SCOTTISHPOWER RENEWABLES

Proposed Ness of Duncansby Tidal Array
Request for a Scoping Opinion
August 2012

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CONTENTS

Executive Summary

ScottishPower Renewables (UK) Ltd (hereafter referred to as "SPR") is proposing to develop a Commercial Tidal Array (hereafter referred to as the 'Tidal Array') at Ness of Duncansby in the Pentland Firth. The Tidal Array would have a capacity of 95MW of renewable power for export to the grid and would contribute to meeting the Scottish Government's targets of providing 80% of Scotland's electricity generation from renewable sources by 2020.

ANDRITZ HYDRO Hammerfest and SPR are currently working together to develop the 1MW tidal stream technology, which will be used at Ness of Duncansby. The tidal device generates power utilising the kinetic energy of tidal flows and is fully submerged and seabed mounted.

The device was originally conceived as an evolution of existing wind turbine technology. A 300kW prototype was designed and constructed in Norway using knowledge from the offshore oil and gas industry. A considerable amount of valuable operating knowledge and data have been obtained over 5 years' deployment and operation of the 300kW prototype in Kvalsund, Norway. This knowledge is being used to optimise the technology with adaptation for UK tidal conditions and an increased maximum output from 300kW to 1MW. A full-scale prototype device will be deployed at EMEC for a period of testing commencing in 2011.

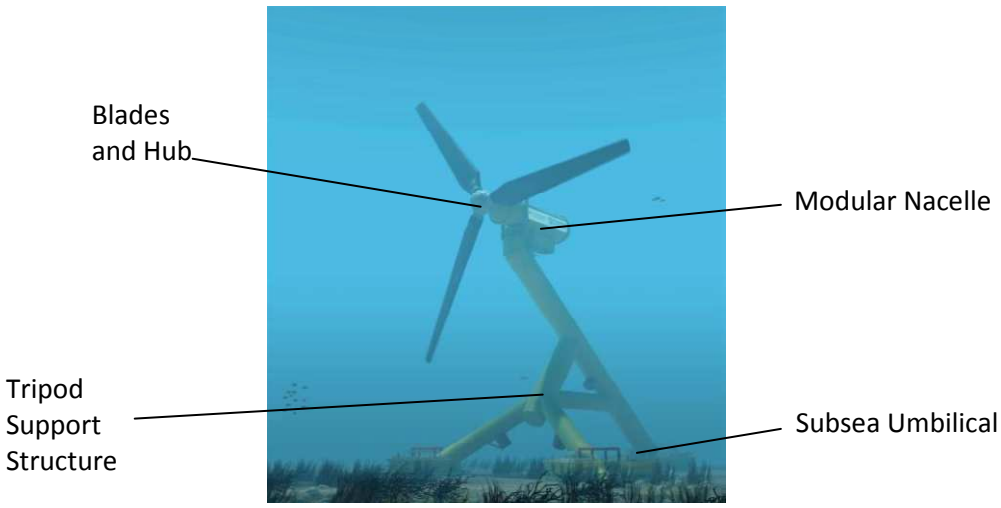


Figure 1: ANDRITZ HYDRO Hammerfest Tidal Turbine

Once testing of the larger scale demonstration tidal device, and any required refinements to the design are complete, it is proposed that a 10MW tidal array will be deployed at the Sound of Islay in order to prove a range of technical, environmental and commercial parameters related to multi-device deployments. After that, the Ness of Duncansby Tidal Array will be deployed in the Pentland Firth, subject to the required Consents and Licenses being obtained. SPR have secured exclusive rights to the development of the site in the Pentland Firth near Ness of Duncansby on the north east coast of the Scottish mainland. The Tidal Array would consist of 95*1MW ANDRITZ HYDRO Hammerfest HS1000 tidal turbines within the area shown in Figure 2.

Figure 2: Ness of Duncansby – Site Location

In addition to the tidal devices, there will be associated onshore/offshore infrastructure including subsea and landfall cable, control building, substation and onshore access. The location for the onshore substation will be subject to final confirmation once local planning constraints and the locational requirements of the grid operator are ascertained. The substation site may also include the array control room. If it is possible to integrate the control room within a compound planned as part of local grid infrastructure upgrades, then this will be considered to minimise any local visual impact.

SPR will, in due course, submit a Section 36 and accompanying Environmental Statement to the Scottish Government for the development and a local planning application for the onshore elements. The development will also require a Licence under Section 21 of the Marine (Scotland) Act 2010 ("Marine licence"), from Scottish Government (Marine Scotland).

This report forms SPR's written request to Scottish Government, under Regulation 7 of the Electricity Works (Environmental Impact Assessment) (Scotland) Regulations 2000, for its opinion as to the information to be provided in the Environmental Statement (a 'Scoping Opinion').

The Environmental Statement that will be produced for this project will support the applications for consent for offshore works, under the following legislation: Section 36 of the Electricity Act 1989; Section 21 of the Marine (Scotland) Act 2010; and a local planning application in regard to the onshore aspects of the development.

Environmental Impact Assessment (EIA) is a process that includes the identification of the potential environmental effects of a development and then seeks to avoid, reduce or offset any adverse effects through mitigation measures.

The purpose of this report is to set out the details of the proposed development, the site and the surrounding area, the potential effects of the development and the approach currently considered appropriate for the EIA to assist in the formal scoping process.

This report describes the baseline environment, and lists aspects of the environment that have the potential to be affected by the proposed development.

Although the layout and design are still developing and evolving, an understanding of the construction and operational parameters of the Tidal Array along with knowledge of the baseline environment of the site enables the possible effects of the development to be identified. The report also outlines the proposed approach and methodology to be adopted for certain studies that will require to be undertaken for the EIA.

The findings of this Scoping Report, in conjunction with the Scoping Response received from Scottish Government and other consultees, will be used to inform the EIA. The list of consultees to be consulted is presented in Appendix A.

By conducting this exercise as early as possible, the overall project planning and design can take account of any alterations or measures that will act to resolve potential issues and minimise possible effects of the proposed development.

1. INTRODUCTION

1.1. BACKGROUND

1.1.1 SPR is wholly owned by Iberdrola Renovables, the global leader in wind energy with over 14,000MW of installed capacity operating worldwide. Iberdrola Renovables is firmly committed to sustainable development and, acknowledging the role that carbon dioxide plays in global climate change, is committed to maintaining its position as a leading international renewables operator, particularly from wind.

1.1.2 SPR is responsible for Iberdrola Renovables' UK renewables project portfolio and pipeline. It is a leading UK onshore windfarm operator, managing operational windfarms in Britain with an installed capacity of >1,000MW.

1.1.3 Under the Renewables Obligation, SPR is implementing an ambitious growth programme in renewable energy, specifically wind energy.

1.1.4 SPR is also working towards becoming market leader in the emerging marine renewables sector.

1.1.5 SPR is currently involved in the development of a candidate 1MW demonstration tidal-stream generating device. The demonstration device was deployed for pre-commercial testing at the Fall of Warness tidal facility, EMEC, in December 2011. This deployment was subject to a separate consent application.

1.1.6 Once testing of the demonstration device and any required refinements to the design are complete, it is proposed that a demonstration tidal array will be deployed in the Sound of Islay, subject to the required Consents and Licenses being obtained, during 2013.

1.1.7 Knowledge gained from the installation and operation of this demonstration tidal array will be used in the installation of the Ness of Duncansby Tidal Array in the Pentland Firth.

1.1.8 It is proposed that the Ness of Duncansby Tidal Array will consist of 95 Tidal Devices and will be one of the first Commercial Tidal Arrays.

1.1.9 The Tidal Array will be 95MW and consent to construct and operate the Tidal Array will therefore be required under Section 36 of the Electricity Act 1989 from the Scottish Government (Marine Scotland).

1.1.10 The development of tidal devices is at an early stage internationally and the UK is currently in a leading position, with a number of devices at various stages of development. It is therefore important to note that this is an innovative development designed to help take the marine renewables sector forward and the following points should be considered:

- The project is of strategic national importance in the UK as it will contribute to the birth of a new industry with enormous economic and environmental potential, as well as contributing to renewables targets;

- The project will be one of the first commercial sites for Tidal Stream Power; and

- It is vital for projects such as this to be progressed expediently for the marine sector to move forward and for the UK to secure associated benefits.

1.2. DOCUMENT PURPOSE

1.2.1 This document forms SPRs written request to the Scottish Ministers, under Regulation 7 of the Electricity Works (Environmental Impact Assessment) (Scotland) Regulations 2000 for their opinion as to the information to be provided in the Environmental Statement.

1.2.2 This document also informs the Scottish Ministers that SPR intends to make an application for the following consents and licences:

- Consent under Section 36 of the Electricity Act 1989 from the Scottish Government (Marine Scotland) for the construction and operation of the Tidal Array;

- Licence under Section 21 of the Marine (Scotland) Act 2010 ("Marine licence") from Scottish Government (Marine Scotland) for the deposit any substance or object in the sea or on or under the seabed; construct, alter or improve works on or over the sea or on or under the seabed; remove substances or objects from the seabed; carry out dredging; deposit and/or use explosives; incinerate substances or objects; and

- Planning permission for the onshore elements of the project will be sought under the Town & Country Planning (Scotland) Act 1997.

1.2.3 The Environmental Statement that will be produced for this project will support the applications for consent for offshore works under the following legislation: Section 36 of the Electricity Act 1989; Section 21 of the Marine (Scotland) Act 2010; and planning permission under the Town & Country Planning (Scotland) Act 1997 for the onshore aspects. Section 20 of the Marine (Scotland) Act 2010 allows the previous FEPA and CPA licenses to be consolidated into one Marine Licence, to be administered by Marine Scotland's Licensing and Policy team.

1.2.4 The Crown Estate owns the foreshore and seabed from Low Water to 12 nautical miles (nm) and an Agreement for Lease under Section 3 of the Crown Estate Act 1961 has been obtained for the right of occupation for the placement of structures on, or passing cables over Crown Estate land.

1.3. DOCUMENT STRUCTURE

1.3.1 Chapter 2 identifies the legal framework, policy and Development Plan applicable to the content of this document.

1.3.2 Chapter 3 provides general information on the proposal including site selection, description of the nature and purpose of the proposed Tidal Array. A description of the potential effects on the environment is presented in Chapter 4.

1.3.3 Chapter 5 provides an outline of the proposed contents of the Environmental Statement. The approach to consultation is provided in Chapter 6 and contact details for further information are provided in Chapter 8.

2. POLICY & LEGISLATIVE CONTEXT

2.1. CLIMATE CHANGE

2.1.1 Climate change is the single most important long-term threat to the global environment, particularly to biodiversity and to birds[1]. Recent research suggests that climate change could drive between 18% and 35% of species to extinction by 2050[2].

2.1.2 The UK government, as part of its strategy to reduce greenhouse gases and tackle global warming, has placed a national obligation on all electricity suppliers to provide 10 per cent of their electricity from renewable sources by 2010 and 15% by 2015.

2.1.3 In addition, the UK Government has set a target for the supply of 15% of energy from renewable sources by 2020 and the Scottish Government has set a target for the supply of 80% of Scotland's electricity from renewable sources by 2020, recognising the extent of Scotland's important renewables resources. At the end of 2008 the amount of electricity generated in Scotland from renewable sources was around 18 per cent of the total[3].

2.2. RENEWABLE ENERGY

2.2.1 Renewable energy sources are natural energy sources such as sunlight, wind, waves and tides, which are continuously replenished. Of these, marine renewables (wave and tidal) energy has the potential to play a vital part in the future energy supply. This is recognised in the Scottish Government Marine Energy Strategy, March 2008.

2.2.2 The scale of Scotland's marine renewables potential is vast with the total wave and tidal resource in Scotland estimated at 14GW and 7.5GW respectively[4]. Within the marine industry wave and tidal prototype devices are currently being developed and tested in the field with a view to the deployment of arrays of such devices at suitable locations around the coastline of the United Kingdom. Wave and tidal offer benefits in terms of electricity generation that is free from emissions of carbon dioxide (the main 'greenhouse gas' associated with global warming) and other pollutants.

2.2.3 This Tidal Array is proposed as part of the response of SPR to targets set by UK and Scottish Governments to increase the proportion of electricity generated from renewable sources and hence reduce Scotland's contribution to climate change. In addition SPR is working towards becoming a market leader in the emerging marine renewables sector.

2.2.4 The Scottish Government's Marine Energy Strategy (March 2008) recognises the potential that marine renewables (wave and tidal) has in future energy supply. The Strategy sets out the support mechanisms available to this growing sector of renewable energy and the next steps required in developing the Strategic Environmental

[1] Chief Scientific Adviser to the Government, Professor Sir David King, evidence to the House of Lords Select Committee on the European Union, inquiry into a "Sustainable EU Policy on Climate Change", Hansard, 10 March 2004

[2] Royal Society for the Protection of Birds, evidence to the House of Lords Select Committee on the European Union, inquiry into a "Sustainable EU Policy on Climate Change", Hansard, 3 March 2004.

[3] http://www.scotland.gov.uk/Topics/Statistics/Browse/Environment/seso/sesoSubSearch/Q/SID/205

[4] Scottish Government Marine Energy Strategy, March 2008.

Assessment for the development of wave and tidal devices around the Scottish coastline. The Strategy underwrites the Scottish Government's commitment to maintaining Scotland's position at the forefront of the marine energy industry.

2.3. PLANNING CONTEXT

2.3.1. Terrestrial Planning

2.3.1.1 A request to the Local Authority will be made under Section 57 of the Town & Country Planning (Scotland) Act covering the onshore elements of the development.

2.3.1.2 Depending on the precise location of the site consideration will also be made to the Conservation (Natural Habitats &c) Regulations 1994 (as amended) with regards to the potential requirement for an Appropriate Assessment, and Environmental Protected Species licences (see Section 2.4.1). However, given that there is limited room for manoeuvre within the CE lease area and the proximity of the various conservation designations (and features likely to be impacted); it is highly unlikely that changes to site location will remove the need for an Appropriate Assessment.

National Regulations

2.3.1.3 Scottish Ministers are responsible for the National Planning Framework for Scotland (NPF) which sits at the top of the policy hierarchy and is the long term strategy for the development of Scotland.

2.3.1.4 The first NPF (NPF 1) was produced in 2004 and provides a non-statutory spatial planning framework for Scotland for the period to 2025. It identifies key drivers of change in the environment and economy of Scotland and defines strategic infrastructure requirements to provide a basis for future planning.

2.3.1.5 Several provisions of the NPF are of relevance to the current proposals: for example, the need for sustainable development, and the need to promote and deliver the Scottish Government's renewable energy targets and aspirations. The framework also recognises the economic benefits that developing Scotland renewable energy potential could bring.

2.3.1.6 The second NPF (NPF 2) was published in 2009 and provides an important vehicle for the national debate about the sort of place we want Scotland to be. It will guide and provide a vision for Scotland's spatial development up to 2030, setting out strategic development priorities to support the Scottish Government's central purpose - promoting sustainable economic growth.

2.3.1.7 The introduction of NPF 2 is a big step towards securing the future of the renewable energy industry in Scotland; the Government clearly states its commitment to realising the power generating potential of all renewable sources of energy. NPF 2 recognises that longer term potential is likely to lie with new technologies such as wave and tidal power, biomass and offshore wind.

2.3.1.8 Scottish Planning Policy (SPP) is the statement of the Scottish Government's policy on nationally important land use planning matters. It was published in February 2010 as a result of the commitment to proportionate and practical planning policies. The SPP

replaces a series of planning guidance documents, providing a shorter, clearer and more focused statement of national planning policy.

2.3.1.9 The SPP is a statement of Scottish Government policy on land use planning and contains the following:

- Scottish Government's view of the purpose of planning;
- Core principles for the operation of the system and the objectives for key parts of the system;
- Statutory guidance on sustainable development and planning under Section 3E of the Planning etc. (Scotland) Act 2006;
- Concise subject planning policies, including the implications for development planning and development management; and
- Scottish Government's expectations of the intended outcomes of the planning system.

2.3.1.10 The SPP contains 'subject policies', one of which relates to renewable energy. The following extracts are taken from this subject policy:

2.3.1.11 '*Planning authorities should support the development of a diverse range of renewable energy technologies, guide development to appropriate locations and provide clarity on the issues that will be taken into account when specific proposals are assessed. Development plans should support all scales of development associated with the generation of energy and heat from renewable sources, ensuring that an area's renewable energy potential is realised and optimised in a way that takes account of relevant economic, social, environmental and transport issues and maximises benefits.*'

2.3.1.12 '*Off-shore renewable energy generation presents significant opportunities to contribute to the achievement of Government targets. Although the planning system does not regulate off-shore development, it is essential that development plans take into account the infrastructure and grid connection needs of the off-shore renewable energy generation industry. Development plans should identify appropriate locations for facilities linked to the manufacture, installation, operation and maintenance of off-shore wind farms and wave and tidal devices.*'

Regional Regulations

2.3.1.13 The Local Development Plan (LDP) for an area comprises both the approved structure and the adopted local plan.

2.3.1.14 The Planning etc (Scotland) Act 2006 requires Highland Council to replace the existing Structure Plan and Local Plan with a single LDP. The LDP will set out the long-term vision for future development and land use across Highland.

2.3.2. Marine Planning

2.3.2.1 Marine spatial planning is recognised as the mechanism for achieving a more integrated, simplified and sustainable approach to the management of marine sectors and activities and increased protection of the natural marine and coastal environment. The Marine (Scotland) Act 2010 sets out provisions for marine planning in Scottish waters.

2.3.2.2 Marine planning in Scotland will be based on a 3-tier system:

- Scotland (National) Level Planning;
- Regional Level Planning; and
- International Level Planning.

2.3.2.3 Renewable energy developments would be incorporated as part of the regional level planning.

2.3.2.4 The requirements under The Energy Act 2004 for offshore installations to prepare decommissioning plans will also be considered.

Scotland (National) Plans

2.3.2.5 Nationally there will be a single Scottish National Marine Plan. The plan will be prepared by Marine Scotland and will set national economic, social and marine ecosystem objectives alongside objectives relating to the mitigation of, and adaptation to, climate change. The plan may set out specific spatial requirements for particular types of activity or development where these are of national significance.

Regional Plans

2.3.2.6 These will be prepared for Scottish Marine Regions to take forward policies and priorities defined in the National Marine Plan. Regions will be defined by Marine Scotland and managed by a Marine Planning Partnership which will comprise someone nominated by the Scottish Ministers as well as one or more public authorities and/or stakeholders. The Partnerships will prepare a regional plan for their area, which is likely to include a vision for the marine area covered by the plan, management policies for specific sectors, and a framework for decision making in relation to development consents.

2.4. DEVELOPMENT CONTROL AND EIA

2.4.1. Consents and Licensing

Electricity Act 1989

2.4.1.1 Under Section 36 of the Electricity Act 1989 ('the Act'), consent is required from the Scottish Ministers for the construction, extension and operation of a tidal power generating station with a capacity of 1.0MW or more.

2.4.1.2 On granting consent under Section 36, the Scottish Ministers can also decide that planning permission be deemed to be granted, if requested to do so.

2.4.1.3 The capacity of the proposed Tidal Array will be in the region of 95MW. Consent for the Tidal Array will therefore be required under Section 36 of the Electricity Act.

Marine Licence

2.4.1.4 The Tidal Array will require a licence under Section 21 of the Marine (Scotland) Act 2010 ("Marine licence") from Scottish Government (Marine Scotland).

Onshore Planning

2.4.1.5 The onshore aspects of the Tidal Array will require planning permission under the Town & Country Planning (Scotland) Act 1997.

EPS

2.4.1.6 Under the Conservation (Natural Habitats, & c.) Regulations 1994, as amended by The Conservation (Natural Habitats, &c.) Amendment (Scotland) Regulations 2007 and The Conservation of Habitats and Species Regulations 2010 it is an offence to disturb or to recklessly capture or kill European protected species (EPS), including all cetaceans. A license to damage or disturb EPS can be applied for from Scottish Ministers; however, in granting such a license Scottish Ministers must make arrangements for monitoring the incidental capture and killing of EPS, as well as make arrangements for the carrying out of such research or the taking of such conservation measures as are necessary for ensuring that such incidental capture and killing does not have a significant negative impact on the species considered.

SEA and AA

2.4.1.7 A Strategic Environmental Assessment (SEA), which covered the Pentland Firth and Orkney Waters (PFOW) area, was carried out in 2007. This highlighted all of the possible effects relating to marine renewable energy projects as well as providing baseline data for the area.

2.4.1.8 An Appropriate Assessment (AA) has been undertaken for the leasing round in general, which incorporated the Ness of Duncansby Tidal Array site but was not specific to this site. Consequently, a site specific AA will also have to be undertaken by Marine Scotland in due course, based on information provided by SPR.

Scoping Question: Have all regulatory requirements that the project should be taking into account been identified?

2.4.2. EIA Regulations

2.4.2.1 The Electricity Works (Environmental Impact Assessment) (Scotland) Regulations 2000 ('the EIA Regulations') implement Council Directive 85/337/EEC as amended by Council Directive 97/11/EC on the assessment of the effects of certain public and private projects on the environment, insofar as it relates to applications for consent to construct, extend or operate a power station or install or keep installed overhead electricity lines under Sections 36 and 37 of the Act. Guidance on the Regulations is contained in a Guidance Note (the 'Guidance Note').

2.4.2.2 Under the Regulations, Section 36 development that is considered likely to have significant effects on the environment must be subject to EIA and an Environmental Statement (ES) submitted with the Section 36 application.

2.4.2.3 Schedule 1 of the Regulations lists those developments for which EIA is mandatory, whilst Schedule 2 describes projects for which the need for EIA is judged by the Scottish Ministers on a case-by-case basis through a screening process. Schedule 3 describes the criteria to be used by the Scottish Ministers to determine if a development is 'EIA development'.

2.4.2.4 Where EIA is required, environmental information must be provided by the developer in an Environmental Statement. Schedule 4 specifies the information that must or may be provided in such a Statement.

2.4.2.5 The Regulations prohibit the Scottish Ministers from granting consent for an EIA development without taking into account an Environmental Statement, together with any associated environmental information.

2.4.2.6 The proposed Tidal Array is a Schedule 2 development: *"(1) 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."* If therefore it is likely to have significant environmental effects because of factors such as its nature, size or location, it is 'EIA development', and a formal EIA is required. SPR independently proposed that the proposed Tidal Array should be subject to EIA.

Obtaining a Scoping Opinion (Regulation 7)

2.4.2.7 Under Regulation 7, the developer of an EIA development may 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 Environmental Statement (i.e. to provide a 'Scoping Opinion').

2.4.2.8 The Guidance Note (Guidance on The Electricity Works (Environmental Impact Assessment)(Scotland) Regulations 2000) states that this provision allows the developer to be clear about what the Scottish Ministers consider the main effects of the development are likely to be and therefore the topics on which the Environmental Statement should focus.

2.4.2.9 The request for a Scoping Opinion must be in writing and should include basic information on the proposed development as set out below:

(a) a plan sufficient to identify the site which is the subject of the proposed development;

(b) a brief description of the nature and purpose of the proposed development and its possible effects on the environment; and

(c) such further information or representations as the person making the request may wish to provide or make.

2.4.2.10 This information is presented in the following sections. The Guidance Note 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, to provide a focus for the Scottish Ministers' considerations.

2.4.2.11 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).

2.4.2.12 When the Scottish Ministers issue a Scoping Opinion, they must state what information should be included in the Environmental Statement, giving their reasons why. The Regulations also require the Scottish Ministers to make available to the public, via the Planning Authorities, their Scoping Opinion.

2.4.2.13 The findings of this Scoping Report in conjunction with the Scoping Opinion received from Scottish Government and other consultees will be used to inform the EIA. The list of consultees to be consulted is presented in Appendix A.

2.4.2.14 Other relevant Environmental Impact Assessment legislation are as follows:

- Marine Works (Environmental Impact Assessment) Regulations 2007; and
- Environmental Impact Assessment (Scotland) Regulations 1999.

2.4.2.15 The requirements of the above will be met within the EIA process adopted for the Tidal Array.

Provision of Information by Consultative Bodies (Regulation 8)

2.4.2.16 Under the Environmental Information (Scotland) Regulations 2005, public bodies must make environmental information available to any person who requests it. These Regulations are pertinent where a developer is preparing an Environmental Statement for an EIA development.

2.4.2.17 Regulation 8 of the EIA Regulations provides for the developer to acquire from public bodies any environmental information which they hold which will assist in the preparation of the Environmental Statement.

2.4.2.18 When the developer notifies the Scottish Ministers, under Regulation 8, that he intends to provide an Environmental Statement with the application, the Scottish Ministers will notify the Consultative Bodies and other relevant environmental organisations and ask them to make the information available. The developer will be told who these organisations are, together with their addresses.

The Environmental Impact Assessment Process

2.4.2.19 Environmental Impact Assessment (EIA) is a process which includes the identification of the potential environmental effects of a development and then seeks to avoid, reduce or offset any adverse effects through 'mitigation measures'. EIA follows a series of stages:

•Site selection and project initiation;

• Screening – is an EIA required?

• Pre-application discussions;

• **Scoping – consultation on proposed scope and methodology[5];**

• Environmental baseline studies – establish what is there;

• Assessment of effects – determine the potential effects;

• Mitigation – modify proposals to incorporate mitigation measures and re-assess residual effects;

• Preparation of Environmental Statement;

• Submission of Section 36 Application with Environmental Statement;

• Consideration of application and environmental information by Scottish Ministers and consultees;

• Decision to refuse or grant consent (with or without conditions); and

• Implementation and monitoring.

2.4.2.20 In reality the EIA process is both iterative and cyclic, and runs in tandem with project design. As potential effects are identified, the design of the project, e.g. the layout of the Tidal Array, will be adjusted and mitigation measures proposed. Consultation, a vital component of the EIA process, continues throughout each stage and contributes both to the identification of potential effects and mitigation measures.

2.4.2.21 The EIA process therefore provides the opportunity to develop projects, for which the environmental effects have effectively been removed or minimised. In many cases significant effects on, for example, ecology, birds, mammals and noise can be prevented through sensitive design and selection. Others, for example the effects of construction, can be effectively managed through the adoption of best practice.

2.4.2.22 At this early scoping stage however it is important to identify all the *'potential'* effects so that a rigorous assessment process, with input from independent experts, is followed based on sound objective evidence. The *potential* effects of the proposed Tidal Array are therefore described in Section 4 of this report. The main potential significant effects of the Tidal Array are then stated on which the Environmental Statement should focus. Those effects that are considered to be non-significant issues, and that are therefore scoped out of the Environmental Statement, are also stated.

2.4.3. Other Consents and Licences

2.4.3.1 A request to the Local Authority will be made under Section 57 of the Town & Country Planning (Scotland) Act covering the onshore elements of the development.

2.4.3.2 Determining bodies for these consents and licences have been included in the Consultee List (Appendix A) to ensure that they are aware of the proposals at the earliest

[5] The stage ScottishPower Renewables is currently at with the Tidal Array.

stage and their requirements for environmental information are incorporated into the Scoping Opinion and Environmental Statement as appropriate.

2.4.3.3 Depending on the precise location of the site, consideration will also be made to the Conservation (Natural Habitats &C.) Regulations 1994, as amended, with regards to the potential requirement for an Appropriate Assessment and Environmental Protected Species licences.

2.4.4. Legislation

2.4.4.1 The Marine and Coastal Access Act 2009 aims to put in place a better system for delivering sustainable development of the marine and coastal environment and address both the use and protection of the marine resources. It proposes to deliver an integrated system for planning, consents, nature conservation, coastal and estuary management, fisheries management and enforcement, with some marine functions to be reserved for the UK Government whilst others are devolved to regional administrations. A key aspect of the Marine and Coastal Access Act is the introduction of a network of Marine Conservation Zones.

2.4.4.2 The key issues covered in the UK Marine Act are:

- The creation of the Marine Management Organisation (MMO);
- Planning in the marine area;
- Licensing activities in the marine area;
- Marine nature conservation;
- Managing marine fisheries;
- Reform of inland and migratory fisheries;
- Modernisation and streamlining of enforcement powers; and
- Administrative penalties scheme for domestic fisheries offences.

2.4.4.3 To address devolved matters the Scottish Government introduced the Marine (Scotland) Act 2010. The Scottish Marine Act sets out a strategic approach to managing Scotland's seas and includes:

- Greater local control over marine and coastal areas;
- A simpler regulatory system for the marine environment;
- Creation of a Scottish marine management organisation – Marine Scotland;
- More action on marine nature conservation; and
- A strategic national approach.

2.4.5. Development Plan

2.4.5.1 The statutory development plan for the area currently comprises the Highland Structure Plan (approved March 2001) and The Caithness Local Plan (adopted in September 2002).

2.4.5.2 The Highland Structure Plan recognises the potential of all forms of renewable energy and in Policy E1, the council states that it supports the utilisation of the regions distributed renewable energy resource, including hydro, wind, wave and tidal stream power. Proposals will be assessed against the provisions of the General Strategic Policies. Approvals for renewable energy developments will normally be for a temporary period only (tied to the lifetime of a project), with provision where appropriate for the removal and reinstatement of affected areas. Earlier action for removal and reinstatement will be required in the event of premature permanent cessation of energy production.

2.4.5.3 The Caithness Local Plan states that opportunities to harness the renewable energy potential of Caithness have been investigated in recent years, partly stimulated by the Government's Scottish Renewables Obligation (SRO) initiative. Smaller scale 'stand-alone schemes' can help meet local needs. Potential sites for wind energy in Caithness need to be assessed in relation to the criteria outlined in the Approved Structure Plan. The Plan also states that the Dounreay site and its highly skilled workforce may offer a potential location for a centre for alternative energy technology development.

2.4.5.4 In an effort to promote economic development throughout the County, the Council states that it will support overall objectives and strategy of the Structure Plan and Caithness Partnership through safeguarding and support for strategic industrial business development sites and allocation of land for general business and industrial development, particularly along the Wick – Thurso – Dounreay corridor.

2.4.5.5 The Caithness Regeneration Partnership was established in 2007 to help develop the local economy during the run-down of the Dounreay nuclear plant. One of the key initiatives being promoted is The Pentland Firth Tidal Energy Project. The project is one of the most significant projects in the Caithness Regeneration Plan. It is focusing on how the area can obtain the best results out of the Pentland Firth and the energy it can generate for the local economy.

3. DESCRIPTION OF THE DEVELOPMENT

3.1. SITE SELECTION

3.1.1 SPR recently participated in a round of bidding for the lease of Crown Estate sites in the Pentland Firth and Orkney Waters (PFOW). The purpose of this leasing round was to accelerate the development of commercial wave and tidal arrays in the PFOW. SPR were successful in their bid to develop the Ness of Duncansby tidal site on the north coast of Scotland, and have been awarded exclusive development rights for a tidal array with a capacity of 95MW.

3.1.2 SPR commenced work in 2007 to investigate the potential for tidal stream power extraction in UK waters. A preliminary screening exercise identified locations that would benefit from a more detailed assessment using numerical models.

3.1.3 A number of sites were considered and surveyed in detail as part of the site-selection process, including the Sound of Islay and the North Antrim coast. The Pentland Firth was identified at an early stage as having the greatest potential in terms of available energy. It was considered that a staged development process should be followed to ensure that technology and development learning could be safely established through work at less exposed and energetic sites prior to large-scale deployment in the Pentland Firth. This is reflected in SPR's overall development strategy.

3.1.4 In addition, the site-selection process also took due consideration of all technical, environmental, social, economic and political constraints, including factors such as shipping, MoD operations, ecology, bathymetry, seabed conditions, fishing, wave and tidal resource, grid issues, support infrastructure and accessibility. An overall assessment of each site was established against these criteria.

3.1.5 This work identified the Sound of Stroma, Duncansby Head and the area to the west of South Ronaldsay as being the most promising areas for early projects. It was decided to avoid the middle of the firth for the time being due to accessibility and shipping issues.

3.1.6 Numerical models were built for a number of areas and an initial calibration was carried out in a subsequent study. The numerical modelling was conducted using a calibrated and validated 100m grid model of the Pentland Firth to simulate water depth and current flux in the area.

3.1.7 Depth averaged current speeds were derived and plotted across the Pentland Firth area to allow identification of the most promising resource areas. Model simulations were carried out over a period of around 20 days. A period of approximately 14 days, a spring neap cycle, was extracted from this simulation and used for the subsequent calculations.

3.1.8 In the summer of 2008 a series of surveys were carried out in the areas, including vessel mounted ADCP measurements. This work has allowed SPR to identify the suitable seabed and flow characteristics in the Sound of Stroma and the area to the north of the Ness of Duncansby. The area around South Ronaldsay has been excluded due to

extreme flow conditions with very large vertical and horizontal shear which is unlikely to be acceptable to any tidal technology.

3.1.9 Within the Ness of Duncansby area a more localised site selection exercise has also considered shipping activity. The site is not within any designated shipping lanes and AIS data suggests that activity in this area is relatively limited.

3.1.10 SPR has had valuable input from their consultation process in the run up to the publication of this formal scoping report. This has so far suggested that the site does not appear to have any "showstopper" environmental issues (based on available information), although the site does overlap with North Caithness Cliffs Special Protection Area designated for breeding seabird populations which will require full consideration via a Habitat Regulations Appraisal and subsequently an Appropriate Assessment. However, the feedback from this report will form the basis of the Environmental Impact Assessment process and Habitat Regulations Appraisal and may highlight issues that have not been identified during the production of this report.

3.1.11 All of these factors have led to SPR's selection of Ness of Duncansby as an optimum site for development.

3.2. SITE LOCATION

3.2.1 The Pentland Firth is located off the north coast of Scotland and lies south of the Orkney Islands. The proposed location for the Tidal Array is shown on Figure 3.

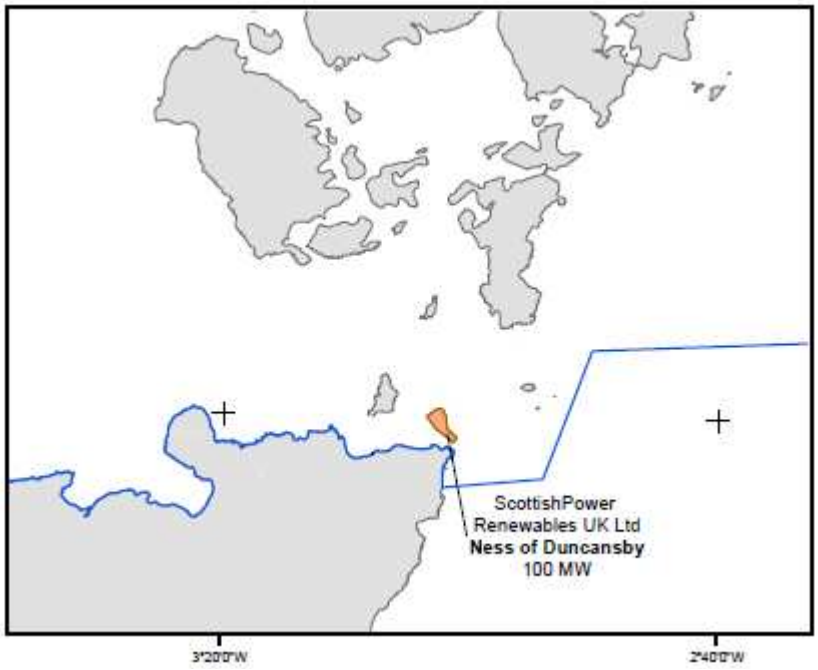


Figure 3: Map Showing Site Location

3.2.2 The area under consideration is off Ness of Duncansby, in the waters to the north of the Scottish mainland. There are piers at Gills Bay and Ness of Duncansby which are accessed via local roads connecting to the coastal A836. The Gills Bay (Caithness) to St Margarets Hope (north shores of South Ronaldsay) ferry route passes to the north of the Duncansby site.

3.2.3 South Ronaldsay is the nearest Orkney Island to Scotland, being approximately 10 km (6 miles) across the Pentland Firth from John O'Groats and lies within Orkney Islands Council.

3.2.4 Burwick is the main village on the south coast of South Ronaldsay and is accessed by land via B9041/A961. Access by sea to South Ronaldsay is via two ferry routes:

- Burwick Pier to John O'Groats (Ness of Duncansby Pier) (passenger service summer only); and

- Gills Bay (Caithness) to St Margaret's Hope (north shores of South Ronaldsay) (Ro-Ro service).

3.2.5 Stroma is approximately 3km north of Gills Bay to the west of the Duncansby site. The island is uninhabited and lies within Highland Council.

3.2.6 At present the precise location for the tidal turbines within the Duncansby site is yet to be determined and will be the subject of a review of technical (such as separation distances between each device), environmental and stakeholder considerations as the Environmental Assessment progresses. Depth and tidal conditions are all suitable for deployment of a Tidal Array within the proposed area.

3.2.7 In addition to the tidal devices there will also be a requirement for an export power cable route from the Tidal Array as well as onshore infrastructure components such as a grid connection point, control building and substation. The preferred and secondary search areas for both the cable corridors and the onshore infrastructure are shown in Figure 4. The areas selected include Huna pier, Gills Bay and the Bay of Sannick. These sites vary in distance from the proposed development area by approximately 1.5 – 2.5km. The proximity of the offshore development to the associated onshore infrastructure helps to reduce offshore cable routeing costs and risks. The longer the cable run is from the offshore development site then the higher the costs and risks become. As part of their involvement in the Pentland Firth Developers Forum, and inclusion into discussions with SHETL and their search for appropriate infrastructure sites, SPR will aim to tie in their plans with other potential developments in the area. The EIA will consider (if details are available) the planned infrastructure sites being proposed by other developers and how SPR may coordinate with these developers to reduce any impact on the local area. This particularly relates to the Inner Sound MeyGen development and its associated landfall locations.

3.2.8 In 2009, Highlands and Islands Enterprise (HIE) published a grid options study to assist the development of the Pentland Firth and Orkney waters. This study indicates where potential future local grid reinforcements could be made, while the recent conclusions report from the Electricity Network Strategy Group discusses the potential new wider transmission infrastructure developments. According to both studies there is potential future build of transmission assets into the east of the region (near Duncansby Head) via an HVDC link to the Moray coast, with potential timeframes of between 2015 and 2020. This is considered to be the likely preferred grid connection option for the project.

3.2.9 The final, most appropriate design will be guided by the findings of the environmental assessment together with feedback from consultation and responses to this Scoping Report.

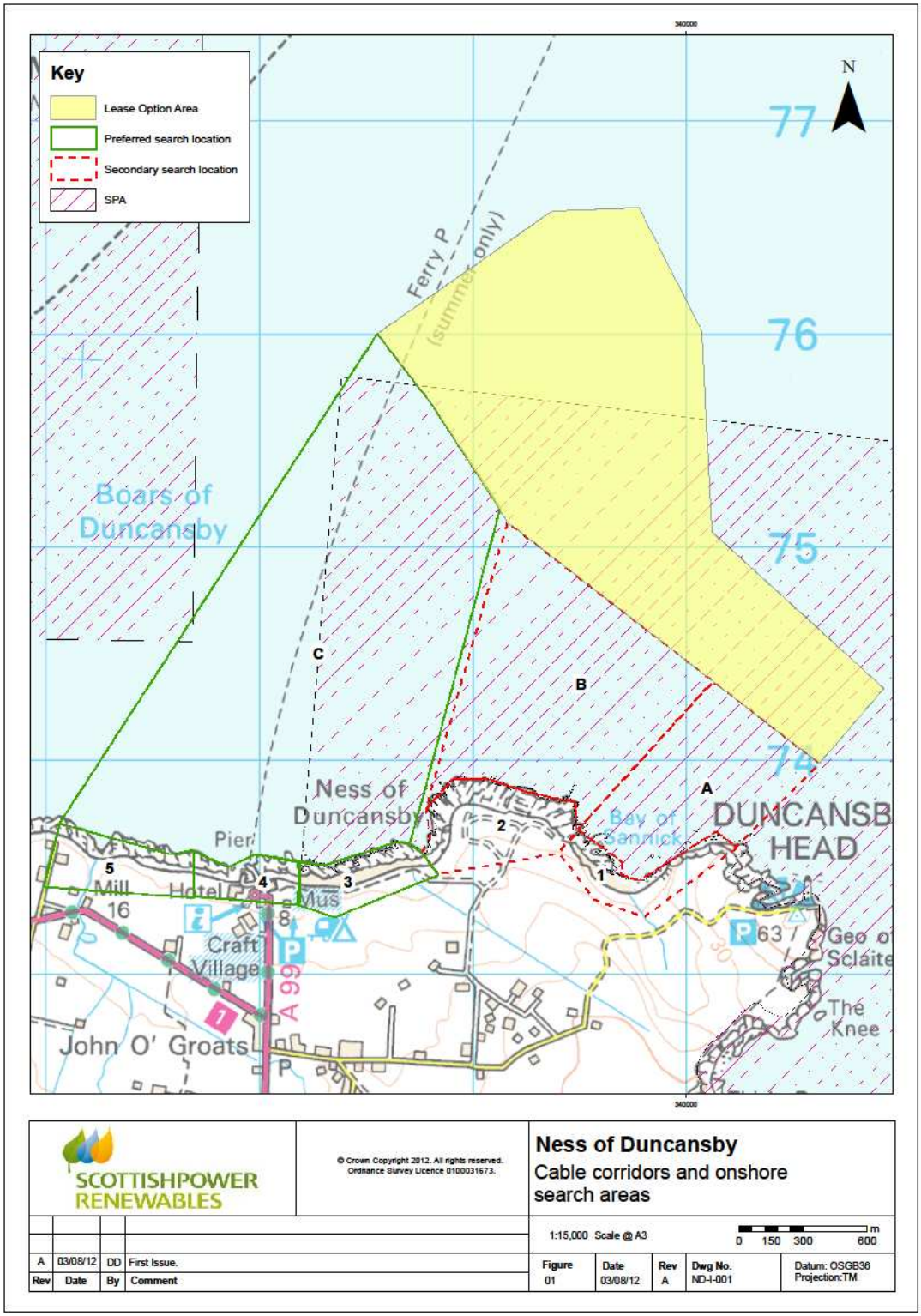


Figure 4: Map Showing Potential Cable Corridors and Onshore Areas of Search

3.2.10 The Crown Estate owns the foreshore and seabed from Low Water to 12 nautical miles (nm).

3.2.11 The proposed site is partly situated within the North Caithness Cliffs SPA (Figure 5), which is designated for regularly supporting seabird populations of European importance (see Section 4.3.3.7). Consideration will also be given to other designations in the vicinity of the area of interest as required under Regulation 48 of The Conservation (Natural Habitats, & c.) Regulations 1994 (as amended). Marine, coastal and terrestrial designations are described in Chapter 4.

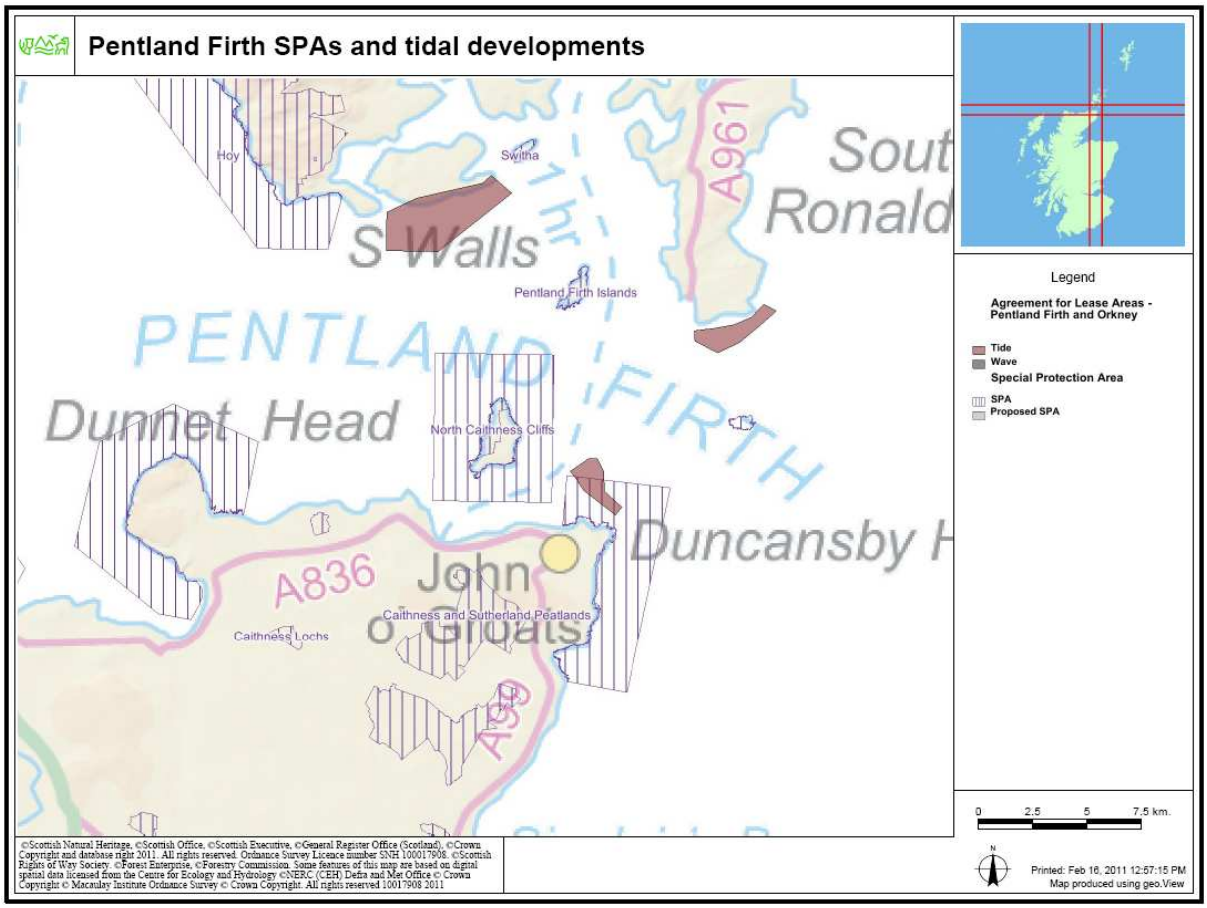


Figure 5: Locations of SPA boundaries and the proposed tidal development sites in the Pentland Firth6.

3.3. NATURE OF THE PROPOSED TIDAL ARRAY

3.3.1. Candidate Technology

3.3.1.1 The proposed Tidal Array would generate renewable electricity from tidal power. Tidal power has the benefits of providing a regular and predictable resource.

3.3.1.2 ANDRITZ HYDRO Hammerfest and SPR are currently developing a 1MW demonstration tidal stream generating device which was deployed at EMEC in December 2011. This work builds on the development work undertaken for the Hammerfest Strøm AS device in Norway where a 300kW scale device has been successfully designed, built and operated for approximately 5 years.

[6] Note that the MeyGen tidal site in the Inner Sound was not present on the map when accessed from the SNH website.

3.3.1.3 The device is a fully submerged seabed mounted tidal device. Electricity production from tidal currents can in principle be achieved by extracting either its potential energy (difference in sea level between high and low water) or its kinetic energy (the movement of the water masses). The ANDRITZ HYDRO Hammerfest turbine utilises the latter method of energy conversion and would typically be deployed in deep water >40m. Initial detailed bathymetry surveys at the Ness of Duncansby site show that the majority of the lease area has a depth of between 50-70m, a more accurate figure than can be gained by simply studying the available charts. The devices will be sited with regards to the navigational risk assessment undertaken as part of the development process to ensure that the maximum tip to surface clearance is afforded to other sea users.

3.3.1.4 During the operational period in Norway extensive performance data have been collected to determine the output based on the tidal flows. These data have been used to validate the theoretical and experimental output of the design phase and provide confidence in the techniques, which will subsequently be used to predict the output of the Ness of Duncansby Tidal Array.

3.3.1.5 Most importantly, the installation of the substructure and nacelle and subsequent removal of the nacelle in Norway has provided proof of the validity of the patented operation methods. The Hammerfest Strøm AS device is one of few worldwide that has implemented a successful installation and reinstallation operation.

3.3.1.6 The testing period has also served to prove the operation of the various subsystems associated with the power capture and conversion of kinetic to electrical energy. The forensic examination of the nacelle has provided a database of reliability and performance of individual components operating in the marine environment. This information has been used to optimise the design and improve the reliability of the technology.

3.3.2. Turbines

3.3.2.1 The ANDRITZ HYDRO Hammerfest technology is an evolution of a horizontal axis wind turbine, and there are many similarities in the design of the structure and drive train. However, the density of water as compared to air means that the blade diameter is much shorter than would be required for the equivalent rated wind turbine. The turbine characteristics also incorporate a much slower rotation and tip speed.

3.3.2.2 Again, the power conversion method is largely similar to that of an onshore wind turbine. Blades pitch to maximise the energy extracted from the tidal currents. The rotating blades turn a low-speed shaft to the gearbox. The gearbox increases the speed of rotation to allow generation at network frequency. The 300kW device is fixed speed, but a variable speed generator may be used for subsequent variants.

3.3.2.3 The nacelle is fixed onto a support tripod and will yaw like a traditional wind turbine. In addition, the turbine blades turn along their own axis to enable extraction of energy in both ebb and flood tides, in the theoretical case that yaw is not employed for whatever reason. The diameter of the existing 300kW prototype turbine rotor is 20m, with a blade length of 10m and rotational speed of 7.1 rotations per minute (RPM).

3.3.2.4 The blade diameter of the 1MW device will depend on the water velocity at the candidate site, with higher water velocities reducing the blade diameter. The rotational

velocity of the device will also depend on the water velocity along with the power take off system developed. This will be determined during the EIA process when extensive resource studies are planned to be undertaken. The turbine design has been tested in Norway and a 1MW test device was deployed at the EMEC test facility in December 2011. There are also plans to deploy ten devices at the Sound of Islay from 2013. This represents a staged approach to deployment at this site. Further details of deployments of this design will be presented in the ES along with any results from the planned monitoring programmes.

3.3.3. Components

3.3.4.1 Based on previous experience, the Tidal Array is likely to comprise the following key components:

- 95 tidal devices each consisting of a tripod base support structure, modular nacelle, hub and blades which are connected onshore via a subsea umbilical;
- Landfall cabling for power transmission and control system;
- Onshore control building, external substation compound containing transformer and switch gear equipment;
- Grid connection from onshore control building to a local connection point (at a location to be determined): and
- Local access to the onshore control building.

3.3.4.2 There will also be associated infrastructure with the above components such as utility cabling and temporary onshore construction facilities. It is also likely that a number of tidal current monitoring devices will be deployed throughout the operational life of the Tidal array. The data provided by these monitoring devices will be essential to advance the understanding of the performance and interaction of tidal energy converters with the resource.

3.3.4.3 As stated above there will also be a requirement for onshore infrastructure. The location of such infrastructure will depend upon the precise location of the Tidal Array and will be developed as the design progresses. SPR considers it important to gather the initial views of consultees before finalising the layout, so that initial views, in particular natural heritage constraints can be taken into account at the earliest possible stage. There will also be a subsea and landfall cable route connecting the Tidal Array to the onshore infrastructure.

3.3.4.4 An assessment of the environmental effects of both the onshore and offshore components of the Tidal Array will be prepared and reported within the Environmental Statement.

3.3.4.5 Careful consideration will be given to the design and layout of the Tidal Array as the EIA progresses. The most appropriate layout of the array will be guided by the findings of the environmental assessment together with feedback from consultation and consideration of technical requirements.

3.3.4.6 The distance of the location of the devices offshore will depend on local seabed conditions, water depth and grid connection requirements.

3.3.4.7 The details of the proposed Tidal Array are presented in Table 3.1; this is however subject to ongoing design refinement. Such refinement will come from the resource assessment studies being undertaken at the site, which will allow, for instance, the rotor diameter to be defined based on the flow speed. The finalised turbine height and the sea surface clearance distances will be defined within the Environmental Statement and the Navigation and Safety Risk Assessment (NSRA).

TABLE 3.1: DETAILES OF PROPOSED TIDAL ARRAY	
Item	**Specification***
Number of tidal turbines	95
Hub-height above seabed	20-26 metres
Rotor diameter	16-26 metres
Height to blade tip from seabed	28-39 metres
Generating capacity per device	1MW
Total Tidal Array generating capacity	95MW
*Note: Indicative only at this stage	

3.3.4. Turbine Spacing

3.3.4.1 The actual layout and numbers of devices would be based on the results of the geophysical and resource surveys and the device output. The depth and the width of the site would vary accordingly based on the optimised site design.

3.3.4.2 The assumed spacing of devices is 2.5 times the rotor diameter laterally and 10 times the rotor diameter downstream. This is based on an optimised assumption of minimising wake losses and Tidal Array footprint. The assumptions that produce these distances are a focus of research for ANDRITZ HYDRO Hammerfest.

3.3.4.3 With an assumed rotor diameter of 21 meters the site will take up an approximate maximum footprint of 2.42km^2.

3.3.5. Foundations/Base

3.3.5.1 A review of various foundation and batch deployment options has confirmed that the tripod base arrangement (as used in the 300kW and 1MW devices) is the optimum approach. Due to the energetic waters of the Pentland Firth, the foundations may require to be pinned to the seabed as an alternative to gravity based anchoring.

3.3.5.2 In either case the foundation design removes the requirement for invasive piling operations. It also enables ease of removal for maintenance and decommissioning and minimises the footprint for installation.

3.3.5.3 Extensive noise monitoring will be undertaken in relation to the installation of the devices within the Sound of Islay and these will be incorporated into the Ness of Duncansby EIA process. Additionally, an assessment of the noise likely to be generated from any proposed installation method (undertaken through a modelling process and previous measurements where possible) will be detailed within the ES.

3.3.6. Installation Methodology

3.3.6.1 The 300kW was installed using the following technique:

- The substructure was lowered from the specially adapted barge onto the seabed;
- Weights were docked to the footing of the three-legged structure after it was lowered onto the seabed to enable station keeping; and
- The turbine blades were mounted on the nacelle on the surface and by means of guide wires the nacelle module was lifted from the barge, lowered into the sea and fitted to the three-legged structure. This is illustrated in Figure 6.

Figure 6: Installation of Nacelle

3.3.6.2 The above installation method will be adapted to enable the installation in the more energetic waters in the Pentland Firth, and to account for the potentially varying seabed conditions. A variety of techniques are currently being investigated and may involve vessels with dynamic positioning and heave compensation, or the towing of submerged components.

3.3.7. Installation Infrastructure

3.3.7.1 Land access for construction vehicles for the onshore/coastal components will be subject to survey and will be selected to minimise potential effects on the local area and transport infrastructure.

3.3.7.2 For road access to the Duncansby site grid infrastructure, the A836 lies on the northern coast of the mainland and the A99 runs south along the east coast.

3.3.7.3 Depending on the final infrastructure locations some upgrading of existing roads may be required and/or a new local road to the control building/substation compound may be required.

3.3.7.4 The tidal devices themselves will be delivered by sea. The piers at Burwick, Gills Bay and Ness of Duncansby will be reviewed for their suitability for berthing of sea vessels.

3.3.8. Monitoring Devices - ADCPs / Wave buoys

3.3.8.1 Between 2012 and 2013, SPR will be undertaking surveying and modelling work of the Ness of Duncansby site. The use of ADCP current measuring devices and wave buoys will commence during a Work Package scheduled for 2012, in which it is anticipated that two years of continuous wind and wave data will be recorded. The exact technology to be used is still under review, but will consist of an onshore met station near the site and/or a wave buoy on location.

3.3.9. Inter-Array Cabling

3.3.9.1 Each device will be interconnected with other devices on the Tidal Array via an umbilical. The final layout of devices and therefore cables will largely depend on the site seabed conditions and bathymetry. However, the layout will be designed to minimise the cable lengths while maximising the level of redundancy. The techniques adopted for the laying of the subsea and landfall cable will depend on the local conditions and will either be buried or protected, as appropriate.

3.3.9.2 The onsite control building/substation will need to be large enough to hold a transformer, switchgear, power electronics, control and communications equipment and auxiliary supplies.

3.3.9.3 In 2009, Highlands and Islands Enterprise (HIE) published a grid options study to assist the development of the Pentland Firth and Orkney waters. This study indicates where potential future local grid reinforcements could be made, while a conclusions report from the Electricity Network Strategy Group discusses the potential new wider transmission infrastructure developments. According to both studies there is potential future build of transmission assets into the east of the region (near Duncansby Head) via an HVDC link to the Moray coast, with potential timeframes of between 2015 and 2020. This is considered to be the likely preferred grid connection option for the project.

3.3.9.4 HIE also indicated that there could be significant reinforcement of the existing line from Hastigrow up to Gills. This line may be upgraded to operate at 33kV (by 2011) providing up to 30MW of capacity. In addition, a second potential 33kV circuit could be built between Gills and Hastigrow, providing up to 60MW of export from Gills (by end of 2013). These options are, however, a little distant from the project and, ultimately, inadequate in terms of MW capacity. There is likely to be a significant level of competition for any new grid capacity that may be built at Gills and this development is likely to be progressed earlier than might match the partners' expectations.

3.3.10. Export Cabling/Grid Connection

3.3.10.1 The diameter of the subsea cable for the existing prototype is 81mm. Cables for the Ness of Duncansby Tidal Array are likely to be larger based on the larger output. The array will most likely have several subsea cables laid from the devices to the cable landfall point onshore. Minimising the number of export cables required is the focus of current industry research of which SPR is a leading partner.

3.3.11. Operations and Maintenance Strategy

3.3.11.1 The device can be controlled remotely via the supervisory control and data acquisition (SCADA) connections and control system. These are used to start and stop the turbine, pitch the blades and operate the onshore electrical equipment to allow grid connection. They also communicate with the various operating systems and condition monitoring systems to provide status reports and alarms on a wide variety of performance indicators such as generator temperature, voltage, and water ingress amongst others. Under normal operating conditions the device can be operated automatically and doesn't require constant supervision to optimise output and carry out start up and shut down operations. However, it is possible to manually intervene with the device using the control systems.

3.3.11.2 The nacelle unit will be fitted to the support structure via the yaw mechanism and cone arrangement. This allows the device to maximise yield and minimise fatigue by being aligned with the oncoming flow at all times.

3.3.11.3 The system operates autonomously and scheduled maintenance of the nacelle is currently anticipated to occur as a minimum every five years. However, the maintenance period for the device will be reviewed upon final design.

3.3.11.4 Maintenance of the nacelle will be carried out by removing the nacelles in a method similar to the installation in reverse, using a similar number and type of vessels. The nacelle will be taken from site to shore, where it will be maintained and any faults addressed in a clean, safe environment.

3.3.11.5 Maintenance and intervention requirements outwith the 5-year intervention period will be minimal. ROV inspections will be carried out to visually inspect the condition of the nacelle, blades, structure and cabling.

3.3.11.6 In compliance with established North Sea standards, cathodic protection will be applied to all subsea equipment. Methods for preventing marine growth will be investigated and tested on the demonstration device installation preceding this project.

3.3.11.7 The device will contain oils for lubrication, anti fouling agents and hydraulic fluids. A water lubricant is also being considered. Only recognised marine standard materials and substances will be used in the device.

3.3.11.8 The nacelle is likely to be filled with nitrogen or air to create a pressured environment within which the aforementioned substances are contained. The pressurised environment prevents ingress of seawater in the event of a fissure in the nacelle.

3.3.12. Operations and Maintenance Infrastructure

3.3.12.1 For the purpose of routine maintenance activities it will be required to move the machine from its operational site to a berth at a service / operational base. This berth will require power and allow safe access and egress for inspection and maintenance of the machine. The routine servicing will require some plant such as portable generators, air compressors and hydraulic power packs to be located on the quayside alongside the machine.

3.3.12.2 Cranes will be required for the replacement of larger components, it is anticipated that all lifts required would be less than 200 tonnes. The harbour used will also need to have the ability for cargo barges accepting trailer load outs to moor stern to the quay. The water depth would need to be at least 8m to handle larger construction vessel / anchor handlers.

3.3.12.3 Storage and workshop facilities will be required for maintenance activities to be carried out, this would need to be large enough to hold approximately 4 nacelles and spares and have an overhead gantry crane.

3.3.12.4 The maintenance interval for the nacelle is scheduled to occur once every 5 years and the systems and their components are being designed so that this can be achieved. In order to carry out maintenance, the nacelle will be removed from the substructure in a method similar to the installation in reverse, using a similar number and type of vessels. The methodology required is currently being put together detailing the type and number of vessels to be utilised, including the use of bespoke installation vessels[7]. Various vessels and methodologies will be trialled at EMEC and the Sound of Islay development to define the most appropriate systems and processes for the Ness of Duncansby site. The finalised methodology will be detailed within the ES and NSRA.

3.3.12.5 The nacelle will be taken from site to shore, where it will be maintained and any faults addressed in a clean, safe environment. Maintenance and intervention requirements outwith the 5-year intervention period for the array are expected to be minimal. Redundant systems and high reliability components will be used to extend the period between maintenance operations.

3.3.13. Decommissioning

3.3.12.6 Decommissioning is virtually a reversal of the installation process. Depending on the substructure fixation method, ballast weights will be removed by crane vessels and ROV's, should drilled foundations be used, they will be designed to allow drill re-entry and downhole cutting tools to remove pin piles at least 2.0m below the line of the seabed. Decommissioning will take place in five phases:

- Lift and removal of nacelle (regular maintenance operation);
- Subsea cutting or disconnection of HV power cables;
- Removal of ballast weight/cutting of pin piles;
- Lifting of substructure; and
- Recovery of HV power cables and manifolds.

3.3.12.7 "As-left" surveys will be undertaken and any debris removal operations would be carried out as required.

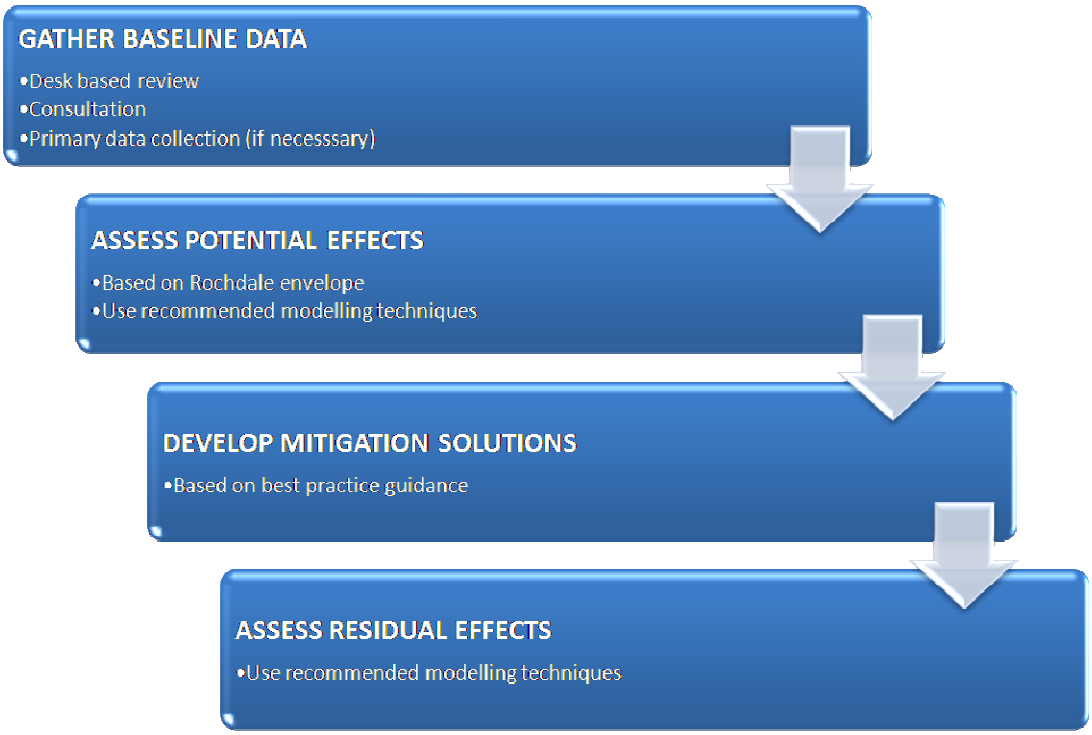
[7] Installation is currently designed around a large DP vessel similar to the one that installed the HS1000 at EMEC. However, there are currently desktop assessments being undertaken to look into cheaper options using barge systems similar to those adopted by other tidal developers.

4. ENVIRONMENTAL BASELINE & POTENTIAL EFFECTS

4.1. INTRODUCTION

4.1.1. Assessment Methodology

4.1.1.1 Each of the subtopics in this chapter will use the same broad environmental assessment methodology structure. This is illustrated in the figure below.



4.1.2. Cumulative and In-Combination Impacts

4.1.1.2 This part of the assessment will take into account all plans and projects which may act in combination to increase the magnitude of certain impacts upon the local environment. The appropriate spatial scale will be based upon the biology of the species or habitat being impacted.

Scoping Question: Do the requirements outlined for assessment of effects look appropriate and complete?

Scoping Question: Are there any other key sources of environmental information that should be consulted?

4.2. PHYSICAL ENVIRONMENT

4.2.1. Marine and Coastal Processes

Baseline Conditions

Bathymetry

4.2.1.1 Surveys of the proposed site carried out by iX Survey during 2008 indicate that the water depths in the development area are between 11m and 94m (chart datum), with a range of depths at the likely turbine locations of 40m to 70m. There are deep crack features within parts of the site, some of which are 14m in depth.

Hydrography

4.2.1.2 The northern Scottish coastline experiences a tidal rise and fall of approximately 1.7m and tidal streams of up to 9kts (4.5m/s) (from Jones, 1975 in Bennett and Covey, 1998). Results of a Tidal Stream Resource Modelling Study commissioned by SPR identified mean tide speeds in the proposed area for development of 1-1.6m/s.

EIA Methodology

TABLE 4.1 Primary Data Collection Methodology

Information requirement	Field method	Key regulators/public bodies
PHYSICAL ENVIRONMENT		
Marine and Coastal Processes		
Baseline bathymetric and oceanographic data	A full geophysical survey will be undertaken on the Ness of Duncansby site. This will include: ▪ Multibeam swath bathymetry; ▪ Sidescan sonar; ▪ Ground truthing of bathymetric/sonar data with boreholes and grab samples, where required; ▪ Optical Backscatter to determine suspended sediment concentrations; ▪ Seismic profiling; ▪ ADCP measurements (vessel mounted and seabed); ▪ Drop-down video tow; and ▪ Beam trawl. Information on bathymetric and oceanographic data from this survey will be extracted.	Marine Scotland Scottish Environment Protection Agency (SEPA) Scottish Natural Heritage (SNH) Highland Council
Cetacean risk assessment	This work will determine whether an EPS licence is needed and what mitigation is required. It is likely that an MMO will require to be present during 'noisy' elements of the work	

Potential Project Effects (Marine)

4.2.1.3 Tidal energy extraction effects of the Ness of Duncansby Tidal Array may occur across three spatial scales. The magnitude of the effect will reduce significantly as the spatial scale becomes larger.

- Device scale – localised to the immediate vicinity of a single device, such as downstream and scour effects;
- Near-field scale – on the scale of the lease area – the effects of the devices acting in combination;
- Far-field – the effects of the array extending beyond the lease area.

4.2.1.4 No significant effects on seabed bathymetry are expected to result from installation or operation of the site. However, the water depth available for navigation and other sea users is likely to be affected. However, the site has been selected for its deep water in order that any navigational effects are confined to the activities in which a surface vessel is required on-site. Whilst operational the array should not pose a hazard to shipping in the area.

4.2.1.5 Alteration of the tidal currents as a result of increased friction or flow enhancement around each device or around the site may occur. However, the Scottish Marine Renewables Strategic Environmental Assessment reports that no gross alteration of the tidal stream is expected to result from the installation or operation of tidal energy devices (Faber Maunsell and Metoc, 2007).

4.2.1.6 Alteration of sediment transport may result from modifications to tidal current flows. Impacts on sediment processes will depend on the size of the rotors compared to the water depth and the height of the device above the seabed. Given the high energy nature of the site it is thought unlikely that sediment transport in the area will be affected.

Potential Project Effects (Terrestrial)

4.2.1.7 Given the high energy environment of the site there is not thought to be any effect of the development on the local terrestrial environment.

Potential Cumulative Effects

4.2.1.8 Cumulative effects are only likely to occur at the scale of the development (the cumulative effect of multiple devices) and at the scale of multiple arrays in the area (the far-field level). There are other tidal arrays proposed for development within the Pentland Firth and these could potentially act in combination with the Ness of Duncansby site. However, the sites are considerable distances apart and the area is an extremely high energy one.

4.2.2. Geology, Seabed Sediments and Sediment Transport

Baseline Conditions

Seabed geology and sediments

4.2.2.1 The Caithness BGS seabed sediments and quaternary geology covers the Pentland Firth area and indicates the seabed in the area of the proposed development site and in fact the majority of the Pentland Firth is bedrock outcrop. Barne *et al.* (1996), shows that the area of interest for the proposed development is an area of bedrock outcrop.

4.2.2.2 Additionally, surveys carried out in relation to the proposed development have shown that the seabed is principally composed of bedrock, which is comprised of folded and tilted sedimentary sandstone, flagstone and siltstone exhibiting palaeo-fault lines. Within parts of the area of interest there are bodies of migrating sand. These areas are composed of sandbanks with megaripples superimposed.

Coastal geomorphology

4.2.2.3 Caithness is formed from the Devonian Old Red Sandstone Group. This was laid down some 370 million years ago when northern Caithness and Orkney were part of a vast freshwater lake, known as Lake Orcadia (Caithness BAP, 2003).

4.2.2.4 Most of the coastal environment around Duncansby Head and the eastern shores of Caithness consist of cliff coast (Barne *et al*., 1996). In lower lying coastal areas (generally along the northern Caithness coast), such as the Ness of Duncansby, rocky outcrops and/or boulder is also present.

4.2.2.5 The Duncansby Site of Special Scientific Interest (SSSI) has been designated for its dramatic coastal landforms (recently added) and maritime cliff vegetation. The citation for this SSSI reads:

> *Duncansby Head SSSI is designated for the maritime cliff vegetation. This is found on some of the cliff ledges and above the cliffs in a narrow strip, typically about 100m wide. There is a good representation of species-rich maritime heath in a mosaic with maritime grassland. Key species of the maritime heath are: heather Calluna vulgaris, bell heather Erica cinerea, crowberry Empetrum nigrum, juniper Juniperus communis, and bird's-foot-trefoil Lotus corniculatus. Maritime grassland supports red fescue Festuca rubra, thrift Armeria maritima, ribwort plantain Plantago lanceolata, devil's-bit scabious Succisa pratensis, spring squill Scilla verna and scurvy grass Cochlearia anglica.*
> *Vegetation communities on the cliff tops and ledges support plants such as Scots lovage Ligusticum scoticum, bell heather Erica cinerea, creeping willow Salix repens, sea campion Silene uniflora, angelica Angelica sylvestris, red campion Silene dioica, roseroot Sedum rosea and primrose Primula vulgaris.*

EIA Methodology

TABLE 4.2 Primary Data Collection Methodology		
Information requirement	Field method	Key regulators/public bodies
PHYSICAL ENVIRONMENT		
Geology, Seabed Sediments and Sediment Transport		
Existing data (desk based)	Collation and review of any previous records or data relating to the presence of protected sites of geomorphological interest	Marine Scotland Scottish Natural Heritage (SNH)

TABLE 4.2 Primary Data Collection Methodology		
Information requirement	Field method	Key regulators/public bodies
Seabed sediments data	A full geophysical survey will be undertaken on the Ness of Duncansby site. See details of this survey in Table 4.1.	Marine Scotland Scottish Environment Protection Agency (SEPA) Scottish Natural Heritage (SNH) Highland Council

Potential Project Effects (Marine)

4.2.2.6 The environmental effects of cabling/trenching and installation foundations on sediments or water quality will have to be fully considered. This will include consideration of the effects on designated sites including the River Thurso SAC - designated for its Atlantic Salmon.

4.2.2.7 Impacts from scour protection or additional material needed to protect cables will also require consideration. A full cabling study will be undertaken as part of the project development process, which will assess all potential cabling options and the environmental implications of each.

4.2.2.8 Alteration of sediment transport may result from modifications to tidal current flows. Impacts on sediment processes will depend on the size of the rotors compared to the water depth and the height of the device above the seabed; these factors bear on the likelihood of seabed interactions.

Potential Project Effects (Terrestrial)

4.2.2.9 There is not thought to be any effect of the development on the local terrestrial geological environment.

Potential Cumulative Effects

4.2.2.10 Cumulative effects are only likely to occur at the scale of the development (the cumulative effect of multiple devices) and at the scale of multiple arrays in the area (the far-field level). There are other tidal arrays proposed for development within the Pentland Firth and these could potentially act in combination with the Ness of Duncansby site. However, the sites are considerable distances apart and the area is an extremely high energy one.

4.2.3. Water Quality and Effluent Discharges

Baseline Conditions

Marine & Coastal Waters/Freshwater

4.2.3.1 Improvements in the water quality of coastal areas off of the north of Caithness have been made over the period 2000-2006 (SEPA, 2006). 99% of coastal waters in Scotland have been classified as being excellent or good (grade A or B) (from SEPA, 2006 in Faber Maunsell and Metoc 2007).

4.2.3.2 There are two SEPA WFD marine monitoring points in the vicinity of the proposed site, as well as one operational river monitoring point within approximately 10 miles of

the proposed site. However, there are no SEPA WFD monitoring points related to lochs or groundwater sources within the vicinity of the proposed site.

4.2.3.3 There are no designated shellfish growing waters or aquaculture sites of any kind in the vicinity of the proposed site, and there are no designated bathing waters classified by SEPA in the vicinity of the site; the closest to the proposed site being at Dunnet, which is some 10 miles to the west.

4.2.3.4 There are no rivers or streams of any notable size which occur in the vicinity of the proposed site. The closest of note is the River Thurso, which is some 15 miles to the west. This river is designated in relation to the fish that it supports (see Section 4.3.5).

Effluent Discharges

4.2.3.5 Discharges in Caithness have improved over the years as better treatment has been introduced. A Scottish Water Action Plan introduced in 2003/2004 installed a reed bed to assist in the treatment of the Gillock septic tank, improving the quality of the Gillock Burn.

4.2.3.6 To the south of the proposed site in the Wick area there have been improvements to several watercourses following developments at the airport to collect surface water run-off.

4.2.3.7 Inputs to the Murkle Burn in Thurso (some 15 miles to the west of the proposed site), have been identified and an action plan has been in place to alleviate the pressures. This plan has returned some successes and the quality of the burn has been improving. A new sewage treatment works (STW) was introduced to Thurso in 2006 and a storm overflow in the harbour area was upgraded. Both of these introductions have resulted in improvements to water quality.

4.2.3.8 West of the proposed site, Dunnet Bay showed a reduction in the quality of its water during the period 2001-2003, as well as there being increased levels of flotsam and jetsam accumulating on the shore. To alleviate the pressures a new STW was introduced at Castletown, which provides disinfection during the bathing water season (SEPA, 2006). Additionally there were beach clean-ups to remove the flotsam and jetsam accumulations and improvements to the areas septic tanks serving Dunnet and the local caravan park (SEPA, 2006).

Data sources

Faber Maunsell and Metoc (2007). Scottish Marine Renewables SEA.

SEPA (2006). Scotland's Water Environment Review 2000-2006.

http://www.scotland.gov.uk/Topics/Environment/Water/bathingwaters (accessed 17th August 2010).

TABLE 4.3 Primary Data Collection Methodology		
Information requirement	Field method	Key regulators/public bodies
PHYSICAL ENVIRONMENT		
Water Quality and Effluent Discharges		
Existing data (desk based)	Collation and review of any previous records or data relating to the water quality of the area in the vicinity of the proposed site and other water designations present.	Marine Scotland Scottish Environment Protection Agency (SEPA)

Potential Project Effects

4.2.3.9 The potential effects of the proposed project to the local water quality are thought to be nil; however, there may be accidental events which may include spillages of oils and/or lubricants. These are likely to be small in quantity and have only a very localised effect on the marine environment, and will be dispersed rapidly given the high energy nature of the site.

Potential Cumulative Effects

4.2.3.10 Cumulative effects are possible given the number of devices proposed for the array; however, a failure in more than one device resulting in a leakage event is highly unlikely. Other potential cumulative effects may come from the shipping traffic which utilise the area, and any possible leaks/spillages arising from them.

4.2.3.11 The other proposed array sites are considerable distances from the Ness of Duncansby. Given the energetic nature of the Pentland Firth waters it is thought highly unlikely that even if there were a leakage at any other site that it would act in combination with the proposed Duncansby array site.

4.3. BIOLOGICAL ENVIRONMENT

4.3.1. Benthic Ecology

Baseline Conditions

4.3.1.1 Duncansby Head is at the north eastern most extent of the British Isles and, as such, acts as a distribution boundary for certain species (Barne *et al*., 1996). The shoreline along the north and eastern coasts of Scotland, including that in the vicinity of Duncansby are primarily rocky and often backed by cliffs (Bennett and Covey, 1998; Bennett and McLeod, 1998).

4.3.1.2 Moore (2009) describes data gathered from recent Marine Scotland surveys of the benthos in the Duncansby Head area. The four video runs carried out at this location showed the area to be:

> *'mostly sand-scoured, low, flat bedrock with patches of sand, scattered with cobbles and boulders. The rock surface supported dense patches of Flustra foliacea but was otherwise fairly bare, apart from encrusting bryozoans, and scattered Pomatoceros, barnacles and occasional hydroid clumps (CR.EcCr.FaAlCr.Flu). The shallowest site (DH4/1) appeared well-grazed; the rock supported a crust of pink coralline algae but lacked Flustra*

(CR.EcCr.FaAlCr). Some areas at this site were overlain with dense Ophiocomina nigra (CR.EcCr.FaAlCr.Bri).'

Designations and Protection

4.3.1.3 There are no benthic ecology designations in the vicinity of the proposed Ness of Duncansby tidal array site.

4.3.1.4 However, a preliminary Marine Scotland survey identified three species within the wider area as being of conservation importance. These were *Nucella lapillus*, *Modiolus modiolus* and *Echinus esculentus*. *N. lapillus* and *E. esculentus* are common throughout the coastal zones of the UK. *M. modiolus* was only identified from one site south of Duncansby Head and in low numbers with no presence of a bed or *Modiolus* biotope. Work associated with the Caithness interconnector has revealed probably the largest horse mussel (*Modiolus*) bed in Scotland to the south of this location. This, along with work in Yell Sound, Shetland, suggests that broadscale surveys may not always pick up such features (SNH, in litt.). Benthic monitoring to inform micro-siting of devices and cables therefore needs to consider that *Modiolus* might be present in places within the site. More broadly, survey methods will aim to determine whether any Scottish priority marine features (PMFs http://www.snh.gov.uk/protecting-scotlands-nature/safeguarding-biodiversity/priority-marine-features/) are present that might influence micro-siting of devices and cables.

4.3.1.5 There are no known biotopes recognised as being of importance within the proposed project site. However, one biotope (CR.HCR.FaT.CTub) was identified from north of the proposed site and east of Stroma. This is a UK Biodiversity Action Plan Priority Habitat and Scottish Biodiversity List Habitat (Moore, 2010).

Data sources

Barne, J.H., Robson, C.F., Kaznowska, S.S., Doody, J.P. and Davidson, N.C., eds. (1996). Coasts and seas of the United Kingdom. Region 3 North-east Scotland: Cape Wrath to St. Cyrus. Peterborough, Joint Nature Conservation Committee. (Coastal Directories Series).

Bennett, T.L. and Covey, R. (1998). North Scotland (MNCR Sector 3). In: Marine Nature Conservation Review. Benthic marine ecosystems of Great Britain and the north-east Atlantic, ed. By Hiscock, 117-121. Peterborough, Joint Nature Conservation Committee. (Coasts and seas of the United Kingdom. MNCR series).

Bennett, T.L. and McLeod, C.R. (1998). East Scotland (Duncansby Head to Dunbar) (MNCR Sector 4). In: Marine Nature Conservation Review. Benthic marine ecosystems of Great Britain and the north-east Atlantic, ed. By Hiscock, 123-154. Peterborough, Joint Nature Conservation Committee. (Coasts and seas of the United Kingdom. MNCR series).

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

Moore, C.G. (2010). Preliminary assessment of the conservation importance of benthic species and habitats off the west coast of Orkney and in the Pentland Firth in relation to the development of renewable energy schemes. Scottish Natural Heritage Commissioned Report No. 352.

TABLE 4.4 Primary Data Collection Methodology		
Information requirement	Field method	Key regulators/public bodies
BIOLOGICAL ENVIRONMENT		
Benthic Ecology		
Existing data (desk based)	Collation and review of any previous records or data relating to the benthic ecology of the area in the vicinity of the proposed site and other conservation designations present.	Marine Scotland Scottish Natural Heritage (SNH)
Baseline marine ecological data	**Field survey** Multibeam swath bathymetry/Acoustic Ground Determination System data from the Geophysical survey of the Ness of Duncansby site will give preliminary information on the seabed profile and the presence of any notable features (e.g. areas of mobile sediment). This will be used to inform a benthic campaign comprising drop-down/towed cameras (taking stills or video footage) in areas likely to be utilised for development. Towed camera work was undertaken as part of the Sound of Islay Demonstration Tidal Array development and proved to be highly effective and accurate despite the depths and flow regimes involved; however, it is also accepted that the Ness of Duncansby site is very different in nature and extent. The spatial extent of any initial video and or drop-down camera campaigns will be determined by the geophysical survey results after expert analysis and in conjunction with the technology developer and the EIA consultant. Once determined approval would be sought from Marine Scotland and SNH. The methodology agreed upon will give appropriate detail and extent of the proposed turbine deployment area, any agreed buffer zone (likely to be small given the perceived localised effects of tidal turbine deployments) and the selected cable route to shore. If utilised, video surveys will cover the likely deployment area of the turbines, an agreed buffer and any control sites and also the selected cable route(s). A drop-down campaign (instead of or in addition to) the video surveys will follow a grid pattern, with more intensive drops being undertaken in areas of notified features. Video and/or stills camera work will allow for the broad determination of the development site with regards the biotopes present and allow for the production in GIS of a biotope map for the area. As part of this process any	Marine Scotland Scottish Natural Heritage (SNH)

TABLE 4.4 Primary Data Collection Methodology		
Information requirement	Field method	Key regulators/public bodies
	PMF's will also be identified. Biotopes and/or PMF's of particular importance can then be targeted with additional video and/or drop-down stills camera work in order to determine their extent. This will be particularly important when it comes to the micro-siting of the turbines and the cables. Phase I Habitat Surveys will also be undertaken in appropriate intertidal areas likely to be affected by any cable landfall operations. These will follow best practice techniques used in current SCM assessments. In areas that are determined from the geophysical survey, to be highly sedimentary in nature it is unlikely that video work would be a suitable technique for biotope determination (video and/or stills camera techniques will only be used in this instance for ground-truthing); therefore, a programme of grab sampling will be developed. This will be based on a grid system, unless this is unsuitable for the spatial extent of the feature and/or technically unfeasible due to the conditions encountered by the sampling vessel. Video tows, drop-down stills camera work and grab sampling may also be carried out on control sites outwith the Ness of Duncansby development site, if this is determined to be necessary after consultation with MS and SNH. Phase I Habitat surveys will also be undertaken in the intertidal zone, especially in the areas identified as potential cable landfall locations.	

Potential Project Effects

4.3.1.6 The potential effects of the proposed project to the benthic ecology of the area are thought not to be significant in nature. There will be direct loss of habitat due to the presence of the devices; however, these structures will also act as hard substrata on which organisms may colonise. There may also be small levels of re-suspension of sediments in the area of the turbines during installation. The levels of sediment present will be determined during surveys.

Potential Cumulative Effects

4.3.1.7 Cumulative effects are possible given the number of devices proposed for the array; however, the total area of seabed loss will be negligible in the context of the area of the Pentland Firth.

4.3.1.8 There are other proposed array sites within the Pentland Firth; however, even when taken into account they are not expected to lead to a significant loss of benthic habitat.

4.3.2. Terrestrial Ecology

Baseline Conditions

4.3.2.1 Caithness supports both mixed farming and crofting. To the north-east of the region the primary agricultural land-use is in the form of mown/grazed turf (Fowler *et al*., 1996).

4.3.2.2 The uniform crop structure provides for low species diversity. However, spring planted crops are essential to support over-wintering birds, due to the presence of stubble.

4.3.2.3 Rough grassland in Caithness supports populations of brown hares, field voles and rabbits, which together provide a part of the diet of local raptor and wildcat populations. This habitat type also supports a wide variety of insects, which provide food for the local bird populations (e.g. skylark and grey partridge) (BAP, 2003).

4.3.2.4 Coastal heath is an important feature of cliff-top habitat and there are areas that have survived agricultural improvements. These areas have been designated due to their importance and are given mention in the next section.

Designations and Protection

4.3.2.5 Duncansby Head and Stroma SSSI's are designated for the maritime cliff vegetation. This is found on some of the cliff ledges and above the cliffs in a narrow strip (typically about 100m wide) dominated by grassland and maritime heath. The heath and grassland vegetation are both of national importance and are often found together in a mosaic. Of particular botanical importance is the maritime heath, which is a northern, species-rich type that is only found in Caithness, Sutherland and Orkney (SNHi website).

4.3.2.6 Typical vegetation found on the cliff ledges and cliff tops of Duncansby Head includes species such as Scots lovage and roseroot as well as areas of species rich maritime heath (including species such as heather, bell heather, crowberry, juniper and birds-foot trefoil) and grassland (including species such as spring squill and sea plantain) (SNHi website).

4.3.2.7 Typical vegetation found on the on the cliff ledges and cliff tops of Stroma includes species such as angelica, Scots lovage, roseroot, wild carrot, sorrel, bluebell, sea mayweed, sea spleenwort and primrose. The cliff ledges are not as heavily vegetated as on the Duncansby cliffs. Maritime grassland species include thrift, sea campion, Yorkshire fog, sea plantain, ribwort plantain, buck's-horn plantain, spring squill and Scottish primrose. The maritime heath is dominated by crowberry, heather, spring squill and common tormentil (SNHi website).

Data sources

Fowler, S.L., Everett, S.J. and Norton, J.A. (1996). Chapter 8 Land use, infrastructure and coastal defence. *In:* Coasts and seas of the United Kingdom. Region 3 North-east Scotland: Cape Wrath to St. Cyrus ed. by Barne, J.H., Robson, C.F., Kaznowska, S.S., Doody, J.P. and Davidson, N.C., 159-174. Peterborough, Joint Nature Conservation Committee. (Coastal Directories Series).

Caithness Biodiversity Action Plan (2003).

SNHi website – accessed August 2010.

EIA Methodology

TABLE 4.5 Primary Data Collection Methodology		
Information requirement	Field method	Key regulators/public bodies
BIOLOGICAL ENVIRONMENT		
Terrestrial Ecology		
Existing data (desk based)	Collation and review of any previous records or data relating to the terrestrial ecology of the area in the vicinity of the proposed site and other conservation designations present.	Scottish Natural Heritage (SNH)
Baseline ecological data	Initial Phase 1 Habitat Survey in order to identify principal communities and habitats across site of any proposed onshore works. Survey findings used to identify the requirement for any further detailed surveys. These may include a National Vegetation Classification survey, and/or species specific surveys.	Scottish Natural Heritage (SNH)

Potential Project Effects

4.3.2.8 The potential effects of the proposed project to the terrestrial ecology of the area are thought not to be significant in nature. There will be direct loss of habitat due to the presence of the substation; however, selecting the location for this will be carried out in a sensitive manner so as not to significantly affect any designated sites or areas of conservation importance.

Potential Cumulative Effects

4.3.2.9 There is not thought to be any potential for cumulative effects at present. However, this will depend upon the proposed locations for other projects' onshore infrastructure and their proximity to those involved in the Ness of Duncansby tidal array project.

4.3.3. Ornithology

Baseline Conditions

4.3.3.1 Cliffs in the area support a variety of seabird fauna and breeding birds will be present throughout much of the year and especially from March to August. They are home to a number of nesting species including Atlantic puffins (*Fratercula arctica*), northern fulmars (*Fulmarus glacialis*), black-legged kittiwakes (*Rissa tridactyla*), razorbills (*Alca torda*), common guillemots (*Uria aalge*), black guillemots (*Cepphus grylle*), great cormorants (*Phalacrocorax carbo*) and European shags (*Phalacrocorax aristotelis*). There are no longer any breeding populations of great cormorants on the northern coast of Caithness.

4.3.3.2 The non-cliff sections of the north Caithness coast are likely to have a strandline composed of detached and decaying seaweeds. This acts as a particularly important habitat for wintering wading birds such as turnstones (*Arenaria interpres*) and purple

sandpipers (*Calidris maritima*) which feed on invertebrates in the decaying vegetable matter. Other wintering waders, such as redshanks (*Tringa totanus*) and curlews (*Numenius arquata*) feed in intertidal habitats and on pasture land close to the coast.

4.3.3.3 The coastal waters in the area of the proposed development are important feeding grounds for breeding seabirds, and in winter support coastal populations of common scoter (*Melanitta nigra*) and long-tailed ducks (*Clangula hyemalis*), common goldeneye (*Bucephala clangula*), common eiders (*Somateria mollissima*), great northern (*Gavia immer*) and red-throated divers (*Gavia stellata*).

4.3.3.4 Improved grasslands are important feeding areas for various RSPB red and amber listed wading birds and other birds. Flocks of the red-listed twite (*Carduelis flavirostris*) and migrant and overwintering geese also feed in fields of improved grasslands, and some raptors utilise these fields for hunting (Caithness LBAP, 2003). Corncrakes (*Crex crex*), which are also red-listed, may occur where such grasslands have wet patches and areas of longer vegetation (Caithness LBAP, 2003) and have been recorded from areas of farmland close to John O'Groats and Upper Gills (NBN, 2010).

4.3.3.5 Spring planted crops are beneficial to certain species of overwintering birds, primarily due to the stubble that remains after the crop has been combined. This provides a source of food for some passerines such as brambling, chaffinch and greenfinch (Caithness LBAP, 2003). Resident greylag and migratory Greenland white-fronted geese also benefit from the growing of oats and barley (Caithness LBAP, 2003). Inland areas of blanket bog provide habitat for a varied invertebrate fauna, which provides a food source for bird species such as common scoter, greenshank, dunlin and wood sandpiper (Caithness LBAP, 2003).

4.3.3.6 Receptor bird species at risk of being affected by tidal turbine development in this area include seabirds, and especially those species that dive to forage at depth, and species that are notified features of SPAs. Species at greatest risk are likely to be those seabirds that feed in areas of high tidal flow, as breeding species or as wintering populations. Diving seabirds that feed on benthic invertebrates (e.g. common eiders, common scoters, long-tailed ducks, common goldeneyes) generally avoid areas of high tidal flow as this increases their swimming costs, whereas some planktivorous (such as little auk) and piscivorous seabirds (such as black guillemots, European shags, razorbills, common guillemots) may concentrate their diving activity within or on the fringes of tidal flow areas, and those species are likely to be the primary focus of EIA. Coastal birds, such as shorebirds, birds of prey and scavengers, may be at low risk of being affected by disturbance and these include red-breasted merganser, turnstone, purple sandpiper, curlew, redshank, white-tailed eagle and peregrine. Effects on terrestrial birds are likely to be negligible, providing siting of the substation takes account of local habitats. Receptor bird species identified are thus: common eider, long-tailed duck, common scoter, common goldeneye, red-throated diver, black-throated diver, great northern diver, Slavonian grebe, northern fulmar, Manx shearwater, sooty shearwater, European storm-petrel, Leach's storm-petrel, northern gannet, great cormorant, European shag, Arctic skua, great skua, black-headed gull, common gull, lesser black-backed gull, herring gull, great black-backed gull, black-legged kittiwake, common tern, Arctic tern, Sandwich tern, common guillemot, razorbill, black guillemot, little auk, Atlantic puffin, red-breasted merganser, turnstone, purple sandpiper, curlew, redshank, white-tailed eagle and peregrine. Many of these species may have negligible effects from tidal turbines, but are scoped in at this stage due to the uncertainty over impacts. Furness and Wade (2012) reviewed evidence for likely impacts of tidal turbines on

Scottish seabird populations and ranked species' populations according to their estimated vulnerability (see Table 4.6).

Table 4.6. Species vulnerability index for tidal turbine impacts on Scottish seabird populations (ranked by species score). Data from Furness and Wade (2012)

Species	Vulnerability index	Descriptor on 5-score scale
Black guillemot	9.9	4: high vulnerability
Razorbill	9.6	4: high vulnerability
Shag	9.6	4: high vulnerability
Common guillemot	9.0	4: high vulnerability
Great cormorant	7.0	4: high vulnerability
Great northern diver	4.1	3: moderate vulnerability
Red-throated diver	3.8	3: moderate vulnerability
Atlantic puffin	3.8	3: moderate vulnerability
Black-throated diver	3.6	3: moderate vulnerability
Little auk	2.2	3: moderate vulnerability
Slavonian grebe	2.0	2: low vulnerability
Arctic tern	1.9	2: low vulnerability
Common eider	1.5	2: low vulnerability
Common scoter	1.5	2: low vulnerability
Manx shearwater	1.5	2: low vulnerability
Velvet scoter	1.4	2: low vulnerability
Northern gannet	1.4	2: low vulnerability
Common goldeneye	1.1	2: low vulnerability
Great-crested grebe	1.1	2: low vulnerability
Sooty shearwater	1.1	2: low vulnerability
Sandwich tern	1.1	2: low vulnerability
Greater scaup	1.0	1: very low vulnerability
Long-tailed duck	1.0	1: very low vulnerability
Great black-backed gull	1.0	1: very low vulnerability
Roseate tern	1.0	1: very low vulnerability
Black-legged kittiwake	0.9	1: very low vulnerability
Herring gull	0.8	1: very low vulnerability
Great skua	0.7	1: very low vulnerability
Common gull	0.7	1: very low vulnerability
Lesser black-backed gull	0.7	1: very low vulnerability
Little tern	0.7	1: very low vulnerability
White-tailed eagle	0.6	1: very low vulnerability
Arctic skua	0.6	1: very low vulnerability
Common tern	0.6	1: very low vulnerability
Black-headed gull	0.6	1: very low vulnerability
Northern fulmar	0.5	1: very low vulnerability
European storm-petrel	0.5	1: very low vulnerability
Leach's storm-petrel	0.5	1: very low vulnerability

Designations and Protection

4.3.3.7 There are several designations in the vicinity of the proposed project, which are detailed in the table below.

Special Protection Areas (SPAs)		
Site	**Description and Qualifying Feature**	**Comment**
North Caithness Cliffs	North Caithness Cliffs SPA is of special nature conservation and scientific importance within Britain and the European Community for supporting very large populations of breeding seabirds. The site overlaps either partly or wholly with Duncansby Head SSSI, Stroma SSSI, Dunnet Head SSSI, Holborn Head SSSI, and Red Point Coast SSSI. The seaward extension extends approximately 2km into the marine environment to include the seabed, water column and surface. Qualifying species include Fulmar (*Fulmarus glacialis*), Guillemot (*Uria aalge*), Kittiwake (*Rissa tridactyla*), Peregrine (*Falco peregrinus*), Puffin (*Fratercula arctica*), and Razorbill (*Alca torda*).	The North Caithness Cliffs SPA is split into blocks along the Caithness coast and extends as far west as Melvich Bay. The proposed development overlaps with one of these blocks at Duncansby Head and is immediately adjacent to another at Stroma.
Pentland Firth Islands	Pentland Firth Islands SPA consists of the small uninhabited islands of Swona and Muckle Skerry situated in the Pentland Firth between South Ronaldsay and mainland Scotland. Pentland Firth Islands SPA qualifies under Article 4.1 by regularly supporting a nationally important breeding population of the Annex 1 species Arctic tern (*Sterna paradisaea*).	The Pentland Firth Islands SPA are situated >3km to the NE (Muckle Skerry) and >5km to the NNW (Swona) from the proposed development location.
Switha	Switha SPA is a small grassy island east of South Walls in the Orkney archipelago. Switha SPA qualifies under Article 4.1 by regularly supporting an internationally important wintering population of Greenland barnacle goose (*Branta leucopsis*).	The Switha SPA is situated >10km NNW from the proposed development location.
Hoy	Hoy SPA covers the northern and western two-thirds of Hoy island, which is formed of Old Red Sandstone and contains Orkney's highest hills, and adjacent coastal waters. The SPA supports an extremely diverse mixture of mire, heath and alpine vegetation and Britain's most northerly native woodland. These upland areas and the high sea cliffs at the coast support an important assemblage of moorland breeding birds and breeding seabirds. The seaward extension extends approximately 2km into the marine environment to include the seabed, water column and surface.	The Hoy SPA is situated >10km NW from the proposed development location.

Special Protection Areas (SPAs)		
Site	**Description and Qualifying Feature**	**Comment**
	Qualifying species include red-throated diver (*Gavia stellata*), peregrine (*Falco peregrines*), great skua (*Stercorarius skua*), Atlantic puffin (*Fratercula arctica*), black-legged kittiwake (*Rissa tridactyla*), Arctic skua (*Stercorarius parasiticus*), Northern fulmar (*Fulmarus glacialis*), great black-backed gull (*Larus marinus*) and common guillemot (*Uria aalge*).	
East Caithness Cliffs	East Caithness Cliffs SPA is of special nature conservation and scientific importance within Britain and the European Community for supporting very large populations of breeding seabirds. It includes most of the sea-cliff areas between Wick and Helmsdale on the north-east coast of the Scottish mainland. The seaward extension extends approximately 2km into the marine environment to include the seabed, water column and surface. Qualifying species include cormorant (*Phalacrocorax carbo*), fulmar (*Fulmarus glacialis*), great black-backed gull (*Larus marinus*), guillemot (*Uria aalge*), herring gull (*Larus argentatus*), kittiwake (*Rissa tridactyla*), peregrine (*Falco peregrinus*), razorbill (*Alca torda*) and shag (*Phalacrocorax aristotelis*).	The East Caithness Cliffs SPA is situated south of Wick – >20km south of the proposed development location.

Note: These are the principal coastal SPAs in the area. Others (most notably those further inland and more distant coastal SPAs) will be considered during the EIA process, if appropriate. Data from the SNHi SiteLink web pages.

4.3.3.8 Connectivity between seabird populations of these SPAs and the Area of Search (AOS) can be estimated based on known maximum foraging ranges of breeding seabirds (Table 4.7).

Table 4.7. Maximum foraging ranges of breeding seabirds which have the potential to use the proposed development area.

Species	Mean foraging range (km)	Maximum foraging range (km)	Reference
Red-throated diver	11 4.5	50 9	Langston 2010 Thaxter *et al.* 2012
Northern fulmar	69 48	664 580	Langston 2010 Thaxter *et al.* 2012
Great cormorant	10 8 5.2	50 50 35	Forrester *et al.* 2007 Langston 2010 Thaxter *et al.* 2012
Shag	7 .	17 17	Wanless *et al.* 1991 Pearson 1968

Table 4.7. Maximum foraging ranges of breeding seabirds which have the potential to use the proposed development area.			
Species	**Mean foraging range (km)**	**Maximum foraging range (km)**	**Reference**
	7	20	Langston 2010
	.	12.7	Wanless *et al.* 1998
	5.9	17	Thaxter *et al.* 2012
Arctic skua	28	100	Langston 2010
	6.4	75	Thaxter *et al.* 2012
Great skua	36	100	Langston 2010
	.	13 or 219	Thaxter *et al.* 2012
Herring gull	<40	.	Ratcliffe *et al.* 2000 (in Langston 2010)
	10.5	92	Thaxter *et al.* 2012
Great black-backed gull	<40	.	Ratcliffe *et al.* 2000 in Langston 2010
Black-legged kittiwake	.	55	Pearson 1968
	.	40-60	Suryan *et al.* 2000
	.	73	Daunt *et al.* 2002
	<5km, 1991	.	Hamer *et al.* 1993
	>40km, 1990	.	Hamer *et al.* 1993
	25	200	Langston 2010
	26	59	Kotzerka *et al.* 2010
	25	120	Thaxter *et al.* 2012
Arctic tern	.	20	Pearson 1968
	12	21	Langston 2010
	7.1	30	Thaxter *et al.* 2012
	.	29	Perrow *et al.* 2011
Sandwich tern	.	25	Pearson 1968
	15	70	Langston 2010
	11.5	54	Thaxter *et al.* 2012
	.	54	Perrow *et al.* 2011
Common tern	.	22	Pearson 1968
	9	37	Langston 2010
	4.5	30	Thaxter *et al.* 2012
	.	9	Perrow *et al.* 2011
Common guillemot	6-8	100	Bradstreet and Brown 1985
	24	200	Langston 2010
	38	135	Thaxter *et al.* 2012
Razorbill	10	51	Langston 2010
	.	35	Benvenuti *et al.* 2001
	24	95	Thaxter *et al.* 2012
Black guillemot	0-4	7	Bradstreet and Brown 1985
	5	55	Langston 2010
Atlantic puffin	.	140	Pearson 1968
	3-5	100	Bradstreet and Brown 1985
	30	200	Langston 2010
	4	200	Thaxter *et al.* 2012

4.3.3.9 The AOS is within the normal breeding season mean foraging range of breeding northern fulmars, common guillemots, black-legged kittiwakes, Atlantic puffins and razorbills from North Caithness Cliffs SPA. In relation to Hoy SPA, the AOS is within the normal breeding season mean foraging range of breeding northern fulmars, common guillemots, black-legged kittiwakes, Atlantic puffins, great skuas, Arctic skuas, and great black-backed gulls, and is close to the limit of normal foraging range of breeding red-throated divers. In relation to the Pentland Firth Islands SPA, the AOS is within the normal foraging range of breeding Arctic terns. In relation to the East Caithness Cliffs SPA, the AOS is within the normal breeding season mean foraging range of breeding northern fulmars, common guillemots, black-legged kittiwakes, close to the limit of normal foraging range of breeding razorbills, great cormorants, great black-backed gulls and herring gulls, but beyond the normal foraging range of breeding European shags.

4.3.3.10 Given the very large foraging ranges of some seabirds, such as northern fulmars which may forage as much as 600km from the nest while breeding, and common guillemots which may forage up to 200 km from their nest while breeding (Table 4.7), many seabird SPAs around the British Isles will have some connectivity with the AOS, but for those at considerable distances such connectivity will be trivial because the area increases with the square of distance so, all else being equal, seabird density will tend to fall with the square of distance from the breeding site. There will be a need in the Environmental Assessment and Habitat Regulations Appraisal to consider which of these sites fall close enough to the AOS to require assessment. This is likely to include all seabird SPAs in Orkney and Caithness, but in the extreme case (northern fulmar) would include all SPAs in Scotland for which northern fulmar is a notified feature. This is likely also to be informed by assessment of the hazard that tidal turbines represent to different seabird species. Clearly that hazard will be greater for underwater swimming seabirds than for surface feeders. Furness and Wade (2012) identified the vulnerability of the Scottish northern fulmar population to tidal turbines as 'very low vulnerability' so consideration of connectivity of northern fulmar SPAs to the AOS should focus on the closest sites which are likely to be responsible for most of the northern fulmar abundance in the AOS. In contrast, species identified by Furness and Wade (2012) as 'high vulnerability' (black guillemot, razorbill, European shag, common guillemot, great cormorant) and 'moderate vulnerability' (great northern diver, red-throated diver, black-throated diver, Atlantic puffin, little auk) require connectivity to be considered over the full range of their breeding season foraging and in relation to their migration routes and winter distributions.

Sites of Special Scientific Interest (SSSIs)		
Site	**Description and Qualifying Feature**	**Comment**
Duncansby Head	Duncansby Head SSSI is located on the northeast coast of Caithness. The site extends along a 6.5km section of coastline between Duncansby Head and Skirza Head. The site has been designated for the nationally important coastal landforms, coastal vegetation and breeding seabirds. More than 10,000 pairs of seabirds use the cliffs to nest in the crevices and ledges making this site of national importance for breeding	Although the proposed development does not overlap with this SSSI the seabirds for which it is designated may well use the area of the proposed development.

Sites of Special Scientific Interest (SSSIs)		
Site	**Description and Qualifying Feature**	**Comment**
	seabirds. The seabird colony includes fulmar (*Fulmarus glacialis*), guillemot (*Uria aalge*), kittiwake (*Rissa tridactyla*), razorbill (*Alca torda*), puffin (*Fratercula arctica*), shag (*Phalacrocorax aristotelis*), cormorant (*Phalacrocorax carbo*), herring gull (*Larus argentatus*), great black-backed gull (*Larus marinus*) and black guillemot (*Cepphus grylle*). This site provides suitable breeding ledges for particularly large numbers of fulmar (>2% of the UK population), guillemot (>5% of the UK population) and kittiwake (>1% of the UK population).	
Pentland Firth Islands	Pentland Firth Islands SSSI supports nationally and internationally important numbers of breeding Arctic terns (*Sterna paradisaea*). Over the five years 1992-1996, an average of at least 1,000 breeding pairs were present, representing 2.4% of the British breeding population.	The Pentland Firth Islands SSSI are situated >3km to the NE (Muckle Skerry) and >5km to the NNW (Swona) from the proposed development location.
Stroma	Stroma SSSI is located on the western side of the island of Stroma. The island is 3km northwest of John O'Groats. Stroma SSSI has been designated, in part for the nationally important colonies of breeding seabirds, in particular the number of breeding guillemot (*Uria aalge*), arctic tern (*Sterna paradisaea*) and sandwich tern (*Sterna sandvicensis*). The cliffs on Stroma SSSI hold more than 1% of the British population of guillemots. The breeding populations of Arctic tern and sandwich tern on Stroma also represent more than 1% of the British populations of these species.	The Stroma SSSI is situated approximately 3km WNW from the proposed development location.
Switha	Switha SSSI is a small grassy island situated in Scapa Flow and east of South Walls in the Orkney archipelago. Switha supports an internationally important wintering population of Greenland barnacle geese (*Branta leucopsis*). The barnacle geese roost on Switha and feed on the neighbouring island of South Walls. An average of 1,200 birds was recorded during the winter of	The Switha SSSI is situated >10km NNW from the proposed development location.

Sites of Special Scientific Interest (SSSIs)		
Site	**Description and Qualifying Feature**	**Comment**
	2002/03 representing approximately 2% of the British population of the Greenland barnacle goose.	
Dunnet Head	Dunnet Head SSSI is to the west of the proposed development area and sits between John O'Groats and Thurso. Large numbers of seabirds nest on the cliffs and it is of national importance for some species. The seabird colonies between Easter Head and Chapel Geo comprise over 3% of the British population of kittiwakes and 1% of guillemots as well as substantial numbers of razorbills, puffins, fulmars, shags, cormorants and gulls.	The Dunnet Head SSSI is situated >15km to the west of the proposed development location.

Note: These are the principal coastal SSSIs in the area. Others (most notably those further inland and more distant coastal SSSIs) will be considered during the EIA process, if appropriate. Data from the SNHi SiteLink web pages.

RAMSAR		
Site	**Description and Qualifying Feature**	**Comment**
Caithness and Sutherland Peatlands	The Caithness and Sutherland Peatlands Ramsar site contains a large proportion of the Caithness and Sutherland peatlands, which form the largest and most intact blanket bog in Scotland. Blanket bog is rare in world terms and Britain has a significant proportion of the total world resource of which the Caithness and Sutherland peatlands represent the extreme northern Atlantic part of the range of variation. Associated with these peatlands, and the surrounding moorland and open water, is a unique and diverse assemblage of breeding birds that is of international importance. Qualifying bird species include nationally important populations of red-throated diver (*Gavia stellata*), black-throated diver (*G. arctica*), wigeon (*Anas penelope*), teal (*A. crecca*), scaup (*Aythya marila*), common scoter (*Melanitta nigra*), spotted crake (*Porzana porzana*), golden plover (*Pluvialis apricaria*), wood sandpiper (*Tringa glareola*) and greenshank (*T. nebularia*). They additionally support an internationally important breeding population of North Scottish greylag goose (30 pairs, 5% of total	

RAMSAR		
Site	**Description and Qualifying Feature**	**Comment**
	world population) and dunlin *schinzii* race (1860 pairs, 18% of temperate *schinzii* population).	
Caithness Lochs	The Caithness Lochs Ramsar site contains three principal qualifying non-breeding species of bird. These are the Greenland white-fronted goose (*Anser albifrons flavirostris*), Greylag goose (*Anser anser*) and Whooper swan (*Cygnus cygnus*).	

Note: Data from the SNHi SiteLink web pages.

4.3.3.11 The Joint Nature Conservation Committee (JNCC) working with SNH, reviewed SPA designated sites and boundaries for existing seabird colonies and added seaward extensions of SPAs for seabird breeding colonies. The North Caithness Coast SPA sites at Duncansby Head, Stroma and Dunnet Head were extended seawards in 2009 to include areas used by seabirds for maintenance activities on the water close to the breeding colonies. The seaward extension extends approximately 2km into the marine environment to include the seabed, water column and surface (SNH Sitelink). These extensions overlap with the AOS.

4.3.3.12 The JNCC is currently making recommendations to SNH that Scapa Flow be put forward as a candidate SPA, The Flow meets SPA criteria both in winter and summer. In winter, two species, Great Northern Diver and Slavonian Grebe, are present in the Flow in internationally important concentrations while a further 11 species are there in nationally important numbers. In summer, observational work has shown that the Flow is the most important feeding area for the Red-throated Divers that nest within the Hoy SPA.

Data sources

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TABLE 4.8 Primary Data Collection Methodology		
Information requirement	Field method	Key regulators/public bodies
BIOLOGICAL ENVIRONMENT		
Ornithology		
Existing data (desk based)	Collation and review of any previous records or data relating to the ornithological ecology of the area in the vicinity of the proposed site and other conservation designations present. APEM data collection has been ongoing under contract to MS. This data will be analysed by SPR and its consultants who will decide its applicability to the environmental assessment of the development site.	Scottish Natural Heritage (SNH) Royal Society for the Protection of Birds (RSPB) Marine Scotland
Baseline presence and use of area by resident birds in proximity to site and migratory birds on passage through site	**Terrestrial survey** A dedicated survey, including breeding birds, will cover the area of all possible proposed cable landfall and substation locations. **Boat and VP survey** Dedicated monthly boat survey (for 2-years) using methodology recommended in Camphuysen *et al.* (2004). Surveys to be conducted in transect pattern by boat based visual observers. Survey covering tidal array lease boundary area and an appropriate buffer zone. Survey methodologies have been agreed with SNH and MS and can be made available on request. SPR will endeavour to work with adjacent developers to share data on impacts to inform cumulative assessments.	Scottish Natural Heritage (SNH) Royal Society for the Protection of Birds (RSPB) Marine Scotland

Potential Project Effects

4.3.3.13 The potential effects of the proposed project to the ornithological interest of the area are thought to be small in nature, based on the recent SNH review of hazards to seabird populations of tidal and wave energy devices in Scotland (Furness and Wade 2012) and other recent reviews (ICES, 2010; ABP Marine Environmental Research, 2011; Langton *et al.*, 2011; Witt *et al.*, 2012). There will be direct loss of habitat due to the presence of the substation; however, the location for this will be carried out in a sensitive manner so as not to significantly affect any designated sites or areas of conservation importance. The main concern will be potential effects on populations of seabirds, resulting from collision mortality, displacement from habitat, or alteration of habitat. Boat survey data will be used to assess the numbers of seabirds of each species using the area and hence potentially affected by the development.

4.3.3.14 Other effects to be considered during the Habitat Regulations Appraisal and Environmental Impact Assessment are the potential uses of the proposed project area by seabirds from specific SPAs, based on observed flight-lines, information available from tracking seabirds from breeding sites (such as from the FAME project and from work by Environmental Research Institute, Thurso), and knowledge of foraging ranges of

the key species. This will allow an assessment to be made on the potential for collision risk to diving seabirds from protected sites and also any risks posed by the presence of installation vessels at the site.

Potential Cumulative Effects

4.3.3.15 As there are several designated sites in the vicinity of the proposed development and there are also other proposed developments within the Pentland Firth area then there is the potential possibility for cumulative effects. This potential will be fully assessed during the EIA process, following recommended best practice methodologies currently being developed by The Crown Estate for developments in the Pentland Firth Orkney Waters (PFOW) area.

4.3.4. Marine Mammals

Baseline conditions

4.3.4.1 Grey (*Halichoerus grypus*) and harbour (*Phoca vitulina*) seals occur all year round in the coastal waters of the north coast of Scotland. Seals often return to shore to haul out on rocks or beaches between feeding trips at sea. Such trips can last up to two to three weeks. Seals also come ashore during the breeding season to give birth, and at other times to moult their fur (Faber Maunsell and Metoc, 2007).

4.3.4.2 The northern Caithness coast has a limited number of seal haulout locations and breeding areas. These are primarily located in Loch Eribol, and around Eilean nan Rón and Neave Island (Faber Maunsell and Metoc, 2007), all of which are considerably to the west of the proposed development area. The Pentland Firth itself contains a small number of grey and harbour seal haulouts and breeding areas. These are principally located on the islands of Stroma, Switha and Swona, and the Pentland Skerries (Faber Maunsell and Metoc, 2007). There is also a large grey seal breeding colony on the east coast, south of Duncansby Head. This grey seal colony produces approximately 1,200 pups annually, and seals from this colony are likely to be present within the Pentland Firth. In addition to the seals being present within the Pentland Firth the northern isles (Orkney and Shetland) have the largest populations of both grey and harbour seals in Scotland. The populations present, certainly within the Orkney archipelago, are likely to utilise the waters of the Pentland Firth. Data from 2006 (SEA) highlight that within the Pentland Firth 3500 seal pups were born and that telemetry studies show that the Pentland Firth is a stopping off place for grey seals, as well as a route for animals moving between feeding areas. These patterns are brought up to date in SNH's publication 'Seal movements in the Pentland Firth and Orkney'. The ES will need to take into account the local seal management unit and the current state of populations of grey and harbour seals (the UK harbour seal population status is currently classified as 'unfavourable').

4.3.4.3 Over twenty species of whales, dolphins and porpoise can be seen around the Scottish coastline, including common dolphins (*Delphinus delphis*), minke whales (*Balaenoptera acutorostrata*), killer whales (*Orcinus orca*) and bottlenose dolphin (*Tursiops truncates*) (of which the Scottish population is the most northerly in the world) (Faber Maunsell and Metoc, 2007). Harbour porpoise (*Phocoena phocoena*) are also present throughout the year and Risso's dolphin (*Grampus griseus*) has been recorded from the Caithness coastline (NBN, 2010). Most or all of these species are likely to occur within the Pentland Firth. Records of marine mammal species in this area have recently been summarised in an SNH report 'Abundance and behaviour of cetaceans and basking sharks in the Pentland Firth and Orkney waters' published in 2011 (Evans *et al.*, 2011).

This report provides a valuable summary of marine mammal distribution and ecology in the area, but also has severe limitations, as observations were mainly opportunistic and so are heavily biased to specific locations and times of year. This makes it very difficult to assess the spatial use of the area by particular species and makes assessment of numbers and seasonality difficult. Evans *et al*. (2011) report 6635 records of cetaceans since 1980, of which about half (3332) were harbour porpoises. Minke whales (800), killer whales (474), white-beaked dolphins (416), Risso's dolphins (361) and unidentified dolphins (448) form the bulk of the other half of the records. No other species represented more than 3% of records although there were around 100 records of each of bottlenose dolphin, short-beaked common dolphin, Atlantic white-sided dolphin and long-finned pilot whale. Harbour porpoise are present throughout the year, but most of the dolphins and whales have been seen predominantly in summer. It is unclear whether this represents seasonal movements of these animals or simply a lack of observers present in winter and more difficult sea conditions obscuring presence of mammals. The report suggests that Scapa Flow and adjacent areas in south Orkney, Gills Bay, Dunnet Bay, and Strathy Bay may be favoured areas for cetaceans, but concludes that '*the uneven distribution of effort limits clear interpretation of distribution patterns*' (Evans *et al.*, 2011). Detailed and scientifically well-designed observations of cetaceans (A. Robbins, unpublished report to SNH and EMEC, 2011) have been made at the EMEC test site at Fall of Warness, and these could be used to inform on the extent to which different marine mammals use such an area of high tidal flow.

Designations and Protection

4.3.4.4 There are no designated sites for marine mammals within the area of interest; however, there are several protected sites within the Orkney archipelago and elsewhere. The individual animals from these sites may utilise the Pentland Firth. Given the protection afforded marine mammals and the number of haulout and breeding sites in the vicinity of the proposed development location, these species and their behavioural patterns will be fully assessed within the EIA. At this early stage, the SACs at Sanday, Faray and Holm of Faray, Moray Firth, North Rona, Dornoch Firth, Isle of May and North Northumberland Coast will be scoped in on the basis of the potential foraging range of the species concerned. The ES will review published telemetry data to assess proportions of seals belonging to each SAC that may be in the development area.

Data sources

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EIA Methodology

TABLE 4.9 Primary Data Collection Methodology

Information requirement	Field method	Key regulators/public bodies
BIOLOGICAL ENVIRONMENT		
Marine Mammals		
Existing data (desk based)	Collation and review of any previous records or data relating to the marine mammal ecology of the area in the vicinity of the proposed site. APEM data collection has been ongoing under contract to MS. This data will be analysed by SPR and its consultants who will decide its applicability to the environmental assessment of the development site.	Scottish Natural Heritage (SNH) Sea Mammal Research Unit (SMRU) Marine Scotland
Baseline distribution of marine mammals: Temporal and spatial distribution of marine mammals within the site Habitat utilisation of marine mammals within the site	**Boat and VP survey** Monthly boat based surveys by Marine Mammal Observers conducting visual observations in transects. Boat surveys (for 2 years of data) will be integrated with the ornithological methodology. Surveys to be conducted in transect pattern by boat based visual observers. Survey covering tidal array lease boundary area and an appropriate buffer zone (agreed with SNH). Survey methodologies have been agreed with SNH and MS and can be made available on request. SPR will endeavour to work with adjacent developers to share data on impacts to inform cumulative assessments. **Other Field Surveys** Noise monitoring.	Marine Scotland Scottish Natural Heritage (SNH) Sea Mammal Research Unit (SMRU)

Potential Project Effects

4.3.4.5 The potential effects of the proposed project to the marine mammal ecology of the area are thought to primarily consist of the effects of noise and the potential collision/barrier effects of the proposed array. The potential uses of the proposed project area by marine mammals will be assessed as part of the EIA process. This will allow an assessment to be made on the potential risks posed by the presence of the array as well as the installation vessels at the site.

4.3.4.6 Page 52 of the Marine Licencing Manual Wave and Tidal Annex notes the following impacts. These will be considered by the EIA:

- Collision.
- Entrapment.
- Disturbance as a result of noise, light, vibration.
- Pollution from routine and accidental discharges.
- Interruption of known migratory routes.
- Physical intrusion/obstruction and/or barrier to movement.
- Electric and electromagnetic field effects.
- Disruption to feeding, nursing, socialising and mating.
- Displacement from preferred breeding sites and feeding areas (could be through deterrence or attraction caused by devices).
- Loss and/or creation of haul out areas.
- Death/injury due to collisions, entanglement or extreme noise during construction.
- Finally, cumulative effects of the above and other projects will be considered.

4.3.4.7 Mitigation may be required to reduce impacts on marine mammals to an acceptable level. Page 53 of the Marine Licencing Manual Wave and Tidal Annex details the following mitigation options:

- Avoid sensitive sites /species.
- Avoid siting devices in particularly sensitive areas e.g. migration routes, feeding, breeding areas, haul out sites.
- Avoid installation during sensitive seasons.
- Minimise use of high noise emission activities such as piling or percussive drilling.
- Increase device visibility.
- Use of protective netting or grids.
- Use of observation (for example marine mammal observers (MMO)) and warning systems (e.g. passive acoustic monitoring (PAM) or active sonar) with feedback to control activity.
- Implementation of relevant SNH/JNCC or other guidance.
- Implement ‘soft start’ for piling and, where possible, other noisy activities.

Potential Cumulative Effects

4.3.4.8 As there are several other proposed developments within the Pentland Firth area then there is the potential possibility for cumulative effects. This potential will be fully assessed during the EIA process.

4.3.5. Fish and Shellfish

Baseline Conditions

Teleosts, Bivalves and Crustaceans

4.3.5.1 A variety of finfish and shellfish are present in and around the proposed development area at the Ness of Duncansby. These include spawning and nursery areas for finfish and important areas for some shellfish species. The table below outlines the importance of the area for certain species.

Finfish and Shellfish Resource		
Species	**Proposed development site use**	**Comment**
Herring (*Clupea harengus*)	Spawning area	-
Blue Whiting (*Micromesistius poutassou*)	Spawning area	Spawning area not directly at proposed development site, but in the wider Pentland Firth
Sprat (*Sprattus sprattus*)	Spawning area	-
Saithe (*Pollachius virens*)	Nursery area	-
Sandeel (*Ammodytes marinus*)	Spawning and nursery area	Benthos at the site unlikely to be suitable due to prevalence of rocky substratum
Lemon sole (*Microstomus kitt*)	Spawning and nursery area	Benthos at the proposed development site unlikely to be suitable due to prevalence of rocky substratum
King Scallop (*Pecten maximus*)	Present in proposed development area	Benthos at the proposed development site unlikely to be suitable due to prevalence of rocky substratum
Queen Scallop (*Aequipecten opercularis*)	Present in proposed development area	Benthos at the proposed development site unlikely to be suitable due to prevalence of rocky substratum
Velvet crab (*Necora puber*)	Present in proposed development area	-
Lobster (*Homarus gammarus*)	Present in proposed development area	-
Edible crab (*Cancer pagurus*)	Present in proposed development area	-

4.3.5.2 Anadromous species (Atlantic salmon and sea trout) are not fished commercially in the area, but are known to be present on the Caithness coast (although no data are available for the Duncansby Head area; NBN, 2010). These will be assessed for their known migratory patterns in the area, with particular attention being paid to the River Thurso, which is designated as an SAC due to the presence of Atlantic salmon.

Elasmobranchs

4.3.5.3 Basking sharks (*Cetorhinus maximus*) are listed as 'vulnerable' on the IUCN red list, though these are seen only occasionally in the Pentland Firth and Orkney waters. There

are no records for this species off of the Caithness coastline or the Orkney archipelago within the NBN records (NBN, 2010). Evans *et al.* (2011) report 345 records of basking sharks (involving 385 individuals) from North Scotland and Orkney reported since 1980. These were widely scattered throughout the region, with no particular concentration, and have occurred in most months of the year, though mostly between July and September. Since basking sharks filter feed plankton they are expected to occur particularly in areas with frontal systems that aggregate plankton, so the rather diffuse distribution pattern shown by the 345 records plotted by Evans *et al.* (2011) (Figure 15 in their report) is unexpected and suggests either that these animals were passing through the area rather than aggregating on food patches, or that suitable aggregations of plankton are spatially unpredictable in this region.

Designations and Protection

4.3.5.4 There are no designated sites for fish or shellfish within the area of interest; however, the River Thurso is a Special Area of Conservation (SAC) for Atlantic salmon (*Salmo salar*). This SAC and species will be fully assessed within the EIA.

Data Sources

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

Faber Maunsell and Metoc (2007). Scottish Marine Renewables SEA.

NBN (2010). Website accessed August 2010.

SNHi (2010). Website accessed August 2010.

EIA Methodology

TABLE 4.10 Primary Data Collection Methodology

Information requirement	Field method	Key regulators/public bodies
BIOLOGICAL ENVIRONMENT		
Fish and Shellfish		
Existing data (desk based)	Collation and review of any previous records or data relating to the marine and freshwater fisheries resource of the area in the vicinity of the proposed site.	Marine Scotland Scottish Natural Heritage (SNH)
Baseline marine ecological data	**Field survey** Assessment of multibeam swath bathymetry/Acoustic Ground Determination System data from the Geophysical survey of the proposed development area site will give preliminary information on the seabed profile. This will be used to inform the benthic environment, which, once known, will give an indication as to the species likely to be present in the area. This will be backed up by a drop-down/towed camera (taking stills or video footage) to identify some of the habitats and	Marine Scotland Scottish Natural Heritage (SNH)

TABLE 4.10 Primary Data Collection Methodology		
Information requirement	Field method	Key regulators/public bodies
	species present. Beam trawling and grab sampling may also be carried out in support of the camera surveys if deemed to be appropriate.	

Potential Project Effects

4.3.5.5 The potential effects of the proposed project to the fish and shellfish ecology of the area are thought to primarily consist of the effects of habitat removal, noise and the potential collision/barrier effects of the proposed array. The potential presence of fish and shellfish within the proposed project area will be assessed as part of the EIA process. This will allow an assessment to be made on the potential risks posed by the presence of the array as well as the effects of the installation program.

Potential Cumulative Effects

4.3.5.6 As there are several other proposed developments within the Pentland Firth area then there is the potential possibility for cumulative effects. This potential will be fully assessed during the EIA process.

4.4. HUMAN ENVIRONMENT

4.4.1. Commercial Fisheries & Aquaculture

Baseline Conditions

4.4.1.1 Most commercial fishing in the area is inshore creel fishing for edible crab (*Cancer pagurus*), velvet crabs (*Necora puber*), and lobster (*Homarus gammarus*). There are known to be two local fishermen who utilise the shoreline adjacent to the proposed project and may be affected by the proposals. There are no known areas for aquaculture (finfish or shellfish) in the vicinity of Duncansby Head.

4.4.1.2 Due to the high tidal flow within the area of the proposed project there is no significant pelagic or demersal commercial fishing in the area as the tidal flow poses difficulties with regards the trawling of nets. There are also high levels of vessel movements in the area, which also pose restrictions to the level of fishing present.

4.4.1.3 Scrabster is the main port in the north for commercial fishing and sea-angling. Fishing in the area employs relatively few people, although the industry is currently experiencing a healthy level of activity.

4.4.1.4 Although, as mentioned above, commercial fishing in the immediate area of the proposed site is restricted to inshore creel fishing for edible crab (*C. pagurus*), velvet crab (*N. puber*), and lobster (*H. gammarus*); common skate (*Dipturus batis*), cod (*Gadus morhua*), herring (*Clupea harengus*), mackerel (*Scomber scombrus*), plaice (*Pleuronectes platessa*), saithe (*Pollachius virens*), sole (*Microstomus kitt*), whiting (*Merlangius merlangus*), monkfish (*Lophius piscatorius*) and ling (*Molva molva*) are also caught in inshore waters around Caithness.

Data sources

NBN (2010). Website accessed August 2010.

EIA Methodology

TABLE 4.11 Primary Data Collection Methodology		
Information requirement	Field method	Key regulators/public bodies
HUMAN ENVIRONMENT		
Commercial Fisheries		
Existing data (desk based)	Collation and review of any previous records or data relating to fishing activities (commercial and otherwise) in the area of the proposed development.	Marine Scotland
Baseline activity, location, species and commercial value	Consultation with commercial and recreational fishermen, fishing organisations and fishery management organizations. Consultations will be facilitated by a Fisheries Industry Representative.	Marine Scotland

Potential Project Effects

4.4.1.5 The potential effects of the proposed project to the fish and shellfish fisheries in the area are thought to primarily consist of the effects of limiting fishing activity in an area of the Pentland Firth close to the development site. The potential presence of fisheries within the proposed project area will be assessed as part of the EIA process to determine the significance of this impact. This will allow an assessment to be made on the potential risks to fishermen posed by the presence of the array as well as the effects of the installation program.

Potential Cumulative Effects

4.4.1.6 As there are several other proposed developments within the Pentland Firth area then there is the potential possibility for cumulative effects to impact upon the local fishing sector. This potential will be fully assessed during the EIA process.

4.4.2. Maritime Navigation

Baseline Conditions

4.4.2.1 Very high vessel densities occur in the Pentland Firth area. The main shipping lane, and consequently the area with the greatest traffic movements, is in the centre of the channel (north of the island of Stroma) for vessels travelling along and around the north coast of Scotland and cross channel traffic associated with ferry links between the Scottish mainland and Orkney (Faber Mansell and Metoc, 2007). There are also considerable movements of tanker and supply vessels associated with the oil trade in the Pentland Firth, and Orkney is a known port of call for tanker vessel traffic. Tankers call at the Talisman operated Flotta Oil Terminal in Scapa Flow, and Scapa Flow is also utilised for ship to ship transfers of oil.

4.4.2.2 The year-round Pentland Ferries ro-ro ferry route running from Gills Bay on the Caithness side of the Pentland Firth to St. Margaret's Hope on Orkney passes close to the proposed development site, if the ferry routes to the east of Stroma (this is the operators 'poor-weather' route). The John O'Groats passenger ferry, which operates between John O'Groats and Burwick Pier, South Ronaldsay, Orkney during the summer

months is likely to pass directly to the west or over the proposed development site, depending on routing.

4.4.2.3 The proposed development area does not lie within an RYA sailing area and no RYA cruising routes pass through it (Faber Maunsell and Metoc, 2007). However, two routes are present immediately to the east of the proposed development site. These are a light route that routes boats into Scapa Flow and a medium route that routes boats around Duncansby Head.

4.4.2.4 The deeper water off Gills Bay is a recommended place of anchorage. The Clyde Cruising Club also recommends John O'Groats and 'The Haven' off south Stroma as places of anchorage (Clyde Cruising Club, 2003).

Data sources

Faber Maunsell and Metoc (2007). Scottish Marine Renewables SEA.

Clyde Cruising Club (2003). Clyde Cruising Club Sailing Directions and Anchorages. 5: N & NE Scotland and Orkney Islands. Clyde Cruising Club Publications. ISBN 978-1-899786-05-3.

EIA Methodology

TABLE 4.12 Primary Data Collection Methodology

Information requirement	Field method	Key regulators/public bodies
HUMAN ENVIRONMENT		
Maritime Navigation		
Baseline vessel traffic information	**Navigational Traffic Survey** Methods for this survey will be agreed with the MCA, and will include gathering of Automatic Identification System (AIS) and radar data for vessels transiting the site and adjacent area. Data will be gathered in order to identify vessel routes, types, and transit times.	Maritime and Coastguard Agency (MCA) Northern Lighthouse Board (NLB)
Navigational risk presented by a tidal array	**Navigational Safety Risk Assessment** Any assessment would be carried out in close consultation with the MCA, and in order to fulfil requirements under MGN 371. A Preliminary Hazard Analysis will be undertaken, and a scope will be agreed for a full Navigational Safety Risk Assessment (NSRA), if deemed necessary by the MCA. Any full NSRA would include assessment of baseline risks of collision, followed by analysis of collision risk presented by the construction/ operation/ decommissioning of the tidal array. This would include collision risk due to the physical presence of the array and any associated installation/ maintenance vessels.	Maritime and Coastguard Agency (MCA) Northern Lighthouse Board (NLB)

TABLE 4.12 Primary Data Collection Methodology		
Information requirement	Field method	Key regulators/public bodies
	There would also be consideration of cumulative effects (with other marine renewable projects) and in combination effects (with other developments/activities).	

Potential Project Effects

4.4.2.5 The potential effects of the proposed project to maritime navigation are primarily related to the presence of proposed project vessels at the proposed project site. These will be present during all phases of the project, with the greatest intensity during the construction and decommissioning phases. However, maintenance vessels will also be present during the operational phase. The tidal turbines themselves, due to their deep-water location and large surface clearance, are not thought to pose a significant risk to vessels operating in the area. Additionally, these devices are located outwith the main navigation channel.

Potential Cumulative Effects

4.4.2.6 As there are several other proposed developments within the Pentland Firth area then there is the potential possibility for cumulative effects to affect the risk to navigation. This potential will be fully assessed during the EIA process.

4.4.3. Landscape and Seascape

Baseline Conditions

4.4.3.1 'Mixed agriculture and settlement' is the predominant landscape character type on the northern Caithness coast adjacent to the proposed development area. An area of sweeping moorland lies by the coast to the south of the proposed site, with flat peatland beyond that (Stanton, 1998). There are pockets of 'mixed agriculture and settlement' to the west of the proposed site; however, the majority of this landscape form covers a large area of Caithness to the SW of the site (Stanton, 1998). Other farming land occurs along the northern coastal areas of Caithness in the form of 'small farms and crofts', which meets an area of 'high cliffs and sheltered bays' by the coast at Duncansby Head (Stanton, 1998).

4.4.3.2 The island of Stroma, which lies 2.4km across the Inner Sound of the Pentland Firth from Caithness, is classified a 'coastal island' and is uninhabited. It is approximately 3.5km long by 1.5km wide with a maximum elevation of 53m.

4.4.3.3 The seascape character types in the area are 'mainland rocky coastline with open sea views' with small areas of 'deposition coastline with open sea views'. The open hinterland is gently rolling with views across to the Orkney Islands providing the key focus.

Data sources

Stanton, C., 1998. Caithness and Sutherland landscape character assessment. Scottish Natural Heritage Review No. 103.

TABLE 4.13 Primary Data Collection Methodology		
Information requirement	Field method	Key regulators/public bodies
HUMAN ENVIRONMENT		
Landscape and Seascape		
Change to landscape/ seascape character from the proposed tidal development	Field surveys not thought necessary. Sufficient information to assess impacts is thought to exist.	Scottish Natural Heritage (SNH) Highland Council

Potential Project Effects

4.4.3.4 The potential effects of the proposed project to the landscape character and seascape of Caithness are primarily related to the presence of onshore works (e.g. a substation) and any vessels at the proposed project site (during all phases of the project). The tidal turbines themselves, due to their fully-submerged nature, will not affect the landscape/seascape in the area.

Potential Cumulative Effects

4.4.3.5 As there are several other proposed developments within the Pentland Firth area then there is the potential possibility for cumulative effects to affect the landscape/seascape character of the area. This potential will be fully assessed during the EIA process.

4.4.4. Cultural Heritage

Baseline Conditions

4.4.4.1 Caithness has a unique cultural heritage and has been described as 'a crossroads in history' (Caithness Explorer Guide, 2008). There are a large number of cultural heritage sites near the coast adjacent to the proposed site, both on the mainland and on the island of Stroma. These include some Scheduled Ancient Monuments (SAMs), National Monuments and Listed Buildings.

4.4.4.2 There are four SAMs on Stroma, including Castle Mestag, a fortified seastack at the southwest tip of the island. The SAM of St John's Fort and site of St. John's chapel lies on the mainland at St. Johns Point, 9-10km to the west of the proposed site.

4.4.4.3 National Monuments on the coast of Caithness include the early 19th century Gill's Pier in Gill's Bay and the boathouse and slipway at Huna. The listed Castle of Mey and designated garden lies behind St John's Point, 12km to the west of the proposed site.

4.4.4.4 Records show that numerous wrecks have occurred in the area; however, it is unclear as to the extent of what may remain on the seabed in such a highly tidal area.

EIA Methodology

TABLE 4.14 Primary Data Collection Methodology		
Information requirement	Field method	Key regulators/public bodies
HUMAN ENVIRONMENT		
Cultural Heritage		
Baseline information on marine and terrestrial archaeology in the region of the Ness of Duncansby site	Data from benthic and geophysical surveys of the proposed Ness of Duncansby site will be subject to archaeological assessment. Additionally, surveys will be carried out along any proposed cable routes (marine and onshore) as well as at proposed substation locations. If required, further detail may be collected on specific archaeological sites of interest, should these be discovered within the Ness of Duncansby project envelope.	Historic Scotland The Ministry of Defence (MoD) The Receiver of Wreck (The Maritime and Coastguard Agency) Highland Council

Potential Project Effects

4.4.4.5 The potential effects of the proposed project to the cultural heritage assets of the area are primarily related to the presence of the devices, cabling and onshore facilities. All of these infrastructure components will be present during all phases of the project and they will be sited sensitively after taking the cultural heritage assets into account.

Potential Cumulative Effects

4.4.4.6 As there are several other proposed developments within the Pentland Firth area then there is the potential possibility for cumulative effects to affect local cultural heritage assets. This potential will be fully assessed during the EIA process.

4.4.5. Noise

Baseline Conditions

4.4.5.1 Anthropogenic noise levels in the area of the proposed development are likely to be low due to the lack of industrialisation, however farm machinery, traffic and marine vessel movements are intermittent noise sources.

4.4.5.2 Ambient underwater noise levels at the proposed site are not known and will vary depending on weather conditions.

EIA Methodology

TABLE 4.15 Primary Data Collection Methodology		
Information requirement	Field method	Key regulators/public bodies
HUMAN ENVIRONMENT		
Noise[8]		
Noise generated form vessel and road traffic related to the tidal farm	Onshore field surveys not thought necessary. Sufficient information to assess impacts is thought to exist. Underwater noise assessments may be undertaken to assess the background ambient noise at the proposed	Highland Council Sea Mammal Research Unit (SMRU) Scottish Natural Heritage (SNH)

[8] Relates to effects on humans, and not on other marine and ecological receptors

TABLE 4.15 Primary Data Collection Methodology		
Information requirement	Field method	Key regulators/public bodies
	tidal development site. This will be compared with operational data of devices deployed elsewhere.	

Potential Project Effects

4.4.5.3 The potential effects of the proposed project to onshore and underwater noise are primarily related to installation noise (vessels and activities), the presence of the turbines during their operational phase and onshore noise levels being affected by construction traffic as well as from the presence of additional maritime vessels to the local area. Vessels will be present during all phases of the project, with the greatest intensity during the construction and decommissioning phases. However, maintenance vessels will also be present during the operational phase. The tidal turbines themselves will create a certain level of noise, which will be assessed in the EIA and related to local ambient noise levels. Any addition to the onshore noise levels in the area will be assessed against the receptors present.

Potential Cumulative Effects

4.4.5.4 As there are several other proposed developments within the Pentland Firth area then there is the potential possibility for cumulative effects to affect underwater and onshore noise in the area. This potential will be fully assessed during the EIA process.

4.4.6. Socio Economics

Baseline Conditions

4.4.6.1 Highland is one of the most sparsely populated large areas of Britain. The two main centres of population in northern Caithness are Thurso and Wick. Thurso, with a population of approximately 8,700, is located on the north coast of Caithness, approximately 25km west of the proposed site. Wick is on the east coast of Caithness, approximately 25km south of the proposed site, and has a population of around 8,000. Between these two main population centres there are many smaller crofting and farming communities. The overall population of Caithness in 2001 was approximately 25,400. Government projections continue to suggest an overall fall in population up to almost 3,000 people in the 15 years between 2001 and 2016. The island of Stroma, to the west of the proposed site, has been uninhabited since the 1960's.

4.4.6.2 Around 9,000 people work in Caithness. Most work in the service sector, particularly in tourism and public administration, but manufacturing is well represented. Farming remains a significant component of the Caithness economy, particularly livestock rearing (Caithness Local Plan, 2002).

EIA Methodology

TABLE 4.16 Primary Data Collection Methodology		
Information requirement	Field method	Key regulators/public bodies
HUMAN ENVIRONMENT		
Socio-Economics		
Baseline information on socio-economic	Field surveys not thought necessary. Sufficient information to assess impacts thought to exist.	Highland Council Highlands and Islands Enterprise (HIE)

TABLE 4.16 Primary Data Collection Methodology		
Information requirement	Field method	Key regulators/public bodies
environment in the region of the proposed tidal site		Scottish Enterprise

Potential Project Effects

4.4.6.3 The potential effects of the proposed project on the socio-economics of the area would likely be generally positive in nature. The project will attract capital investment to the area and lead to the creation of jobs. Job creation will occur primarily during the construction/installation and maintenance phases of the project. There is currently a local project officer based in Caithness employed to assist with the development of the project.

Potential Cumulative Effects

4.4.6.4 As there are several other proposed developments within the Pentland Firth area then there is the potential possibility for cumulative effects to occur in relation to inward investment to Caithness and job creation. This potential will be fully assessed during the EIA process.

4.4.7. Tourism and Recreation

Baseline Conditions

4.4.7.1 Recreational activities in the immediate area of the proposed development include windsurfing, surfing, fishing (including sea angling), kayaking, birdwatching, diving, cycling and walking. There is also a museum at John O'Groats.

4.4.7.2 Recent years have seen an increase in wildlife tourism in the area, with shore-based cetacean watching and boat trips from John O'Groats to destinations such as Stroma and Duncansby Head attracting many visitors in the summer months.

4.4.7.3 Directly south of the proposed site, a coastal path runs from John O'Groats to Duncansby Head, with views across the Pentland Firth to the island of Stroma and the Orkney Islands. There is also a candidate Core Path running along the spine of Stroma in the draft Caithness Core Paths Plan.

4.4.7.4 Approximately 9km from the proposed site, the Castle of Mey (the most northerly castle on the UK mainland and formerly owned by the late Queen Mother) attracted over 29,000 visitors in 2007 (Caithness Explorer, 2008).

4.4.7.5 John O'Groats has '*frequent if irregular links to Land's End (the far southwest tip of England), maintained by a succession of walkers, cyclists, vintage-car drivers and pushers of baths*' (Humphreys and Reid, 2002). In addition, Dunnet Head, which lies approximately 15km to the west of the proposed site, is the most northerly point of mainland Britain and as such has also become a tourist attraction.

Data sources

Caithness Core Paths Plan
http://www.highland.gov.uk/FJ_CMS/Templates/Standard.aspx?NRMODE=Published&NRNODEGUID=%7b915BB9A3-4177-47ED-B724-D295723C94F2%7d&NRORIGINALURL=%2fleisureandtourism%2fwhat-to-see%2fcountrysideaccess%2fcorepathplans%2ehtm&NRCACHEHINT=Guest#caithness

Caithness Explorer (2008). Things to see and do in Caithness. North of Scotland Newspapers.

Humphreys, R. and Reid, D. (2002). The Rough Guide to Scotland 5th edition. Rough Guides Ltd.

EIA Methodology

TABLE 4.17 Primary Data Collection Methodology

Information requirement	Field method	Key regulators/public bodies
HUMAN ENVIRONMENT		
Tourism and Recreation		
Baseline information on tourism and recreation activities in the area	Field surveys not thought necessary. Sufficient information to assess impacts thought to exist.	Highland Council Highlands and Islands Enterprise (HIE) Scottish Enterprise VisitScotland

Potential Project Effects

4.4.7.6 The potential effects of the proposed project on the tourism and recreation of the area would likely be generally positive in nature. In the short term the project is likely to attract a lot of media attention, which will advertise the area to the wider world. This in turn may well lead to an increase in visitor numbers and, indirectly, increased job creation.

Potential Cumulative Effects

4.4.7.7 As there are several other proposed developments within the Pentland Firth area then there is the potential possibility for cumulative effects to occur in relation to the creation of tourist attractions/visitor centres to highlight the areas marine renewable energy projects. This potential will be fully assessed during the EIA process.

4.4.8. Military Activity

Baseline Conditions

4.4.8.1 The proposed Ness of Duncansby site is located within a military practice and exercise area which covers a large area of the Pentland Firth. It is not, however, located in a specific 'danger area' or a 'byelawed' area which are 'no go' areas for marine renewable energy development. However, the MOD is currently undertaking a review of its practice and exercise areas under byelaw; however no information is yet available on the location of proposed new byelawed sites (Faber Mansell and Metoc, 2007).

4.4.8.2 Faber Maunsell and Metoc, 2007 identify the proposed site as being within a minefield area and thus there is a possibility that munitions may be present on the seabed in the proposed development area. An assessment of the proposed site will be made to identify if there is any possibility of munitions to be located within the lease area.

Data sources

Faber Maunsell and Metoc (2007). Scottish Marine Renewables SEA.

EIA Methodology

TABLE 4.18 Primary Data Collection Methodology		
Information requirement	Field method	Key regulators/public bodies
HUMAN ENVIRONMENT		
Military Activity		
Baseline information on military activity in the region of the Ness of Duncansby site	Field surveys not thought necessary. Sufficient information to assess impacts thought to exist.	Ministry of Defence (MOD)

Potential Project Effects

4.4.8.3 The potential effects of the proposed project on the military activity of the area would occur through all phases of the proposed project; however, they are not thought likely to be of any significance. Close consultation with the Ministry of Defence (MOD) will be undertaken to ensure that this remains the case.

Potential Cumulative Effects

4.4.8.4 As there are several other proposed developments within the Pentland Firth area then there is the potential possibility for cumulative effects to occur in relation to the effects on military activity. This potential will be fully assessed during the EIA process.

4.4.9. Air and Climate

Baseline Conditions

4.4.9.1 Due to the rural nature of Caithness the air quality in the region is generally excellent. Air pollution in the area of the Ness of Duncansby currently comes from low levels of road traffic and marine vessels transiting through the Pentland Firth, as well as those vessels that work the area (e.g. local ferries and fishing vessels).

4.4.9.2 Airborne dust sources are primarily from road traffic as well as some agricultural soil erosion.

EIA Methodology

TABLE 4.19 Primary Data Collection Methodology		
Information requirement	Field method	Key regulators/public bodies
HUMAN ENVIRONMENT		
Air and Climate		
Baseline air quality pollutant levels	Field surveys not thought necessary. Sufficient information to assess impacts thought to exist.	Highland Council Scottish Environment Protection Agency (SEPA) Scottish Government Traffic Scotland

Potential Project Effects

4.4.9.3 The potential effects of the proposed project on the air quality of the area would occur through all phases of the proposed project; however, the construction phase will likely have the greatest potential for impact. These will come in the form of emissions from road traffic associated with the onshore elements of the project and the marine vessels associated with device installation.

Potential Cumulative Effects

4.4.9.4 As there are several other proposed developments within the Pentland Firth area then there is the potential possibility for cumulative effects to occur in relation to the effects on air quality; however, activities are unlikely to occur at the same time. This potential will be fully assessed during the EIA process.

4.4.10. Other Human Activities

Baseline Conditions

4.4.10.1 As the marine renewables sector grows in the Pentland Firth area so there are plans to develop the local infrastructure. This will primarily take the form of harbour improvements, which are planned at sites such as Scrabster. Such improvements will have the potential to impact on the area in a similar fashion as the proposed project (e.g. increased vessel and road traffic movements).

4.4.10.2 There are no known areas of aggregate extraction in the area.

EIA Methodology

TABLE 4.20 Primary Data Collection Methodology		
Information requirement	Field method	Key regulators/public bodies
HUMAN ENVIRONMENT		
Other Human Activities		
Baseline water quality and local contaminant status	Field surveys not thought necessary. Sufficient information to assess impacts thought to exist.	The Crown Estate Scottish Environment Protection Agency (SEPA) Maritime and Coastguard Agency (MCA) Highland Council

Potential Project Effects

4.4.10.3 The potential effects of the proposed project on other human activities of the area would occur through all phases of the proposed project; however, they are not thought likely to be of any significance as the timings of any such activities are unlikely to overlap. Close consultation with those groups in Table 4.20 will be undertaken to ensure that this remains the case.

Potential Cumulative Effects

4.4.10.4 At present there are no known activities that are likely to overlap with the works involved in the proposed Ness of Duncansby project development. However, the potential for any cumulative impacts to occur will be fully assessed during the EIA process.

4.4.11. Summary of Main Potential Environmental Effects

4.4.11.1 An initial qualitative assessment of all potential effects has been based on the information presently available on the project and the baseline environmental description presented above. Table 4.22 summarises the main potential effects associated with the proposed Ness of Duncansby tidal array development. As potential effects will vary between each phase of the project, effects have been split into the following categories, (this follows the same approach as set out in the Scottish Government Scottish Marine Renewables SEA scoping document):

- Construction and installation;
- Operation;
- Maintenance; and
- Decommissioning.

4.4.11.2 Effects have been considered as set out in Table 4.21. Note that for some of the potential effects, effect significance is unknown at this stage (highlighted orange) and will require further data collection and analysis. Depending on the further data analysis and assessment during the EIA process these effects may be identified as potentially significant, or conversely, effects may be identified as unlikely to be significant and will then be scoped out of the EIA.

TABLE 4.21 CONSIDERATION OF EFFECTS	
✓	Potentially significant effect requiring detailed investigation in the EIA
✓	Effect significance unknown at this stage until further data collated and assessed
✓	Effect unlikely to be significant (and therefore scoped out of EIA)
×	No effect (and therefore scoped out of EIA)

4.4.11.3 The main potential effects of the proposed tidal array on the environment are summarised in Table 4.22. Table 4.22 also includes details of the issues that are considered not to be significant in nature and which are proposed to be "scoped out" of the Environmental Impact Assessment. Consultees are invited to consider these non-significant issues and advise whether they agree with the view that these issues need not be addressed within the Environmental Impact Assessment.

Scoping Question: 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?

TABLE 4.22 MAIN POTENTIAL EFFECTS OF THE PROPOSED SITE

Potential Effect	Construction & Installation	Operation	Maintenance	De-commissioning
PHYSICAL ENVIRONMENT				
Marine and Coastal Processes				
Changes to wave climate	×	×	×	×
Changes to tidal flows	×	✓	×	×
Geology, Seabed Sediments and Sediment Transport				
Increase in suspended sediment	✓	×	×	✓
Changes to seabed morphology	×	✓	×	×
Changes to sediment processes	✓	✓	✓	✓
Changes to coastal processes	×	✓	×	×
Disturbance of contaminated sediments	✓	✓	✓	✓
Water Quality and Effluent Discharges				
Release of contaminants into marine environment	✓	×	✓	✓
Accidental release of contaminants into marine environment	✓	✓	✓	✓
Disturbance of existing contaminants in marine environment	✓	✓	✓	✓
Creation of obstacle to munitions likely to migrate	✓	✓	✓	×
Disturbance of seabed sediments	✓	✓	✓	✓
Release of pollutants into freshwater	×	×	×	×
Accidental release of pollutants into freshwater	✓	✓	✓	✓
Disturbance of existing contaminants in the terrestrial environment	✓	×	✓	✓
BIOLOGICAL ENVIRONMENT				

TABLE 4.22 MAIN POTENTIAL EFFECTS OF THE PROPOSED SITE

Potential Effect	Construction & Installation	Operation	Maintenance	De-commissioning
Benthic Ecology				
Substratum loss	✓	×	×	✓
Smothering	✓	×	×	✓
Increased turbidity	✓	✓	✓	✓
Decrease in flow velocities	×	✓	×	×
Devices act as invasives stepping stone	×	✓	×	×
Accidental release of contaminants	✓	✓	✓	✓
Terrestrial Ecology				
Permanent physical loss of important terrestrial habitats and species	✓	✓	✓	×
Temporary disturbance of important terrestrial habitats and species	✓	✓	✓	✓
Siltation of water courses and secondary effects on freshwater bodies	✓	×	×	✓
Accidental release of contaminants	✓	✓	✓	✓
Marine Mammals				
Noise disturbance	✓	✓	✓	✓
Collision risk (vessels and underwater structures)	✓	✓	✓	✓
Barrier effects	✓	✓	✓	✓
Accidental release of contaminants	✓	✓	✓	✓
Loss of potential important habitats	✓	✓	✓	✓
Electromagnetic effects	✓	✓	✓	✓
Cumulative impacts	✓	✓	✓	✓
Ornithology				
Collision risk with vessels	✓	✓	✓	✓
Collision risk with underwater turbines	×	✓	×	×

TABLE 4.22 MAIN POTENTIAL EFFECTS OF THE PROPOSED SITE

Potential Effect	Construction & Installation	Operation	Maintenance	De-commissioning
Disturbance by noise and human activity related to the tidal array	✓	✓	✓	✓
Loss of potential foraging and/or breeding/nesting habitats	✓	✓	×	✓
Disturbance by noise and human activity related to the onshore supporting works	✓	✓	✓	✓
Barrier effects, indirect effects and disturbance due to operations and maintenance	✓	✓	✓	✓
Accidental release of contaminants	✓	✓	✓	✓
Cumulative effects	✓	✓	✓	✓
Fish and Shellfish				
Noise and vibration disturbance	✓	✓	✓	✓
Loss of habitat in footprint	×	✓	×	✓
Effects of electromagnetic fields	×	✓	×	×
Collision risk	×	✓	×	×
Increase in habitat heterogeneity (e.g. artificial reef creation)	×	✓	×	✓
Suspended sediments	✓	✓	✓	✓
Disturbance to spawning and nursery grounds	✓	✓	✓	✓
Disturbance to migratory fish routes (e.g. Atlantic salmon)	✓	✓	✓	✓
Plankton				
Alteration of plankton productivity through alteration of tidal current strength	×	✓	×	×
HUMAN ENVIRONMENT				
Commercial Fisheries				
Altered access to fishing grounds	✓	✓	✓	✓

TABLE 4.22 MAIN POTENTIAL EFFECTS OF THE PROPOSED SITE

Potential Effect	Construction & Installation	Operation	Maintenance	De-commissioning
Increased conflict over diminished grounds	✓	✓	✓	✓
Displacement of, or reduction in, fish and shellfish resource	✓	✓	✓	✓
Loss or damage to fishing gear	✓	✓	✓	✓
Maritime Navigation				
Temporary disturbance to regular shipping traffic	✓	×	×	✓
Permanent displacement of regular shipping traffic	×	✓	×	×
Increased navigational risk and collision risk	✓	✓	✓	✓
Landscape and Seascape				
Effect on landscape	✓	✓	✓	✓
Effect on seascape	✓	×	✓	✓
Effect on visual amenity	✓	✓	✓	✓
Effect on submerged landscapes	✓	✓	✓	✓
Cultural Heritage				
Disturbance and destruction of known and unknown archaeological submarine sites (incl. wrecks)	✓	✓	×	✓
Disturbance and destruction of known and unknown archaeological terrestrial sites	✓	×	×	✓
Influence to cultural heritage setting	✓	✓	×	✓
Noise[9]				
Noise generated form	✓	×	✓	✓

[9] Relates to effects on humans, and not on other marine and ecological receptors

TABLE 4.22 MAIN POTENTIAL EFFECTS OF THE PROPOSED SITE

Potential Effect	Construction & Installation	Operation	Maintenance	De-commissioning
vessels related to the tidal array				
Noise generated from heavy plant associated with the onshore infrastructure	✓	×	✓	✓
Socio-Economics				
Employment opportunities related to onshore facilities	✓	✓	✓	✓
Increased demand for local private services/goods	✓	✓	✓	✓
Increased demand for local public services/goods	✓	✓	✓	✓
Nuisance impacts e.g. noise, lighting, dust, etc.	✓	✓	✓	✓
Interference with planned infrastructure improvements in the local area	✓	✓	×	×
Tourism and Recreation				
Disturbance to recreational activity	✓	✓	✓	✓
Visual impacts which deter tourism	✓	✓	✓	✓
Opportunities for local tourism	×	✓	×	×
Military Activity				
Temporary disruption to military exercises	✓	✓	✓	✓
Long-term obstruction to military exercises	×	✓	✓	×
Effects of array on military sonar	×	✓	×	×
Disturbance of unexploded ordinance	✓	×	✓	✓
Air and Climate				
Dust emissions	✓	×	×	✓
Gas emissions (e.g. CO_2)	✓	×	✓	✓
Avoidance of air quality pollutant emissions	✓	✓	✓	✓
Avoidance of greenhouse gas emissions	✓	✓	✓	✓
Infrastructure				
Temporary disruption to local traffic/access	✓	✓	✓	✓

TABLE 4.22 MAIN POTENTIAL EFFECTS OF THE PROPOSED SITE				
Potential Effect	Construction & Installation	Operation	Maintenance	De-commissioning
Direct damage to subsea power/telecommunications cables	×	×	×	×
Other Human Activities				
Temporary disruption to transiting of marine disposal vessels	×	×	×	×
Permanent displacement of routes for marine disposal vessels	×	×	×	×

4.5. MITIGATION

4.5.1.1 The most effective mitigation of the effects of the tidal array will be achieved through identification of an appropriate site for the array and evolution of the most sensitive layout of individual tidal turbines through an optimisation process. Timing of construction and decommissioning will need to take account of the potential disturbance to birds and marine mammals. It is likely that some or potentially all elements of construction will need to be timed outwith the seabird breeding season to avoid disturbance having an adverse effect on the qualifying features of the local SPAs. This would likely mean construction between August and March.

4.5.1.2 In continuing the iterative development of the tidal array, SPR and their environmental consultants will combine careful site design with comprehensive mitigation measures to avoid, reduce or offset the significant environmental effects. These effects will be identified through the detailed EIA process and will assist in the tiering of appropriate mitigation measures.

4.6. MONITORING

4.6.1.1 Where elements of uncertainty remain regarding predicted effects (as part of the full EIA exercise) a monitoring programme and period of review maybe required.

4.6.1.2 Any requirements for monitoring programmes will be discussed with the relevant regulatory authority and committed to as part of the Environmental Statement. It would be expected that monitoring commitments would become subsequent consent conditions.

4.7. ENVIRONMENTAL MANAGEMENT FRAMEWORK

4.7.1.1 It is acknowledged that the prevention or control of effects depends not only on the implementation of mitigation and monitoring measures, but also good design and continual iteration between all studies. These will include engineering design, construction and operation activities and technical criteria. Constant review of development proposals will be an important element, and will be the precursor to successful consent and development.

5. DRAFT OUTLINE OF THE ENVIRONMENTAL STATEMENT

5.0.1.1 It is proposed at this stage that the Environmental Statement will comprise a single A3 document combining text and graphics. A separate A4 Non-Technical Summary of the information contained in the Environmental Statement will also be provided. Detailed specialist reports will be available as a separate Technical Appendix if considered appropriate. Electronic Copies/PDFs of NTS will be made available on the project website and/or on DVDs.

5.0.1.2 It is proposed the text of the Environmental Statement will be divided into 2 parts, as described below.

5.1. PART 1: INTRODUCTION

5.1.1.1 Part 1 will comprise six chapters, as follows:

5.1.1.2 Chapter 1 will provide an introduction to renewable energy development and tidal power in particular. It will give a short overview of the tidal resource in Scotland and the Pentland Firth, and the potential benefits of the tidal array in terms of reduced emissions.

5.1.1.3 Chapter 2 will include an overview of the impact assessment methodology used by the team, including scoping and consultation and the identification of key environmental effects. This section will conclude by providing an overview of the Environmental Statement structure.

5.1.1.4 Chapter 3 will provide the reader with an overview of all additional consultations (e.g. community consultation, landowner consultation, commercial fisheries consultation, etc.) undertaken by SPR throughout the EIA process.

5.1.1.5 Chapter 4 will describe the tidal array site selection process. 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 site design, layout and the EIA process.

5.1.1.6 Chapter 5 will provide details of the site and a description of the proposed tidal array. This will include details of the size, layout and design of the tidal array and associated onshore/offshore infrastructure. This chapter will also outline the construction, installation, operational, maintenance and decommissioning requirements of the project.

5.1.1.7 Chapter 6 will present an overview of the relevant statutory planning guidance and Development Plan policies which apply to the tidal array on the proposed site.

5.2. PART 2: THE ENVIRONMENTAL IMPACT ASSESSMENT

5.2.1.1 Part 2 will report the results of the EIA to date, and will contain a number of chapters reporting the findings of the impact assessment on each of the topics, which have been identified for inclusion in the EIA process during this scoping exercise. It is considered that the Chapters will include:

- Ecology (Benthic, Terrestrial and Marine mammals);
- Ornithology;
- Coastal Processes and Morphology;
- Fish and Shellfish;
- Commercial Fisheries;
- Maritime Navigation;
- Landscape and Seascape;
- Noise (underwater and onshore);
- Socio-economics;
- Cultural Heritage; and
- Other issues (such as military activities, munitions and contamination, water quality and onshore transport and traffic).

5.2.1.2 Each of these 'assessment chapters' will be prepared by the relevant expert environmental consultant(s). SPR experts in marine energy development, construction and operation, and additional specialist input would be utilised during the EIA, as required.

5.2.1.3 The assessment chapters will be structured using the same format, where practicable. Each chapter will begin with an Introduction followed by a description of the method of assessment for the particular topic under discussion. This will include an outline of relevant consultations undertaken, documentation studied and the means of defining the Study Area 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.

5.2.1.4 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, and maintenance and decommissioning of the proposed tidal array on the topic. Mitigation measures that have been committed to will be taken into account in the assessment. These mitigation measures would be used to avoid, reduce and remedy the effect, where practical. An assessment will be made of the significance of the likely residual effect, following mitigation.

5.2.1.5 Part 2 would be concluded by a chapter summarising the EIA findings.

6. CONSULTATION STRATEGY

6.1. OVERVIEW

6.1.1.1 It is understood and acknowledged that a well considered and implemented Consultation Strategy initiated at the start of the EIA process is a vital tool in the successful development of a project. The primary aim of any such strategy should be to inform, engage and resolve.

6.1.1.2 By conducting the exercise as early as possible, the overall project planning and design can take account of any alterations or measures that will act to resolve potential issues and minimise possible effects of the proposed development.

6.1.1.3 The need for effective public participation is identified throughout relevant legislation and planning guidance.

6.1.1.4 The Public Participation Directive (PPD) (Directive 2003/35/EC) was issued by the European Commission in order to provide members of the public with opportunities to participate on the consenting and ongoing regulation of certain categories of activities within Member States. Such opportunities are provided through access to information, justice, and through consultation on certain key documents.

6.1.1.5 The Directive makes specific changes to the way in which EIA is undertaken, and the EIA Directive14 has been amended to incorporate these requirements.

6.1.1.6 PAN81 was released by the Scottish Executive in 2007 to provide guidance to local authorities and developers when engaging communities through the planning process.

6.1.1.7 The implementation of the new Planning (etc) Scotland Act 2006 will result in large changes to the planning system in Scotland. One of the main drivers for these changes is the recognised need for greater public involvement and consultation in the planning system.

6.1.1.8 The new Act will require applicants to undertake pre-consultation with local communities before submission of a planning application.

6.1.1.9 Whilst not yet applicable, the Tidal Array will be developed in cognisance of the new planning Act in relation to community consultation and with due regard for PAN81: Community Engagement.

6.2. PROJECT APPROACH

6.2.1.1 The consultation strategy proposed for the project will consist of open engagement with stakeholders via:

- Communication (the dissemination of project information); and
- Consultation (opportunity for stakeholders' views to be reported, discussed and considered).

6.2.1.2 Communication will be facilitated by various approaches including this Scoping Report and may include Public Information Days and Leaflets.

6.2.1.3 The Consultation exercise provides an opportunity for organisations to raise concerns or issues with regard to the proposed development that they would like to see addressed as part of the EIA. They can also provide local and specialised information or advice to assist the compilation of the Environmental Statement. Any such advice in conjunction with the feedback on concerns will help to define the approach and scope for the assessments undertaken during the EIA.

6.2.1.4 SPR has held initial meetings with officials at Joint Nature Conservation Committee, Marine & Coastguard Agency, Chamber of Shipping, The Crown Estate, Ministry of Defence, Scottish Natural Heritage, Royal Society for the Protection of Birds and Scottish Government as part of the site selection exercise.

6.2.1.5 Non-statutory bodies and individuals will not automatically be consulted by the determining authority. However, these bodies and individuals may also possess local knowledge and information useful in compiling the Environmental Statement.

6.2.1.6 Through this scoping exercise and a consultation process undertaken by SPR and topic specialists we are inviting input from non-statutory consultees and individuals to inform the development of the Tidal Array. The scope of works detailed in the above Chapters is therefore not exhaustive and will be subject to further consideration by SPR, the project team and consultees.

6.2.1.7 The list of consultees to be consulted during the Scoping Exercise is presented in Appendix A.

Scoping Question: Does the list of proposal consultees reflect the range of stakeholders that should be considered as consultees for this project?

7. SCOPING QUESTIONS

7.0.1.1 A list of the scoping questions is covered throughout this document, and for ease is also provided below. When providing comment and feedback it will be very helpful if these questions are considered.

Have all regulatory requirements that the project should be taking into account been identified?

Do the requirements outlined for assessment of effects look appropriate and complete?

Are there any other key sources of environmental information that should be consulted?

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?

Does the list of proposal consultees reflect the range of stakeholders that should be considered as consultees for this project?

8. FURTHER INFORMATION

8.0.1.1 The scope of works detailed in the above sections is not exhaustive and will be subject to further consideration by SPR, the project team and consultees.

8.0.1.2 SPR invites consultees to comment on this scoping document, provide comment on the methodologies proposed, and identify any concerns that they consider have not been addressed in this document and provide details of any relevant environmental information that would inform the assessment. This information will then be considered to influence the scope and approach to the EIA.

8.0.1.3 SPR is now seeking consultees' views on the proposed Tidal Array in order to incorporate these into the EIA process. All responses should be addressed to:

Douglas Watson
Marine Development Officer
ScottishPower Renewables
4th Floor
1 Atlantic Quay
Glasgow
G2 8JB

Tel: +44 (0) 141 614 0491

Or e-mail response to:

Douglas.Watson2@scottishpower.com

8.0.1.4 If you wish to discuss matters in this report in more detail, please do not hesitate to contact SPR on the above number prior to responding to the scoping exercise.

APPENDICIES

APPENDIX A SCOPING CONSULTEES

Organisation *Organisations who are issued the scoping report via the Scottish Government. The scoping report is sent directly to all other organisations by ScottishPower Renewables.	
General	
Association of Caithness Community Councils	North of Scotland Hospitality (NOSH)
Association of Salmon Fisheries Boards	NorthCoast Marine Adventures
British Marine Aggregate Producers Association(BMAPA)	Northern Lighthouse Board (NLB)*
British Telecommunications (Radio Network Protection Team)	NorthLink Ferries
Caithness and North Sutherland Regeneration Partnership	North Highland College
Caithness Chamber of Commerce	Pentland Ferries
Caithness Diving Club	Royal National Lifeboat Institution (RNLI)
Caithness Salmon Fishery Board	Royal Society for the Protection of Birds (Scotland) (RSPB)*
Chamber of Shipping*	Royal Yachting Association (RYA) *
Civil Aviation Authority (CAA)*	Salmon and Trout Association
Crofters Commission	Scottish and Southern Energy
Defence Estates (MOD)*	Scottish Canoe Association
Department for Business Enterprise and Regulatory Reform (BERR)	Scottish Coastal Forum
Dounreay Stakeholders Group	Scottish Creelers and Divers
Forestry Commission*	Scottish Environment Protection Agency (SEPA)*
Gills Harbour Ltd.	Scottish Federation of Sea Anglers
Heritage GB	Scottish Fisheries Committee
Highland Council*	Scottish Fishermen's Federation (SFF)*
Highlands and Islands Enterprise (HIE)	Scottish Fishermen's Organisation
Historic Scotland*	Scottish Government* (Energy Consents; Air Climate Division, Environmental Division-Freshwater Team, Environment Group, Trunk Roads Networks and Ports and Harbours)
Institute of Fisheries Management	Scottish Natural Heritage (SNH)*
International Centre for Island Technology (ICIT)	Scottish Surfing Federation
John O'Groats Ferries	Scottish Water
Joint Nature Conservation Committee (JNCC)	Scottish Wildlife Trust*
Joint Radio Company	Scotways
Marine Conservation Society	Sea Fish Industry Authority
Marine Safety Forum	Sea Mammal Research Unit (SMRU)
Marine Scotland (re: S36, S34, FEPA, MS: Compliance)*	The Crown Estate (TCE)*
Maritime and Coastguard Agency (MCA)*	The Health and Safety Executive*

Organisation *Organisations who are issued the scoping report via the Scottish Government. The scoping report is sent directly to all other organisations by ScottishPower Renewables.	
General	
National Grid	VisitScotland
NATS*	Wick Harbour Authority
Caithness Local Councillors	
Councillor David Bremner	Councillor David Flear
Councillor Robert Coghill	Councillor Willie Mackay
David Sutherland (Caithness Wards Manager)	
Community Councils	
Dunnet and Canisbay Community Council	

APPENDIX B DATA SOURCES

TABLE A1 Data Sources		
Databases/Tools/Statistics	Publications	Consultees
PHYSICAL ENVIRONMENT		
Geology, Seabed Sediments, Sediment Transport and Coastal Processes		
▪ DTI. (2004). Atlas of UK Marine Renewable Energy Resources. Produced by ABPmer, the Met Office, Garrad Hassan, Proudman Oceanographic Laboratory. ▪ UK National Tidal Gauge Network (owned and funded by the Environment Agency, kept online by the Proudman Oceanographic Laboratory) ▪ WaveClimate Accessed at: http://www.waveclimate.com ▪ Mapping European Seabed Habitats (MESH) webGIS ▪ SeaZone	▪ British Geological Society (1996). Chapter 2 Geology and physical environment. *In: Coasts and seas of the United Kingdom.* Region 3 North-east Scotland: Cape Wrath to St. Cyrus, ed. by J.H. Barne, C.F. Robinson, S.S. Kaznowska, J.P. Doody and N.C. Davidson, 19-40. Peterborough, Joint Nature Conservation Committee (Coastal Directories Series). ▪ Appropriate Admiralty charts. ▪ Orkney Admiralty Tidal Stream Atlas	▪ Marine Scotland (MS) ▪ Scottish Environment Protection Agency (SEPA) ▪ Scottish Natural Heritage (SNH) ▪ Highland Council ▪ British Geological Society (BGS) ▪ UK Hydrographic Office (UKHO) ▪ Categorisation of waters - Maritime and Coastguard Agency (MCA)
Water Quality and Effluent Discharges		
▪ Hydrogeology map for Scotland – BGS ▪ SEPA website	▪ Faber Maunsell and Metoc (2007). Scottish Marine Renewables SEA. ▪ SEPA (2006). Scotland's Water Environment Review – Coastal Water Quality 2000-2006. ▪ Scotland's WFD aquatic monitoring strategy (SEPA, 2007).	▪ Scottish Environment Protection Agency (SEPA) ▪ Highland Council Transport, Environmental and Community Services (Environmental Health)
BIOLOGICAL ENVIRONMENT		
Benthic Ecology		
▪ JNCC coastal and sub littoral surveys ▪ Mapping European Seabed Habitats (MESH) database ▪ SNHi website	▪ Barne, J.H., Robson, C.F., Kaznowska, S.S., Doody, J.P. and Davidson, N.C., eds. (1996). Coasts and seas of the United Kingdom. Region 3 North-east Scotland: Cape Wrath to St. Cyrus. Peterborough, Joint Nature Conservation Committee. (Coastal Directories Series). ▪ Bennett, T.L. and Covey, R. (1998). North Scotland (MNCR Sector 3). In: Marine Nature Conservation Review. Benthic marine ecosystems of Great Britain and the north-east Atlantic, ed. By Hiscock, 117-121. Peterborough, Joint Nature Conservation Committee. (Coasts and	▪ Marine Scotland (MS) ▪ Scottish Natural Heritage (SNH)

TABLE A1 Data Sources		
Databases/Tools/Statistics	Publications	Consultees
	seas of the United Kingdom. MNCR series). ▪ Bennett, T.L. and McLeod, C.R. (1998). East Scotland (Duncansby Head to Dunbar) (MNCR Sector 4). In: Marine Nature Conservation Review. Benthic marine ecosystems of Great Britain and the north-east Atlantic, ed. By Hiscock, 123-154. Peterborough, Joint Nature Conservation Committee. (Coasts and seas of the United Kingdom. MNCR series). ▪ Moore, C.G. (2009). Preliminary assessment of the conservation importance of benthic epifaunal species and habitats of the Pentland Firth and Orkney Islands in relation to the development of renewable energy schemes. Scottish Natural Heritage Commissioned Report No. 319. ▪ Moore, C.G. (2010). Preliminary assessment of the conservation importance of benthic species and habitats off the west coast of Orkney and in the Pentland Firth in relation to the development of renewable energy schemes. Scottish Natural Heritage Commissioned Report No. 352.JNCC Coastal Directory for Region 3 North-east Scotland: Cape Wrath to St. Cyrus.	
Terrestrial Ecology		
▪ SNHi	▪ Fowler, S.L., Everett, S.J. and Norton, J.A. (1996). Chapter 8 Land use, infrastructure and coastal defence. In: Coasts and seas of the United Kingdom. Region 3 North-east Scotland: Cape Wrath to St. Cyrus ed. by Barne, J.H., Robson, C.F., Kaznowska, S.S., Doody, J.P. and Davidson, N.C., 159-174. Peterborough, Joint Nature Conservation Committee. (Coastal Directories Series). ▪ The Caithness Biodiversity Action Plan (2003).	▪ Scottish Natural Heritage (SNH)
Ornithology		
▪ SNHi ▪ JNCC ▪ NBN Gateway ▪ Commissioned surveys ▪ Local Biological Records	▪ Faber Maunsell and Metoc (2007). Scottish Marine Renewables SEA. ▪ The Caithness Biodiversity Action Plan (2003). ▪ Seabird and sea mammal observations,	▪ Royal Society for the Protection of Birds (RSPB) ▪ Scottish Natural Heritage (SNH)

TABLE A1 Data Sources		
Databases/Tools/Statistics	Publications	Consultees
	existing 300kW device, Norway. ▪ Mitchell, P.I., Newton, S.F., Ratcliffe, B. & Dunn, T.E. (2004). Seabird populations of Britain and Ireland. Christopher Helm, London. ▪ Stone *et al* (1995). An atlas of seabird distribution in north-west European waters. Discontinued	▪ Marine Scotland (MS)
Marine Mammals		
▪ SNHi ▪ NBN Gateway ▪ Commissioned surveys ▪ SMRU survey records ▪ Local Biological Records	▪ Faber Maunsell and Metoc (2007). Scottish Marine Renewables SEA. ▪ Sea Mammal Research Unit (2001). Surveys of harbour seals on the west and east coasts of Scotland. Scottish Natural Heritage Commissioned Report F00PA41. ▪ Sea Mammal Research Unit (2002). Surveys of harbour (common) seals in Shetland and Orkney, August 2001. Scottish Natural Heritage Commissioned Report F01AA417 ▪ Sea Mammal Research Unit (2003). Monitoring harbour seals in Special Areas of Conservation in Scotland. Scottish Natural Heritage Commissioned Report F01AA403. ▪ Reid, J.B., Evans, P.G.H., & Northridge, S.P. (2003) Atlas of Cetacean distribution in north-west European waters	▪ Scottish Natural Heritage (SNH) ▪ Sea Mammal Research Unit (SMRU) ▪ Marine Scotland (MS)
Fish and Shellfish		
▪ SNHi ▪ NBN Gateway ▪ MarLin ▪ CEFAS	▪ Faber Maunsell and Metoc (2007). Scottish Marine Renewables SEA. Environmental Report Section C SEA Assessment: Chapter C7 Fish and Shellfish. ▪ Coull, K.A., Johnston, R. & Rogers, S.I. (1998). Fisheries Sensitive Maps in British Waters. Published and distributed by UKOOA Ltd.	▪ Scottish Natural Heritage (SNH) ▪ Marine Scotland (MS)
HUMAN ENVIRONMENT		
Commercial Fisheries and Aquaculture		
▪ CEFAS ▪ DEFRA	▪ DEFRA (2008). The United Kingdom fishing vessel list. ▪ Faber Maunsell and Metoc (2007). Scottish Marine Renewables SEA. Environmental Report Section C SEA Assessment: Chapter C7 Fish and Shellfish. ▪ Seafish (2008). Economic survey of the UK fishing fleet 2006.	▪ Marine Scotland (MS) ▪ Scottish Environment Protection Agency (SEPA) ▪ Scottish Fishermen's Federation
Maritime Navigation		

TABLE A1 Data Sources		
Databases/Tools/Statistics	Publications	Consultees
▪ Maritime and Coastguard Agency (MCA) ▪ Northern Lighthouse Board (NLB)	▪ RYA (2008). UK coastal atlas of recreational boating, second edition. ▪ Admiralty Charts ▪ RADAR survey data ▪ Automatic Identification System (AIS) data	▪ Maritime and Coastguard Agency (MCA) ▪ Northern Lighthouse Board (NLB) ▪ Marine Scotland (MS)
Landscape and Seascape		
▪ SNHi	▪ Caithness Local Plan: http://www.highland.gov.uk/yourenvironment/planning/developmentplans/localplans/caithness-local-plan.htm ▪ Stanton, C. (1998). Caithness and Sutherland Landscape Character Assessment. Scottish Natural Heritage Review No. 103.	▪ Scottish Natural Heritage (SNH)
Cultural Heritage		
▪ The Royal Commission on the Ancient and Historical Monuments of Scotland (RCAHMS) ▪ Hydrographer of the Navy (Admiralty Charts) ▪ Lloyds Wreck register	▪ Faber Maunsell and Metoc (2007). Scottish Marine Renewables SEA. ▪ Historic Environment Guidance for the Offshore Renewable Energy Sector (Wessex Archaeology Ltd for COWRIE, 2007)	▪ Historic Scotland (HS)
Noise		
▪ SNH ▪ SMRU ▪ JNCC ▪ COWRIE	▪ Scottish Executive (1999). Planning Advice Note (PAN 56). Planning and Noise. ▪ Faber Maunsell and Metoc (2007). Scottish Marine Renewables SEA. ▪ Faber Maunsell and Metoc (2007). Scottish Marine Renewables SEA; Chapter 9: Marine Mammals. ▪ Atlas of Cetacean Distribution in north-west European Waters – JNCC	▪ Scottish Natural Heritage (SNH) ▪ Marine Scotland (MS) ▪ Sea Mammal Research Unit (SMRU)
Socio-economics		
▪ VisitScotland Research ▪ Office for National Statistics – Official labour market statistics. ▪ HIE	▪ Scottish Government (2007). Economic Strategy. ▪ Caithness Local Plan: http://www.highland.gov.uk/yourenvironment/planning/developmentplans/localplans/caithness-local-plan.htm ▪ Scottish Government (2005). Going for Green Growth; a Green Jobs Strategy for Scotland.	▪ Scottish Government ▪ Highlands and Islands Enterprise (HIE)
Tourism and Recreation		
▪ VisitScotland Research ▪ Office for National Statistics – Official labour market statistics. ▪ Highlands and Islands	▪ Scottish Government (2007). Economic Strategy. ▪ Caithness Local Plan: http://www.highland.gov.uk/yourenvironment/planning/developmentplans/localpl	▪ Scottish Government ▪ Highlands and Islands Enterprise (HIE)

TABLE A1 Data Sources		
Databases/Tools/Statistics	Publications	Consultees
Enterprise	ans/caithness-local-plan.htm ▪ RYA (2008). UK coastal atlas of recreational boating, second edition. ▪ Caithness Core Paths Plan http://www.highland.gov.uk/FJ_CMS/Templates/Standard.aspx?NRMODE=Published&NRNODEGUID=%7b915BB9A3-4177-47ED-B724-D295723C94F2%7d&NRORIGINALURL=%2fleisureandtourism%2fwhat-to-see%2fcountrysideaccess%2fcorepathplans%2ehtm&NRCACHEHINT=Guest#caithness ▪ Caithness Explorer (2008). Things to see and do in Caithness. North of Scotland Newspapers. ▪ Humphreys, R. and Reid, D. (2002). The Rough Guide to Scotland 5th edition. Rough Guides Ltd.	
Military Activity		
▪ MoD	▪ Faber Maunsell and Metoc (2007). Scottish Marine Renewables SEA. ▪ MOD Practice and Exercise area (PEXA) charts	▪ MoD
Air and Climate		
▪ Meteorological Office ▪ National Atmospheric Emissions Inventory	▪ National Atmospheric Emissions Inventory	▪ Highland Council ▪ Scottish Environment Protection Agency (SEPA) ▪ Scottish Government ▪ Traffic Scotland
Other Human Activities		
		▪ The Crown Estate ▪ Scottish Environment Protection Agency (SEPA) ▪ Maritime and Coastguard Agency (MCA) ▪ Highland Council