components

There are a wide range of installation and removal methodologies currently being trialled in the testing of tidal energy converters and support structures ranging from the use of jack-up barges, moored and tugged barges, anchored crane barges, to dynamically positioned (DP) heavy lift construction vessels. The installation method(s) for the offshore components described above are outlined in the following sections:

3.3.1 Tidal energy converters

Table 3.1 below summarises the main techniques that have been used, or are thought to be technically feasible, to deploy both shrouded and un-shrouded devices.

Table 3.1 Possible deployment methods for tidal devices

Technique	Comment	Example Technology
Device and support structure deployed as a single entity	Generally limited to shrouded device designs only.	Open Hydro (utilising purpose built barge)
Device floated out	Device deployed onto support structure by ballasting with water and run down guide wires	TGL (Rolls Royce)
Heavy lift (possibly with guide wires/ winches)	Device prime move lifted into position utilising a heavy lift vessel.	Voith Hydro

3.3.2 Support Structures

3.3.2.1 Monopiles

Monopiles would be installed by being placed into a drilled socket and grouted in place. This would most likely be conducted from a DP vessel although jack-up barges have also been considered by some technology developers (Figure 3.4).

Figure 3.4 DP Vessel 'North Sea Giant' and jack-up barge 'Pauline' with support tugs

3.3.2.2 Braced Monopile

Braced monopiles are typically held into place with pin pile anchors which are usually fixed into pre-drilled sockets. Installation options and methodologies are essentially similar to those for monopile installation using a DP vessel or jack up barge.

3.3.2.3 Gravity Base Structure

Gravity base structures rely on their own inherent weight and design which may incorporate self penetrating legs and/or ballast (with rocks, water, concrete etc.).

Gravity base structures can either be installed with the turbine unit attached or in a separate operation with attachment of the turbine unit completed after installation of the gravity base.

To date, gravity base structures have been installed using DP vessels or purpose built deployment vehicles.

Figure 3.5 OpenHydro's Deployment Barge, 'Openhydro Installer'

Pinned gravity based structures have to date been tripod based and the feet pinned to the seabed with grouted piles (in drilled sockets) with the turbine then mounted on a central column.

3.3.3 Electrical Infrastructure

3.3.3.1 Subsea Cables – Inter-array

A specialised cable lay vessel would be used to install all subsea cables (similar to that shown in Figure 3.6). More than one vessel may be employed in cable laying activity at any one time.

Figure 3.6 Cable ship Galathea (left) and ductile iron cable protection (right)

Where the seabed has a suitable covering of sediment it may be possible to use a cable plough or a jetting system to install the cable between 1-1.5m below the seabed. In other areas the cables may be laid directly onto the seabed. Where the cables are laid directly on the seabed (as shown in Figure 3.6) they will most likely be armoured using materials such as ductile iron sheathing (refer to Figure 3.6) or a synthetic polymer such as 'Uraduct'. In some areas the use of concrete mattresses or overlaying of rock may need to be considered to secure and protect some areas of the cable.

3.3.3.2 Subsea Cable - Export to Shore

In deeper water, installation methods would be similar for those utilised for laying inter-array cables. On approach to the landfall the cable(s) is typically pulled ashore from the cable laying vessel whilst being supported with buoys.

3.3.3.3 Offshore Substation

Installation could involve the use of heavy lift vessels, DP vessels or a jack-up barge. Cables from shore and from the devices/device arrays would be conveyed onto the substation via J-tubes. If the substation is on a floating structure then this could be towed into place without the need for heavy lift vessels, etc.

3.4 Construction of onshore infrastructure

3.4.1 Electrical Infrastructure

3.4.1.1 Landfall

There are two main options for constructing a landfall:

- Direction drilled from a near-shore location to beyond the surf zone and the offshore cable pulled through the drilled duct to shore; and
- Cable burial up an existing beach in an open trench.

The method(s) employed are informed by environmental and engineering constraints, planning guidance and consultation.

3.4.1.2 Onshore Substation and National Grid/ SHETL Substation

Construction of this infrastructure would use general civil, mechanical and electrical construction methods. In addition, there would be specialist methods required for transport and construction of very heavy pieces of equipment, most notably the transformers.

3.4.1.3 Overhead Line

Construction would involve access along the route by vehicles capable of traversing the terrain and installing the required size of wooden poles, insulators and wires. Post construction there would be minimal disturbance except for that related to operation and maintenance activities.

3.4.1.4 Underground Cable

Underground installation would most probably involve burial at a target depth of 1m. In suitable soil types this can be achieved with minimal disruption to the ground by use of a cable burial plough. Alternatively a trenching and backfilling method can be employed in any soil type. In most circumstances normal use of the land can resume post installation.

3.5 Operation and maintenance

As a worst case scenario the overall principle that should be assumed for operation and maintenance activities is that at some stage in the lifetime of the project it may be necessary to repeat the activities carried out during construction.

The following sections provide a conservative overview of the potential operational and maintenance activities which may be required.

3.5.1 Tidal energy converters

For major maintenance or modification, the turbine would be removed from the support structure (or both components together) using a reverse of the installation procedure described earlier. Where the turbines and the gravity base structures are incorporated into one unit the whole unit would be removed.

A DP equipped vessel with a heave compensated crane or a purpose build deployment vessel would most likely be used for these tasks.

3.5.2 Support Structures

It is unlikely that the support structures will require major maintenance during the lifetime of the project except for occasional antifouling. Monopile and pinned gravity based structures (i.e. fixed structures) would be most likely be cleaned *in situ,* whilst unpinned gravity based structures may be retrieved from the seabed and taken ashore for overhaul using either a DP vessel or a purpose built recovery/ deployment vessel.

3.5.3 Electrical Infrastructure

Most offshore electrical infrastructure components required to build a project of this scale are in widespread use although typically not in such a harsh environment. The operation and maintenance requirements are therefore uncertain at this stage.

3.5.3.1 Subsea Cables – Inter-array & Export to Shore

In general, subsea cables require little maintenance. Enhanced protection through design and at the installation stage in response to identified risks is preferred to relying upon retrospective maintenance due to the difficulties associated with fault finding and cable retrieval.

3.5.3.2 Offshore Substation

If an offshore substation is required then it would most likely be designed to be operated as an unmanned installation. Routine maintenance would be conducted either by vessel or helicopter transfer of personnel. Except in exceptional circumstances (e.g. very large and heavy items) the procedures for replacing any equipment would most likely require use of multi-cat type vessels in conjunction with the onboard cranes of the substation platform. For replacement of very large and/ or heavy items it may be necessary to utilise heavy lift cranes mounted on large offshore construction type vessels/ barges.

3.5.4 Onshore Electrical Infrastructure

The onshore electrical infrastructure options available are all established technologies in widespread use with a proven track record for reliability. Beyond allowing for exceptional events it is anticipated that the operation and maintenance requirements should be minimal compared with the scale of operations required for installation and decommissioning.

3.6 Decommissioning

3.6.1 Tidal energy converters

The decommissioning process for most tidal energy converters will essentially be a reversal of the installation process and will follow the agreed decommissioning plan.

3.6.2 Support Structures

Where possible, it is anticipated that all structures will be completely removed from the site. Monopiles or pins would most likely be cut as close as possible to the seabed.

3.6.3 Offshore Electrical Infrastructure

3.6.3.1 Subsea Cables – Inter-array and Export to Shore

Subsea cables can either be removed, or left *in situ*. With buried cables removal is generally considered to lead to more significant environmental effects. If the cables are to be left *in situ* they will be marked as ‘disused’ on charts.

3.6.3.2 Offshore Substation

At the end of its lifespan the platform will be completely decommissioned. Any steel piles would be cut near to seabed level to allow the whole of the substructure to be lifted from the seabed and returned to land for recycling or disposal.

3.6.4 Onshore Electrical Infrastructure

3.6.4.1 Landfall

Beach or shore landfall cables would most probably be removed whereas it is likely that directionally drilled cables would be left in place.

3.6.4.2 Onshore Substation and Connection to SHETL Substation

The design life of substations is generally 40 years although longer may be possible if the capacity and condition of equipment continues to be fit for use. An end of life plan for an onshore or offshore substation will be prepared.

3.6.4.3 Overhead Line/ Underground Cable

In a scenario where the grid connection infrastructure is no longer required overhead lines are likely to be removed whilst for underground cables the final decision would be taken in consultation with the relevant authorities.

4 KEY POLICY AND LEGISLATIVE OBJECTIVES

The aims of this section are:

- To demonstrate the alignment of the proposals with relevant national policies; and
- To identify the Consents and Licences required for the construction/installation, operation and removal of this type of project.

The EIA process will be informed by Marine Renewable Licensing Manual going forward.

4.1 Renewable Energy Policy in Scotland

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[1]. 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 and 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.

4.1.1 The Climate Change (Scotland) Act 2009

This Act introduced binding targets on the Scottish Government to reduce net Scottish greenhouse gas emissions by 83% by 2050 from 1990 levels; with an interim target of 42% by 2020. The Scottish Governments' Renewables Action Plan, published in July 2009 and most recently updated in March of this year, reiterates the targets set in 2007. Support for renewables development, including tidal, is contained in National Planning Framework (NPF) 2 and Scottish Planning Policy (SPP).

[1] http://www.decc.gov.uk/en/content/cms/meeting_energy/renewable_ener/renewable_ener.aspx

4.2 Marine and Terrestrial Planning Policy

4.2.1 Marine Planning

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 STW (0 -12nm), and within the Scottish Renewable Energy Zone (REZ) (12 – 200nm).

In accordance with the MCAA, a joint Marine Policy Statement has been prepared by the UK Government in conjunction with the Scottish Government and the devolved administrations of Wales and Northern Ireland. In March 2011 the Scottish Government published a draft National Marine Plan which covers both Scottish Territorial Waters (STW) and the Scottish REZ. The draft Plan is currently being consulted upon and is to be finalised in summer 2012. The draft Plan identifies certain key objectives for management of the marine environment. The draft Plan identifies the role offshore renewables can play in promoting economic growth and tackling climate change. The draft Plan also identifies 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.

The Marine (Scotland) Act 2010 requires the Scottish Government to establish marine regions. The number and extent of the marine regions have yet to be established. Following creation of the marine regions, regional marine plans will be put in place with policies applicable at a local level. The Marine (Scotland) Act 2010 and MCAA also provide for the creation of Marine Protection Areas (MPAs). MPAs will be afforded particular protection on account of their nature conservation, historic or research and development value.

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; SSER awaits the publication of the policy.

4.2.2 Terrestrial Planning

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.

4.3 Marine (Scotland) Act

In March 2010 the Marine (Scotland) Act received Royal Assent; it 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 development can proceed. Prior to the introduction of the Act, developers would submit licence and planning consent applications to a number of authorities under various pieces of legislation. However, with the introduction of the Act, co-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 access, Marine Scotland Licensing Operations Team (MS-LOT), as part of a unified licensing and consenting process.

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

These Regulations implement the European EIA Directive 1985 (as amended, 2009), 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 Schedule 1 development*".

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

Under Regulation 7, the developer (i.e. SSER) 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, SSER 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 Environmental Statement, 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 Environmental Statement, giving their reasons why.

4.5 Consents & 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 of the Electricity Act, 1989;
- Section 37 of the Electricity Act 1989 to install overhead electric lines;
- Section 16 of the Marine (Scotland) Act Marine Licence (replacing Section 5 Part II of the Food and Environment Protection Act (FEPA), 1985 and Section 34 of Coast Protection Act, 1949[2]);
- Planning permission (express or deemed) under the Town and Country Planning (Scotland) Act 1997;
- Lease of the seabed from TCE[3];
- Wayleaves and leases for onshore infrastructure development areas;
- Appropriate Assessment, under The Conservation of Habitats and Species Regulations 2010 (SI 2010 No 490) and The Offshore Marine Conservation (Natural Habitats, &c.) Regulations 2007/1842 (as amended); and
- Approval of a decommissioning programme under Energy Act 2004.

In addition to the above, further consents may also include:

- Harbour Works Licences from the relevant port or harbour authorities. 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);
- Approvals from Scottish Environment Protection Agency (SEPA) under Section 20 of the Water Environment & Water Services (Scotland) Act 2003 and Water Environment (Controlled Activities) (Scotland) Regulations 2005 for activities liable to pollute or significantly affect the water environment; and

[2] From April 2011, a Single Marine Licence granted under the Marine (Scotland) Act 2010 and UK Marine and Coastal Access Act 2009 will replace the requirement for Coastal Protection Act consent and a FEPA licence.
[3] TCE issue leases for the development of Marine Renewable developments within the 12nm territorial limit.

- Under The Conservation (Natural Habitats, & c.) Regulations 1994 a European Protected Species licence may also be required.

The applicable legislation to the licences and consents required for the Westray South tidal array development are discussed in further detail in the following sections below.

4.5.1 Electricity Act 1989 ('S36 Consent')

Section 36 of the Electricity Act 1989 is the primary consent required from the Scottish Ministers (administered by Marine Scotland on their behalf) for the construction and operation of a tidal power generating station with a capacity of 1 megawatt (MW) or more. Consent for the construction and operation of both phases of the development will therefore be sought under Section 36.

As part of a Section 36 Consent, the Scottish Ministers can also grant deemed planning permission for associated onshore works under Section 57 of the Town and Country Planning (Scotland) Act 1997. Alternatively, onshore works from Mean Low Water Spring (MLWS) can also be consented by the onshore planning authority under the Town and Country Planning (Scotland) Act 1997.

4.5.2 Electricity Act 1989 ('S37 Overhead power lines')

Section 37 of the electricity Act 1989 requires consent from Scottish Ministers for the construction of most overhead electric lines. Overhead electric lines may need to be installed between the onshore substation and the electricity network.

4.5.3 Marine Licence (Section 16)

From April 2011, under the Marine (Scotland) Act 2010 a single Marine Licence has replaced the previously separate FEPA and CPA licences required under Section 5, Part II Food and Environment Protection Act 1985 (FEPA licence) and Section 34 of the Coastal Protection Act 1949 (CPA licence). Developers will be able to submit their application for a Marine Licence alongside their S36 consent application to MS-LOT.

A Marine Licence will be required for the Westray South tidal array due to the installation of the support structures, devices and associated cabling being considered as a deposit by construction activity both in the sea and or under the seabed as described within the legislation.

4.5.4 Town and Country Planning (Scotland) Act 1997, Section 57

A request to the Scottish Government for planning permission under Section 57 of the Town & Country Planning (Scotland) Act (i.e. deemed planning permission) can be made as part of the Section 36 application process, therefore removing the need for a separate planning application.

4.5.5 Energy Act 2004

Sections 105 – 114 of the Energy Act 2004 introduce a decommissioning scheme for offshore wind and marine energy installations. Due to the decommissioning responsibilities not being devolved to Scotland all licensing requirements lie with the Department of Energy and Climate Change (DECC), under the terms of the Act, the Secretary of State may require a person who is responsible for one of these installations to submit (and ultimately carry out) a decommissioning programme for the installation. SSER will produce a decommissioning programme for the Westray South tidal array as per the DECC guidance Note standards 2011.

4.6 Conservation regulations

4.6.1 Habitat Regulation Appraisal

Under the Conservation (Natural Habitats, etc & C) Regulations 1994 (as amended by the Conservation of Habitats and Species Regulations 2010 and the Offshore Marine Conservation (Natural Habitats, etc & C.) (Amendment) Regulations 2010), where a development is proposed in or near to a Natura 2000 site, or in an area recognised as an important site for marine species which are a feature of a Natura 2000 site, the competent authority should determine, and inform the developer as early as possible, on the requirement to undertake an Appropriate Assessment (AA) prior to granting the relevant consents and licenses for development.

The AA tests whether a plan or a project is likely to have a significant effect on a European and/or Ramsar site, species or habitat. The Habitats Regulations also require that, in determining whether a plan or project is likely to have a significant effect on a European site the plan or project should be considered both alone and in-combination with other plans or projects.

4.6.2 European Protected Species (EPS)

For any European Protected Species (EPS)[4], Regulation 39 of the Conservation (Natural Habitats, &c.) Regulations 1994 makes it an offence to deliberately or recklessly capture, kill, injure, harass or disturb any such animal. An EPS Licence is required for any activity that might result in disturbance to EPS. In the case of the Westray South tidal array any requirement for an EPS Licence would be on advice from SNH to Marine Scotland as the licensing authority.

Questions to be put forward to MS-LOT
Q4 Can Marine Scotland issue deemed planning consent through the Section 36 process for the onshore elements of this project?
Q5. Have all the regulatory requirements for the Westray South tidal array been identified?

[4] EPS include all cetaceans and otters amongst other species

5 POSSIBLE IMPACTS ON THE HUMAN ENVIRONMENT

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

- Local communities;
- Commercial fisheries;
- Shipping and navigation;
- Ports and harbours;
- Utilities;
- Disposal sites;
- Landuse;
- Seascape and landscape;
- Archaeology and cultural heritage;
- Ministry of Defence (MOD) areas;
- Aviation;
- Tourism;
- Other renewables; and
- Onshore traffic and transport.

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

5.1 Local communities and socio-economics

5.1.1 Baseline

Population - The population of Orkney has been slowly increasing since a 2002 figure of 19,210 and was estimated to be 19,973 in 2009 (OIC, 2010).

Employment - Figures for 2008 and 2009 show that approximately 10% more of the working age population of Orkney are economically active as compared to statistics for Scotland and the UK (OIC, 2010). The vast majority of employees work in the services, public administration, education and health, and distribution, hotels and restaurants industries.

Income - Data from the Office for National Statistics shows that income levels in Orkney are 15% lower than Scottish mean levels and 5% lower than Scottish median levels (Office for National Statistics, 2011). Note that mean and median figures for Scotland are lower than those for the UK.

Fuel poverty - In Orkney the climate, high fuel costs and low incomes mean that 46% of households are in fuel poverty compared with the Scottish average figure of 26.5% (Scottish Government, 2010).

Education - Academic standards are above the national average and teacher/pupil ratios are among the lowest in Scotland. Orkney also has amongst the highest proportion of school leavers going into higher and further education in Scotland.

Public services - Orkney enjoys good levels of public services, many of them provided and managed by Orkney Islands Council.

5.1.2 Potential impacts

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

Potential impact	Phase	Potential significance	Comment
Local employment and business opportunities	All	Beneficial impact	There will be significant opportunities for local residents and businesses to become involved at various stages of the project. Local content in contracts will help to ensure that opportunities are maximised.

Potential impact	Phase	Potential significance	Comment
Wage inflation	All	Potential significance of impact unknown	The project may attract a significant number of high wage earners to the Islands resulting in slight wage inflation
Improvements to infrastructure and facilities	All	Beneficial impact	External investment into infrastructure i.e. ports, grid, public service facilities to meet increased demand etc
Population increase	All	Potential significance of impact unknown	Jobs created by the project may cause an influx of workers into Orkney leading to a population increase.
Change in population distribution	All	Potential significance of impact unknown	Workers associated with the project may wish to live close to the AfL or main ports which could cause a change in the distribution of population.
House price inflation	All	Potential significant impact	An increase in population caused by an influx of workers associated with the project could lead to an increase in demand for property causing house price inflation. This could create a barrier for first time buyers trying to get on the property ladder and/or push up rent for locals.
Pressure on local utility services	All	Potential significance of impact unknown	An increase in population caused by an influx of workers associated with the project could lead to an increase in demand for utility services beyond present capabilities.
Improvements to local transport services	All	Beneficial impact	An increase in population caused by an influx of workers associated with the project could lead to an increase in demand for transport services providing stimulus for improvement

5.1.3 Baseline characterisation strategy:

It is proposed that baseline conditions regarding local communities can be further defined to sufficient detail by completing the tasks outlined in the table below:

Data gap	Methodology	Example data sources
Population numbers	Gather census data and other sources	Scottish economic statistics

Data gap	Methodology	Example data sources
and distribution through settlements		OIC statistics HIE statistics
Employment by sector and wages	Survey businesses directly, discuss with business organisations, HIE, and OIC	Scottish economic statistics OIC statistics HIE statistics
Supply chain capacity, capability and aspirations	Survey companies directly, discuss with business organisations, HIE, and OIC	Scottish economic statistics OIC statistics HIE statistics Crown Estate commissioned research into the economic impacts of marine energy projects Scottish Enterprise
House availability, pricing and standards	Liaise with Orkney Housing, OIC and local house builders	Orkney Housing OIC Local building companies
Infrastructure and facilities investment	Create a catalogue of investment plans	OIC, HIE and business organisations

SSER plan to begin baseline characterisation investigations by the end of 2011

5.1.4 Impact assessment strategy

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

Potential impact	Assessment topics	Assessment method	Relevant research
Local employment and business opportunities	Amount and type of employment Pulling employees from other key roles Scale and type of contracts	Strategic level economic impact assessment	Multipliers for economic benefit Multipliers for economic benefit
Wage inflation	Average wages and wages per sector		Previous instances of rapid growth
Improvements to infrastructure and facilities	Identify local community investment targets and assess compatibility		None

Change in population distribution	impacts on existing residents from increase housing and services demands		None
House price inflation	Change in house prices		None
Pressure on local utility services	Mark out utility networks		None
Improvements to local transport services	Existing service provision		None

5.1.5 Possible mitigation and monitoring measures

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

Potential impact	**Mitigation measures**	**Monitoring during installation**	**Post-deployment monitoring**
Local employment and business opportunities	SSER will investigate measures which can help to facilitate local business involvement.	Track numbers Track local content in contracts	None proposed
Wage inflation	Track wage levels	Scottish and local stats	None proposed
Improvements to infrastructure and facilities	Monitor level and type of investment	Direct catalogue	None proposed
Distribution of population	Track level	Use local monitoring data	None proposed
House price inflation	Track level	Use local monitoring data	None proposed
Pressure on local utility services	Early notification of any needs Monitor any issues	Direct catalogue	None proposed
Improvements to local transport services	Track level of activity	Ferry and air route operators	None proposed

5.2 Commercial fisheries

5.2.1 Introduction

This section discusses Commercial fisheries. Navigation with regards to fishing vessels in discussed in 5.3 Shipping and Navigation and in Appendix C PHA.

5.2.2 Baseline

The number of active fishing vessels based in Orkney was 152 in 2009 which is just under 7% of the Scottish total. The majority (110 out of the 152 vessels) of active vessels based in Orkney are 10m and under. An additional 35 vessels are between 10 – 15m. The remaining 7 vessels are between 15-50m. The value of fish landed by Scottish based vessels into Eilean Siar, Orkney and Shetland totalled £78.1 million in 2009 and employed 1,328 fishermen (3.79% of the labour force). Of these 421 fishermen operate out of Orkney. About 60% of these are regularly employed as fishermen. The majority of landings into Orkney are shellfish with 3,350t (with a value of £6,259,000) landed in 2009 compared to 1t of demersal fish and 3t of pelagic fish (with a value of £1,000 and £3,000 respectively) [5]. These figures can be compared to a GVA (Gross Value Added) for Orkney in 2007 of 141 million[6].

The core development area lies in a region of strong tides with a relatively flat and featureless seabed, which holds little by the way of fish or shellfish populations, and which is difficult to fish in; particularly in rough sea and weather conditions. Fishing activity within the AfL area is limited to creeling. The area is unsuitable for any kind of trawling. The Westray Firth is also used for passage by vessels from Orkney and by vessels from NE Scotland to and from the fishing areas west of Orkney.

The peripheral areas around the AfL area are more regularly used by creel fishermen for lobster (generally in waters shallower than 20m) and for crabs (generally shallower than 50m). These fishermen are based in several different areas of Orkney including Rousay, Eday, Westray and Tingwall (Mainland). Hand gathering of scallops by divers also takes place around the edge of tidal streams such as the Westray Firth. It is assumed that scallop

[5] Scottish Sea Fisheries Statistics (Scottish Government, 2009)

[6] Orkney Economic Review 2010

diving does not occur within the AfL area itself but most likely will take place within cable corridors to shore with suitable seabed habitats.

Creel fishing and scallop diving are two essential contributing factors to Orkney's successful fishing industry; a key source of livelihood for a significant proportion of the local community.

5.2.3 Potential impacts

Possible impacts along with the potential significance of effect on commercial fisheries are considered in the table below:

Potential impact	Phase	Potential significance	Comment
Loss of access to fishing grounds	Installation, operation and maintenance	Potential significant impact	It is known that the AfL area and the wider area is actively used by both creel and dive fishermen.
Obstruction to regular fishing vessel transit routes	Installation, operation and maintenance	Potential significance of impact unknown	Larger fishing vessels use parts of the AfL as a regular transit route to/from fishing grounds. It is also assumed that smaller vessels transit the AfL area and the adjacent coastal area on a highly regular basis to reach other fishing grounds within and outwith Orkney.
Change in abundance of targeted species	Operation	Potential beneficial impact	The addition of new structures at the seabed, which may provide some degree of shelter from strongest tidal currents, may provide suitable shelter for some commercial species.

5.2.4 Baseline characterisation strategy:

It is proposed that baseline conditions regarding commercial fisheries can be further defined to sufficient detail by completing the tasks outlined in the table below:

Data gap	Methodology	Example data sources
Establish the types and level of fishing activity within and around the AfL area, any offsite storage/ maintenance areas and along potential cable corridors	Through targeted consultation with OFA and local fishermen, the types and level of fishing activity undertaken in and around the AfL area/along the cable corridors will be established.	Liaison with OFA (commenced and ongoing) as first point of contact.

Data gap	Methodology	Example data sources
		Consultation with local fishermen
		OFA fisheries mapping exercise
		MS Inshore Fisheries Study
Establish any potential fishing 'hot spots' within the AfL area, any offsite storage/ maintenance areas and along potential cable corridors	Through consultation with local fishermen (particularly creelers and divers), identify whether any hot spots exist within or around the AfL area/along the cable corridors.	Consultation with local fishermen AIS and VMS data
Establish the 'use patterns' of any hot spots	Through consultation with local fishermen, establish when, how often, within which weather systems, during which tides etc each hot spot is particularly utilised.	Consultation with local fishermen
Establish the number and types of fishing vessels transiting the AfL area to reach other fishing grounds	Using existing data and through consultation with SFF, MS, OFA and local fishermen, the types and numbers of vessels using the Westray Firth as a transit route to/from fishing grounds/ports will be determined.	AIS and VMS data EMEC vessel observations Experience of local mariners, especially ferry crews

SSER plan to commence baseline characterisation investigations by the end of 2011.

5.2.5 Impact assessment strategy

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

Potential impact	Assessment topics	Assessment method	Relevant research
Loss of access to fishing grounds	Relative economic and social value of AfL area and cable corridors in terms of commercial fishing.	Determine what use is made of key areas. Discuss with local fishers the implications of any disruption to any fishing activity.	Marine Scotland is currently undertaking an Inshore Fisheries Study. Orkney Fisheries Association OFA is currently engaged in a fishing data

Potential impact	Assessment topics	Assessment method	Relevant research
		Establish the relative value of catch for the relevant areas through consultation with local fishermen and OFA.	gathering exercise.
	Availability of other suitable areas	Discuss with local fishers the availability of any alternative sites for fishing during times that the AfL area and peripheral area is normally most utilised for fishing.	Application of the redistributed effort models developed by Jon Side at ICIT.
	Potential opportunities within the AfL area in conjunction with the proposals	Consider the extent of habitat creation associated with the development. Establish a notional density of shellfish per amount of habitat. Liaise with OFA and local fishermen to identify potential opportunities.	None identified
Disruption to regular fishing vessel transit routes	Potential for a suitable channel through/around the AfL area/proposed development area	Use sea-routing skills, AIS and VMS data to establish options for routing and consult with OFA, local fishermen and navigational experts on potential ways forward.	Shipping channels are established throughout the world.
	Availability of other suitable routes	Use sea-routing skills, AIS and VMS data to establish options for routing and consult with OFA, local fishermen and navigational experts on potential ways forward.	Shipping channels are established throughout the world.
Change in abundance of	Potential for habitat and population enhancement	Liaise with lobster hatchery and local experts	Ongoing experimental habitat enhancement trials

Potential impact	Assessment topics	Assessment method	Relevant research
targeted species		in shellfish behaviour over possible attributes to artificial habitats. Establish the design options available for structures in relation to promoting population stocking.	at EMEC with the local lobster hatchery.

5.2.6 Possible mitigation and monitoring measures

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

Potential impact	Mitigation measures	Monitoring during installation	Post-deployment monitoring
Loss of access to fishing grounds	Liaise with local fishers in establishing the deployment plan. Collate best available information with regard to fishing activities and possible interactions with the proposed development.	None	Liaise with OFA and local fishermen to quantify the extent of any effects which may be linked to the development.
Obstruction to regular fishing vessel transit routes	Evaluate options to maintain a transit route through ongoing consultation with SFF, OFA and local fishermen.	None	AIS and VMS records plus direct observations

5.3 Shipping and Navigation

5.3.1 Introduction

This section identifies the baseline, potential impacts and strategy for shipping and navigation. A Preliminary Hazard Analysis (PHA) has been completed (Appendix C) and is summarised in Chapter 9. Non-navigation impacts for commercial fisheries, recreation and tourism receptors are discussed in 5.2, 5.12 and 5.13 respectively.

5.3.2 Baseline

Full details of shipping movements though the AfL and adjacent waters are presented in the NRA PHA in Appendix 3.

The Westray Firth is an important, navigation channel between the North Isles and the Orkney mainland and between the Atlantic and the North Sea. It is particularly important for ferries transiting from Kirkwall to the North Isles, and for vessels supporting tidal energy deployments in the Fall of Warness. The full range of vessels using the Westray Firth and its approaches are as follows:

- Ferries;
- Fishing vessels (of all classes);
- Merchant vessels;
- Recreational craft;
- Cruise liners;
- Support vessels for marine energy projects;
- Lighthouse supply ships; and
- Water taxis and other charter vessels.

The Westray Firth has been utilised by the inter-island ferries since services began. These ferries not only provide a lifeline services for residents of the Inner and Outer North Isles but also a valuable source of trade and tourism which contributes greatly to the local economy.

The Westray Firth is a particularly dynamic environment and is renowned for its tidal currents and rough conditions in certain areas, during certain tidal states and weather conditions. Navigation is therefore already challenging through the area. In addition to this, inshore waters and some approaches to the main channel are regularly creeled; adding further obstacles to navigation.

Activity between the harbours and the EMEC tidal test site off Eday has also seen a general increase in vessel movements through the local area in recent years. This is likely to increase in the coming years with more devices being installed on the EMEC site. Near to Kirkwall the opening of EMEC's nursery tidal test site off Shapinsay will add to the levels of harbour traffic.

5.3.3 Potential impacts

Possible impacts along with the potential significance of effect on shipping are considered in the table below:

Potential impact	Phase	Potential significance	Comment
Disruption to navigation created by devices or any required marine exclusion zone	Construction, operation, maintenance, decommissioning	Potential significant impact	Submerged devices are proposed for the Westray South site. Clearance between blade tips and LAT would likely vary across the development but in many places would be down to 5m.
Disruption to navigation created by support vessels	Construction, operation, maintenance, decommissioning	Potential significant impact	The many surface vessels needed for the operation will cause an obstacle during installation, maintenance and decommissioning.
Loss of or change to traditional navigation routes	Construction, operation, maintenance	Potential significant impact	The Westray Firth and the adjacent Fall of Warness have well established routes for safe passage during poor sea conditions. Any alterations to these routes would need careful management and consultation.

5.3.4 Baseline characterisation strategy:

It is proposed that baseline conditions regarding shipping and navigation can be further defined to sufficient detail by completing the tasks outlined in the table below (for additional baseline characterisation measures, please refer to the PHA in Appendix C):

Data gap	Methodology	Example data sources
Vessel traffic survey	A vessel traffic survey will be undertaken in line with the requirements of MGN 371 and DTI's Guidance on the Assessment of the Impact of Offshore Wind Farms (2004) as part of the project NRA which will inform the wider EIA.	Automatic Instrument System (AIS) Vessel Monitoring System (VMS) Feedback from local mariners Orkney Harbours VTS, Northern Lighthouse Board, Maritime and Coastguard Agency, Chamber of Shipping; Harbour Master; Royal Yachting Association, Royal National Lifeboat Institution;
Fishing vessel movements	Discussions with key organisations and fishermen	Orkney Fisheries Association Scottish Fishermen's Federation Vessel Monitoring System (VMS) Orkney Harbours VTS
Recreational boating	Discussions with local yacht skippers and motor boat skippers, Orkney Marina's	Orkney Marina's committee and members Orkney Harbours VTS RYA
Cruise liners	Discussions with promoters of cruise liner services and specific captains	OIC Marine Services Orkney Harbours VTS

SSER plan to begin baseline characterisation investigations by the end of 2011 and extend through to summer 2012.

5.3.5 Impact assessment strategy

It is proposed that the following strategy is followed to assess the potential impacts on shipping and navigation (please note that any detailed methodologies are presented in the PHA in Appendix C):

Potential impact	Assessment topics	Assessment method	Relevant research
Disruption to navigation created by devices	Undertake a full Navigational Risk Assessment	Traffic survey Trajectory modelling for drifting ships Collision modelling Consequence	Failure rates in vessels
Disruption to navigation created by	Undertake a full Navigational Risk		Failure rates in vessels

support vessels	Assessment	assessment Plunge depth assessment	
Loss of or change to traditional navigation routes	Undertake a full Navigational Risk Assessment	Consultation with local seafarers	None

5.3.6 Mitigation and monitoring strategy

The following possible mitigation and monitoring measures will be considered during future ongoing EIA and project development activities (please refer to the PHA in Appendix C for possible additional measures):

Potential impact	**Mitigation measures**	**Monitoring during installation**	**Post-deployment monitoring**
Disruption to navigation created by devices	Maximise potential keel clearance during device and support structure design and site layout	Operational reporting	AIS surveillance VTS surveillance
	Marking and Lighting, Chart Depiction & Local Information Circulation. The sea room available for vessels will be investigated in the NRA and EIA once the layout have been developed and discussed with maritime stakeholders.	Operational reporting	AIS surveillance VTS surveillance
Disruption to navigation created by installation and support vessels	Consideration of the approach to installation, O&M and decommissioning to include minimisation of navigation disruption	Operational reporting	AIS surveillance VTS surveillance
Loss or change to traditional safe	Early discussion and dialogue with local	None	None

Potential impact	Mitigation measures	Monitoring during installation	Post-deployment monitoring
passage routes	seafarers over plans. Establish any new regime in advance of the devices being installed		

5.4 Ports and harbours

5.4.1 Introduction

This section discusses ports and harbours. Impacts associated with road networks are discussed in Section 5.15.

5.4.2 Baseline

The nearest port to the study area is Kirkwall located approximately 24km to the south of the project lease area on the north coast of the mainland of Orkney (refer to Figure 5.1).

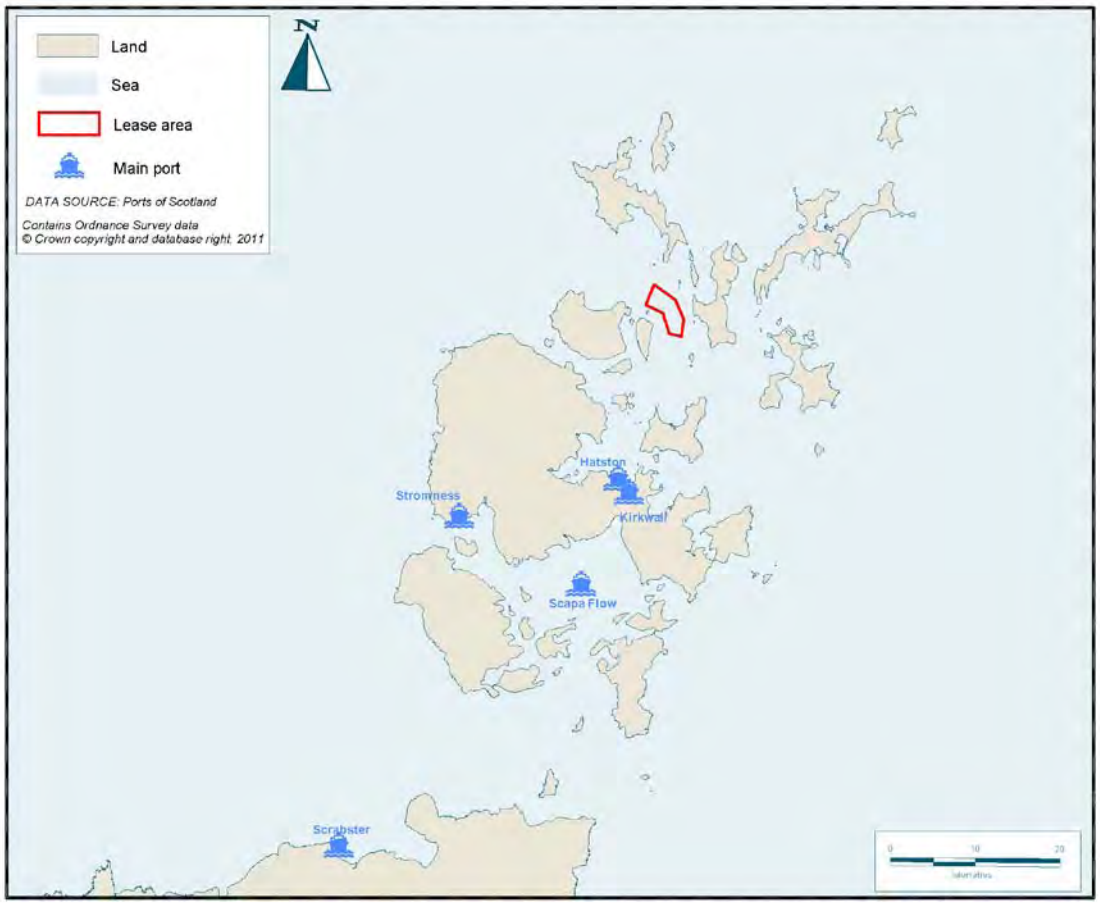

Figure 5.1 Location of main ports and piers in the vicinity of the AfL

Kirkwall has two harbour areas, in Kirkwall harbour and at Hatston:

- Kirkwall Pier - Located at the south end of Kirkwall Bay with 750 metres of quayside at a depth of up to 5 metres at LAT[7]. The piers are mostly used by inter-island ferries, merchant vessels, fishing vessels, recreational craft and shallow draft cruise liners. The Lifeboat is based at the West Pier in Kirkwall. The piers and the slipway are important bases for local creel and scallop dive boats which land catch there on a daily basis. The harbour area and approaches are therefore, always busy with small to medium sized fishing vessels. There is a marina within the harbour with 95 berths for vessels up to 20m. The marina is particularly busy in summer months with vessels present all year round.

- Hatston Pier – There is a ro-ro facility offering berthing of 150 meters with a minimum depth of 8 meters at LAT. In addition there are three large berth areas. There are plans to extend Hatston Pier in preparation 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.

Figure 5.2 View of Hatston and Kirkwall Piers

[7] Orkney ports handbook 4th edition (OIC Marine Services, 2010)

There are other smaller piers and harbours within the area that may be used by smaller vessels throughout the project i.e. survey and maintenance vessels.

5.4.3 Potential impacts

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

Potential impact	Phase	Potential significance	Comment
Opportunity for expansion of existing port infrastructure.	All	Beneficial impact	The main ports (Kirkwall and Hatston) are near capacity with existing users and are likely to reach capacity during busy periods due to increased activity at the EMEC tidal test sites in the coming years. Major upgrade works are about to commence at Hatston which will increase available quayside space considerably which will help to accommodate any additional vessels which will operate out of the area as part of these proposals. There are also plans to increase adjacent onshore space available for project developers in the Hatston Industrial Estate Area. Whilst no decision has been made, it is recognised that the project will require both a loadout and operational base.

5.4.4 Baseline characterisation strategy:

It is proposed that baseline conditions regarding ports and harbours can be further defined to sufficient detail by completing the tasks outlined in the table below:

Data gap	Methodology	Example data sources
Distribution of ports infrastructure	Map of ports infrastructure	Orkney Islands Council, Marine Services & Economic Development Dept.
Patterns of port use	Monthly berthing fees of berth meters used	Orkney Islands Council, Marine Services

SSER plan to begin baseline characterisation investigations by the end of 2011.

5.4.5 Impact assessment strategy

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

Potential impact	Assessment topics	Assessment method	Relevant research
Overcapacity for ports infrastructure	How much capacity will be needed	Analysis of future work tasks	None
	Where, when & by who could this capacity be best provided	Defined on basis of business plan	None

5.4.6 Possible mitigation and monitoring measures

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

Potential impact	Mitigation measures	Monitoring during installation	Post-deployment monitoring
Overcapacity for ports infrastructure	Good forward planning	None	None

5.5 Utilities

5.5.1 Baseline

5.5.1.1 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. Further cables within the vicinity include two 11kV cables that link the islands of Egilsay and Wyre to Rousay. These cables are shown in Figure 5.3.

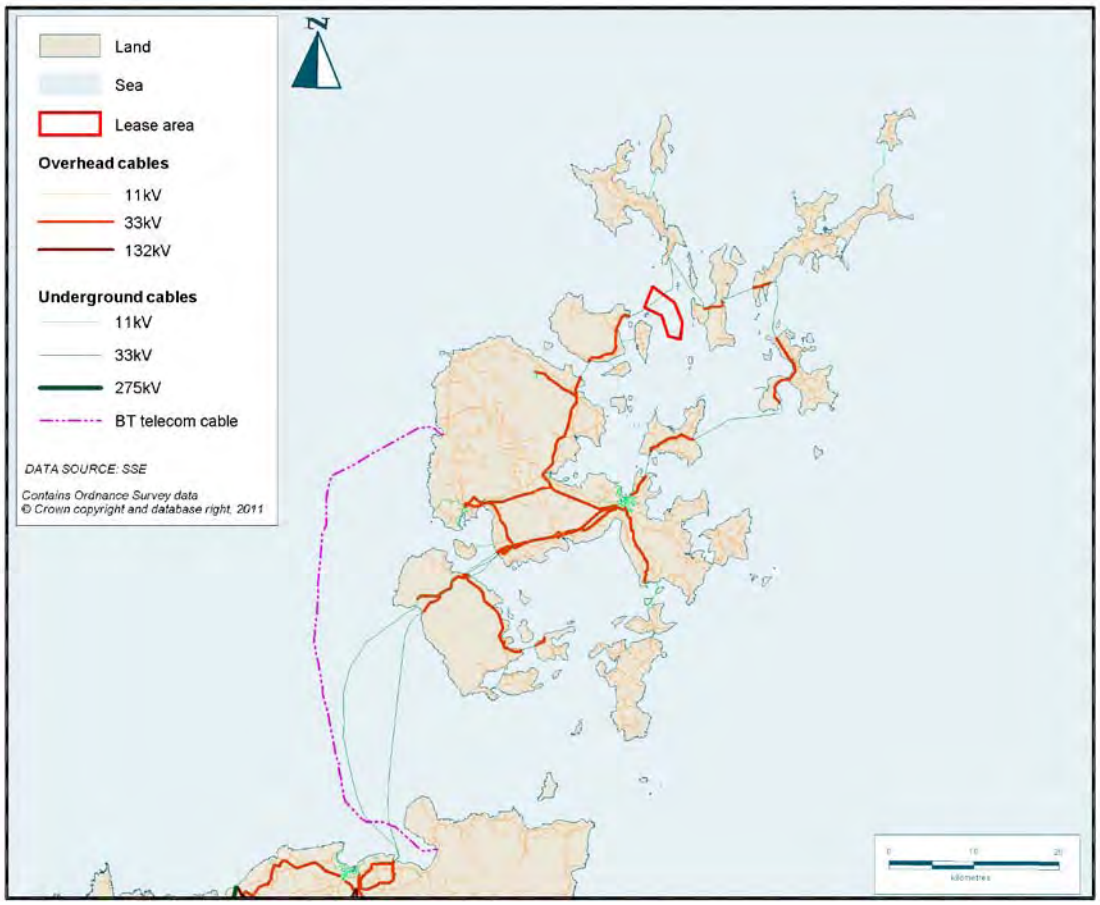

Figure 5.3 Electrical and telecoms cables in Orkney

This project, along with the other renewable energy generation projects in the Pentland Firth and Orkney Waters Leasing Round, will require improvements to the existing onshore and offshore transmission grid network. These improvements are currently planned by SHETL, and will be required to go through the statutory planning and regulatory processes.

The SHETL grid works would include a substation on the West Mainland of Orkney, underground cables to the landfall and subsea cables between Orkney and Caithness. Four substation site options are currently being discussed (refer to Figure 2.1).

The initial Caithness to Orkney upgrade is based on a 132 kV AC cable which would be capable of exporting up to 180MW and is proposed to be commissioned by early 2016. Grid connection capacity is then proposed to be further increased by 2020 with the construction of an HVDC subsea connection which would be capable of exporting a further 600MW. The 132 kV AC and 600 MW HVDC connections would both utilise the same substation compound in West Mainland.

5.5.1.2 Telecoms network

As shown in Figure 5.3 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 buried cables along side roads. This will be confirmed during the EIA in consultation with the telecoms operator.

5.5.1.3 Water distribution network

Water pipes follow the road network along which most dwellings are located. Many of the individual and remoter properties will be served by septic tanks for sewage. This will be confirmed during the EIA in consultation with Scottish Water.

5.5.2 Potential impacts

Possible impacts along with the potential significance of effect on utilities are considered in the table below:

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 Westray South grid connection there is the possibility that this could strengthen the existing grid network. This may create opportunities for other

Potential impact	Phase	Potential significance	Comment
			renewable projects, including community wind projects, to connect into the planned hub and export power to the national grid.
Potential impacts on electrical grid, telecoms and water network during construction and installation	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	Presence of all utility networks will be fully investigated. Any disruption will be localised and temporary with prior notice and alternative supplies provided where appropriate.

No potentially significant impacts have been identified and utilities are therefore, scoped out of the EIA. It is proposed that the relevant stakeholders are consulted during the project design process to ensure that no potential issues arise and that existing utilities infrastructure can be avoided.

5.6 Disposal sites

5.6.1 Baseline

5.6.1.1 Dredged Material

There are five licensed disposal sites for dredged material around Orkney (Baxter *et al*., 2011) four of which are in or around Scapa Flow and one which is north of Kirkwall. A disposal site for silt, sand gravel or rock between Sanday and Stronsay is also shown on maps contained within the Scottish Marine Renewable SEA, although this site is not shown in the Marine Atlas and may be a historic site that is no longer used as the SEA data includes sites active within the last 10 years and the Marine Atlas data does not show historic disposal sites.

The only site relevant to the proposals is the site north of Kirkwall which is a dredge spoil disposal site used for maintenance of the approaches to the harbour and specifically, the 'basin' between the main piers. This site lies approximately 15km from the AfL.

5.6.2 Potential impacts

Possible impacts along with the potential significance of effect on disposal sites are considered in the table below:

Potential impact	Phase	Potential significance	Comment
Potential disruption to existing disposal site activity	All	No impact	Given the distance from the proposed development, no impact on existing disposal site activity with the harbour is anticipated.

No potentially significant impacts have been identified and disposal sites are therefore, scoped out of the EIA. It is proposed that SEPA is consulted during the EIA to confirm that no changes in baseline conditions have occurred; particularly just prior to ES preparation and Licence Application submission.

5.7 Land use

5.7.1 Baseline

The predominant land use across much of Orkney is agriculture (Barne *et. al*., 1997). The majority of land on the islands that surround the Westray Firth is used for agricultural grazing with small areas of crofting peat cutting also present (Figure 5.4). The land use on Mainland Orkney is broadly similar to that of the islands that surround the Westray Firth.

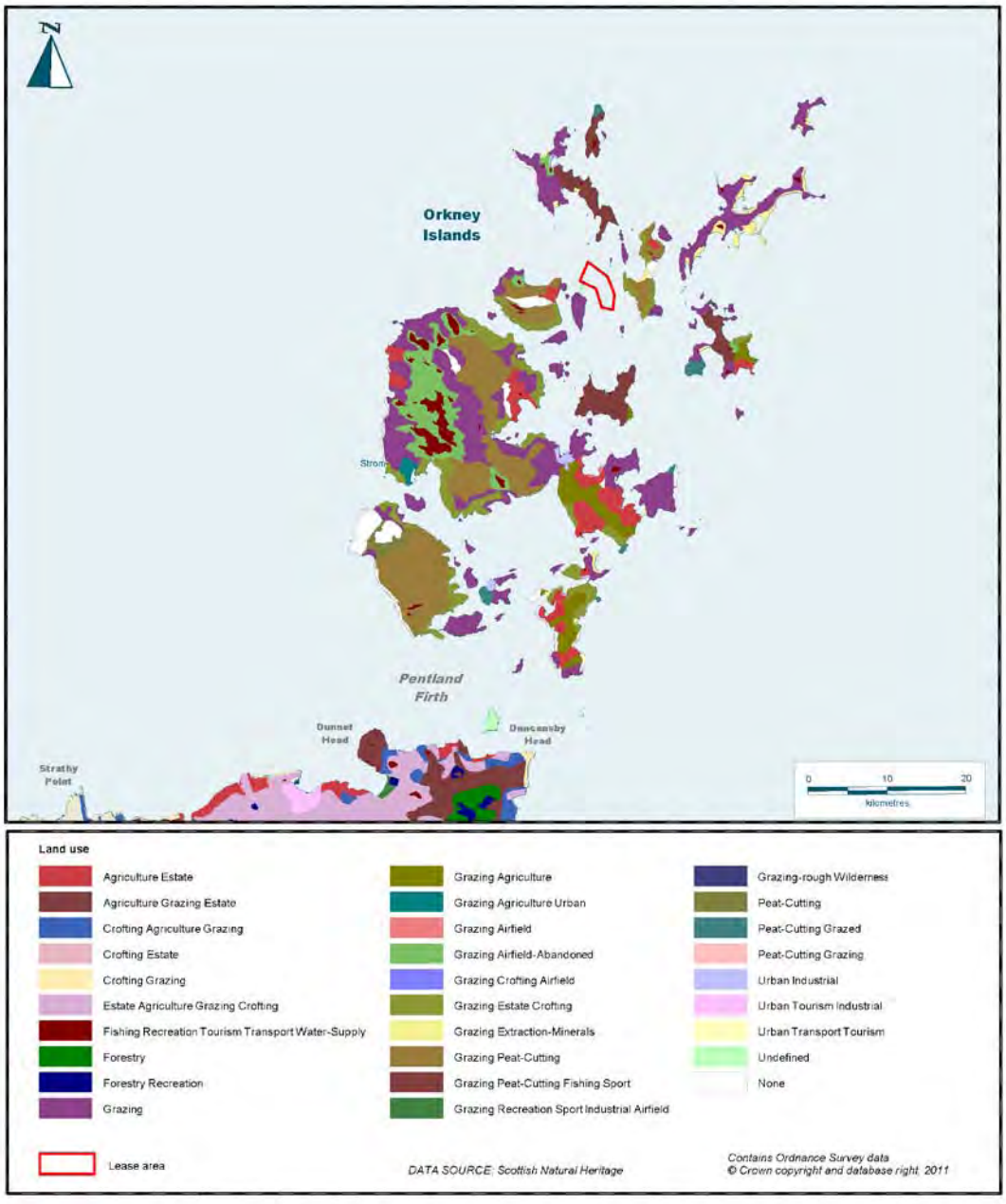

Figure 5.4 Land use across Orkney

Within the study area are a number of farms, dwellings and small villages. Disused quarries and airfields are present on Mainland, along with a small sewage works, a transmitting station, a small wind farm and campsite. Nature reserves are present on Egilsay and Rousay.

5.7.2 Potential impacts

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

Potential impact	Phase	Potential significance	Comment
Changes to landuse from construction of onshore buildings	Construction and operation	Potential significance of impact unknown	Construction of any onshore substation infrastructure would require a change in landuse from agricultural land over a limited area
Nuisance or obstructions to landuse from construction and presence of overhead or buried cables	Construction and operation	Potential significance of impact unknown	Construction of a new grid connection would place restrictions on future changes to land use along the grid connection routes (restriction on construction of buildings directly above or below electrical wires). Selection of the grid connection route will consider likely future landuse so as to minimise any potential impacts.

5.7.3 Baseline characterisation strategy:

It is proposed that baseline conditions regarding land use can be further defined to sufficient detail by completing the tasks outlined in the table below:

Data gap	Methodology	Example data sources
Describe distribution of land use activities	Map and describe the activities presently undertaken and any important trends	Local plan OS mapping
Distribution of services and utilities	Obtain GIS data of pipeline, cable and overhead wire routes	OS mapping BT Scottish water SHEPD
Distribution of	Obtain GIS data on roads and	OS mapping

roads and dwellings	dwellings	OIC engineering division

SSER plan to begin baseline characterisation investigations by the end of 2011.

5.7.4 Impact assessment strategy

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

Potential impact	Assessment topics	Assessment method	Relevant research
Changes to landuse from construction of onshore buildings	Amount of change to overall landuse activities	Percentage change	None
Nuisance or obstructions to landuse from construction and presence of overhead or buried cables	Access and other activities associated with landuse which may be affected	Percentage change	None

5.7.5 Possible mitigation and monitoring measures

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

Potential impact	Mitigation measures	Monitoring during installation	Post-deployment monitoring
Changes to landuse from construction of onshore buildings	Employment of a land agent who will seek to secure appropriate landowner agreements to permit construction of the grid connection	None	None
Nuisance or obstructions to landuse from construction and presence of overhead or buried cables		None	None

5.8 Landscape and Seascape

5.8.1 Introduction

This section discusses the proposed development in terms of landscape and seascape. Cultural heritage also forms an important part of the landscape, with tombs, brochs and military heritage recorded within the search area and setting of archaeological features is discussed in Section 5.9 Archaeology and Cultural Heritage.

5.8.2 Baseline

Orkney has a predominantly low and gentle relief, the smooth contours of which are emphasised by the general lack of trees and woodland cover. This landscape, though windswept, supports large areas of productive pastures and some arable farming. The onshore grid connection corridor search area is characterised by grassland, moorland, rough grazing, rural development, peatland and dunes, with high ground steeply rising from sea level on Rousay.

The islands are interlinked by ferries, with recreational sailing and cruise liners also occurring within the AfL and subsea cable corridor and offshore substation area of search. These factors, along with the close proximity of islands, mean the AfL and areas of search (including, potential landfall, substations and cable routes) would be visible from both land and sea view points. The Hoy and West Mainland National Scenic Area is also located immediately south of the onshore grid connection corridor area of search.

The Landscape Character of Orkney has been described by Land Use Consultants (1998), with twelve Landscape Characters identified within the search areas presented in Table 5.1 below. Island Character Assessments are also discussed for Rousay, West Mainland, and Egilsay, and sensitivities and guidelines for each island highlighted within Land Use Consultants (1998).

Table 5.1 Landscape Characters in Study Area

Landscape Characters in the study area		
Holms	Inclined Coastal Pasture	Loch Basins
Whale back Island Landscapes	Coastal Hills and Heath	Moorland Hills
Low Island Pasture	Peatland Basins	Isolated Coastal Knolls

Landscape Characters in the study area		
Rolling Hill Fringe	Enclosed Bay Landscapes	Cliff Landscapes

Based on a review of a series of landscape character assessments commissioned by SNH, The Scottish Marine Renewables Strategic Environmental Assessment (Faber Maunsell and Metoc PLC, 2007) identified the following seascape types within Orkney, all of which are present within the AfL and/or areas of search:

- Low Coastal Sand and Flat;
- High Cliffs;
- Inter-island associated with Outer-Island Chains; and
- Low Lying Agricultural Coastal Fringe.

5.8.3 Potential impacts

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

Potential impact	Potential significance	Phase	Justification
Changes to landscape character	Potential significance of impact unknown	Construction and Operation	The introduction of permanent man-made features, such as the substations and associated infrastructure, as well as alterations to existing landforms as a result of excavation/surface preparation may lead to changes in the existing landscape character. This is, especially the case where there is currently limited infrastructure adjacent to the coastline. Increased traffic and the introduction of lighting (structural/security) will also potentially alter landscape character significantly.
Changes to seascape character	Potential significance of impact unknown	Construction, Operation and decommissioning	Any infrastructure above the sea surface and/or the temporary increase in vessel traffic associated with the development has the potential to alter the seascape character locally during

Potential impact	Potential significance	Phase	Justification
			construction, operation and maintenance and decommissioning.
Changes to visual amenity	Potential significance of impact unknown	Construction and Operation	The development has the potential to change perception of the area from, for example, a wild or remote area to an active, working landscape. Such a change may be balanced by the perception by some receptors of the development as a point of interest in the local landscape.

5.8.4 Baseline characterisation strategy

It is proposed that baseline conditions regarding landscape and seascape can be further defined to sufficient detail by completing the tasks outlined in the table below:

Data gap	Methodology	Example data sources
SLVIA (desk-based and field survey)	As set out in Landscape Institute and the Institute of Environmental Management and Assessment (2002) guidelines. Consultation with Local Authority / stakeholder to identify sensitive viewpoints, including dwellings or areas of tourism	Landscape, Seascape and Island Character studies (SNH / Local Authority), Orkney Local Development Plan (Orkney Island Council, 2011), Ordnance Survey maps, consultation outputs, Ferry visibility based upon AIS data, reference to other relevant guidelines such as SNH guidance on 'Marine Aquaculture and the Landscape' and SNH's guidance on the Visual Representation of Windfarms (December 2007).

SSER plan to conduct baseline characterisation investigations in Quarters 2 and 3 of 2012.

5.8.5 Impact assessment strategy

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

Potential impact	Assessment topics	Assessment method	Relevant research
All	Key features, components and characteristics which determine the existing land and seascape and assessment of impacts during construction and operation	SLVIA	Landscape Institute and the Institute of Environmental Management and Assessment guidelines (Wilson, 2002)

5.8.6 Possible mitigation and monitoring measures

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

Potential impact	Approach to mitigation measures	Monitoring during installation	Post-deployment monitoring
All	Adherence to best practice. May include for sensitive design, siting and positioning of infrastructure Close consultation with relevant stakeholders during project design activities	To be determined through consultation and outcomes of SLVIA	To be determined through consultation and outcomes of SLVIA

5.9 Archaeology and Cultural Heritage

5.9.1 Introduction

The archaeological assessment will cover both marine and terrestrial archaeological elements.

Historic Scotland is responsible for nationally important onshore Scheduled Ancient Monuments and for the preservation of the marine archaeological resource within STW. Initial consultation has taken place with Historic Scotland, following circulation of the PBD.

The installation of the tidal devices, cable routing, substation(s), and other ancillary works could result in potential damage to any features of archaeological significance located within the vicinity of the scheme.

5.9.2 Baseline

5.9.2.1 Marine archaeology

Historic Scotland has confirmed there are no archaeological or cultural heritage designations within the footprint of the AfL area.

No designated wrecks are located within the vicinity of proposed landfall locations. Data provided by the Royal Commission on the Ancient and Historical Monuments of Scotland (RCAHMS[8]) does show that several, non designated, wrecks have been identified within the vicinity of the proposed offshore or cable landfall areas of search, including off the coasts of Egilsay, Rousay and west Mainland, and within Eynhallow Sound, and Rousay Sound (Figure 2.1).

The high energy marine environment found within the Westray Firth and West Mainland is not conducive to the conservation of wrecks and it is anticipated that wrecks will be rapidly broken up and dispersed within much of the study area. However, there is potential for wrecks to persist in more sheltered areas along a potential export cable route. Known wreck locations would be avoided during identification of potential development sites, including cable routes.

[8] www.pastmap.org.uk

During initial consultation Orkney Island Council (OIC) identified the greatest potential for archaeology as inundated bays, anticipating that coastal areas around all bays will have been inhabited at some point in the Norse period.

There is potential for submerged landscapes (archaeological sites on the seabed following sea level rise since the last ice age) to persist within Orkney waters, with the potential for this lowest in current swept areas. Consultation with the County Archaeologist has identified the potential for these features in 5m or less in depth, and the retention of potential depends on the depositional and erosional history of the seabed and will vary from place to place. In deeper waters the sea bed has potential to contain information related to the post-glacial inundation of Orkney.

5.9.2.2 Onshore built heritage

Data provided by the RCAHMS identifies in excess of 150 Scheduled Monuments across the islands within the onshore grid connection corridor search area, which potential cable route options may need to pass over or close to. Numerous non scheduled sites also occur in the study area, particularly around coastal margins where settlement has historically occurred. Further undiscovered sites may also be present. The Heart of Neolithic Orkney World Heritage Site was designated by UNESCO in 1999, incorporating a group of Neolithic monuments on Orkney. As tourism is a mainstay of many islands' economy, the setting of archaeological sites is important, and a consideration under Scottish Planning Policy (SPP).

5.9.3 Potential impacts

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

Potential impact	**Anticipated significance**	**Phase**	**Justification**
Physical disturbance of submerged historic and prehistoric land surfaces and archaeological finds (known and unknown)	Potential significance of impact unknown	Construction	Potential known and unknown features within the development footprint may be disturbed during construction activities.
Physical disturbance of terrestrial (onshore) sites and finds (known and unknown)	Potential significance of impact unknown	Construction	

Direct disturbance to the visual setting of Scheduled Monuments and effects on historic landscape character (both within and outwith the areas of search)	Potential significance of impact unknown	Construction and operation	Construction activities, cables and the substation itself may lead to impact on historic setting. Key views will need to be identified to enable assessment to be completed
Indirect disturbance of submerged historic and prehistoric land surfaces and archaeological finds as a result of changes to the hydraulic and sedimentary regime	Potential significance of impact unknown	Operation	Depends on location of historic features and predicted change to regime

5.9.4 Baseline characterisation strategy

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

Data gap	Methodology	Example data sources
Assessment of current records	Archaeological desk-based assessment (ADBA) using relevant guidance e.g. Institute of Field Archaeologists (2008). This will: Identify the known and potential archaeological resource in both terrestrial and marine environments; evaluate the importance of the sites that could be affected by the proposed scheme; Consider the visual impacts of the proposed scheme on the key heritage resource within the area of search (including Scheduled Monuments and Historic Landscape Character); Identify, in detail, past impacts on the area of search; Undertake a detailed assessment of the potential impacts of the proposed scheme on archaeological features; and Identify the nature of any further	Consultation with Scottish Natural Heritage, Historic Scotland, and the Council Archaeological Service. Sites and Monuments Record; NMR, UKHO, Receiver of Wreck, BGS boreholes, historic maps, etc. The results of all archaeological assessments will be archived through the Royal Commission on the Ancient and Historical Monuments of Scotland.

	work/surveys that may be required to fill any data gaps. Site walkovers, including an inspection of historic assets that may be visually impacted by the development. (may include sites outside the proposed development) Consultation with relevant stakeholders.	
Review of existing bathymetric and geophysical data in the area of search.	Desk review for anomalies and other indicators of archaeological interest Analysis of magnetometer and sub-bottom profiling data (where available)	Survey of area of search, and reference to the guidelines identified in '*Historic Environment Guidance for the Offshore Renewable Energy Sector*' (Wessex Archaeology Ltd, 2007) and '*Offshore Geotechnical Investigations and Historic Environment Analysis*' (Gribble and Leather, 2011).

SSER plan to conduct baseline characterisation investigations during 2012 as part of this survey the detailed bathymetric and geophysical survey will be undertaken.

5.9.5 Impact assessment strategy

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

Potential impact	**Assessment topics**	**Assessment method**	**Relevant research**
Physical disturbance of submerged historic and prehistoric land surfaces and archaeological finds;	As far as possible determine presence of indefinable	Desk reviews, reviews of bathymetric and geophysical data, stakeholder consultation,	Historic Scotland Guidance Note on setting[9]: Consultation with: Historic Scotland; Council

[9] http://www.historic-scotland.gov.uk/setting-2.pdf

Physical disturbance of terrestrial (onshore) sites and finds; Indirect disturbance of submerged historic and prehistoric land surfaces and archaeological finds as a result of changes to the hydraulic and sedimentary regime	features within onshore cable corridor, assessing importance of features, assess potential for submerged features within development footprint, landfall(s) and offshore cable route	assessment of features, site walk overs, potential for further surveys such as tidal excavations, depending on outcomes of ADBA and consultation Outcomes of ADBA to determine level of further work required e.g. excavations or analysis of marine engineering cores etc	Archaeology Service; Joint Nautical Archaeology Policy Committee (JNAPC); and Receiver of Wreck. Orkney Local Development Plan (Orkney Island Council 2011)
Direct disturbance to the visual setting of Scheduled Monuments and effects on historic landscape character	Consultation and assessment of features	Liaison with Historic Scotland and the EIA landscape architects in order to identify key views that will need to be assessed in terms of potential disturbance on setting.	

5.9.6 Mitigation and monitoring strategy

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

Potential impact	**Approach to Mitigation measures**	**Monitoring during installation (validating predictions)**	**Post-deployment monitoring (measuring impacts)**
All impacts	Assessment of features, avoidance where possible of significant /sensitive / scheduled features, consultation,	To be determined from ADBA, may include archaeological watching briefs during construction	To be determined from ADBA

5.10 Ministry of Defence (MOD) areas

5.10.1 Baseline

Scotland's coastal areas and seas are used for military training, surveillance and monitoring of potential threats, locating bases as well as testing and evaluation activities. A large proportion of the sea around Scotland is used for exercise activities by both UK and overseas armed forces. The closest defined MoD practice and exercise area is used by the Air Force and is about 24km to the south west of the AfL. Further to the south west, around Cape Wrath, there is also a Navy controlled firing practice area (Figure 5.5).

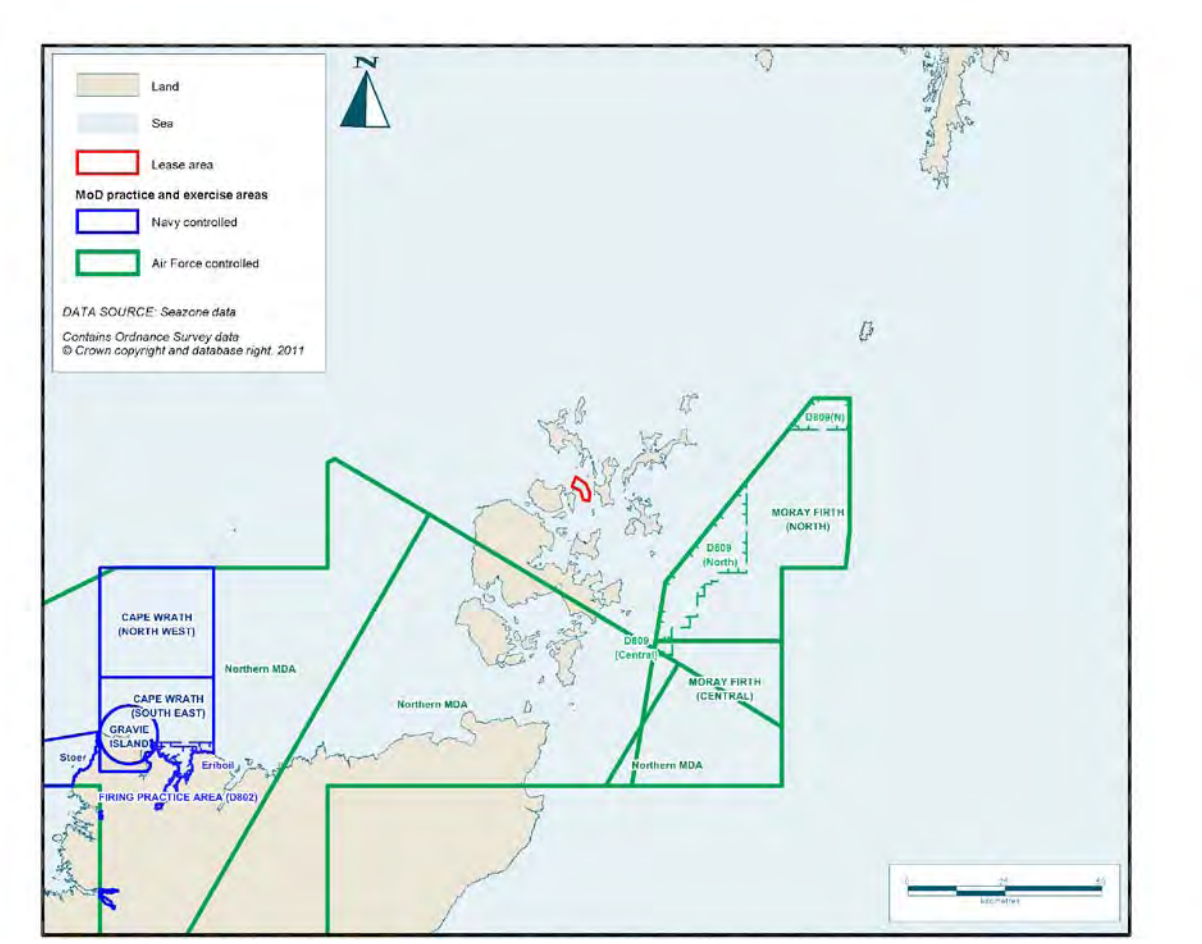

Figure 5.5 MoD areas in the region

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

5.10.2 Potential impacts

Possible impacts along with the potential significance of effect on MoD areas are considered in the table below:

Potential impact	Phase	Potential significance	Comment
Potential disruption to existing MoD activity	All	No impact	As shown in Figure 5.5 there are no exercise areas in the vicinity of the AfL likely to be affected by the proposals. Therefore, no effect on existing activity is anticipated.

No potentially significant impacts have been identified and MoD areas are therefore, scoped out of the EIA. It is proposed that the MoD is consulted during the EIA to confirm that no changes in baseline conditions have occurred; particularly just prior to ES preparation and Licence Application submission.

5.11 Aviation

5.11.1 Baseline

Flights into most of the major Scottish city airports are available from Kirkwall Airport, including Sumburgh, Inverness, Glasgow and Aberdeen. 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.

5.11.2 Potential impacts

Possible impacts along with the potential significance of effect on aviation are considered in the table below:

Potential impact	Phase	Potential significance	Comment
Disruption to aviation	All	No impact	There is no mechanism for impact on aviation arising from the proposals. The highest structure will be any offshore substation constructed

No potentially significant impacts have been identified and aviation is therefore, scoped out of the EIA.

5.12 Recreation

5.12.1 Baseline description

The following baseline description is split into onshore and offshore recreation.

5.12.1.1 Onshore recreation

The scenery, coastline, history and wildlife of the Orkney provide a major focus for much of the recreation in the county.

Angling is a popular activity in Orkney with a number of well-established local clubs. Lochs are commonly fished, particularly for trout. There is a wide variety of sports clubs with leagues and practices continuing throughout the year. Clubs and associations for wildlife, archaeology and photography also exist although much of the recreation in Orkney, such as walking, is on an informal basis.

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.

5.12.1.2 Offshore recreation

The water around Orkney is regularly utilised for various types of recreation; particularly, sailing, kayaking, surfing, water-kiting, 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 at Kirkwall, Stromness and Westray. All are popular with visiting and local boats (particularly yachts) and it is common for vessels to travel between the three. There are two RYA light recreational cruising routes through the area of search, while the whole area of search (and surrounding areas between the North Isles) is an RYA sailing area (Baxter et al., 2011).

Most recreational diving in Orkney occurs in Scapa Flow around wreck sites. There are no known recreational dive sites within the area of search, 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 currently no information held by the project team regarding the level of activity associated with angling and other recreational fishing within the AfL area, the wider area and at sites along the adjacent coastline. It is anticipated that small craft will be used for angling

in the majority of inshore waters at some point throughout the year and that the area of search is transited by recreational fishing vessels. Occasional rod fishing will occur at a number of locations around the adjacent coasts; particularly off piers and rocky outcrops.

5.12.2 Potential impacts

Possible impacts along with the potential significance of effect on recreation are considered in the table below:

Potential impact	Phase	Potential significance	Comment
Disturbance to offshore recreation activities during construction and maintenance works offshore	All	Potential significance of impact unknown	Only interaction is likely to be with yachting and boating. The waters of the Westray Firth are crossed regularly in the summer but not intensively. Maximum usage around Westray regatta and any Tall Ships type events
Disturbance to onshore recreation during onshore construction works and afterwards from presence of structures	All	Potential significance of impact unknown	All cable corridors and substation locations potentially have some recreational value; be it as a walking destination, through visual amenity etc. Therefore, the potential significance of the effects of erecting any structures within the proposed areas will be considered within the ES.

5.12.3 Baseline characterisation strategy

It is proposed that baseline conditions regarding recreation can be further defined to sufficient detail by completing the tasks outlined in the table below:

Data gap	Methodology	Example data sources
Establish uses and levels of activity within and around the AfL area.	Discussions with local sailors and seafarers	Kirkwall sailing club Orkney Marinas Orkney VTS RYA Kirkwall kayak club Orkney Island Council SNH
Establish uses and levels of activity within and around the	Discussions with local landowners, community groups,	Landowners

landfall locations, onshore grid corridor options and substation locations	activity groups and tourism groups	Orkney Tourism Association Visit Scotland Community councils Orkney Field Club Orkney Archaeological Trust

SSER plan to conduct baseline characterisation investigations in Quarters 3 and 4 of 2011.

5.12.4 Impact assessment strategy

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

Potential impact	Assessment topics	Assessment method	Relevant research
Disturbance to offshore recreation activities during offshore construction and maintenance works	Possible collision risks. Interference of devices with wave and tidal conditions. Re-routing through less favourable sea areas.	Navigational risk assessment to examine possible impact scenarios and associated consequences	Influence of devices on wave and tidal conditions
Disturbance to onshore recreation during onshore construction works and afterwards from presence of structures	Visual disturbance, noise, dust, restricted access	Landscape and visibility assessment, noise assessment, detailed route and site planning	None

5.12.5 Possible mitigation and monitoring measures

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

Potential impact	Mitigation measures	Monitoring during installation (validating predictions)	Post-deployment monitoring (measuring impacts)
Disturbance to	Site design and subsea cable	None	None

offshore recreation activities during offshore works	route selection will consider offshore recreation use patterns		
Disturbance to onshore recreation during onshore construction works and afterwards from presence of structures	Site design and onshore cable route selection will consider onshore recreation use patterns	None	None

5.13 Tourism

5.13.1 Baseline

Tourism is a mainstay industry in Orkney employing a significant number of local people. Of 16,800 employee jobs in Orkney in 2008, 1000 (6%) were tourism-related. Orkney had approximately 141,000 visitors in the period 2008/09 with an estimated visitor spend of £31,822,917 (OIC, 2010). Figures for cruise liner visitors were not included in the scope of the surveys detailed above. It is estimated that Orkney received around 45,583 cruise liner visitors in 2009 spending an estimated £1,133,492 (AB Associates, 2010).

5.13.2 Potential impacts

Possible impacts along with the potential significance of effect on tourism are considered in the table below:

Potential impact	Phase	Potential significance	Comment
Offshore - Industrialisation of the local seascape reducing tourists' visual amenity	All	Effect unlikely to be significant	Increased vessel activity at the offshore site and along cable routes during construction, within the context of existing shipping and marine energy related vessel activity in the area, is unlikely to have a significant effect. Vessel presence during operation and maintenance and decommissioning is likely to be minimal and of a temporary nature.
Onshore - Industrialisation of the local landscape reducing tourists' visual amenity	All	Potential significance of impact unknown	The installation and sustained presence of any substation and overhead grid infrastructure may reduce the visual amenity associated with an area.
Increased pressure on local temporary accommodation	Construction and installation	Potential significance of impact unknown	Increased personnel in Orkney, particularly during the construction phase, may put increased pressure on temporary accommodation, reducing availability for tourists during summer months when construction activities are planned.
Opportunity for expansion of existing port infrastructure.	All	Beneficial impact	Most cruise ships lay anchor in Kirkwall bay and ferry passengers into Kirkwall or Hatston using small boats. The local

Potential impact	Phase	Potential significance	Comment
			ports at Kirkwall and Hatston are already utilised to near capacity by developers operating at EMEC's tidal test site. This is likely to increase with the establishment of the nursery site close by. Any significant project such as this will require an expansion to local port infrastructure. OIC are already investing in port expansion. It is therefore likely, that this project will act as a trigger for expanding local harbour infrastructure, improving services available for tourists. SSER will not be directly responsible for these works and the impacts are not therefore, considered within the scope of the EIA.
Additional topic of interest creating new draw for tourists	All	Beneficial	There is already significant interest in the renewables industry in Orkney and it is reasonable to assume that the industry may be a key area of interest for some visitors to the Islands. A project of this scale may contribute to this.

5.13.3 Baseline characterisation strategy:

It is proposed that baseline conditions regarding tourism can be further defined to sufficient detail by completing the tasks outlined in the table below:

Data gap	Methodology	Example data sources
Establish existing levels and types tourism in the wider area	Desk based analysis of available data	Orkney Islands Council Visit Scotland SNH
Identify key tourist locations, use levels and patterns	Map areas/resources of key importance to the tourism industry	Orkney Islands Council Visit Scotland

SSER plan to begin baseline characterisation investigations by the end of 2011.

5.13.4 Impact assessment strategy

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

Potential impact	Assessment topics (what?)	Assessment method (how?)	Relevant research
Industrialisation of the local landscape reducing tourists' visual amenity	Refer to 'seascape and landscape' in Section 5.8	Refer to 'seascape and landscape' in Section 5.8	None
Increased pressure on local temporary accommodation	Establish the requirements of existing and planned developments in the wider area	Capacity assessment for different scenarios based upon phase and pace of development	None

5.13.5 Possible mitigation and monitoring measures

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

Potential impact	Mitigation measures	Monitoring during installation	Post-deployment monitoring
Industrialisation of the local landscape reducing tourists' visual amenity	None proposed	None proposed	None proposed
Increased pressure on local temporary accommodation	SSER will investigate the potential for suitable temporary accommodation prior to construction to avoid conflict with tourism	None proposed	None proposed

5.14 Other renewables

The AfL area boundary lies approximately 63 metres from the boundary of the existing EMEC test site at the falls of Warness. The test facility currently offers 7 test berths for tidal turbines with pre-laid electrical cables on the seabed.

There are currently four devices (Open Hydro, Atlantis Resources Corporation, Tidal Generation Ltd and Scotrenewables) and one other subsea structure (Open Hydro's gravity base) installed at the EMEC tidal test site. A number of companies are preparing to install devices in the coming year (Voith Hydro and Hammerfest Strom) and more companies coming to the test site over the next few years. These developers operate out of the existing ports at Kirkwall and Hatston and along transit routes to the Westray South AfL. They also each make extensive use of the local supply chain.

A small scale 'nursery' test area has also been established by EMEC between Shapinsay and the Orkney Mainland. Developers are expected to begin operating at the site this year and are again, likely to operate out of Kirkwall and Hatston and make extensive use of the local supply chain.

5.14.1 Potential impacts

Possible impacts along with the potential significance of effect on other renewables are considered in the table below:

Potential impact	Phase	Potential significance	Comment
Reduced resource potential due to effects on hydrodynamic regime	Construction, operation, decommissioning	Potential significance of effects unknown at this stage	There remains uncertainty over the downstream effects of tidal devices In their response to the project description document EMEC estimated that 20MW of installed capacity at the Westray South site would detract from the tidal resource at the test site in the order of less than 1%.
Opportunity for expansion of existing port infrastructure	Construction, operation, maintenance, decommissioning	Beneficial impact	The local ports at Kirkwall and Hatston are already utilised to near capacity by developers operating at EMEC's tidal test site. This is likely to increase with the establishment of the nursery site close by. Any significant project such

Potential impact	Phase	Potential significance	Comment
			as this will require an expansion to local port infrastructure. OIC are already investing in port expansion. It is therefore likely, that this project will act as a trigger for expanding local harbour infrastructure, improving facilities available for other marine energy developers. SSER will not be directly responsible for these works and the impacts are not therefore, considered within the scope of the EIA.
Opportunities for local supply chain	Construction, operation, maintenance, decommissioning	Beneficial	The scale and breadth of the supply chain is growing as the marine sector develops. Also as more experience is gained more cost effective ways of working would be envisaged to be established.

5.14.2 Baseline characterisation strategy:

It is proposed that baseline conditions regarding other renewables can be further defined to sufficient detail by completing the tasks outlined in the table below:

Data gap	Methodology	Example data sources
Establish existing levels and types of marine renewable energy development in the wider area	Monitor leasing round, marine licensing and landward planning activity	The Crown Estate Marine Scotland Orkney Islands Council
Supply chain capacity	Directories of services and facilities	OREF, HIE, EMEC, OIC, THC

SSER plan to begin baseline characterisation investigations by the end of 2011.

5.14.3 Impact assessment strategy

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

Potential impact	Assessment topics	Assessment method	Relevant research
Reduced resource potential due to effects on hydrodynamic regime	Level of energy extraction and turbulence resulting from devices. Trajectory of energy flows through wider area	Energy flow modelling	Tidal modelling techniques Monitoring downstream effects
Overcapacity for ports infrastructure	How much capacity will be needed	Strategic assessment required	None
	Where, when & by who could this capacity be best provided		None

5.14.4 Possible mitigation and monitoring measures

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

Potential impact	Mitigation measures	Monitoring during installation	Post-deployment monitoring
Reduced resource potential due to effects on hydrodynamic regime	Site design;	None	Validate downstream flow predictions after deployment
Overcapacity for ports infrastructure	Good forward planning	None	None
Using local resources used by other developers	Identify possible needs early and contribute to capacity building initiatives	None	None

5.15 Onshore Traffic

5.15.1 Introduction

Possible transport infrastructure links are examined as key routes for materials and people to the site as well as a potential receptor for impacts to the existing transport network.

5.15.2 Baseline

5.15.2.1 Road network

There are no trunk roads on Orkney. Several A-roads connect the main towns/villages with B-road branches connecting smaller settlements and houses to the network.

Transportation of materials and people to site will as far as possible use the main A-roads, although for certain parts of the grid connection route use of B-roads and unclassified roads will also be necessary, depending on the final route chosen.

A-roads, B-roads and unclassified roads in the West Mainland of Orkney, and possibly Rousay and Egilsay, will also, potentially, be crossed by the grid connection.

5.15.2.2 Onshore traffic

Traffic information will be gathered during the EIA process from Orkney Islands Council and Transport Scotland if necessary and will be described fully within the ES. This will include peak traffic flows and as well as annual average traffic flows. Information on local bus links will also be gathered.

5.15.3 Potential impacts

Possible impacts along with the potential significance of effect on onshore transport are considered in the table below:

Potential impact	Phase	Potential significance	Comment
Temporary increase in traffic	Construction	Potential significance of impact unknown	Possible sporadic temporary driver delay and community effects during construction, Potential for construction traffic on remote islands Rousay and Egilsay.
Road crossings	Construction	Effect unlikely to be significant	The grid connection route will potentially cross some roads on Rousay, Egilsay and the west mainland of Orkney. The height of the proposed lines will cause little or no

Potential impact	Phase	Potential significance	Comment
			disruption to normal conditions other than temporary disturbance during construction.
Movement of abnormal loads (cable drums, transformers etc)	Construction	Potential significance of impact unknown	Movement of abnormal loads may require Special Order authorisation under Section 44 of the 1988 Road Traffic Act. This will be addressed prior to construction.
Permanent increase in traffic during operation	Operation	Effect unlikely to be significant	TIA (traffic impact assessment) may be necessary but it is anticipated that standard road vehicles will be used in all operations associated with the onshore infrastructure. It is anticipated that any movement of offshore structures during onshore maintenance etc will be temporary and sporadic procedures restricted to industrial park areas

5.15.4 Baseline characterisation strategy:

It is proposed that baseline conditions regarding onshore transport can be further defined to sufficient detail by completing the tasks outlined in the table below:

Data gap	Methodology	Example data sources
Transport assessment for the grid infrastructure	Desk based review of data and assessment Peak and average traffic flows	Orkney Islands Council Transport Scotland Public Consultation Ordnance Survey

SSER plan to begin baseline characterisation investigations during Summer 2012.

5.15.5 Impact assessment strategy

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

Potential impact	Assessment topics	Assessment method	Relevant research
Temporary increase in traffic	Driver delay, Community effects	Using guidelines outlined in (Department of	

Potential impact	Assessment topics	Assessment method	Relevant research
		Transport et al., 1993; Institution of Highways and Transportation, 1994; and Institute of Environmental Assessment, 1993).	
Movement of abnormal loads	A separate assessment of the capacity of road to take abnormal loads will be undertaken	As above	

5.15.6 Possible mitigation and monitoring measures

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

Potential impact	Mitigation measures	Monitoring during installation	Post-deployment monitoring
All changes to existing traffic regime	A traffic management plan (TMP) will be developed. The plan will be agreed with Orkney Islands Council in advance of construction. Temporary off road parking for contractors' vehicles will be provided at works compounds and at other suitable off-road sites along the route. Local residents will be kept informed of any potentially disruptive activities (such as delivery of abnormal loads, delays or diversions) and the actions being taken to mitigate the impact of these activities.	The contractor will be required as part of the TMP to monitor delays through and in proximity to the works and if any significant delays were identified to take account of this and programme activities to reduce the impacts on local traffic.	As for installation

It is proposed that Transport Scotland and Orkney Islands Council are consulted during the EIA to confirm that no additional actions are required and that there have been no significant changes to baseline conditions.

5.16 Questions

Questions for Reader
Q6. Do the studies proposed for assessment of effects on the human environment look appropriate and complete?

6 POSSIBLE IMPACTS ON THE ECOLOGICAL ENVIRONMENT

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

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

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

6.1 Birds

6.1.1 Introduction

This section of the report discusses ornithology in both marine and terrestrial species. This section should be considered alongside Appendix B 'The identification of Natura interests which may be affected by the proposals' which identifies the sites that may be affected based on a range of criteria. The potential effects on birds, including the qualifying species of Natura sites and of nationally designated sites, are considered within this section.

6.1.2 Baseline description

6.1.2.1 Protected sites

The AfL area is outwith any sites designated for ornithological interests at European, national or local levels. However, there are several sites designated for ornithological interests, including Special Protection Areas (SPAs), within the wider area (refer to Figure 6.1), in particular sites designated for breeding seabirds. For some species, it is possible that birds from these designated sites, especially foraging seabirds, make use of the AfL area and so could potentially be affected by the proposed development.

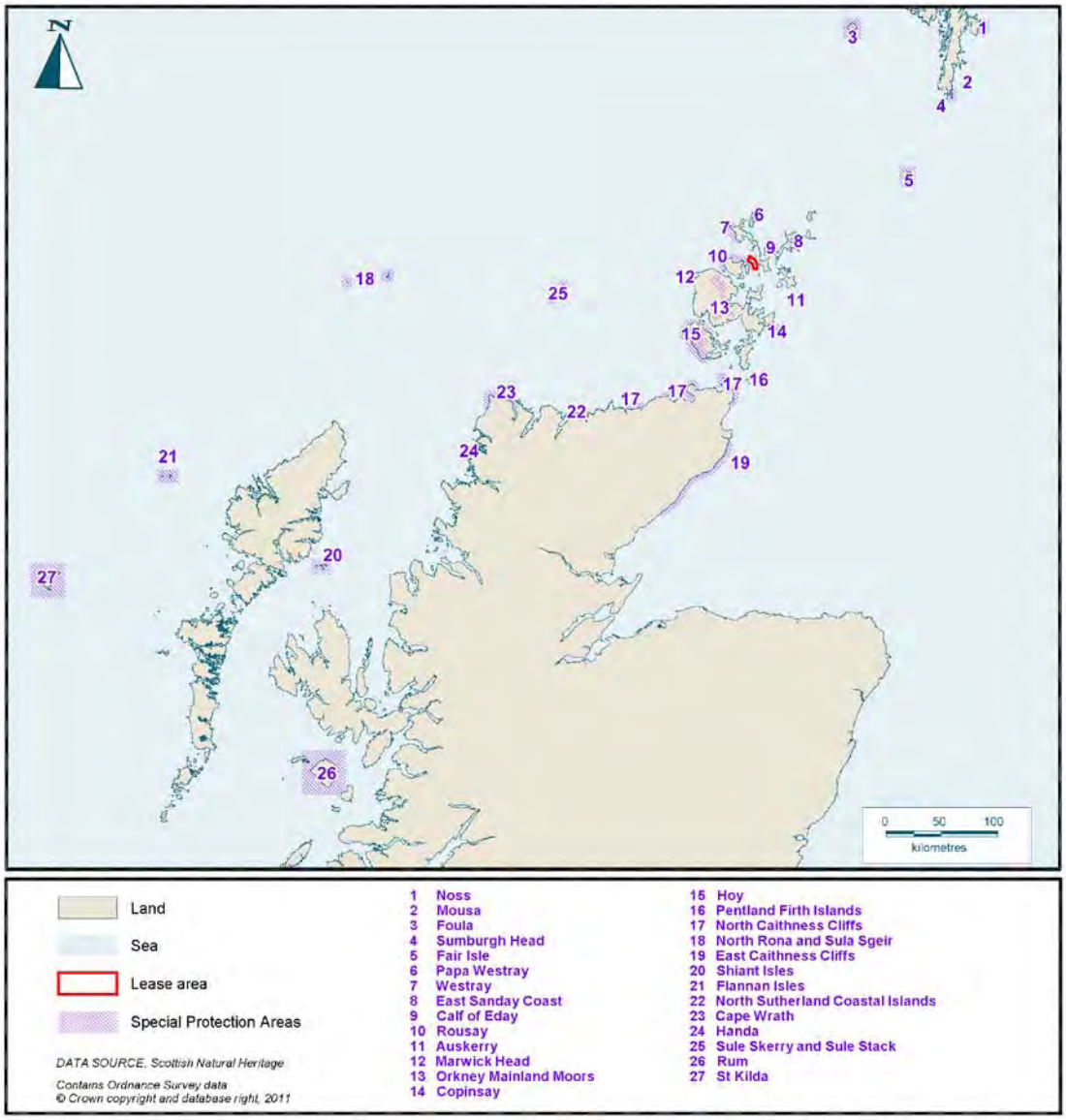

Figure 6.1 SPAs relevant to the proposals

6.1.2.2 International designated sites - Special Protection Areas and Ramsar sites

Sites within that have qualifying interests that could potentially be affected by the proposed development are listed in Table 6.1 and are displayed in Figure 6.1. Three SPAs lie within the area of search for onshore works: Orkney Mainland Moors SPA, Marwick Head SPA and Rousay SPA. At this time the proposed location for the onshore works has not been identified therefore all qualifying species of these sites have been scoped into the assessment.

For the AfL area, buffer distances based on the maximum foraging ranges of species as defined in the Crown Estate Report to Inform Appropriate Assessment for the Pentland Firth Strategic Area, (APBmer, 2010, Ross *et. al.,* 2009), have been used to identify sites that could potentially be affected by the proposed development and therefore those which it is proposed to consider within the EIA. These sites are presented in table 6.1. It should be noted that only those qualifying species that have foraging buffer distances which may overlap with the project AfL area have been scoped into the assessment.

East Sanday Coast SPA and Ramsar has been scoped out as this site is designated for aggregations of non-breeding wader species and is located >20km from the AfL area. Switha SPA has been scoped out as it is designated for its wintering population of barnacle geese and is approximately 40km from the AfL area. There is no potential impact to these sites from the proposed development as due to an absence of suitable supporting habitat there is no potential connection between the qualifying species and the AfL area.

Table 6.1 SPAs with qualifying features that could potentially be affected by the proposed development; as identified using The Crown Estate foraging range thresholds.

Site (distance to AfL area where relevant)	Notified feature	Reason for scoping in (marine / onshore / both)
Rousay SPA (1km)	Arctic tern*	Both (25km foraging buffer)
	The following species qualify as part of a breeding seabird assemblage:	-
	Arctic skua	Both (10km foraging buffer)
	Black-legged kittiwake	Both (50km foraging buffer)
	Common guillemot	Both (50km foraging buffer)
	Northern fulmar	Both (50km foraging buffer)
Calf of Eday SPA (8km)	The following species qualify as part of a breeding seabird assemblage:	-
	Cormorant *Phalacrocorax carbo carbo*	Marine (35km foraging buffer)
	Great black-backed gull *Larus marinus*	Marine (40km foraging buffer)
	Common guillemot *Uria aalge*	Marine (50km foraging buffer)

Site (distance to AfL area where relevant)	Notified feature	Reason for scoping in (marine / onshore / both)
	Northern fulmar *Fulmarus glacialis*	Marine (50km foraging buffer)
	Black-legged kittiwake *Rissa tridactyla*	Marine (50km foraging buffer)
West Westray SPA (8km)	Arctic tern*	Marine (25km foraging buffer)
	Common guillemot*	Marine (50km foraging buffer)
	The following species qualify as part of a breeding seabird assemblage:	
	Razorbill	Marine (50km foraging buffer)
	Black-legged kittiwake	Marine (50km foraging buffer)
	Arctic skua	Marine (10km foraging buffer)
	Northern fulmar	Marine (50km foraging buffer)
Orkney Mainland Moors SPA (15km)	Hen harrier *Circus cyaneus,* breeding	Onshore (within onshore area of search)
	Hen harrier, non-breeding	Onshore (within onshore area of search)
	Red-throated diver, breeding	Onshore (not marine as 13km foraging buffer)
	Short-eared owl *Asio flammeus,* breeding	Onshore (within onshore area of search)
Papa Westray (North Hill and Holm) SPA (16km)	Arctic tern, breeding	Marine (25km foraging buffer)
	Arctic skua, breeding	Scoped out, (10km foraging buffer)
Auskerry SPA (20km)	European storm petrel *Hydrobates pelagicus,* breeding	Marine (100km foraging buffer)
	Arctic tern *Sterna paradisaea,* breeding	Marine (25km foraging buffer)
Marwick Head SPA (24km)	Common guillemot*, breeding	Both (50km foraging buffer and within onshore area of search)
	The following species qualify as part of a breeding seabird assemblage:	-
	Black-legged kittiwake	Both (50km foraging buffer and within onshore area of search)
Copinsay SPA (27km)	The following species qualify as part of a breeding seabird assemblage:	-

Site (distance to AfL area where relevant)	Notified feature	Reason for scoping in (marine / onshore / both)
	Common guillemot	Marine (50km foraging buffer)
	Black-legged kittiwake	Marine (50km foraging buffer)
	Great black-backed gull	Marine (40km foraging buffer)
	Northern fulmar	Marine (50km foraging buffer)
Hoy SPA (34km)	Great Skua* *Stercorarius skua,* breeding	Scoped out, (31km foraging buffer)
	Red-throated diver *Gavia stellata,* breeding	Scoped out, (13km foraging buffer)
	Peregrine *Falco peregrinus,* breeding	Scoped out, site is not in onshore area of search
	The following species qualify as part of a breeding seabird assemblage:	-
	Atlantic puffin *Fratercula arctica*	Marine (50km foraging buffer)
	Black-legged kittiwake	Marine (50km foraging buffer)
	Arctic skua *Stercorarius parasiticus*	Scoped out (10km foraging buffer)
	Northern fulmar	Marine (50km foraging buffer)
	Great black-backed gull	Marine (40km foraging buffer)
	Common guillemot	Marine (50km foraging buffer)
Pentland Firth Islands SPA (47km)	Arctic tern, breeding	Scoped out, (25km foraging buffer)
Fair Isle SPA (75km)	Northern gannet *Morus bassanus* qualifies only as part of a seabird assemblage:	Marine (within potential foraging range)
Sule Skerry and Sule Stack SPA (84km)	European storm petrel*	Marine (100km foraging buffer)
	Leach's storm petrel* *Oceanodroma leucorhoa*	Marine (100km foraging buffer)
	Northern gannet*	Marine (foraging buffer not known)
Rum SPA (301km)	Manx shearwater* *Puffinus puffinus*	Marine (330km foraging buffer)

* qualifying species **and** part of seabird assemblage

Information on maximum foraging ranges is also provided in the BirdLife Seabird Database (BirdLife, 2010). Foraging threshold distances between these two sources (Birdlife and The Crown Estate (ABPmer 2010)) vary somewhat. These foraging distances are provided in Table B3 in Appendix B. Additional SPAs which may be scoped into the environmental assessment if Birdlife 2010 foraging distances are used are summarised in the in Table 6.2. As shown, the main variant is the foraging distances identified for northern gannet and northern fulmar.

Table 6.2 SPAs with qualifying features that could potentially be affected by the proposed development in addition to those outlined in Table 6.1 as identified using birdlife data foraging thresholds.

Site (distance to AfL area where relevant)	Notified feature (foraging buffer)	Reason for scoping in (marine / onshore / both)
Noss SPA (Shetland, 153 km)	Northern fulmar	Marine (within potential foraging range)
Troup, Pennan and Lion`s Heads SPA (165 km)	Northern gannet*	Marine (within potential foraging range)
Hermaness, Saxa Vord and Valla Field SPA (Shetland, 213km)	Northern gannet*	Marine (within potential foraging range)
Shiant Islands SPA (off Lewis, 248km)	Northern fulmar	Marine (within potential foraging range)
Flannan Islands SPA (off Lewis, 289 km)	Northern gannet*	Marine (within potential foraging range)

* qualifying species **and** part of seabird assemblage

Questions for SNH

Q7. Is it appropriate to use both The Crown estate and the Birdlife foraging data to determine which SPAs will be included within the EIA and HRA or is it appropriate to just use The Crown Estate data?

6.1.2.3 Nationally designated sites - SSSIs

Table 6.5 lists the ornithological sites designated (SSSIs) for their national ornithological importance that could potentially be affected by the proposed development within 100km. Sites that have notified features that may be present in the marine environment have been scoped in to the assessment using the same criteria as used for sites with international designations, namely buffer distances based on maximum foraging distances. Species where foraging buffer is unknown have been scoped in to the assessment. All notified features of sites within the area of search for onshore works have been scoped in to the assessment.

It should be noted that in several cases the designated national sites listed in Table 6.3, in whole or in part, are also designated as International sites (SPAs). Where this occurs it has been recorded in Table 6.3.

Table 6.3 Sites of national importance that could potentially be affected by the proposed development

Site (distance to AfL area where relevant)	Notified feature	Reason for scoping in (marine / onshore / both)
Rousay SSSI (1km) Part of this site forms part of the Rousay SPA	Arctic skua, breeding; Arctic tern, breeding; Common guillemot, breeding; Black-legged kittiwake, breeding; Seabird colony, breeding	Both (as per Rousay SPA)
	Moorland breeding bird assemblage	Onshore
Doomy and Whitemaw Hill SSSI (5km)	Arctic skua, breeding	Marine (10km foraging buffer)
	Whimbrel *Numenius phaeopus,* breeding	Scoped out, site is not in onshore area of search
Mill Loch SSSI, Eday (7km)	Red-throated diver, breeding	Marine (13km foraging buffer)
Calf of Eday SSSI (8km) Same area as terrestrial component of SPA	Cormorant, breeding	Marine (as per Calf of Eday SPA)

Site (distance to AfL area where relevant)	Notified feature	Reason for scoping in (marine / onshore / both)
West Westray SSSI (8km) The terrestrial portion of this site forms part of the West Westray SPA	Arctic skua, breeding; Arctic tern, breeding; Common guillemot, breeding; Black-legged kittiwake, breeding; Razorbill, breeding; Seabird colony, breeding	Marine (as per West Westray SPA)
West Mainland Moorlands SSSI (15km) This site forms part of the Orkney Mainland Moors SPA	Hen harrier, breeding; Red-throated diver, breeding; Short-eared owl, breeding	Onshore (as per Orkney Mainland Moors SPA)
	Moorland breeding bird assemblage	Onshore
North Hill SSSI (16km) This site forms the North Hill part of the Papa Westray (North Hill and Holm) SPA	Arctic skua, breeding	Scoped out, (10km foraging buffer)
	Arctic tern, breeding	Marine (25km foraging buffer)
Holm of Papa Westray SSSI (17km)	Black guillemot *Cepphus grylle,* breeding	Marine (foraging buffer unknown)
Auskerry SSSI (20km) Same as SPA	Arctic tern, breeding; European storm petrel, breeding	Marine (as per Auskerry SPA)
Loch of Banks SSSI (22km)	Hen harrier, non-breeding	Onshore
	Breeding bird assemblage	Onshore
Lochs of Harray and Stenness SSSI (23km)	Goldeneye *Bucephala clangula*, non-breeding	Onshore
	Pochard *Aythya ferina*, non-breeding	
	Scaup *Aythya marila*, non-breeding	
	Tufted duck *Aythya fuligula*, non-breeding	
Loch of Isbister and the Loons SSSI (24km)	Pintail *Anas acuta*, breeding	Onshore
	Breeding bird assemblage	Onshore
Marwick Head SSSI (24km)	Common guillemot, breeding	Both (50km foraging

Site (distance to AfL area where relevant)	Notified feature	Reason for scoping in (marine / onshore / both)
		buffer)
Marwick Head SSSI forms part of the Marwick Head SPA	Seabird colony, breeding	Both
Copinsay SSSI (27km) Same area as terrestrial component of SPA	Common guillemot, breeding; Black-legged kittiwake, breeding; Breeding seabird assemblage	Marine (as per Copinsay SPA)
Hoy SSSI (34km) Same area as terrestrial component of SPA	Arctic skua, breeding; Northern fulmar, breeding; Great black-backed gull, breeding; Great skua, breeding; Common guillemot, breeding; Red-throated diver, breeding; Breeding seabird assemblage	Marine (as per Hoy SPA)
	Peregrine; Moorland breeding bird assemblage	Scoped out, site is not in onshore area of search
Pentland Firth Islands SSSI (47km) Same as SPA	Arctic tern, breeding	Scoped out, (outwith foraging buffer)
Sule Skerry SSSI (84km) The terrestrial portion of this site forms part of the Sule Skerry and Sule Stack SPA	Atlantic puffin, breeding	Scoped out, (outwith potential foraging buffer)
	Shag *Phalacrocorax aristotelis*, breeding	Scoped out, (outwith potential foraging buffer)
	European storm petrel, breeding	Marine (within assumed potential foraging buffer)
	Seabird colony, breeding	Marine
Sule Stack (92km) The terrestrial portion of this site forms part of the Sule Skerry and Sule Stack SPA	Northern gannet, breeding	Marine (foraging buffer not known)

6.1.2.4 Local sites - Local Natural Conservation Sites (LNCSs)

These sites are listed in the Orkney Local Development Plan which is currently out to consultation. LNCSs will be taken into consideration during development design and the EIA process. RSPB and other nature reserves will also be identified and considered within the EIA.

6.1.3 Key species based on protection level and conservation status

The use of the AfL and its near vicinity (within 2km) by species that have particular importance on account of either receiving special legislative protection or occurring on various priority conservation listings will be scoped in for consideration in the EIA. Specifically, species on Annex 1 of the Habitat Regulations or Schedule 1 of the Wildlife and Countryside Act 1981 (as amended) are considered to have special protection status. UKBAP species, or species that are on the Birds of Conservation Concern Red List (Eaton *et. al*., 2009), or the IUCN threatened species list, are considered to high importance due to their current poor conservation status.

6.1.4 Identification of key issues and sensitivities

Possible impacts along with the potential significance of effect on birds are considered in the table below.

Impact	**Phase**	**Potential significance**	**Comment**
Collision risk from underwater turbines	Operation	Potential significance of impact unknown	Survey and consultation will be required to establish abundance and distribution of species. However there is a general lack of understanding of the behaviour of seabirds in the vicinity of turbines and potential collision risks
Displacement from vicinity of underwater turbines	Construction and operation	Potential significance of impact unknown	Survey and consultation will be required to establish abundance and distribution of species. However there is a general lack of understanding of the behaviour of seabirds in the vicinity of turbines
Disturbance by vessel activity	Construction, operation and decommissioning	Potential significance of impact unknown	In order to assess this impact the extent and nature of seabird activity will need to be

			established. An increase in vessel activity will be most apparent during construction and installation works
Onshore habitat loss (breeding or foraging habitat) due to land-take for infrastructure	Construction and operation	Potential significance of impact unknown	Survey will be required to establish abundance and distribution of species.
Disturbance due to onshore construction works	Construction	Potential significance of impact unknown	Survey and consultation will be required to establish abundance and distribution of species.

6.1.5 Baseline characterisation strategy:

Information on baseline conditions regarding birds sufficient to inform HRA and EIA will be assembled from a combination of existing data sources and commissioned survey work as outlined in the table below.

APEM data aerial survey data will be used to provide regional context for at-sea seabird densities. These data were collected in 2010 and cover alternate 2x2km blocks of sea around Orkney and the Pentland Firth.

JNCC's aerial survey reports of wintering seaducks and divers (Lewis *et al.,* 2009) shows that the inshore waters in the vicinity of the AfL area are some importance for wintering seaducks and divers, however, the importance of the Westray Firth tidal stream itself for these species is not known. Additional data on non-breeding/wintering birds will be obtained from RSPB and BTO.

Subject	**Methodology**	**Example data sources**
Species present and their distribution and abundance	Assemble and summarise existing data on: - Seabird breeding colony counts, - Boat-based surveys of sea birds, - Aerial surveys of seabirds, - Land-based coastal and terrestrial bird surveys - Records held in national and local bird reports.	JNCC/ESAS data of birds at sea JNCC Seabird colony database and reports (e.g. Mitchell *et al*, 2004) ESAS database and reports Aerial surveys (e.g. APEM 2010 survey data and reports, JNCC commissioned surveys). BTO Atlas and WEBs data.
	Boat-based ESAS surveys of	Commissioned ESAS surveys

Subject	Methodology	Example data sources
	development site and 4km buffer (normal ESAS distance). Survey visits through the year with greatest focus on April-Aug when SPA breeding birds may be present.	
Behaviour of species at the development site and their connectivity to breeding sites	Boat-based behavioural observations of birds using the area, in particular flight directions of birds carrying fish in breeding season.	Commissioned ESAS surveys

6.1.6 Impact assessment strategy

6.1.6.1 Proposed survey work

SSER plan to begin boat-based baseline surveys using ESAS methods (Camphuysen *et.al.,* 2004) in November 2011. It is intended that the site will be surveyed nine times during Year 1. Surveys will be undertaken at approximately monthly intervals during the bird breeding season (April - August) and at approximately bi-monthly intervals over the rest of the year. The greater emphasis in the breeding season reflects the greater known importance of the development area at this time as this is when breeding birds from SPAs could potentially be using the survey the area.

The survey area has high exposure and strong tidal currents and these will present a significant constraint to undertaking boat-based surveys, especially as ESAS surveys must be undertaken in conditions of Sea State 4 or below. For this reason there will need to be inherent flexibility within the survey programme, especially in winter. The emphasis will be on collecting high quality data when conditions are suitable and making sure all the main stages of the annual cycle are sampled at least once, rather than dogged adherence to surveying at regular intervals. All surveyors will be ESAS trained. Surveying will be undertaken by a team of two surveyors. Survey visits are anticipated to take approximately 5 hours to complete, and therefore a relief third bird surveyor is not likely to be required.

The survey site will consist of the development area and a buffer area extending up to 4km (in some parts 4km will not be possible due to land). The present intention is for the survey

to consist of traversing the area with a series of parallel transect lines 2km apart. The optimum orientation of transects is being considered and a statistician and local boat operator are being consulted on this matter. However it should be noted that the final decision on survey layout will depend on both sampling theory and practical considerations of operating safely in strong currents. The survey vessel will be shared with the marine mammal surveyors, who will operate as an independent team. Seabird survey data will be analysed using Distance software and will aim to estimate with confidence limits the total numbers of each species present at different times of the year and identify any consistent spatial differences in use by a species of the survey area. The ESAS method collects information of species behaviour and this will be used to infer information about why species use the site.

It is proposed that the impact assessment strategy outlined in the table below is applied to address the potentially significant and unknown impacts identified in 6.1.4.

Potential impact	Assessment topics	Assessment method	Relevant research
Collision risk from underwater turbines	Undertake a high level assessment of species vulnerability based on their behavioural traits	Using baseline information	General behaviour of a species
	Determine rotational speed envelope of turbine(s)	Data from manufacturer	None
	Conduct a qualitative collision risk assessment	For species at risk compare behaviour manoeuvring ability/ swimming speed with blade velocity and position	Literature on swimming speeds and underwater visual acuity.
	Keep abreast with advances in research on effects of tidal devices and arrays on birds		
Disturbance from vessel activity	Identify which species are vulnerable to disturbance.	Quantify numbers of individuals of vulnerable species predicted to be affected by disturbance and duration and frequency of disturbance events	Extensive disturbance literature and monitoring results from other projects.

Potential impact	Assessment topics	Assessment method	Relevant research
Habitat loss due to land-take for onshore infrastructure	Type of land to be used for infrastructure, options available and define associated use by birds for each land type	Comparison of mapped habitat use by key species with predicted loss of habitat buffered to a distance appropriate to each species.	Studies on disturbance sensitivity
Disturbance from onshore works	Consider access routes and needs for services to key infrastructure sites. Define associated use by birds for each land type affected.	Map the type and level of disturbance in relation to spatial and temporal use of site by vulnerable key species.	Spatial and temporal data on the distribution, abundance and habitat use by vulnerable key species.

6.1.7 Possible mitigation and monitoring measures

Mitigation aims to avoid or limit any adverse effects on bird populations. This will be achieved by three types of measure, applied in a hierarchical way, that seek to:

- Avoid the adverse effect occurring outright;
- Reduce the magnitude of the adverse effect; and
- Compensate for the adverse effect, e.g. through improving conditions for affected species elsewhere.

Mitigation is desirable for all adverse affects but is considered essential for any effects that are assessed as being significant under EIA. At minimum mitigation measures will aim to reduce any such effects such that the residual effect is assessed as not significant.

In the first instance avoidance measures will be sought to address significant effects. If these are insufficient then reduction and compensation measures will also be proposed.

The results of monitoring will be essential to determine the effectiveness of mitigation and inform any possible changes in operating procedures in response to new information.

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

Potential impact	Possible mitigation measures	Possible monitoring during installation	Possible post-deployment monitoring
Collision risk from underwater turbines	Apply research into birds and tidal streams to inform site development process. Avoid areas shown to be of very high value to diving birds (if present).	A suitable monitoring strategy will be developed in consultation with SNH and JNCC Mitigation and monitoring measures will be developed through the engineering design process with the intention of , wherever possible, to minimise potential for impact	A suitable monitoring strategy will be developed in consultation with SNH and JNCC Mitigation and monitoring measures will be developed through the engineering design process with the intention of , wherever possible, to minimise potential for impact
Disturbance from vessel activity	Limit vessel speeds to those that minimise disturbance. Avoid as far a possible vicinity of areas of high importance to vulnerable species (if there are any), Plan vessel activity careful to minimise number of journeys required.		
Habitat loss due to land-take for onshore infrastructure	Avoid sensitive areas through project design.		
Disturbance from onshore construction works	Time works to avoid sensitive times of year for any vulnerable species present, e.g. avoid nesting season. Avoid as far as possible vicinity of areas used by vulnerable species. Reduce potential for disturbance by sensitive working practices, e.g. speed restrictions on vehicles, use of screening if appropriate.		

6.2 Marine mammals and reptiles

6.2.1 Introduction

The marine mammals and reptiles assessment will consider cetaceans (whales and dolphins), pinnipeds (seals) and marine reptiles (turtles). It will not consider otters, which will be included in the terrestrial coastline and terrestrial ecology assessment. 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. Both Marine Scotland and SNH have been consulted regarding potential impacts on marine mammals.

6.2.2 Baseline

6.2.2.1 Protection

All marine mammals are protected species and there are a number of legislative requirements that must be met by developers. Grey seals *Halichoerus grypus*, harbour (common) seals *Phoca vitulina*, bottlenose dolphins *Tursiops truncates* and harbour porpoise *Phocoena phocoena* are protected under European legislation (Annex II and IV of the European Habitats Directive). All cetaceans are also listed under Appendix II of the Bern Convention, and small cetaceans are covered 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 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.

The leatherback turtle is protected under UK legislation as well as being of international conservation significance. It is also included in Scottish Natural Heritage's 'Species Action Programme'.

6.2.2.2 Cetaceans

Based on the Marine Atlas (Marine Scotland, 2011), the Marine Renewables SEA (Scottish Executive, 2007), information published by Seawatch Foundation[10] and local knowledge (e.g. Booth and Booth, 2005), the following cetaceans are commonly found in Orkney waters and are anticipated to utilise the AfL and offshore area of search:

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

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*, Cuvier's beaked whale *Ziphius cavirostris*, northern bottlenose whale *Hyperoodon ampullatus*, bottlenose dolphin, false killer *Pseudorca crassidens*, and Beluga *Delphinapterus leucas*. In addition, three species have been recorded prior to 1980: blue whale *Balaenoptera musculus*, Sei whale *Balaenoptera physalus*, and narwhal *Monodon monoceros*.

6.2.2.3 Pinnipeds

Both the grey seal and the harbour seal occur in the Westray Firth (SMRU, 2011).

6.2.2.4 Designated sites

There are no designated sites for cetaceans in the vicinity of the development. The closest site where cetaceans are a qualifying feature is Moray Firth SAC where bottlenose dolphins

[10] http://www.seawatchfoundation.org.uk/docs/Orkney.pdf

are a qualifying interest. However, despite photo-id studies, there is no evidence that the Moray Firth bottlenose dolphins use Westray Firth, for this reason this SAC is scoped out.

The Faray & Holm of Faray SAC (further detail on this designated site can be found in (Appendix B) is located approximately 1.8km to the north of the AfL area. This SAC has as its qualifying feature grey seal and the conservation objectives for this SAC (as specified in the SNH Advice under Regulation 33(2)) are to maintain the population size structure, function and distribution of grey seals and their supporting habitats and to ensure that no significant disturbance is suffered. Sanday SAC (further details on this designated site can be found n Appendix B) is designated for common seal and is located approximately 17km by sea from the AfL area. This site supports the largest group of common seal at any discrete site in Scotland.

Eynhallow SSSI is designated for harbour seal and is 15.4km from the AfL (by sea).

6.2.2.5 Other sites

Recent work conducted on behalf of the Scottish Government, in response to the Marine (Scotland) Act 2010 (the Act), has identified possible seal haul-out[11] sites across Scotland. This work did not identify any suitable seal haul out sites within the AfL or cable landfall area of search (Scottish Government, 2011). However there are seven locations identified for harbour seals close to the AfL area and these are:

- Sweyn Holm North- North East of Gairsay;
- Holm of Rendall- E of Rendall, N Mainland;
- Taing Skerry (Shapinsay)- Wide Firth, W of Shapinsay;
- Seal Skerry (Eday)- SW Eday;
- Point of Hisber- N Mainland, opp. from Eynhallow;
- Skerry of Wastbist- S Westray; and
- Eynhallow- between Mainland & Rousay (Scottish government 2011).

[11] A haul-out site is a location on land where seals haul themselves out to rest

And one site close to the AfL for grey seals:

- North coast of Eday.

6.2.2.6 Marine Reptiles

Between 1970 and 1997, thirteen leatherback turtles *Dermochelys coriacea* - seven alive and six dead - were recorded either swimming at sea or stranded on the shores of Orkney. No records later than 1997 are present on NBN Gateway[12]. The leatherback turtle is now thought to be resident in Scottish waters at certain times of the year (Brongersma 1972; Langton *et al.* 1996); where previously, they were considered to be vagrants (Barne *et. al*.,1997).

6.2.3 Potential impacts

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

Potential impact	Anticipated significance	Phase	Justification
Impact to marine reptiles	Effect unlikely to be significant	Construction, Operation and decommissioning	No records of reptiles in Orkney for 14 years, considered very rare and occasional visitor, therefore an interaction of marine reptiles with the proposed development is considered unlikely,
Disturbance to marine mammals from underwater noise generated by DP vessels	Potential significance of impact unknown	Construction, maintenance and decommissioning	Dependant on information on species and behaviour in the vicinity of development – further investigation required
Disturbance to marine mammals from underwater noise generated during potential drilling activities	Potential significance of impact unknown	Construction	Dependant on information on species and behaviour in the vicinity of development – further investigation required
Marine mammal	Potential	Construction,	Dependant on information on species and

[12] http://data.nbn.org.uk/

collision with vessels	significance of impact unknown	maintenance, decommissioning	behaviour in the vicinity of development – further investigation required
Disturbance to marine mammals from underwater noise generated by the devices	Potential significance of impact unknown	Operation	Dependant on information on species and behaviour in the vicinity of development and anticipated noise levels from devices – further investigation required
Risk of injury to marine mammals from collision with devices	Potential significance of impact unknown	Operation	Dependant on information on species and behaviour in the vicinity of development – further investigation required
Reduction of food resource for marine mammals	Effect unlikely to be significant	Operation	Food resource not predicted to decrease to any level likely to have effect on marine mammals
Accidental contamination to marine mammals from vessels or devices	Effect unlikely to be significant	Construction, Operation and decommissioning	Industry best practice will be followed. Risk of contamination not deemed to be significant

6.2.4 Baseline characterisation

It is proposed that baseline conditions regarding marine mammals can be further defined to sufficient detail by completing the tasks outlined in the table below:

Data gap	Methodology	Example data sources
Determine species present	Review of existing data, marine surveys	Atlas of cetacean distribution in north-west European waters (Reid et al. 2003) Data from the Sea Mammal Research Unit (SCANS-II) (Small Cetaceans in the European Atlantic and North Sea).
Determine the behaviour of marine mammals within the area	Marine mammal surveys, to be agreed in consultation with SNH, considering vantage point and boat-based surveys	

		Technical reports on marine mammals from SEA 4, Offshore Energy SEA Cetacean and seal volumes of SNH and Marine Scotland's draft guidance document for surveying and monitoring in relation to marine renewables deployments in Scotland (Macleod *et al*., Sparling *et al*., in press) Local biodiversity records EMEC observations Results commissioned baseline surveys (Bboat-based surveys) JNCC, SMRU Crown Estate Aerial Survey data
Determine the collision risk	Evaluate likely level of effect based on information relating to operational mode of devices and knowledge of species.	Experience from SeaGen (MCT, 2010) and Hammerfest Strom. SAMS studies on collision risk modelling Wilson *et. al.,* (2007).

SSER plan to begin baseline characterisation surveys in November 2011.

6.2.5 Impact assessment strategy

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

Potential impact	**Assessment topics**	**Assessment method**	**Relevant research**
Disturbance from underwater noise generated by DP vessels	Predicted noise signatures of vessels and piling activities	Conduct a desk-based assessment investigating the noise signatures of vessels likely to be used	Data on likely vessels

		in all operations	
Disturbance from underwater noise generated during drilling		Investigate the noise signatures of drilling activity through desk review or noise modelling as appropriate	Thompson *et. al*., 2010 responses of coastal cetaceans to the construction of offshore wind turbines, consultation with SNH
Collision with construction vessel.	Behavioural traits of Marine mammals present within the area	Marine mammal observation of behaviour within the study area, desk based review of collision incidents with vessels	SMRU 2010 research into seal mortalities
Disturbance from underwater noise generated by the device	Noise output of device(s)	Gather noise monitoring results from technology developers	Research from SeaGen (MCT, 2010).
Risk of injury from collision with devices	Device characteristic of moving parts. Behavioural traits of Marine mammals present within the area	Evaluate likely level of effect based on information relating to operational mode of devices and knowledge of species.	Research from SeaGen (MCT 2010) and by SAMS Wilson *et. al.,* (2007)

6.2.6 Mitigation and monitoring strategy

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

Potential impact	**Approach to mitigation measures**	**Monitoring during installation (validating predictions)**	**Post-deployment monitoring (measuring impacts)**
Disturbance from underwater noise generated by DP vessels	Follow Scottish Marine Mammal Watching Code Avoid seal haul outs during transit to and from site during operations	A suitable monitoring strategy will be developed in consultation with SNH and JNCC Mitigation and monitoring measures will be developed through the engineering design	A suitable monitoring strategy will be developed in consultation with SNH and JNCC Mitigation and monitoring measures will be developed through the engineering design
Collision with construction vessel.			
Disturbance from underwater noise	JNCC drilling protocol		

generated during drilling		process with the intention of , wherever possible, to minimise potential for impact	process with the intention of , wherever possible, to minimise potential for impact
Disturbance from underwater noise generated by the device			
Risk of injury from collision with devices			

6.3 Fish and Shellfish resource

6.3.1 Baseline

The AfL site offshore area of search lies within the wider area of ICES rectangle[13] 47E3. Catch data provided by Marine Scotland Analytical Unit provides a good indication of which species are present in commercially exploitable numbers within the study area. Species (of which more than one tonne) landed from this rectangle between 2008 and 2010 are shown in Table 6.4.

Table 6.4 Fish and shellfish species caught within ICES rectangle 47E7 between 2008 and 2010. Source: Marine Scotland Science 2011. Note these calculations are based on provisional data for 2010.

Demersal / Pelagic (live weight, tonnes)	Shellfish (live weight, tonnes)
Herring-*Clupea harengus* (9,698)*	Velvet Swimming crab *Necora puber* (1,496)
Mackerel *Scomber scombrus* (953)*	Unidentified crabs, likely to be mostly edible crabs *Cancer pagurus* (821)
Haddock *Melanogrammus aeglefinus* (97.46)	Scallops *Pecten Maximus* (344)
Cod- *Gadus morhua* (17.55)*	Green Crab *Carcinus maenas* (212)
Monks or Anglers (*Lophius piscatorius, Lophius budegassa or similar species)* (7.95)*	Lobster (142)
Whiting *Merlangius merlangus* (7.80)*	Periwinkles (70)
Saithe *Pollachius virens* (7)	Whelks (50)
Megrim *Lepidorhombus whiffiagonis* (4.86)	Squid (6)
Plaice *Pleuronectes platessa* (2.27)*	Razor Clam (4)
	Nephrops (1.25)

* indicates UK BAP species

Many of the species landed from within the AfL and offshore area of search are UK BAP species, priority species identified as being the most threatened and requiring conservation action under the UK Biodiversity Action Plan (UK BAP). Atlantic herring, haddock, plaice

[13] 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 rectangles.

and cod are also listed on The World Conservation Union (IUCN) Red List of Threatened Species.

No protected areas have been designated for finfish or shellfish species within the AfL or offshore area of search (SNH sitelink).

The seabed of the AfL and offshore area of search is believed to be largely composed of a mixture of coarse sediments and boulders and these substrata may provide suitable habitat for species which spawn on the seabed, such as herring or sandeels. Low resolution data on spawning and nursery grounds for commercial species are available from Cefas and indicate that the study area is within spawning grounds for sandeels, herring, lemon sole and sprat (Coull *et al*.,1998 and Cefas 2010). Of these, only herring and sandeel spawn on the seabed, the rest being pelagic spawners. The AfL and offshore area of search also lies in wider nursery grounds for herring, angler fish, blue whiting, common skate, European hake, ling, sand eel, mackerel, spotted ray, spur dog, saithe and whiting (Coull *et al*.,1998 and Cefas 2010).

Sandeels are an important food source for both commercial fish species such as cod, haddock and whiting, and are also an essential food source for seabirds and mammals. It is thought that the declines in the populations of sandeels have contributed to fluctuations in puffin numbers within the area (Marine Scotland *et. al.,* 2010).

6.3.1.2 Elasmobranchs

The Offshore Energy SEA (DECC, 2009) indicates that the following elasmobranch species may also be present within the Afl and offshore area of search: common skate, porbeagle shark, several species of dogfish (e.g. lesser-spotted dogfish and the spiny dogfish), skates and rays (e.g. common ray, cuckoo ray and spotted ray). Barne *et. al.,* (1997) reports that 19 species of elasmobranch can be found in Orkney waters.

The basking shark *Cetorhinus maximus* is known to inhabit the waters around Orkney (NBN Gateway, 2011). This species is listed as a UKBAP and OSPAR species and is protected under the Wildlife and Countryside Act 1981 (as amended in 1985) and CITES[14] .

[14] 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.

6.3.1.3 Migratory Fish

Several species of diadromous (migratory between fresh and salt waters) fish may potentially migrate through the Westray Firth. A recent study commissioned by Marine Scotland concluded that although broad scale patterns of migration can be identified for adult Atlantic salmon and to some extent European eels no specific migratory routes for either of these species or sea trout can be identified with any certainty, due to a lack of data (Malcolm *et. al*., 2010). The distribution of salmonid rivers in Scotland (Gardiner and Egglishaw 1985) indicates that no salmonid rivers feed into the Westray Firth. The Loch of Swannay and the Loch of Broadhouse, both located on the west coast of mainland, feed into the sea along the north west coast, however fish from these rivers are likely to go out to sea and not around the coast into the Westray Firth as migrations patterns are usually in an offshore direction (Malcolm *et. al*., 2010).

There are historical records of the sea lamprey *Petromyzon marinus* in Orkney waters, however these records are elderly (Barne *et., al* 1997)..

6.3.2 Potential impacts

Possible impacts along with the potential significance of effect on fish are considered in the table below:

Potential impact	**Phase**	**Anticipated significance**	**Comment**
Effects on herring and sand eel populations from disturbance to spawning grounds	Construction , decommissioning	Potential significance of impact unknown	Further information on species present required before assessment can be made regarding disturbance due to noise or physical disturbance of the seabed impacting spawning grounds or species
Physical disturbance to crustacean and demersal fish species	Construction, decommissioning	Potential significance of impact unknown	
Effects of noise and vibration of increased boat traffic and construction activity on hearing specialists (i.e. herring and sprat)	Construction, Operation, Decommissioning	Potential significance of impact unknown	
Collision of slow moving larger species such as basking sharks with the devices	Operation	Potential significance of impact	Further information needed on presence of basking shark and potential for

		unknown	collision before assessment can be made
Effects of Electromagnetic fields on Elasmobranchs	Operation	Potential significance of impact unknown	Further research on industry knowledge required
Changes in the existing habitat	Operation	Potential significance of impact unknown	Further information on species and habitats present required before assessment can be made

6.3.3 Baseline characterisation strategy

It is proposed that baseline conditions regarding fish can be further defined to sufficient detail by completing the tasks outlined in the table below:

Data gap	Methodology	Example data sources
Assessment of which species utilise the study area	Baseline desk-based assessment, including: - Fish and shellfish of conservation importance, including protected under the Wildlife and Countryside Act (including seasonal sensitivities). - Designated sites and protected habitats. - Species of fish/shellfish of significant importance to recreational and commercial fisheries. - Species with restricted geographical distribution, which may be locally abundant. - Elasmobranch fish (sharks, skates and rays) of commercial and recreational importance. - Species which use the area for spawning or nursery grounds (including types of spawning and seasons). - Over-wintering areas for crustaceans such as lobster/crab. - Migratory movements within the development area and assess whether	CEFAS data (Spawning, nursery grounds) Marine Scotland science (landings data) Consultation with local fishermen (confirmation of presence, absents and seasonality) Benthic survey drop down video/ stills photography data Relevant guidance i.e (EMEC 2005, EMEC and Xodus Aurora in press) Inshore Fisheries Group Local fishermen groups and associations District Salmon Fisheries Board

	there is the potential for an adverse impact on such routes.	Marine Scotland Scottish Fishermen's Federation Local Fishermen's Associations

SSER plan to conduct baseline characterisation investigations by the end of 2011.

6.3.4 Impact assessment strategy

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

Potential impact	**Assessment topics**	**Assessment method**	**Relevant research**
Effects on herring and sand eel populations	Determine the extent of herring and sand eel spawning/nursery	Desk review of available data	Cefas data, fisheries consultation and benthic survey.
Physical disturbance to crustacean and demersal fish species	Assess the risk of disturbance to crustacean and demersal fish species	Review technology options and installation methodology	
Effects of noise and vibration	Investigate the predicted noise output of the array and its construction	Desk study	Existing noise studies of underwater turbine devices and similar equipment (Hammerfest strom, Seagen).
Collision of slow moving larger species such as basking sharks with the devices	Collision risk	Desk based assessment.	Studies into collision incidents at established tidal turbine sites and relevant research from other industries.

Effects of Electromagnetic fields on Elasmobranchs	Electromagnetic effects from subsea cables.	Desk based assessment and literature review.	Growing body of research ie. COWRIE 2003, 2009)
Changes in the existing habitat	Review of colonisation of marine renewables structures	Desk based review	EMEC, SAMS, marine renewables developers

6.3.5 Possible mitigation and monitoring measures

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

Potential impact	**Mitigation measures**	**Monitoring during installation**	**Post-deployment monitoring**
Effects on herring and sand eel populations	A suitable monitoring strategy will be developed in consultation with SNH and JNCC Mitigation and monitoring measures will be developed through the engineering design process with the intention of , wherever possible, to minimise potential for impact	A suitable monitoring strategy will be developed in consultation with SNH and JNCC Mitigation and monitoring measures will be developed through the engineering design process with the intention of , wherever possible, to minimise potential for impact	A suitable monitoring strategy will be developed in consultation with SNH and JNCC Mitigation and monitoring measures will be developed through the engineering design process with the intention of , wherever possible, to minimise potential for impact
Physical disturbance to crustacean and demersal fish species			
Effects of noise and vibration			
Collision of slow moving larger species such as basking sharks with vessels or the devices			
Effects of Electromagnetic fields on Elasmobranches			
Changes in the existing habitat			

6.4 Coastal and terrestrial ecology

6.4.1 Baseline description

The majority of habitat across Orkney is determined as improved grassland, with some areas of blanket bog and peatlands on higher ground (approximately 25% of the West Mainland is classified as blanket bog and peatland or heather moor). Several freshwater lochs are present within the study area, with associated networks of rivers and burns.

The coastline of Orkney is characterised by rugged seacliffs, shore platforms, geos and caves, with beaches and dunes within more sheltered areas. The landfall options are characterised by either grassland or duneland.

The Westray South onshore substation area of search is mostly improved grassland and recreational land with some adjacent coastal features on Egilsay including duneland. There are also areas of wetland on Egilsay which would be avoided through site selection should a substation be required within this area.

The grid connection corridors have potential to cross the following habitat types (Figure 6.2):

- improved grassland;
- blanket bog and peatlands;
- heather moor, and
- smooth grassland.

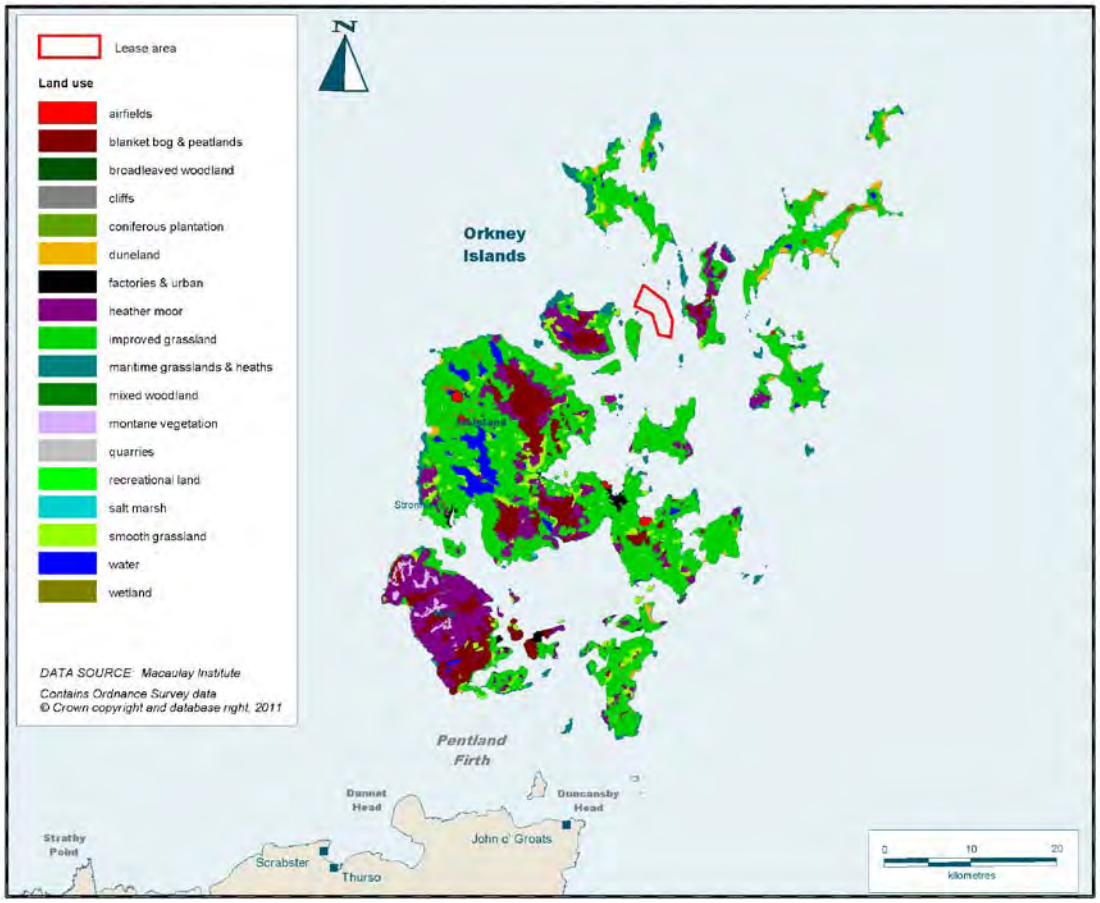

Figure 6.2 Terrestrial ecology across Orkney

6.4.1.2 Designated sites

Sites protected nationally and internationally for terrestrial and coastal ecological features (non ornithological) are identified in the table below:

Designation type	Island	Name of Designation	Features (not ornithological or geological)
SAC	Mainland	Loch of Isbister	Naturally nutrient rich lakes or lochs which are often dominated by pondweed; Otter *Lutra lutra*; Very wet mires, often identified by an unstable 'quaking' surface
SSSI	Mainland	Loch of Isbister and the Loons	Basin Fen

Designation type	Island	Name of Designation	Features (not ornithological or geological)
	Mainland	Loch of Banks	Basin Fen
	Mainland	West Mainland Moorland	Blanket bog
	Mainland	Cruaday Quarry	Devonian chordata
	Mainland	Bay of Skaill	Palaeozoic paleobotany
	Mainland	Stromness Heaths and Coasts	Coastal geomorphology of Scotland; Maritme cliff, Non-marine Devonian, Subalpine dry heath
	Mainland	Loch of Harray and Stenness	Caddisfly *Ylodes reuteri*; eutrophic loch, freshwater nerite snail *Theodoxus fluviatilis*; Saline lagoon
	Rousay	Rousay	Blanket bog, mesotrophic loch, subalpine wet heath
	Eynhallow	Eynhallow	Common seal *Phoca virtulina*

There are no Local Nature Reserves or National Nature Reserves within the study area. Local Natural Conservation Sites are out to consultation at the present time and will be taken into consideration during the EIA process. RSPB reserves are present within the study area at Onziebust (Egilsay), Trumland (Rousay) Cottascarth and Rendall Moss; Birsay Moors; and The Loons and Loch of Banks (all Mainland).

6.4.1.3 Protected fauna

NBN gateway identifies records of bats on the islands of Sanday and South Ronaldsay, and on Mainland close to Kirkwall and Stromness. There are no records of bats within the study area on NBN Gateway. Booth and Booth (2005) report that in general, bats are considered to be rare in Orkney with only one known colony of common pipistrelles in Hoy. In most years, there are 1 or 2 sightings from widespread localities.

The European otter *Lutra lutra* is a semi-aquatic mammal, which is common around the freshwater and coastal areas of Scotland. UK Populations are internationally important, especially since their widespread decline across much of their western European range (JNCC, 2004). Populations in coastal areas utilise shallow, inshore marine areas for feeding

and require fresh water for bathing and terrestrial areas for resting and breeding holts (JNCC, 2004). Where otters live in coastal areas (particularly in Scotland) they tend to have a largely diurnal habit, live in group territories, and have home ranges below 5km (Kruuk, 1996). Otters are a common species in Orkney, and a designated feature of the Loch of Isbister SAC.

6.4.1.4 Local Biodiversity Action Plan

The Orkney Local Biodiversity Action Plan (Orkney Islands Council, 2007) has prepared plans for several habitats and species[15]. Potential habitats with Action Plans within the study area include: Road verges, Eutrophic standing waters, Mesotrophic standing waters, Coastal sand dunes, Coastal vegetated shingle, Coastal strandline, Coastal saltmarsh, and Seagrass beds. The Orkney Biodiversity Action Plan lists all species on the local BAP list, and those on the Scottish Biodiversity List or UK Biodiversity Action Plan, including otter *Lutra lutra*, Orkney vole *Microtus arvalis orcadensis*, mountain hare *Lepus timidus,* Scottish Primrose *Primula scotia* and several scarce species of Eyebright *Euphrasia spp.*

6.4.2 Potential impacts

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

Potential impact	**Potential significance**	**Phase**	**Comment**
Physical disturbance of intertidal habitats during cable landfall installation	Potential significance of impact unknown	Construction, decommissioning	The level and type of disturbance will depend on the character of the shoreline where the cable is landed. The types of coast in the vicinity of the development are not generally sensitive, often comprising low rocky platforms with a surface veneer of mobile sand.
Physical disturbance of terrestrial communities during onshore grid and substation	Potential significant impact	Construction, maintenance, decommissioning	There are a number of onshore grid connection options all of which span the north west Mainland. A relatively large area (circa 90 x 50m) would also be required for the substation compound. There are a number of areas, along potential cable routes or substation locations, where

[15] Orkney Local Biodiversity Action Plan, 2007. Available at: http://www.orkney.gov.uk/Files/Planning/Biodiversity/Local_Biodiversity_Action_Plan_2008-2011.pdf

installation			detailed surveys and informed route selection will be required to minimise and where possible avoid impacts on sensitive habitats and species.
Terrestrial habitat /species loss during and following grid infrastructure installation	Potential significance of impact unknown	construction	
Disturbance of otters during landfall, grid and substation installation	Potential significant impact	Construction, maintenance, decommissioning	Otters are protected under Annex IV of the EU Habitats Directive as a species of European Community Interest in need of strict protection. Otters are fairly common in Orkney in the vicinity of burns which run down onto beaches and sheltered coasts and along adjacent coastlines. The potential for disturbance along each potential route and at each potential substation location will therefore, require careful consideration.

6.4.3 Baseline characterisation strategy:

It is proposed that baseline conditions regarding coastal and terrestrial communities can be further defined to sufficient detail by completing the tasks outlined in the table below:

Data gaps	Methodology	Example data sources
Intertidal habitats	Skilled eye walkover survey assisted by Google Earth images and aerial photography Intertidal survey for prospective development areas for landfall	Digital data providers & SNH Commissioned survey
Terrestrial habitats	Skilled eye walkover survey assisted by Google Earth images	Digital data providers
	Desk review of habitats and species within area, including rare, protected, BAP species. Extended phase 1 habitat survey for prospective development option areas	Commissioned survey Biodiversity records centre for rare species Commissioned survey
Bat survey	If potential sites are in vicinity of development option areas	Consultation with SNH to determine requirement for survey, Commissioned survey Local knowledge

Freshwater habitat survey	Kick sampling of streams and ecological assessment of any standing water bodies	Consultation with SEPA to determine requirement for survey, Commissioned survey
Establish which areas within the boundaries of the proposals may be important for otters	Desk-based review of existing information	SNH Mammal recorder
	Consultation with SNH, OIC and local environmental specialists to determine which potential landfall locations, areas along the possible grid routes and substation locations may require investigation.	Local knowledge
Establish the importance of relevant areas for otters[16]	All landfall options, relevant grid corridor areas and substation locations i.e. those near to water bodies will be surveyed for otter activity following the recommended guidelines[17]	Commissioned survey

SSER plan to conduct baseline characterisation investigations during 2012.

6.4.4 Impact assessment strategy

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

Potential impact	Assessment topics	Assessment method	Relevant research
Physical disturbance of intertidal habitats during cable landfall installation	Excavation for cables and long term protection measures	Area of change and possible mitigation measures	Recovery of beaches from construction disturbance
Physical disturbance or loss of terrestrial communities during onshore grid and substation	Soil excavation foot print Altered drainage issues Spread of dust	Area of change and possible mitigation measures. Sensitivity of	Local rates of recovery from development activities

[16] SNH, 2008. Otters and Development: Scottish Wildlife Series [online] Available at: http://www.snh.org.uk/publications/on-line/wildlife/otters/default.asp [Accessed August 2011].

[17] Chanin P (2003). *Monitoring the Otter* Lutra lutra. Conserving Natura 2000 Rivers Monitoring Series No. 10, English Nature, Peterborough.

installation		surrounding and downstream habitats.	
Disturbance of otters during landfall, grid connection route and substation installation	Sensitivity to disturbance Likelihood of interaction	Predict area and duration of effect.	Typical behaviour of otters

6.4.5 Possible mitigation and monitoring measures

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

Potential impact	**Mitigation measures**	**Monitoring during installation**	**Post-deployment monitoring**
Physical disturbance of intertidal habitats during cable landfall installation	Minimise footprint, Prioritise selection of low sensitivity site where other constraints allow, minimise number of cables	A suitable monitoring strategy will be developed in consultation with SNH. Mitigation and monitoring measures will be developed through the engineering design process with the intention of , wherever possible, to minimise potential for impact	A suitable monitoring strategy will be developed in consultation with SNH. Mitigation and monitoring measures will be developed through the engineering design process with the intention of , wherever possible, to minimise potential for impact
Physical disturbance of terrestrial communities during onshore grid and substation installation	Minimise footprint, Prioritise selection of low sensitivity site where other constraints allow, select low disturbance methods		
Terrestrial habitat loss during and following substation and grid installation	Minimise footprint, Prioritise selection of low sensitivity site where other constraints allow, identify low disturbance methods		
Disturbance of otters during landfall, grid and substation installation	Site selection and grid corridor identification to be informed by knowledge of sensitive areas for otter		

6.5 Seabed communities

This section primarily covers benthic ecology. Information regarding marine fish and shellfish species is discussed in Section 6.3, with intertidal ecology discussed in Section 6.4.

6.5.1 Baseline

Orkney lies on a biogeographical boundary between the generally richer marine life of western Britain and the less diverse marine life of the North Sea region (Barne *et., al*. 1997). The islands are heavily influenced by the North Atlantic Current, which carries warm water northwards along the west coast of Britain preventing extreme temperature fluctuations and helping to develop diverse marine communities.

The AfL area and Subsea cable corridor and offshore substation area of search contains many locations of marine interest (as defined in Barne *et.al*., 1997) ranging from the moderately sheltered sounds of Rousay, Eynhallow and Wyre in which Maerl, a UK BAP habitat has been recorded, to the more exposed seas of the west coast of mainland at Skipi Geo (Barne *et. al.,* 1997).

As part of a survey program requested by Scottish Government, to inform potential marine renewables development in Scotland, underwater video footage was collected in the Westray Firth Moore, 2009). Two video runs were located in the centre of the northwestern entrance to the firth and a further sample was located to the south between the Point of Holm and the Point of Ridden.

Analysis of the two northern runs revealed that the channel floor was composed of a mixed substrate of dense cobbles and pebbles, with scattered small boulders on a gravel bed. The stones were densely encrusted with red bryozoans, barnacles and *Pomatoceros* and although the community found here was of fairly low diversity, the stones supported a low density cushion fauna of sponges and the colonial ascidian *Botryllus schlosseri*, while small individuals of the soft coral *Alcyonium digitatum* and the anemones *Urticina feline* and *Sagartia elegans* were common between the stones. Reviews of both video samples allowed the biotope “circalittoral coarse sediment[18]” to (Moore, 2009) to be assigned to the areas surveyed.

[18] Using Marine Habitat Classification for Britain and Ireland (version 04.05) (Conner *et.al*., 2004)

The southern run showed the substrate consisted of dense boulders and cobbles with a shell gravel infill and small patches of coarse sediment and outcropping bedrock. The rock supported a low-diversity community dominated by crusts of barnacles, coralline algae and red bryozoans, with patches of the hydroid *Tubularia indivisa*, encrusting and cushion sponges, *Alcyonium digitatum* and the bryozoan *Flustra foliacea*. The biotope recorded has been referred to as **"***Tubularia indivisa* on tide-swept circalittoral rock" (Moore and Roberts 2011).

6.5.2 Potential impacts

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

Potential impact	Anticipated significance	Phase	Justification
Substratum / habitat loss / damage from placement of devices and other infrastructure on the seabed, cable laying;	Potential significance of impact unknown	Construction, operation and decommission –ing	Significance of impact not known as will depend on species and habitats within the footprint and surrounding area of any infrastructure placed on the seabed, will be considered further
Scour around devices and other subsea infrastructure (including vessel mooring cables as result of movement with wave and tides)	Potential significance of impact unknown		
Increased suspended sediment and turbidity from installation of subsea infrastructure in inshore waters	Potential significance of impact unknown		
Smothering of benthic species	Effect unlikely to be significant		High energy environment, - quick dispersion so effects of smothering not deemed to be significant
Disturbance of contaminated sediments	Effect unlikely to be significant		Limited source of contaminated sediments in study, not deemed to be significant
Decrease in water flow leading to change in	Potential significance of		Potential for devices to effect water

Potential impact	Anticipated significance	Phase	Justification
benthic habitat downstream of devices	impact unknown		flow, will be considered further
Damage to habitat or species due to pollution from routine and accidental discharges;	Effect unlikely to be significant		Industry best practice will be followed, and effects not deemed to be significant
Colonisation of subsea infrastructure, scour protection and support structures	Beneficial impact		Habitat creation – beneficial impact
Introduction of marine non-natives.	Potential significance of impact unknown		Use of devices/infrastructure as stepping stones, and introduction of species through vessel movements

6.5.3 Baseline characterisation strategy

It is proposed that baseline conditions regarding seabed communities can be further defined to sufficient detail by completing the tasks outlined in the table below:

Data gap	**Methodology**	**Example data sources**
Habitats and species currently existing within the study area and ECR.	Site specific survey; desk based study.	Moore 2009; Moore and Robertson 2011. NBN (National Biodiversity Network), MNCR reports. MESH (Mapping European Seabed Habitats). Advice is currently being sought from the MSLOT, MS-Science and SNH to inform the scope of benthic data collection appropriate

SSER plan to conduct baseline characterisation investigations during 2012.

6.5.4 Impact assessment strategy

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

Potential impact	Assessment topics	Assessment method	Relevant research
Substratum / habitat loss / damage;	Determine the presence and extent of habitats and species within the study area, including rare, sensitive or protected species	Site specific survey and Desk based research	Moore 2009; Moore and Robertson 2011. NBN (National Biodiversity Network), MNCR reports. MESH (Mapping European Seabed Habitats), UK Biodiversity Action Plan. Relevant guidance includes Guideline for EIA (IEEM 2010) renewables licensing manual (EMEC & Xodus in press), and the benthic volume of SNH/MS guidance document for surveying and monitoring in relation to marine renewables deployments in Scotland (Saunders *et al*., in press)
Scour around devices and other subsea infrastructure (including mooring cables as result of movement with wave and tides)			
Increased suspended sediment and turbidity from installation of devices and other subsea infrastructure			
Decrease in water flow leading to change in habitat	Changes in water flow	Desk based research.	EMEC
introduction of marine non-natives.	Identification of relevant species and potential for opportunities	Desk based research	SAMS research, Oil and gas guidance (OGP/ IPIECA, 2010)

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:

Potential impact	Mitigation measures	Monitoring during installation	Post-deployment monitoring
Substratum / habitat loss / damage;	To be determined following outcomes of desk based research, survey and consultation, will be considered when micro siting of devices.	To be determined following outcomes of desk based research, survey and consultation. Review footage taken during installation to validate predictions (operations will most likely be monitored)	To be determined following outcomes of desk based research, survey and consultation. Post installation ROV survey along cable route(s) and structures on the seabed
Scour around devices and other subsea infrastructure (including mooring cables as result of movement with wave and tides)			
Increased suspended sediment and turbidity from installation of devices and other subsea infrastructure			
Decrease in water flow leading to change in habitat			
Colonisation of subsea infrastructure, including marine non natives.	Method statement to minimise risk of non-native introduction Follow relevant IMO regs		

6.6 Questions

Questions for Reader

Q8. Do the studies proposed for assessment of effects on the ecological environment look appropriate and complete?

7 POSSIBLE IMPACTS ON THE PHYSICAL ENVIRONMENT

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

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

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

7.1 Physical processes

7.1.1 Baseline description

7.1.1.1 Tidal Stream and Range

A previous study of the wave climate at the EMEC Fall of Warness test site[19] 5km to the south east of the study area found the tidal ranges to be:

- 3.4m above Lowest Astronomical Tide (LAT) at Mean High Water Springs (MHWS);
- 1.1m above LAT At Mean Low Water Springs (MLWS); and
- 2.23m above LAT Mean Sea Level (MSL).

The tidal range across the study area is likely to be approximately 2.3, depending on exact locations.

7.1.1.2 Wave climate

Large swells can build up within the Westray Firth and their size depends upon the direction and strength of the wind and the length of time that wind is blowing. Prevailing winds are from between west and south-east for 60% of the year (Hansom, 2007). When the tide is running in the opposite direction to the prevailing wave direction, very steep waves are created, which are known locally as "tide lumps" or ‘standing waves’. These waves are hazardous to small craft and difficult to operate in with larger vessels, the waves often reaching heights of over 5m (Lawrence *et.al*., 2009). The wave climate study mentioned above found that the most frequently occurring wave heights at the Fall of Warness site were between 0.5m and 1.0m and that wave heights between 3m and 3.5m occurred at that site 0.55% of the time. The prevailing wave direction was from a north west or a south east and the extreme wave height for a 200 year return period was predicted to be 10.3m (Weir Stranchan & Henshaw 2005). It should be noted that although the Fall of Warness site is located within the Westray Firth it is approximately 5km to the south of the study area and there are likely to be differences in the wave climate between the two areas.

[19] Weir Strachan & Henshaw (2005) Neptune Waves Assessment: Wave Modelling Report

7.1.1.3 Seabed and Bathymetry

Water depths across the AfL area range from 25 - 54m with no apparent significant geomorphological features. Depths greater than 40m are however only found in the north west of the AfL area. The waters that surround Rousay, Egilsay and Wyre are much shallower (less than 20m); while the seabed west of Orkney Mainland shelves steeply, dropping to over 60m in places within 5km of the coast.

MESH (Mapping European Seabed Habitats) data identifies the seabed of the AfL area as shallow coarse sediment plain with high tidal stress. Areas to the south and west of the AfL area through which the ECR may pass were also identified as a shallow coarse sediment plain with the exception of Saviskaill Bay on the north coast of Rousay which is identified as being a bay.

As part of a survey program requested by the Scottish Government to inform potential marine renewables development in Scotland, underwater video footage was collected in the Westray Firth. Analysis of this footage identified the seabed substrate as a “mixed substrate of dense cobbles and pebbles, with occasional small boulders, on stone and shell gravel” in the northern part of the lease area and “dense boulders and cobbles with shell gravel infill, with small patches of coarse sediment and bedrock outcrops” in the middle section.

7.1.1.4 Sediment Transport

Ramsay and Brampton (2000) describes sediment transport in terms of coastal cells, and sub-cells. All Islands north of Eynhallow Sound and Gairsay Sound were determined to be in a single sub-cell. HR Wallingford determined that the littoral processes within this sub-cell are likely to be wave dominated, although this will depend on the orientation of the beaches and the amount of shelter provided by other islands. They predicted that there is unlikely to be any significant net longshore drift or interchange of beach sediments. Although tidal currents are very strong on both ebb and flood tides, it is unlikely that such currents directly affect beach areas and there is little long-term erosion within this sub-cell.

7.1.2 Potential impacts

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

Potential impact	Anticipated significance	Phase	Justification
Changes to sediment regime as a result of physical structures on the seabed	Potential significance of impact unknown	Construction, operation and decommissioning	Due to the large number of structures being placed on the seabed (up to 200 devices and associated infrastructure) and the presence of gravel on the seabed localised changes to the sediment regime may occur.
Changes to sediment regime as a result of energy extraction.	Potential significance of impact unknown	Operation	Once operational the turbines will be extracting energy from the surrounding water which may have a localised effect on water currents and therefore also the sediment regime.
Changes to seabed morphology	Potential significance of impact unknown	Construction	The effects of construction on seabed morphology and sediment transport will largely depend on the eventual siting and methodology for installation of the devices. There will be a degree of disturbance associated with seabed preparation (i.e. rock and kelp removal) and directional drilling (should this be required), which has the potential to affect bedforms, solid geology or geomorphological features. Surveys conducted during the EIA process will identify geomorphic features which may need to be avoided through micro-siting of the devices and associated infrastructure, and will also enable understanding of the degree of seabed works required
Impacts to important geological features during construction activities	Effect unlikely to be significant	Construction	Construction activities have the potential to affect geology, however given that there are very few recognised important geological features or GCRs in the vicinity of the development or possible ECR these impacts are likely to be insignificant.

7.1.3 Baseline characterisation strategy

It is proposed that baseline conditions regarding physical processes can be further defined to sufficient detail by completing the tasks outlined in the table below:

Data gap	Methodology	Example data sources
Bathymetric/ Geophysical site conditions (field study)	Multibeam swath bathymetry to provide a high quality bathymetric model. Sub Bottom Profiler to provide an assessment of sediment overburden.	To be commissioned by SSER
Baseline tidal current conditions (field study)	Tidal current speeds can be measured through complete tidal range and in variety of weather conditions using Acoustic Doppler Current Profiler (ADCP). The effects of the tidal device infrastructure on flow conditions can subsequently be calculated / estimated.	Currently being undertaken by SSER
Coastal process modelling (desk study)	Measured field data relating to tidal currents, wave action and bathymetry will be used to model the potential effects of tidal energy extraction on coastal processes. – will inform device siting and array layout, and also coastal processes assessment.	To be undertaken by SSER

SSER are undertaking baseline characterisation investigations between at present and hope to conclude these by Autumn 2012.

7.1.4 Impact assessment strategy

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

Potential impact	Topic	Methodology	Relevant research
All	Affects on the sediment regime	Modelling to predict any changes that may result from extraction of tidal energy	Research from other tidal energy projects.

7.1.5 Possible mitigation and monitoring measures

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

Potential impact	Possible mitigation measures	Possible monitoring during installation	Possible post-deployment monitoring
All	No mitigation measures are proposed.	No monitoring is proposed.	No post development modelling is proposed.

7.2 Air and climate

7.2.1 Baseline

Air quality in Orkney is generally good due to a number of factors including low population densities, low volumes of traffic, limited industrial processes and predominance of agricultural land practices, as well as a location generally remote from any significant areas of population density. No areas within Orkney have been identified as "air quality management areas".

The climate within the Westray Firth and surrounding area is influenced by its 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 30km from the study area) between 1970 and 2000 shows yearly average temperatures to range between 5.3 ^{O}C and 10.5 ^{O}C, frost is present (Met office) 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 of an average year (Barne *et al.*, 1997). Further details on wind, storm frequency and fog are considered within the NRA.

7.2.2 Potential Impacts

Possible impacts along with the potential significance of effect on air and climate are considered in the table below:

Potential impact	Anticipated significance	Phase	Justification
Vessel emissions, decreasing air quality	Effect unlikely to be significant	Construction, operation, maintenance and decommissioning	Vessels used will emit gasses such as carbon dioxide, sulphur oxides and nitrogen oxides which will have a localised effect on the atmosphere, but not considered to be significant. All vessels will operate to IMO standards (refer to MARPOL Annex VI).

Potential impact	Anticipated significance	Phase	Justification
Construction of onshore elements for the project resulting in dust impacts	Effect unlikely to be significant	Construction	Landside construction activities may result in the release of dust during dry periods.

7.2.3 Baseline characterisation strategy

It is proposed that baseline conditions regarding air and climate can be further defined to sufficient detail by completing the tasks outlined in the table below:

Data gap	Methodology	Example data sources
Assessment of vessels emissions (or likely emissions)	Using data available on emissions of CO_2, Sox and NOx	Vessel suppliers.
Baseline data	Desk based assessment	1981-2010 data (averages) will be available from the Meteorological Office, Kirkwall in January 2012

SSER plan to collate baseline characterisation data during 2012.

7.2.4 Impact assessment strategy

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

Potential impact	Assessment topics	Assessment method	Relevant research
Vessel emissions, decreasing air quality	see mitigation below	see mitigation below	Vessels specifications documents.

7.2.5 Mitigation and monitoring strategy

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

Potential impact	Mitigation measures	Monitoring during installation	Post-deployment monitoring
Vessel emissions, effecting air quality.	Procurement of vessels with lower emissions, industry best practice All vessels will operate to IMO standards (refer to MARPOL Annex VI).	None proposed	None proposed
Dust release from onshore construction activities	Follow CIRIA best practise for construction site management including dust suppression measures as required	None proposed	None proposed

7.3 Water and Sediment quality

7.3.1 Baseline

7.3.1.1 Offshore Water bodies

The water quality of the seas around Orkney largely reflects the oceanographic regime (Orkney is positioned on the edge of the North Atlantic Drift) which assists in the dilution and dispersion of any contaminants or pollutants that enter coastal waters and therefore water quality in the region is generally excellent (Marine Scotland, 2010). The AfL area and subsea cable corridor and offshore substation area of search lie within the Westray Firth water body (Water body ID 200243) and the Breck Ness to Noup Head (Water body ID 200237) both of which are identified as being of good status (SEPA, 2008).

Fast flowing tidal currents within the Westray Firth would quickly remove any potential pollution or contaminants from the lease area, while the open nature of the west coasts of Rousay and Mainland also creates a high wave energy climate that would disperse pollutants rapidly. The only locations within the study area where pollution and contaminants could potentially remain in the water column for any period of time without dispersion are in sheltered waters such as coastal bays that occur in the south of the study area around the islands of Rousay, Wyre, and Eglisay where tidal flows are weaker.

7.3.1.2 Onshore water bodies

The ground water body on Mainland (Water body ID 150021) has been classified as having good overall status and the drinking water protection zone of Mainland has been given a pass (SEPA, 2008). Several lochs, streams and burns occur within the study area.

7.3.1.3 Sediment

The sediment across much of the site is of a coarse nature (Section 7.1) and therefore provides limited potential for sediment contamination as it is generally finer sediments that facilitate the accumulation of contaminants.

7.3.2 Potential impacts

Possible impacts along with the potential significance of effect on water and sediment quality are considered in the table below:

Potential impact	Anticipated significance	Phase	Justification
Potential pollution of the offshore water environment.	Effect unlikely to be significant	Construction	Industry best practice will be followed. Risk of contamination not deemed to be significant
Contamination of Marine sediments	Effect unlikely to be significant	Construction	The technology will be designed so that no pollutants will be released into the environment and any accidental spills will be rapidly dispersed. There is unlikely to be any contamination of sediments within the development site
Potential impacts of onshore infrastructure on relevant water bodies.	Potential significance of impact unknown	Construction	As the project is in an early development phase the location and extent of onshore infrastructure has not yet been determined and therefore the level of this impact is unknown.
Pollution due to flood risk of onshore infrastructure	Potential significance of impact unknown	Construction and operation	The location of onshore infrastructure is yet to be finalised. Flood risk assessment will both inform siting of onshore infrastructure and will help identify the risk.

7.3.3 Summary of potential impacts and study requirements

It is proposed that baseline conditions regarding water and sediment quality can be further defined to sufficient detail by completing the tasks outlined in the table below:

Data gap	Methodology	Example data sources
Water quality assessment (desk study and field studies if required)	Risks to water quality will be identified and assessed as part of the EIA, and mitigation measures recommended as appropriate. Consultation with SEPA and Marine Scotland will identify any requirement for analysis of water quality and / or sediments.	EMEC website (www.emec.org.uk/index.asp) SEPA River Basin Management Plans (SEPA, 2009). Marine Scotland.

SSER plan to conduct baseline characterisation investigations in Quarter 4 of 2011.

7.3.4 Impact assessment strategy

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

Potential impact	Assessment topics	Assessment method	Relevant research
Potential impacts of onshore infrastructure on relevant water bodies.	Mechanism for pollution to enter water environment	The ES will identify all possible impacts to all watercourses, lochs, groundwater and will include a full assessment of the likely significant impacts. Other water features and sensitive receptors, such as water supplies will be assessed. It will also include details of mitigation, pollution prevention and waste management proposals. The ES will contain maps and diagrams providing information on the site layout, device foundation and cabling footprint areas, including onshore components such as access tracks, buildings and cables. These maps will be supported by a statement detailing the development and reasons for the choice of site and layout of the development.	SEPA groundwater vulnerability map of Scotland (2003) SEPA aquifer map of Scotland (2004) SEPA river basin management plans (SEPA, 2009)
Pollution due to flood risk of onshore infrastructure	Assessment of flood risk	A flood risk assessment (in line with SPP) will be conducted once the location of onshore infrastructure has been further identified. This will inform the EIA.	

7.3.5 Mitigation and monitoring strategy

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

Potential impact	Mitigation measures	Monitoring during installation (validating predictions)	Post-deployment monitoring (measuring impacts)
Potential impacts of onshore infrastructure on relevant water bodies.	Dependant on location of onshore infrastructure, Avoidance of sensitive features	Will be determined through EIA and consultation	Will be determined through EIA and consultation
Pollution due to flood risk of onshore infrastructure	Location of infrastructure away from flood risk areas		

7.4 Geology, Soils and Hydrology

7.4.1 Baseline

7.4.1.1 Geology

The underlying geology of the Study Area is predominantly Middle Old Red Sandstones of the Devonian age. These rocks have been divided into Stromness Flags, Rousay Flags and Eday Beds. The first two groups comprise mainly rhythmic sequences of grey and black siltstone and mudstones alternating with thin beds of sandstone. The Eday Beds comprise yellow and red sandstone separated by Eday Flags and Eday Marls. Fossilised fish remains are found in all three groups and are particularly abundant and well preserved in the Sandwick Fish Bed (Barne *et. al.,* 1997).

No Geological Conservation Review[1] sites are within the study area, however several are within the vicinity of the AfL area and possible export cable routes including: one site on northwest coast of Eday and one in northwest of Mainland. In addition much of the west coast of Mainland is a GCR, however this site lies south of any cable route currently under consideration. All three GCR sites have been identified due to their Devonian sandstones and associated fossils.

Three Sites of Special Scientific Interest are present on Mainland and include geological features. Cruaday Quarry SSSI is designated for Devonian chordata, Bay of Skaill is designated for Palaeozoic paleobotany, and Stromness Heath and Coasts SSSI is designated for Coastal geomorphology of Scotland; Maritme cliff, Non-marine Devonian,

7.4.1.2 Soils

The soils of Orkney are dominated by poorly drained non-calcareous gleys and peat.

7.4.1.3 Peat

The formation of peat is inextricably linked with the presence of water and the hydrological character of an area can be affected significantly by peat deposits. Peat acts as a reservoir of fresh water that can provide a significant proportion of baseflow to rivers and streams, especially during dry spells of weather. Much of the Orkney peatlands are protected by

[1] GCRs are selected as the very best and most representative geological and geomorphological features of Britain. These are features of national and international importance that are considered to qualify for designation in SSSIs.

international or national designations, with any remaining peaty areas recognised under local designations.

7.4.1.4 Sand

In Orkney sand deposits are a coastal feature within the larger bays. They are often associated with dune systems and a machair type hinterland.

7.4.2 Hydrology

7.4.2.1 Rivers

Orkney has no major rivers, so true estuarine habitats are few and far between (Murray *et al*, 1999). Water in Orkney's East Mainland and isles, drains largely into the sea over sloping coastal habitats, whereas in the West Mainland, a significant portion of falling water drains into the loch basin systems in Harray and Stenness.

7.4.2.2 Wetlands

Orkney has extensive areas of wetland that have not been totally drained to make way for agriculture or other forms of development. These wetland areas have rich flora and wildlife associated with them and some are designated at international or national levels.

7.4.2.3 Lochs

The lochs and pools of the region have a range of water chemistry and acidity that reflects the surrounding rocks, soils and proximity to the sea. Moorland or peatland lochs, such as those found on Hoy, are naturally poor in nutrients (oligotrophic) and are characterised by Bogbean and *Sphagnum* mosses. Where loch catchments contain base-rich rocks or shell sand, their waters are more nutrient-rich (eutrophic).

The generally good water quality of the area means that aquatic systems are generally productive for their type. Problems have been encountered in Orkney in The Loch of Harray in particular where excessive nutrient inputs led to an explosion in aquatic vegetation a reduction in water quality once this started to decay during the early and mid 1990s.

The Loch of Harray and its neighbour the Loch of Stenness hold particular interest due to the mixing of salt and fresh water within them. The Loch of Stenness is, in part, designated as an SAC for this reason.

7.4.2.4 Groundwater

The search area is predominantly flagstone (see above); largely confining groundwater to dilated joints and bedding planes within the uppermost section of the rock

7.4.3 Potential impacts

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

Potential impact	**Phase**	**Potential significance**	**Comment**
Contamination of soils or waterways from spills during onshore construction works	Installation	Potential significance of impact unknown	Any spillage of concrete, lubricants, fuels, oils and other fluids used during construction may adversely affect soils and water quality of watercourses and groundwater
Interaction with geology if directional drilling is used for cable landfall	Installation	Potential significance of impact unknown	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 such as fish beds.
Direct or indirect impact on water courses downstream of works	Installation	Potential significance of impact unknown	Watercourse crossings have the potential to affect the watercourses' hydrology and to alter the potential for erosion and the associated sediment regime. There may also be indirect impacts on receptors downstream if water quality is degrade
Altered surface and ground water flows due to cable trenching and construction of an onshore substation	Operation	Potential significance of impact unknown	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.
Increased sediment loads in watercourses due to excavation and	Installation	Potential significance of impact	Construction activities have the potential to create sedimentation in watercourses, particularly during periods of heavy

reinstatement.		unknown	rainfall. For example, rainfall on soil stores could create sediment laden runoff that could reach watercourses

7.4.4 Baseline characterisation strategy:

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

Data gap	Methodology	Example data sources
Topographical characterisation	Desk based study and site visit	SEPA, BGS, landowners, historic maps
Geotechnical characterisation of offshore site	Testing of rock samples from site or offset samples from coastal analogues	None identified
Geological characterisation of offshore cable routes & cable landfall	Use detailed bathymetric survey backed up by geophysical surveys in areas of deeper sediments, trial pits dug on sedimentary shores if required.	As above and project specific surveys
Geological and soils characterisation on land	Skilled eye survey and appraisal supported by existing geological maps, trial pits dug across land if required.	Published maps and project specific survey
Hydrological characterisation on land	Skilled eye survey and appraisal supported by existing hydrological maps	Published maps and project specific survey, SEPA flood risk assessment maps

7.4.5 Impact assessment strategy

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

Potential impact	Assessment topics	Assessment method	Relevant research
Contamination of soils or watercourses by spillages	Sources of spillage Type and level of possible contamination Consequences of	Spill risk assessment for all works and facilities	Established best practise regards spill minimisation and management, extensive literature on effects of spill

Potential impact	Assessment topics	Assessment method	Relevant research
	possible spillage events Likelihood of possible spillage events		events
Interaction with geology if directional drilling is used	Trajectory for any drilling Possible hazards in local stratigraphy. Amounts of materials generated Materials use to facilitate drilling eg drill muds, cements etc	Drilling risk assessment by experienced geologist	Case studies from other directional drilling works
Impact on water courses by works at crossing points	Locations of water courses Status and sensitivity of water courses Location and type of works to be undertaken	Risk of turbidity reaching water course Sensitivity of water course to sediment loading	Case study examples
Altered surface and ground water flows	Identify any activities that could affect flows. Location of any sensitive water flows	Hydrological assessment by specialist	Case study examples
Increased sediment loads in watercourses	Possible sources of run-off Locations of turbidity sensitive areas	Risk of turbidity reaching water course Sensitivity of water course to sediment loading	Case study examples

SSER plan to begin baseline characterisation investigations in Quarter 4 of 2011.

7.4.6 Possible mitigation and monitoring measures

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

Potential impact	Mitigation measures	Monitoring during installation	Post-deployment monitoring
Contamination of soils or watercourses by	The proposed development will adhere is current best practice and CIRIA guidance.	The proposed development will adhere is current	The proposed development will adhere is current best

Potential impact	Mitigation measures	Monitoring during installation	Post-deployment monitoring
spillages	Any further mitigation required will be developed in consultation with SEPA.	best practice and CIRIA guidance	practice and CIRIA guidance
Interaction with geology if directional drilling is used			
Impact on water courses by works at crossing points			
Altered surface and ground water flows			
Increased sediment loads in watercourses			

7.5 Questions

Questions for Reader

Q9. Do the studies proposed for assessment of effects on the physical environment look appropriate and complete?

8 CUMULATIVE AND IN-COMBINATION EFFECTS

The EIA Regulations require that potential cumulative effects (i.e. the effects of a proposal for one type of development with other developments of the same type) and in-combination effects (i.e. the effects of an activity or development in combination with other, different projects and activities) are taken into account within the project EIA. Cumulative effects may be understood as *"incremental effects of an action..."* arising *"from individually minor but collectively significant actions"*. The EIA will consider how the proposed development at Westray South and associated grid connection may interact with other ongoing and planned projects and activities.

Potential cumulative and in-combination impacts for the proposed development identified as being of greatest significance (either positive or negative) are identified as follows:

- Impacts to commercial fisheries, including loss of access to fishing grounds, displacement to less profitable areas, increased steaming times, increased running costs and conflict between users of different gear;
- Impacts to marine mammals, through disturbance due to underwater noise, collision risk and displacement;
- Impacts to ornithology, through habitat loss, modification to migratory routes, collision risk and disruption to habitat function;
- Impacts to shipping and navigation, including constriction of shipping routes, increased navigational risk, increased travel and running costs;
- Impacts to archaeology and cultural heritage, including impacts to known and potential archaeological features both terrestrially and subsea, and impacts to historic setting;
- 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 wider UK economy;
- Contributions to achieving Scottish and UK renewable energy targets and promotion of marine renewable energy technology, and

- Benefits to emission reduction and climate and offset of traditional energy generation.

Impacts that will be considered in this EIA relate to impacts due to the Project and:

- Other wave and tidal energy projects (including Phase 2 of the Project) in the Pentland Firth and Orkney Waters leasing round and other projects in the scoping process or beyond;
- Other sea and seabed users e.g., commercial fishing, shipping, wind farms, marine aggregate extraction, oil and gas; and
- Other onshore infrastructure, including wind farms and other energy project's grid connection infrastructure.

Consultation will take place with Marine Scotland and The Crown Estate regarding potential studies they may conduct in the Pentland Firth and Orkney Waters regarding cumulative and in-combination effects. Consideration will be given to The Crown Estate's document identifying cumulative and in combination effects associated with wave and tidal development in the Pentland Firth and Orkney Waters (Royal Haskoning, in prep).

Questions for Reader

Q10. Are you aware of any proposed developments within the planning process or activities with which the proposed tidal development might interact to result in cumulative effects?

9 PRELIMINARY HAZARD ANALYSIS – SUMMARY

Shipping and navigation in the vicinity of the Westray South AfL area has been assessed by Anatec as part of a Preliminary Hazard Analysis (PHA) (Appendix 3).

From the baseline data and local stakeholder consultation it was identified that the AfL area is presently used by a mixture of vessels, most notably Orkney Ferries between Kirkwall and the North Isles.

Vessels operating in the area could be potentially affected by the Westray South project. The impacts will vary between installation, maintenance, decommissioning and normal operations.

An assessment methodology for the Navigation Risk Assessment has been proposed in the PHA based principally on the following guidance:

- Department for Energy and Climate Change (DECC) Methodology for Assessing the Marine Navigational Safety Risks of Offshore Windfarms (2005); and
- Maritime and Coastguard Agency (MCA) Marine Guidance Notice 371 (MGN 371) Offshore Renewable Energy Installations (OREIs) – Guidance on UK Navigational Practice, Safety and Emergency Response Issues.

The DECC methodology, which was produced in association with the DfT / MCA, provides a template for preparing a navigation risk assessment for marine renewable developments. The methodology is centred on risk controls and the feedback from risk controls into risk assessment. It requires a submission that shows that sufficient risk controls are, or will be, in place for the assessed risk to be judged as broadly acceptable or tolerable with further controls or actions.

The MCA guidance MGN 371 highlights issues that need to be taken into consideration when assessing the impact on navigational safety from offshore renewable energy developments in the UK. Specific annexes within the guidance that address particular issues include:

- Annex 1: Site position, structures and safety zones;
- Annex 2: Developments, navigation, collision avoidance and communications;

- Annex 3: MCA's windfarm shipping template for assessing windfarm boundary distances from shipping routes;
- Annex 4: Safety and mitigation measures recommended for OREI during construction, operation and decommissioning; and
- Annex 5: Search and Rescue (SAR) matters.

One of the key requirements of MGN 371 is the collection of maritime traffic survey data of appropriate duration, including seasonal and tidal variations. This is to record all vessel movements in and around the project boundary and its vicinity. The method and timetable for data collection will be agreed with the MCA in advance to ensure it meets their requirements.

Further consultation will be carried out about the proposal as more detailed site design work progresses and potential layouts are developed. This will allow stakeholders to influence the final layout of the development. All the identified navigational stakeholders, such as OIC Marine Services and local fisheries representatives, will be consulted during the NRA process, as well as any other interested parties identified during the Scoping and NRA process.

Local stakeholders representing all the different maritime interests, including ports, ferries, fishing, shipping, recreation and emergency services, will be invited to the Hazard Review Workshop, which is a key part of the NRA and a useful method of identifying additional risk controls.

Other key guidance and reference materials that will be used in the assessment are listed below:

- MCA Marine Guidance Notice 372 (2008). Guidance to Mariners Operating in the Vicinity of UK OREIs;
- IALA Recommendation O-139 On The Marking of Man-Made Offshore Structures, 1st Edition, December 2008;
- DECC Guidance Notes on Applying for Safety Zones around Offshore Renewable Energy Installations; and
- IMO Guidelines for Formal Safety Assessment (FSA).

10 PROPOSED EIA METHODOLOGY

10.1 EIA Process

An Environmental Impact Assessment will be required to support the consent applications associated with the proposed tidal development. Table 10.1 below identifies the main stages of the EIA process that the Westray South Tidal Development 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 all key stakeholders, providing preliminary information on the scheme to date	Documents tailored to stakeholders groups, consultation
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)
EIA	Baseline data collection	To characterise the existing environment	Background data including existing literature and specialist studies
	Specialist studies	To further investigate those environmental parameters which may be subject to potentially significant effects	Specialist reports
	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; Figures Environmental Monitoring Plan
	Pre-Application Consultation	Advertising of application for licensing must occur at least 12 weeks prior to submission of joint s36 Application	Joint s36/Licence Application (if applicable)
	Post submission	Liaison and consultation to resolve matters or representations/objections	Addendum to ES
EIA Consent Decision			

10.2 Environmental Statement

The findings of the EIA are presented in a written Environmental Statement (ES). It is proposed at this stage that the ES will comprise a single document combining text and graphics with a separate 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.

10.2.1 Introductory Chapters

Overview of Renewable Energy and Project Introduction

- An introduction to renewable energy development and in particular, tidal power will be outlined. It will give a short overview of the tidal resource in Scotland, in particular around Orkney, and will outline the potential benefits of the development in terms of reduced emissions. It will also outline the project drivers, aims and objectives.

Overview of EIA 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.

Site Selection Process

- A description of the site selection process for the tidal array and grid connection route will be outlined. It will describe the main alternatives studied, and the main reasons for the choice of this site, taking into account the environmental effects. It will describe the way in which mitigation of environmental effects has been considered during project design, layout, cable route to substation and the EIA process.

Project Description

- Details of the site and a description of the proposed tidal array will be discussed. This will include details of the possible size, layout and design of the site and associated onshore/offshore infrastructure. This chapter will also

outline the construction, installation, operational, maintenance and decommissioning requirements of the project.

Policy and Legislation

- This section will present an overview of the relevant statutory planning guidance and Development Plan policies which apply to the proposed development.

10.2.2 EIA Results

- **Human Parameters**
    - Local communities and socio-economics;
    - Commercial Fisheries;
    - Shipping and Navigation;
    - Ports and Harbours;
    - Utilities;
    - Disposal sites;
    - Landuse;
    - Seascape and Landscape;
    - Archaeology and Cultural Heritage;
    - Military Activity;
    - Aviation
    - Recreation;
    - Tourism;
    - Other renewables;
    - Onshore Traffic and Transport;
- **Biological Parameters**[20]

[20] Designated sites to be included in the relevant sections

- Birds;
- Seabed Communities;
- Fish;
- Marine Mammals;
- Coastal and Terrestrial communities;

- **Physical Parameters**
  - Physical processes;
  - Geology and Hydrology; and
  - Water and sediment quality.

Each topic chapter will describe the approach taken to impact assessment. This will include an outline of relevant consultations undertaken, documentation studied and the means of defining the area of search for that topic. Should there be any difficulties (technical deficiencies or lack of know-how) encountered in compiling the required information, this will be noted. The existing baseline conditions for the topic will then be described. An assessment will then be made of the nature, magnitude, duration and significance of the likely effects of the construction, installation, operation, maintenance, and decommissioning of the proposed development on the topic.

Mitigation measures to avoid, minimise, or remedy the predicted effects, where practical, will be outlined. An assessment will be made of the significance of the likely residual effect, following mitigation.

Potential cumulative effects will be discussed within each EIA topic chapter, and summarised in a Cumulative Effects chapter.

10.2.3 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. SSER are committed to considering current best practice to minimise the risk of adverse impact to the physical, biological or social environments on site and in the surrounding area. 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.

10.2.4 Environmental Monitoring Plan

Where elements of uncertainty remain regarding predicted effects (as part of the full EIA exercise) a monitoring programme may be required. Any requirements for monitoring will be discussed with Marine Scotland and the relevant stakeholders and committed to as part of the EIA consultation process. It would be expected that monitoring commitments would become subsequent consent conditions.

10.2.5 Monitoring

An appropriate environmental monitoring programme is under development through consultation with key stakeholders, to gather baseline data where appropriate to inform on the existing environment, and to improve understanding of the potential interactions of the proposed development during construction and operation with the physical, biological and social environments.

11 CONCLUSIONS

The Environmental Statement 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 outline the need for the potential impacts outlined in this scoping study to be considered further during EIA. In addition to the site specific environmental impacts outlined below there are significant beneficial impacts to the development of renewable energy technologies with regards to reducing carbon emissions and combating climate change.

Table 11.1 Consideration of Effects Shown in Table 11.2

✓	Potentially significant effect requiring detailed investigation in the EIA
✓	Effect significance unknown requiring further data to be collated and assessed
×	Effect unlikely to be significant (and therefore has been scoped out of EIA)
×	No effect (and therefore scoped out of EIA)
✓	Beneficial

Table 11.2 Key Potential Effects of the Proposed Tidal Array

Potential Effect	Construction & Installation	Operation	Maintenance	Decommissioning
HUMAN ENVIRONMENT				
Local Communities and Socio-economics				
Local employment and business opportunities	✓	✓	✓	✓
Wage inflation	✓	✓	✓	✓
Improvements to infrastructure and facilities	✓	✓	✓	✓
Population increase	✓	✓	✓	✓
Change in population distribution	✓	✓	✓	✓
House price inflation	✓	✓	✓	✓

Potential Effect	Construction & Installation	Operation	Maintenance	Decommissioning
Pressure on local utility services	✓	✓	✓	✓
Improvements to local transport services	✓	✓	✓	✓
Commercial Fisheries				
Loss of access to fishing grounds	✓	✓	✓	
Obstruction to regular fishing vessel transit routes	✓	✓	✓	
Change in abundance of targeted species		✓		
Shipping and Navigation				
Disruption to navigation created by devices or any required marine exclusion zone	✓	✓	✓	✓
Disruption to navigation created by support vessels	✓	✓	✓	✓
Loss of or change to traditional navigation routes	✓	✓	✓	
Ports and harbours				
Opportunity for expansion of existing port infrastructure	✓	✓	✓	✓
Utilities				
Potential upgrade of existing electrical grid infrastructure	✓			
Potential impacts on electrical grid, telecoms and water network during construction and installation	×			
Disruption to utilities provision	×			
Disposal sites				
Potential disruption to existing disposal site activity	×	×	×	×
Land Use				
Changes to land-use from construction of onshore buildings	✓	✓		
Nuisance or obstructions to land-use from construction and presence of overhead or buried cables	✓	✓		
Landscape and Seascape				
Changes to landscape character	✓	✓	✓	

Potential Effect	Construction & Installation	Operation	Maintenance	Decommissioning
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)	✓			
Direct disturbance to the visual setting of Scheduled Monuments and effects on historic landscape character (both within and outwith the areas of search)	✓	✓	✓	
Indirect disturbance of submerged historic and prehistoric land surfaces and archaeological finds as a result of changes to the hydraulic and sedimentary regime		✓	✓	
Ministry of Defence (MOD) areas				
Potential disruption to existing MOD activity	×	×	×	×
Aviation				
Disruption to aviation	×	×	×	×
Recreation				
Disturbance to offshore recreation activities during construction and maintenance works offshore	✓	✓	✓	✓
Disturbance to onshore recreation during onshore construction works and afterwards from presence of structures	✓	✓	✓	✓
Tourism				
Offshore Industrialisation of the local seascape reducing tourists' visual amenity	×	×	×	×
Onshore Industrialisation of the local landscape reducing tourists' visual amenity	✓	✓	✓	✓

Potential Effect	Construction & Installation	Operation	Maintenance	Decommissioning
Increased pressure on local temporary accommodation	✓			
Opportunity for expansion of existing port infrastructure.	✓	✓	✓	✓
Additional topic of interest creating new draw for tourists	✓	✓	✓	✓
Other renewables				
Reduced resource potential due to effects on hydrodynamic regime	✓	✓	✓	✓
Opportunity for expansion of existing port infrastructure				
Opportunities for local supply chain	✓	✓	✓	✓
Onshore Traffic				
Temporary increase in traffic	✓			
Road crossings	x			
Movement of abnormal loads (cable drums, transformers etc)	✓			
Permanent increase in traffic during operation		x		
ECOLOGICAL ENVIRONMENT				
Birds				
Collision risk from underwater turbines		✓		
Displacement from vicinity of underwater turbines	✓	✓	✓	✓
Onshore habitat loss (breeding or foraging habitat) due to land-take for infrastructure	✓	✓		
Disturbance due on onshore construction works	✓			
Disturbance due to onshore construction works	✓			
Marine Mammals and Reptiles				
Impact to marine reptiles	✓	✓	✓	✓
Disturbance to marine mammals from underwater noise generated by DP	✓		✓	✓

Potential Effect	Construction & Installation	Operation	Maintenance	Decommissioning
vessels				
Disturbance to marine mammals from underwater noise generated during potential drilling activities	✓			
Marine mammal collision with vessels	✓		✓	✓
Disturbance to marine mammals from underwater noise generated by the devices		✓		
Risk of injury to marine mammals from collision with devices		✓		
Reduction of food resource for marine mammals		×		
Accidental contamination to marine mammals from vessels or devices	×	×	×	×
Fish and Shellfish Resource				
Effects on herring and sand eel populations from disturbance to spawning grounds	✓			✓
Physical disturbance to crustacean and demersal fish species	✓			✓
Effects of noise and vibration of increased boat traffic and construction activity on hearing specialists (i.e. herring and sprat)	✓	✓		✓
Collision of slow moving larger species such as basking sharks with the devices		✓		
Effects of Electromagnetic fields on Elasmobranchs		✓		
Changes in the existing habitat		✓		
Coastal and Terrestrial Ecology				
Physical disturbance of intertidal habitats during cable landfall installation	✓			✓
Physical disturbance of terrestrial communities during onshore grid and substation installation	✓		✓	✓
Terrestrial habitat /species loss during and following grid infrastructure installation	✓			✓
Disturbance of otters during landfall, grid and substation installation	✓		✓	✓
Seabed Communities				

Potential Effect	Construction & Installation	Operation	Maintenance	Decommissioning
Substratum / habitat loss / damage from placement of devices and other infrastructure on the seabed, cable laying;	✓	✓		✓
Scour around devices and other subsea infrastructure (including vessel mooring cables as result of movement with wave and tides)	✓	✓		✓
Increased suspended sediment and turbidity from installation of subsea infrastructure in inshore waters	✓	✓		✓
Smothering of benthic species	×	×		×
Disturbance of contaminated sediments	×	×		×
Decrease in water flow leading to change in benthic habitat downstream of devices	✓	✓		✓
Damage to habitat or species due to pollution from routine and accidental discharges;	×	×		×
Colonisation of subsea infrastructure, , scour protection and support structures	✓	✓		✓
Introduction of marine non-natives.	✓	✓		✓
PHYSICAL ENVIRONMENT				
Physical Processes				
Changes to sediment regime as a result of physical structures on the seabed	✓	✓		✓
Changes to sediment regime as a result of energy extraction.		✓		
Changes to seabed morphology	✓			
Impacts to important geological features during construction activities	×			
Air and Climate				
Vessel emissions, decreasing air quality	×	×	×	×
Construction of onshore elements for the project resulting in dust impacts	×			
Water and sediment Quality				
Potential pollution of the offshore water environment.	×			

Potential Effect	Construction & Installation	Operation	Maintenance	Decommissioning
Contamination of Marine sediments	×			
Potential impacts of onshore infrastructure on relevant water bodies.	✓			
Pollution due to flood risk of onshore infrastructure	✓	✓		
Geology, Soils and Hydrology				
Contamination of soils or waterways from spills during onshore construction works	✓			
Interaction with geology if directional drilling is used for cable landfall	✓			
Direct or indirect impact on water courses downstream of works	✓			
Altered surface and ground water flows due to cable trenching and construction of an onshore substation		✓		
Increased sediment loads in watercourses due to excavation and reinstatement.	✓			

Questions for Reader

Q 11. Have the most likely and significant effects been identified through this analysis? Are there any others that should be considered for inclusion in the full assessment process and if so why?

12 SCOPING QUESTIONS

A number of questions have been posed to all readers throughout this document, with a number specifically posed to MS-LOT. We would be grateful if you could consider these in your scoping response, making any additional comments as necessary.

MS-LOT	*SNH*	*All Readers*	*Questions to be put forward*
		✓	Q1. Are the project geographic and technical boundaries outlined both clear and sufficient for what will be included and not included within the EIA?
✓			Q2. Do MS-LOT have a clear understanding of the approach being taken with regard to the EIA process for Westray South?
✓			Q3. Are MS-LOT content with the approach for the consenting strategy?
✓			Q4 Can Marine Scotland issue deemed planning consent through the Section 36 process for the onshore elements of this project?
✓			Q5. Have all the regulatory requirements for the Westray South tidal array been identified?
		✓	Q6. Do the studies proposed for assessment of effects on the human environment look appropriate and complete?
	✓		Q7. Is it appropriate to use both The Crown estate and the Birdlife foraging data to determine which SPAs will be included within the EIA and HRA or is it appropriate to just the Crown Estate data.
		✓	Q8. Do the studies proposed for assessment of effects on the ecological environment look appropriate and complete?
		✓	Q9. Do the studies proposed for assessment of effects on the physical environment look appropriate and complete?
		✓	Q10. Are you aware of any proposed developments within the planning process or activities with which the proposed tidal development might interact to result in cumulative effects?
		✓	Q11. Have the most likely and significant effects been identified through this analysis? Are there any others that should be considered for inclusion in the full assessment process and if so why?

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Appendix A: Responses received

The following table outlines the stakeholders contacted and records where responses were received to the Project Briefing Document. Note the following colour coding for the type of stakeholder:

	Regulator Group
	Marine Scotland non-statutory stakeholders (to be contacted directly by Marine Scotland)
	Wider non-statutory stakeholder

Record of responses received

Stakeholder	Response (Y / N)
Marine Scotland - Licensing Operations Team (MS-LOT)	N
UK Department of Energy and Climate Change (DECC)	N
Orkney Island Council	Y
Scottish Natural Heritage (SNH)	Y
Marine Coastguard Agency (MCA)	N
Northern Lighthouse Board (NLB)	Y
Scottish Environment Protection Agency (SEPA)	Y
Marine Scotland - Science	N
Marine Scotland - Compliance	N
Proposed Marine Planning Partnerships (MPP) - of Scottish Marine Regions (represent recreation, conservation and commercial interests of their area)	N
The Crown Estate (TCE)	N
Scottish Water	N

Health and Safety Executive (HSE)	N
Scottish Ministers	N
Royal Yachting Association (RYA)	N
Orkney Island Council (OIC) Marine Services	Y
MOD	N
Local Fisheries	N
RSPB	Y
Scottish Fisherman's Federation	N
Historic Scotland	Y
Association of (District) Salmon Fisheries Board	N
Association of Scottish Shellfish Growers	N
British Trout Association	N
Fishermans Association Ltd	N
Marine Conservation Society	N
Marine Safety Forum	N
Scottish Renewables Forum	N
Scottish Canoe Association	N
BT (Network Radio Protection)	Y
Chamber of Shipping	Y
Civil Aviation Authority	N
Inshore Fisheries Groups	N
Joint Nature Conservation Committee (JNCC)	N
Joint Radio Company	N
National Air Traffic Services (NATS)	N

National Trust for Scotland	N
UK Marine Management Organisation	N
County Archaeologist	N
Department for Transport (DfT)	N
Forestry Commission	N
Royal Commission on the Ancient and Historical Monuments (RACHMS)	N
The Fisheries Committee	N
Transport Scotland	Y
UK Hydrographic Office	N
British Ports Association	N
Eday Partnership	N
Federation of Scottish Aquaculture Producers (Scottish Aquaculture Research Forum)	N
North District Fisheries Board	N
North of Scotland Industries Group	N
Orkney Renewable Energy Forum (OREF)	N
Orkney Archaeological Trust/ Orkney Archaeology Society	N
Orkney Creel Fishermen's Assoc	N
Orkney Dive Boat Operators Association	Y
Orkney Fisherman's Society Ltd	N
Orkney Islands Sea Angling Association	N
Orkney Sailing Club	N
Orkney Trout Fishing Association	N
Orkney Tourism Group	N
Papay Development Trust	N

Rousay, Egilsay and Wyre Development Trust	N
Sail Orkney	N
Salmon Net Fishing Association	N
Scottish Aquaculture Research Forum	N
Scottish Environment Link	N
Scottish Pelagic Fishermen's Association	N
Scottish Wildlife Trust	N
Orkney Sea Kayaking Association	Y
Westray Development Trust	N
Westray and Papa Westray Tourist Association	N
Whale & Dolphin Conservation Society	N
Surfing GB	N
Birsay Community Council	N
Eday Community Council (North Isles ward)	N
Evie & Rendall Community Council	N
Harray & Sandwick Community Council	N
Kirkwall and St Ola Community Council	Y
Papay Westray Community Council (North Isles ward)	N
Rousay, Egilsay and Wyre Community Council (North Isles ward)	N
Westray Community Council (North Isles ward)	N
European Marine Energy Centre (EMEC)	Y
Friends of the Earth (Scotland)	N
Highlands and Islands Airport Ltd	Y
International Tanker Owner's Pollution Federation (ITOPF)	N

Kirkwall Kayak Club	N
Orkney Seal Rescue	N
RNLI	N
Surfers against Sewage	N
UK Cable Protection Committee	N
UK Civil Aviation Authority	N
UK Oil and Gas	N
Visit Scotland	N
Visit Orkney	N
Westray Sailing Club	N
Westray Small Boat Owners Assoc	N
World Wildlife Fund (Scotland)	N

Appendix B:

IDENTIFICATION OF NATURA INTERESTS WHICH MAY BE AFFECTED BY THE PROPOSALS

European Directives and supporting UK and Scottish regulations have afforded special protection to a number of habitats and species that are considered to be of prime importance for conservation. A key component of this protection is the establishment of a network of sites which hold representatives of many of these habitats and species. This is known as the Natura network.

Under the regulations regarding this network, there is a requirement for the Competent Authority to consider the potential effects of any proposed plan or project upon the primary and qualifying features of Natura sites as well as the relevant conservation objectives. This is achieved by undertaking a Habitat Regulation Assessment (HRA) which consists of the following tasks:

1. The identification of possible Natura sites that could be affected by a proposed plan/project;
2. A test of Likely Significant Effect (LSE) on primary and qualifying features as well as the relevant conservation objectives; and
3. An Appropriate Assessment (where it is anticipated that LSE is possible).

The aim of this preliminary process is to determine the sites that would be affected by the proposals and therefore, those for which an LSE test will be completed; essentially determining the 'scope' of the HRA. It is proposed that this will form the basis of an HRA Screening Report which will present the results of the LSE test for each site; its qualifying features and conservation objectives. This process will also be used to inform the requirements for baseline characterisation studies to commence during 2011/12. This process firstly considers SACs in the first section and then goes on to consider SPAs in the second section.

In order to identify the Natura Sites that could be affected by the proposals, the assessment team has drawn on information presented in "Report to Inform Appropriate Assessment for the Pentland Firth Strategic Area (PFSA) Leasing Round" (ABPmer, 2010) as commissioned

by the Crown Estate. This report considers the potential effects on Natura Sites of the Crown Estates' wet renewable leasing work within the PFSA (which constitutes a 'plan' and must undergo its own HRA). In the case of seabirds, additional information on foraging ranges has been taken from the BirdLife Seabird Database (BirdLife 2010).

Identification of Special Areas of Conservation

The Crown Estate report (ABPmer, 2010) identified a number of SACs for which there is a potential LSE. Each Site was considered within the context of four assessments:

- Potential for adverse effects on habitat features
- Potential for adverse effects on marine mammal features
- Potential for adverse effects on otter features
- Potential for adverse effects on fish and freshwater pearl mussel features

Within each of these categories, a number of habitats and species were identified with which there was the potential for the leasing round to have a LSE. These are summarised below:

- Habitat features;
    - Reefs;
    - Subtidal sandbanks;
    - Intertidal mudflats and sandflats; and
    - Supralittoral dune habitats.
- Marine mammal features;
    - Common seal (*Phoca vitulina*);
    - Grey seal (*Halichoerus grypus*);
    - Bottlenose dolphin (*Tursiops truncates*); and
- Otter features;
    - Otter (*Lutra lutra*).

- Fish and freshwater pearl mussel features;
    - Freshwater pearl mussel (*Margaritifera margaritifera*);
    - Atlantic salmon (*Salmo salar*)
    - Sea lamprey (*Petromyzon marinus*)

Based on these conclusions, the following criteria were developed for identifying the SACs relevant to the proposed development:

- Habitat features – SACs within a 100km buffer zone with relevant qualifying features;
- Marine mammal features – SACs for seals and cetaceans within 100km of the proposed development area (buffer zone defined within the Crown Estate report [ABPmer, 2010]);
- Otter features – SACs for otters within areas of search; and
- Fish and freshwater pearl mussel features – SACs along the north coast of Scotland from/to which migratory fish could feasibly be passing through the proposed development and adjacent areas during migration.

The map presented in Figure B1 was then used to confirm site locations and proximity to buffer zone limits.

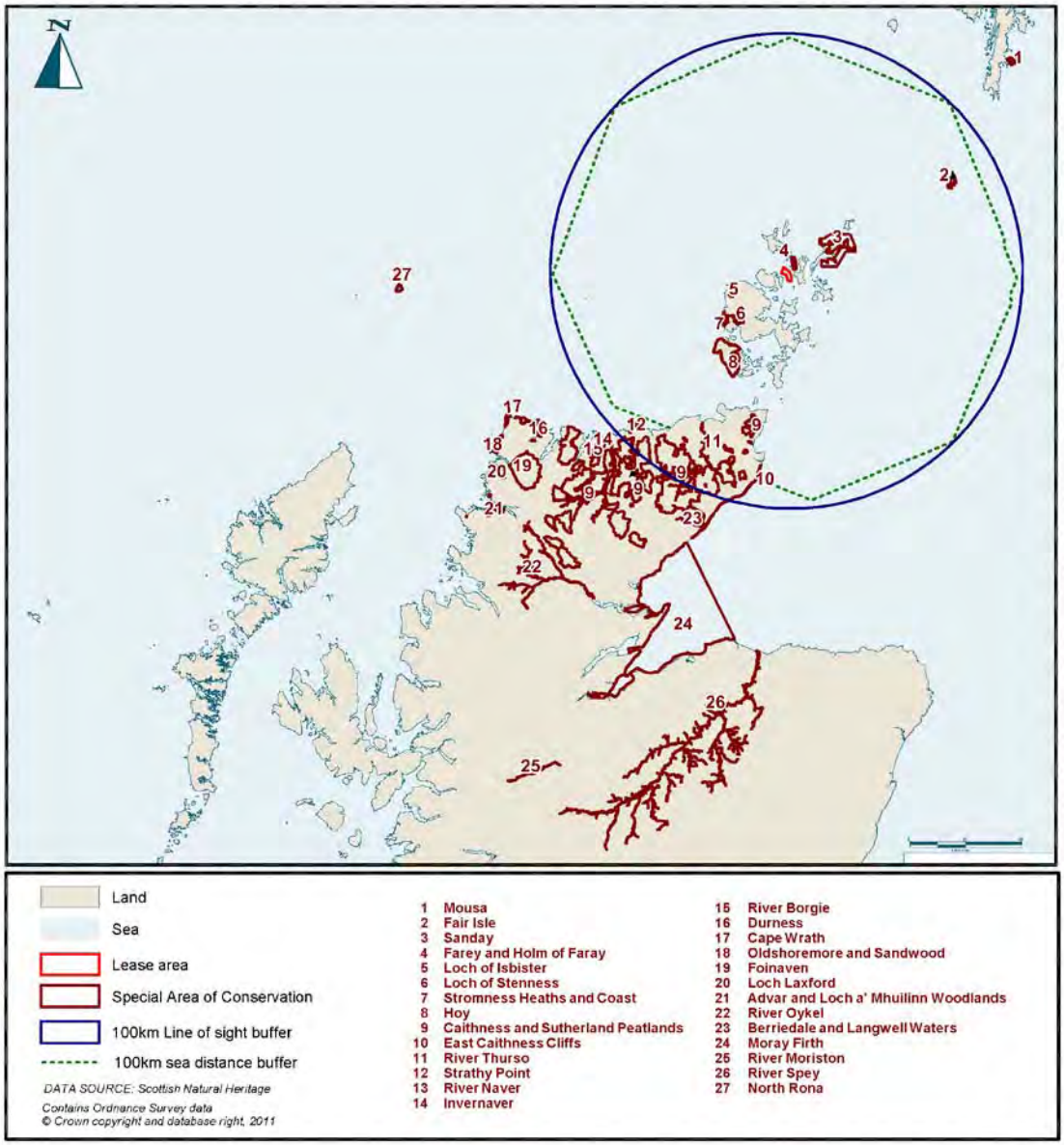

Figure B1. SACs within the region

Through this process, the SACs presented within figure B1 are deemed to be those which could be affected by the proposed development and will be considered during the LSE test. Features for which a potential LSE was predicted within the Crown Estate report (ABPmer, 2010) are highlighted for each site in Table B1.

Table B1 SACs that could be affected by the proposals

Protected site	Annex I Habitat – primary reason	Annex I Habitat – qualifying feature	Annex II Species – primary reason	Annex II Species – qualifying feature
Berridale and Langwell (SAC)	None	None	Atlantic salmon	None
Faray and Holm of Faray (SAC)	None	None	Grey seal	None
Loch of Isbister (SAC)	Natural eutrophic lakes with *Magnopotamion* or *Hydrocharition*-type vegetation	Transition mires and quaking bogs	None	Otter
Moray Firth (SAC)	None	Sandbanks which are slightly covered by sea water all the time	Bottlenose dolphin	None
Oykel (SAC)	None	None	Freshwater pearl mussel	Atlantic salmon
River Moriston (SAC)	None	None	Freshwater pearl mussel	Atlantic salmon
River Spey (SAC)	None	None	Freshwater pearl mussel Sea lamprey Atlantic salmon Otter	None
Sanday (SAC)	Reefs	Sandbanks which are slightly covered by sea water all the time. Mudflats and sand flats not covered by sea water at low tide	Common seal	None

The potential impacts on the qualifying features and the conservation interests of each SAC are considered in Table B2

Table B2 Potential impacts on SACs that could be affected by the proposals

Protected site	Potential impact	Conclusion
Berridale and Langwell (SAC)	It is theoretically possible that Atlantic salmon from the SAC migrate through the Westray Firth. However, given the distance to the site and other available routes between the SAC and the offshore waters utilised by Atlantic salmon that 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 not considered further within the EIA/HRA.
Faray and Holm of Faray (SAC)	It is theoretically possible that seals from this SAC forage/utilise the area proposed for deployment. Any impact on seals from the SAC may have an effect on the site. The potential significance of effect on the site is unknown.	SAC considered further within EIA/HRA
Loch of Isbister (SAC)	The onshore cable corridor search area passes the Loch of Isbister and as such, any impact on otters from the SAC may have an effect on the site. The potential significance of effect on the site is unknown at this stage.	SAC considered further within EIA/HRA
Moray Firth (SAC)	Given the distance from the SAC, it is theoretically possible that dolphins from this SAC forage/utilise the area of search. However, bottlenose dolphins are very rare in Orkney (four records only between 1987 and 1994)[21] and are not considered to be regularly present in the area in the recently published Marine Atlas[22] or JNCC's Atlas of cetacean distribution in north-west European waters. It is therefore extremely unlikely that bottlenose dolphins from the Moray Firth SAC use the development area. Therefore, it is anticipated that the location of the proposals mean that there will be no impact on the qualifying features or the conservation objectives of the site	SAC not considered further within the EIA/HRA.

[21] The Mammals of Orkney (Booth and Booth, 1994)

[22] Scotland's Marine Atlas: Information for the national plan (Marine Scotland, 2011)

Protected site	Potential impact	Conclusion
Oykel (SAC)	It is theoretically possible that Atlantic salmon from the river migrate through the Westray Firth. Any impact on these fish may have an indirect effect on the freshwater pearl mussels in the SAC. However, given the distance to the site and other available routes between the SAC and the offshore waters utilised by Atlantic salmon that 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 not considered further within the EIA/HRA.
River Moriston (SAC)	It is theoretically possible that Atlantic salmon from the river migrate through the Westray Firth. Any impact on these fish may have an indirect effect on the freshwater pearl mussels in the SAC. However, given the distance to the site and other available routes between the SAC and the offshore waters utilised by Atlantic salmon that 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 not considered further within the EIA/HRA.
River Spey (SAC)	It is theoretically possible that Atlantic salmon, eels and lampreys from the river migrate through the Westray Firth. Any impact on these fish may have an indirect effect on the freshwater pearl mussels in the SAC. However, given the distance to the site and other available routes between the SAC and the offshore waters utilised by each species that impacts from disturbance during migration is likely to be so minimal that the conservation objectives of the site will not be undermined.	SAC not considered further within the EIA/HRA.
Sanday	It is theoretically possible that seals from this SAC forage/utilise the area proposed for deployment. Any impact on seals from the SAC may have an effect on the site. The potential significance of effect on the site is unknown.	SAC considered further within EIA/HRA

Given these conclusions, the potential significance of effect on the following SACs will be considered within the ES/HRA:

- Faray and the Holm of Faray;
- Loch of Isbister; and
- Sanday.

Identification of Special Protection Areas

The Crown Estate report (ABPmer, 2010) was written specifically for the PFOW and identified a number of SPAs for which there is a potential LSE from the PFSA Leasing Round. This report concluded that there was a possibility of a LSE (or that it was not possible to conclude no LSE) for eighteen breeding seabird species that were qualifying features of these sites. The species potentially affected, along with their buffer zones (based on foraging distance) are presented in Table B3. The location and names of SPAs identified through this process are shown in Figure B2.

Additional information on foraging ranges has been taken from the BirdLife Seabird Database (BirdLife, 2010). This database holds information on all known foraging ranges on seabirds worldwide and is updated regularly. The data from this source has also illustrated in Table B3 providing a comparison of the two data sources.

Table B3 Foraging ranges of breeding seabird species.

Species	Crown Est. report buffer (ABPmer 2010) (km)	BirdLife Seabird Database mean maximum foraging distance (km)
Red-throated Diver	13	12
Northern Fulmar	50	311
Manx Shearwater	330	196
European Storm Petrel	100	Not assessed
Leach's Storm Petrel	100	Not assessed
Northern Gannet	Not assessed	308
Great Cormorant	35	32
European Shag	17	16
Arctic Skua	10	40
Great Skua	31	42
Herring Gull	54	Not assessed
Great Black-backed Gull	40	Not assessed
Black-legged Kittiwake	50	66
Arctic Tern	25	12
Sandwich Tern	Not assessed	42
Common Guillemot	50	61
Razorbill	50	31
Atlantic Puffin	50	62
Black Guillemot	Not assessed	12

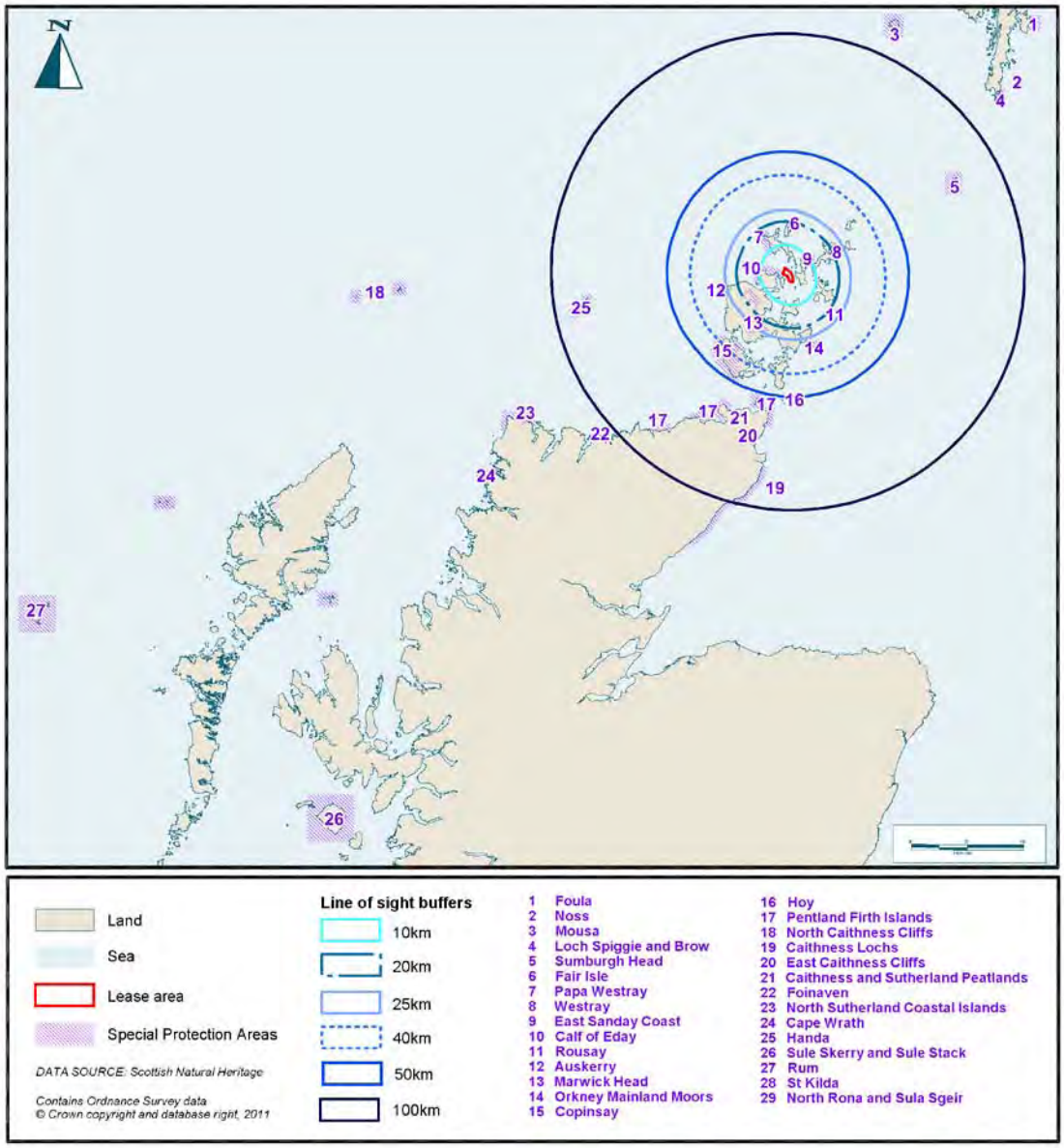

Figure 13.3 Figure B2. Relevant SPAs

The SPAs listed in Table B4 have been identified as those which could be affected by the proposals using the foraging ranges of the qualifying species as identified by The Crown Estate (ABPmer, 2010). For each relevant SPA, the following is outlined:

- those qualifying species for which there is potential for a LSE (i.e. those with foraging ranges that could potentially overlap with the proposed areas of search)

- those relevant qualifying species for which there is no potential for a LSE (i.e. those with foraging ranges not overlapping the proposed areas of search of terrestrial species) (ABPmer, 2010). These have been highlighted in grey.

Species marked * in Table B4 are qualifying features and part of the seabird assemblage.

Table B4. SPAs considered relevant to the proposed project using foraging ranges of bird species identified by The Crown Estate (ABPmer, 2010)

Site (distance to AfL area where relevant)	Notified feature	Reason for scoping in (marine / onshore / both)
Rousay SPA (1km)	Arctic tern*	Both (25km foraging buffer)
	The following species qualify as part of a breeding seabird assemblage:	-
	Arctic skua	Both (10km foraging buffer)
	Black-legged kittiwake	Both (50km foraging buffer)
	Common guillemot	Both (50km foraging buffer)
	Northern fulmar	Both (50km foraging buffer)
Calf of Eday SPA (8km)	The following species qualify as part of a breeding seabird assemblage:	-
	Cormorant *Phalacrocorax carbo carbo*	Marine (35km foraging buffer)
	Great black-backed gull *Larus marinus*	Marine (40km foraging buffer)
	Common guillemot *Uria aalge*	Marine (50km foraging buffer)
	Northern fulmar *Fulmarus glacialis*	Marine (50km foraging buffer)
	Black-legged kittiwake *Rissa tridactyla*	Marine (50km foraging buffer)
West Westray SPA (8km)	Arctic tern*	Marine (25km foraging buffer)
	Common guillemot*	Marine (50km foraging buffer)
	The following species qualify as part of a breeding seabird assemblage:	
	Razorbill	Marine (50km foraging buffer)
	Black-legged kittiwake	Marine (50km foraging buffer)
	Arctic skua	Marine (10km foraging buffer)
	Northern fulmar	Marine (50km foraging buffer)

Site (distance to AfL area where relevant)	Notified feature	Reason for scoping in (marine / onshore / both)
Orkney Mainland Moors SPA (15km)	Hen harrier *Circus cyaneus,* breeding	Onshore (within onshore area of search)
	Hen harrier, non-breeding	Onshore (within onshore area of search)
	Red-throated diver, breeding	Onshore (not marine as 13km foraging buffer)
	Short-eared owl *Asio flammeus,* breeding	Onshore (within onshore area of search)
Papa Westray (North Hill and Holm) SPA (16km)	Arctic tern, breeding	Marine (25km foraging buffer)
	Arctic skua, breeding	Scoped out, (10km foraging buffer)
Auskerry SPA (20km)	European storm petrel *Hydrobates pelagicus,* breeding	Marine (100km foraging buffer)
	Arctic tern *Sterna paradisaea,* breeding	Marine (25km foraging buffer)
Marwick Head SPA (24km)	Common guillemot*, breeding	Both (50km foraging buffer and within onshore area of search)
	The following species qualify as part of a breeding seabird assemblage:	-
	Black-legged kittiwake	Both (50km foraging buffer and within onshore area of search)
Copinsay SPA (27km)	The following species qualify as part of a breeding seabird assemblage:	-
	Common guillemot	Marine (50km foraging buffer)
	Black-legged kittiwake	Marine (50km foraging buffer)
	Great black-backed gull	Marine (40km foraging buffer)
	Northern fulmar	Marine (50km foraging buffer)
Hoy SPA (34km)	Great Skua* *Stercorarius skua,* breeding	Scoped out, (31km foraging buffer)
	Red-throated diver *Gavia stellata,* breeding	Scoped out, (13km foraging buffer)
	Peregrine *Falco peregrinus,* breeding	Scoped out, site is not in onshore area of search

Site (distance to AfL area where relevant)	Notified feature	Reason for scoping in (marine / onshore / both)
	The following species qualify as part of a breeding seabird assemblage:	-
	Atlantic puffin *Fratercula arctica*	Marine (50km foraging buffer)
	Black-legged kittiwake	Marine (50km foraging buffer)
	Arctic skua *Stercorarius parasiticus*	Scoped out (10km foraging buffer)
	Northern fulmar	Marine (50km foraging buffer)
	Great black-backed gull	Marine (40km foraging buffer)
	Common guillemot	Marine (50km foraging buffer)
Pentland Firth Islands SPA (47km)	Arctic tern, breeding	Scoped out, (25km foraging buffer)
Fair Isle SPA (75km)	Northern gannet *Morus bassanus* qualifies only as part of a seabird assemblage:	Marine (within potential foraging range)
Sule Skerry and Sule Stack SPA (84km)	European storm petrel*	Marine (100km foraging buffer)
	Leach's storm petrel* *Oceanodroma leucorhoa*	Marine (100km foraging buffer)
	Northern gannet*	Marine (foraging buffer not known)
Rum SPA (301km)	Manx shearwater* *Puffinus puffinus*	Marine (330km foraging buffer)

* qualifying species **and** part of seabird assemblage

The SPAs listed in Table B5 are additional SPAs which when using the foraging ranges of the qualifying species as identified in The Crown Estate (ABPmer, 2010) estate data are **not** likely to be affected by the proposals but when using foraging ranges as identified by the Birdlife data could potentially be affected by the proposals.

Table B5. SPAs with qualifying features that could potentially be affected by the proposed development in addition to those outlined in Table B4 as identified using birdlife data (Birdlife international, 2010) foraging thresholds.

Site (distance to AfL area where relevant)	Notified feature (foraging buffer)	Reason for scoping in (marine / onshore / both)
Noss SPA (Shetland, 153 km)	Northern fulmar	Marine (within potential foraging range)
Troup, Pennan and Lion`s Heads SPA (165 km)	Northern gannet*	Marine (within potential foraging range)
Hermaness, Saxa Vord and Valla Field SPA (Shetland, 213km)	Northern gannet*	Marine (within potential foraging range)
Shiant Islands SPA (off Lewis, 248km)	Northern fulmar	Marine (within potential foraging range)
Flannan Islands SPA (off Lewis, 289 km)	Northern gannet*	Marine (within potential foraging range)

* qualifying species **and** part of seabird assemblage

Questions for Reader

Is it appropriate to use both The Crown estate and the Birdlife foraging data to determine which SPAs will be included within the EIA and HRA or is it appropriate to just use the Crown Estate data?

Appendix C: Preliminary Hazard Analysis Westray South (Technical Note)

Prepared by:	*Anatec Limited*
Presented to:	*SSE Renewables*
Date:	*16 September 2011*
Revision No.:	*03*
Ref.:	*A2455-SSE-PHA-1*

This study has been carried out by Anatec Ltd on behalf of SSE Renewables. The assessment represents Anatec's best judgment based on the information available at the time of preparation. Any use which a third party makes of this report is the responsibility of such third party. Anatec Ltd accepts no responsibility for damages suffered as a result of decisions made or actions taken in reliance on information contained in this report.

Introduction

Background

Anatec were commissioned by SSE Renewables to carry out a Preliminary Hazard Analysis (PHA) of the proposed Westray South tidal energy project in the Westray Firth, Orkney.

General and detailed overview of the Agreement for Lease (AfL) area awarded to SSE Renewables by The Crown Estate are presented in Figure C1 and Figure C2

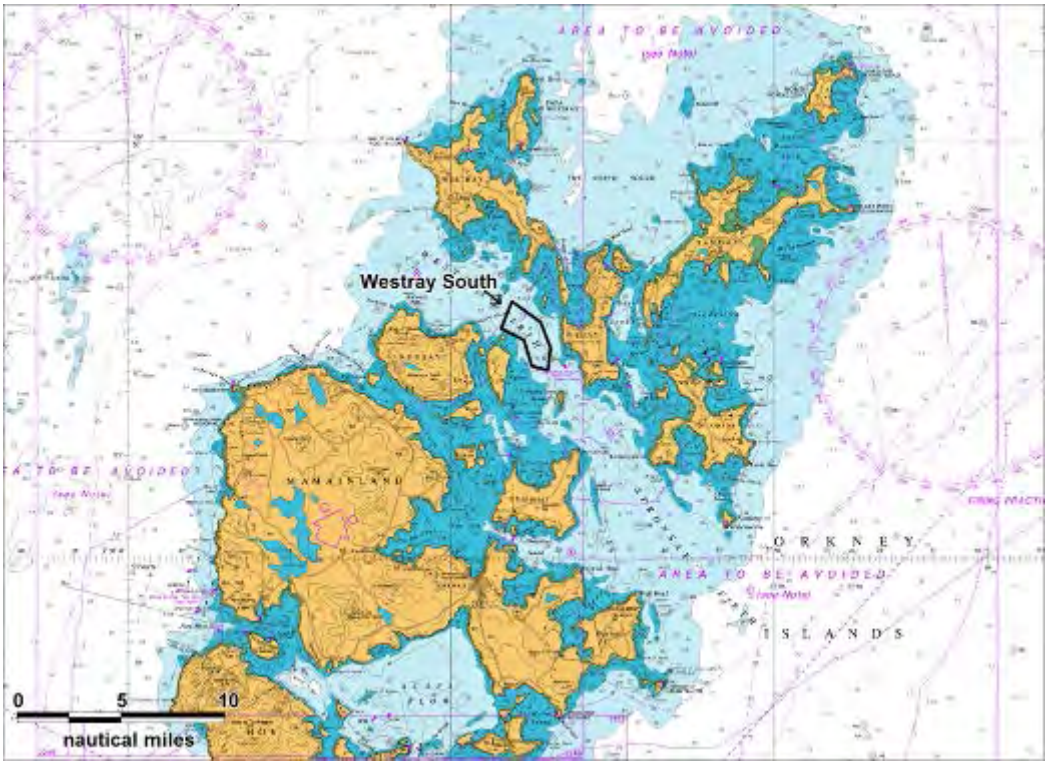

Figure C1. General Overview of Westray South Agreement for Lease (AfL) Area

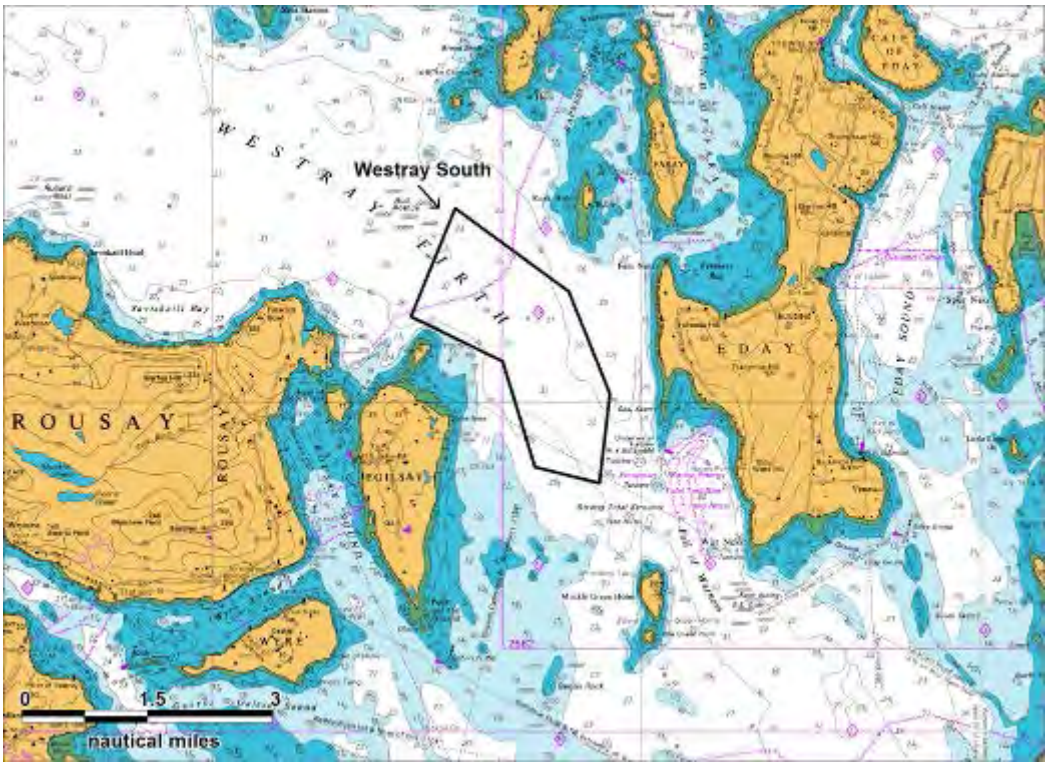

Figure C2 Detailed Overview of Westray South Agreement for Lease (AfL) Area

Objectives

The objectives of the work were as follows:

- Identify the navigational features of the area;
- Perform a baseline vessel activity review (including AIS survey data);
- Review recent maritime incident data;
- Consult with navigational stakeholders about the propped development;
- Perform a preliminary hazard analysis; and
- Propose an appropriate scope and methodology for the Navigation Risk Assessment.

Abbreviations & Glossary

AfL	-	Agreement for Lease
AIS	-	Automatic Identification System
ALARP	-	As Low As Reasonably Practicable
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
OIC	-	Orkney Islands Council
OREI	-	Offshore Renewable Energy Installations
PHA	-	Preliminary Hazard Analysis
PLN	-	Port Letter Number
RNLI	-	Royal National Lifeboat Institution
RYA	-	Royal Yachting Association
SSE	-	Scottish and Southern Energy
UKHO	-	United Kingdom Hydrographic Office
VMS	-	Vessel Monitoring Service
VTS	-	Vessel Traffic Services
WGS84	-	World Geodetic System (1984)

ICES Rectangle	Sea area of 30 minutes latitude by one-degree (60 minutes) longitude used in the UK and internationally to record fisheries statistics such as catch and effort.
Subsquare	One quarter of an ICES Rectangle.

Patrol	A patrol within a specific ICES Rectangle where details on all fishing vessels within the Rectangle at that time are logged by surveillance aeroplane and/or patrol vessel.
Sighting	Vessel logged within a specific ICES Rectangle during a surveillance patrol. Each vessel is identified by name and registration (confidential information not released), and its activity and position (latitude and longitude to one hundredth of a minute) are recorded.

Description of Project

Introduction

This section presents details on the tidal array project. Westray South is planned to be a tidal array of up to 200MW capacity. It lies adjacent to and north of the EMEC Fall of Warness tidal test site and approximately 10nm north of Kirkwall. (More details on the project are provided in the Scoping Report prepared by Royal Haskoning and Aquatera.)

Project Boundary

The coordinates of the Agreement for Lease area awarded by The Crown Estate, hereafter referred to as the AfL area, are presented in Table C1.

Table C1 Coordinates of Westray South AfL Area Boundary (WGS 84)

Point	Latitude	Longitude
A	59° 12’ 19” N	002° 54’ 20” W
B	59° 11’ 20” N	002° 51’ 43” W
C	59° 10’ 06” N	002° 50’ 45” W
D	59° 09’ 02” N	002° 50’ 59” W
E	59° 09’ 14” N	002° 52’ 30” W
F	59° 10’ 29” N	002° 53’ 15” W
G	59° 11’ 02” N	002° 55’ 23” W

A chart overview of the AfL area is presented in Figure C3. The total area is approximately 3.7nm^2 (12.6km^2).

The charted water depths within the AfL area vary between 25 and 54 metres (depths are reduced to chart datum which is approximately the level of lowest astronomical tide).

The development is planned in two phases, with an initial first phase of 30 - 45MW followed by full build out in Phase 2. The locations of each phase have to date not been determined.

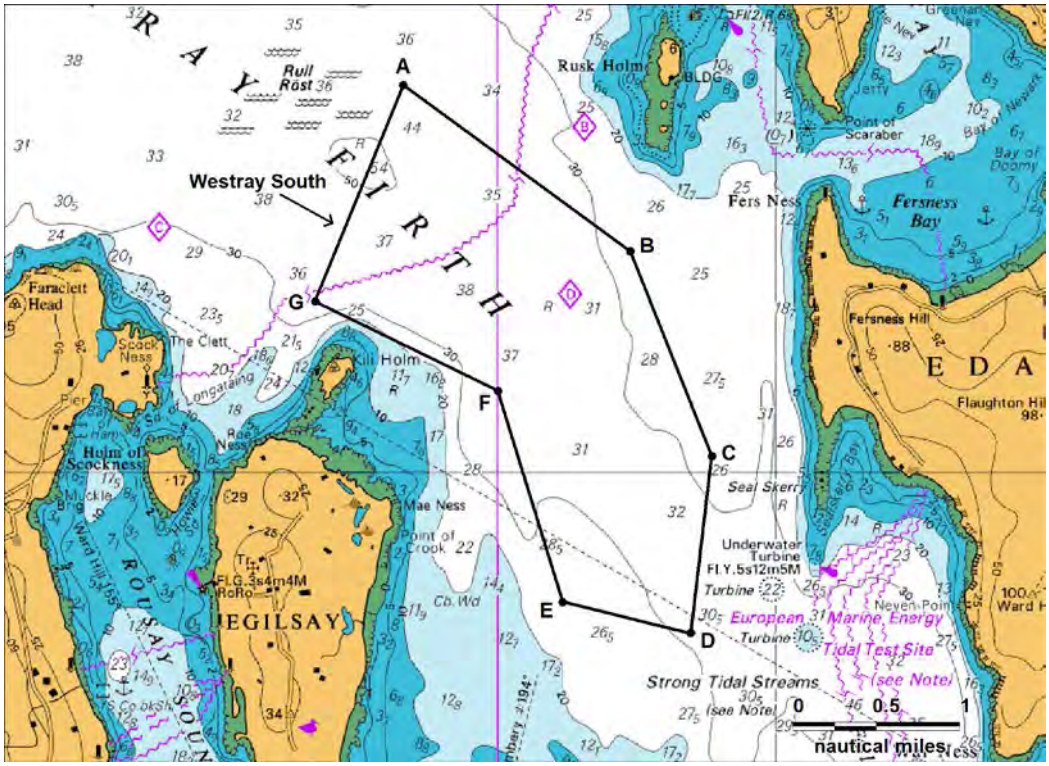

Figure C3 Chart Overview of Westray South AfL Area

Structure Details

A specific manufacturer or design of device has not been selected for the proposed development to date, but it has been determined by SSE Renewables that the technology installed will be a horizontal axis turbine device. These could be shrouded or unshrouded devices.

It is planned that unless required for navigational purposes the devices would be submerged rather than surface piercing, with a planned minimum under keel clearance of 5m below lowest astronomical tide.

There are a number of device support structures / foundation types being considered:

- Monopile foundation (drilled socket in the seabed);
- Braced monopile (commonly 3/4 legged); and
- Gravity base structure (pinned or unpinned).

In addition to the turbines, there may be a requirement to have an offshore substation on a surface penetrating jacket, similar to those utilised for offshore wind farms, or alternatively a moored floating structure.

Installation and Removal

There are a wide range of installation and removal methodologies currently being trialled in the testing of tidal technologies ranging from that using jack-up barges, moored and tugged barges, to dynamically positioned (DP) heavy lift vessels. All options are currently being considered.

Grid Connection and Inter-array Cables

A number of options for the electrical infrastructure are being considered for the proposed development, including the possibility of offshore substation(s).

Navigational Features

The Westray South AfL area has charted depths of 25 – 54m and is within the Westray Firth, approximately 0.8nm north east of Egilsay and 0.7nm west of Eday at its nearest point.

The waters around Orkney (excluding the Pentland Firth and Scapa Flow) are categorised by the IMO as an Area to be Avoided. To avoid the risk of pollution and damage to the environment, all vessels over 5,000 GT carrying oil or other hazardous cargoes in bulk, should avoid this area.

Orkney Islands Council (OIC) Marine Services administers 29 Orkney Harbour Areas for which it is the Competent Harbour Authority. Within 5nm of the AfL area there are six ports, Loth Terminal on Sanday, Backaland Pier and Terminal on Eday, Egilsay Pier and Terminal on Egilsay, Trumland Pier and Terminal on Rousay, Wyre Pier and Terminal on Wyre and Rapness Terminal on Westray.

The nearest main ports are Kirkwall Pier and Hatston Pier approximately 10nm south west of the AfL area. The smaller Rapness Terminal on Westray, used by Orkney Ferries' passenger vessels which transit Westray Firth, is located approximately 3.2nm to the north east of the AfL area.

Marine Services operate a Vessel Traffic Service (VTS) from the Harbour Authority Building at Scapa. They presently have three radar sites:

- Sandy Hill covering Scapa Flow and the Pentland Firth;
- Scapa covering the body of Scapa Flow; and
- Kirkwall covering Kirkwall Harbour and approaches.

The VTS is planned to be upgraded and a further three radar sites added by the summer of 2012 aimed at monitoring the marine renewable energy developments at Westray Firth, Fall of Warness and to the west of Orkney.

Pilotage is compulsory within the Competent Harbour Authority areas for passenger vessels over 65m in length, all other vessels over 80m overall length, all vessels under tow where the combined overall length of the towing vessel and the vessel being towed is over 65m, all vessels over 300 GRT carrying persistent oils in bulk.

Tidal streams and tide races in the vicinity of the AfL area, setting in the channels around Muckle Green Holm, are very strong.

A submarine power cable runs through the northern extent of the AfL area and is laid across the Firth from a point three cables south of The Clett on Rousay to Rapness Sound (4nm north east). The landing positions of the cable on the shore are marked by beacons. A number of other submarine cables exist in the area, detailed on Admiralty Charts.

South east of the AfL area, is the European Marine Energy Centre (EMEC) Fall of Warness Tidal Test Site. Within this area permanent and semi-permanent structures, both above and below water, mooring anchors, ground work, submarine cables, prototype underwater turbines and marker buoys may be established and removed at any time.

Figure C4 presents the project area relative to the main navigational features.

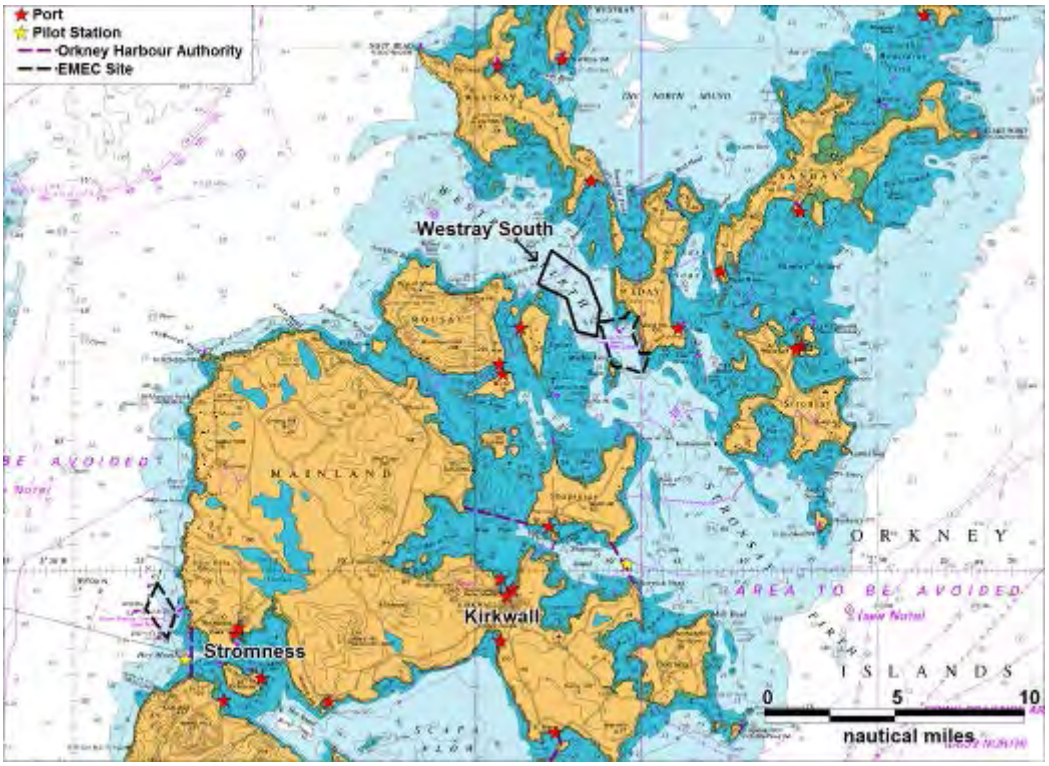

Figure C4 Navigational Features in the Area

Baseline Vessel Activity Analysis

Shipping

This section presents AIS data within 5nm of the Westray South AfL area for two separate 28 day periods in 2010; a summer period and a winter period. Plots of all the tracks recorded within 5nm of the Westray South AfL area during the summer and winter periods, colour-coded by vessel type, are presented in Figure C5 and Figure C6, respectively.

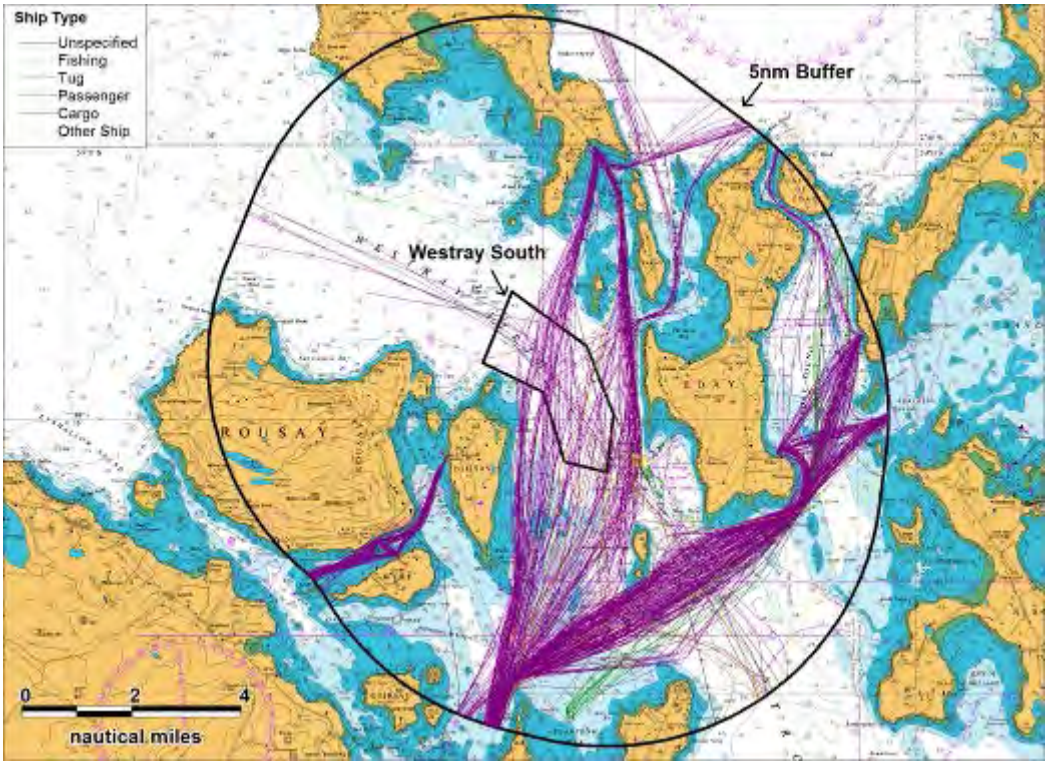

Figure C5 AIS Tracks by Type – 28 Days in Summer 2010

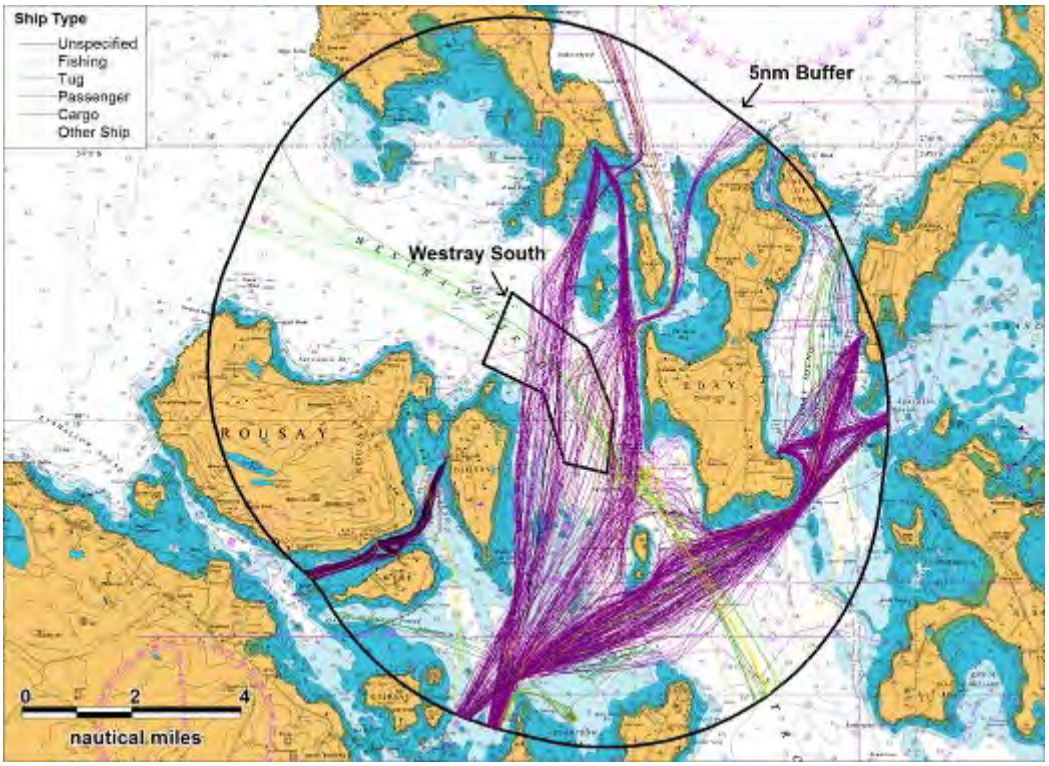

Figure C6 AIS Tracks by Type – 28 Days in Winter 2010

During both summer and winter, an average of 5 unique vessels per day in total passed within 5nm of the AfL area, with a maximum of 8 vessels per day in summer and 10 in winter.

More detailed plots of the tracks relative to the Westray South AfL area during summer and winter, colour coded by vessel type, and draught, are presented in Figure C7 to Figure C10

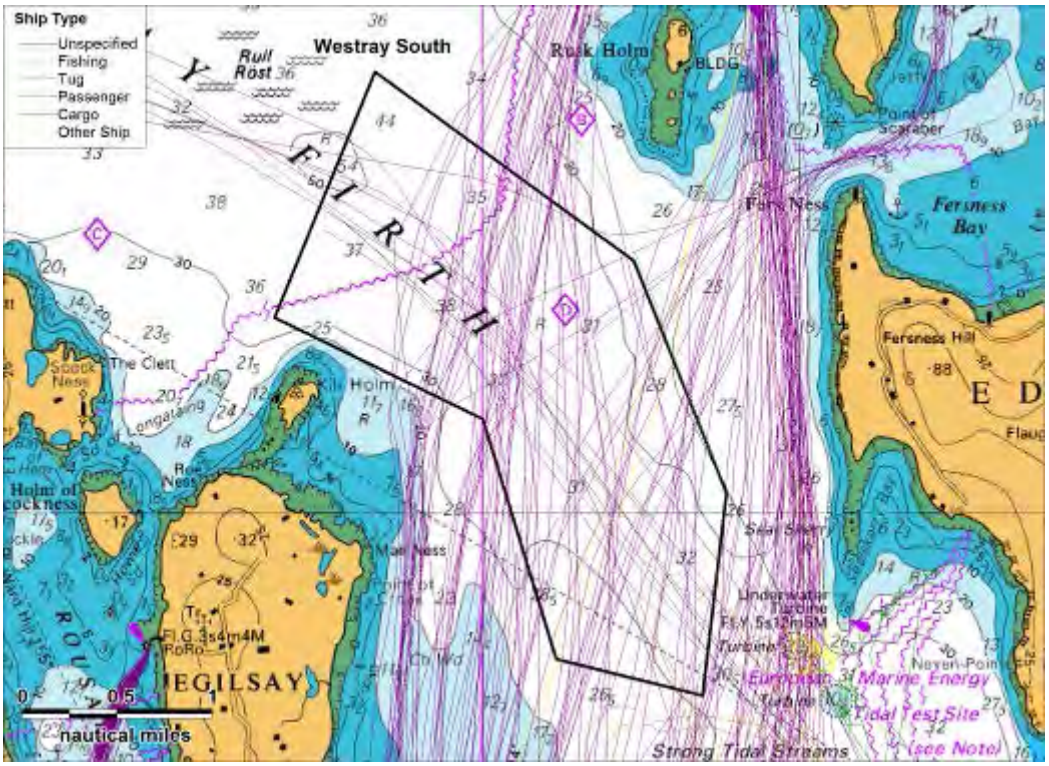

Figure C7 Detailed Plot of Summer 2010 AIS Tracks by Type

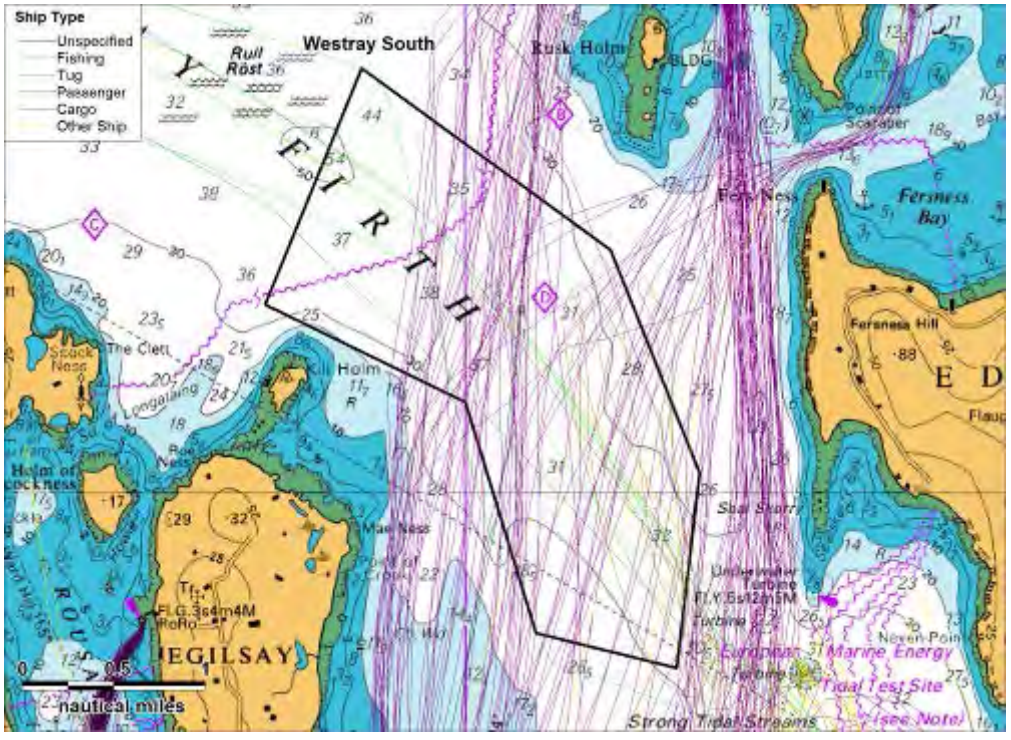

Figure C8 Detailed Plot of Winter 2010 AIS Tracks by Type

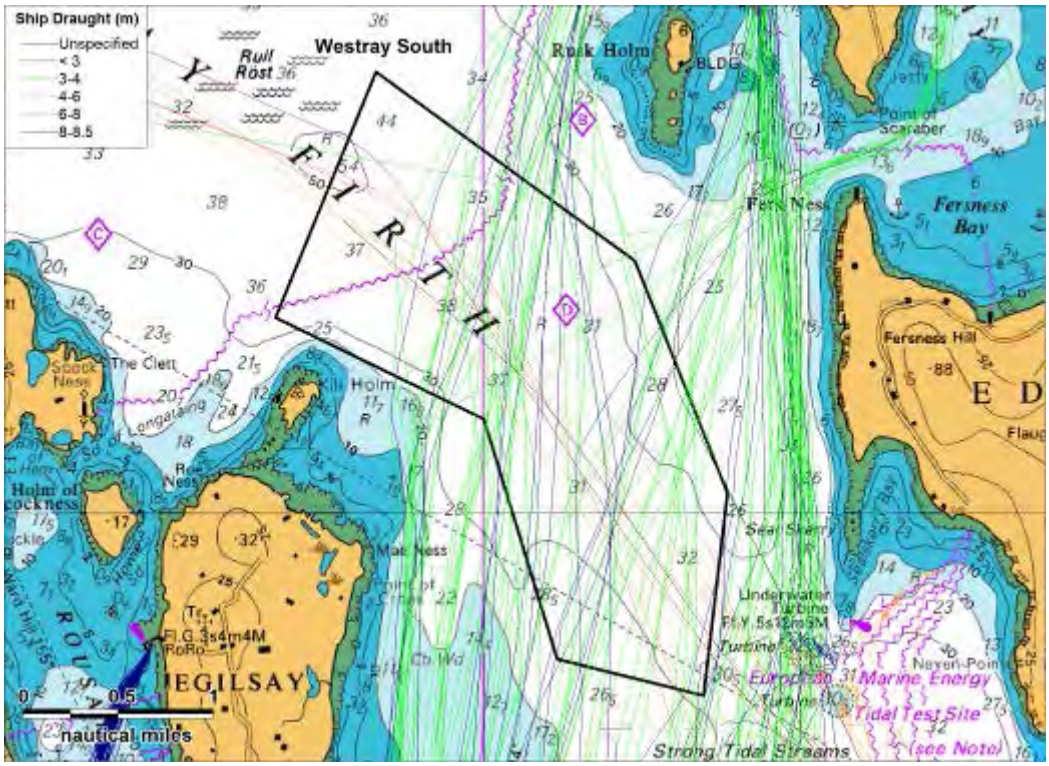

Figure C9 Detailed Plot of Summer 2010 AIS Tracks by Draught

Figure C10 Detailed Plot of Winter 2010 AIS Tracks by Draught

The ship type distribution (excluding unspecified) within the project boundary based on the AIS data is presented in Figure C11.

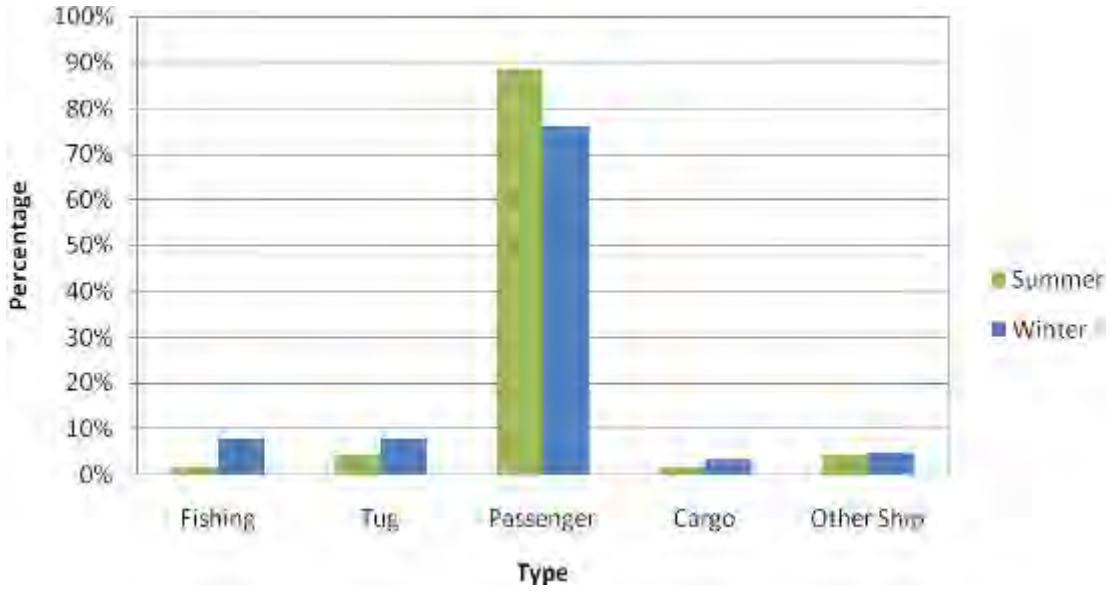

Figure C11 Vessel Types identified passing within the Westray South AfL Area

89% of vessels in summer and 76% of vessels in winter were passenger vessels. The vast majority of these were the Orkney Ferries presented in Figure C12 and Figure C13.

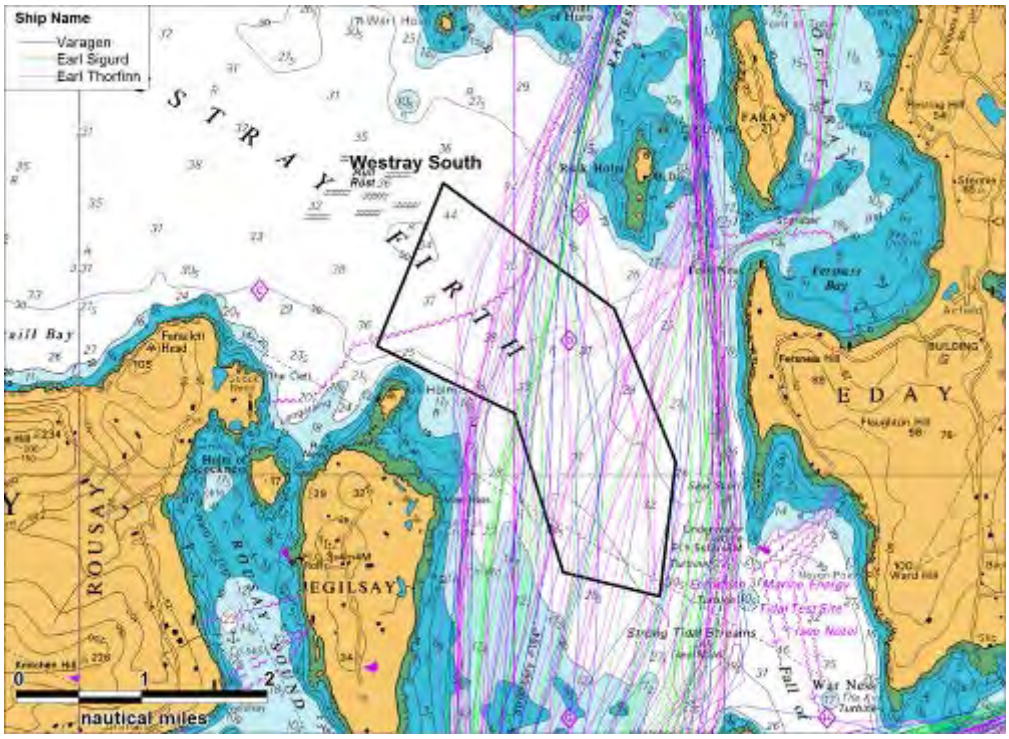

Figure C12 Detailed Plot of Summer 2010 AIS Tracks for Outer North Isles Service

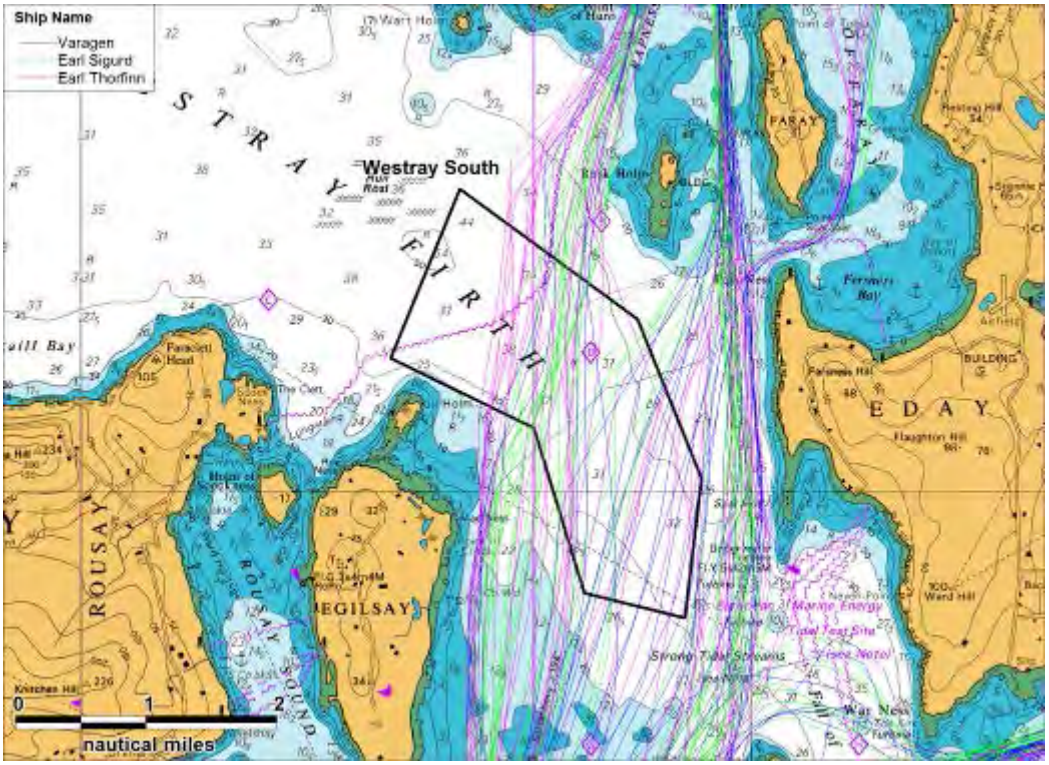

Figure C 13 Detailed Plot of Winter 2010 AIS Tracks for Outer North Isles Service

It can be seen that the ferries mostly navigated close to the islands of Eday or Egilsay, where there is greatest shelter from the weather and tide. A proportion of tracks followed a more direct route through the AfL area, which consultation with Marine Services indicated was only taken in flat sea conditions with a favourable tide.

Excluding the local ferries, the remaining vessels in both periods were mainly transiting the Westray Firth, including eight cruise ships in summer. Three tugs were also recorded over the entire period associated with the EMEC Fall of Warness site. In terms of fishing vessels, one was tracked transiting the AfL area during summer and five during winter.

The number of different ships recorded within the AfL area during both the summer and winter survey periods averaged two per day. The busiest day during the summer period was 11th June when 7 different ships were recorded within the boundary. During the winter survey, there were several days with four different ships recorded within the AfL area. However it should be noted that the Orkney ferries tend to make a number of transits per day, varying from 3 to 7 during the summer and 2 to 6 during the winter.

The draught distribution of vessels passing within the AfL area is presented in Figure C14.

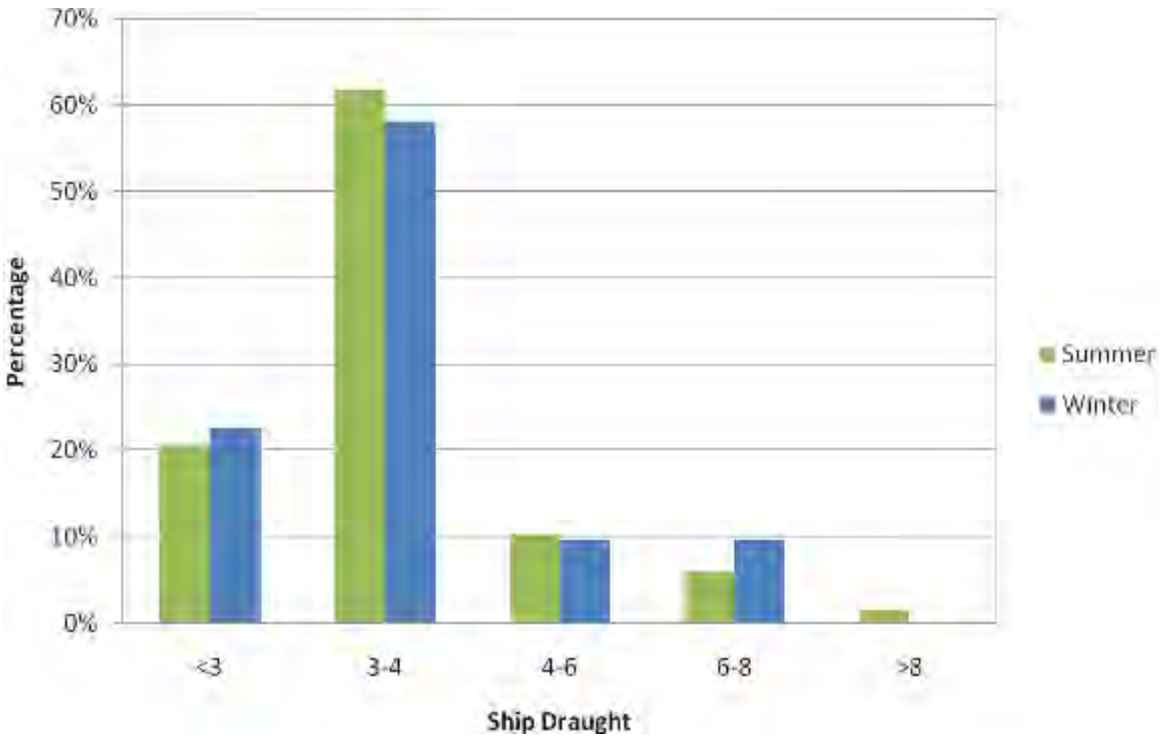

Figure C14 Ship Draught Distribution passing within the Westray South Project Area

During both the summer and winter surveys, the average draught of vessel passing within the AfL area was 3.5m. This average is influenced by the Orkney Ferries which had broadcast draughts of 2.9 – 3.2m on AIS.

The vessel with the deepest draught during the summer period was the cruise ship *Mona Lisa* en route to Reykjavik with a draught of 8.5m. During winter, the deepest draught recorded was 6.3m on the tug supply vessel *Olympic Hera*, working at the EMEC Fall of Warness site.

The destinations of vessels (excluding unspecified) tracked within the AfL area during summer and winter are presented in Figure C15.

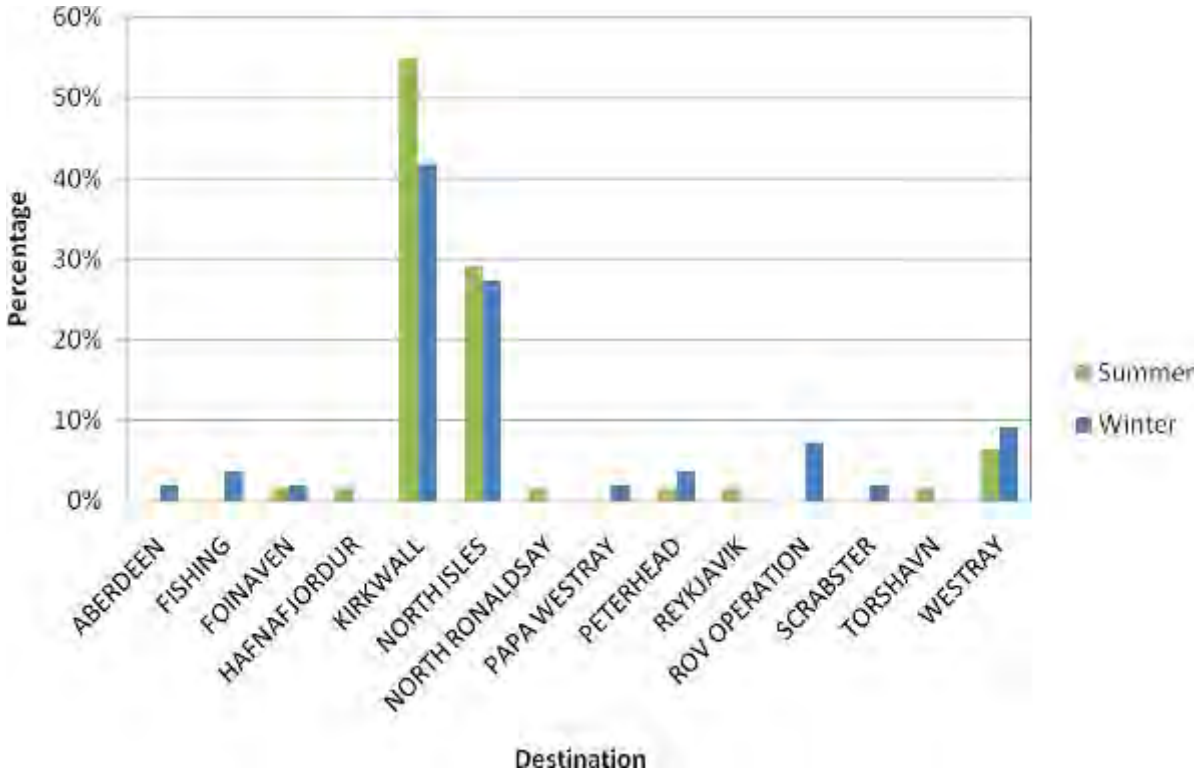

Figure C15 Main Destinations of Vessels passing within the Westray South Project Area

The main destination in both summer and winter was Kirkwall. It should be noted that AIS destination information for the Orkney Ferries was “North Isles”. Tracks with destinations stated as “North Isles” and which intersected the AfL area included Westray, Papa Westray and North Ronaldsay.

The speed of vessels tracked within the AfL area ranged from 0 to 18 knots. Higher speeds were recorded during the summer months by the transiting cruise ships steaming through the AfL area. Fishing vessels transiting the AfL area generally had speeds of 8 – 12 knots. The local ferries' speeds ranged from 5 to 14 knots within the area. Lower speed vessels were mainly the tugs working at the EMEC Fall of Warness site.

Fishing Vessel Activity

This section reviews the fishing vessel activity at the AfL area based on the latest available sightings and satellite data for the area.

Surveillance Data - Geographical Division

Fisheries statistics in the UK are reported by ICES statistical Rectangles and Subsquares. The Westray South AfL area is located within ICES Rectangle 47E7 Subsquare 3 (47E7/3), as shown in Figure C16. The average Subsquare area is approximately 231nm^2 (795km^2). The four closest Subsquares have been analysed as part of the baseline fishing assessment. Data was obtained for the five-year period 2006 to 2010.

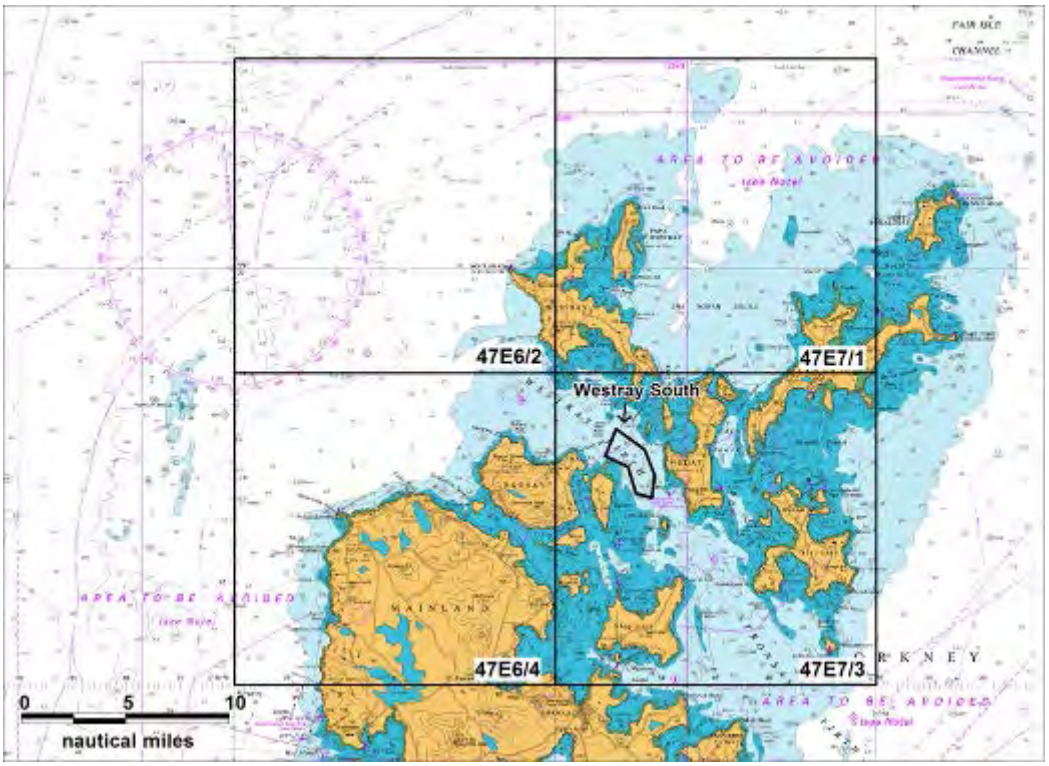

Figure C16 ICES Subsquares encompassing Westray South AfL Area

Sightings Data

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

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

The numbers of fishing vessel sightings, surveillance patrols and hence average sightings per patrol within each ICES Subsquare encompassing the AfL area in the five-year period 2006-10 are presented in Table C2 and Figure C17

Table C2 Average Sightings per Patrol (2006-10)

ICES Subsquare	Sightings	Patrols	Sightings per Patrol
47E6/2	218	1120	0.19

ICES Subsquare	Sightings	Patrols	Sightings per Patrol
47E6/4	60	1120	0.13
47E7/1	86	962	0.19
47E7/3	67	962	0.15

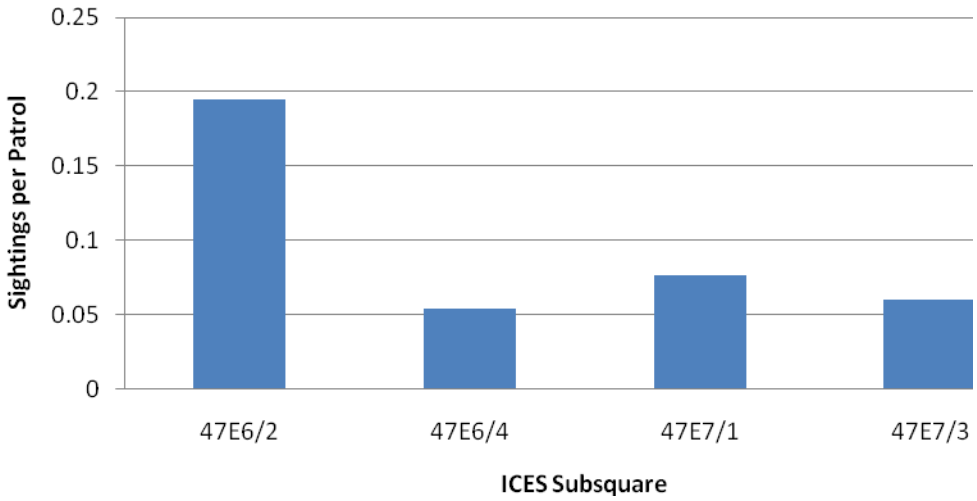

Figure C17 Average Fishing Vessel Sightings per Surveillance Patrol (2006-10)

47E6/2 and 47E7/1, the Subsquares to the north of the AfL area, had the highest average sightings per patrol of the four Subsquares, although it was still relatively low at 0.19, i.e., an average of one sighting per five patrols.

The sightings data were imported into a GIS for mapping and analysis. A plot of the vessel sighting locations, colour-coded by gear type is presented in Figure C18.

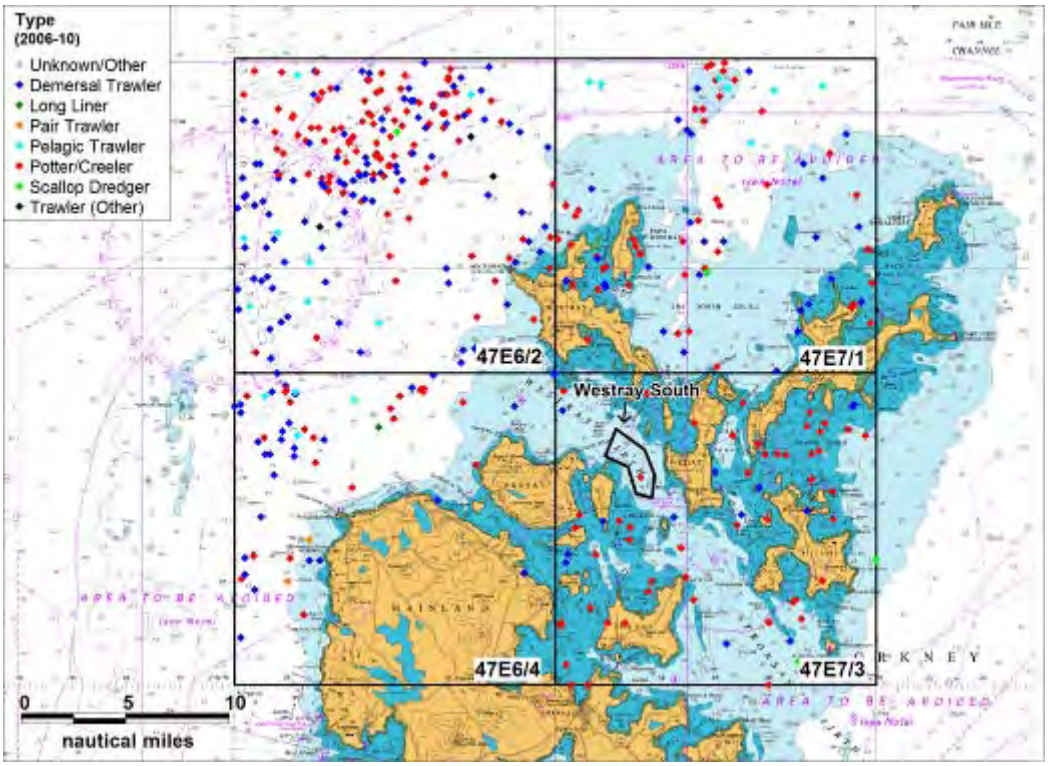

Figure C18 Fishing Vessel Sighting Locations (2006-10)

The main fishing type overall was potter/creeler (53%), including the one vessel sighted in the AfL area. The next most common type of fishing vessel was demersal trawler (40%).

Fishing vessels colour-coded by nationality are presented in Figure C19

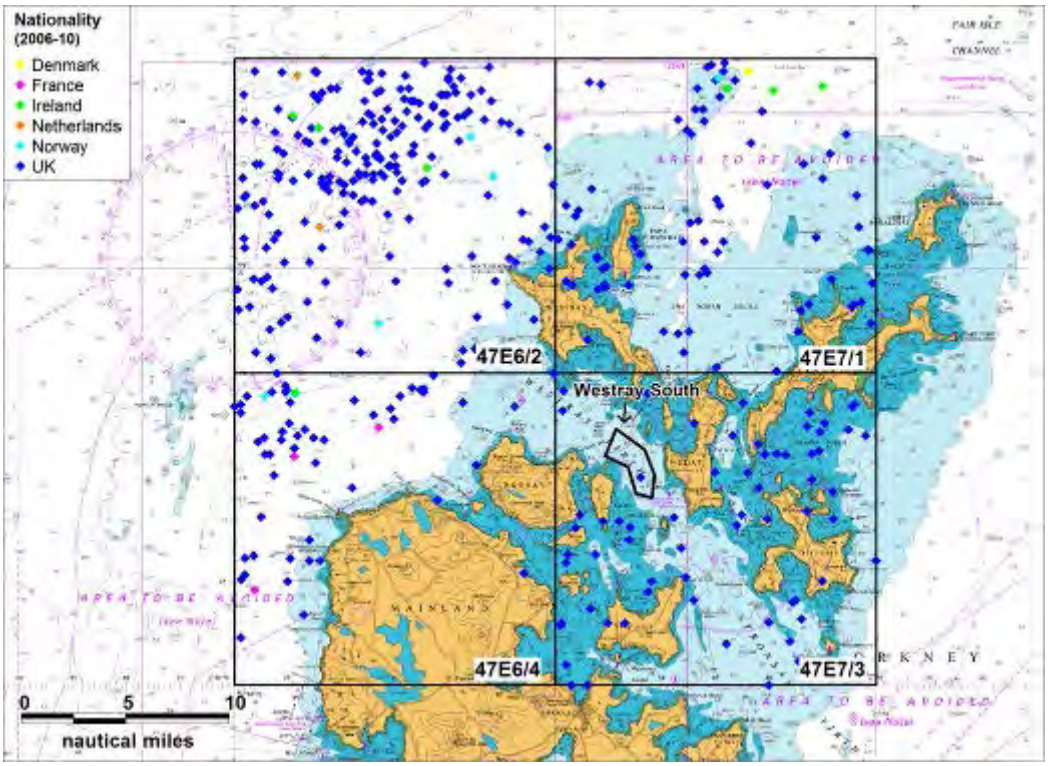

Figure C19 Fishing Vessel Sightings by Nationality (2006 – 10)

The vast majority of fishing vessels were registered in the UK (95%), including the single sighing within the AfL area.

The fishing vessels colour-coded by activity when sighted are presented in Figure C20.

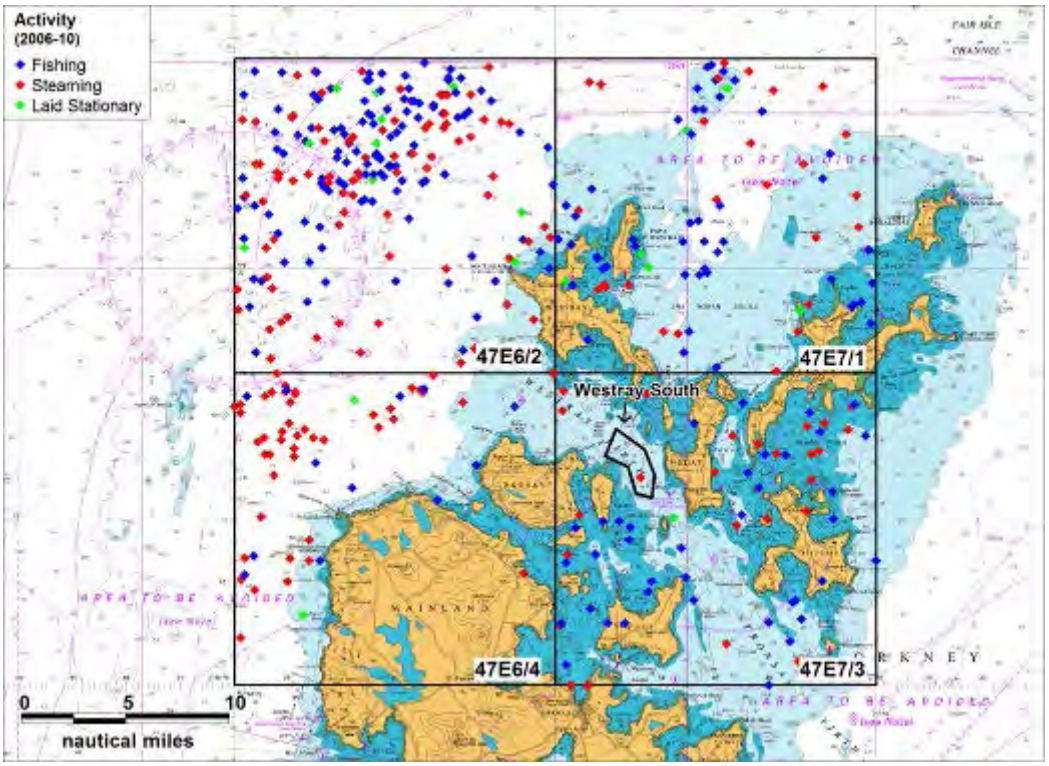

Figure C20 Fishing Vessel Sightings by Activity (2006 – 2010)

52% of vessels sighted were engaged in fishing, i.e., gear deployed, 43% were steaming (transiting to/from fishing grounds), and 5% were laid stationary (vessels at anchor or pair vessels whose partner vessel is taking the catch whilst the other stands by). The vessel sighted within the boundary was steaming on passage.

The lengths of vessels are presented in Figure C 21. The majority (59%) of vessels sighted were below 12m in length, including the vessel sighted within the AfL area.

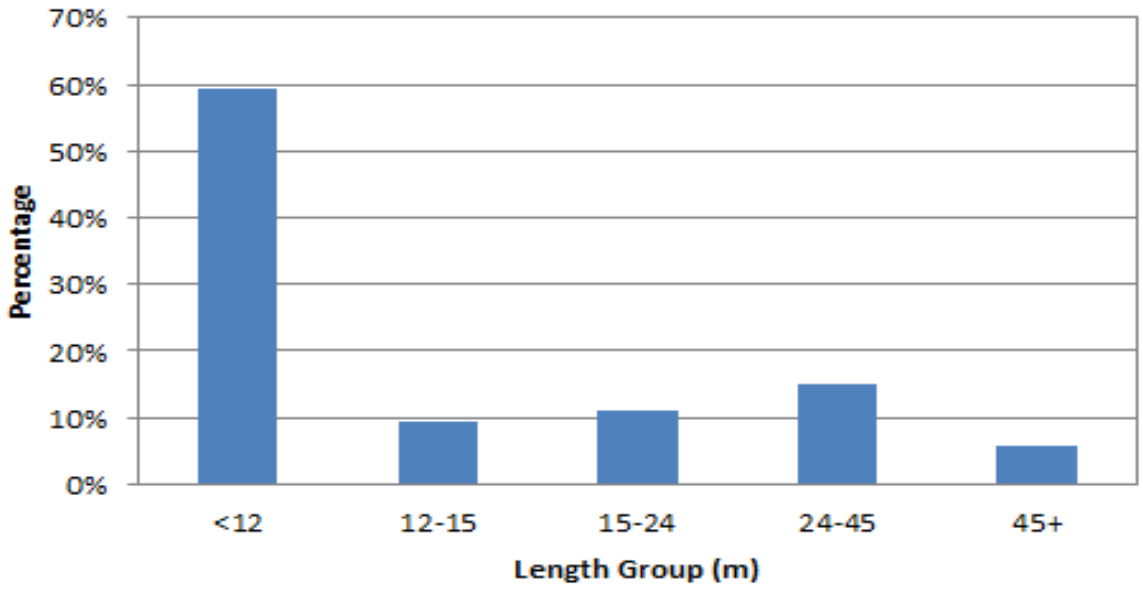

Figure C21 Fishing Vessel Sightings by Length Group (2006 – 2010)

Satellite Data Analysis

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

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

The satellite data used for the analysis was provided by Marine Scotland Compliance, who have responsibility for fishing vessel activity in Scottish Waters. Only UK vessel activity was available. Based on the sightings analysis, UK vessels of 15m length and over represent approximately 30% of the vessel activity recorded during patrols.

A plot of vessel positions, colour-coded by speed, is presented for the years 2008-10 in Figure C22 to C24. This shows a low number of positions recorded within the AfL area each year, with the speeds and pattern of positions indicating that most vessels were transiting the area between the Westray Firth and Stronsay Firth. The data for 2008 is likely to include fishing vessels acting as guard vessels at the EMEC Fall of Warness site to the south.

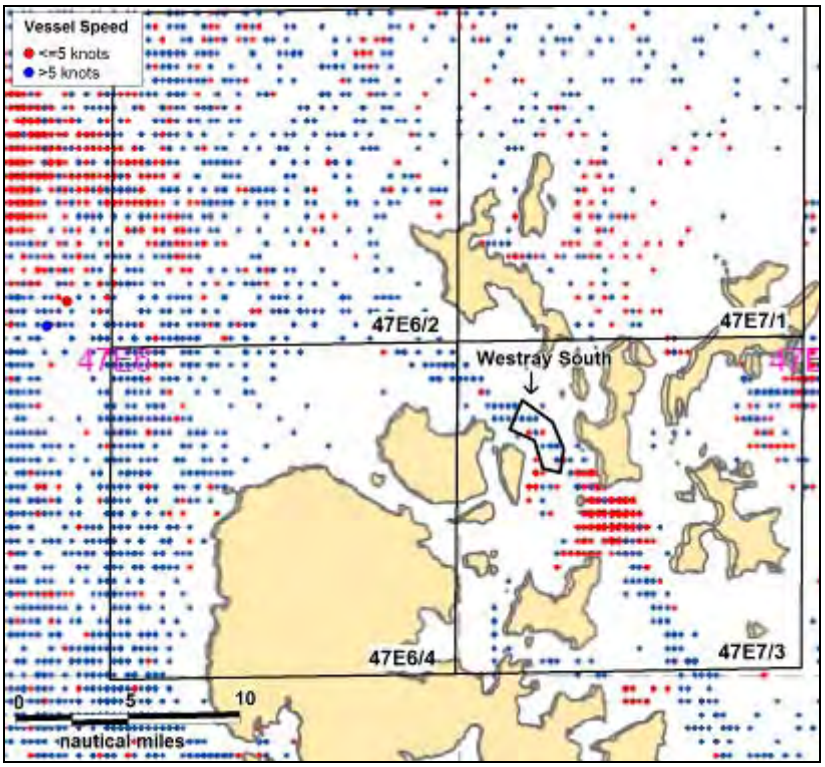

Figure C 22 Chart of Satellite Fishing Vessel Positions by Speed (2008)

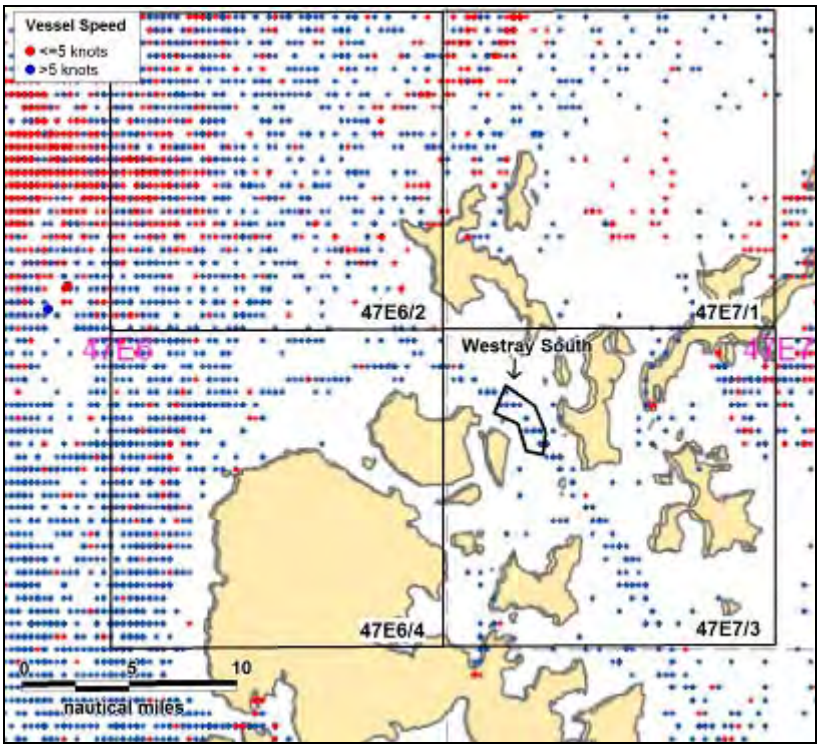

Figure C23 Chart of Satellite Fishing Vessel Positions by Speed (2009)

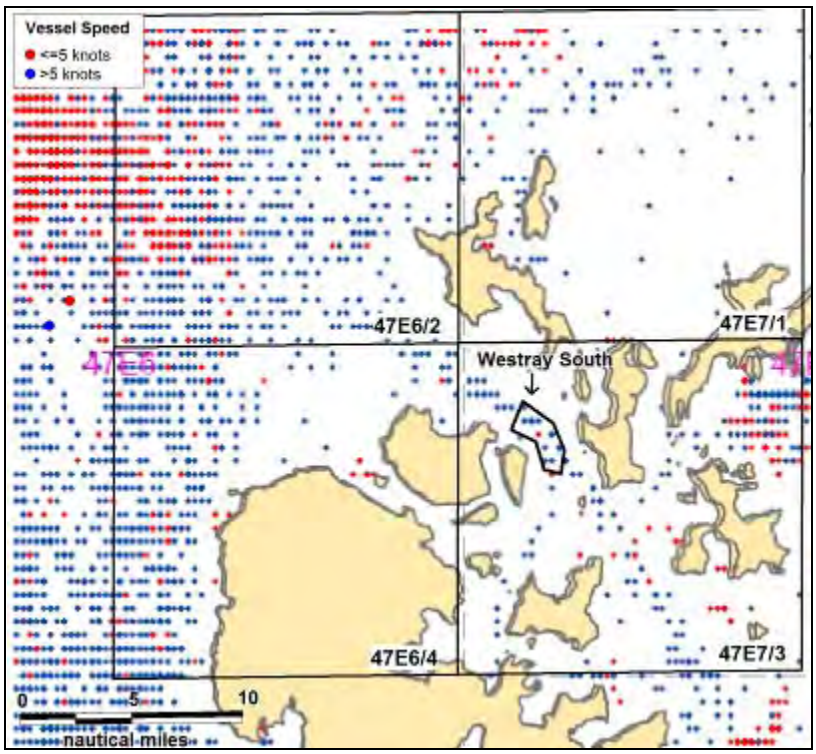

Figure 24 Chart of Satellite Fishing Vessel Positions by Speed (2010)

Recreational Vessel Activity

This section reviews recreational vessel activity at the Westray South AfL area based on the available desktop information.

RYA Data

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

The results of this work were published in Sharing The Wind (Ref. [i]) and updated GIS layers published in the Coastal Atlas (Ref. [ii]).

A summary plot of the recreational sailing activity and facilities identified in the North East Scotland Sailing Area is presented in Figure C25.

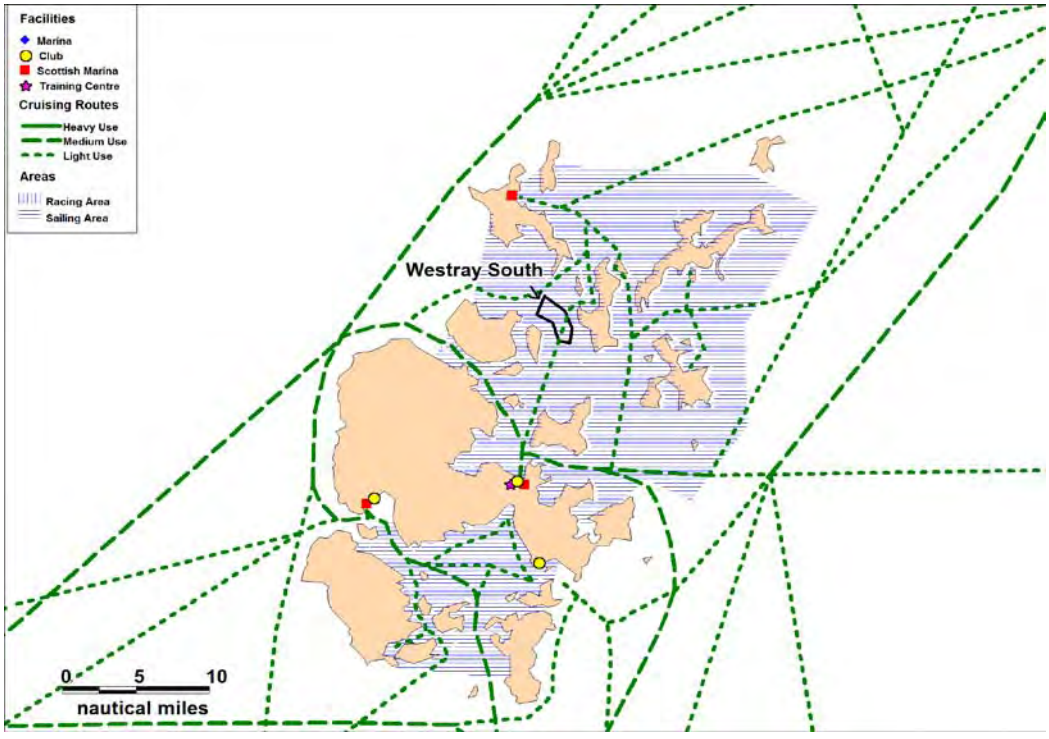

Figure C25 Recreational Information for North East Scotland Strategic Area

A more detailed chart of the recreational vessel activity and facilities in the vicinity of the AfL area is presented in Figure C26

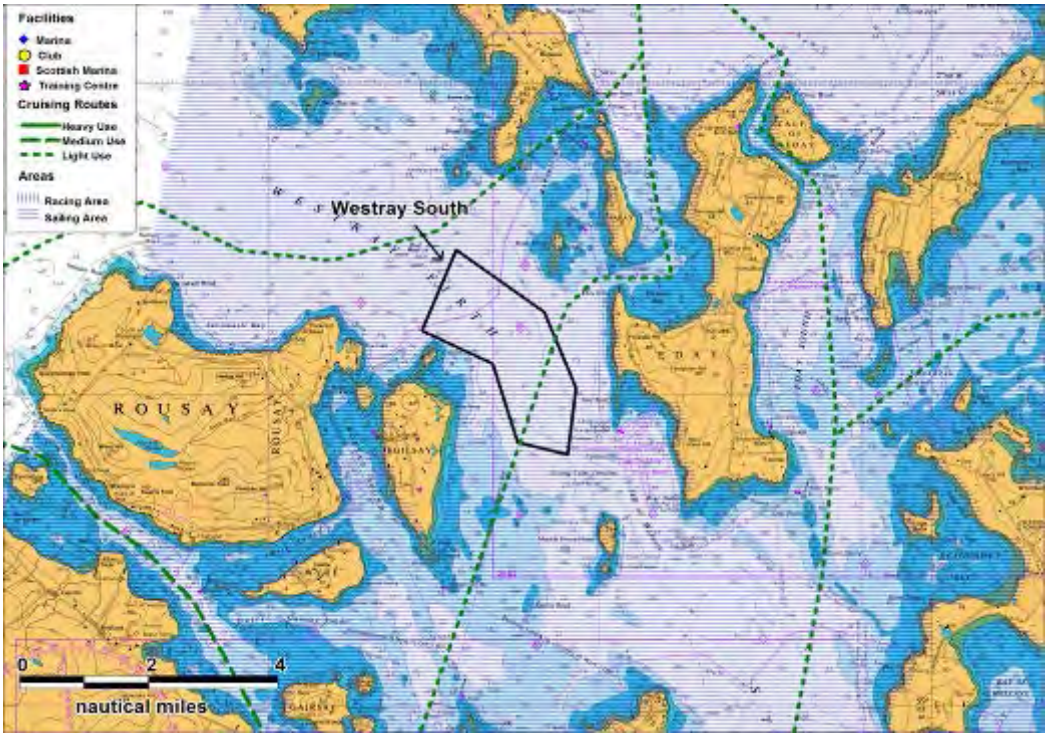

Figure C26 Recreational Data in the vicinity of Westray South AfL Area

Based on the RYA published data, the AfL area is within the North East Scotland general sailing area covering a large proportion of Orkney waters. There is a single light-use[23] cruising route passing through the AfL area boundary, between Kirkwall and Westray Marina in Pierowall Harbour. A second light-use route passes about 0.8nm to the north, linking Kilmerford Yacht Haven Route with the route passing through the Westray South AfL area.

[23] Recreational boating, both under sail and power is highly seasonal and highly diurnal. A light use recreational route is classified by the RYA as a route known to be in common use but which does not qualify for medium or heavy classification. A medium use recreational route is classified as a popular route on which some recreational craft will be seen at most times during daylight hours.

In terms of facilities, the nearest club is the Orkney Sailing Club at Kirkwall, approximately 20nm south of the AfL area boundary, and the closest marinas are Kirkwall Marina and Westray Marina.

Clyde Cruising Club Sailing Directions

The Clyde Cruising Club produce Sailing Directions for various areas of Scotland. The publication covering Orkney Waters (Ref. [iii]) which was compiled with local knowledge, includes information for recreational sailors using the Westray Firth.

On the ebb tide, passage is made from Fersness Bay (Eday) to Kirkwall. From the bay, the route leads close around Fers Ness, south along the shore to Seal Skerry. The next part of the route depends on power of the vessel and either the tide is cut across to the north of Muckle Green Holm if the vessel has high power or the bay south of Seal Skerry is entered and the coastline followed to War Ness to cut across the tide to the north of Muckle Green Holm if the vessel is of low power. Next, the tidal stream to the west of the island is crossed to Galt Skerry buoy and from there toward Vasa Sound.

On the flood tide, the route leads from Fers Ness across the Firth towards the Egilsay shore toward the Graand buoy, keeping distance from Rull Rost. From there, it is recommended to proceed through Vasa Sound with the tide or to use the west buoyed channel.

Orkney Marinas Sailing Guides – Kirkwall to/from Westray

The Orkney Marinas website has sailing guides for Orkney waters. The publications covering Kirkwall to/from Westray include information for the sailing community transiting the Westray Firth. The routes are described below with Figure C27 highlighting some of the key reference points.

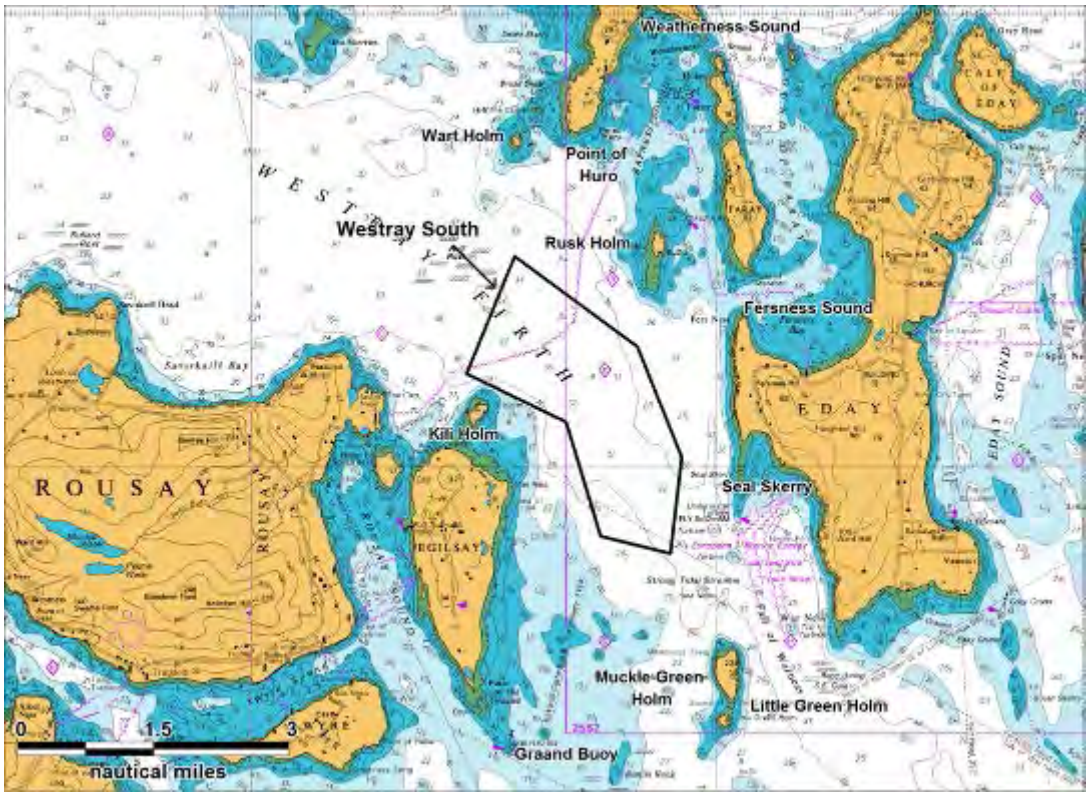

Figure C27 Kirkwall to/from Westray – Key Features mentioned in Sailing Guide

Kirkwall to Westray

It is recommended that the journey from Kirkwall to Pierowall on Westray is made on the ebb, leaving Kirkwall to cross the Westray Firth on the last ebb of the tide. When crossing the Westray Firth it is advisable to keep well over to Muckle Green Holm and across to Seal Skerry if there is any westerly weather. The further west travelled during westerly conditions, the worse the conditions are, with a rough edge of tide running from Seal Skerry to the south west corner of Rusk Holm and north west to Rull Noost off Wart Holm, especially during the last two hours of the ebb. The quickest route, to be used if conditions are not averse, is to let the tide carry to the west of Rusk Holm and north east to Weatherness. The quickest route, to be used if conditions are not averse, is to let the tide carry to the west of Rusk Holm and north east to Weatherness. Fersness or Weatherness sounds can be used with the deeper water in Fersness. The tide runs east for four hours and west for eight hours.

If the Buoyed channel is used, then the Graand buoy should be steered for off the south end of Egilsay. Then the back eddy that runs north along the east side of Egilsay should be kept toward to the Kili Holm. At the corner of Kili Holm, a strong tide will be met. The Westray

Firth can be crabbed across by steering for Wart Holm then the Point of Huro to pass well west of Rusk Holm, if the weather is good. Otherwise, the flood tide can be used to pass close by the skerry on the south west side of Rusk Holm. If this is during the last part of the flood, the tide will be running west through Fersness and Weatherness, and therefore against the sailor from the south end of Rusk Holm. The tide is negligible once north of Weatherness.

Westray to Kirkwall

For sailing from Westray to Kirkwall, the quickest journey is to leave Westray so that the last of the flood tide is used to travel to Kirkwall Bay. If the weather is good then the tide should be going west through Weatherness and Fersness. Unless the wind is strong, crossing of Westray Firth on the flood should not be problematic. If weather is suitable, passage should be made west of Rusk Holm, giving Rusk Holm a good berth. Egilsay shore should not be passed too near, as there will be a strong eddy running north.

If sailing during ebbing water after passing through either Weatherness or Fersness, the west side of Eday to Seal Skerry should be kept toward, where there will be a strong ebb tide. If it is possible to crab across to Muckle Green Holm there will be the benefit of an eddy until a strong tide is met at the south west corner of Little Green Holm. The best time to cross the Westray Firth would be near slack water.

Review of Historical Maritime Incidents

Introduction

This section reviews maritime incidents that have occurred in the vicinity of the Westray South AfL area in recent years.

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

Data from the following sources has been analysed:

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

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

MAIB

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

The locations[24] of accidents, injuries and hazardous incidents reported to MAIB within 5nm of the Westray South AfL area boundary between January 2001 and December 2010 are presented in Figure C28, colour-coded by type. (Note: The incident plotted onshore at Rousay would have occurred offshore as it involved a creel vessel.)

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

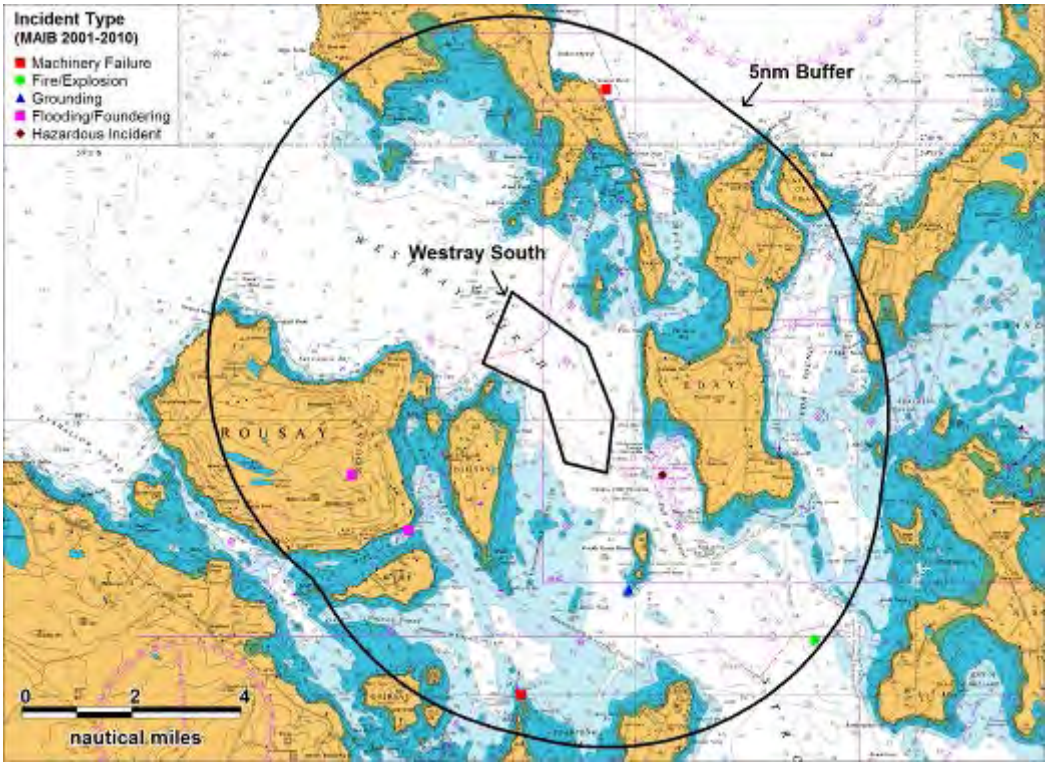

Figure C28 MAIB Incident Locations by Type within 5nm of Westray South AfL Area

A total of 7 incidents were reported in the area within 5nm of the boundary, corresponding to an average of less than one per year. These incidents comprised:

- Two floodings/founderings – one involving a creeler and one an unspecified vessel;
- Two machinery failures – one offshore industry dive vessel and one unspecified craft;
- One grounding of a jackup barge being towed by a tug;
- One fire/explosion involving an unspecified vessel; and
- One hazardous incident involving a jack up barge.

No incidents were recorded within the area boundary over the 10 years analysed. The closest incident to the AfL area occurred approximately 1nm away. In July 2010 a floating jack up barge was conducting jacking operations at EMEC Fall of Warness. During jacking operations leg four experienced a rapid penetration of approximately 20 to 30 cm which caused the pin to jam. It took approximately 15 to 20 minutes to clear the pin during which

time the tide had picked up. This caused excessive drag on the hull with potential for leg damage. The crew were mustered at emergency stations and the Coastguard was informed. Once the leg pin had been freed the barge was refloated and returned under tow to Kirkwall. During the return trip the tug lost one of two azimuth thrusters due to a leaking oil seal and was constrained to 70% power on one engine.

RNLI

Data on RNLI lifeboat responses within 5nm of the Westray South project boundary in the ten-year period between 2001 and 2010 have been analysed. A total of 21 unique launches were recorded by the RNLI (excluding hoaxes and false alarms), i.e., an average of two per year with a range of 1-4 per year.

Figure C29 presents the geographical location of incidents colour-coded by casualty type.

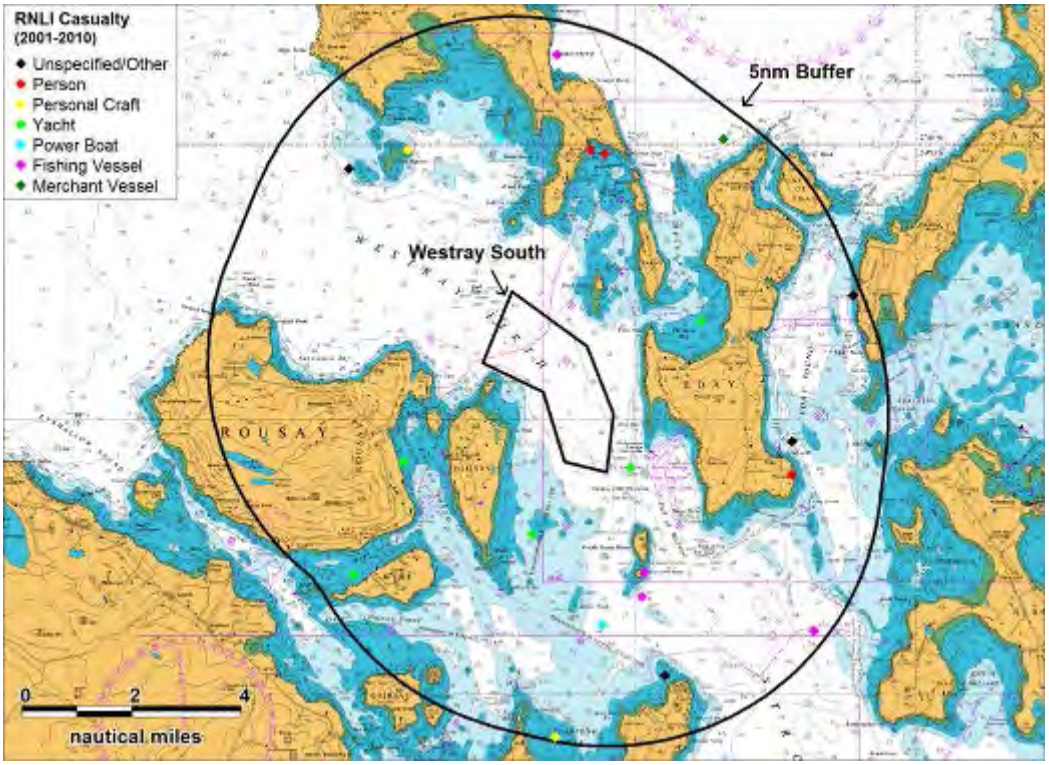

Figure C29 RNLI Incidents by Casualty Type within 5nm of the AfL Area

No incidents were recorded within the area boundary over the 10 years analysed. The closest incident to the site occurred approximately 0.5nm south east of the boundary. This incident involved a yacht which got into difficulty in adverse conditions and was responded to by Kirkwall ALB on 18th June 2004.

The overall distribution by casualty type is summarised in Figure C30. The most common vessel types involved were yachts and fishing vessels, accounting for 24% and 19%, respectively, of all incidents.

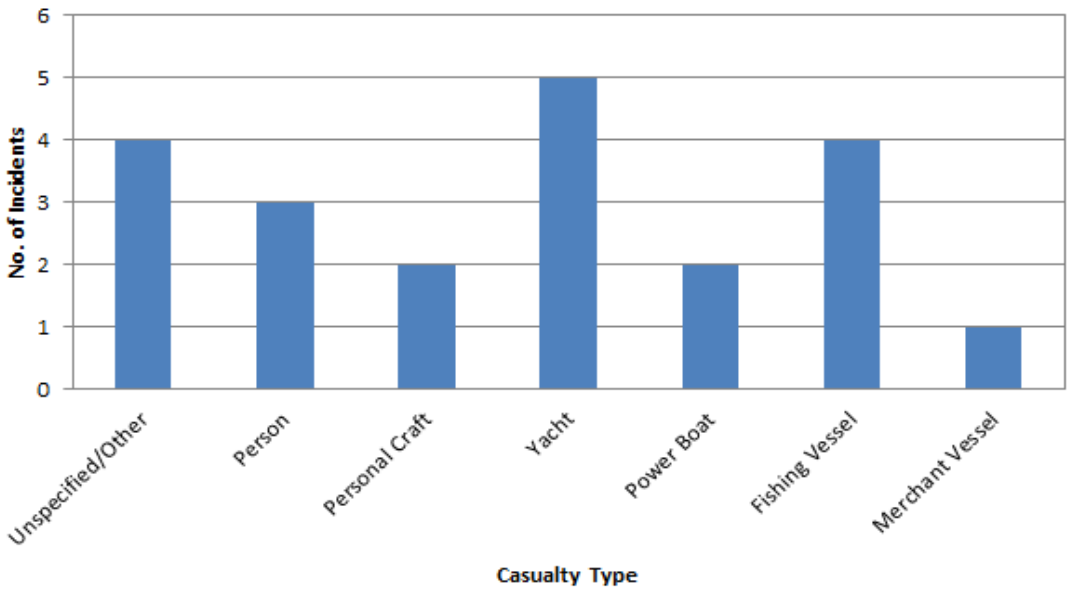

Figure C30 RNLI Incidents by Casualty Type within 5nm of the AfL Area (2001-2010)

The reported causes are summarised in Figure C31. The two mains causes were person in danger (33%) and machinery failure (29%).

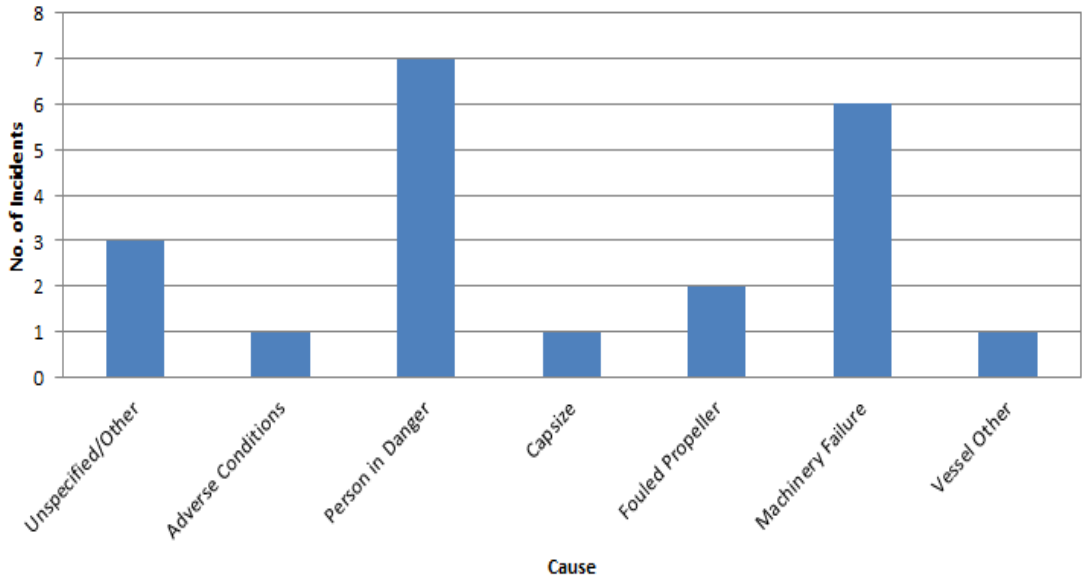

Figure C31 RNLI Incidents by Cause within 5nm of the AfL area (2001-2010)

All incidents were responded to by Kirkwall all-weather lifeboat (ALB). This is currently a Severn class lifeboat *Margaret Foster*. The Kirkwall station is approximately 10nm from the Westray South AfL area. There are other RNLI stations in Orkney located at Stromness and Longhope.

Stakeholder Consultation

Introduction

This section outlines the consultation carried out to date on the Westray South project. The list of navigational organisations consulted to date includes:

- Chamber of Shipping;
- Cruising Association;
- Department for Transport (DfT);
- Marine Scotland Compliance (Fishery Officer - Kirkwall);
- Marine Scotland Licensing Operations Team (MS-LOT);
- Maritime and Coastguard Agency (MCA);
- Northern Lighthouse Board (NLB);
- Orkney Dive Boat Operator's Association (ODBOA);
- Orkney Fisheries Association (OFA);
- Orkney Fishermen's Society (OFS);
- Orkney Islands Council (OIC) Marine Services;
- Orkney Sea Kayaking Association (OSKA);
- RYA (Scotland); and
- Transport Scotland.

Project Briefing Document Responses

Consultation comments were initially received to the Project Briefing Document which was circulated widely to national and local navigational stakeholders. The main responses received are summarised in Table C3.

Table C3 Stakeholder Responses to Project Briefing Document

Stakeholder	Response
Chamber of Shipping	• Wish to view results of initial NRA to inform their assessment of any risks posed to navigational safety. • NRA should cover changes to navigational arrangements requiring additional buoyage, displacement of recreational or fishing craft into commercial fishing lanes, increased collision risk at sea, displacement of anchorages/fouling of anchors on cables, cumulative and in-combination

Stakeholder	Response
	effects of other offshore renewable energy installations in the region. • Recommend that a clearance distance of 20-25m from highest point of device to the surface at LAT is maintained. • Economic analysis must consider increased steaming distance/time, potential long-term loss of revenue, reduction of scope for shipping lane expansion to increase trade/supply opportunities.
NLB	• Require that an NRA be undertaken. • Comments on more specific navigational marking and lighting of the area, vessels working in connection with the project, devices and support structures, will be given once NRA has been submitted.
Transport Scotland	• Expect NRA to fully cover all issues arising from interaction with all types of shipping using these waters.
Orkney Fisheries Association (OFA)	• When considering the navigation of vessels it must be recognised that large fishing vessels will transit areas, but smaller creelers (mainly <10m) will navigate between creeling sites in planned journeys which are dependent on weather, geography, tidal conditions and sequence of gear shoots. Deviation from these patterns may increase risk to safe working and increase fuel costs. Gear will be moved and reset to protect it against adverse weather conditions. Removal of that flexibility may cause losses to gear. • Project designs should be built in specifications which maximise access for boats working their usual navigational patterns. Physical specifications of devices should include mandatory intention to enhance shelter or breeding opportunities for finfish and shellfish. • A study to evaluate quantity and weight of natural and man-made sea-born debris should be undertaken in relation to capacity to interfere with moving parts of all types of device. • Types of device which would least affect the activities of fishing are most likely to be those set well under the seabed. There is less risk of 'breakaway' devices becoming a danger to vessels. Those in deep water where passage above could be maintained are most suitable, and those with housed rotors or blades rather than exposed. Devices with piles extending from the seabed above the surface would be least favoured.
OIC Marine Services (Harbour Authority & Ferry Services)	• Appropriate NRA must be completed with findings being fully considered as part of the development with appropriate mitigating actions being taken where necessary. • Characteristics and size of any device(s) to be deployed with details of minimum underwater clearances form an important part of any marine development from a mariner's perspective. • Indications of anticipated levels of support vessel activity for the proposed final array and restrictions anticipated around support activities which would impact upon vessel movements within an area should be detailed. • An array of devices with surface elements would not be acceptable. The need to provide clear vessel routeing without a number of obstructions within the Westray Firth for local lifeline ferry services is significant along

Stakeholder	Response
	with vessels transiting through Orkney waters. • The AfL area is a major area where ferries transit up to six times a day, sometimes more if the wind is lying in the south east and the Falls of Warness is inaccessible. • Devices could cause disruption to Westray, Papa Westray and North Ronaldsay services. Due to the tide set experienced in this area, it may prove highly dangerous to manoeuvre in proximity to turbines. Should it be necessary to re-route, long delays are expected. • Anticipate disruption to ferry services caused by cable laying and support vessel. Concern about possibility of exclusion zones effectively closing the area to other users.

PHA Consultation Meetings

Meetings were held with key navigational regulators and stakeholders during the PHA. The main comments are presented in Table C4.

Table C4 Stakeholder Comments at Meetings

Stakeholder	Meeting Comments
Cruising Association (Orkney representative)	• No objections but appropriate signage of the development to maritime users is key. • CA members tend to be better equipped as going on longer distance voyages. Marking on charts may have initial limitations as cruisers might not have up-to-date charts. • AIS could be a useful technology and carriage is becoming more common. • More charters take place in the south of Orkney and tapers to the north. • Kirkwall – Pierowall is one of the main transits. The bottom half of the AfL area is the main area used, then passing north of Fersness. • If weather is good, could pass to south of the AfL area, or avoid it altogether by passing south and east of Eday. This is weather dependent. In strong westerly wind, cruiser would hug coast of Egilsay and cross between Holm and Fersness. A channel for crossing east to west would be useful. In strong easterly, cruisers would cross the top of Shapinsay, hug the coast and cross to the south of the AfL area then hug Eday coast. In flat calm, they might run through the centre. • Some power cruisers use similar routes as sail boats. These tend to have shallower draughts. • Yachts typically have draughts of 2m (1.7m standard). Recent call by 3.2m draught yacht. In terms of yacht design, draught is tending to get deeper.
MS-LOT	• List of stakeholders for the project, including navigational stakeholders, was reviewed.

Stakeholder	Meeting Comments
	• Noted that MS's Marine Renewable Facilitators Group includes the MCA and NLB. Agreed that direct approach could be made where considered necessary provided MS were provided with feedback. • Approach to technology neutral and phased developments were discussed in terms of consenting issues.
MCA & DfT	• Have some concerns regarding 3rd party verification of devices being developed. • Issues regarding underkeel clearance and the mariner's perception of risk, particularly at different states of tide. "Appetite for risk" may be changing as a result of projects and test devices being developed. Previously vessels tended to avoid development areas altogether, but this might not be the case in future. • Potential concerns regarding cable burial depths and protection and the on-going monitoring, based on some experience of remedial work undertaken on some of the east coast offshore wind farms. • For further consultation, official documents will go through Marine Scotland, but technical queries can be discussed directly with MCA. • Stated that in the context of Marine Guidance Note 371, the proposal would have to be considered as a major development and therefore a dedicated radar/AIS survey would likely be required. A further review will be taken on completion of the PHA. • UKHO input would be required on the markings of developments on charts.
ODBOA	• Currently 10 dive boats in ODBOA. Vessels mainly hired by tourists for diving trips, and less frequently angling. • 3 or 4 dive boats tour the North Isles transiting Westray Firth. These tend to be larger vessels. A few wrecks are positioned north of Westray. Vessels head round the east of Egilsay and clip the corner of Westray. They would do this transit once. There were 6 trips this year compared to 14 last year. Activity is variable and weather dependent. The Westray proposal would not pose a problem. • Vessels have chart plotter and can set guard zones Two vessels have AIS. • The deepest draught dive boat in Orkney is Jean Elaine at 3.5m draught and 22m length. Others include Sharon Rose and Karin. All are similar and carry 12 passengers and 2-3 crew. They have single engines and can anchor up to about 30m in good holding ground. • Diving vessel that had lost power could be towed by lifeboat or held in place by a fishing vessel. Tide would tend to take the drifting vessel parallel to, rather than into, the Westray South development.
Fisheries (OFA and MS Compliance)*	• There is creeling and diving in the vicinity of the AfL area. Diving is mainly confined to coastal regions, with only creel fishing taking place inside the AfL area. • Creeling for lobsters and crabs in stonier, rockier areas. Weather dependent and seasonal. About 20 Westray vessels. Most are members of the OFA. Also possibly some based in Tingwall. Majority below 10m and about 2m draught.

Stakeholder	Meeting Comments
	• Local creel boats in Westray are day boats. Kirkwall boats might go out for several days and stay overnight in the area. • Diving for clams takes place normally up to 30-36m in sandy seabed conditions. In extreme cases beyond 60m. About a dozen boats overall, all full-time. Most based in Kirkwall and represented by OFA. Most under 10m, a few above. • Diving all over the North Isles. Westray area fished more in summer. Part-timers also in summer (nearshore). • Diving boats and dredgers also come from further afield, such as Scottish mainland. Local dredgers tend to favour 36m+ and leave shallower water for divers, but fishermen from elsewhere will dredge in all areas. • Further data is being collected by OFA and Marine Scotland which should be available for the NRA. • [*Note: OFS could not attend but were content to be represented by OFA.]
OIC Marine Services	• Under keel clearance of only 5m is a collision risk for the local ferries due to wave motion. • Relatively old ferries with maximum 3.22m draft. New ferries have been discussed but no funding is in place as yet. Would be marginal change in draft (up to max 3.5m) as unable to access piers with significantly deeper draught. • A review of whether ferries sail is initiated at Force 9 or over. They sail in 3m significant wave height, which could mean 7m waves. Problem conditions when tides and waves in opposite direction. • Ferry AIS track plots were reviewed. Ferries tend to run up near land, e.g., in flood tide, keep close to Egilsay and then out into tide and turn. Tend to keep out of the middle. Only use the fast run through the centre of the Firth if tide is behind them on a nice (flat) day. • In extreme weather the current diversion route adds over an hour each way. • Installation of devices is an issue time for ferries due to having to avoid the associated vessels on site. Also a problem during maintenance and decommissioning. This needs to be a focus of the NRA. • Less of a problem if devices are marked above the surface, at least along the array periphery. Underwater and out of sight but within reach of keel interaction is a problem. • Approximately 10 cruise ships in summer passing through Westray Firth. Some others may not call in Orkney but pass through the Firth. Biggest cruise ship has draught of 8-9m and carrying 4,500 people. Also deep draught trawlers (8-9m) transiting the area. • Other mitigation measures were discussed such as AIS, ECDIS, and emergency response.
RYA (Scotland) (Orkney representative)	• No problem as long as devices are a minimum of 5m under the surface. Recreational craft draughts normally 1-2m. Some up to 3m. Larger racing yachts can be • • • • Westray has a marina and an annual regatta. Boats visit from Kirkwall and Stromness.

Stakeholder	Meeting Comments
	• Depending on time, tide and winds, vessels may go west or east of Eday. East is more interesting and has a good anchorage between Eday and Calf of Eday. • Vessel lengths vary from 20 – 50ft and crews from solo up to about 12. • If there were under keel risk, yachts could still pass within 100m of the development provided they had good marking of the periphery, e.g., cardinal buoys a minimum of 3nm apart (to account for the short horizon of smaller vessels). • If problem near the development then, could not anchor in water depths but most have sail and engine so should be able to make way. RYA represents motor boats as well as sail. Draughts of these typically below 1m. Larger motor cruisers are up to 1.5m draught. • Every boat has VHF but a minority have radar or AIS as there is no regulatory requirement. • Preferable if device sinks rather than floats if it loses station. • Queried whether tidal array could cause disturbances, like other underwater obstructions such as rocks.

Preliminary Hazard Analysis

Introduction

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

Overview of Vessel Exposure

From the baseline data collection and local consultation it was been identified that several vessels types currently pass through and near the area, including local ferries, transiting cruise ships and large fishing vessels as well as smaller local fishing and recreational vessels. No tankers were observed using the Westray Firth, which is within an IMO Area To Be Avoided (ATBA) for all vessels over 5,000 gross tonnes carrying oil or other hazardous cargoes in bulk

The MCA have published guidance to mariners operating in the vicinity of offshore renewable energy installations (OREI) (Ref. [iv]). The guidance notes that, unlike wind farms, tidal energy systems may not be clearly visible to the mariner. Some installations are totally

submerged while others may only protrude slightly above the sea surface. For Westray South it is planned to have a minimum 5m under keel clearance, although there may also be one or more surface offshore substation(s).

The MCA guidance suggests three options, in simple terms, for mariners operating in OREI areas:

a. Avoid the area completely;
b. Navigate around the edge; and
c. In the case of a wind farm, navigate, with caution, through the array.

The last option specifically mentions wind farms but it is considered also to apply to tidal farms where the under keel clearance permits navigation over the submerged devices and / or array layouts permit navigation between devices.

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

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

Complete avoidance of the area may be an option for transiting vessels, such as cruise ships and larger fishing vessels, which could use alternative routes. This would be at the expense of increased passage times and therefore a proportion of transiting vessels may continue using the Westray Firth in certain conditions. Given the draughts of many of these vessels, it would be necessary to navigate around rather than through the array, therefore, use of the area will depend upon the final site layout.

Complete avoidance of the Westray Firth is not a realistic option for local vessels such as the inter-island ferries, fishing vessels and recreational vessels. Given the draughts of these vessels, navigation through the proposed development may be possible in certain wave and tidal conditions. However, there may be a preference to navigate completely around it, or between arrays if a suitable channel is available, to avoid the risk of collision with submerged devices, as well as to keep clear of any surface elements.

A number of renewable energy industry vessels associated with the EMEC Fall of Warness site were also seen operating in the vicinity. It is generally considered that these industry-related vessels will be able to re-route as necessary, although hazards will still need to be considered.

A discussion of specific hazards and how they will be addressed within the NRA is presented below for the main operational phases of the Westray South development.

Hazard Review

Normal Operations

During normal operations, any surface installations, such as offshore substation(s), will present a fixed collision hazard. It is straightforward to assess this hazard based on the installation location and dimensions, vessel activity, etc.

For submerged devices, more detailed information will be used to assess the under keel clearance and the risk of a subsea collision, including:

- Vessel Static Draughts;
- Wave Heights;
- Tidal Heights;
- Squat; and
- Surge.

Any changes in vessel routeing due to the development, e.g., displacement of vessels around the development, will influence the probability of vessels encountering (and colliding) with one another in the area. A comparison will be made between the current and predicted routeing and associated collision risk levels will be modelled.

There is also a potential hazard to vessels in the area should any part of the development fail and become detached / lose station. The object, if buoyant, could pose a collision hazard to passing vessels both within and beyond the development boundary. This hazard will be assessed within the NRA taking into account measures for alerting and recovery.

Finally, the subsea cabling could present a snagging hazard to fishing gear and vessel anchors. Once the options are finalised these hazards will be assessed based on the vessel activity in the area and the planned protection measures.

Installation, Maintenance and Removal

For all vessels operating in the area there will be risks during installation, removal and to a lesser extent maintenance, when there will be additional vessels in and around the development, some of which may have restricted manoeuvrability. This will extend beyond the development in the case of cable-laying operations.

This introduces a collision hazard (vessel-to-vessel) as well as potential obstruction to normal routes beyond the development area.

This will be assessed within the NRA based on the best available information on the likely areas of operation, number and types of vessels involved, base ports, duration of operations and weather limits.

Mitigation Measures

Appropriate risk control measures will be developed during the NRA to address the risks during all phases of operation to ensure they are reduced to a level as low as reasonably practicable (ALARP).

An important measure is to ensure the final array layout is selected to minimise navigational hazards as far as practicable, i.e., taking into account tidal resources as well as technical and other constraints. The analysis and consultation carried out during this PHA is part of this process, which will continue based on the responses received and into the NRA process.

In addition to preventive mitigation in the form of site selection and shaping, there are a large number of measures that can be applied to help control navigation risks, many of which are now standard industry practice such as:

- Depiction on Charts;
- Marking and Lighting;
- Circulation of Notices to Mariners; and
- Fisheries Liaison.

Discussions will be held with national and local stakeholders, such as NLB, UKHO and OIC Marine Services, to ensure these and other measures are implemented as effectively as possible for the Westray South development, taking into account vessel activity.

Other mitigation measures will be identified during the Hazard Review Workshop, which is discussed further in Section “Proposed Methodology – Navigation Risk Assessment “.

Proposed Methodology – Navigation Risk Assessment

The assessment methodology will principally be based on the following:

- Department for Energy and Climate Change (DECC) Methodology for Assessing the Marine Navigational Safety Risks of Offshore Windfarms (2005); and
- Maritime and Coastguard Agency (MCA) Marine Guidance Notice 371 (MGN 371) Offshore Renewable Energy Installations (OREIs) – Guidance on UK Navigational Practice, Safety and Emergency Response Issues.

The DECC methodology provides a template for preparing a navigation risk assessment. The methodology is centred on risk controls and the feedback from risk controls into risk assessment. It requires a submission that shows that sufficient risk controls are, or will be, in place for the assessed risk to be judged as broadly acceptable or tolerable with further controls or actions. The DECC assessment methodology includes:

- defining a scope and depth of the submission proportionate to the scale of the development and the magnitude of the risk;
- estimating the 'base case' level of risk;
- estimating the 'future case' level of risk;
- creating a hazard log;
- defining risk control and creating a risk control log;
- predicting 'base case with windfarm' level of risk; and
- predicting 'future case with windfarm' level of risk.

The MCA guidance MGN 371 highlights issues that need to be taken into consideration when assessing the impact on navigational safety from offshore renewable energy developments in the UK. Specific annexes that address particular issues include:

- Annex 1: Site position, structures and safety zones;
- Annex 2: Developments, navigation, collision avoidance and communications;
- Annex 3: MCA's windfarm shipping template for assessing windfarm boundary distances from shipping routes;

- Annex 4: Safety and mitigation measures recommended for OREI during construction, operation and decommissioning; and
- Annex 5: Search and Rescue (SAR) matters.

One of the key requirements of MGN 371 is the collection of maritime traffic survey data of appropriate duration, including seasonal and tidal variations. This is to record all vessel movements in and around the project boundary and its vicinity. The method and timetable for data collection will be agreed with the MCA in advance to ensure it meets their requirements.

Further consultation will be carried out about the proposal as more detailed site design work progresses and potential layouts are developed. This will allow stakeholders to influence the final layout of the development. All the organisations listed in Section “Stakeholder Consultation” above will be consulted during the NRA process, as well as any other interested parties identified during the Scoping and NRA process.

Local stakeholders representing all the different maritime interests, including ports, ferries, fishing, shipping, recreation and emergency services, will be invited to the Hazard Review Workshop, which is a key part of the NRA and a useful method of identifying additional risk controls.

Other key guidance and reference materials that will be used in the assessment are listed below:

- MCA Marine Guidance Notice 372 (2008). Guidance to Mariners Operating in the Vicinity of UK OREIs;
- IALA Recommendation O-139 On The Marking of Man-Made Offshore Structures, 1st Edition, December 2008;
- DECC Guidance Notes on Applying for Safety Zones around Offshore Renewable Energy Installations; and
- IMO Guidelines for Formal Safety Assessment (FSA).

References

[i] RYA, Sharing the Wind, 2004.

[ii] UK Coastal Atlas of Recreational Boating; Recreational Cruising Routes, Sailing and Racing Areas around the UK Coast; Second Edition by RYA; Supported by Trinity House.

[iii] Clyde Cruising Club Sailing Directions and Anchorages – Part 5; N & NE Scotland and Orkney Islands; Clyde Cruising Club Publications Ltd, 2010.

[iv] MCA Marine Guidance Notice 372, Guidance to Mariners Operating in the Vicinity of UK OREIs, August 2008