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Pentland Firth and Orkney Waters Marine Spatial Plan

A Proposed Approach for a MSP Framework and Regional Locational Guidance for Marine Renewable Energy

Scottish Government (Marine Scotland)
May 2009

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Rev No	Comments	Checked by	Approved by	Date
1	Draft Report	SE	IAB	April 2009
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Table of Contets

Summary

The following document sets out the proposed approach to be taken for the preparation of:

- A Framework for a Marine Spatial Plan (MSP) for the Pentland Firth and Orkney Waters, and
- Regional Locational Guidance (RLG) for marine renewable energy developments (wave and tidal stream) for the same area.

The aim of the document is to seek feedback on the suggested approach.

Descriptions MSP Framework and RLG

The MSP Framework and RLG which will be completed by January 2010, represent the first step towards preparing a statutory Marine Spatial Plan for the Pentland Firth and Orkney Waters. They are being prepared to assist stakeholders, developers and decision makers in responding to the rapid increase in interest in developing marine renewable energy in the Pentland Firth and Orkney Waters.

A summary of the reports is provided below.

Document Title	Summary Description	Date of Issue
MSP Framework	▪ Sets out long term strategic vision, high level strategic objectives and guiding principles for the current and future use, management and protection of the Pentland Firth and Orkney Waters. ▪ Will also include high level policy statements on the direction and priorities for future marine developments in the area. ▪ ***This document will cover all marine sectors***	January 2010
Regional Locational Guidance (RLG)	▪ Will provide guidance and technical advice for developers and regulators on future marine renewable energy developments (wave and tidal) within the Pentland Firth and Orkney Waters. ▪ ***This document will focus on marine renewable energy developments (wave and tidal stream only.***	January 2010

Overview of this Document

This document provides information on the following:

- Background information including an explanation of the proposals for marine spatial planning in Scotland.
- A route map illustrating the relationship between this document, the MSP Framework and RLG and how these documents all fit within the wider process of preparing a statutory MSP following formal introduction of the Scottish Marine Bill.
- The proposed approach to consultation with stakeholders, developers, regulators and the public.
- The proposed approach to the preparation of the MSP Framework (to be issued in January 2010)
- The proposed approach to the preparation of the RLG (to be issued in January 2010 with the MSP Framework)
- Information obtained to date including a review of existing environmental baseline data that has been obtained from previous studies.

A summary of key facts about this study is provided in the table below.

Ownership of MSP Framework and Locational Guidance	Marine Scotland
What Prompted the Document	This document has been prepared in response to the following: ➢ Proposed enactment of the Scottish Marine Bill which will provide the legal framework for the preparation marine spatial plans ➢ Increased commercial interest in developing marine renewable energy in Scottish waters as demonstrated by the Crown Estates licensing round ➢ Increased need to understand and resolve potential challenges to the development of marine renewable energy
Lifespan of Framework and Guidance	The Framework and Regional Locational Guidance will remain relevant until the statutory Marine Spatial Plan is produced.
Period Covered	For planning purposes, the year 2020 has been chosen.
Geographical Coverage	The area covered by this study includes the Pentland Firth and Orkney Waters from mean high water mark seaward to 12nm (see Figure 1.1).

Timeline for Preparation of Reports

The Key Milestones for this study are shown in the table below. Possible dates for the Statutory MSP following the enactment of the Marine Bill are also show,

Key Milestone Dates	**MSP Framework**	**RLG for Wave and Tidal Stream Energy Projects**
May 2009	**MSP Framework: Proposed Approach**	**RLG Proposed Approach**
May /August 2009	Consultation	Consultation
Autumn 2009	Draft MSP Framework	Draft RLG

Key Milestone Dates	MSP Framework	RLG for Wave and Tidal Stream Energy Projects
Autumn 2009	Consultation	Consultation
January 2010	Final MSP Framework	Final RLG
Scottish Marine Bill Enacted 2010 (Likely)		
2010 onwards	National Marine Spatial Plan including strategic initiatives & secondary legislation and or Guidance produced	
2010 to 2014 (approximate date)	Regional Marine Spatial Plans (MSP).	

Feedback

We would welcome your views on the proposals set out in this report. These should be received by **26 June 2009**. Please respond by e-mail or in writing to contact address below.

Contact Point for Responses	**Iain Bell** AECOM Dunedin House 25 Ravelston Terrace Edinburgh EH4 3TP Iain.Bell@aecom.com

1 Introduction

1.1 Introduction

This document sets out the proposed approach to be taken to the preparation of a Framework for the Marine Spatial Plan (MSP) for the Pentland Firth and Orkney Waters (Figure 1.1) together with Locational Guidance for marine renewable energy development (wave and tidal stream) for the same area (referred to as Regional Locational Guidance (RLG)). The aim is to seek feedback on the suggested approach.

This study is being undertaken as a result of two related events (see Chapter 2 below):

- The considerable interest in developing marine renewable energy in the Pentland Firth and Orkney Waters, as demonstrated by Scottish Government policy and the Crown Estates' licensing round; and
- The emergence of marine spatial planning, which would become a statutory requirement with the enactment of the Scottish Marine Bill.

The key outputs of this study are:

- A MSP Framework to provide guidance and direction for the preparation of a future, statutory MSP for the Pentland Firth and Orkney Waters. The Framework will cover all relevant marine sectors, activities and objectives; and
- Regional Locational Guidance (RLG) for wave and tidal stream energy developments (individually and cumulatively) for the Pentland Firth and Orkney Waters. This work needs to be undertaken rapidly in order to usefully inform emerging development proposals.

1.2 Definitions and Key Facts

The precise function and coverage of marine spatial planning, and what a marine spatial plan will contain, will not be established until such time as the Marine Bill is enacted and further legislation and / or guidance is published by government (see Chapter 2 below). Furthermore, it is recognised that in the timescales available there are significant limitations on what can be achieved. The terms used in this document and the proposed scope of the MSP Framework and RLG therefore need to be explained.

Earlier references to the MSP for Pentland Firth and Orkney Waters referred to an 'Interim' Plan. The word Framework has replaced Interim Plan to reflect the fact that the Framework is not a plan but refers to the establishment of a strategic vision for the Pentland Firth and Orkney Waters. The MSP Framework is non statutory and will include strategic objectives and guiding principles for the future comprehensive MSP. It is a stepping stone on the way to producing a statutory MSP, but it is not an MSP. It will cover all marine sectors of relevance to the study area.

The need for locational guidance for marine renewable energy developments was set out in the Scottish Government's Marine Energy Policy Statement (Scottish Government, 2008)[1].

Logically, locational guidance for development should be undertaken in tandem with the marine spatial planning process. While marine spatial planning has not been formally introduced there is an opportunity to progress with the preparation of locational guidance for the Pentland Firth and Orkney Waters area in advance of the enactment of the Scottish Marine Bill. This will help to ensure that the locational guidance is linked into the wider marine planning process and to act as a pilot study to inform the preparation of future MSPs.

In terms of this study, the RLG will be restricted to wave and tidal stream power developments within the Pentland Firth and Orkney Waters. This is in response to the need to react rapidly to the considerable interest shown in developing marine renewable energy within the study area.

It is recognised that there are many other users of the sea and that other marine developments may occur within the study area and the timeframe for the preparation of the MSP Framework. However, planning for these other activities is complex and would require a considerable amount of data collection and analysis, combined with stakeholder consultation. Therefore it was considered better to adopt this more flexible approach than to produce a full MSP in haste and risk planning poorly.

In this document the term Regional Locational Guidance refers to guidance on:

- Identifying areas of opportunity for wave and tidal stream development within the Pentland Firth and Orkney Waters area and identifying locations of existing and potential supporting infrastructure
- Providing criteria that developers would need to meet in order to increase the acceptability of their proposals
- Explaining how overlapping interests can be managed in a way which can be agreed by all stakeholders; and
- Providing spatial planning guidance for multiple wave and tidal stream developments within a given area.

It is hoped that in developing regional locational guidance for a specific sector, that lessons can be learned to inform locational guidance for other sectors.

A summary of Key Facts about this study is provided in Table 1.1 below.

Table 1.1: Key Facts

Ownership of MSP Framework and Locational Guidance	Marine Scotland
Title of Document	Pentland Firth and Orkney Waters Marine Spatial Plan (MSP) Framework and Regional Locational Guidance (RLG) for Marine Renewable Energy
Document Subject	➢ Preparation of a Framework for the future Pentland Firth and Orkney Waters MSP ➢ Locational Guidance for wave and tidal stream developments in the Pentland Firth and Orkney Waters

[1] The Marine Energy Policy Statement included the following statement: '*By drawing together data gathered during the SEA [Marine Renewables Strategic Environmental Assessment (Faber Maunsell & Metoc, 2007] process and available elsewhere, the Group will commission a detailed analysis and map of the marine resource, overlaid with all known data regarding potential constraints or other limiting factors. This might take the form of a GIS map, balancing the resource against known constraints and identifying broadly the best potential sites for development*. While the policy statement refers to all of Scotland, the same principles apply to the area specific guidance proposed for the Pentland Firth and Orkney Waters as set out in this consultation document.

What Prompted the Document	This consultation document has been prepared in response to the following: ➢ Proposed enactment of the Scottish Marine Bill which will provide the legal framework for the preparation marine spatial plans ➢ Increased commercial interest in developing marine renewable energy in Scottish waters as demonstrated by the Crown Estates licensing round ➢ Increased need to understand and resolve potential challenges to the development of marine renewable energy
Lifespan of Framework and Guidance	The Framework and Regional Locational Guidance will remain relevant until the statutory Marine Spatial Plan is produced.
Period Covered	For planning purposes, the year 2020 has been chosen. This date ties in with the Scottish Government's target for renewable energy of 50% and is also the target date for meeting the objectives of the Marine Strategy Framework Directive (see Chapter 2).
Geographical Coverage	The area covered by this study includes the Pentland Firth and Orkney Waters from mean high water mark seaward to 12nm (see Figure 1.1). The coverage is linked to the Strategic Area of Interest proposed by Crown Estates (see Chapter 2, Section 2.1). It is considered that by 2020 development will primarily focus in areas within 12nm. The geographical coverage is likely to be revised once the boundaries of the Marine Regions are determined (see Chapter 2, Section 2.3.2).
Contact Point for Responses	**Iain Bell** AECOM Dunedin House 25 Ravelston Terrace Edinburgh EH43BH Iain.Bell@aecom.com

1.3 Aims and Structure of this Document

The main aims of this document are to:

- Consult on scope and content of a Framework for the Pentland Firth and Orkney Waters MSP.
- Consult on scope and content of RLG for wave and tidal stream energy development.
- Identify the key issues relatig to the current and future use of the marine environment within the Pentland Firth and Orkney Waters.
- Facilitate open and transparent discussion, and commitment, amongst key stakeholders, regulators, developers and the local community on the following:
  - Opportunities and solutions for resolving overlapping/ competing interests.
  - Identification of potential locations/areas for wave and tidal stream energy projects and locations of existing and potential supporting infrastructure.
  - Development of technical advice and criteria for inclusion in RLG to assist with the consenting and deployment of marine development projects. Development of practical and enforceable mitigation measures for inclusion in the RLG. Identification on future research/survey and monitoring requirements and preparation of methods statements for their development and implementation.

The document is **structured** as follows:

- **Chapter 2** sets the context to the marine spatial planning process in Scotland
- **Chapter 3** provide information on how the preparation of a Framework for the Pentland Firth and Orkney Waters MSP (MSP Framework) and RLG fits within the wider process of marine spatial planning
- **Chapter 4** sets out the proposed approach to consultation and involving stakeholders in the development of the MSP Framework and RLG
- **Chapters 5 and 6** set out the approach to the preparation of the MSP Framework and RLG
- **Appendices A to D** provide an overview of the information obtained to date as part of the initial preparation for the development of the MSP Framework and RLG. This includes a review of baseline data that has been obtained from previous studies or made available through initial consultations held as part of the preparation of this consultation document.

1.4 Timescales and Key Milestones

Table 1.2 provides an overview of the anticipated timescale and key milestone dates involved in the preparation of the MSP Framework and RLG. Further information on how this relates to the wider marine spatial planning process and the preparation of a Marine Spatial Plan (MSP) for the Pentland Firth and Orkney Waters is presented in Chapters 2 and 3.

Table 1.2: Timescale and Key Milestone the Pentland Firth and Orkney Waters MSP and RLG

Key Milestone Dates	**MSP Framework**	**RLG for Wave and Tidal Stream Energy Projects**
Feb 2009 to March 2009	Initial consultation	Initial consultation
May 2009	**MSP Framework: Proposed Approach**	**RLG Consultation Document**
Summer 2009	Consultation	Consultation
Autumn 2009	Draft MSP Framework	Draft RLG
Autumn 2009	Consultation	Consultation
January 2010	Final MSP Framework	Final RLG
Scottish Marine Bill Enacted 2010 (likely)		
2010 onwards	National Marine Spatial Plan including strategic initiatives & secondary legislation and or guidance to be produced	
2010 to 2014 (approximate date)	Regional Marine Spatial Plans (MSP). Note that the boundaries of planning regions have not yet been determined.	

1.5 Benefits and Limitations of Producing a MSP Framework and RLG

There are a number of benefits and limitations associated with advancing the preparation of an MSP Framework and associated Regional Locational Guidance for the Pentland Firth and Orkney Waters. A widely held view is that marine spatial planning must consider all sectors simultaneously and that planning for a single development sector in isolation (such as offshore renewable energy) contradicts one of the fundamental aims of marine spatial planning. This is because planning for a single sector in isolation may fail to take fully into account all competing demands for marine resources and conservation objectives. To mitigate this risk with respect to preparing RLG, the MSP Framework will provide comprehensive coverage of all sectors and recognise that marine renewable energy is only part of a larger set of uses, activities and interactions. Even so, the proposed approach does have a number limitations as well as benefits. These are summarised in Table 1.3 below.

Table 1.3: Benefits and Limitations

Benefits	Limitations
Preparation of MSP Framework: ■ Provides advance notice to developers and regulators on likely content and structure of formal MSP for Pentland Firth and Orkney Waters. ■ Acts as a pilot study for future MSPs. ■ Provides the ground work for the statutory MSP and speeds up the process. **Preparation of RLG**: ■ Assist developers and regulators with consenting of developments following award of site leases from the Crown Estate. ■ Assist developers and regulators with consenting and deployment of future marine developers associated with future licensing rounds. **Resolving overlapping interests**: ■ Establishes a Framework for tackling overlapping interests. ■ Early consultation enables options for resolving overlapping interests to be examined and identifies areas where further work will be required as part of development of formal MSP. ■ Help steer activities/developments to the most appropriate locations. ■ Help address issues of capacity and cumulative impacts. **Availability of Baseline Data**: ■ Early identification of data gaps and survey/research studies/monitoring required to inform preparation of formal MSP (post 2010). ■ Focuses current survey/research studies and monitoring on collection of data to inform formal MSP and supporting assessments e.g. SEA and Appropriate Assessment.	**Current disparity in timescales between preparation of MSP Framework and Crown Estate Licensing Round**: ■ Evaluation of Crown Estate licence applications: Summer/Autumn 2009. ■ Preparation of MSP Framework and RLG Autumn 2009 for adoption January 2010. Consequences: ■ MSP Framework will not be prepared in time to inform Crown Estate evaluation of licences (summer 2009) ■ The RLG will not inform initial selection of sites presented in licence application tenders (May 2009) as preferred sites for development are unknown (see below). Crown Estate Confidentially Clause: ■ Due to Crown Estate confidentially associated with licence applications, there are restriction on the level of information that can be made available until site licences have been awarded (summer / autumn 2009). **Absence of Legislation, Guidance and National Marine Planning Policy** ■ The precise content and function of an MSP will not be known until such time as legislation, national guidance and national policy are in place. It is anticipated that the Marine Bill will be enacted in 2010 and secondary legislation and guidance will follow the Act over a period of years. A National Marine Plan will be produced in advance of Regional MSPs. As such the Framework being produced should be seen as a pilot study. **Availability of Baseline Data** ■ Survey, research and monitoring requirements for preparation of MSP Framework (and for other needs) are still under discussion/development ■ Baseline data may not be available for preparation of RLG or to inform development of MSP Framework.

2 Context

2.1 Background

In 2008, The Crown Estate, in response to rising levels of interest in the development of marine renewables in the Pentland Firth and Orkney waters, commenced a competitive call for the submission of applications from developers to secure sites (seabed leases) for future marine renewable energy projects. The closing date for the receipt of these applications was the 15th May 2009.

The Pentland Firth and Orkney Waters have long been recognised as having exceptional resource potential for marine renewable energy. Orkney, in particular, has been at the forefront of efforts to promote and develop the marine renewables sector over the last decade and more, as demonstrated by the establishment of the European Marine Energy Centre (EMEC).

The Scottish Marine Renewables SEA (Faber Maunsell (now AECOM) & Metoc, 2007) confirmed that there is considerable potential for the development of marine renewable energy projects in the Pentland Firth and Orkney Waters. However, it also identified that there is the possibility of adverse impacts on the environment. One of the recommendations of the SEA was to further investigate how opportunities for development could be increased by preparing locational guidance for marine renewables. This recommendation was incorporated into the Scottish Government's Marine Energy Policy Statement. The Scottish Government recognised that locational guidance could best be achieved through the process of marine spatial planning.

Marine spatial planning was identified in Scotland in 2005 by the Scottish Coastal Forum (SCF) as a mechanism for the sustainable management of marine activities and increased protection of the valuable marine environment and natural resources. Consequently the process of marine spatial planning now forms a major component of the emerging Scottish Marine Bill, which is expected to receive royal assent in 2010.

In absence of any formal legislation, there is currently no formal requirement for the preparation of an MSP for the Pentland Firth and Orkney Waters. Although there have been a number of pilot schemes implemented through the Scottish Sustainable Marine Environment Initiative (SSMEI) to examine different approaches to the management of the coastal and marine environment and options for development of a MSP there is currently no formal guidance on how an MSP should be prepared, what it should contain and how it should be used.

Therefore, whilst the process of marine spatial planning is recognised as the best approach for managing future marine renewable energy developments in the Pentland Firth and Orkney Waters, the Crown Estates licensing round, for which site applications are being awarded in the summer/autumn 2009, is being undertaken well in advance of the preparation of a formal MSP for this area.

However, keen to maintain alignment with the Crown Estate licensing round and increasing developer interest in the Pentland Firth area, the Scottish Government has made a decision to advance preparation of an MSP for this area. It has also identified the need to advance the preparation of supporting technical advice and guidance (Regional Locational Guidance) to assist with the future consenting and deployment of future marine renewable energy developments. This will be taken forward in a staged approach with the preparation of an MSP Framework and supporting regional Locational Guidance being issued for consultation in autumn 2009, prior to adoption in January 2010.

2.2 The UK and Scottish Marine Bills

The Marine Bill and Coastal Access Bill covers the UK and is currently at the Parliamentary Reporting stage with Royal Assent expected later in 2009. The Marine and Coastal Access Bill "*will ensure clean healthy, safe, productive and biologically diverse oceans and seas, by putting in place better systems for delivering sustainable development of marine and coastal environment*". High level objectives are being developed as part of the UK Marine Bill process.

In 2008, the Scottish Government released its consultation document *Sustainable Seas for All: A Consultation on Scotland' First Marine Bill.* This document set out the Scottish Government's proposals for the preparation of a Scottish Marine Bill. The Marine Bill was subsequently published in May 2009. It is anticipated that this Bill will be enacted in 2010.

The aims of the Scottish Marine Bill are to establish a more integrated, simplified and sustainable approach to the management of marine activities and sectors and increased protection of the natural marine and coastal environment. This will be achieved through five key policy areas:

- A new system of marine planning including overarching objectives for the marine area;
- A streamlined system of consenting and licensing;
- A improved approach to marine conservation;
- A Marine Management Organisation (MMO); and
- Science and data.

This main focus for this consultation document is on the marine spatial planning elements of the Bill as they influence the Framework and regional Locational Guidance.

As stated in Sustainable Seas for All, the formulation of a marine planning system needs to '*integrate with existing statutory planning regimes in and around the marine environment. These include River Basin Management Planning (RBMP) initiatives under the Water Framework Directive (WFD), Inshore Fisheries Group (IFGs) plans and local authorities' existing planning responsibilities. In the near shore zone (approximately out to 6 nautical miles), where competition for space may be more of an issue, a planning system should also consider how it will successfully link and implement an integrated approach to the management of coastal resources'* – Integrated Coastal Zone Management (ICZM).

2.3 Proposals for Marine Planning In Scotland

The marine planning process is expected to result in the production of a series of formal 'spatial plans' for the marine environment. The proposals for marine planning are based on a three tier approach. These tiers comprise:

1. Scotland (National) Level;
2. Regional Level; and
3. International Level.

2.3.1 National Level Plans

Nationally, there will be a single Scottish National Marine Plan. This plan will be prepared by Marine Scotland and will form part of a wider national planning framework for Scotland. The National Marine Plan will have statutory force and therefore will have to be accorded to by all Scottish Public Bodies in exercising their devolved functions.

The National Marine Plan will include:

- National Marine Objectives which would be developed to reflect International and European commitments and obligations and which will include socio-economic objectives for specific sectors; energy, food and tourism;
- Marine Ecosystem Objectives (MEOs) will set out how the Scottish Government will comply with the Marine Strategy Framework Directive (MSFD) obligations and other European and

international commitments e.g. OSPAR and Habitats Directives. The MEOs will be underpinned by the MSFD requirements to adopt the 'ecosystem' approach to the management of the natural marine environment. Further information on MSFD and ecosystem approach is provided in Appendix A; and
- Policies and priorities for the sustainable use, development, management and protection of Scotland's marine and coastal resources.

The National Marine Plan will also include strategic initiatives which will be framed to secure the exploitation of renewable energy resources, in line with targets, the sustainable harvest of the sea, and the sustainable exploitation of wider marine natural resources.

2.3.2 Regional Level Plans

Regional level plans will be prepared for Scottish Marine Regions (SMRs). These regions are likely to be based on a range of characteristics e.g. coherence of the marine and coastal zone; need for planning activity and/or conflict resolution; and the existence of local management structures.

The Scottish Marine Regions (SMRs) will be determined by Marine Scotland and will be managed by Marine Planning Partnerships (MPPs). It is proposed that the Marine Planning Partnerships will comprise representatives from the main stakeholder interests in the area and will include the designation of a lead partner, which may, in some cases, be the local authority.

The main deliverables of a regional marine plan may include:

- Local interpretation of the National Marine Plan and national priorities;
- Strategic local vision for marine and coastal areas;
- Consultation and stakeholder engagement;
- Development of local management policies for specific sectors and activities;
- Identification of potential areas of conflict and resolving conflict;
- Provision of a framework for the granting of development consent;
- Identification of areas of sea for potential activity/development;
- Identification of areas and actions needed for conserving biodiversity;
- Local decision making mechanisms applying marine nature conservation measures;
- Construction of shared principals that could be applied by local public sector organisations in their approach to carrying out activities in the marine area;
- Coordination with existing local management plans and existing regimes (which may not be marine focused) to ensure joined up delivery of a shared local vision for the marine area; and
- Local data and information gathering and co-ordination to inform the development of a locally-focused Marine Plan.

The SMR Planning Partnerships will be responsible for ICZM. ICZM is described in *Sustainable Seas for All* as a "*management process that is intended to facilitate a more integrated approach to the use, development and protection of resources across the land/sea interface and in the near shore zone. ... ICZM aims to ensure sustainable development through coordinating management of resources and activities in the coastal zone*". A key aspect of ICZM will be the integration of the marine and terrestrial planning systems. Scottish Ministers intend that Marine Scotland should have an overarching duty to deliver ICZM in Scotland. Additionally, lead partners should take responsibility for ensuring that the terrestrial impacts of marine developments are reflected in terrestrial plans and vice versa.

A further initiative is the establishment of Inshore Fisheries Groups (IFGs). IFGs will aim to allow all fishermen to participate the management of Scottish inshore fisheries and will result in the preparation of Fisheries Management Plans. It will not be the purpose of MSPs to manage fisheries resources or methods employed, but MSPs will need to consider the interactions between all marine activities and plan for any new infrastructure requirements. Equally, the ISFG Management Plans must take into account the policies contained in the MSP.

The links between the regional marine plans and other plans are illustrated in Diagram 2.1 below.

2.3.3 International Level Plans

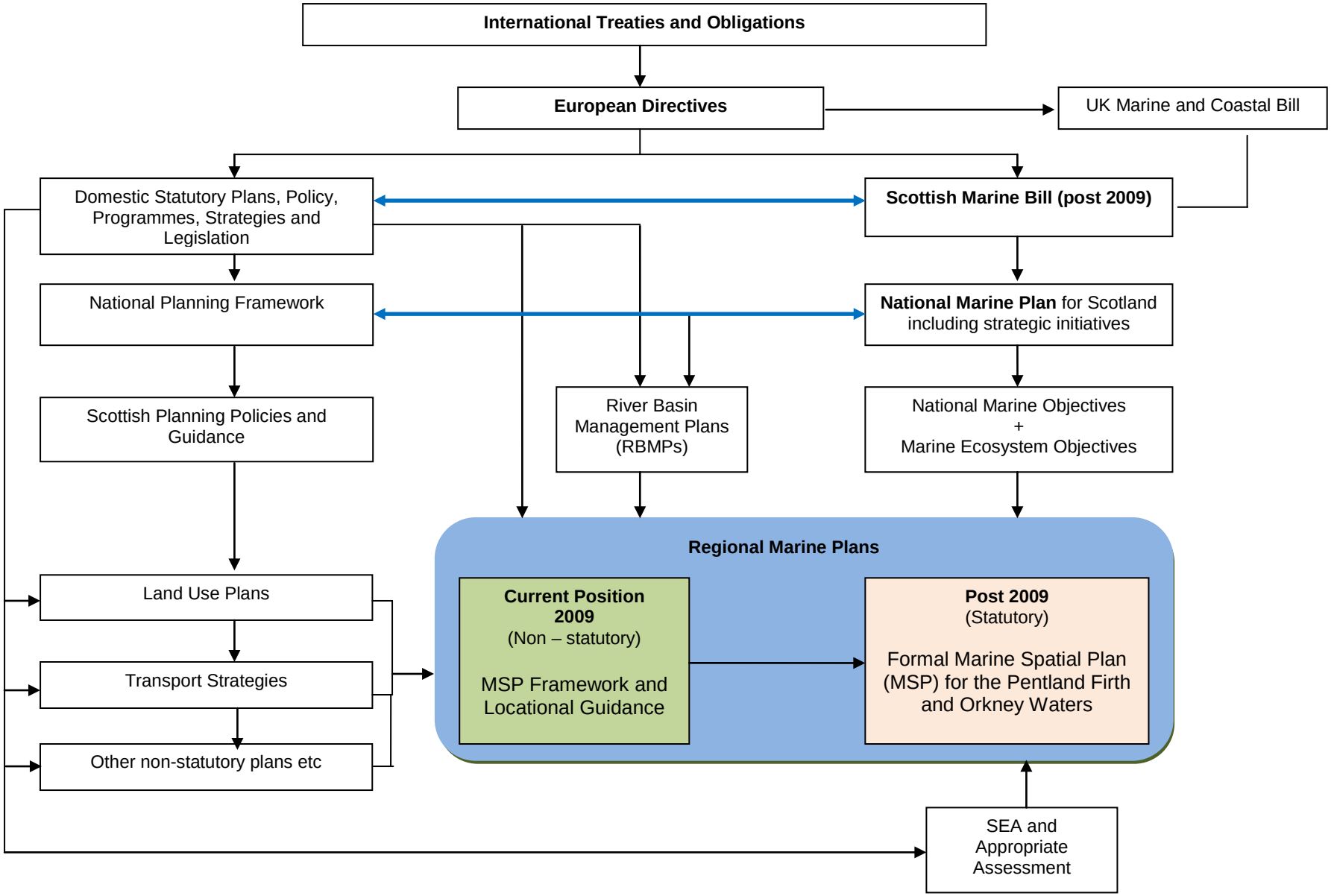
The focus at an international level would be to set Scottish Waters within the wider UK, EU, North Atlantic and global frameworks. The content and objectives of the National Marine Plan and Regional Marine Plans, and the wider Scottish Marine Bill will be underpinned by a number of international and European commitments and obligations. Marine developments that occur outwith the marine spatial planning process e.g. as part of the Crown Estate licensing round will also be underpinned by these international and European commitments and obligations. These are set out in Appendix A.

The wider (international and European) context for the Scottish Marine Bill and the national and regional marine plans is illustrated in Diagram 2.1 below.

2.4 Wider Context: Other Relevant Obligations, Commitments, Legislation and Plans

Diagram 2.1 illustrates the relationship between the MSP Framework and Locational Guidance and other international and European obligations and commitments and national legislation and plans. Further information on this wider context is provided in Appendix A.

Diagram 2.1 Legislative and Planning Context



2.5 National and Land Use Planning Context

In 2006, the Scottish Government introduced the new Planning etc. (Scotland) Act. This Act, which amends the Planning (Scotland) Act 1997, is considered to be the most fundamental and comprehensive reform of the Scottish planning system for sixty years[2].

The main focus of the Planning etc. (Scotland) Act 2006 is to modernise the planning system to enable it to:

- Respond more effectively to different types of development from major developments of national strategic importance (national developments) to very small (minor) developments;
- Improve the efficiency of the planning process including the preparation and content of development plans, determination of planning applications and procedures for appeals;
- Increase community engagement and public participation; and
- Improve the enforcement and monitoring of conditions.

The Act comprises 10 parts which make a number of provisions relating to specific areas of the planning process. In terms of the development of the MSP Framework it will be necessary to identify how proposals for a National Marine Plan will link into the National Planning Framework (NPF) for Scotland, established under Part 1 of the Planning etc (Scotland) Act. In particular, how any strategic development policies or investment priorities that affect the marine environment will be aligned within the National Marine Plan and transposed into relevant regional marine plans.

Part 1 of the Act also includes provisions for the NPF to be used to designate certain developments as 'national developments' and establishes specific procedures for considering such developments. These could include marine developments e.g. port expansions, and will therefore need to be considered in marine spatial plans.

Part 2 sets out the requirements for future development plans. One of the main changes of the Act is the replacement of the previous two tier hierarchy of development plans with a simplified system of single tier Local Development Plans across Scotland except for the City Regions of Edinburgh, Glasgow, Aberdeen and Dundee where there will be a requirement to prepare a Strategic Development Plans. The orders and regulations on the preparation and content of the development plans and to transitional arrangements and appeal procedures came into effect on 28th February 2009.

2.6 Local Development Plan Context

Both the Orkney Island Council and the Highland Council have commenced preparation of their Local Development Plans which, once adopted with replace their existing structure and local plans. As required under the new Act, the preparation of the development plans will involve extensive stakeholder engagement and public participation.

In addition, Highland Council is preparing a Coastal Development Strategy, which may form supplementary guidance linked to the Highland-wide Local Development Plan. The Coastal Development Strategy is progressing in tandem with the Highland wide Local Development Plan to ensure they inform each other.

There is an opportunity for these consultation exercises and the plan preparation process to be linked to, or a least inform the preparation of the MSP Framework and the subsequent Formal MSP, as this will help to ensure consistency across the land use plans and marine plans. Chapter 4 below explains the proposals for joint consultation activities.

[2] http://www.scotland.gov.uk/Publications/2005/06/27113519/35294

2.7 Strategic Environmental Assessment (SEA) and Appropriate Assessment (AA)

Marine plans and programmes resulting from the enactment of the Marine Bill will fall under the requirements of the Environmental Assessment (Scotland) Act 2005. At this time no plan or programme requiring a strategic environmental assessment (SEA) is in preparation and as a result an SEA will not be necessary for the purpose of producing a Framework or Locational Guidance. However, the comprehensive statutory MSP would be subject to SEA. Similarly, an Appropriate Assessment (AA) (or Habitat Regulations Assessment (HRA)) under the Habitats Directive is likely to be required for both future MSPs and for marine based projects likely to have adverse impacts on Natura 2000 sites.

3 Route Map for MSP Framework and Regional Locational Guidance (RLG)

3.1 Introduction

Diagram 3.1 below illustrates how proposals for the preparation of a MSP Framework and Regional Locational Guidance (RLG) for wave and tidal stream energy projects relate to the overall process for the preparation of future statutory MSP. The diagram provides an indication of some of the key stages and activities involved in producing the MSP.

The key below relates to the colour coding attributed to Diagram 3.1 to highlight different levels of progress within the wider MSP timeframe against individual tasks/deliverables.

Key: Progress against Individual Tasks/Deliverables

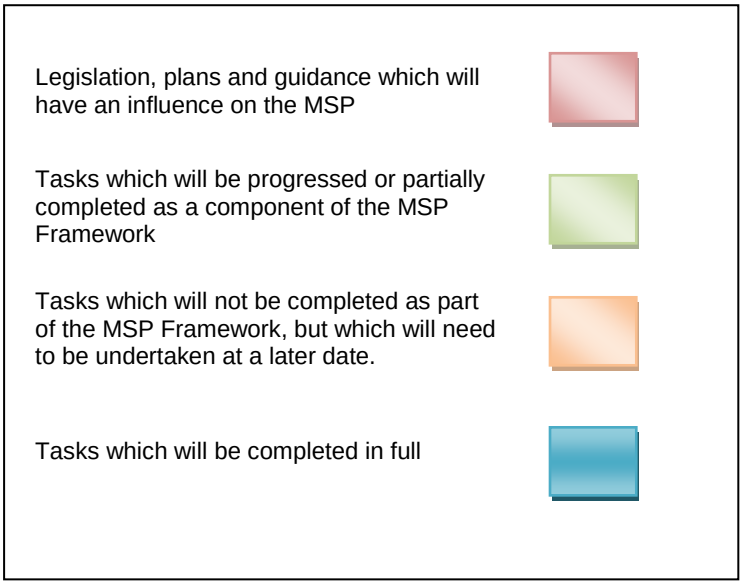
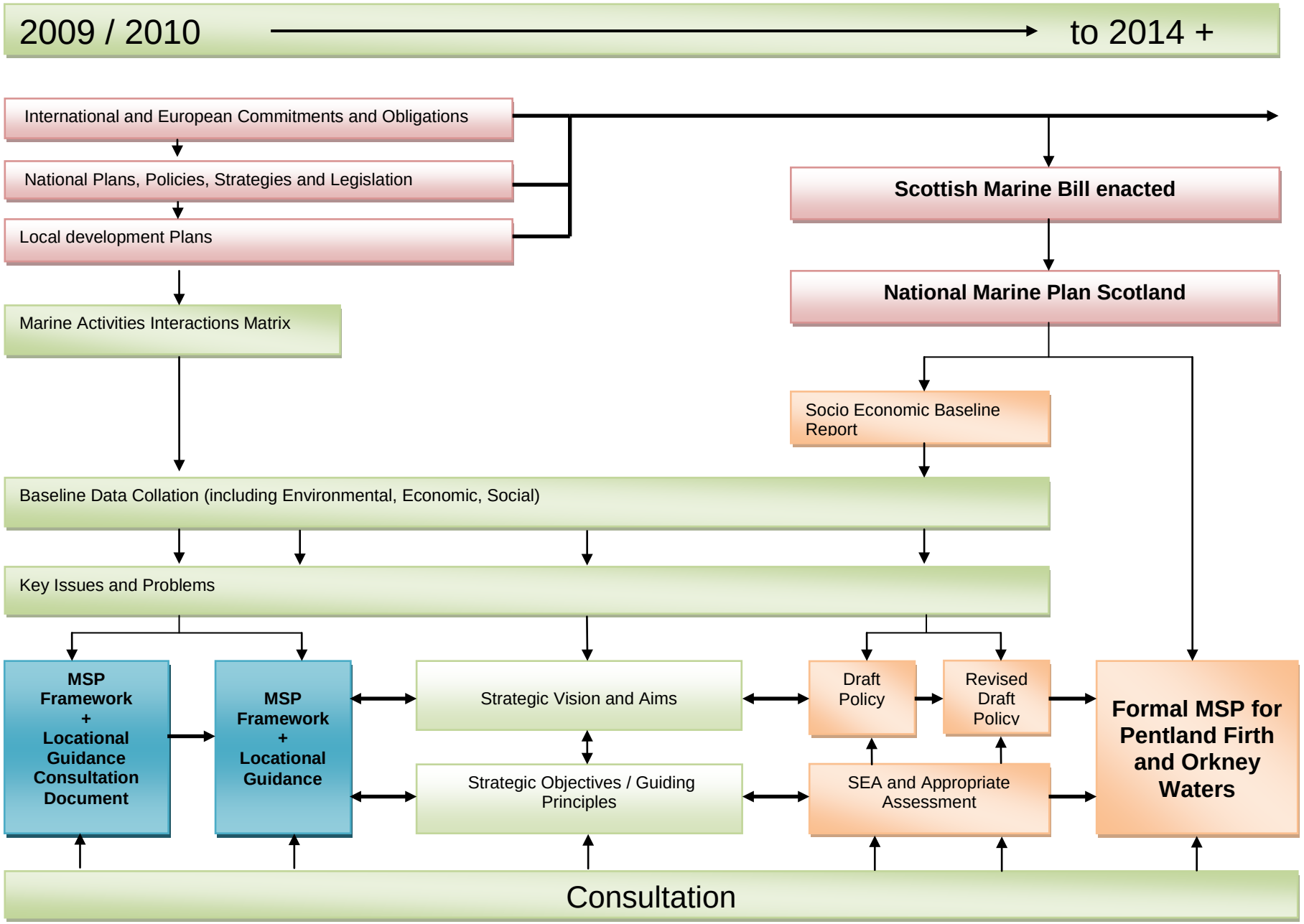


Diagram 3.1 Route Map



4 Approach to Consultation

4.1 Introduction

The approach to the preparation of both the Framework for the MSP and RLG is based on a combination of consultation and technical analysis. The two processes work in tandem with one informing the other. Consultation ensures that all sectors of the marine community, the public and all organisations with responsibilities for the overall protection of the marine environment are given the opportunity to be actively involved in the development of the MSP.

One of the challenges for marine spatial planning is to link into land use planning activities and establish an integrated approach to the use, development and protection of resources across the land/ sea interface. As explained in Chapter 2 Section 2.6 the local authorities are currently in the early stages of preparing LDPs and in the case of Highland Council a Coastal Development Strategy is in preparation. As these plans are being prepared to similar timescales there is an opportunity to link the preparation of LDP, the Coastal Development Strategy and MSP processes.

The aim of this Chapter is to set out the main aims for consultation to be undertaken now as part of the development of the MSP Framework and RLG and explain how and when consultation will be undertaken. The previous chapter explained that this document is the first stage in the process of producing a comprehensive, statutory MSP. It is therefore important to note that there will be further opportunities for consultation and that this is only the starting point.

4.2 Aims of Consultation

Consultation has a number of aims, as summarised below:

- Helps to create working relationships
  - Building trust in the MSP process amongst individuals within different sectors and organisations
  - Building relationships - this is essential for the ongoing preparation and delivery of the MSP
  - Defining roles and responsibilities within and across groups and organisations
  - Establishing connections – building links through people to alternative sources of information or local knowledge
  - Identification of existing and possible future, problems, concerns and overlapping interests
  - Gaining consensus/agreement for the overall content of the MSP
  - Encouraging groups to take ownership of the MSP (or elements of it) and responsibility for its delivery and implementation

- Assists with building the knowledge base
  - Extracting relevant local data
  - Making use of local knowledge to better understanding local conditions, management regimes, protocols
  - Agreeing the approach to baseline data acquisition, identify gaps and agreeing approaches to filling gaps.
  - Gain opinions on existing and possible future problems and issues which need to be addressed by the MSP

- Assists with the preparation of the MSP
  - Ensuring development and delivery of the MSP in accordance with legal requirements and / or good practice
  - Ensuring consistency of the MSP policies with other plans and programmes and integrating the MSP and LDP processes
  - Ensuring the MSP contains the information required by different groups to inform/assist decision making processes
  - Agreeing the Vision, Aims, Objectives and Guiding Principles for the MSP
  - Identification of solutions and opportunities for managing competing or overlapping interests
  - Ensuring mechanisms for the implementation of guidance/advice are appropriate and accord with existing regulatory guidelines/requirements
  - Establishing new guidance and protocols where guidance/advice currently doesn't exist

Although the aims of stakeholder engagement are well understood, in practice they can be difficult to achieve. While the aim is to build consensus and reach agreement it recognised that this is not always possible. Furthermore, the approaches and methods applied to consultation are often not suitable for some of the groups that are being consulted. It is therefore necessary to use a number of different approaches and also to recognise the limitations on what can be achieved.

4.3 How and When Consultation will be Undertaken

In terms of the Framework for the MSP and RLG, the following groups will be included in consultation activities:

1. Local Government (Highland and Orkney Councils)
2. Governmental agencies
3. Non-governmental organisations
4. The public
5. The private sector
6. The Pentland Firth Tidal Energy Project Board (PFTEPB)

A comprehensive list of consultees will be developed in liaison with Marine Scotland, the MESPG and Orkney and Highland Councils. The latter will assist in identifying local people and organisations who should be involved. Table 4.1 below summarises the types of consultation activities that aim to capture each of the target groups. Note that in addition to these activities, all groups will be able to respond to consultation reports including this document and the Draft MSP Framework and Draft RLG.

Table 4.1 Summary of how Different Groups will be involved in Consultation

Main Consultation Groups	How they will be Consulted
Local Government (Highlands and Orkney Councils)	Integrated programme of consultation activities linked to LDP and Coastal Development Strategy processes. Attendance at workshops, community and public consultation events. One-to-one meetings to discuss specific issues.
Governmental Agencies and Crown Estate	One-to-one meetings. Attendance at workshops. Marine Scotland and the MESPG will be involved at all stages.

Main Consultation Groups	How they will be Consulted
Non-governmental organisations	Attendance at workshop (although numbers will need to be need to be limited). One-to-one meetings (although the number of meetings will need to be limited).
The public	Exhibitions at local events. Town hall meetings. Questionnaire.
The private sector	One to one meetings (although numbers will need to be need to be limited). Attendance at workshops (although numbers will need to be need to be limited). Close involvement of the SRF through Scottish Government/ Marine Scotland and MESPG.
The Pentland Firth Tidal Energy Project Board (PFTEPB)	One-to-one meetings. Attendance at workshops. Members are also represented in other groups (local government and government agencies)

More specially, the events which are proposed and their timing are set out in Table 4.2 below. The joint events proposed with Orkney and Highland Councils are shaded.

Table 4.2: Proposed Consultation Activities for MSP Framework and Integration with LDP

Consultation Activity (Joint consultation events are shaded)	Timing	Participation
Stage: Definition and Scope of MSP Framework and Locational Guidance		
Initial meetings	February to April 2009	This includes members of the MESPG, local government and agencies such as SNH.
Presentations at conference and other events directly related to marine spatial planning or marine renewable energy	March to April 2009	Presentations to inform those attending these events.
Framework for MSP: Approach (This document)	Published May 2009. Comments requested within 5 weeks of publication.	Publicly available document which anyone can comment. Will be targeted a key stakeholders and other interested parties.
Stage: Preparation of the Draft MSP Framework and Locational Guidance		
Internet questionnaire for LDP and MSP Framework.	To be undertaken in the early stages (June/July) to get initial feedback on key issues and concerns.	To be focussed on local stakeholders, organisations, and members of the public within the study area.
Further meetings with key stakeholders	May to August 2009	Key national and local stakeholder groups. One-to-one meetings designed to deal with specific matters.
Local workshop(s) in Orkney and Caithness. The events are envisaged to provide the opportunity for presentation and workshop based activities focusing on thematic issues which can be made relevant to both the Local Development Plan and the Marine Spatial Plan.	June – July to provide information prior to finalising the Draft MSP Framework.	Bringing together key local stakeholder groups into a single forum. A wide range of interested parties will be invited including user or the marine environment and developers.
Combined exhibition with Council staff at main agricultural shows or similar local events (such as local Highland Games).	These events are typically in August.	Meeting, informing and getting feedback from the public at popular local events.

Consultation Activity (Joint consultation events are shaded)	**Timing**	**Participation**
Stage: Consultation on Draft Framework for MSP and Locational Guidance		
Publish Draft Framework and Location Guidance for consultation	September - October 2009	Available for all. Publicise locally, in newspapers and other media including local radio.
Public consultation. Travelling exhibition to the main inhabited north and south isles of Orkney and around Caithness and Sutherland would ensure maximum awareness and opportunity for public to be involved in the LDP and Marine planning process.	The tour would fall within our consultation period (Sept-Nov) following the publication of the Draft Framework. The audience could comment on the draft Framework for the MSP	Local people and organisations, including remote communities.
Consultation Report	Published with Framework and Locational Guidance in January 2010.	Available for all to comment.
Stage: Other Activities carried out over all Stages		
Incorporating information in newsletters and leaflets.	To be determined	Aimed at public and local stakeholders

4.4 Consultation with the Public

A number of the events are focussed primarily at the public. These include the household questionnaire, exhibitions at important local events, the travelling exhibition and the provision of information through other media sources such as the internet, local radio, newsletters and leaflets. We would welcome feedback on this approach and other ideas for engaging with the public.

5 MSP Framework

5.1 MSP Framework

5.1.1 Focus of MSP Framework

The MSP Framework will set out a long-term strategic vision for the use, management and protection of the Pentland Firth and Orkney Waters, and will contain a series of high level objectives, guiding principles and policy statements on the direction and priorities for future marine developments in the area.

The Framework will be a short, succinct, illustrated document which will be developed through extensive consultation with a number of key stakeholders. It will underpin any future statutory MSP prepared for the area, and, until a statutory MSP is adopted, will form a material consideration in future development management decisions.

5.1.2 Content of the MSP Framework

The MSP Framework will contain the following information:

- Non-Technical Summary (NTS) with illustrative figures and diagrams
- Introduction
- Context
  - Importance of Pentland Firth and Orkney Waters in a national, regional and local context
  - Legislative and policy context for the MSP Framework
  - External influences e.g. other relevant plans and programmes e.g. Highland Council Local Plan and Coastal Strategy, Orkney Island Local Plan
- Statement on stakeholder engagement (consultation)
- Key issues
- Vision, strategic objectives and guiding principles
- Strategic priorities e.g.:
  - Growth of marine renewable energy sector
  - Provision of supporting infrastructure e.g. grid connections and reinforcement
  - Scapa Flow Transhipment Terminal Development
  - Pentland Firth International Shipping Route
  - Inshore fisheries
  - Designation of offshore Special Areas of Conservation (SAC) and Special Protection Areas (SPAs)
- Action plan
  - Advice on future policy development
  - Recommendations for examining and resolving competing interests
  - Advice on preparation of detailed Area/Sector Action Plans
  - Additional studies/assessments required to support the development of a statutory MSP e.g. Appropriate Assessments, Heritage Studies, Shipping and Navigation Studies and assessments into grid requirements
  - Recommendations for guidance and protocols to support development of marine policies (informed by work undertaken on Marine Energy Spatial Planning Group (MESPG) environmental research studies and preparation of EIA Guidance and Licensing Procedures)

5.1.3 Coverage of the MSP Framework

Geographically, the MSP Framework will cover the Pentland Firth and Orkney territorial waters from the mean high water mark seaward to 12nm (see Figure 1.1). However, this area may be subject to change in line with future Marine Regions that will be introduced under the Scottish Marine Bill.

In terms of sector coverage, it is proposed that the MSP Framework will take into account all marine and coastal sectors that occur (current and future) within the Pentland Firth and Orkney Waters and will therefore need to be covered in detail within the Statutory MSP. The main marine and coastal sectors that will be referred to in the MSP Framework and covered in a future statutory MSP are listed in Table 5.1 below.

Table 5.1: MSP Framework Sectors

Marine MSP Sectors	Sub-Sectors
General	Population and local communities (sizes and distribution)
Environmental Quality	Nature conservation, biodiversity, geological
	Natura Sites
	Other existing protected sites (SSSIs)
	Protected species
	Marine Protected Areas (MPAs)
	'Local' designations
	Seascape quality and designations
	Heritage
	Water environment and contaminants
	Emissions to air
Renewable Energy Production	Tidal Power
	Wave power
	Offshore wind power
	Grid connection/reinforcement and other associated infrastructure
Infrastructure	Carbon storage areas
	Coastal defence
	Cables including telecommunications
	Marine waste disposal
	Military activities
Mineral Resources	Oil and Gas extraction and supporting infrastructure
	Aggregate extraction
Navigation, ports and harbours	Navigation and Shipping
	Ports and harbours including Scapa Flow Container Transhipment Terminal
	Ferries
Tourism and Recreation	Recreational boating
	Tourism and recreational development
	Other marine recreation activities
Fishing and Aquaculture	Aquaculture
	Commercial fishing
	Inshore Fisheries

5.2 Key Influencing Factors

The preparation of the MSP Framework will be underpinned by the following:

- Identifying solutions for tackling overlapping interests and competing activities
- Tackling existing and future issues/problems rather than introducing unnecessary changes
- Ensuring stakeholder/developer and regulator engagement led process
- Maximising inputs from existing baseline data and current knowledge
- Building upon previous and current research studies e.g. MESPG environmental research studies and preparation of EIA Guidance and Licensing Procedures
- Identifying where additional studies/assessments are required to inform development of Statutory MSP e.g. navigation studies, Appropriate Assessments, heritage studies
- Developing a flexible framework that can be readily updated to reflect future statutory requirements for Marine Spatial Planning set out in the Scottish Marine Bill and subsequent secondary legislation and guidance
- Focusing on spatial planning for the marine environment and not reproducing, reinforcing or amending existing legislative controls or regulatory mechanisms

5.2.1 Addressing Overlapping Interests

The MSP Framework will identify where current and future overlapping interests and competing activities are likely to occur and will recommend actions for working with stakeholders to identify solutions for tackling and resolving those overlapping interests and competing activities as part of the preparation of the statutory MSP.

In developing actions/recommendations for identifying and examining overlapping interests and competing interests, specific attention will be given to:

- Maximising the use of existing baseline data and current knowledge on marine sectors and environmental quality/characteristics.
- Establishing a robust, objective and transparent approach to tackling overlapping interests and competing activities as part of the preparation of the statutory MSP.
- Identifying proposals for managing risk where data/information gaps or limitations could affect the ability of the MSP to deliver the strategic vision/high level objectives for the Pentland Firth and Orkney Waters. This will involve:
  - Prioritising sectors/issues to enable resources/additional studies/research to be focused on tackling the most significant issues/competing interests.
  - Identifying practical solutions for increasing knowledge/understanding of particular sectors/environmental characteristics that can be agreed by all stakeholders within scope and proposed programme for the preparation of the Statutory MSP.
  - Establishing information/data thresholds, acceptance levels or protocols between sectors for the purposes of decision making and policy development where there are no practical solutions for filling data gaps within the statutory MSP timeframe.
  - Identifying where more detailed studies/assessments can be undertaken as part of specific development proposals (for individual developments) rather than at a strategic level to reduce the risk of delays to the MSP process.

Tackling overlapping interests will be a challenging and complex process, the success of which will depend upon the ability and willingness of stakeholder to identify and agree practical and reasonable solutions for tackling overlapping interests and to work together to find an integrated and coordinated way forward for the future management and use of the marine environment in the Pentland Firth and Orkney Waters.

A detailed examination of overlapping interests and competing activities associated within marine renewable energy developments will be undertaken as part of the preparation of the supporting Regional Locational Guidance (RLG) for Marine Renewable Energy developments in the Pentland Firth and Orkney Waters (Chapter 6). The information presented in this RLG will inform the recommendations/actions for tackling overlapping interests and competing activities presented in the MSP Framework.

5.2.2 Avoiding Unnecessary Change

There is a risk that the process of marine spatial planning could be interpreted in some areas, or by some sectors, as a mechanism for introducing unnecessary change as a result of having to meet the legal requirements to deliver a MSP.

The MSP process, by its very nature will introduce an element of change in terms of the overall management and use of the marine environment. However, what is important is what changes will occur and how they will be implemented.

The marine environment is currently regulated on a sector/activity basis. This approach does not naturally lend itself to facilitating an integrated or coordinated approach to the management and use of the marine environment. The aim of marine planning is to therefore examine how current activities and sectors currently interact, both spatially, and in terms of environmental management and protection, and how these interactions are likely to change in the future as different sectors expand or decrease. This analysis will then be used to identify solutions and opportunities for managing the different interactions in a more holistic and coordinated way.

However, it should be recognised that, although there are a number of interactions between the different marine sectors, the majority of sectors are compatible with each other and have limited adverse effects on the environment. The focus for the MSP Framework and subsequent Statutory MSP will therefore be to focus on guiding the development of policies to areas or sectors where there are there are known issues or problems, or where future development or growth/expansion in existing sectors/activities could lead to increased pressure on the environment or exacerbate overlapping interests.

The MSP Framework will identify different ways in which certain policies could be developed to help address those issues/problems and manage pressures/overlapping interests. It is not the intention of the MSP Framework to encourage the introduction a series of management policies or objectives to directly change the way in which current activities/uses operate unless change is required.

5.2.3 Consultation and Engagement

Developer, regulator, decision maker and stakeholder engagement will be fundamental to the successful development of the MSP Framework and subsequent delivery of a statutory MSP for the Pentland Firth and Orkney Waters. Further information on the approach to consulting on the MSP Framework is provided in Chapter 4.

5.2.4 Plan Flexibility

The MSP Framework will form the basis for the preparation of a statutory MSP for the Pentland Firth and Orkney Waters once the Scottish Marine Bill comes into force. The MSP Framework will therefore have to be produced in a way which would enable it to be readily updated and modified to reflect the legal requirements for marine spatial planning as set out in the Scottish Marine Bill (and subsequent secondary legislation and guidance) following its formal enactment into Scottish Law.

The MSP Framework will also have to remain flexible to other external factors including:

- International and European commitments and obligations and National legislation
- National Strategic Initiatives developed as part of the wider National Planning Framework
- Links to other land use plans and coastal plans

5.2.4.1 International and European Commitments and Obligations/National Marine Plan for Scotland

There are a number of International and European commitments and obligations that will have to be taken into account in the preparation of the MSP Framework e.g. OSPAR, WSSD and MSFD. It is expected that some of these commitments and obligations will be reflected within the proposed National Marine Plan for Scotland in the form of National Marine Objectives and Marine Ecosystem Objectives (MEOs).

However, in the absence of a final Scottish Marine Bill and therefore any legal requirement to prepare a National Marine Plan or associated objectives, it will be necessary for the key international and European commitments and obligations discussed in Chapter 2 and Appendix A to be reflected in the MSP Framework and RLG. This will be necessary to ensure that both are legally compliant and will be able to adapt to the statutory requirements for a MSP introduced once the Scottish Marine Bill is brought into force.

Any future strategic initiatives developed as part of the wider National Planning Framework and Government Economic Strategy that impact upon the marine environment will also need to be included within the National Marine Plan. These national strategic initiatives will therefore have to be integrated into regional planning policy, where appropriate, as part of any Region Marine Spatial Plans. Current national strategic initiatives affecting the Pentland Firth and Orkney Waters area e.g. Scapa Flow Container Transhipment Terminal and any infrastructure required to support marine renewable energy developments e.g. grid reinforcements, will also have to be taken into account the development of the MSP Framework for this area.

5.2.4.2 Links to Other Land Use Plans and Coastal Management Plans

There will also be an additional requirement for the MSP Framework to take account of relevant land use plans (e.g. the emerging Orkney Island Council Local Development Plan and Highland Wide Local Development Plan) and any related Coastal Management plans or strategies to ensure consistency across area specific policies and sectors and across the interface between the marine and terrestrial environment. Current revisions/changes in the land use planning system in Scotland will also need to be considered in the development of the MSP Framework.

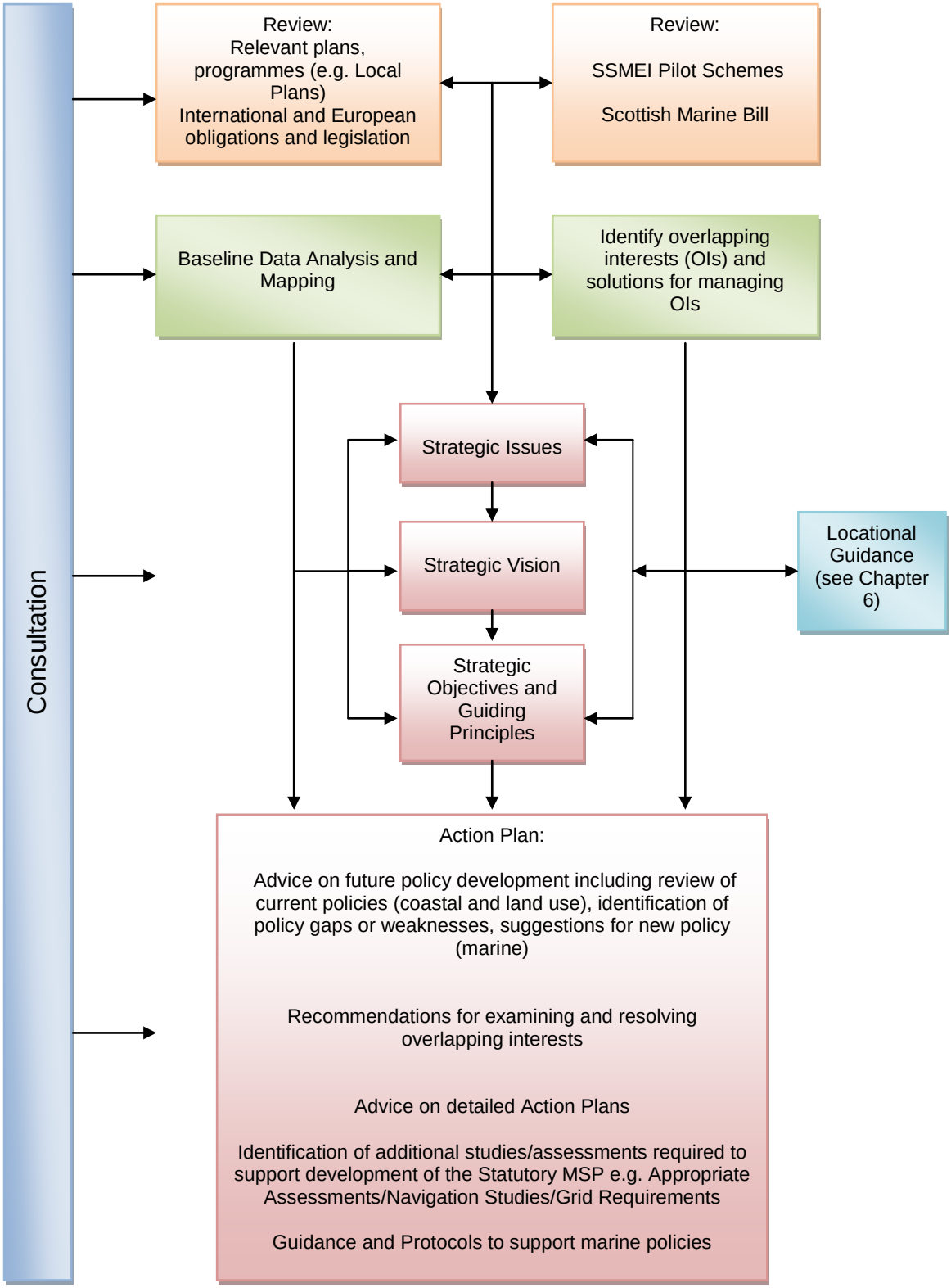
5.2.5 Legislative Controls and Regulatory Mechanisms

Whilst it is recognised that the existing legislative controls and regulatory mechanism for the marine environment will influence the content of the MPS Framework and associated Regional Locational Guidance (see Chapter 6), it is assumed that these will continue to be applied under the existing and any future legislative frameworks and regimes. It will therefore not be the role or responsibility of the MSP process to reproduce or reinforce this legislation or to create new legislation.

5.3 Approach to the Preparation of the MSP Framework

The following diagram provides an overview of the proposed approach to preparing the MSP Framework.

Diagram 5.1: Preparation of MSP Framework



6 Regional Locational Guidance for Marine Renewables

6.1 Regional Locational Guidance (RLG) for Marine Renewables (Wave and Tidal)

6.1.1 Focus of the Regional Locational Guidance (RLG)

The Regional Locational Guidance (RLG) for Marine Renewables (wave and tidal energy) will be prepared in support of the MSP Framework. The RLG is being prepared in response to the rapid increase in interest in the development of wave and tidal energy within the Pentland Firth.

The aim of the RLG is twofold:

1. Provide guidance to marine renewable energy developers on potential areas of opportunity for future development and technical advice on specific procedures/survey requirements and assessments etc likely to be required as part of a marine renewable energy (wave or tidal) development).
2. Progress the marine spatial planning process in a way which enables stakeholders and decision makers to respond to the rapid increase in interest in marine renewable energy developments whilst enabling 'issues' relating to other marine sectors to be examined over a longer timescale as part of the preparation of the statutory MSP.

The RLG will be published in January 2010 with the MSP Framework following a period of consultation on both documents during autumn 2009.

6.1.2 Content of the RGL for Marine Renewable Energy

The RLG for the Pentland Firth and Orkney Waters will include the following:

Contents of the Pentland Firth and Orkney Waters Locational Guidance

- Introduction
- Context
- Approach to consultation as part of the development of the RLG
- Review of baseline data
- Mapping baseline data
- Identification of key characteristics of future marine renewable energy developments including size, scale, footprints, configurations of arrays, spacing between individual devices and arrays
- Identification of potential areas of interest for future marine renewable energy development
- Identification of interactions (e.g. effects of marine devices) and overlapping interests between future marine renewable energy developments and existing sea users and marine environment
- Identify solutions or opportunities for reducing interactions and resolving overlapping interests through consultation with key stakeholders and sector representatives
- Prepare sector maps illustrating areas of opportunity for future marine renewable energy developments (based on various criteria etc developed/identified during consultation)
- Prepare overarching opportunities map (taking account of range of sea users/sectors and marine nature conservation objectives)
- Develop technical advice note relating to development procedures and requirements for mitigation, further assessment (e.g. EIA and appropriate assessment), survey work and monitoring
- Identify gaps in baseline data and make recommendations to fill gaps as part of wider MSP process

6.1.3 Coverage of the RLG

The RLG will be prepared for the same geographical area as the MSP Framework. This coverage is linked to the Strategic Area of Interest proposed by the Crown Estate for the current Licensing Round for Marine Renewable Energy in the Pentland Firth (see Figure Appendix D1).

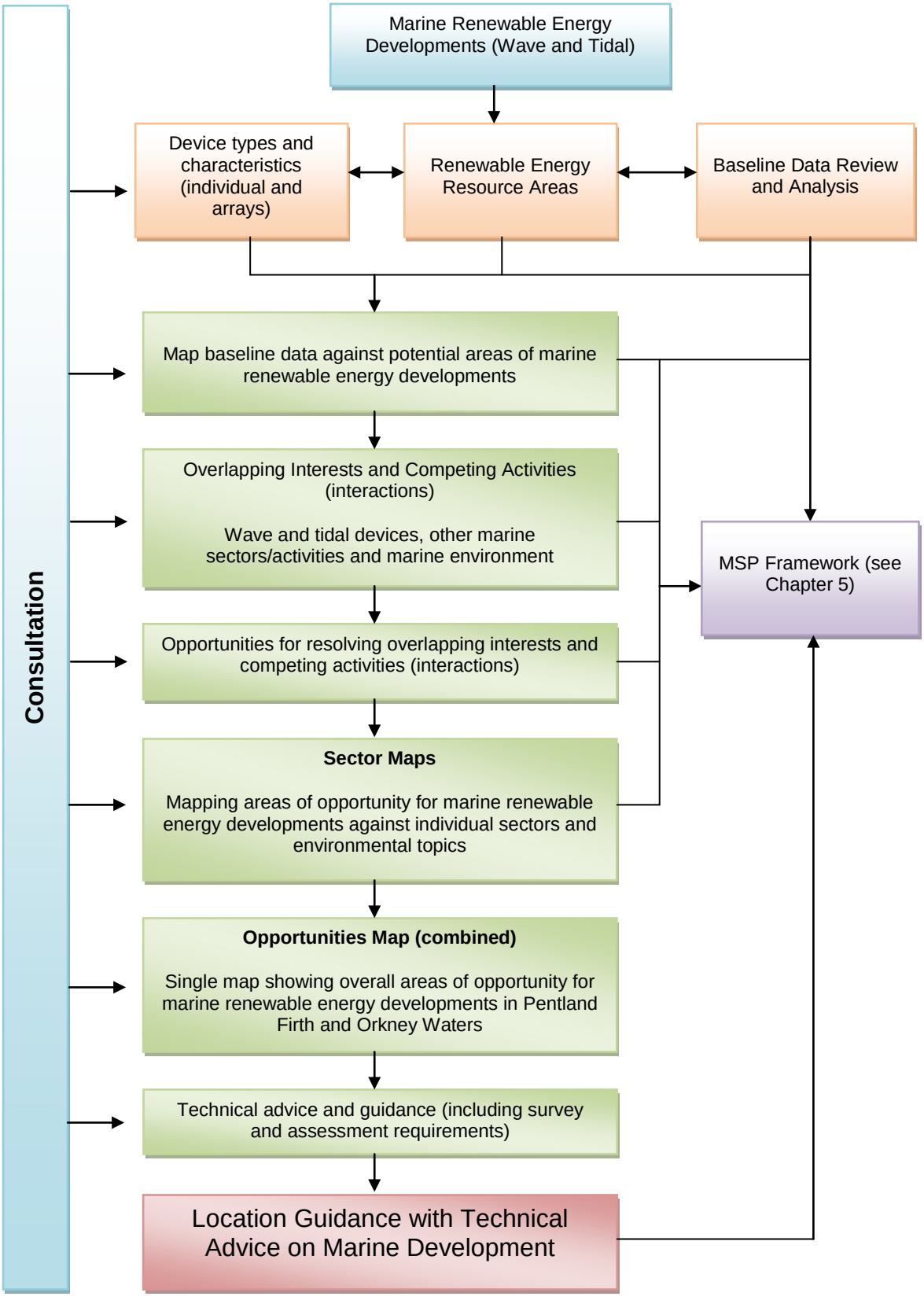
6.2 Key Influencing Factors

Preparation of the RLG will be underpinned by the following:

- Robust and comprehensive review and analysis of existing available baseline data
- Mapping baseline data
- Extensive programme of consultation with wide range of stakeholders, regulators and developers to identify, and resolve, interactions and overlapping interests/competing activities
- Mapping areas of opportunity for marine renewable energy developments based on available information, level of understanding of potential constraints in certain areas, and potential cumulative effects
- Development of technical advice notes to support and guide future marine developments including:
  - Advice on development control, licensing procedures and assessing cumulative effects
  - Mitigation and monitoring requirements
  - Additional assessment requirements e.g. Appropriate Assessments, navigation studies, grid requirements, heritage studies (these are likely to inform both the RLG and preparation of statutory MSP – see Chapter 5)
  - Requirements for consultation

6.3 Approach to the Preparation of the RLG

Diagram 6.1: Approach to the preparation of the RLG



6.3.1 Identifying Characteristics of Marine Renewable Energy Developments

One of the first stages in developing the RLG will be to understand the different types of marine renewable energy developments that could occur within the Pentland Firth and Orkney Waters, based on the available wave and tidal resource and current technologies. However, the RLG will not provide information on specific technical and operational constraints (technological issues) associated with different technologies.

In providing a robust and comprehensive review of potential future developments information on wave and tidal devices will be sought from a number of sources including:

- Consultation with marine renewable energy developers (wave and tidal)
- Scottish Marine Renewable SEA
- Consultation with European Marine Energy Centre (EMEC)
- The Crown Estate

In identifying key characteristics associated with marine developments the following factors will be taken into account:

- Device characteristics:
  - Operating envelopes e.g. water depths, position in water column, seabed requirements, optimal tidal currents and wave heights
  - Type e.g. mechanism/design
  - Method of attachment to seabed
  - Size and footprint
  - Generating capacity

- Array characteristics:
  - Configuration
  - Spacing between devices
  - Spacing between arrays
  - Footprints
  - Generating capacity of arrays
  - Maintenance requirements
  - Additional infrastructure requirements to support development e.g. grid connections/reinforcements

6.3.2 Baseline Data Collection and Review

6.3.2.1 Background to Marine Baseline Data

Information and data relating to the marine environment is, in general, limited in comparison to the terrestrial environment. The main reasons for this include:

- Scale of study area – surface water area and sea depths
- Challenging environment – tidal currents, swell and extreme weather conditions severely restrict access to large part of the marine environment
- Limited accessibility – opportunities to carry out surveys are heavily influenced by the weather and generally require the use of specialist vessels and equipment, particularly for more detailed/technical surveys of the seabed etc
- Limited opportunity to obtain information based on previous experience – although well used, the marine environment is generally undeveloped in terms of the installation of structures on the seabed etc. Information on the effects of activities associated with marine developments is therefore fairly limited and survey information tends to relate to the areas directly affected by development which tend to be very localised and widespread

However, the amount of information that does exist for the marine environment has increased considerably over the last few years. These increases can be attributed to a number of factors including:

- General increased awareness of the importance of the marine environment
- Requirement for the Scottish Government to develop a more robust and accurate understanding of the current condition of the marine environment in delivering its obligations to achieved Good Environmental Status (GES) of marine waters by 2020 as set out under the Marine Strategy Framework Directive (MSFD)
- Requirement for the Scottish Government to identify areas for inclusion within a network of new Marine Protected Areas (MPAs) in meeting its international obligations under the OSPAR Convention and World Summit on Sustainable Development (WSSD)
- Requirement to identify areas for protection as offshore Natura 2000 sites (Special Protection Areas (SPAs) or Special Areas of Conservation (SACs) under the Habitats Directive
- Increased development of the marine renewable technology industry with devices being installed and tested at a range of locations including the European Marine Energy Centre in Orkney

6.3.2.2 Approach to Collecting and Reviewing Baseline Data

Baseline data collection and review is an ongoing process which will occur throughout the entire MSP process from the preparation of this consultation paper to the development of the Formal MSP. The main aim of the RLG will be to obtain and review as much data and information as is available at this current time to assist in developing an understanding of the current baseline conditions within the Pentland Firth and Orkney Waters and to assist with the identification of potential interactions and overlapping interests.

However, it is likely that there will still be some gap in the baseline information and data that is currently available. Some of these gaps will need to be filled as part of the development of the Locational Guidance, whilst it may be more appropriate and practical for other gaps to be filled through the MSP Framework and subsequent Formal MSP.

The approach to collecting baseline data for the RLG (and MSP Framework) will rely heavily on consultation with key stakeholders (including the Orkney Island and Highland Councils), sector representatives and developers. The approach to consultation is discussed in Chapter 4.

In summary the process of baseline data collation will involve:

1. Review, analysis and update of baseline data and information collected as part of the Scottish Marine Renewable SEA
2. Collation of additional existing baseline data from known sources e.g. internet (SNH websites, JNCC websites, previous studies etc)
3. Collation of additional existing but unknown sources of baseline data through consultation (see Chapter 3)
4. Identification of data/information gaps where data/information is required to inform the development of the RLG
5. Development of proposals/commissioning of additional studies to obtain information and data to fill data gaps as part of the development of the RLG (within appropriate timescales to enable data for inform the RLG)
6. Establishing information/data thresholds, acceptance levels or protocols between sectors for the purposes of decision making and policy development where there are no practical solutions for filling data gaps within the RLG timeframe
7. Identification of data gaps where information is not required for the RLG but will be required as part of the preparation of the formal MSP (the need for this data will also be identified through the MSP Framework)

6.3.3 Interactions and Overlapping Interests

As part of the development of the RLG, it will be necessary to identify where possible overlapping interests or increased pressures (e.g. environmental/resource) could occur as a result of the future development of marine renewables or the growth/expansion of existing sectors, and identify solutions or opportunities for resolving those conflicts.

Overlapping interests, interactions and environmental pressures, and the way in which they are managed, underpins the whole process of marine spatial planning. Ultimately for a MSP, and associated RLG, to be successful, it has been identified that these overlapping interests not only need identifying, but more importantly, opportunities for providing solutions to, or managing these overlapping interests need to be examined.

Identifying and tackling overlapping interests will be a fundamental factor in providing necessary information and advice to inform the future development of the marine renewable energy sector in the Pentland Firth and Orkney Waters. A number of previous studies (e.g. the Scottish Marine Renewables SEA) identified that are a number of potential overlapping interests and competing activities associated with future marine renewable energy developments in the Pentland Firth and Orkney Waters. These mainly include shipping and navigation, conservation interests (e.g. seabirds and marine mammals) and commercial fisheries. Further details on these overlapping interests are provided in Appendix C.

It is expected that tackling overlapping interests and competing activities including interactions and environmental pressures will be a very complex and challenging process that will require extensive consultation with key stakeholders, regulators and developers. Further information on consultation and stakeholder engagement is provided in Chapter 4.

The principal aim of the marine planning process and associated RLG is to identify solutions for resolving overlapping interests and competing activities to enable the sustainable growth and expansion of certain marine sectors whilst maximising environmental protection. However, in some cases, it may emerge that, even through extensive consultation, it may not be possible to reach agreement on possible solutions for managing competing interests.

The success of the marine planning process and RLG in providing advice to marine renewable energy development will therefore depend heavily on the ability of all stakeholders, regulators and developers to agree to appropriate solutions for resolving overlapping interest and to work together to develop a coordinated and integrated approach to the future management and use of the marine environment in the Pentland Firth and Orkney Waters.

6.3.4 Mapping Areas of Opportunity

It is proposed that the information on potential areas of opportunity for marine renewable energy developments will be illustrated through a series of maps. These maps will be prepared for individual sectors/environmental topics and as an overall opportunities map for the Pentland Firth and Orkney Waters area. These maps are likely to be based on a series of different scenarios which illustrate varying levels of opportunity according to:

- Device/array type, configuration, footprint etc
- Level of development (e.g. number of developments (arrays) in an area)
- Likely interactions (with other marine sectors and environment)
- Potential level of constraint associated with different marine sectors and the environment
- Implementation of varying levels of mitigation e.g. avoidance or reduction of potential effects
- Varying levels of resolution for managing overlapping interests

6.3.4.1 Potential Challenges to Mapping Areas of Opportunity

One of the main aims of preparing the RLG will be to produce maps to illustrate potential areas of opportunity for future marine development. However, it is likely that there will be a number of potential limitations on the actual extent to which information relating to certain marine sectors can be plotted.

These limitations are expected to occur under the following circumstances:

- Where there is uncertainty in distribution, frequency of occurrence and concentration of certain activities e.g. commercial inshore and offshore fisheries and shipping and navigation routes
- Where there is uncertainty in the distribution and abundance of marine species and habitats e.g. marine mammals, seabirds and benthic habitats and species
- Where there is uncertainty over the potential interactions that are likely to occur between different marine sectors and marine developments
- Where there are challenges in gaining agreement and general consensus amongst stakeholders and regulators
- Lack of guidance on content and structure of an MSP and any related guidance (e.g. Locational Guidance) due to absence of statutory Scottish Marine Bill and related secondary legislation and guidance
- The process of developing an MSP Framework and Locational Guidance for an area of the scale of the Pentland Firht and Orkney Waters and which seeks to identify and tackle overlapping interests as part of the marine spatial planning process is relatively unchartered territory

For the mapping of potential areas of opportunity for marine developments to be successful, these potential challenges or limitations will need to be identified and options for their resolution identified at the earliest opportunity. This may include additional survey work or research studies being undertaken to increase knowledge and understanding in certain sectors. Due to the timescales for the production of the MSP Framework and Locational Guidance it may be the case that some of these additional studies and surveys will have to be undertaken to inform the preparation of the formal MSP post 2009/2010.

6.3.5 Technical Advice Notes

In addition to presenting areas of opportunity for future marine developments on maps there will also be a need to provide technical advice to assist with the consenting and deployment of individual developments/projects. The development of a technical advice note and guidance will involve close consultation with stakeholders, regulators and developers (see Chapter 4). It will also be informed by ongoing studies being undertaken by MESPG on the development of EIA guidance and licensing procedures for marine renewable energy developments.

The key information that will be included in a technical advice note that will be prepared as part of the RLG will include:

- Environmental assessment's required to support consent/licences applications
- Generic mitigation measures for avoiding/offsetting or reducing adverse effects
- Detail on key consultation requirements in relation to individual marine sectors including contact details for key representatives
- Details of any additional surveys, assessments or research studies required to inform consent/licence applications
- Information on approaches and methods to be adopted for additional surveys or research studies
- Information on assessments/survey's required to evaluate potential cumulative effects and developing protocols for mitigating potential cumulative effects.
- Requirements for monitoring individual developments e.g. surveying/research studies etc

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Appendices: Supporting Information

Appendix A: Wider Policy Context

This Appendix provides further information on the Marine Strategy Framework Directive (MSDF) and the international, European and national policy context.

Marine Strategy Framework Directive (MSFD)

Significant progress has been made recently towards increased and improved protection of the marine environment through the introduction of the European Marine Strategy Framework Directive (MSFD). This Directive is the environmental pillar to the EU's Integrated European Maritime Policy 2007, which aims to provide a coherent framework for joined up maritime governance[3].

In the context of the Integrated European Maritime Policy the objective of the MSFD, which was adopted on 17th June 2008, and which must be transposed into domestic legislation by 15th July 2010, is to enable the sustainable use of marine goods and services and to ensure the marine environment is safeguarded for the use of future generations. In achieving this objective the MSFD requires member states to 'take the necessary measures to achieve or maintain good environmental status (GES) of the marine environment by 2020 at the latest'. It also establishes European Marine Regions and requires Member States to apply an ecosystem based approach to the management of human activities.

The MSFD extends and builds on the requirements of the Water Framework Directive (WFD) into seas beyond the current WFD limit (3nm in Scotland). Under the WFD member states are required to achieve Good Ecological Status (GES) of all controlled waters including estuarine, transitional and coastal waters. Consequently where the MSFD overlaps with the WFD in coastal areas, the latter will continue to take precedence except where the MSFD introduces additional requirements.

In order to achieve the targets for GES set out in the MSFD all member states are required to develop a strategy for their marine waters. This strategy must address a number of key actions within specific timescales. These actions include:

- Initial assessment of current environmental status of waters and environmental impact of human activities by 2012;
- Determine what constitutes 'good environmental status' (GES);
- Develop environmental targets and indicators by 2012;
- Implementation of a monitoring programme by 2014; and
- Programme of measures (management actions) developed by 2015 and implemented by 2016.

The MSFD sets out a number of qualitative descriptors that will be used for determining good environmental status (GES). Table A1 presents some of the key GES descriptors that have been identified in relation to the preparation of the MSP Framework and Regional Locational Guidance.

[3] http://www.doeni.gov.uk/index/protect_the_environment/water/marine_thematic_strategy_.htm

Table A1 : Relevant MSFD Qualitative GES Descriptors

GES Descriptor	Description
GES Descriptor 1	**Biological Diversity** is maintained. The quality and occurrence of habitats and the distribution and abundance of species are in line with prevailing physiographic, geographic and climatic conditions
GES Descriptor 2	**Non-indigenous species** introduced by human activities are at levels that do not adversely alter the ecosystems
GES Description 3	Populations of all **commercially exploited fish and shellfish** are within safe biological limits, exhibiting a population age and size distribution that is indicative of a healthy stock
GES Descriptor 4	All elements of the **marine food webs**, to the extent that they are known, occur at normal abundance and diversity and levels capable of ensuring the long-term abundance of the species and the retention of their full reproductive capacity
GES Description 5	Human-**induced eutrophication** is minimised, especially adverse effects thereof, such as losses in biodiversity, ecosystem degradation, harmful algae blooms and oxygen deficiency in bottom waters
GES Descriptor 6	**Sea-floor integrity** is at a level that ensures that the structure and functions of the ecosystems are safeguarded and benthic ecosystems, in particular, are not adversely affected
GES Descriptor 7	Permanent **alteration of hydrographical conditions** does not adversely affect marine ecosystems
GES Descriptor 8	**Concentrations of contaminants** are at levels not giving rise to pollution effects
GES Descriptor 9	**Contaminants in fish and other seafood** for human consumption do not exceed levels established by Community legislation or other relevant standards
GES Descriptor 10	Properties and quantities of **marine litter** do not cause harm to the coastal and marine environment
GES Descriptor 11	**Introduction of energy**, including underwater noise, is at levels that do not adversely affect the marine environment

Source: Scotland's Seas: Towards Understanding their State 2008

Wider Policy Context: International and European Commitments and Obligations

A summary of the main international and European commitments and obligations relating to the process of marine spatial planning and marine developments is presented in Table A2 below.

Table A2: Current Marine Protection Obligations/Instruments (note this list is not definitive)

Obligation/Instrument	Main Aim
The MARPOL Convention	Protection of the marine environment with focus on preventing pollution from shipping

The OSPAR Convention 1992	▪ Protection of the marine environment of the North East Atlantic. Relates to the pollution prevention e.g. from dumping at sea and protection and conservation of marine ecosystems.
	▪ Set requirements to determine pollution loads to the Marine Environment which are now embodied in the Water Framework Directive (WFD)
	▪ Led to adoption several long term strategies for protection of the marine environment of the North East Atlantic relating to:
	  ▪ Hazardous substances
	  ▪ Radioactive substances
	  ▪ Eutrophication
	  ▪ Protection of Ecosystems and biological diversity
	  ▪ Environmental goals and management mechanisms for offshore activities
	▪ In 2000 OSPAR published its first comprehensive Quality Status Report (QSR) on the quality of the marine environment of the North-East Atlantic. Supported by five reports that will be updated in 2010
	▪ In 2002/3 OSPAR set a requirement for the identification of a network of Marine Protected Areas (MPAs). This network, which is due to be completed by 2010, will complement the Natura 2000 network (required under the Habitats Directive).

UNCLOS (United Nations Convention on the Law of the SEA) 1982	▪ Sets out a legal framework for use of the world's oceans. Covers navigation, over flight, resource exploration and exploitation, fishing, shipping and conservation and pollution.
World Summit on Sustainable Development (WSSD)	▪ Sets challenging targets and goals for Governments ▪ For oceans these are to promote integrated sustainable management of oceans at all levels in order to help maintain the productivity and biodiversity of marine and coastal areas and help to secure a significant reduction in biodiversity decline by 2010. ▪ This will be achieved through the introduction of policies, measures and tools such as the ecosystem approach, marine protected areas and the incorporation of coastal interests in watershed management.

European Integrated Maritime Policy 2007	▪ Aims to deliver a sustainable development approach for Europe's oceans and seas
	▪ Includes:
	  ➢ A comprehensive maritime transport strategy and new ports policy
	  ➢ A European Strategy for Marine Research
	  ➢ A European Marine Observation and Data Network
	  ➢ A Strategy to mitigate the effects of climate change on coastal regions
	▪ The MSFD provides the environmental pillar of the sustainable development approach

Obligation/Instrument	Main Aim
Water Framework Directive (WFD) 2000	▪ Legal framework for the protection, improvement and sustainable use of surface waters, transitional waters and coastal waters (up to 3nm of territorial waters) and groundwater across Europe. ▪ Main aims of the WFD include: ➢ Prevent deterioration and enhance status of aquatic ecosystems, including groundwater ➢ Promote sustainable water use ➢ Reduce pollution ➢ Contribute to the mitigation of floods and droughts
The RAMSAR Convention (The Convention of Wetlands of International Importance (1971 and amendments)	▪ Protection and conservation of wetlands, particularly those of importance to waterfowl and waterfowl habitat.
Bern Convention on the Conservation of European Wildlife and Natural Habitats (1979)	▪ Conservation of wild flora and fauna
Bonn Convention on the Conservation of Migratory Species and Wild Animals (1979)	▪ Conservation of species and wildlife on a global scale, in particular migratory species
Habitats Directive 1992 (Directive 92/43/EEC Conservation of Habitats and Wild Flora and Fauna)	▪ Sets out the framework for the establishment of Special Areas of Conservation (SACs) for areas containing habitats of conversation importance (listed under Annex I of the Directive) or species of conservation importance listed under Annex II of the Directive. ▪ Requires the establishment of a network of protected (Natura 2000) sites which include SACs and SPAs (see Birds Directive below) ▪ Network of Natura 2000 sites also now includes the designation of offshore areas for protection
Birds Directive 1979 (Directive 79/409/EEC on the Conservation of Wild Birds)	▪ Sets out the framework for the establishment of Special Protection Areas (SPAs) for areas containing rare or vulnerable birds (listed under Annex I of the Directive) or for regularly occurring migratory species.
Marine Strategy Framework Directive (MSFD) 2008	▪ As described above

National Legislation

Table A3 provides a summary of the main pieces of national legislation that are of relevance to the MSP Framework and Regional Locational Guidance for marine renewable developments.

Table A3: National Legislation

National Legislation	Main Aim
Coast Protection Act 1949	Part I of the Act provides for flood defences and coastal erosion protection. Part II provides for safety of navigation.
Food & Environment Protection Act 1985	Part I relates to food safety (relevant to polluted waters) and Part II to protection of the marine environment.

National Legislation	Main Aim
Wildlife and Countryside Act 1981 (as amended) and the Nature Conservation (Scotland) Act 2004	Places duties on public bodies in relation to the conservation of biodiversity and increases protection for Sites of Special Scientific Interest (SSSI). Apply out to 12nm around Scotland and include protection measures for marine species. The Scottish Act includes a Biodiversity Duty on public bodies which is supported by the Scottish Biodiversity List i.e. the list of species and habitats considered to be of principal importance for the purpose of biodiversity conservation in Scotland.
The Conservation (Natural Habitats &c) Regulations 1994 (as amended)	Implement EC legislation within 12nm.
The Offshore Marine Conservation (Natural Habitats, &c) Regulations 2007 (known as the Offshore Marine Regulations)	Extend protection to important species and habitats under the Wild Birds and Habitats Directives beyond UK territorial waters (i.e. outside 12nm). They give protection to marine species, wild birds and habitats, mainly through the creation of offences and through site protection mechanisms.
Conservation of Seals Act 1970	Provides for the protection and conservation of seals in and in adjacent territorial seas. The Habitats Directive and the 1994 Regulations introduced additional measures for the protection of seals.
Scottish Biodiversity Strategy 2004	Sets out a 25 year framework for action to conserve and enhance biodiversity for the health, enjoyment and well-being of all the people of Scotland.
UK Biodiversity Action Plan 1994 (UKBAP)	This is s the UK Government's response to the Convention on Biological Diversity 1992 (CBD). It describes the UK's biological resources, commits a detailed plan for the protection of these resources. Major reviews of the Priority Species and Habitats are underway, and the Targets for these priorities are complete.
Protection of Wrecks Act 1973	The 1973 Act provides protection for designated wrecks and for the designation of dangerous sites.
Ancient Monuments and Archaeological Areas Act 1979	Provides for the protection of archaeological heritage.
Water Environment and Water Services (Scotland) Act 2003 and Water Environment (Controlled Activities) Regulations 2005 (CAR)	The 2003 Act gave Scottish Ministers powers to introduce regulatory controls over activities in order to protect and improve Scotland's water environment, including wetlands, rivers, lochs, transitional waters (estuaries and saline lagoons), coastal waters and groundwater. Activities such as abstraction, impoundment and engineering activities, as well as pollution control are regulated under CAR.
Harbours Act 1964 and Orders	Provides powers to make Orders, the general purpose of which is to amend local harbour legislation and to introduce new harbour legislation.
Fishing vessel licences	A fishing vessel licence authorises registered fishing vessels to fish in specified sea areas for sea fish. The licence enables UK Fisheries Administrations to control fishing so that the UK does not exceed the quotas set under the EU Common Fisheries Policy. The licence allows Fisheries Administrations to set specific conditions and requirements, such as arrangements for the landings of stocks.

National Legislation	Main Aim
Climate Change Agreements (SI 2006/59, SI 2001/622, SI 2006/60, SI 2006/1931)	The climate change levy is a tax on the use of energy in industry, commerce and the public sector, with offsetting cuts in employers' National Insurance Contributions - NICs - and additional support for energy efficiency schemes and renewable sources of energy. The levy forms a key part of the Government's overall Climate Change Programme. The levy is intended to play a major role in helping the UK to meet its targets for reducing greenhouse gas emissions.
Strategic Framework for Scottish Aquaculture 2003 (SFSA)	The SFSA is based on four guiding principles; economic; environmental; social and stewardship. It is the main policy instrument to deliver a diverse, competitive but sustainable aquaculture industry in Scotland and provides a set of parameters within which industry can balance socio-economic benefits against environmental impact. The SFSA is being renewed in 2008. A three month pre-consultation period has now finished. A full public consultation will be launched in August 2008, with a renewed framework expected to be in place by December 2008.
Salmon and Freshwater Fisheries (Consolidation) (Scotland) Act 2003	This Act allows for the Salmon Conservation Regulations to be made where it is considered necessary to do so for the conservation of salmon e.g. relating to fishing in the sea, estuaries or rivers.
A Strategic Framework for Inshore Fisheries in Scotland	Sets out the strategic direction for inshore fisheries policy and a network of inshore fisheries groups around Scotland to plan the management of inshore fisheries locally. Includes an Action Plan which outlines timescales for setting up inshore fisheries groups and identifies target dates for groups to start work.
A Sustainable Framework for Scottish Sea Fisheries	Sets out a strategy for the sea fisheries industry in Scotland and a series of guiding principles for managing Scotland's marine resource.
The Environmental Impact Assessment and Natural Habitats (Extraction of Minerals by Marine Dredging) (Scotland) Regulations 2007	Set out requirements for permitting of dredging activities.
Electricity Act 1989 and Electricity Act 1989 (Requirement of Consent for Offshore Generating Stations) (Scotland) Order 2002	The Act provides the core legislation for planning consents for the construction and operation of power generating stations. The 2002 Order modifies section 36(2) of the Electricity Act to specify that any generating station constructed in Scottish territorial waters (and wholly or mainly driven by water or wind) with a permitted capacity of 1 megawatt or above requires the consent of the Scottish Ministers. This allows for more control over developments in territorial waters and brings these generating stations within the Electricity Works (Environmental Impact Assessment) (Scotland) Regulations 2000.
Telecommunications Act 1984	Sets out permitting controls for laying telecommunications cables in the marine environment.

Appendix B: Key Strategic Issues

Focus of this Section

The following provides an overview of the potential strategic issues that will need to be taken into consideration in the MSP Framework. The information presented in this chapter is based on current available information. The strategic issues presented below will therefore be subject to continual review and modification as part of the overall preparation of the MSP framework.

Strategic Issues

Understanding strategic issues will be a central part in developing a future vision and strategic objectives for the MSP Framework and formal MSP for the Pentland Firth and Orkney Waters. They will help to focus policy development in key areas where change is required or there are gaps and weaknesses in current policy provisions.

The strategic issues that have been identified to date as listed in Table Appendix B1 below. It should be noted that this table is not complete and requires further review of information and consultation to ensure that the issues identified are relevant to the Pentland Firth and Orkney Waters.

Table Appendix B1: Key Strategic Issues

Policy Area	Sub-topics	Strategic Issues identified to date (April 2009) – this list is not complete and the information provide will require further review. Further input will be required as part of the development of the MSP Framework and Locational Guidance
General	Generic 'development control' policy	TBC
	Wider management objectives	TBC
	Population and Local Communities	▪ **TBC for Pentland Firth and Orkney** ▪ Scotland's seas support a wide range of activities most of which have an economic value and contribute towards employment within Scotland. The value of these marine activities to the Scottish economy is around £2.2 billion (Gross Value Added) which is 2.6% of the total Scottish GVA and supports 50,000 employees[4]. ▪ Declining population in some coastal areas ▪ Increasing pressure on nearshore and coastal areas from range of different activities these have environmental effects and impacts on each other ▪ Indirect effects on human health of pollutants and contaminants in water through bioaccumulation in shellfish and fin fish
Environmental Quality	Nature conservation, biodiversity, geological	▪ Scotland has some of the finest and biologically diverse marine habitats in Europe. These therefore need protecting ▪ Need for increased protection of nationally important habitats and species not covered under European legislation (national nature conservation objectives) ▪ Lack of data relating to the distribution and abundance of habitats and species – need to expand scientific understanding of the sea ▪ Need to adopt ecosystem approach to the protection and management of marine habitats and species ▪ Unknown effects of climate change on species and habitat distribution and abundance ▪ Threats to ecosystems include: - Build up of waste materials and the proliferation of simpler forms that thrive on it - Loss of keystone species due to predation, climate change, food scarcity or disease leading to an unbalance in relationships - Bio-invaders - Loss of biological diversity
	Natura 2000 Sites	▪ Obligation to protect sensitive species and habitats offshore under European legislation. ▪ This particularly important for Pentland Firth and Orkney where there a number of important seabird colonies
	Other existing protected sites (SSSIs)	▪ These currently apply to mainly terrestrial and coastal protection
	Protected species	▪ Lack of data relating to the impact of marine renewable energy developments on marine mammals, seabirds, fish and marine reptiles

[4] Scotland's Sea: Towards Understanding their State, April 2008, FRS, SEPA and SNH

Policy Area	Sub-topics	Strategic Issues identified to date (April 2009) – this list is not complete and the information provide will require further review. Further input will be required as part of the development of the MSP Framework and Locational Guidance
		▪ This is very important in Pentland Firth and Orkney Waters where there are a number of key seal breeding sites and important bird colonies ▪ Pentland Firth is also potentially an important migration route for other marine mammals (dolphin, whales etc and fish) ▪ Climate change leading to changes in population distributions making designations/protections harder to establish and maintain
	Marine Protected Areas	▪ Obligations to deliver a network of MPAs under European and International legislation. ▪ Insufficient data available to designate MPAs ▪ Climate change leading to changes in population distributions making designations/protections harder to establish and maintain
	'Local' designations	▪ These currently apply to mainly terrestrial and coastal protection
	Seascape quality and designations	▪ Need to protect important landscape and seascapes from development
	Heritage	▪ Area around Orkney and Pentland Firth very important in terms of cultural heritage and marine archaeology ▪ Area is very important for submerged landscape in particular relating to links between Northern Isles and North Eurpe/Scandinava ▪ Pentland Firth is also very important for ship and aircraft wrecks ▪ Current lack of data on presence or distribution of marine archaeological features ▪ No specific protection for marine assets such as submerged landscapes ➢ Historical remains and records are now a valued recreational and educational resource ➢ Some historical remains are at risk from other activities e.g. construction projects, cable laying, salvage, dredging and fishing as well as natural forces e.g. increased storminess and changes in water temperature and salinity
	Water environment and contaminants	▪ Need to improve water quality to achieve MSFD targets for Good Environmental Status by 2020 ▪ Still problems with water pollution and contamination (including chemical, bacteriological and eutrophic) although improving. ▪ Main source of pollution and contamination are terrestrial activities including industrial discharges, effluent, agricultural waste and radioactive waste. ▪ Pollution from marine activities includes dredging, disturbance of contaminated substances, disposal of contaminated waste at sea and discharges from fish farms ▪ Some marine areas experience problems with beach litter. 90% contains plastics and 80% comes from land-based sources
	Emissions to air	▪ Potential for increased risk of air pollution due to SO_2 and NOx emissions from increased shipping activities resulting from the Scapa Flow Transhipment Terminal development

Policy Area	Sub-topics	Strategic Issues identified to date (April 2009) – this list is not complete and the information provide will require further review. Further input will be required as part of the development of the MSP Framework and Locational Guidance
Energy Production	Tidal Power	■ Need to identify alternative, renewable sources of energy to improve security of supply and help Contributing towards targets/commitments for climate change and reducing CO2 emissions ■ Scotland's seas have been identified has having significant potential for renewable energy including offshore wind, wave and tidal power. ■ Pentland Firth and Orkney Waters been identified has having significant wave and tidal resource ■ Harnessing this power could assist the Scottish Government in achieving its target for 50% of all Scotland's electricity to come from renewable sources by 2020 ■ However number of complications/potential issues associated with marine renewable energy developments including: - Complicated / inefficient system for licensing marine development. - Collision risk/disturbance and displacement of marine mammals, sea birds and fish – particular issue in Pentland Firth and Orkney Waters - Loss of/effects on benthic habitats e.g. smothering - Effects of coastal processes - Exclusion from fishing grounds - Increased navigational risk/collision risk - particular issue in Pentland Firth and Orkney Waters - Seascape/landscape effects - Marine noise effecting marine mammals/fish – issue in Pentland Firth which could be a migratory/feeding route for certain species - Refugia for fish in exclusion zones ■ Possible restrictions/hold up to development where there is insufficient data/evidence to inform decision making and licensing - the focus of the proposed MSP Framework and RLG is to find solutions to resolve this issue
	Wave power	
	Offshore wind power	
	Grid connection	■ At present there is insufficient grid capacity to support marine renewable energy developments
Infrastructure	Carbon Storage Areas	■ Need to identify potential sites for carbon storage
	Coastal defence	■ Coastal erosion (12% of Scotland's coast is currently suffering erosion) and steepening of intertidal profiles especially on coasts protected by hard engineering is likely to increase with climate change ■ TBC for Pentland Firth and Orkney Waters area ■ Unknown effects of climate change on increasing storm intensity/frequency and possible sea level rise on coastal areas
	Cables including telecommunications	■ Need to increase telecommunication links (including broadband) to Northern and Western Isles ■ Installation of subsea cables (telecommunication and other electricity cables etc) have potential effects on the marine environment including: - Seabed/substrate disturbance - Disturbance/damage to benthic habitats

Policy Area	Sub-topics	Strategic Issues identified to date (April 2009) – this list is not complete and the information provide will require further review. Further input will be required as part of the development of the MSP Framework and Locational Guidance
		- Electro and Magnetic Fields (EMF) and effects on fish/other species - Exclusion from fishing grounds/limits to trawling and dredging activities - Marine noise during installation ■ There are also onshore effects from construction of substations etc
	Marine waste disposal	■ Potential water contamination/pollution
	Marine mineral extraction	■ Aggregate extraction is the extraction of sand and gravel from the seabed for concrete or land reclamation projects. ■ There are currently two licensed abstraction areas in Scotland, one in the Firth of Forth and one in the Firth of Tay. Activity from these extraction areas is low. ■ There are no known current proposals for abstractions in the Pentland Firth and Orkney Waters
	Oil and gas	■ Oil and gas provides approximately 145,000 jobs (43% UK total for oil and gas) ■ In 2006 the UK continental shelf provided 70 million tonnes of oil and 84 cubic meters of natural gas ■ Main platforms are beyond territorial waters except Beatrice in the outer Moray Firth ■ Industry supported by significant infrastructure across Scotland including the Flotta export facilities at Scapa Flow on Orkney ■ However, there is potential that oil and gas production from Scottish Waters will start to decline ■ There are potential issues associated with oil and gas extraction including: - Seabed and substrate disturbance from construction of offshore facilities and installation of cable and pipelines - Damage/loss of benthic habitats from construction of offshore facilities and installation of cable and pipelines - Marine noise from seismic surveys and drilling - Disposal of water based muds from drill cuttings near to platforms - Discharge of contaminants and pollutants during operation e.g. operational chemicals - Risk of oil spills/discharge - Impacts from construction and operation of onshore facilities e.g. landscape and visual, ecological, archaeology, air quality, noise, etc ■ Exclusion zone around platforms may assist in creation of substrate for corals and refugia for fish species
	Military activities	TBC
Navigation, ports and harbours	Shipping	■ Shipping is one of the major activities within the Pentland Firth as it is one of the main passage routes for cargo vessels between the Atlantic Ocean and the North Sea ■ There are potential issues associated with shipping and navigation that are of particular important to the Pentland Firth and Orkney Waters: - Air pollution from SO2 and NOx - CO2 emissions - Collision risk/grounding (oil/fuel/hazardous cargo) spillage

Policy Area	Sub-topics	Strategic Issues identified to date (April 2009) – this list is not complete and the information provide will require further review. Further input will be required as part of the development of the MSP Framework and Locational Guidance
		- Collision risk (marine mammals) - Antifouling - Discharge of ballast water and associated non-native species - Noise - Ship wash affecting intertidal and shallow water habitats - Waste disposal - Dredging (ports and harbours)
	Ports and harbours within marine area	■ There are more than 100 ports in Scotland. 11 are classed by the Department for Transport under the EC Maritime Statistics Directive as major ports (generally because they handled more than 1 million tonnes (MT) of cargo in 2001). ■ Total cargo handled from Scottish ports in 2006 was 101.5 MT ■ Main cargo includes: crude oil, oil products, coal, other dry bulk and liquefied gas. ■ Passenger transport is also important for travel both internally (8.1 million passengers in 2006) and externally (2 million to Ireland and 112,000 to Belgium ■ Orkney Ports also provide essential transport links for surrounding island communities ■ There are proposals for the development of the Scapa Flow Transhipment Terminal ■ Increased requirement for dredging as part of day-to-day maintenance and future expansion of ports and harbours, and increased marine developments. Other issues associated with port include: - Construction of port facilities – seabed, substrate, geomorphological, hydromorphological effects - Damage/disturbance of benthic habitats/other habitats and species - Marine noise – effects on marine species - Landscape and visual - Archaeological effects - Discharge of substances during construction/from ships (accidental) - Disposal of dredged material (risk of presence of contaminants e.g. metals and other chemicals/hazardous substances)
	Ferries	■ Orkney ports and harbours provide essential transport links (ferries) for surrounding island communities
Tourism and Recreation	Recreational boating	■ Potential issues associated with recreational boating include: - Collision risk/navigational safety - Antifouling - Marine noise - Litter - Seabed disturbance and damage
	Tourism and recreational development	■ Scottish leisure industry contributes £98.9 million (revenue) and £35.3 million (AV) to Scotland's economy and

Policy Area	Sub-topics	Strategic Issues identified to date (April 2009) – this list is not complete and the information provide will require further review. Further input will be required as part of the development of the MSP Framework and Locational Guidance
	Other marine recreation activities	generates employment for 1,800 people. ■ In Pentland Firth Orkney area key marine and coastal recreational and tourist activities include: - Sailing - Recreational diving - Historic records and remains e.g. Skara Brae World Heritage Site - Walking (coastal scenery)
Fishing and Aquaculture	Aquaculture	■ Scottish production of marine fin fish and shellfish represented >99% of UK sectror ■ Production is dominated by Atlantic Salmon for which Scotland is the largest producer in the EU and third in the world. This is followed by rainbow trout ■ Main shellfish include Pacific oyster, native oyster, common mussel, scallop and queen scallop. ■ Aquaculture is a vital industry to Scotland and supports many communities particularly salmon farming ■ Potential threats to the aquaculture industry include: - Risk of contamination from toxic phytoplankton - Effects of climate change on aquaculture due to increasing sea temperatures ■ Aquaculture also has potential impacts on the wider marine and coastal environment including: - Water and seabed pollution from particulate organic wastes, dissolved nutrients, medicines and antifoulants - Loss of benthic habitats - Effects on landscape and seascape quality - Nutrient enrichment of water (in particular sea lochs) - Possible Harmful Algal Blooms (HABs) - Risk of infection to wild salmon and sea trout from sea lice - Genetic variability of wild populations due to inbreeding with escapees - Use of acoustic deterrents to prevent net damage from predators (seals) may also lead to wider exclusion of whales and dolphins
	Commercial fishing	■ Commercial Fishing is a traditional activity employing approximately 5000 people across Scotland ■ Main commercial fish include: - Cod - Haddock - Monkfish - Herring - Mackerel - Nephrops - Scallops

Policy Area	Sub-topics	Strategic Issues identified to date (April 2009) – this list is not complete and the information provide will require further review. Further input will be required as part of the development of the MSP Framework and Locational Guidance
		■ Main threats to commercial fishing include: - Climate change (changes in plankton communities, introduction of different fish species, reduced favourability of conditions for traditional species e.g. fish) - Anthropogenic effects (permanent structures, dumping at sea, oil and chemical spillages and fisheries themselves) - Unwanted bycatch - juvenile fish, cetaceans, non-commercial species, invertebrates - Depletion of commercial stocks - Modification of seabed from towing gear - Loss/damage of benthic habitat e.g. maerl beds/deep water corals from dredging and trawling - Discard of fishing gear at sea - Effects of commercial fishing on food webs and ecosystems for example effect of depleted fish stocks on marine mammals, seabirds and other non commercial fish species ■ However, there is now a greater understanding of effects of other activities on protected sites/species and biodiversity e.g. greater awareness of the importance of ecosystems/food webs in supporting fish stocks therefore promoting more sustainable fishing techniques
	Coastal salmon fishing	■ Due to restrictions on techniques applied to coastal salmon fishing following the introduction of the Salmon and Freshwater Fisheries (Consolidation) Scotland Act 2003, and its seasonal nature, coastal salmon fishing effort is only 10% of that in 1952. Only the most productive fisheries remain in operation.

Appendix C: Interactions and Overlapping Interests

Introduction

In terms of preparing the MSP Framework and Regional Locational Guidance (RLG) for marine renewable energy developments, one of the key elements that will have to be addressed is potential interactions between sectors and areas of overlapping interest. As discussed in the introduction and Chapter 6: Regional Locational Guidance for Marine Renewables, it is expected that the process of identifying and tackling interactions and overlapping interests will be a challenging process that will require extensive consultation with a wide range of stakeholders, regulators, developers and other key decisions makers.

The interactions and overlapping interests that currently exist, and could potentially occur in the future, within the Pentland Firth and Orkney Waters will be examined in detail as part of the development of the MSP Framework and RLG.

An extensive examination of interactions between different marine sectors and activities was undertaken as part of the development of the Draft Marine Spatial Plan for the Firth of Clyde prepared as part of the SSMEI pilot schemes. The results from this assessment are presented in a detailed spreadsheet which can be viewed on the Clyde SSMEI Pilot MSP Website under reports and presentations (http://clydeforum.com/ssmei/). It is proposed that a similar approach would be adopted to the examination of the potential interactions and overlapping interests in the Pentland Firth and Orkney Waters.

Overview of Potential Interactions and Overlapping Interests

An initial review of potential interactions and overlapping interests has been undertaken as part the preparation of this document. The information collated so far is very high level and requires more detailed assessment and examination. This initial overview of the potential interactions and overlapping interests is presented in Table Appendix C.1 below.

Marine Activity	Possible Interactions (Other Marine Activities)
Commercial fishing	■ Renewables – competition for space ■ Biodiversity and marine conservation – conflict between nature conservation objectives and fishing requirements ■ Telecommunications/electricity cables – exclusion from fishing grounds ■ Oil and gas – exclusion from fishing grounds ■ Natural changes – climate affecting fish species/plankton
Aquaculture	■ Recreation and tourism – competition for space with water sports and sailing ■ Renewables – competition for space (offshore) ■ Water quality – potential impacts on water quality from fish and shellfish farm discharges ■ Biodiversity and marine conservation – loss of benthic habitats ■ Fish populations - genetic variability of wild fish populations due to inbreeding with escapees
Nature based tourism	■ Natural changes – climate change affecting species distribution

Marine Activity	Possible Interactions (Other Marine Activities)
Recreational use of the sea	▪ Renewables and aquaculture – competition for space/effects on amenity value
Expanded shipping activities	▪ Renewables and aquaculture – navigation obstacles (risk to navigational safety)
Renewable energy	▪ Competition for space with: - Commercial fishing - Aquaculture - Shipping and navigation - Recreational uses of the sea - Marine conservation
Marine conservation	▪ Commercial fishing – displacement of fishing activities ▪ Renewables – conflict between nature conservation objectives and renewables requirements
Ports and Harbours	▪ Renewables – need for expansion of port/harbour facilities to support marine renewable energy developments
Oil and gas	▪ Commercial fishing exclusion from fishing grounds (pipelines)
Aggregate extraction	▪ Renewables (sterilisation of minerals) ▪ Commercial fisheries (exclusion from fishing grounds) ▪ Shipping and navigation (interference with navigation routes) ▪ Marine conservation (displacement and disturbance of habitats and species)
Telecommunications/ electricity cables	▪ Commercial fishing – exclusion for fishing grounds

Appendix D: Initial Baseline Review

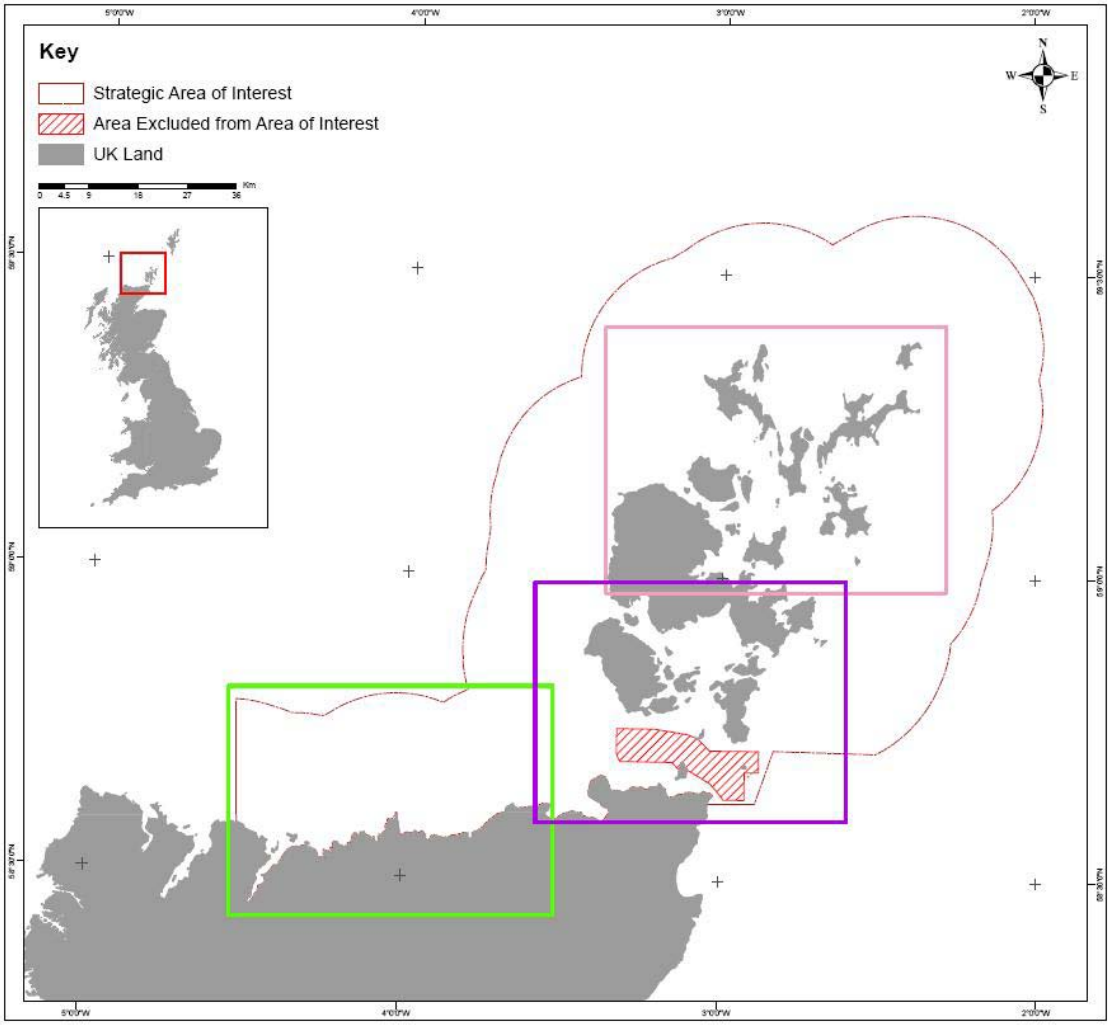
Introduction

This baseline report provides a high-level description of the physical characteristics, environmental conditions and human-environment within the Pentland Firth and Orkney Waters study area (defined below). The purpose of this report is to characterise the baseline conditions, highlighting any sensitivities, and describing the main uses and users of the area. Having a full understanding of the existing conditions and environmental constraints will be essential in developing the marine spatial plan (MSP) and identifying any potential areas where marine renewables could be developed.

Extent of the study area

This report is for the Pentland Firth and Orkney Waters. Data has been collected based on the study area put forward by the Crown Estate which extends along the north coast of Scotland from Whiten Head in the west to Duncansby Head in the east, and around the Orkney Islands out to the 12nm boundary, as depicted in Appendix D 1 below.

Figure Appendix D1 Pentland Firth and Orkney Waters Study Area and Crown Estates' Area of Interest



Maps to support the text in this Appendix are provided for the entire MSP study area, and for the detailed extents given in Figure Appendix D1 and can be found in the attached figures.

Main Sources of Baseline Data

During the last five years there has been a significant increase in the level of understanding of Scotland's marine environment. A number of reports have looked at characterising the condition of the marine environment and establishing a baseline, the most recent of which was the publication of Scotland's Seas: Towards Understanding their State (Baxter *el al* 2008).

Rather than reproduce large quantities of baseline data and information which has already been collated and presented in previous reports and studies, this baseline description looks to review and reference the available data to produce a high level summary of current baseline and future trends.

Key sources of data which have been used to compile this baseline report include:

- Offshore Energy Sea (DECC, 2009) – this SEA considers the environmental implications of a draft plan/programme for licensing for offshore oil and gas, including gas storage, and leasing for offshore wind. The environmental baseline is described in a number of appendices, in a UK context, and at a more detailed level specific to UK Regional Seas.
- Scotland's Seas: Towards Understanding their State (Baxter *et al* 2008) – this report establishes a baseline against which future marine and coastal policy can be measured. It includes contextual information and an initial data inventory on all aspects of the marine environment, with the aim to inform the development of the Scottish Marine Bill.
- Scottish Marine Renewables SEA (Scottish Executive, 2007) – this report, undertaken by Faber Maunsell and Metoc, examines the potential environmental effects of the development of wave and tidal devices off the west and north coast of Scotland. As part of this, a comprehensive description of baseline conditions is provided.
- SEA 4 (DTI 2003) – this SEA looks at the implications of further licensing of the UK Continental Shelf (UKCS) for oil and gas exploration and production for the region north and west of Orkney and Shetland, therefore overlapping with the study area for this MSP.

In addition to these general reports, at the beginning of each topic area the main data sources specific to that section are given. These include the Geographical Information System (GIS) data used to visually display the conditions in the study area, and secondary data in the form of reports to provide additional detail.

This is by no means an exhaustive list of the data which will be used in forming the framework for the MSP, but a starting point for data collection and a list of what is currently held. It is also important to remember that the baseline description presented is only a snap shot of the existing situation and that in future years the marine environment will be subject to continual change, either from natural processes or human intervention.

As such, it is recognised that a vast amount of data is available which has not yet been included and similarly new data will become available as the project progresses. It is hoped that the data sources listed can be supplemented, especially by data that is held locally. It is recognised that a number of local bodies hold information and data that would inform the development of an MSP for the Pentland Firth and Orkney Waters. Utilisation of this data will ensure that local knowledge and understanding is captured and that data is provided at the appropriate scale and within the timescales required. These additional data sources will then be reviewed as part of the process, identifying what has an immediate use and what has a longer-term value.

Consultation Question:
It is recognised that the data set is not complete and consultees are invited to identify further data sources that could be made available for this study.

BASELINE DATA AND KEY ISSUES

Biological Environment

Protected Sites

Proposed Data Sources

Data sources for protected sites include, but are not limited to:

- Natura 2000 sites, Sites of Special Scientific Interest (SSSI), Ramsar, National Nature Reserves – data from Joint Nature Conservation Committee (JNCC) and Scottish Natural Heritage (SNH) who provide descriptive and associated GIS shapefiles

Environmental Baseline

The coasts and seas around Scotland contain areas designated under a range national and international legislation in order to protect the biodiversity of Scottish seas and intertidal areas.

The coastal and marine sites relevant to biodiversity and nature conservation in the study area include:

- International Sites:
  - Natura 2000 Sites: Special Areas of Conservation (SAC) and Special Protection Areas (SPA)
  - Ramsar sites – wetlands of international importance designated under the Ramsar convention
  - World Heritage Sites

- National Sites:
  - Sites of Special Scientific Interest (SSSI)
  - Marine National Parks - Proposals to create a Coastal and Marine National Park for Scotland are not being taken forward at this stage but may be revisited once a wider legislative framework is in place.
  - National Scenic Areas (equivalent of Areas of Outstanding Natural Beauty [AONB] in England & Wales)

The level of protection afforded to Scottish coastal and marine waters reflects the abundance of sensitive and important species and habitats in Scotland. In the study area there are many protected areas, some of which are protected under more than one designation. Table Appendix D1 below details the coastal and nearshore sites which are protected and the designation afforded, and they are also displayed on Figure Appendix D2 (see attached figures). It should be noted for SSSI, that the table does not reflect the total number of sites, but indicates if a SSSI occurs within the boundary of another designated area.

Table Appendix D1 Protected Sites in the Study Area

Site Name	Designation				Designation details				
					SAC			SPA	Ramsar
	SAC	SPA	Ramsar	SSSI	Primary reason for designation	Other site features (qualifying features)	Other site features (non-qualifying)		
Auskerry		✓		✓				European storm-petrel (B); Arctic tern (B)	
Calf of Eday		✓		✓				Seabird assemblage (B)	
Copinsay		✓		✓				Great black-backed gull (B); Black-legged kittiwake (B); common guillemot (B); seabird assemblage	
East Sanday Coast		✓	✓	✓				Purple sandpiper (W); ruddy turnstone (W)	The site comprises inland, marine and coastal wetlands. The coastline consists of rocky and sandy sections, sand dunes, machair habitats, intertidal flats and saltmarsh. It supports greater than 20,000 waterfowl, including *Calidris maritime* and *Arenaria interpres*. Human activities include nature conservation and tourism within the site, and fishing, grazing, and mineral exploration in the vicinity.
Faray and Holm of Faray	✓			✓	Grey seals	None listed	Reefs, subtidal sandbanks, sea caves		
Hoy	✓	✓		✓	Designated as SAC but not for a marine habitat			Red-throated diver (B); great skua (B); seabird assemblage (B)	
Invernaver	✓			✓	Coastal habitats (dunes)	Coastal habitats (dunes)	Intertidal mudflats and sandflats, Atlantic salmon		
Loch of Stenness	✓				Coastal lagoons	None listed	None listed		
Marwick Head		✓		✓				Black-legged kittiwake (B); common guillemot (B); seabird assemblage (B)	
North Caithness Cliffs		✓		✓				Northern fulmar (B); black-legged kittiwake	

Site Name	Designation				Designation details				
					SAC			SPA	Ramsar
	SAC	SPA	Ramsar	SSSI	Primary reason for designation	Other site features (qualifying features)	Other site features (non-qualifying)		
								(B); common guillemot (B); razorbill (B); seabird assemblage (B)	
North Sutherland Coastal Islands		✓		✓				Barnacle goose (W)	
Papa Westray		✓		✓				Arctic tern (B)	
Pentland Firth Islands		✓		✓				Arctic tern (B)	
Rousay		✓		✓				Arctic skua (B); black-legged kittiwake (B); Arctic tern (B); seabird assemblage (B)	
Sanday	✓			✓	Reefs, seacaves Common seal	Tidal sandbanks and mudflats, subtidal sandbanks	Harbour porpoise		
Strathy Point	✓			✓	Designated as SAC but not for a marine habitat				
Stromness Heaths and Coast	✓			✓	Designated as SAC but not for a marine habitat				
Switha		✓		✓				Barnacle goose (W)	
West Westray		✓		✓				Northern fulmar (B); European shag (B); Arctic skua (B); great skua (B); mew gull (B); herring gull (B); black-legged kittiwake (B); Arctic tern (B); common guillemot (B); razorbill (B); black guillemot (B); Atlantic puffin (B); seabird assemblage (B)	

Key Issues and Future Trends

Some of the key issues include, but are not limited to:

- Change to designation boundaries - surveys of seabird distribution adjacent to selected breeding colony SPAs in 2001 resulted in recommendations of seaward extensions for certain species (McSorley *et al* cited in DECC 2009):
- Extensions of 1km: breeding guillemot (*Uria aalge*), razorbill (*Alca torda*) and puffin (*Fratercula arctica*)
- Extension of 2km: gannet (*Morus bassanus*) and fulmar (*Fulmarus glacialis*)
- Extension of 4km: Manx shearwater (*Puffinus puffinus*)

These extensions will affect seven SPAs within the study area. North Caithness Cliffs is designated for razorbill, fulmars, guillemot and kittiwake, and therefore has a 2km extension to the current delineation. West Westray, Calf of Eday, Rousay, Copinsay and Hoy are also extended by 2km. Marwick Head is extended by 1km for breeding guillemots. Figure Appendix D2 (see attached figures) shows the most up-to-date data with the extensions incorporated.

Designation of further sites: existing designations only allow for the protection of certain sites and species and do not protect against extractive activities. When the Scottish Marine Bill comes into force, a larger network of marine protected areas will be established which recognises nationally important species and habitats and designates highly protected marine sites. Work is also underway by JNCC and the four nature conservation agencies to identify further SPAs with marine components that will comprise a suite of entirely marine SPAs (JNCC 2009).

Benthic Ecology

Proposed Data Sources

Data sources available for characterising benthic ecology include, but are not limited to:

- Information on sites designated for benthic habitats as detailed in 2.1.1 above
- Technical reports on benthos from the Offshore Energy SEA, Scottish Marine Renewables SEA and SEA 4
- Mapping European Seabed Habitats (MESH) project GIS maps

Environmental Baseline

Benthic ecology incorporates the flora and fauna that inhabit the seabed and intertidal area. Protection is afforded to many of these habitats and species through Annexes I and II of the Habitats Directive, with SACs providing the main designation. The Countryside and Wildlife Act 1981 ‘as amended’ also covers benthic habitats and species with some subject to specific UK Biodiversity Action Plan (UKBAP) Priority Habitat Action Plans.

The importance of benthic ecology is recognised through the designation of SACs. Several benthic habitats are also recognised as important on the UK Biodiversity Action Plan (UKBAP) list. Whilst UKBAP priority habitats do not have any legal site status, their inclusion on the list means that UK Government will take actions to maintain their current range and abundance. Table Appendix D2 below identifies examples of UKBAP habitats which may be found within SAC sites. The SAC features listed below are all present in the study area, either as a primary reason for SAC designation or a qualifying feature of the SAC.

Table Appendix D2: Protected Benthic Habitats

SAC feature	UK Biodiversity Action Plan priority habitat types likely to be found within the SAC feature
Sublittoral Habitats	
Sandbanks which are slightly covered by seawater at all times.	Maerl beds Sublittoral sands and gravels
Large shallow inlets and bays	Maerl beds Tidal rapids Mud habitats in deep water Mudflats Sheltered muddy gravel
Reefs	*Modiolus modiolus* beds *Sabellaria alveolata* reefs *Sabellaria spinulosa* reefs *Lophelia pertusa* reefs *Serpula vermicularis* reefs Tidal rapids
Intertidal and Coastal Habitats	
Coastal lagoons*	Saline lagoons Tidal rapids Mudflats
Mudflats and sandflats not covered by seawater at low tide	Mudflats Seagrass beds
Submerged or partially submerged sea caves	-
Annual vegetation of drift lines	Coastal saltmarsh
Atlantic salt meadows (*Glauco-Puccinellietalia maritimae*)	Coastal saltmarsh

Source: after Scottish Executive (2007); JNCC 2009

Areas of known importance for marine benthic ecology have been identified in the study area based on their designation status (see Table Appendix D3). However, it should be noted that important areas for benthic ecology will exist outside of these areas, and therefore there may be a need for more detailed description of the benthic ecology within a particular area of interest.

Table Appendix D3: Sites Designated for Benthic Ecology in the Study Area

Site Name	Habitat Directive Primary Reason for Site Designation	Qualifying (but not primary) features	Protected Status	UKBAP Features
Invernaver	Coastal habitats	None	SAC	Intertidal mudflats and sandflats
Sanday	Reefs	Sandbanks which are slightly covered by seawater all the time Mudflats and sandflats not covered by seawater at low tide	SAC SSSI	Reefs Intertidal mudflats and sandflats Sublittoral sands and gravels *Modiolus modiolus*
Loch of Stenness	Coastal lagoons (priority feature)	None	SAC SSSI	Saline lagoons

Source: after Scottish Executive (2007)

Key Issues and Future Trends

Sources of contamination or seabed disturbing activities such as trawling, dredging and development can all impact directly or indirectly on benthic communities, by removing or destroying habitats. Whilst MESH provides a comprehensive overview, there are still data gaps in some areas. Further understanding of the existing baseline would make it possible to assess future trends and identify if further areas need protection.

Fish and Shellfish

Proposed Data Sources

Data sources for fish and shellfish include, but are not limited to:

- Information on nursery and spawning grounds from the Centre for Environment, Fisheries and Aquaculture Science (CEFAS) and Coull *et al* (1998).
- Technical reports on fish and shellfish from SEA 4 and the Offshore Energy SEA.
- Information from the Scottish Marine Renewables SEA

Environmental Baseline

Scottish waters are estimated to support 250 fish species, a number of which can be found in the study area. Of the many species present, the native oyster, cod and haddock are all listed on The World Conservation Union (IUCN) Red List of Threatened Species and the common skate, basking shark and native oyster are listed as UKBAP species. SACs can be designated for the presence of certain fish species (sea lamprey, river lamprey, allis shad and Atlantic salmon) but no sites are designated for this purpose in the study area (JNCC 2009).

Spawning grounds and nursery areas for several commercial species of fish are located across various parts of the study area (see Table Appendix D4 and Figure Appendix D3 in the attached figures) and support a successful fishing industry. This information gives an indication of the type of species found in the study area.

Table Appendix D4: Spawning and Nursery Grounds in the Study Area

Spawning species		Nursery species	
Herring	Sandeels	Haddock	Plaice
Lemon sole	Sprat	Lemon sole	Saithe
Nephrops	Whiting	*Nephrops*	Sandeels
Norway pout		Norway pout	Sprat

Source: Coull *et al* (1998)

Elasmobranchs are also common in the Pentland Firth and waters around the Orkneys. The Offshore Energy SEA (DECC 2009) details several species of dogfish (e.g. lesser-spotted dogfish), shark (e.g. porbeagle), skates (e.g. common skate) and rays (e.g. cuckoo ray).

Key Issues and Future Trends

Key issues and future trends for fish populations include, but are not limited to:

Availability of data: For non-commercial species, the understanding of population sizes and trends is relatively unknown. There are significant fluctuations over the course of the year in the total biomass of fish found in Scottish waters. Data for commercially exploited fish stocks are more readily available as it is one of the most comprehensively monitored and managed

components of the marine environment, due to the economic importance of the commercial fishing industry.

Over-fishing – stocks for commercially important species are being depleted by large-scale fishing activities.

By-catch and discards – many fisheries are partially non-selective and consequently catch non-target species (by-catch). This extra catch is often discarded (thrown back over the side), especially if the fish don't have a commercial value, are under-sized or over quota. Scotland has taken a lead in tackling bycatch and discards through encouraging use of technology such as square-meshed escape panels and behaviour which reduces unwanted catches (for example, real-time closures to avoid juvenile cod) (Baxter *et al* 2008).

Habitat destruction – offshore and coastal developments can lead directly and indirectly to habitat destruction either through removal of habitat or smothering of benthic communities.

In the future, creation of highly protected marine sites (where no extractive activities are permitted) could see populations increase in number and viability. Fishing quotas (set each year by the EU December Council) will also determine which species are targeted and the allowed catch.

Birds

Proposed Data Sources

Seabird data sources include, but are not limited to:

- Seabird vulnerability in UK waters (JNCC 1999)
- Technical report on Seabirds from SEA 4, Offshore Energy SEA and Scottish Marine Renewables SEA
- SPA Natura 2000 sites (JNCC)
- Locations of Important Bird Areas (Skov *et al* 1995)

Environmental Baseline

The study area contains nationally and internationally important seabird populations of a large number of seabird species. These are protected under the EC Birds Directive, through the establishment of Special Protection Areas (SPAs), for the conservation of breeding, migrating and wintering birds.

As of 2007 data from JNCC, there are 13 SPAs in the study area, 10 of which are designated for the protection of breeding seabirds (see Table Appendix D5). As discussed above, surveys of seabird distribution adjacent to selected breeding colony SPAs in 2001 resulted in recommendations of seaward extensions for certain species. These have not yet been formalised, but the data available includes the proposed extensions and so these new boundaries have been taken into consideration in this study.

The study area also overlaps with the Orkney to Shetland Important Bird Area (IBA) (Skov *et al* 1995). IBAs identify sites at a biographic scale which are critical for the long-term viability of bird populations. Whilst the areas are not afforded any statutory protection, they do provide a useful indication as to which areas of the UK are important to seabirds. Within the study area, the report identifies important breeding colonies for gannet (*Morus bassanus*), great skua (*Catharacta skua*) and guillemot (*Uria aalge*). The area is extremely important for the great skua, especially in July and August when more than half the world population of the species is present.

The seabird distribution is likely to be linked to availability of food resources, which are nutrient rich due to the North Atlantic waters flowing in the area. In addition to the species listed above, the following species occur in internationally important numbers in the Orkney – Shetland IBA: great northern diver (*Gavia immer*), gannet, shag (*Phalacrocorax aristotelis*), great skua, herring gull (*Larus argentatus*), guillemot, and black guillemot (*Cepphus grylle*). The area also supports a number of internationally important breeding birds. The distribution of these varies throughout the year, and Table Appendix D4 shows the species present and at what time of year for the study area.

Table Appendix D5: Annual Variability of Seabird Species Present in the Study Area

Species	Month											
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec
Razorbill (*Alca torda*)												
Common tern (*Sterna hirundo*)												
Puffin (*Fratercula arctica*)												
Great skua *(Catharacta skua)*												
Great black-backed gull (*Larus marinus*)												
Great northern diver (*Gavia immer*)												
Herring gull* (*Larus argentatus*)												
Goldeneye (*Bucephala clangula*)												
Shag (*Phalacrocorax aristotelis*), fulmar (*Fulmarus glacialis*), gannet (*Morus bassanus*), guillemot(*Uria aalge*), black guillemot (*Cepphus grylle*), kittiwake (*Rissa tridactyla*) and common eider (*Somateria mollissima*)												

Source: after Skov *et al* 1995

UK BAP Species

There are 59 species of birds which are listed on the UK BAP list of priority species (UK BAP 2007). Only one of these is found in the vicinity of the development: the herring gull. Whilst identified as a priority species, it does not have a specific species action plan as yet, despite showing a moderate decline in the UK.

Additional data on the distribution of seabirds within the study area is available from the Ocean Biogeographic Information System Spatial Ecological Analysis of Megavertebrate Populations (OBIS-SEAMAP), which will be utilised further as the project progresses. OBIS-SEAMAP is a spatially referenced online database aggregating data from across the globe (Read *et al* 2009). One of the key datasets it displays which is useful to this study is the European Seabirds at Sea (ESAS) database. Established in 1991, ESAS is a collaboration of data collected by individuals and institutes in north-west European offshore areas. The database now contains over two million records, collected over 25 years.

Key Issues and Future Trends

Issues affecting seabirds include, but are not limited to:

Food availability – poor availability of food can lead to starvation of chicks and force adults to spend longer periods away from the chicks as they forage for food. This leaves chicks susceptible to predation and chilling.

Poor weather conditions – this can restrict foraging and lead to chilling or washing away of nests during storms.

In the future, **climate change** is likely to be a key issue. This could result in a number of potentially adverse changes including: the displacement of fish stocks (their main food source); an increase in extreme weather events and changes in sea levels and temperatures.

Protected areas are considered important for increasing resilience to change within a population. At present, there is only one complete marine SPA in the UK (in Wales), but work is being undertaken to identify further SPAs with marine components to create a suite of entirely marine SPAs, alongside seaward extensions where applicable. Protected areas created under the UK Marine and Coastal Access Bill could allow species currently omitted from Natura 2000 sites to be protected.

Marine Mammals

Proposed Data Sources

Data sources for marine mammals includes, but is not limited to:

- Atlas of cetacean distribution (Reid *et al* 2003)
- Scottish Marine Renewables SEA chapter on marine mammals
- Deliberate disturbance of marine European protected species guidance (JNCC 2008)
- SCANS-II project (Small Cetaceans in the European Atlantic and North Sea)
- Technical reports on marine mammals from SEA 4, Offshore Energy SEA
- UKBAP list
- JNCC Natura 2000 sites

Environmental Baseline

The waters around Scotland are important for marine mammals. As a whole, Scotland holds ~85% of Europe's population of grey seals (*Halichoerus grypus*) and ~43% of the European population of common seals (*Phoca vitulina*). Within the study area, nationally and internationally important populations of marine mammals can be found. The following text is informed by the Scottish Marine Renewables SEA.

Pinnipeds:

Along the North Coast, there are a limited number of grey and common seal haulouts and breeding areas. These are primarily located in Loch Eribol and around Eilean nan Rón and Neave Island. Although population numbers in this specific area have not been estimated, they are likely to be limited to a few thousand seals.

The Pentland Firth contains a small number of grey and common seal haulouts and breeding areas. These are primarily located on the islands of Stroma, Switha and Swona, and the Pentland Skerries. There is also a large grey seal breeding colongy 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, data from satellite tracked seals show that the Pentland Firth is a regular stopping off point, and the close proximity of this area to Orkney means that relatively large numbers of seals are likely to use this area.

The largest populations of grey and common seals in the study area are found around the Orkney Islands. Both species are reported as being widespread and present in relatively large numbers throughout the area (Baxter *et al* 2008). However, research undertaken by The Sea Mammal Research Unit (SMRU) indicates that the seal population is actually declining: around the Orkney Islands populations have halved since 2001, declining almost 10% each year (BBC news online, 2008).

Cetaceans:

Cetaceans (whales, dolphins and porpoise) are also frequently sighted in the study area. Minke whale (*Balaenoptera acutorostrata*), harbour porpoise (*Phoceona phocoena*), killer whale (*Orcinus orca*), Risso's dolphin (*Grampus griseus*) and white-beaked dolphin (*Lagenorhynchus albirostris*) are all present in the study area at some point in the year (Reid *et al* 2003).

Under Annex IV of the Habitats Directive, all cetacean species have been identified as species of European Community interest and are afforded protection as European Protected Species (EPS). All EPSs are also fully protected under the Wildlife and Countryside Act (1981). For any EPS it is an offence to deliberately or recklessly capture, kill, injure or disturb any such animal. The EU Habitats Directive (1992) lists two species in Annex II: bottlenose dolphins and harbour porpoises, and requires that SACs are set up for them. Despite the presence of harbour porpoise in the study area, no formal designation exists.

Table AppendixD6: Details the Sites in the Study Area which are Protected for Marine Mammals:

Site Name	Key Features	Protected Status
Sanday	Common seals. The breeding groups, found on intertidal haulout sites that are unevenly distributed around the Sanday coasta, represent over 4% of the UK population. Nearshore kelp beds that surround Sanday are important foraging areas for the seals, and the colony is linked to a very large surrounding population in the Orkney archipelago	SAC
Faray and Holm of Faray	Grey seals. These two uninhabited islands in the northern part of Orkney support a well established breeding colony. The seals tend to be found in areas where there is easy access from the shore, and freshwater pools on the islands appear to be particularly important. The islands support the second-largest breeding colony in the UK, contributing around 9% of annual UK pup production	SAC

Source: Scottish Executive (2007)

Marine reptiles

Marine turtle records for the UK and Republic of Ireland indicate that 14% of sightings between 1997 – 2007 were in Scottish waters. A distribution map of these sightings shows that a number of these were within the study area. Leatherback turtles are the most commonly reported species (found along the north coast of the study area) with sightings peaking in late summer and early autumn (Baxter *et al* 2008).

Key Issues and Future Trends

By-catch – accidental catch and entanglement in fishing nets is one of the main threats to marine mammals.

Ocean pollution – both chemical and noise pollution are key issues for marine mammals, the latter affects their ability to echolocate and communicate.

Boat strike – the waters around Scotland, and especially in the Pentland Firth, are very busy, and fatal and non-fatal collisions (which can lead to serious injury) are a key threat to with marine mammals.

In the future, marine mammals could be afforded further protection through the Scottish Marine Bill. In fact, the conservation of seals is one of the key areas being looked into under nature and conservation through a Scottish Marine Bill.

Physical Environment

Meteorology and Oceanography

This Section presents an overview of the oceanographic conditions experienced in the area of the Orkney Islands, the Pentland Firth and the north coast of Scotland. Emphasis is placed on wave and current conditions.

Bathymetry

Water depths within the bays and channels of the Orkney Islands are generally less than 25m (referenced to Chart Datum), and rarely exceed 40m (from UKHO Admiralty Charts).

The Pentland Firth is significantly deeper, with depths in the main channel typically lying in the range 60-80m. Depths of over 90m are found in the western part of the Firth, between Hoy and Dunnet Head. The Inner Sound, south of the Island of Stroma, is somewhat shallower, reaching a maximum depth of around 35m.

Along the north coast of Scotland, between Loch Eriboll and Dunnet Head, the seabed typically drops rapidly to depths of 30m, and then continues dropping at a shallower gradient to depths of at least 60-80m, and over 100m in some areas to the north of Strathy Point.

Figure Appendix D16 (see attached figures) displays bathymetric data for the study area. An understanding of the bathymetry is important as site selection of renewable devices will be, in part, limited by the depth ranges at which the devices can operate.

Water Levels

Water levels throughout the region are dominated by the semi-diurnal tide propagating from the north Atlantic Ocean. The mean spring range is approximately 2.5m in the northeast Orkney Islands, and exceeds 3.0m in the central/western parts of the Islands and within the Pentland Firth. Along the mainland coast west of the Firth, a mean spring range of 4.0m is typical (UKHO, 2009)

The tidal wave floods from west (the North Atlantic) to east throughout the area of interest, before turning south and propagating down the North Sea coast of Scotland. The wave takes almost three hours to pass from Loch Eriboll to the eastern end of the Pentland Firth, so that High Water in the west of the area of interest occurs approximately three hours before that in the east. The tidal wave slows down considerably as it passes through the Pentland Firth and Orkney Islands, such that High Water in the east of the Firth can lag that in the west, little more than 30km distant, by more than 1.5hours (UKHO, 1986a)

Storm surges will occur at irregular intervals in response to meteorological forcing, particularly the passage of low pressure systems. The height of these surges is somewhat limited by the generally open nature of the site. A positive storm surge of about 1.5m might be expected to occur in the area approximately once every 50 years (this height is in addition to the tidal level) (D.En., 1990).

Tidal Currents

Tidal currents within the area of interest are complex. The area lies close to the boundary between the North Atlantic and North Sea tidal systems. The incoming North Atlantic tidal wave reaches the Orkney Islands several hours before the North Sea tidal wave, causing a net flow of water from west to east on the flood tide, particularly through the Pentland Firth (Dacre *et al*., 2001). The interaction of the two tidal systems results in a dynamic and energetic tidal regime throughout the area of interest. However, this flow is strongly modified by local conditions of water depth and topography. Tidal races and eddies are typical throughout the area. These

have the effect that frequently the flood and ebb tides do not directionally oppose one another, which might be an important consideration in the siting of tidal power devices.

The following figures (taken from ABPmer *et al*., 2008) indicate peak spring and neap tidal flows in the Orkney region. The plots are not highly resolved but give a good general indication of the spatial distribution of tidal currents. Flows are strongest where the tide is forced through a constrained channel (such as the Pentland Firth and some of the channels within the Orkney Islands), and also where the tide is forced around a headland (such as to the north of Papa Westray and North Ronaldsay).

Figure Appendix D4 Peak Tidal Current Flow on a Mean Spring Tide

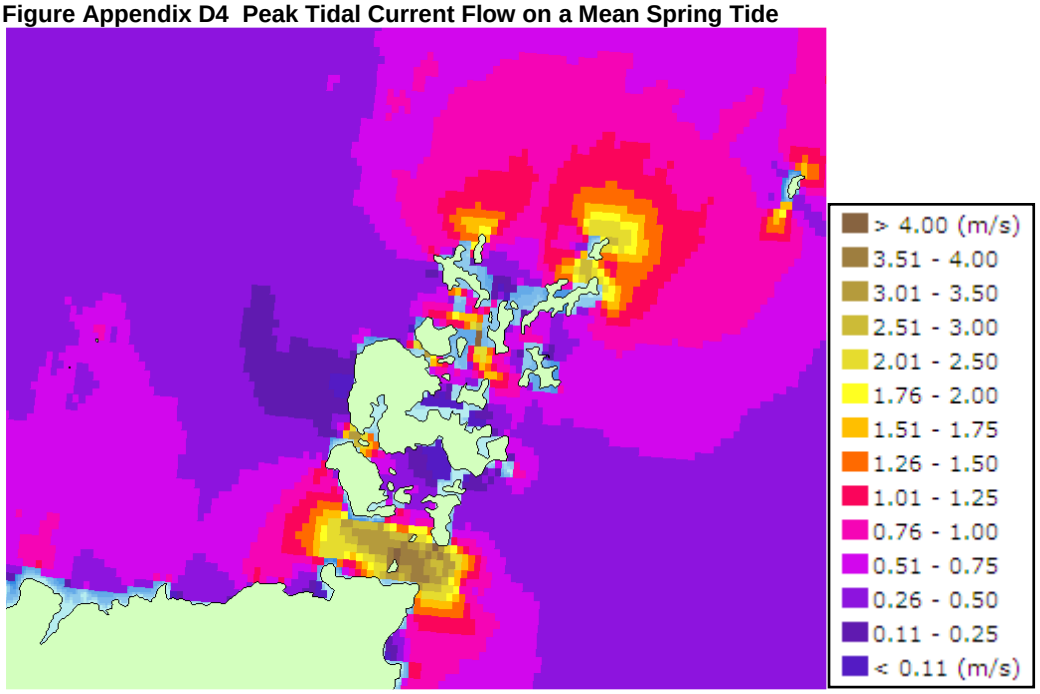
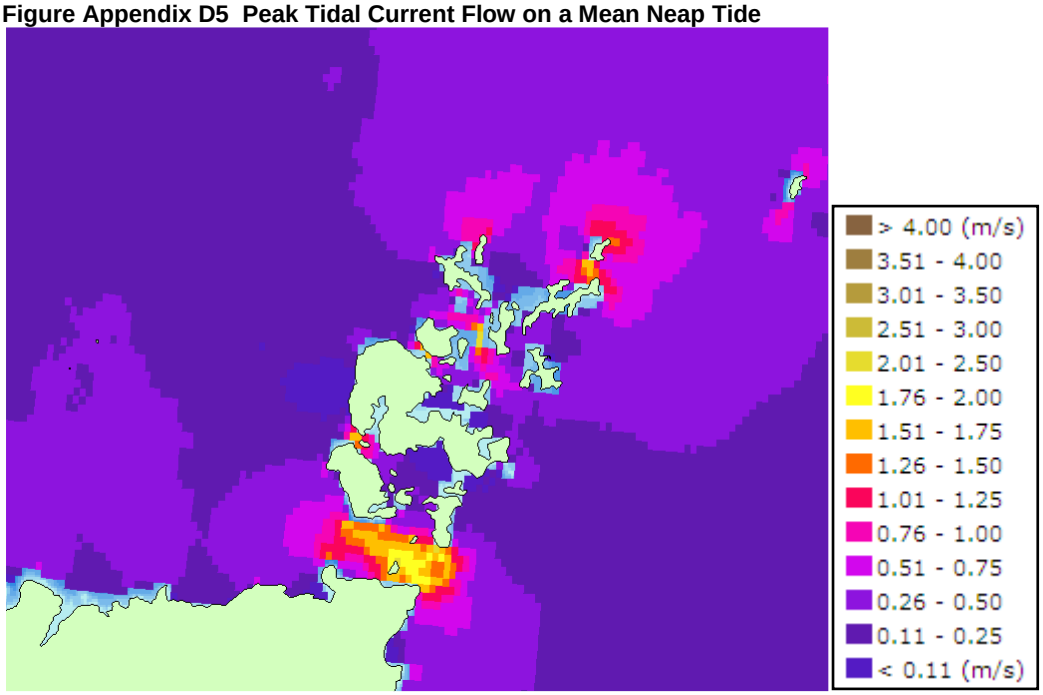


Figure Appendix D5 Peak Tidal Current Flow on a Mean Neap Tide



Orkney Islands

Tidal current flow through the Orkney Islands is dictated by water depth and topography. The islands form a barrier to the flooding North Atlantic tidal wave as it rounds the north of Scotland to enter the North Sea, and form a similar barrier to the ebbing tide travelling in the opposite direction. The effect of this barrier is to force strong current flows north and south of the islands, and through the various channels that dissect them. The areas of strongest tidal flow are described below (UKHO, 1986b and 1997 plus Admiralty Charts).

Where the tidal wave is diverted to the north of the Orkney Islands it causes strong flows close to the coast, which tend to diminish as distance from land increases. To the north of Papa Westray, spring rates of $3ms^{-1}$ are typical on both flood and ebb. Eddies and races can form on both flood and ebb tides, particularly if the wind is opposing the flow. On the west-going ebb tide, the race **north of Papa Westray** is referred to as The Bore Röst. To the **north and northeast of North Ronaldsay,** spring tidal flows of 3ms-1 can occur on both flood and ebb.

Strong tidal flows occur in many of the channels between the Orkney Islands. In the **North Ronaldsay Firth** between North Ronaldsay and Sanday, spring flood and ebb rates of over $2ms^{-1}$ can occur, as well as eddies, overfalls and tidal races in both directions. In **Lashy Sound**, the northern part of **Eday Sound** between Eday and Sanday, peak spring rates of $3.0ms^{-1}$ occur on both flood and ebb. Similar rates occur in **Calf Sound** between Eday and Calf of Eday, and heavy tidal races can occur both here and in Lashy Sound, particularly when north-going tides are opposed by a strong northerly wind.

Westray Firth and **Stronsay Firth** together form the main channel through the Orkney Islands for the flooding and ebbing tide. As such, they exhibit strong tidal flows in both directions, as well as many areas of tidal races, eddies and overfalls, all of which can form at short notice depending on location, tidal state, wind conditions and associated factors. Some of these features are prominent enough to be named, such as the Rull Röst northeast of Rousay and the Fall of Warness south of Eday. In Westray Firth between Westray and Rousay, peak flows on a mean spring tide can be $3.5ms^{-1}$ or greater on the southeast-going flood, and somewhat lower on the northeast ebb. In Stronsay Firth between Shapinsay and Stronsay, peak spring tidal flows of $2ms^{-1}$ are reported on both flood and ebb to the northeast of Shapinsay, diminishing as the Firth opens out to the southeast.

Another flow channel through the Orkney Islands follows the northeast coast of Mainland. This series of channels also has locations of strong tidal flow, tidal races and pronounced eddies. In **Eynhallow Sound** between Mainland and Rousay, peak spring rates of 1.5 ms^{-1} are typical, but they can exceed $3.5ms^{-1}$ northeast and southwest of the small mid-channel island of Eynhallow (the resultant races are referred to as the Weal Race and Burger Röst, respectively). Further southeast, **between Mainland and Gairsay**, there are strong eddies and turbulence associated with peak spring speeds of about $2ms^{-1}$. In **The String** and **Shapinsay Sound** between Mainland and Shapinsay, peak spring rates of $2ms^{-1}$ are also typical. Similar current speeds, and possibly slightly higher, occur at locations to the west of Shapinsay, where a complex system of shoals and channels results in turbulent current flow and numerous areas of tidal races and eddies.

In the southern part of the Orkney Islands, there are areas of very strong current flow through the channels leading to Scapa Flow. The island of Graemsay lies in Hoy Sound, the northwest entrance to Scapa Flow between Mainland and Hoy. **North and northwest of Graemsay**, the strong flows cause an extensive area of races, overfalls and eddies, which are most pronounced at certain states of tide and under certain weather conditions. Peak spring rates exceed $4ms^{-1}$ in the most constricted part of the channel. In **Burra Sound**, southwest of Graemsay, peak spring rates of $3ms^{-1}$ are more typical. The **Sound of Hoxa**, between Flotta and South Ronaldsay, forms the southern entrance to Scapa Flow. Tidal streams are generally weaker here than in other channels, with a peak spring speed of about $1ms^{-1}$, although rates of $2ms^{-1}$ are reported off the southeast tip of Flotta. However, this is an area of complex eddies and unequal flood and ebb streams, due to interaction with the flows through the Pentland Firth.

Pentland Firth:

Tidal currents within the Pentland Firth are very complex and highly variable, due to the strong flows and the presence of reefs and islands, variable water depths, and the influence of the weather. This section presents a summary of the main flow features (UKHO, 1986b and 1997 plus Admiralty Charts).

West of the main part of the Firth (i.e. **west of Dunnet Head**), peak spring current speeds of 1.5ms^{-1} are typical on both flood and ebb. However, flows increase significantly eastwards into the Firth, and there are widespread and highly energetic tidal races, eddies, overfalls and areas of general turbulence. **Between Tor Ness on Hoy and St John's Point on the Scottish mainland**, the Merry Men of Mey is one of the most significant oceanographic features in the Firth. This is an area of tidal racing that occurs on the west-going ebb, particularly when opposed by westerly wind or waves. The feature can extend right across the width of the Firth, and is characterised by strong flows (peak spring rates in excess of 3ms^{-1}) and significant standing waves which frequently break and have been reported to exceed 10m in height on occasion.

The central part of the Pentland Firth may be split into three channels. These are, from north: the channel between the island of Swona and the Orkney Islands of South Walls (Hoy) and South Ronaldsay; the Outer Sound between Swona and the Island of Stroma; and the Inner Sound between the Island of Stroma and the Scottish mainland. The **channel between Swona and South Walls** experiences spring rates of 2.5ms^{-1}, while the **channel between Swona and South Ronaldsay** has spring rates of 4ms^{-1} on the eastern side. Swona itself causes extensive eddies to its east during the east-going flood tide, and similarly to its west during the ebb. There are also significant tidal races both north and south of the island, as there are to the south of South Ronaldsay.

The **Outer Sound** between Swona and the Island of Stroma has peak spring speeds of about 4.5ms^{-1} on both flood and ebb tides. These flows cause an almost continuous tidal race north of the Island of Stroma, referred to as The Swilkie. The Island of Stroma also generates extensive eddies on its downstream side during both flood and ebb flows. The **Inner Sound** between the Island of Stroma and the Scottish mainland experiences peak spring flows of about 2.5ms^{-1}. There are significant tidal races southwest of the Island of Stroma and further east offshore the Ness of Duncansby on the mainland (the Duncansby Race).

Some of the strongest currents of all are found in the eastern part of the Pentland Firth. **Between North Ronaldsay and Muckle Skerry**, peak spring rates can reach 4ms^{-1}, particularly in mid-channel where an area of races, overfalls and eddies is referred to as the Liddel Eddy. Peak spring rates of 4ms^{-1} are also typical of the channel **between the Pentland Skerries and Duncansby Head** on the mainland, although close in to the Pentland Skerries flows as high as 6ms^{-1} are reported. The Pentland Skerries cause eddies on both flood and ebb tides.

North Coast of Scottish Mainland:

Compared to the highly energetic and complex current regime of the Orkney Islands and Pentland Firth, tidal flows along the north coast of the Scottish mainland may be considered relatively benign (UKHO, 1986b and 1997 plus Admiralty Charts). In general terms, tidal flows set to the east during the flood tide and to the west during the ebb, travelling roughly parallel with the coast (although there is some eddying in the vicinity of the more pronounced headlands and bays).

Tidal current speeds are significantly lower than elsewhere in the area of interest, with peak spring flows generally not exceeding 0.75ms^{-1} on either flood or ebb. Such flows occur in the offshore regions and close to the prominent headlands such as Strathy Point. In less prominent near-coast areas, flows are weaker still and unlikely to exceed 0.5ms^{-1} as a peak spring rate.

Non-tidal Currents

Current flow within the area of interest is dominated by the semi-diurnal tide, but other, non-tidal flows will occur. The main components of non-tidal current flows are summarised below.

Storm surge currents are water movements driven by the passage of intense low pressure systems. In the area of interest, surge currents are most likely to travel from west to east along the north coast of the mainland, although the area may also be affected by southward-moving surges in the North Sea. Surge currents are unpredictable (outwith the timescales of accurate weather forecasts) and irregular in nature. They are usually assessed by considering the magnitude of current likely within a given return period. By way of indication, surge currents as high as 1.4ms^{-1} may occur in the Pentland Firth with a return period of 50 years (HSE, 2002). Along the north coast of the mainland and in the northern Orkney Islands, 50-year surge currents of 0.6-1.0ms^{-1} are more typical. As with tidal currents, surge currents will be strongly modified by local water depth and topography.

General circulation currents cause a net transfer of water clockwise around the north coast of the UK. However, associated speeds are generally low, typically no more than 0.1-0.2ms^{-1} (HSE, 2001). This component is therefore relatively insignificant compared to the tidal currents in the Orkney region. Circulatory flows can vary considerably over short distances, and are usually greatest within a few kilometres of significant topographic features such as headlands, islands and banks.

Surface wind-drift currents are caused by the entrainment of the surface water layers (typically only the top few metres) by the wind. These flows are different to general circulatory flows, which are caused by weather systems over larger space and time scales. Wind-drift currents will typically grow to no more than 2 or 3% of the wind speed (i.e. a maximum of c. 0.6ms^{-1} for a strong wind speed of 20ms^{-1}) (HSE, 2001). It is also likely that, since wind-drift currents only affect the top layer of the water column, they will be broken down by wave mixing (particularly if the waves are breaking) or strong three-dimensional flow features. These conditions are known to occur within many areas of the Pentland Firth, such as the Merry Men of Mey between Hoy and the Scottish mainland, and in the many races and eddies that occur around the Firth's islands and headlands at different stages of the tide.

Currents associated with wave orbital motions are discussed in the section on waves.

Waves

The wave climate in the area of interest is dominated by the passage of low pressure systems from west to east across the North Atlantic. In general terms the highest waves approach the Orkney area from westerly directions; these are also the directions from which waves most frequently occur.

Wave Heights:

The following figures (taken from BODC, 1998) plot the significant wave heights that are exceeded for different proportions of the year across the area of interest. Wave conditions are most severe (i.e. the wave field contains the greatest energy) in the exposed coastal areas to the west of the Orkney Islands. East of the Orkney Islands, the wave climate is less severe due to sheltering from the dominant westerlies, even though these sites are correspondingly more open to waves from northeast, east and southeast in the North Sea. Along the north coast of Scotland, the mainland itself and the northern tip of the Hebrides will result in sheltering for wave directions south of west, which will reduce the energy available in the wave field.

Figure Appendix D6:Significant wave height exceeded for 75% of the year

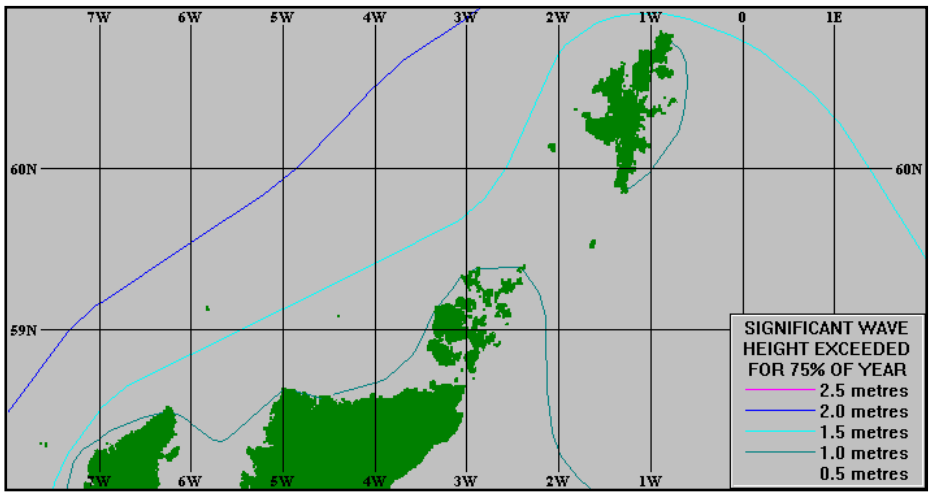


Figure Appendix D7: Significant wave height exceeded for 50% of the year

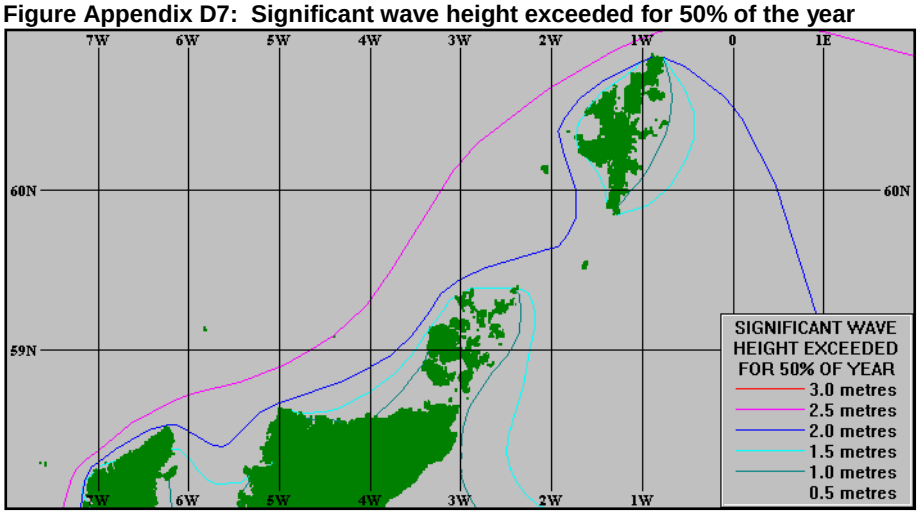


Figure Appendix D8: Significant wave height exceeded for 25% of the year

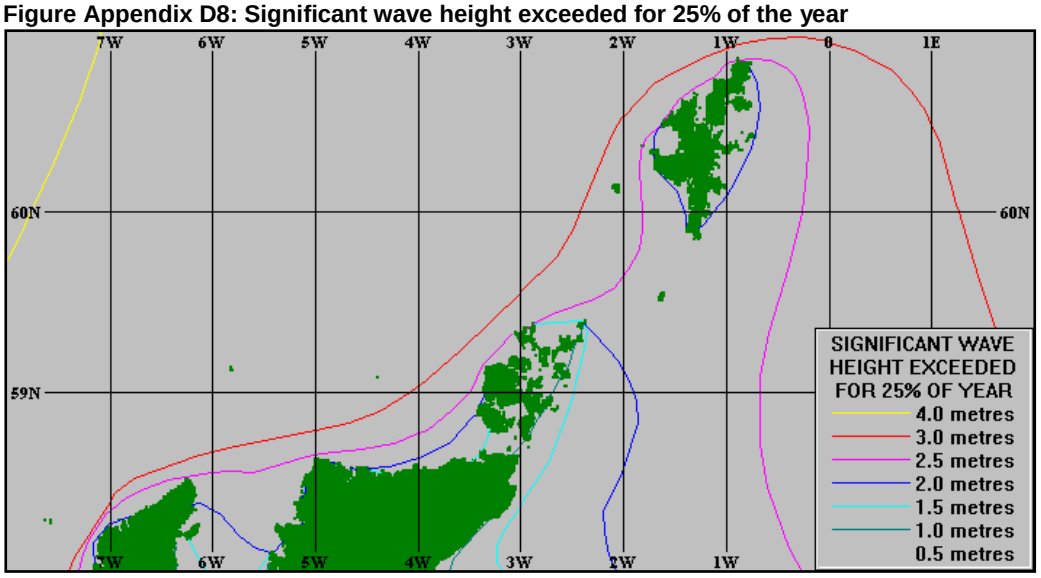
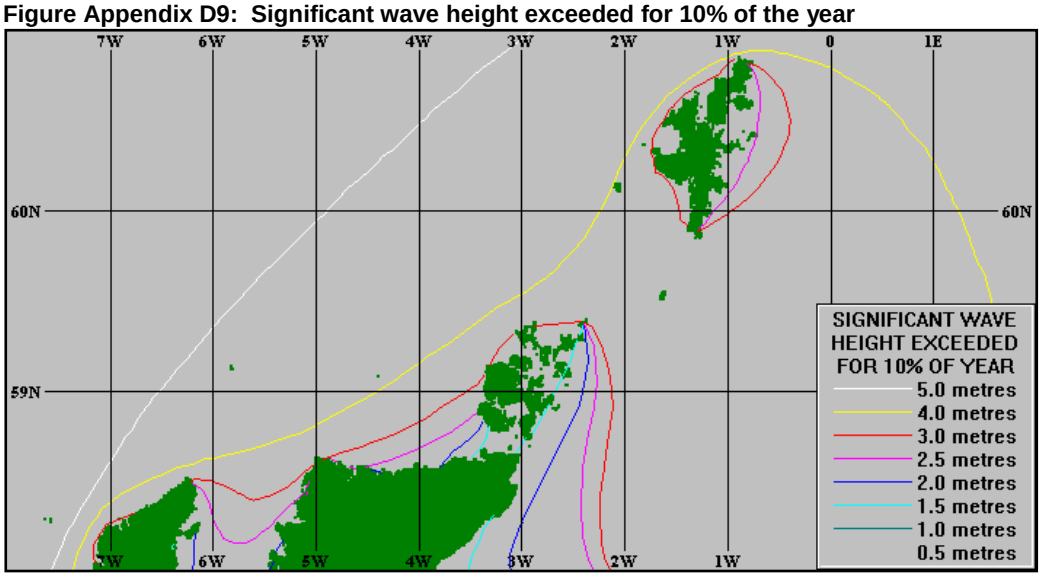


Figure Appendix D9: Significant wave height exceeded for 10% of the year



The following figures (taken from ABPmer *et al*., 2008) show annual and seasonal values for mean significant wave height. In the most exposed part of the area of interest, west of Westray in the northwest Orkney Islands, the annual mean significant wave height is within the range 2.25-2.5 m. The average summer height at the same location is 1.5-1.75 m, and in winter it is 3.0-3.25 m. Compared to this exposed location west of Westray, average wave heights throughout the year are typically at least 0.5 m lower to the west of Hoy; at least 0.75 m lower along the north coast of the Scottish mainland; and over 1.0 m lower within the Pentland Firth.

Figure Appendix D10 Annual Mean Significant Wave Height

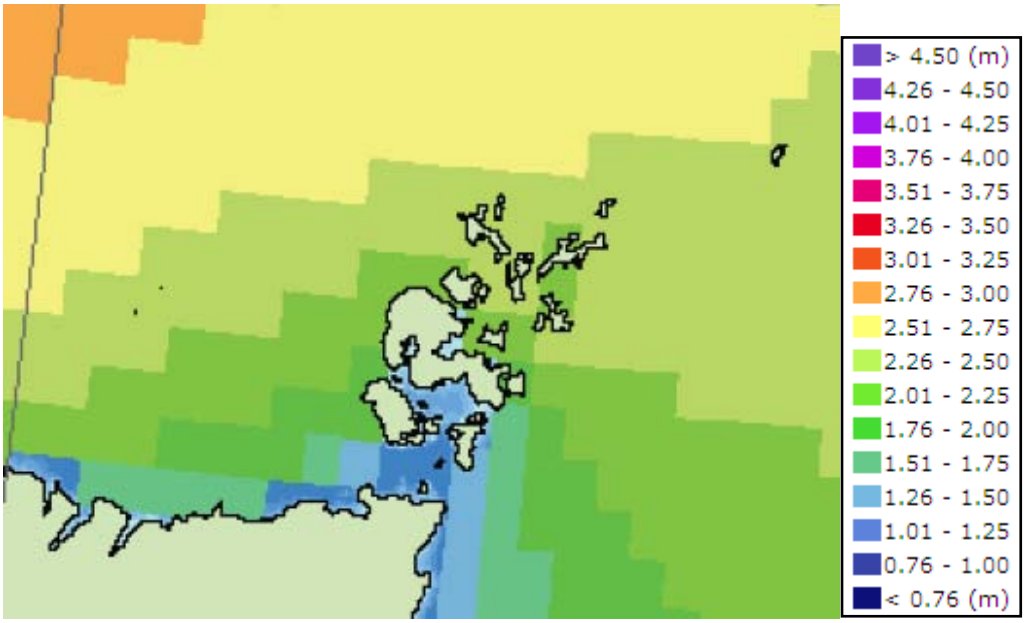


Figure Appendix D11 Spring Mean Significant Wave Height

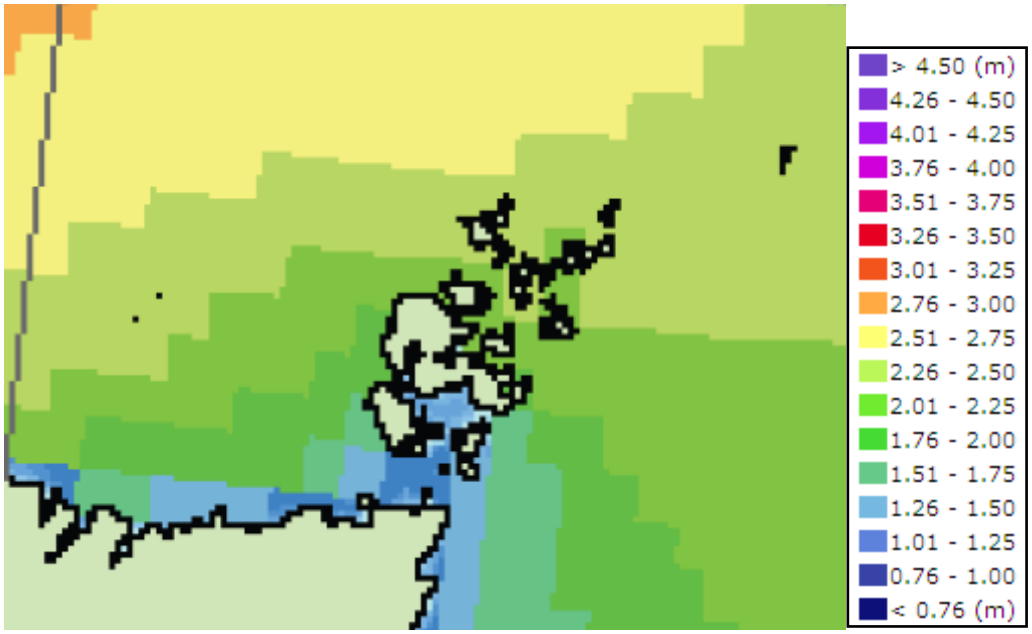


Figure Appendix D12 Summer Mean Significant Wave Height

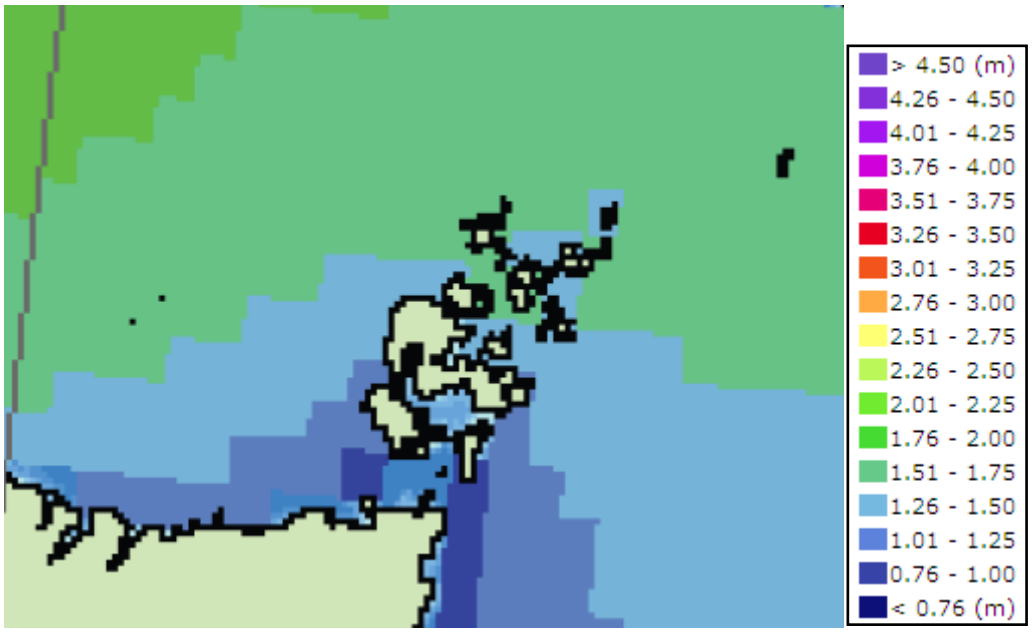


Figure Appendix D 13: Autumn Mean Significant Wave Height

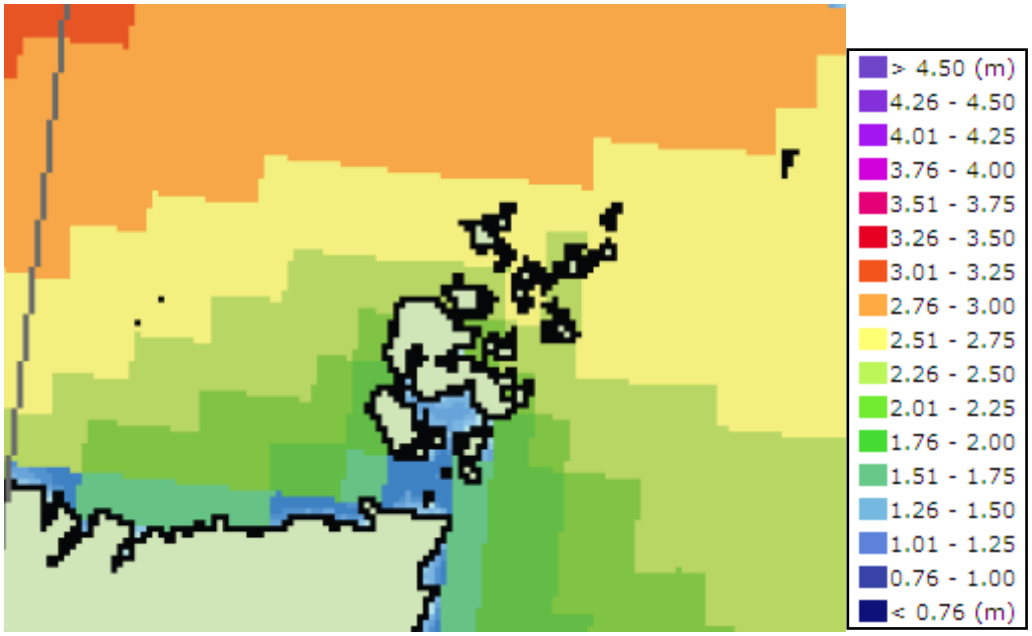
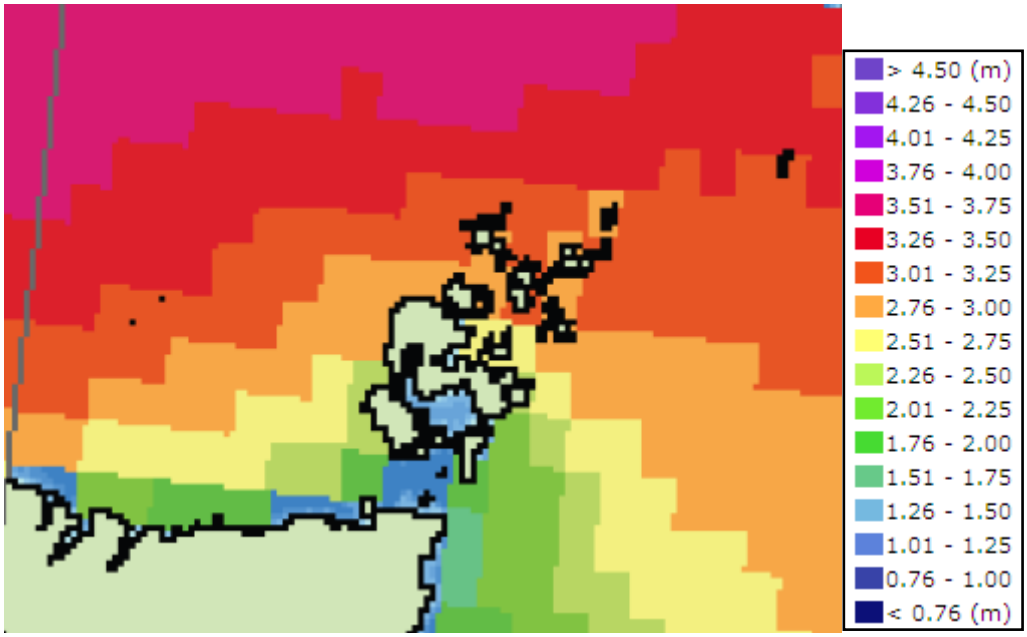


Figure Appendix D 14 Winter Mean Significant Wave Height

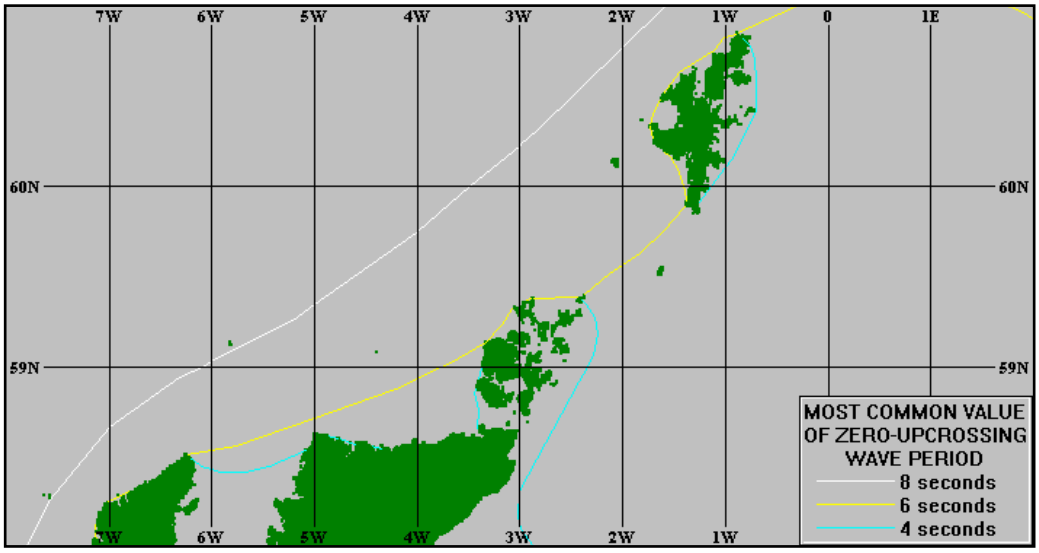


Wave Periods:

The following figure (taken from BODC, 1998) illustrates the most common (modal) wave period across the area of interest. Periods of 6s are common to the west and north of the Orkney Islands, while shorter periods of 4s are more typical of the Pentland Firth and east of the Orkney Islands. However, these modal periods do not indicate the contribution from long-period swell waves. The dominant direction for these is west (i.e. propagating from the North Atlantic), so they will have the greatest impact in those areas most exposed to the west, namely the northwest part of the Orkney Islands. Swell wave periods of 10-16s are typical, and

significantly longer periods of up to 40s have been measured. Swell wave climates tend to exhibit more regular periods and directions, and a narrower range of wave heights, than locally-generated wind waves.

Figure Appendix D 15 Most common value of zero up-crossing wave period



Shallow Water Effects:

Water depth and seabed topography both have important effects in modifying incoming waves. As waves pass from deep water into shallower coastal waters, they begin to interact with the seabed. This causes the waves to slow down and steepen, ultimately to the point where their increasing steepness becomes unstable and wave breaking occurs. The effect of seabed interaction also causes waves to lose energy, thus reducing the amount of energy potentially available for wave power devices. These processes explain why wave heights, and the associated wave energy, tend to be lower in shallower, near-coast areas. Average wave heights in the Pentland Firth are lower than those northwest of the Orkney Islands due to the combined effects of sheltering and shallow water depths.

Wave Orbital Motions:

Wave orbital motions are the oscillatory currents associated with the passage of waves. These cause forwards and backwards movement associated with the passage of crest and trough respectively. Waves typically do not cause a net transport of water but can cause strong instantaneous loads on submerged structures. Wave orbital motions are aligned in the direction of wave propagation. The strength of these currents is primarily dependent on the height and length of the wave and the depth of the water. Typically, higher and longer waves will induce orbital motions at greater depths within the water column. The strength of the motion for a given wave diminishes with depth.

Sea Temperature

Mean sea surface temperature throughout the area of interest varies from about 7°C in winter to 12.5°C in summer (BODC, 1998). A more extreme range is experienced in the North Sea, and less extreme in the North Atlantic. The strong mixing due to currents means that there is little evidence of vertical temperature structure.

The indicative range of sea surface temperature is between c. 19°C as a maximum and c. 3°C as a minimum (BODC, 1998; HSE, 2001).

Salinity

In the area of interest, salinity typically lies in the range 34.5-35.0ppt. There is little variation throughout the year or with depth in the water column (BODC, 1998).

Geomorphology

Proposed Data Sources

Data regarding the geomorphology of the study area includes but is not limited to:

- JNCC Coastal Directories Series: Region 2 North-east Scotland (Barne *et al* 1996), and Region 3 Orkney (Barne *et al* 1997)
- Geomorphology section of the Scottish Marine Renewables SEA

Environmental Baseline

Scotland's present day coastal geomorphology reflects the interaction between sea-level change, land uplift as a result of isostatic readjustment, resistance of coastline rocks and unconsolidated sediments to erosion and the sediment supply to the coast since the end of the last glaciation.

Coastal geomorphology within the study area is closely related to changes in the bedrock, alongside interactions between sea-level change, land uplift and resistance of coastline rocks to erosion. Almost the entire northern section of coast on the mainland is cliffbound – cut in the western section by three large inlets, which extend 10-12km inland. Towards the eastern end, the shoreline is more uniform, although at Dunnet and Sinclair Bay there are large breaks in the cliffs where fringing sands up to 15m high are present. Offshore, the main features are stacks, for example at Duncansby which includes one that is higher than the adjacent cliffs (Barne *et al* 1996).

In contrast, the Orkney Islands have a more varied geomorphology, ranging from high cliffs, low rocky shores, sandy beaches and 'ayres' (sand or shingle spits) (Barne *et al* 1997).

Key Issues and Future Trends

The main issues affecting geomorphology are related to the interaction between the energy within coastal seas and the processes of erosion and sedimentation. Climate change could see an increase in frequency of extreme weather events. The intensity of storm events could impact associated wave heights and the energy within coastal seas, which in turn would affect erosion rates. As such, future trends are difficult to predict.

Seabed Sediments and Features

Proposed Data Sources

Data sources for seabed sediments and features includes, but is not limited to:

- JNCC Coastal Directories Series: Region 2 North-east Scotland (Barne *et al* 1996), and Region 3 Orkney (Barne *et al* 1997)
- Technical reports on seabed and geology from Scottish Marine Renewables SEA
- BGS chart data and GIS data
- Bathymetric data provided by SeaZone

- Technical section on bathymetry from Scottish Marine Renewables SEA

Environmental Baseline

Sediments:

Across the study area, seabed sediments vary from mainly gravely sand to sands and sandy gravels. Sheltered bays and estuaries (firths) contain large areas of muddy sediments in locations sheltered from tidal and wave currents. The distribution of seabed sediment types within the study area is shown in Figure Appendix D16 (see attached figures).

Sediment transport:

The north coast of Scotland, extending from Whiten Head to Duncansby Head, is predominantly rocky and resistant to erosion. Whilst there is one large beach at Dunnet Bay, the majority of beaches along this stretch of coastline are small and generally formed of offshore glacial deposits. Larger intertidal sand flats occur at Durness, Tongue and Torrisdale (Barne *et al* 1997).

Sediment transport around Orkney is described in the Scottish Marine Renewables SEA. In this part of the study area, the coast is very complex, with numerous enclosed and deeply indented bays that interact little with each other. The majority of the coastline between the Pentland Firth and south of the Orkney Isles is rocky and exposed to harsh wave conditions. Sediment transport is from east to west, with sand accreting on the eastern side of the Chruchill Barriers which connect the islands of South Ronaldsay, Burray, Glimps Holm and Lamb Holm to the mainland. High energy wave conditions are present, and consequently wave processes dominate littoral transport. The extremely high ebb and flood currents that occur in most of the straits between the islands decrease inshore and it is unlikely that tidal currents have any direct effect on moving beach material (Scottish Executive 2007). Long-term coastal and cliff erosion occurs on most beaches, and is more noticeable along the till cliffs (Barne *et al* 1996).

In the middle of the Orkney Isles, around Scapa Flow, there is a much less severe wave climate. Whilst current speeds are high in the straits and off rocky headlands they are much lower in the indented bays and hence have little impact on the beaches. Sediment transported into Scapa Flow, which may have eventually found its way onto the beaches, has been blocked off by the Churchill Barriers. Overall, there is little beach erosion and only very slight accretion at the western end of the beach at Scapa (Scottish Executive 2007)

The Scottish Executive (2007) report that the north-east coast of Mainland and Shapinsay have numerous large indented beaches. Whilst they are relatively sheltered, wave action is a dominant factor in the movement of beach material. Littoral drift is low, and strong tidal action is responsible for moving sediment in an easterly direction.

Around the northern islands of Orkney, the littoral processes are wave dominated, dependent upon the orientation of the beaches and the amount of shelter which the other islands provide. Net longshore drift or interchange of beach sediments is unlikely, and whilst tidal currents are very strong on both flood and ebb tides, it is unlikely that beach areas will be directly affected by the currents (Scottish Executive 2007).

Underlying geology:

The geology of Scotland is complex. The Scottish Marine Renewables SEA (2007) indicates that along the north coast of the study area, the four main Precambrian rock groups (Lewisian, Torridonian, Moine and Dalradian) are present. Moine and Lewisian metamohpic rocks outcrop at the seafloor off the Sutherland Coast. Further east, Devonian Sandstones outcrop around Strathy Point.

The Orkney Islands and offshore sediments are underlain by the Shetland Platform, which is composed largely of Devonian sandstones. Offshore, sediments cover most of the solid geology, however rock outcrops can be found on the seabed where material has been removed by high tidal currents, such as those found in the Pentland Firth. Examples of outcrops can be

seen to the south of Orkney, whilst Permian and Triassic rocks outcrop in the West Orkney Basin Complex.

Key Issues and Future Trends

Whilst certain types of seabed development such as capital and maintenance dredging, and marine installations may result in localised changes to seabed sediments, there is no evidence to suggest any general long term trends in marine seabed sediments.

Water Quality and Sediment Contamination

Proposed Data Sources

Data sources relevant to this section on water quality and contamination include, but are not limited to:

- Scottish Marine Renewables SEA
- SEPA data on bathing beaches and bathing waters
- Charted UKHO digital data – disposal sites

Environmental Baseline

Water quality:

Under their national water quality classification scheme, SEPA (2006) classified 98% of estuarine waters and 99% of coastal waters as excellent or good (grade A or B), in 2005. Therefore, the marine and inshore water quality in Scotland is generally good, and has been improving over the last decade (OSPAR 2004, SEPA, 2006). The quality of Scottish waters largely reflects the oceanographic regime, but is also influenced by settlement patterns. For example, diffuse run-off from urban and agricultural areas can be significant sources of pollution (i.e. oils and nutrients).

Over the last decade, coastal water quality has improved dramatically as a result of the application of full treatment to sewage discharges, improved treatment of industrial effluents, and work to reduce diffuse pollution. Marine fish farming has expanded in extent and economic value, but has been managed and controlled to minimise its impact. The dramatic improvements to coastal water quality are illustrated by the quality of designated bathing waters.

Bathing waters:

As of 2008, there are 80 official bathing waters in Scotland, and 77 of these are in coastal locations (The Scottish Government 2008). In 2007, 54 of the 61 identified bathing waters in Scotland (at that time) met the EU mandatory standards. Of these, 29 waters (48%) also met the guideline standard (SEPA 2007).

Within the study area, there are two bathing water beaches: Dunnet Bay and Thurso, both classed as having excellent water quality (see Figure Appendix D17 in the attached figures).

A key indicator of bathing water quality is the number of faecal coliforms. These bacteria are present in human sewage and in traces of animal faeces washed from farmland during periods of wet weather. If swallowed in sufficient quantities by people swimming or bathing in affected waters, faecal coliforms can cause serious stomach upsets. Analysis in 2007 showed there has been steady decline in the average counts of faecal coliforms at all 60 designated bathing waters in Scotland (SEPA 2006).

Sediment contamination:

Key sources of contamination are from marine or terrestrial inputs, atmospheric inputs, disposal sites and munitions contamination, fish farming and radioactive contamination. Terrestrial inputs can include diffuse inputs from agriculture and transportation and consequently emissions to the sea tend to be focussed in areas close to large population centres.

Disposal sites in the area could be another source of sediment contamination (see Figure Appendix D17 in the attached figures). The majority are used for disposal of silt, sand, gravel and rock originating from dredging operations. However, disposal of fish waste is also undertaken in the study area. Two historic fish waste dump sites exist in the region of the Orkneys, Stromness B and C. Dumping of sea fish waste was permitted under the OSPAR convention up until 2004 as material was considered non-hazardous. Nothing has been discharged at either site since 2001, and given that the material is highly biodegradable, it is likely to have been rapidly re-assimilated into the marine ecosystem.

Fish farming can cause elevated concentrations of certain compounds and organic enrichment in seawater and seabed sediments (see Figure Appendix D20 in the attached figures for finfish farm locations). The main inputs area from farming of finfish and comprise faeces, excess food and chemicals used to treat bacteria and infestations. As such, sediments in the vicinity of fish farms should be regarded as contaminated.

Military waste is not anticipated in the study area. The nearest location where this might occur is around Cape Wrath, the site of an official gunnery and bombing range, where shells of various calibres from naval guns, and bombs could be present. This is ~25km west of the study area.

Key Issues and Future Trends

Over the last 30 years, domestic inputs of contaminants to the seas and estuaries have shown marked reductions. It has been possible to track this trend as extensive monitoring of the environmental quality of coastal margins and estuaries has been carried out for many years by SEPA. As of 2006, SEPA has implemented a more thorough classification scheme using methods set out in the Water Framework Directive (2000/60/EC). And in the future, with the introduction of the Marine Strategy Framework Directive (MSFD) it will be possible to extend past the 3 nautical mile limit (extent of the WFD in Scotland), covering more offshore seas out to the national territorial limit. This will give a comprehensive picture of the water quality around Scotland.

In the future, water quality will largely be governed by targets set by European and national legislation. Provided that the relevant legislation is successfully implemented and enforced it is therefore likely that the water quality of coastal and marine waters will continue to improve in the future.

Climate can influence water quality, so future climate change is also likely to impact on trends in water quality, with increased storminess and rainfall influencing freshwater run-off from land and marine circulation patterns (Baxter *et al* 2008).

Human Environment

Marine Archaeology and Wrecks

Proposed Data Sources

Data sources for this section include, but are not limited to:

- Charted SeaZone/UKHO digital data

- Scottish Marine Renewables SEA marine and coastal historic environment chapter

Environmental Baseline

Submarine archaeology:

Submarine archaeological heritage is of considerable importance internationally and nationally. The following pieces of legislation relate to these types of remains:

- International: - these deal directly with submarine archaeology
  - The United Nations Convention on the Law of the Sea 1982 (UNCLOS)
  - The European Convention on the Protection of the Archaeological Heritage (Revised) 1992 (the Valletta Convention)
  - The UNESCO Convention on the Protection of the Underwater Cultural Heritage 2001 (UNESCO 2001)

- National: - the following Acts can be applied to protect submerged remains
  - The Joint Nautical Archaeology Policy Committee (JNAPC) Code of Practice for Seabed Developers (JNAPC 2007) – a voluntary code developed in conjunction with key industries that provides a framework which seabed developers can use in conducting their activities in an archaeologically sensitive manner.

Whilst there is uncertainty as to the possibility of finding evidence of prehistoric settlements within the study region, the Orkneys are of interest for possible archaeological sites. Early retreat of ice from the northern islands (the first Scottish region uncovered), combined with either a land link or a short sea crossing from the exposed land make the Orkney Islands likely candidates for late Paleo- (>12,000 years BP) and early Mesolithic (>5,000 years BP) settlement. Considerable areas of current seabed were exposed and therefore inundated sites are likely to have existed.

Wrecks:

Wreck data from the UKHO (see Figure Appendix D18 in the attached figures) shows that wreck sties are common in the study area. Wrecks in UK waters are the subject of a number of Acts of Parliament and International agreements designed to conserve, preserve or maintain ownership rights over them:

- The Merchant Shipping Act (1995)
- The Protection of Wrecks Act (PWA) 1973
- The Protection of Military Remains Act (PMRA) 1986 (Maritime and Coastguard Agency, 2007).
- The Ancient Monuments and Archaeological Areas Act (AMAAA) 1979 – mainly directed at terrestrial sites but the main piece of legislation regarding archaeological sites in the general.

World Heritage Site:

There is also a World Heritage Site within the study area: the Heart of Neolithic Orkney. Located on the West Mainland of Orkney, the site consists of a large chambered tomb (Maes Howe), two ceremonial stone circles (the Stones of Stenness and the Ring of Brodgar) and a settlement (Skara Brae), together with a number of unexcavated burial, ceremonial and settlement sites, all of which depict life 5,000 years ago (Scottish Executive (2007).

Coastal archaeology:

Coastal archaeological remains are also of interest. The Scottish Marine Renewables SEA details that on the mainland north coast (North Sutherland), there are 498 recorded coastal sites in total, of which 13 are recorded as prehistoric (~3%). In Orkney there are 744 total recorded coastal sites, of which 20% are classes as prehistoric. The most dramatic structures

are Skara Brae on the Bay of Skaill, the Broch at Midhowe and the burial tombs on Holm of Papa Westray.

Key Issues and Future Trends

No key issues / future trends identified

Cables and Pipelines

Proposed Data Sources

Data sources for cables and pipelines include, but are not limited to:

- Kingfisher Cable Awareness Charts
- SeaZone and UKHO GIS data

The Kingfisher charts only display those cables whose owners pay for their cables to be displayed on the charts; therefore only major submarine cables tend to be displayed. The UKHO digital data shows a larger number of cables but does not distinguish between active and out of service cables.

Environmental Baseline

There are very few cables and pipelines within the study area: a telecoms cable runs out from Thurso towards Iceland, and a 230km pipeline links the Flotta oil terminal in Orkney to the Piper and Occidental oil fields in the North Sea. The majority of cables and pipelines lie outside of the study area, to the north, especially around Shetland where there is considerable oil and gas activity.

Also within the study area, there are nine local power cables which link between the Orkney Islands and the mainland. The location of all pipelines and cables in the Pentland Firth and Orkney Waters, including those which lie in the immediate vicinity of the study area can be seen in Figure Appendix D19 in the attached figures.

For the purpose of this assessment it has been assumed that those cables identified are still located in their reported positions on the seabed, and are active, unless stated otherwise.

Key Issues and Future Trends

Taking into account the Scottish Government's objectives for the Scottish Government's target of meeting 50% of Scotland's whole electricity demand from renewables by 2020, there is likely to be a significant increase in the number of power cables in Scottish waters connecting wave, tidal and wind arrays with the national electricity grid. The international and national telecommunications industry is also set to grow significantly as existing services are expanded, new services are provided and consumer demand for internet access and use increases. Routes are also being investigated for an interconnector power cable to link from Orkney to the mainland. See Figure Appendix D19: Other seabed users (in the attached figures).

Ports and Harbours

Proposed Data Sources

Data sources informing this section on ports and harbours include, but are not limited to:

- Charted UKHO digital data
- Orkney Harbour Authority Ports Handbook (Orkney Islands Council 2009)

Environmental Baseline

There are a number of ports, piers and harbours within the study area (see Figure Appendix D21 in the attached figures), ranging from large port facilities to smaller ports essential for ferry traffic and local trade and supplies. The main types of cargo handled by the Scottish major ports in 2006 were crude oil, oil products, coal, 'other dry bulk' and liquefied gas (Baxter *et al* 2008).

A large proportion of shipping movements in and around the Orkney Islands includes ferry traffic. A variety of ferries operate daily services between the Scottish mainland and Orkney Islands. Pentland Ferries, for example, operate a service from Gill's Bay in Caithness to St Margaret's Hope in Orkney. In 2006, 8.1million passengers were carried on internal Scottish ferry services, 0.3million of which were on Orkney Ferries (Baxter *et al* 2008).

Fishing vessels in Orkney waters are now a less common sight than they have been in the past, due to changes in the fishing quota system, but numerous smaller inshore fishing vessels can be seen operating in and around the islands and make use of the ports and harbours in the area.

Other vessels include fish farm service craft, diving support boats, and general work boats. During the summer, passenger liners and pleasure craft are also seen. In the Scapa Flow area, oil related traffic such as tankers and tugs operate continuously (Orkney Islands Council 2009).

The entrances to ports and harbours are also extremely important for shipping and navigation.

Key Issues and Future Trends

In the future, port development is likely to increase, driven by increased cargo, or bigger vessels. There is also the potential for local ports and harbours to service marine developments. The knock-on effect of this will be port developments in order to cope with the larger vessels: increasing the depth of water in entrance channels and alongside berths far above what is currently offered, plus channel widening to account for wider ship beam and to allow for larger turning circles. This implies that much greater investment is necessary in port infrastructure. Modifications will also be necessary on shore for bigger cranes with longer outreach, lift height and loading capacity (Scottish Government 2003).

Scapa Flow Ports is currently one of several planned schemes in the UK and the rest of Europe to establish new container transhipment capacity (Scottish Government 2004).

Oil and Gas

Proposed Data Sources

The following sources of data will be used to inform this section of the environmental assessment:

- UK Digital Energy Atlas (www.ukdeal.co.uk)
- Charted UKHO digital data
- Offshore Energy SEA

Oil and gas development is well documented both via data available from the UK Digital Energy Atlas (www.ukdeal.co.uk), which provides access to data and information relating to the

exploitation and production of hydrocarbons on the UK continental shelf, and strategic environmental assessment work undertaken by the DTI for oil and gas development.

Environmental Baseline

Figure Appendix D19 (see attached figures) indicates that there is little oil and gas extraction activity in the study area. However, the Flotta terminal on Orkney does provide infrastructure support to the oil and gas industry.

Due to the important international trade of oil in and around Orkney, considerable movements of tanker and supply vessels occur in the area. To avoid the risk of pollution, designated areas have been created around Orkney, Shetland and Fair Isle which must be avoided by vessels over 5000 gross registered tonnes carrying oil or other hazardous cargos.

Key Issues and Future Trends

The general view is that UK oil production has peaked and is currently declining. Therefore, whilst oil and gas companies will continue to survey for and develop new reserves in Scottish waters, the level of production is set to decline for the foreseeable future.

Commercial Fisheries

Proposed Data Sources

Data sources for commercial fisheries include, but are not limited to:

- Marine and Fisheries Agency (MFA) fisheries statistics
- Charted UKHO digital data

Environmental Baseline

Commercial fishing is an important industry in the Scotland, both in coastal areas and further offshore towards the 12nm limit.

Key fisheries in the area include those for herring, haddock, cod, whiting, saithe and monkfish. These are a mixture of purse seine fleets and trawl gear, used as part of a mixed fishery. Whilst commercial fisheries do operate within the study area, the bulk of the catch is taken outside of the Pentland Firth and Orkney Waters study area: concentrated to the north-east of Orkney, around Shetland, the west coast of Scotland and along the continental shelf area.

Landings statistics from Scottish Government (2009) show that in 2007, a total of 3,200 tonnes with a value of £5.7 million were landed into Orkney by UK vessels. Wick, which is just south of the study area, was shown to have landings of 12,200 liveweight tonnes which valued £18.7 million.

Mariculture, in the form of fish and shellfish farms is also important in coastal areas within the study area. There are two general types of mariculture practiced in Scotland which involve:

- Finfish in cages, or land-based tanks with pumped seawater
- Shellfish either on trestles on the seabed, attached to vertical ‘dropper’ ropes suspended from horizontal longlines or rafts, or grown directly on the seabed without equipment.

Within the study area, finfish and shellfish farms can be found on the coasts of Orkney. The north coast is of much lower importance for mariculture where, aside from Loch Eriboll, no finfish or shellfish farms are sited (see Figure Appendix D20 in attached figures).

Key Issues and Future Trends

Current trends show that the total quantity of fish landed by Scottish vessels has fallen by 14% since 2002, mainly due to reductions in landings of demersal and pelagic fish. Shellfish landings were seen to have increased by 14% over the same period. In 2006, the total combined value (£368.5 million) of landings showed a 3% increase in value, despite a decrease in live weight landed. Baxter *et al* 2008 report that for the first time, shellfish was the most valuable sector to the Scottish fleet, with shellfish landings representing 38% of total value despite its relatively small contribution in weight. However, the value of demersal stocks has shown a noticeable decline since 1990, based on 2006 prices.

Future trends for commercial fishing are difficult to predict with certainty as they will be affected by stock status, fishery and habitat management measures, fleet size and efficiency and markets. Trends are also likely to be different for the different sectors (e.g. demersal, shellfish and pelagic). In the short term it seems unlikely that total landings will increase as measures are in place to put a ceiling on the amount of allowed catch. 'Total Allowable Catches' (TACs) are set in December each year by the EU Council of Fisheries Ministers for over 130 fish stocks based on a number of factors, including the latest scientific advice on conditions of the stocks (MFA 2007). Medium and longer term plans for most stocks are for reduction in fishing mortality rates to increase long term yield, and marketing and processing to add value to products (Scottish Executive 2007)

Shipping and Navigation

Proposed Data Sources

Data sources for shipping and navigation include, but are not limited to:

- Scottish Marine Renewables SEA section on shipping and navigation
- UKHO navigation infrastructure digital data

Environmental Baseline

Shipping and navigation is a key consideration in the Pentland Firth and Orkney Waters study area (see Figure Appendix D21 in attached figures). Very high vessel densities occur across the north of Scotland, although along the north coast, vessels tend to maintain some distance from the coast.

Shipping:

Within the Pentland Firth, there are very high vessel densities, particularly in the centre of the channel and between Stromness on Orkney and Thurso on the mainland. There is an important international oil trade in Orkney that generates considerable movements of tanker and supply vessels which use the Pentland Firth. Around the Orkney Islands, there is also a very high density of shipping especially in the Scapa Flow area, the Stronsay Firth and around Kirkwall.

The Pentland Firth is considered a critical area when it comes to shipping and navigation. It is an area prone to strong tides and heavy seas but has very restricted sea room. Vessels passing through the Pentland Firth also encounter crossing Island Ferries and cargo vessels.

As indicated on Figure Appendix D21 (see attached figures), an area to be avoided has been identified around Orkney. This area is designated to avoid the risk of pollution and applies to vessels over 5000 gross registered tonnes carrying oil or other hazardous cargos.

Navigational Issues:

Tidal streams are highly significant to the navigation in or through the Pentland Firth. They encounter a number of obstructions which give rise to eddies and races, which, in several areas of the firth can be very strong and extremely hazardous. In some parts of the firth, the transition between the main stream and an eddy, and vice versa, can occur so suddenly to cause even a large vessel to take a violent sheer.

Races can also present navigational hazard as there can be heavy turbulence in the races, particularly when the tidal streams are opposed by strong winds or a swell. This can make the sea in the races extraordinarily violent and dangerous, especially to small vessels.

Around the Orkney Islands, navigation presents little difficulty, except in poor visibility when caution is needed as the tidal streams in the firths and sounds among the islands are generally strong.

Navigational issues related to renewable devices:

With the current demand for renewable energy, developers are turning towards tidal power in addition to wind power. Table Appendix D7 details some of the current systems being developed and provides comments on the restrictions to navigation which they may cause. It should be noted that there may be a number of potential pitfalls with these systems but these have not been addressed in this document.

A number of the systems detailed have structures above the surface and these are clearly a danger to navigation. However, several systems are located sub surface and safety clearance depths have been allocated to these.

Although the main concerns are clearances for vessel draft, some tidal devices have topside structures as maintenance platforms and are used as navigation marks. Whilst these may not be significant when installed to raise aeronautical concerns, they will require heavy lift crane barges during installation that will be a consideration. Each device will have its specific clearance but an assessment to establish if it will be an impact can only be decided when the site is identified and the maximum draft (plus contingency) can then be applied. As an example of this, a tidal device in a loch that is constrained to vessels of 5m draft will be very different to devices in the Pentland Firth that could see vessels with drafts in excess of 10m. These larger vessels and their characteristics will require significant clearance under the keel.

All of the devices in the Table Appendix D7 provide various constraints that are relevant for all locations. The following is a list some common points for consideration:

- **Navigation Marking** will meet the IALA A system requirements. Surface piercing devices will be red and black and marked as Isolated Dangers Marks. The positions of devices or the arrays will probably be marked with Cardinal Buoys enabling shipping to identify in which direction from the buoy the hazard lies.
- **Routing** for vessels is the highest consideration and although a Cardinal buoy may show a hazard that is 10m below the surface, vessels will still be able to transit through the area safely. However, Isolated Danger Marks will be avoided and an array of them may create larger deviations for shipping.
- **Anchoring** will be prohibited in the vicinity of the device, the cable array or the export cable. It is unlikely that areas where high tidal resources are found are preferred anchorages, not only because of the tidal flow but the seabed topography is generally not suitable. The site may, however, be subject to vessels anchors being deployed in an emergency situation or, on occasion, vessels have accidentally deployed their anchor whilst on passage. It is dragged along the seabed potentially causing considerable damage to cables or devices.
- **Multiple devices** will be necessary to be commercially viable. Intense maintenance regimes to accommodate the numbers will revolve around neap tides and other sea users. Devices that can be removed for maintenance at most states of the tidal range will create less constraints on other users in the area. Devices that can be lifted out of the sea without large vessel intervention will be less of an impact on shipping.

- **Aeronautical issues** should be considered for some of the devices during installation and decommissioning. It is not relevant during operations for the devices mentioned.

Table Appendix D7 Renewable devices and associated shipping constraints

Developer	Device Name	Foundation Type			Fully Submerged	Development Stage	Operational Water Depth Approx.	Shipping Constraints and comments
		Gravity Base	Piled	Moored				
Open Hydro	Open Hydro	✓			Yes	250kW Prototype installed and grid connected at EMEC. Specialist vessel in commission	>20m	In shallowest areas this can prove a hazard to larger shipping. It is anticipated that Cardinal Buoyage may be utilised
Voith Hydro	Sea Turtle	✓	✓		Yes	It is understood that a demonstration model programmed for installation in 3rd Qtr 2009	40m	With suggested water depth this device would not appear to be a direct constraint to shipping once deployed
Swan Turbines	Cygnet	✓			Yes	350kW demonstrator under development	25m	In water depth of 25m it can be anticipated that the full size unit blades will be at a height of less than 10m from the surface
Tidal Generation Limited	MEC2	✓	✓			Gravity Base installed at EMEC 2008. Further device trials planned in 2009.	30m	In water depth of 30m it can be anticipated that the full size unit blades will be at a height of less than 15m from the surface
Lunar Energy	RTT	✓				1/3rd scale demonstrator, believed to be installed at EMEC 2010	40m	It is understood that the full size models will be very compact units that should provide no constraints to shipping
Aquamarine	Neptune		✓		No	Piled surface piercing device, understood that there is a planned installation at EMEC 2010	20m – 25m	Each device may present an issue for shipping unless it is utilised as a navigation aid.
Marine Current Turbines	SeaGen		✓		No	2008 1.2MW Sea Gen installed	20-25m	Each device may present an issue for shipping unless it is utilised as a navigation aid.
						2003 Seaflow prototype installed		

Developer	Device Name	Foundation Type			Fully Submerged	Development Stage	Operational Water Depth Approx.	Shipping Constraints and comments
		Gravity Base	Piled	Moored				
ScotRenewables	SRTT			✓	No	Scale model trialled. Understood that a prototype is planned at EMEC 2010	Moored >15m	Potentially the most risk to shipping, a buoyant device which does break the surface. In shallowest waters it should be less of an issue with larger vessels but smaller vessels will require it to be well marked.
SMD Hydrovision	TidEl			✓	Yes	$^1/_{10}$th scale model trialled. Expecting to install 1MW unit at EMEC 2009	>30m	In water depth of 30m it can be anticipated that the full size unit blades will be at a height of less than 15m from the surface
Hammerfest Strom		✓			Yes	300kW prototype installed, grid connected 2003	>25m	In water depth of 25m it can be anticipated that the full size unit blades will be at a height of less than 10m from the surface
Pulse Generation Limited	Pulse Tidal		✓		No	150kW prototype which we believe is currently being trialled.	Shallow Water	Each device may present an issue for shipping unless it is utilised as a navigation aid.
Ocean Flow Energy	Evopod			✓	No	It is understood that a $^1/_{10}$th scale unit is under test in tidal stream	Moored > 20m	Although a constraint because of it surface piercing structure, the design lends itself to being easily marked as an isolated danger mark and should be clearly visible to all shipping.

Key Issues and Future Trends

In future years, it is possible that the Pentland Firth and Orkney Waters will be more extensively used for shipping, which in turn could present navigational issues.

Tanker trade is expected to increase to and from Russian Ports and trade in oil transiting Scottish Waters is also expected to expand. As a result, the waters around Orkney and Shetland will experience an increase in the numbers of tankers.

In recent years there has also been a move towards use of large container vessels. Feeder container vessels will then distribute the cargo to smaller ports. Whilst it is unsure how this will affect the waters under consideration, there will be an increase in the number of feeder container vessels which would be likely to increase the number of such vessel movements (Scottish Executive 2007). A growth of 3.5% (to 2030) for containerised traffic (MDS Transmodal 2006) is also anticipated.

Safety of navigation is also an important consideration in relation to offshore renewables (as indicated in Table 2-7). With targets to expand renewable energy, this could present navigational issues for the future.

Recreation and Tourism

Proposed Data Sources

Sources of data to inform on recreation and tourism include, but are not limited to:

- Royal Yachting Association (RYA) coastal atlas of Recreational Boating (2008)
- Scottish Marine Renewables SEA
- SNH information on National Scenic Areas.
- Orkney and Highlands Council and Tourist Boards.

Environmental Baseline

Tourism is one of Scotland's largest business sectors with an estimated value of £4.2 billion per annum to the Scottish economy. Scotland's coastline and islands play an influential role in attracting tourists and recreational users to the country through the provision of outstanding scenery, wildlife, cultural assets and a wide range of organisations providing a variety of sports and activities.

Scotland's coastline is protected by a complex framework of statutory and non-statutory designations with boundaries overlapping at various points with terrestrial and marine zones. National Scenic Areas (NSAs) relate strongly to the coast, as do heritage designations. Of the 40 NSAs in Scotland, 26 include a coastal element. Within the study area there are two NSAs: the Kyle of Tongue, and Hoy and West Mainland.

Marine and coastal activities include sailing and boating, scuba diving, sea angling, walking, canoeing, surfing, bird watching and visiting coastal attractions such as castles and archaeological features.

Within the study area there are a number of marinas, RYA sailing clubs, and recreational cruising routs and sailing routes (see Figure Appendix D21). These include light to heavy recreational routes. Along the north coast of Scotland, there are several routes classed as medium recreational use (popular routes where recreational craft will be seen at most times during summer daylight hours). In the waters around the Orkney Islands, the routes are considered predominantly as 'light' use, with heavy cruising routes around the periphery of the island group.

Beaches are also a draw for tourists, and within the study area there are two bathing water beaches and one rural award winning beaches: Strathy Bay, along the north coast. Rural beaches receive the award based on overall cleanliness rather than facilities offered, as the qualifying beaches are generally less developed and in quieter locations.

Diving is also popular with tourists, who are attracted by the wildlife and physical characteristics of the area, including caves, drop-offs or the flow of the water. Some will also come to dive on the archaeological wrecks in the region. Scapa Flow, for example, is considered one of the

finest wreck diving sites in the UK, where German Fleet wrecks can be explored alongside the marine life.

Key Issues and Future Trends

Economic cycles are likely to affect tourism in the study area at least in the short term. It is unknown, as yet, whether this will have a positive effect, by increasing the numbers of local visitors unable to afford international holidays, or whether the impact will be negative, as with other sectors.

Military Practise Areas

Proposed Data Sources

Data used to inform on military practice areas includes, but is not limited to:

- UKHO digital data – military practise areas

Environmental Baseline

Military activities occur across a large portion of the study area (see Figure Appendix D19 in attached figures). The assessment is informed by the distribution and classification of Practice and Exercise Areas (PEXA). This data shows areas which are in use or available for use by the Ministry of Defence (MoD) for practice and exercises, which may be with or without the use of live ammunition. Activities occurring in this area range from submarine and shipping activities, to firing and bombing activities.

An area of MoD sea area is also located 25km west of the study area, close to Cape Wrath.

Key Issues and Future Trends

None identified.

Seascape

Proposed Data Sources

The following data sources will be used to characterise landscape and seascape in terms of development within the Pentland Firth:

- Scott, K.E., Anderson, C., Dunsford, H., Benson, J.F. and MacFarlane, R. (2005). An assessment of the sensitivity and capacity of the Scottish seascape in relation to offshore windfarms. Scottish Natural Heritage Commissioned Report No.103 (ROAME No. F03AA06);
- M. Hill, J. Briggs, P. Minto, D. Bagnall, K. Foley, A.Williams. (2001). Guide to Best Practice in Seascape Assessment. Countryside Council for Wales Brady Shipman Martin University College Dublin;
- Faber Maunsell and Metoc. (2007). Environmental Report Section C SEA Assessment: Chapter C19 Seascape Assessment Scottish Marine Renewables SEA. Scottish Executive;
- Scottish Natural Heritage information on National Scenic Areas;
- Orkney Local Plan information on sites of local landscape/seascape character;
- Sutherland Local Plan information on sites of local landscape/seascape character; and
- Caithness Local Plan information on sites of local landscape/seascape character.

Baseline

The study area contains five seascape types as defined in Chapter C19 of the Scottish Marine Renewables SEA, sourced from existing data held by SNH and from original study by Faber Maunsell. The types include:

- Low Coastal Sands and Flats;
- High Cliffs;
- Inter-Island associated with Outer Island Chains;
- Low Lying Agricultural Coastal Fringe; and
- Rugged Coastal Shelf and Headlands with Wide Open Views to Sea.

There are also two National Scenic Areas are located within the study area; Hoy and West Mainland and Kyle of Tongue together with Areas of Great Landscape Value and Historic Gardens and Designed Landscapes (see Figure Appendix D23 in attached figures).

Key Issues and Future Trends

None identified.

Data Gaps

Previous seascape character assessments have been done at strategic level for Scotland. There is a need for a more detailed seascape study to be prepared as part of the MSP.

Socio-economics

Proposed Data Sources

There are numerous data sources. Some of the main sources include:

- Office of National Statistics (ONS)
- Scottish Economic Statistics (Scottish Government)
- Census data / General Register Office for Scotland
- Data and reports published by Orkney Islands Council and Highlands Council e.g. Orkney Economic Review, OIC Harbours Department Data
- HIE reports including Local Area Profiles
- SEERAD data
- Scottish Fish Farms Annual Production Survey
- Tourist Board data
- Other studies such as the Dounreay Socio-economic Plan

Baseline

Within this particular study area there is a fundamental relationship between the economy, communities and the use of the sea and coast. To some extent socio-economic issues have been covered in a number of topics dealt with previously including commercial fisheries, cables and pipelines, military activities , shipping and navigation, tourism and recreation, oil and gas, and ports and harbours. However, the previous sections provided limited information on the relationship between these activities and the local economy and community, in particular employment, the business base, population and social issues.

As part of the development of the Framework it is proposed to undertaken a brief review of economic and social conditions based on available data sources. There is a need for a more comprehensive, bespoke socio-economic review as part of the preparation of the Statutory MSP. The review for the Framework will include an outline of the following as far as they related to the marine and coastal areas and activities:

- Population levels and demographics, including changes across the study area in comparison to national trends (Scotland)
- Employment/ unemployment: levels. Trends across different sectors would be considered together with the relationship to marine and coastal areas.
- The business base across study area including main business sectors and importance of those linked to marine and coastal areas to the local economy.
- Social factors such as deprivation levels, health, education etc.
- Future development and employment prospects in order to plan for growth or consolidate existing sectors, and to facilitate emerging sectors such as offshore renewables.

Future Trends and Data Gaps

A more comprehensive, bespoke socio-economic review will need to be undertaken as part of the preparation of the Statutory MSP. In particular it will need to understand current and future trends, the growing importance of renewable energy generation to the local economy and its relationship (positive and negative) with other sea users.

Data Gaps

Biological Environment

Baseline conditions in protected sites such as Natura 2000 sites and SSSIs are generally well understood, as they have been identified for their known habitats and populations of protected species and continue to be studied to ensure that the structure and function of the site features are maintained. Baseline conditions of future sites such as Potential Annex I Habitat sites are less understood and this is an area which requires further data, especially if potential developers need to be able to demonstrate that their development does not compromise the interest features of a potential future site.

Baseline distribution of mobile species would also benefit from further data. For example, there is limited information to inform the distribution of marine mammals, birds at sea, and non-commercial fish species. This is a consideration for the seaward extensions of SPAs, where further information is required to characterise the behaviours of the seabirds in the region.

There is also limited available information on the impacts of marine installations and developments on marine species, especially with regards to sensitivity to noise in the marine environment, the effects on behaviour and physiology.

Physical Environment

It has been determined that the high level data available on the physical environment provides sufficient detail for the purpose of this framework document and locational guidance. However, it is recognised that individual developers would need to collect more detailed data on a site specific basis.

Human Environment

There is generally a very good understanding of the baseline characteristics of the marine human environment as most sea uses are regulated and monitored to some degree. However, further information would be beneficial on the location and spatial extent of fishing grounds, especially for small scale fisheries. Further information on baseline shipping conditions would also be of benefit to this study given the high intensity of shipping in the area.

Previous seascape character assessments have been completed at strategic level for Scotland. There is a need for a more detailed seascape study to be prepared as part of the MSP.

A more comprehensive, bespoke socio-economic review will need to be undertaken as part of the preparation of the Statutory MSP. In particular it will need to understand current and future trends, the growing importance of renewable energy generation to the local economy and its relationship (possible positive and negative) with other sectors of the economy.

References

ABPmer, Met Office and Proudman Oceanographic Laboratory on behalf of the Department for Business, Enterprise and Regulatory Reform (2008). Atlas of UK Marine Renewable Energy Resources: A Strategic Environmental Assessment Report.

Aquatera (2009) Pentland Firth Tidal Energy Project – Data collection study. Report to Highlands & Islands Enterprise.

Baxter, J.M., Boyd, I.L., Cox, M., Cunningham, L., Holmes, P., Moffat, C.F., (Editors), 2008. Scotland's Seas: Towards Understanding their State. Fisheries Research Services, Aberdeen. pp. 174.

BBC news online (2008) http://news.bbc.co.uk/1/hi/sci/tech/7760521.stm

British Oceanographic Data Centre (1998). United Kingdom Digital Marine Atlas Project (UKDMAP). Version 3.00.

Coull, K.A., Johnstone, R., and Rogers, S.I. (1998) Fisheries Sensitivity Maps for British Waters.Published and distributed by UK Oil and Gas.

Dacre, S.L., Bullen, C. and Bryden, I., on behalf of Scottish Enterprise Ltd. (2001). Pentland Firth Tidal Energy Feasibility Study – Phase 1. Draft Report.

DECC (2009). Offshore Energy Strategic Environmental Assessment. Environmental Report. January 2009.

DTI (2003) Strategic Environmental Assessment – SEA 4

Faber Maunsell (now AECOM) and Metoc, (2007), Scottish Marine Renewables SEA for the Scottish Government.

Health and Safety Executive (2002). Environmental Considerations. Offshore Technology Report OTO 2001/010.

JNCC (1999). Seabird Vulnerability in UK Waters: Block Specific Vulnerability.

JNCC (2008d) The deliberate disturbance of marine European Protected Species: Guidance for English and Welsh territorial waters and the UK offshore marine area

JNCC (2009). Joint Nature Conservation Committee Website www.jncc.gov.uk

JNCC Coastal Directories Series: Region 2 North-east Scotland (Barne et al 1996), and Region 3 Orkney (Barne et al 1997)

MDS transmodal (2006). UK Port Demand Forecasts to 2030. Report for DfT. http://www.dft.gov.uk/consultations/archive/2006/ppr/ukportdemandforecaststo2030.pdf [Website accessed on 23rd July 2008]

MFA (2007) Marine and Fisheries Agencies - Quotas and Statistics. Available Online: http://www.mfa.gov.uk/statistics/setting.htm

Orkney Islands Council (2009) Orkney Harbour Authority Ports Handbook. Available online http://www.orkney.gov.uk/nqcontent.cfm?a_id=10103

OSPAR 2004 Quality Status Report 2000 for the North-East Atlantic http://www.ospar.org/eng/html/welcome.html

Read, A.J., Halpin, P.N., Crowder, L.B., Best, B.D., Fujioka, E.(Editors). 2009. OBIS-SEAMAP: mapping marine mammals, birds and turtles. World Wide Web electronic publication. http://seamap.env.duke.edu, Accessed on April 16, 2009.

Royal Yacht Association (2008). UK Coastal Atlas of Recreational Boating. Recreational Cruising Routes, Sailing and Racing Areas around the UK Coast. Second Edition.

SCANS-II (2008). Small Cetaceans in the European Atlantic and North Sea. Final Report submitted to the European Commission under project LIFE04NAT/GB/000245. Available from SMRU, Gatty Marine Laboratory, University of St Andrews, St Andrews, Fife, KY16 8LB, UK. Not yet approved.

Scottish Executive (2007). Scottish Marine Renewables SEA. Environmental Report Section C

Scottish Government (2003) Container Transhipment and Demand for Container Terminal Capacity in Scotland Prepared for Scottish Enterprise National and Highlands & Islands Enterprise by TRi Maritime Research Group. http://www.scotland.gov.uk/Publications/2004/09/19885/42543

Scottish Government (2004). Container Transhipment and Demand for Container Terminal Capacity in Scotland http://www.scotland.gov.uk/Publications/2004/09/19885/42552

Scottish Government (2008) Strategic Framework for Scottish Aquaculture. Available online: http://www.scotland.gov.uk/Topics/Fisheries/Fish-Shellfish/18364/12843 Accessed 08/08/08.

Scottish Government (2008) Strategic Framework for Scottish Aquaculture. Available online: http://www.scotland.gov.uk/Topics/Fisheries/Fish-Shellfish/18364/12843

Scottish Government (2009). Scottish Sea Fisheries Statistics 2007. Available online: http://www.scotland.gov.uk/Publications/2008/09/04090427/32

SeaZone (2009) Charter vector, raster and hydrospatial data. Licence agreement 042009.010.

SEPA (2006) Scottish Bathing Waters 2006. Available from: http://www.sepa.org.uk/pdf/publications/bathingwaters/2006/bathing_waters_2006.pdf

SEPA (2007) Scottish Bathing Waters 2007 Scottish Environment Protection Agency. Available from: http://www.sepa.org.uk/pdf/publications/bathingwaters/2007/bathing_waters_2007.pdf

Skov, H., Durinck, J., Leopold, M.F., and Tasker, M.L. (1995). Important Bird Areas for seabirds in the North Sea. BirdLife International, Cambridge

SNH (2008) Scottish Natural Heritage website www.snh.org.uk

UK BAP (2007) UK List of Priority Species and Habitats. Available online

UK Deal (2009). Oil and Gas UK DEAL GIS layers for oil and gas industry. <www.ukdeal.oc.uk>

UK Hydrographic Office (1986a). Admiralty Chart 5058 – Co-tidal and Co-range lines, British Isles and Adjacent Waters. Edition 4.

UK Hydrographic Office (1986b). Admiralty Tidal Stream Atlas – Orkney and Shetland Islands. Edition 4. NP 209.

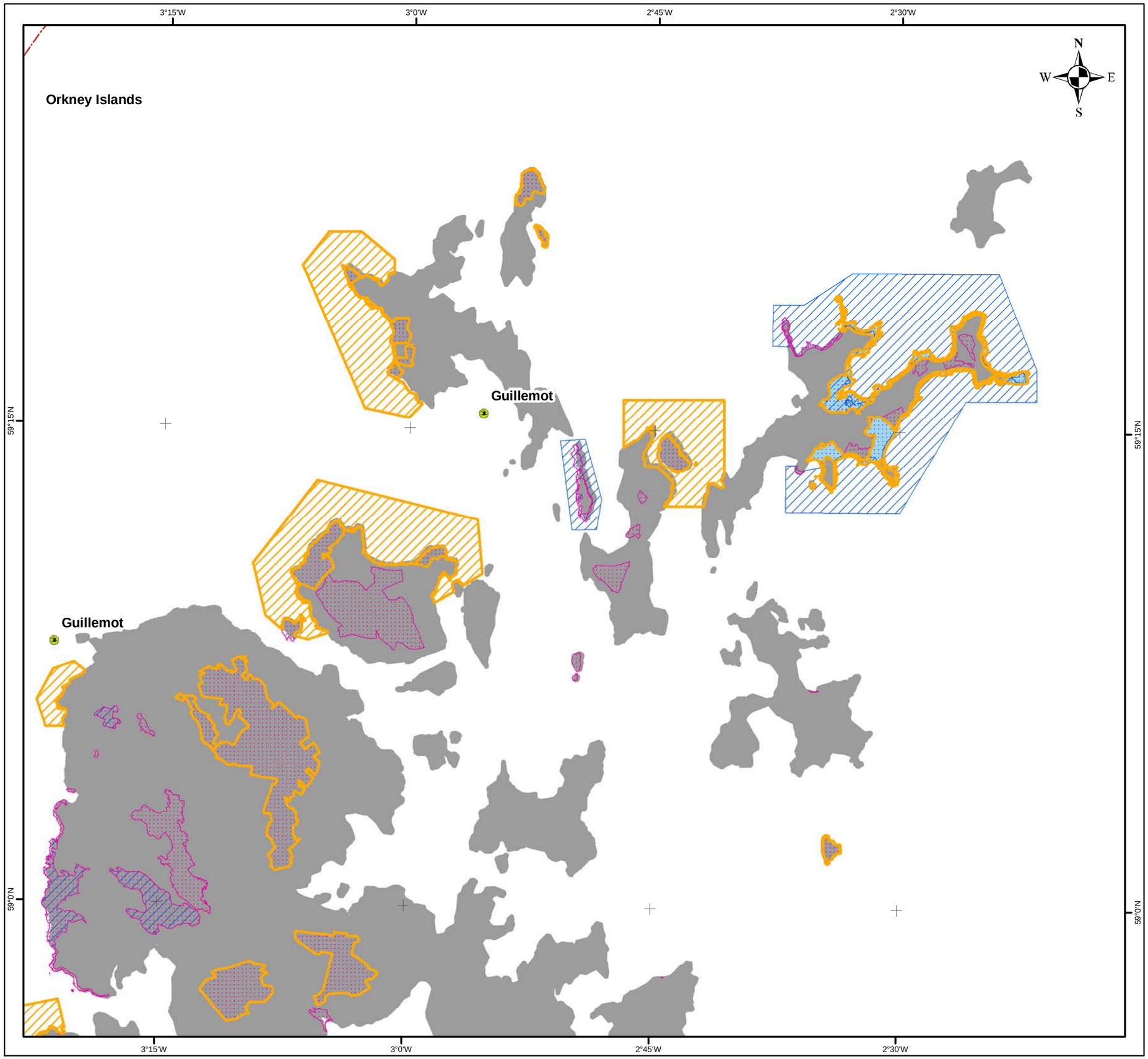
UK Hydrographic Office (1997). North Coast of Scotland Pilot. Third Edition. NP 52.

UK Hydrographic Office (2009). Admiralty Tide Tables, Volume 1 – United Kingdom and Ireland (including European Channel Ports). NP 201-09.

UK Hydrographic Office. Admiralty Charts 1954 (1:200,000), 2249 (1:75,000), 2250 (1:75,000), 2162 (1:50,000), 35 (1:30,000), 2581 (1:26,000), 2584 (1:25,000), 2622 (1:25,000), 2568 (1:12,500).

PENTLAND FIRTH AND ORKNEY WATERS MSP FRAMEWORK AND LOCATIONAL GUIDANCE

Figure Appendix D2a: Protected Sites



Legend

- UK Land
- MSP Study Area
- Important Breeding Colonies
- Bird Conservation Value >50
- Proposed Special Protection Areas (pSPA)
- Special Protection Areas (SPA)
- Sites of Special Scientific Interest (SSSI)
- Special Areas for Conservation (SAC)
- Wetland Conservation (Ramsar)
- Potential Reefs

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	Reviewed By	David Wotherspoon

AECOM

METOC

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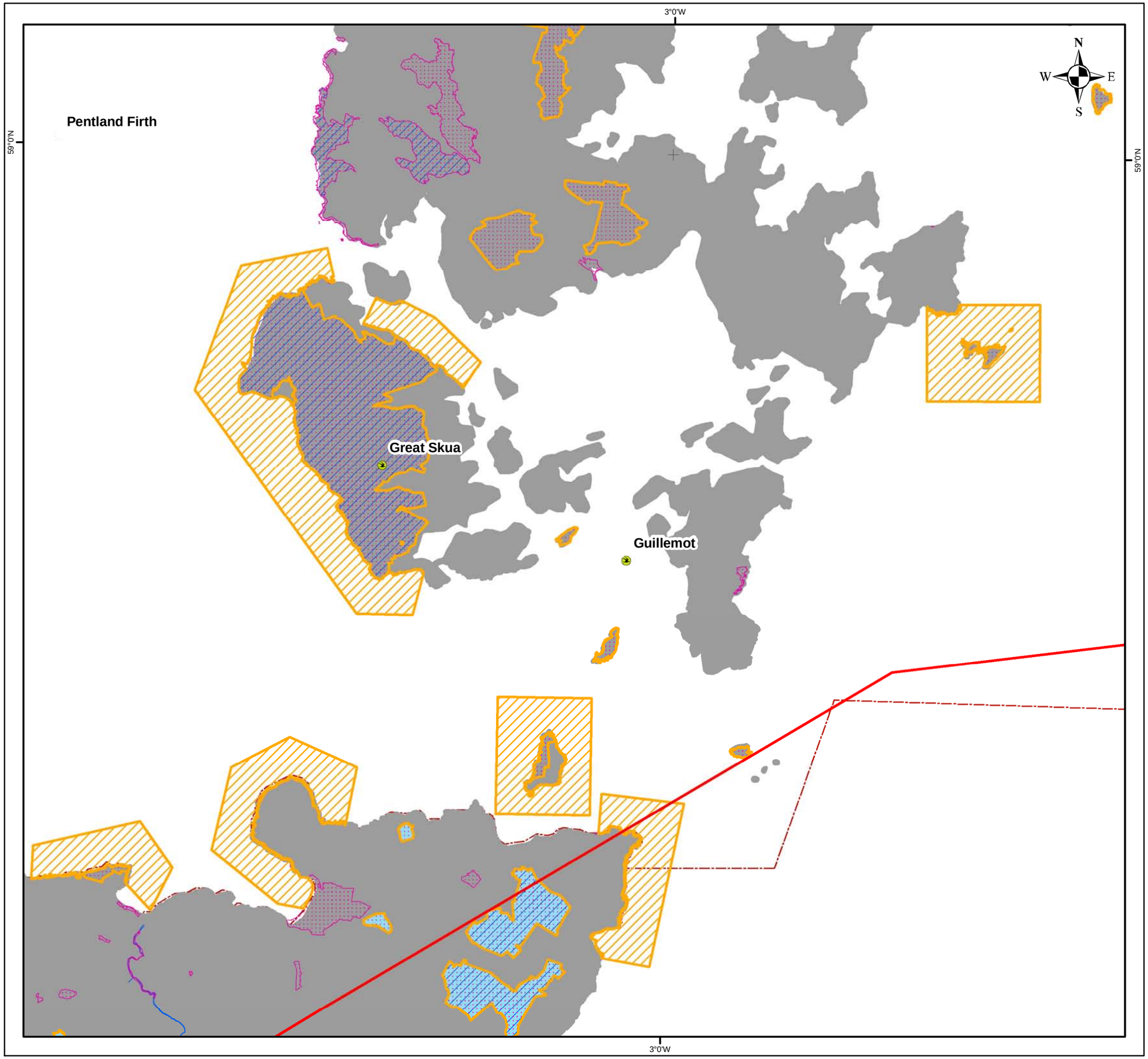
PENTLAND FIRTH AND ORKNEY WATERS MSP FRAMEWORK AND LOCATIONAL GUIDANCE

Figure Appendix D2b: Protected Sites



Legend

- UK Land
- MSP Study Area
- Important Breeding Colonies
- Bird Conservation Value >50
- Proposed Special Protection Areas (pSPA)
- Special Protection Areas (SPA)
- Sites of Special Scientific Interest (SSSI)
- Special Areas for Conservation (SAC)
- Wetland Conservation (Ramsar)
- Potential Reefs

Date	Wednesday, May 20, 2009 17:17:41	
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Checked	Produced By	Harshal Galgale
	Reviewed By	David Wotherspoon

AECOM METOC

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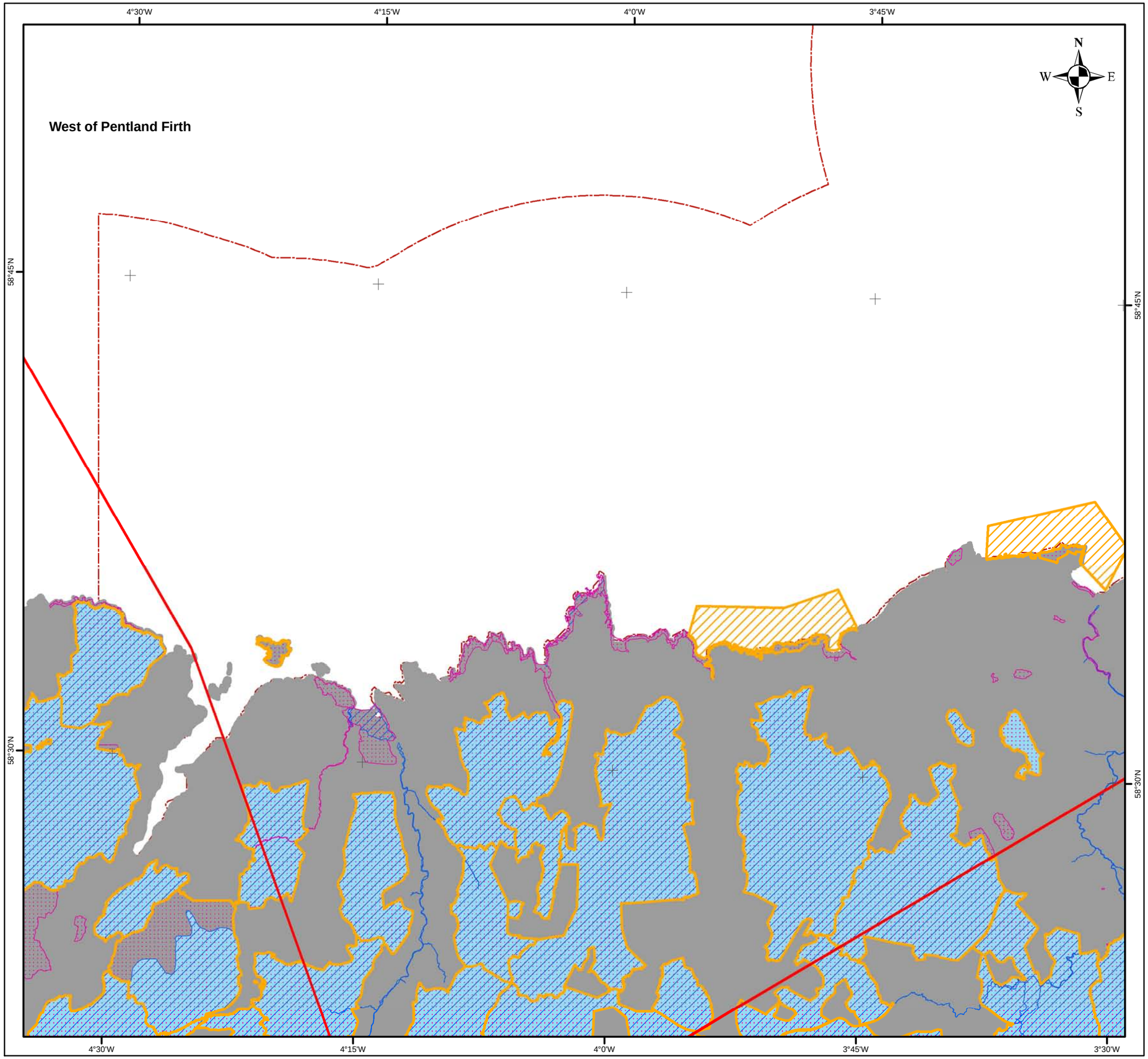
PENTLAND FIRTH AND ORKNEY WATERS MSP FRAMEWORK AND LOCATIONAL GUIDANCE

Figure Appendix D2c: Protected Sites



Legend

- UK Land
- MSP Study Area
- Important Breeding Colonies
- Bird Conservation Value >50
- Proposed Special Protection Areas (pSPA)
- Special Protection Areas (SPA)
- Sites of Special Scientific Interest (SSSI)
- Special Areas for Conservation (SAC)
- Wetland Conservation (Ramsar)
- Potential Reefs

Date	Wednesday, May 20, 2009 17:16:15	
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Checked	Produced By	Harshal Galgale
	Reviewed By	David Wotherspoon

AECOM METOC

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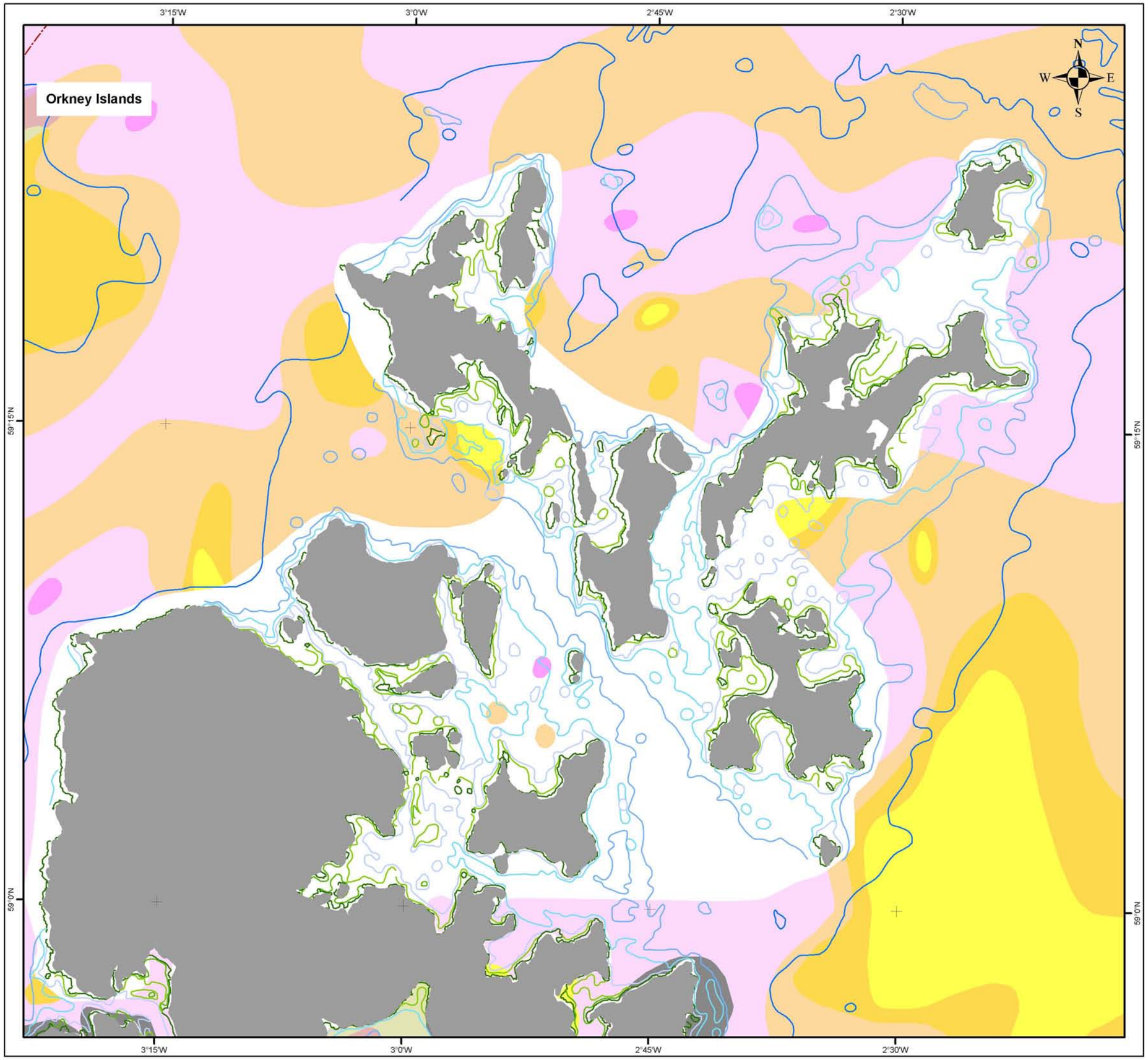
PENTLAND FIRTH AND ORKNEY WATERS MSP FRAMEWORK AND LOCATIONAL GUIDANCE

Figure Appendix D16a: Bathymetry & Seabed surface geology



Legend

- UK Land
- MSP Study Area
- Mussel deposit
- Gravelly muddy sand
- Gravel, mud and silt
- Gravel
- Gravelly mud
- Gravelly sand
- Muddy gravel
- Muddy sandy gravel
- Mud
- Muddy sand
- Sandy gravel
- Sandy mud
- Slightly gravelly muddy sand
- Slightly gravelly mud
- Slightly gravelly sand
- Slightly gravelly sandy mud
- Sand
- Diamicton
- Rock or Diamicton
- Rock and sediment
- Undifferentiated solid rock
- Clay and sand

Bathymetry (m)

- 0
- 2
- 5
- 10
- 20
- 30
- 50
- 100
- 200
- 300

Date	Wednesday, May 20, 2009 17:50:35	
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Checked	Produced By	Harshal Galgale
	Reviewed By	David Wotherspoon

AECOM

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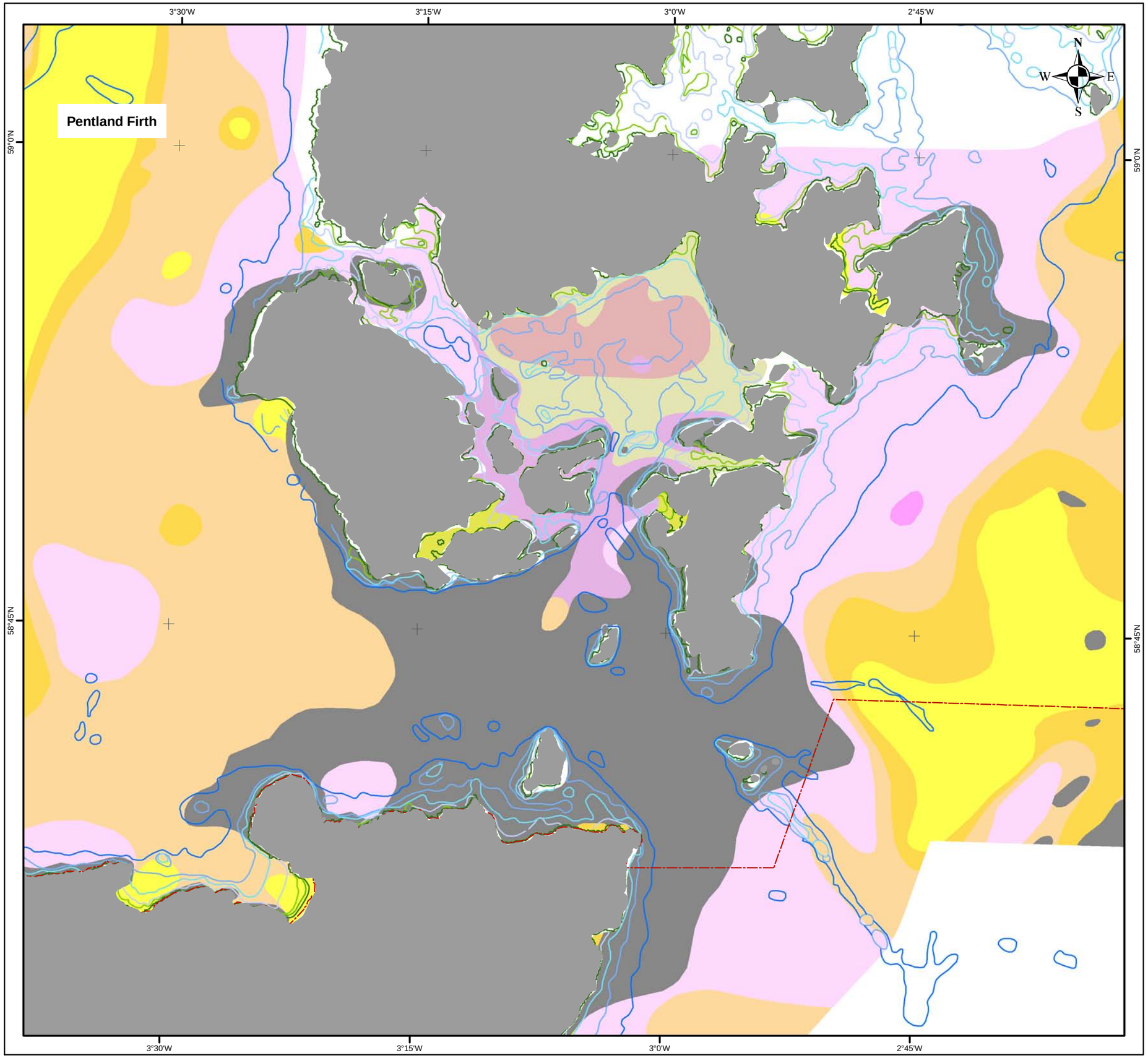
PENTLAND FIRTH AND ORKNEY WATERS MSP FRAMEWORK AND LOCATIONAL GUIDANCE

Figure Appendix D16b: Bathymetry & Seabed surface geology



Legend

- UK Land
- MSP Study Area
- Mussel deposit
- Gravelly muddy sand
- Gravel, mud and silt
- Gravel
- Gravelly mud
- Gravelly sand
- Muddy gravel
- Muddy sandy gravel
- Mud
- Muddy sand
- Sandy gravel
- Sandy mud
- Slightly gravelly muddy sand
- Slightly gravelly mud
- Slightly gravelly sand
- Slightly gravelly sandy mud
- Sand
- Diamicton
- Rock or Diamicton
- Rock and sediment
- Undifferentiated solid rock
- Clay and sand

Bathymetry (m)

- 0
- 2
- 5
- 10
- 20
- 30
- 50
- 100
- 200
- 300

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	Reviewed By	David Wotherspoon

AECOM

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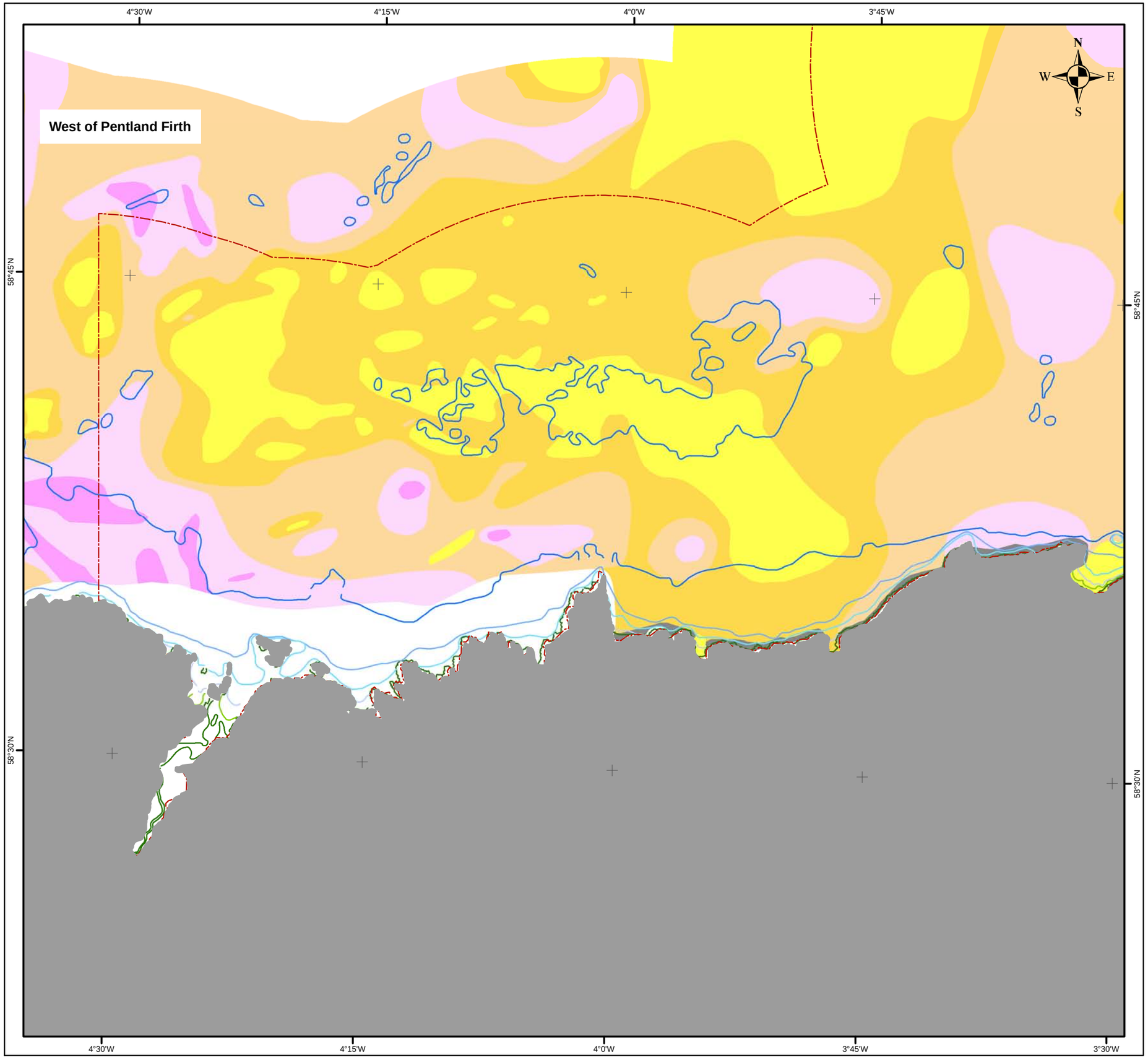
0 1.5 3 6 9 12 Km



PENTLAND FIRTH AND ORKNEY WATERS MSP FRAMEWORK AND LOCATIONAL GUIDANCE

Figure Appendix D16c: Bathymetry & Seabed surface geology

Legend

- UK Land
- MSP Study Area
- Mussel deposit
- Gravelly muddy sand
- Gravel, mud and silt
- Gravel
- Gravelly mud
- Gravelly sand
- Muddy gravel
- Muddy sandy gravel
- Mud
- Muddy sand
- Sandy gravel
- Sandy mud
- Slightly gravelly muddy sand
- Slightly gravelly mud
- Slightly gravelly sand
- Slightly gravelly sandy mud
- Sand
- Diamicton
- Rock or Diamicton
- Rock and sediment
- Undifferentiated solid rock
- Clay and sand

Bathymetry (m)

- 0
- 2
- 5
- 10
- 20
- 30
- 50
- 100
- 200
- 300

Date	Wednesday, May 20, 2009 17:50:29	
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	Reviewed By	David Wotherspoon

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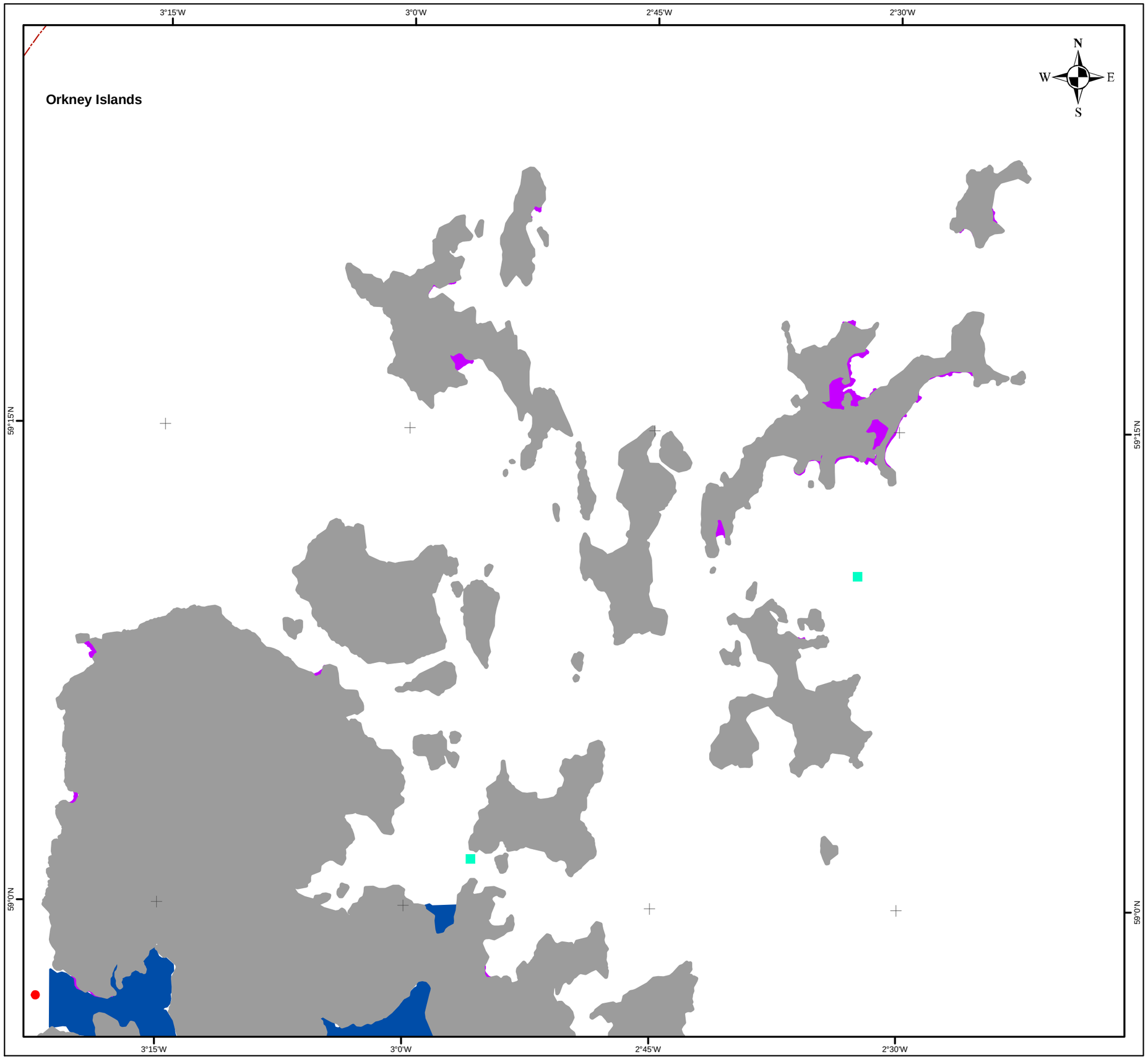
0 1.5 3 6 9 12 Km



PENTLAND FIRTH AND ORKNEY WATERS MSP FRAMEWORK AND LOCATIONAL GUIDANCE

Figure Appendix D17a: Water quality & sediment contamination

Legend

- UK Land
- MSP Study Area
- Non-Designated Bathing Waters
- Designated Bathing Waters
- Fish waste
- Silt, sand, gravel or rock
- Recreational Waters
- Shoreline Waters

Date	Wednesday, May 20, 2009 17:50:17	
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Checked	Produced By	Harshal Galgale
	Reviewed By	David Wotherspoon

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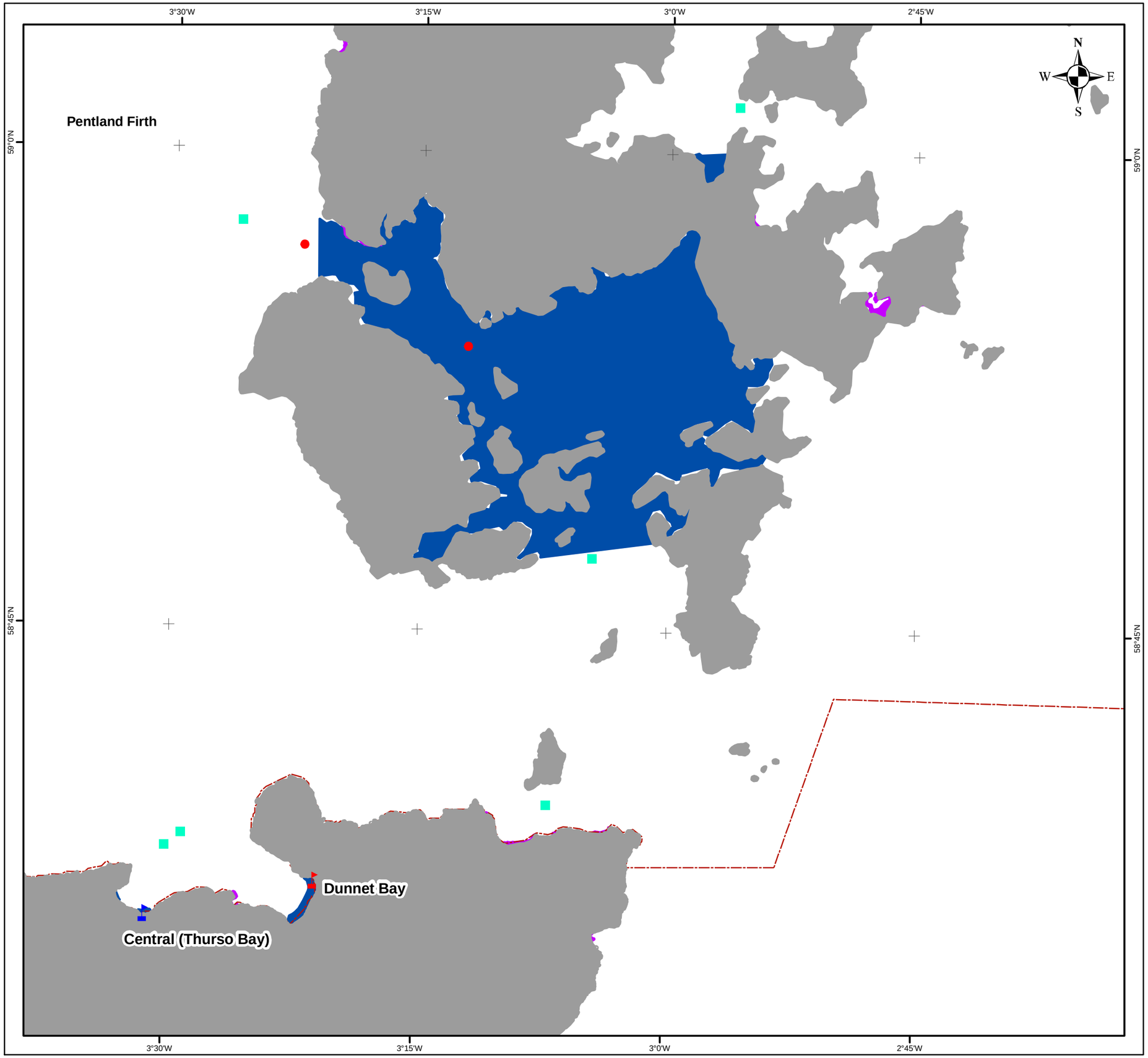
PENTLAND FIRTH AND ORKNEY WATERS MSP FRAMEWORK AND LOCATIONAL GUIDANCE

Figure Appendix D17b: Water quality & sediment contamination



Legend

- UK Land
- MSP Study Area
- Non-Designated Bathing Waters
- Designated Bathing Waters
- Fish waste
- Silt, sand, gravel or rock
- Recreational Waters
- Shoreline Waters

Date	Wednesday, May 20, 2009 17:49:53	
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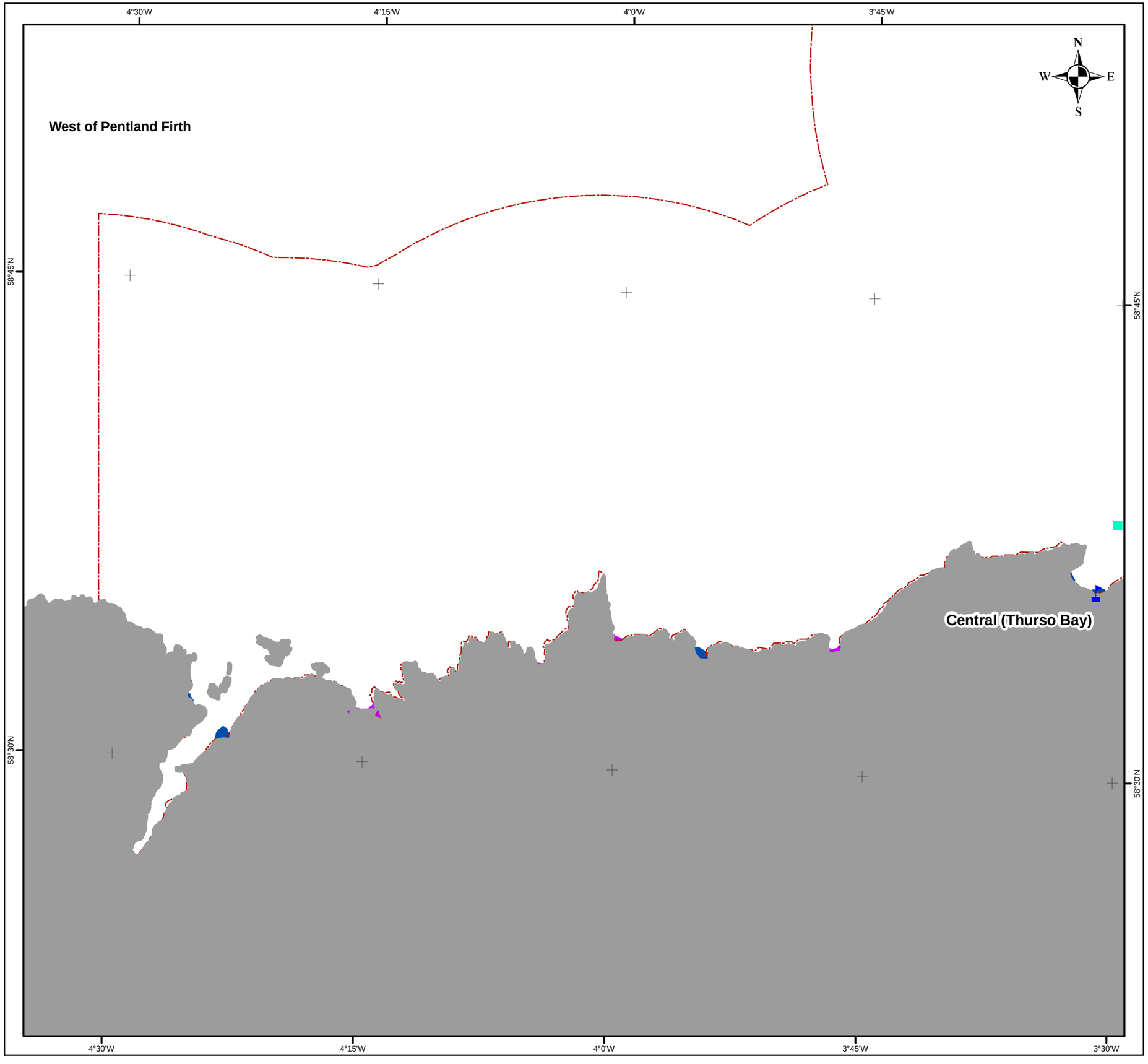
Checked	Produced By	Harshal Galgale
	Reviewed By	David Wotherspoon

AECOM METOC

0 1.5 3 6 9 12 Km

PENTLAND FIRTH AND ORKNEY WATERS MSP FRAMEWORK AND LOCATIONAL GUIDANCE

Figure Appendix D17c: Water quality & sediment contamination



Legend

- UK Land
- MSP Study Area
- Non-Designated Bathing Waters
- Designated Bathing Waters
- Fish waste
- Silt, sand, gravel or rock
- Recreational Waters
- Shoreline Waters

Date	Wednesday, May 20, 2009 17:49:47	
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Checked	Produced By	Harshal Galgale
	Reviewed By	David Wotherspoon

AECOM

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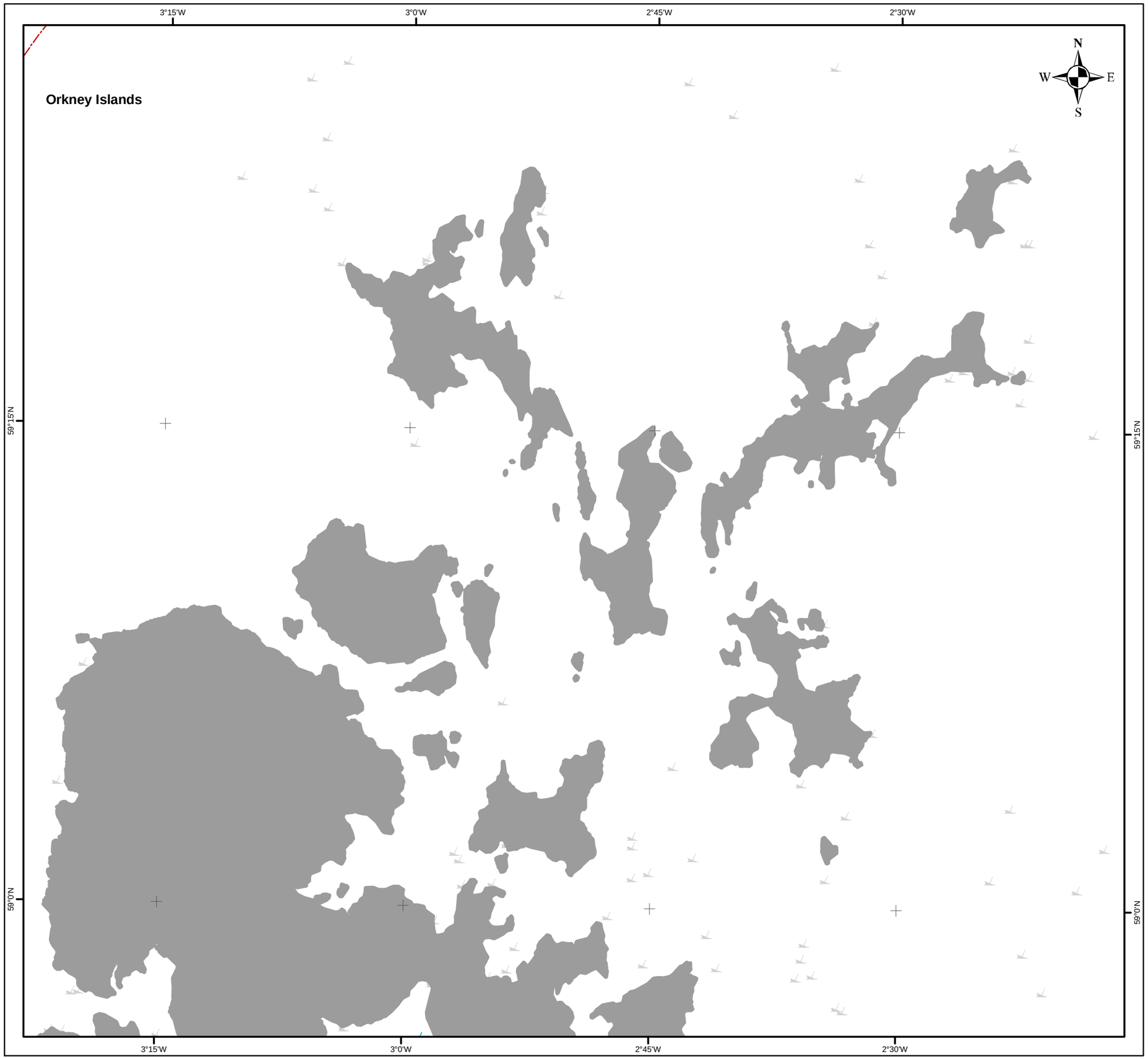
0 1.5 3 6 9 12 Km

PENTLAND FIRTH AND ORKNEY WATERS MSP FRAMEWORK AND LOCATIONAL GUIDANCE

Figure Appendix D18a: Wreck sites



Legend

- UK Land
- MSP Study Area
- Marine Scheduled Ancient Monument
- Protected under Military Remains Act
- Protected under Protection of Wrecks Act
- Live wreck

Date	Wednesday, May 20, 2009 17:49:38	
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Checked	Produced By	Harshal Galgale
	Reviewed By	David Wotherspoon

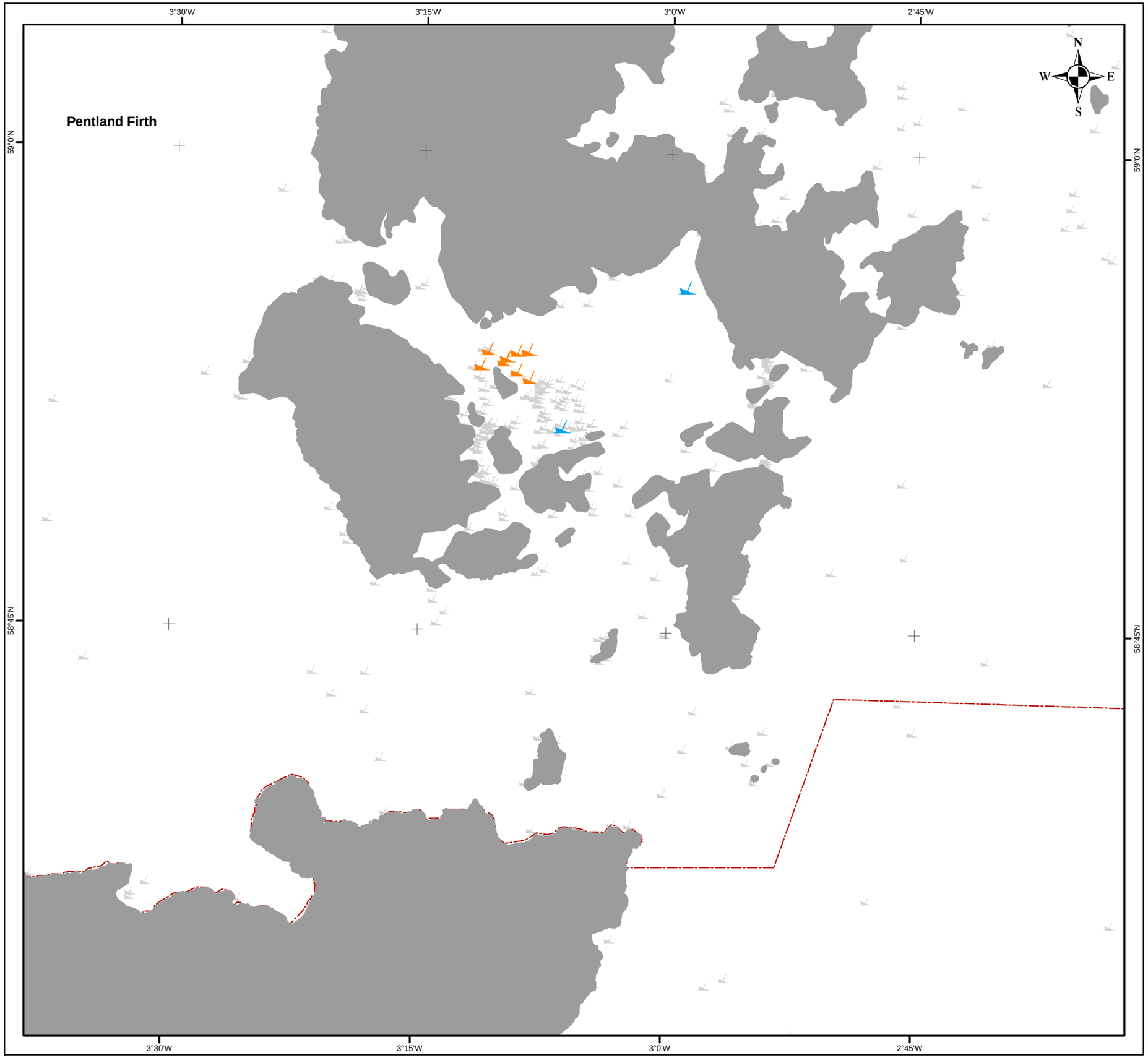
AECOM

METOC

0 1.5 3 6 9 12 Km

PENTLAND FIRTH AND ORKNEY WATERS MSP FRAMEWORK AND LOCATIONAL GUIDANCE

Figure Appendix D18b: Wreck sites



Legend

- UK Land
- MSP Study Area
- Marine Scheduled Ancient Monument
- Protected under Military Remains Act
- Protected under Protection of Wrecks Act
- Live wreck

Date	Wednesday, May 20, 2009 17:50:06	
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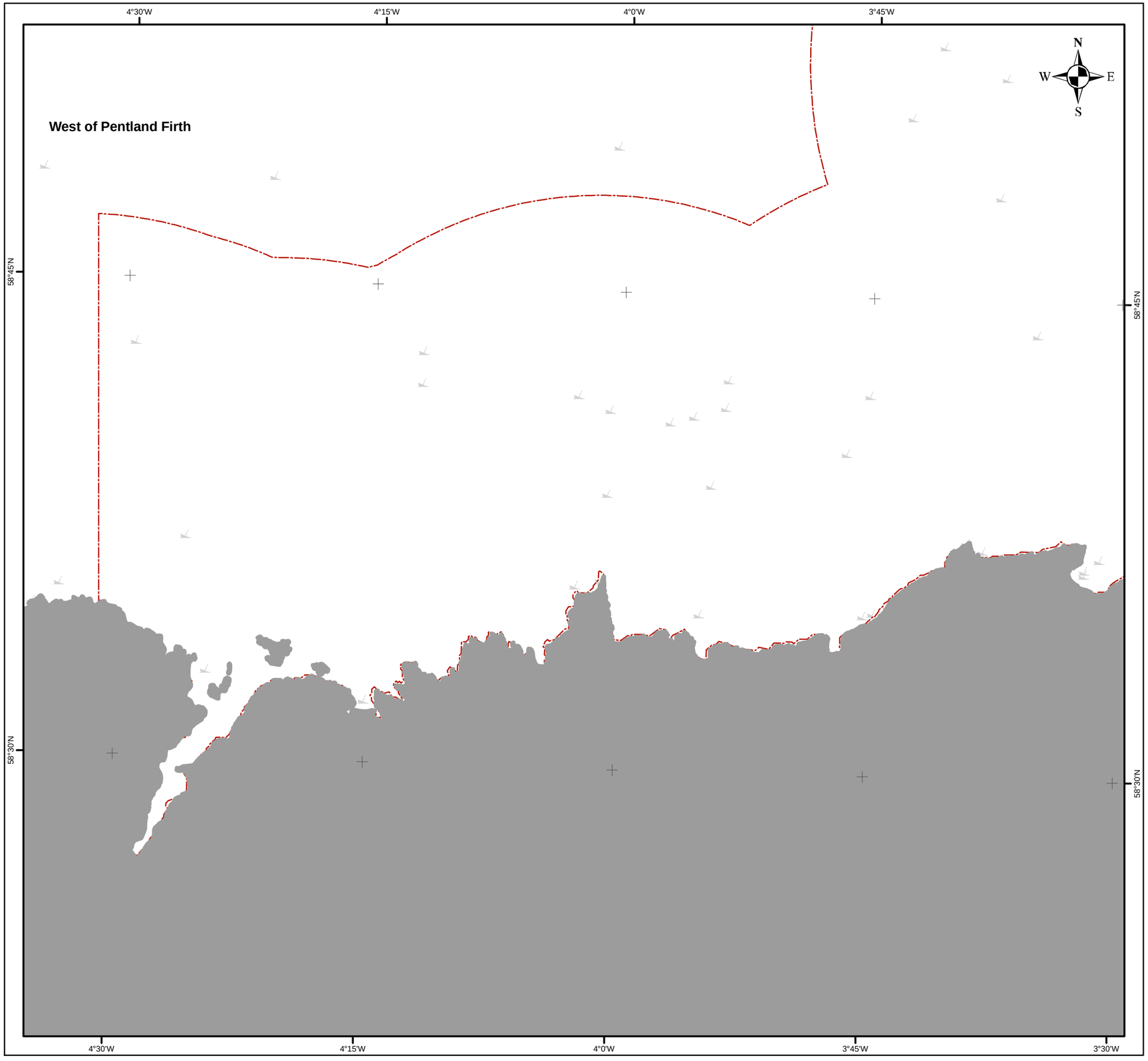
	Reviewed By	David Wotherspoon

AECOM

METOC

0 1.5 3 6 9 12 Km



PENTLAND FIRTH AND ORKNEY WATERS MSP FRAMEWORK AND LOCATIONAL GUIDANCE

Figure Appendix D18c: Wreck sites

Legend

- UK Land
- MSP Study Area
- Marine Scheduled Ancient Monument
- Protected under Military Remains Act
- Protected under Protection of Wrecks Act
- Live wreck

Date	Wednesday, May 20, 2009 17:50:24	
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Checked	Produced By	Harshal Galgale
	Reviewed By	David Wotherspoon

AECOM

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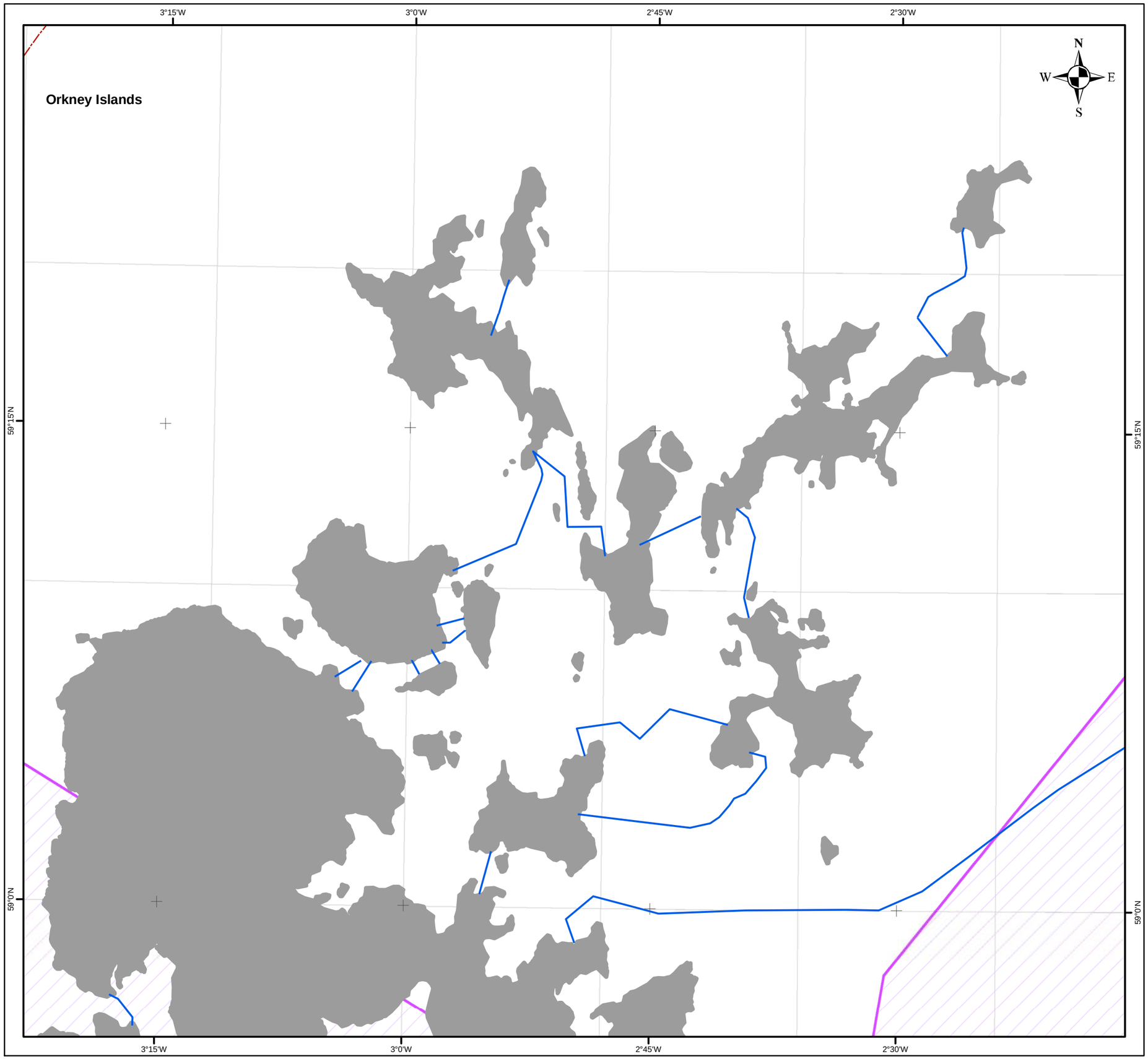
0 1.5 3 6 9 12 Km

PENTLAND FIRTH AND ORKNEY WATERS MSP FRAMEWORK AND LOCATIONAL GUIDANCE

Figure Appendix D19a: Other Seabed Users



Legend

- UK Land
- MSP Study Area
- Practice & Exercise Areas
- MoD Sea Areas

Cables

- Status: Active
- Status: Out of Service
- Pipelines
- Terminal
- Wells
- Oil and gas licencing blocks

Date	Wednesday, May 20, 2009 17:35:12	
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	Reviewed By	David Wotherspoon

AECOM

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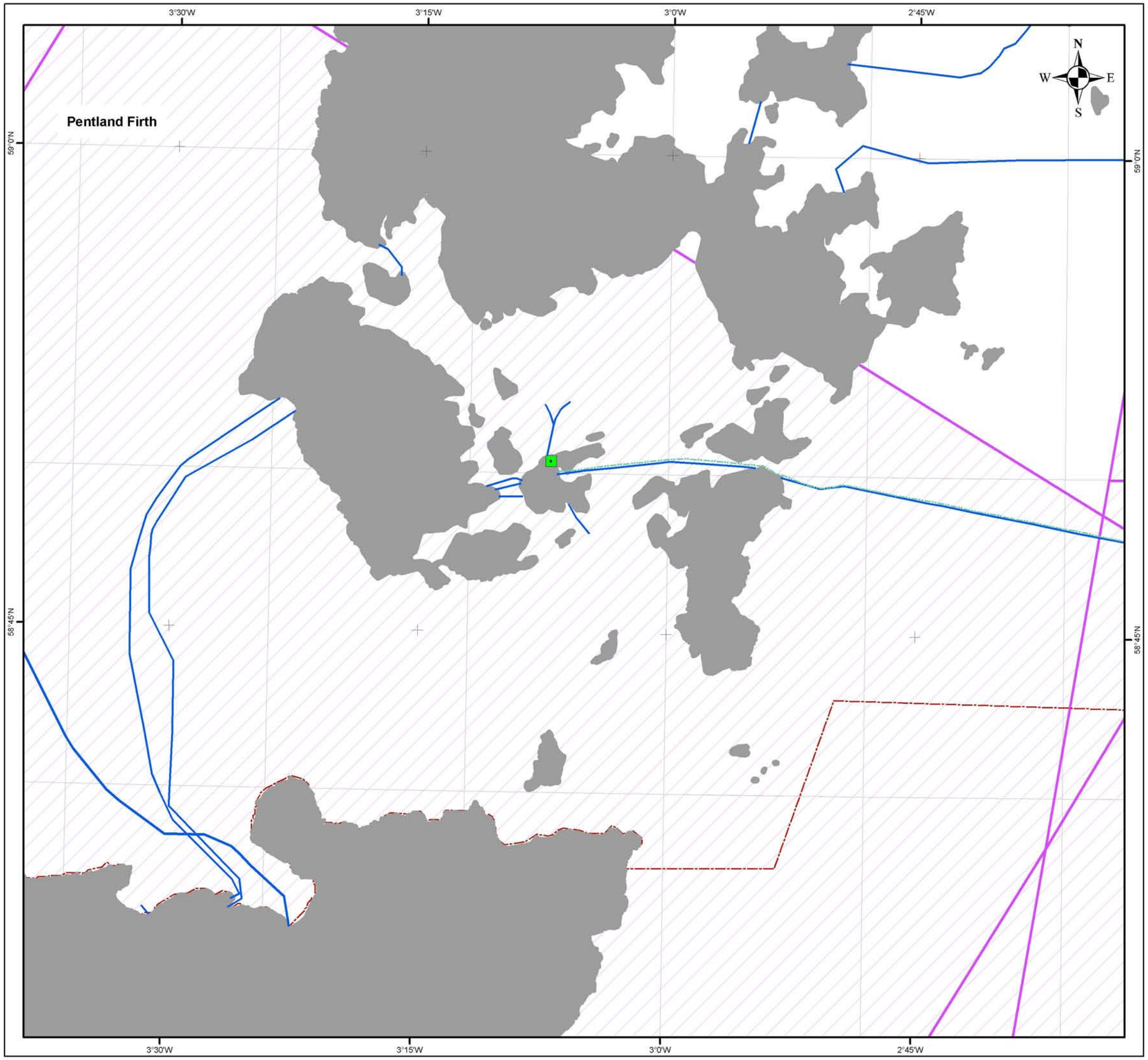

PENTLAND FIRTH AND ORKNEY WATERS MSP FRAMEWORK AND LOCATIONAL GUIDANCE

Figure Appendix D19b: Other Seabed Users

Legend

- UK Land
- MSP Study Area
- Practice & Exercise Areas
- MoD Sea Areas

Cables

- Status: Active
- Status: Out of Service
- Pipelines
- Terminal
- Wells
- Oil and gas licencing blocks

Date	Wednesday, May 20, 2009 17:35:21	
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Checked	Produced By	Harshal Galgale
	Reviewed By	David Wotherspoon

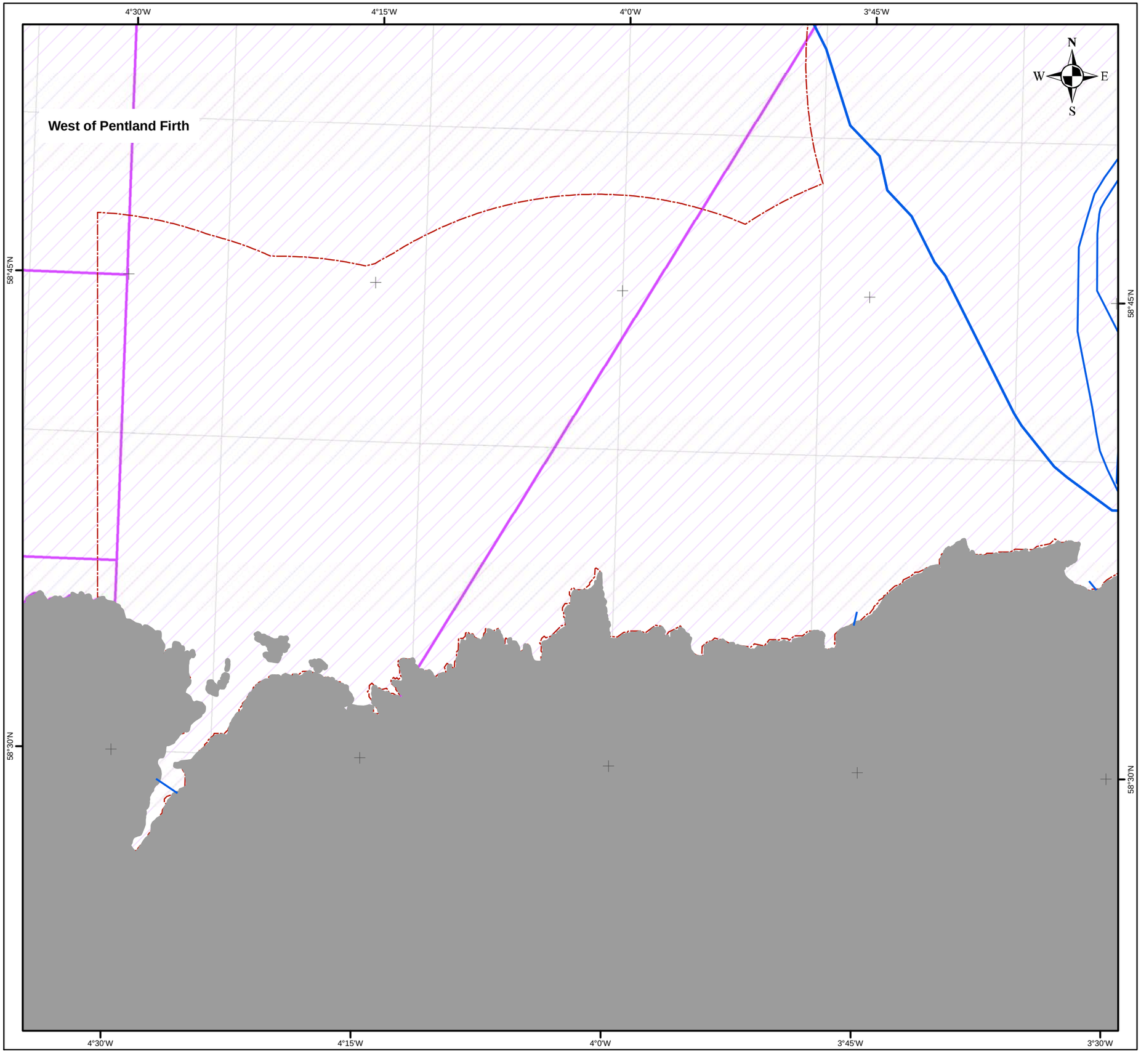
AECOM

METOC

0 1.5 3 6 9 12 Km

PENTLAND FIRTH AND ORKNEY WATERS MSP FRAMEWORK AND LOCATIONAL GUIDANCE

Figure Appendix D19c: Other Seabed Users



Legend

- UK Land
- MSP Study Area
- Practice & Exercise Areas
- MoD Sea Areas

Cables

- Status: Active
- Status: Out of Service
- Pipelines
- Terminal
- Wells
- Oil and gas licencing blocks

Date	Wednesday, May 20, 2009 17:35:03	
Projection	British National Grid	
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File Reference	J:\P1199\Mxd\Reports\Details\ Figure_2-18_Other_Seabed_Users_WS.mxd	
Checked	Produced By	Harshal Galgale
	Reviewed By	David Wotherspoon

AECOM

METOC

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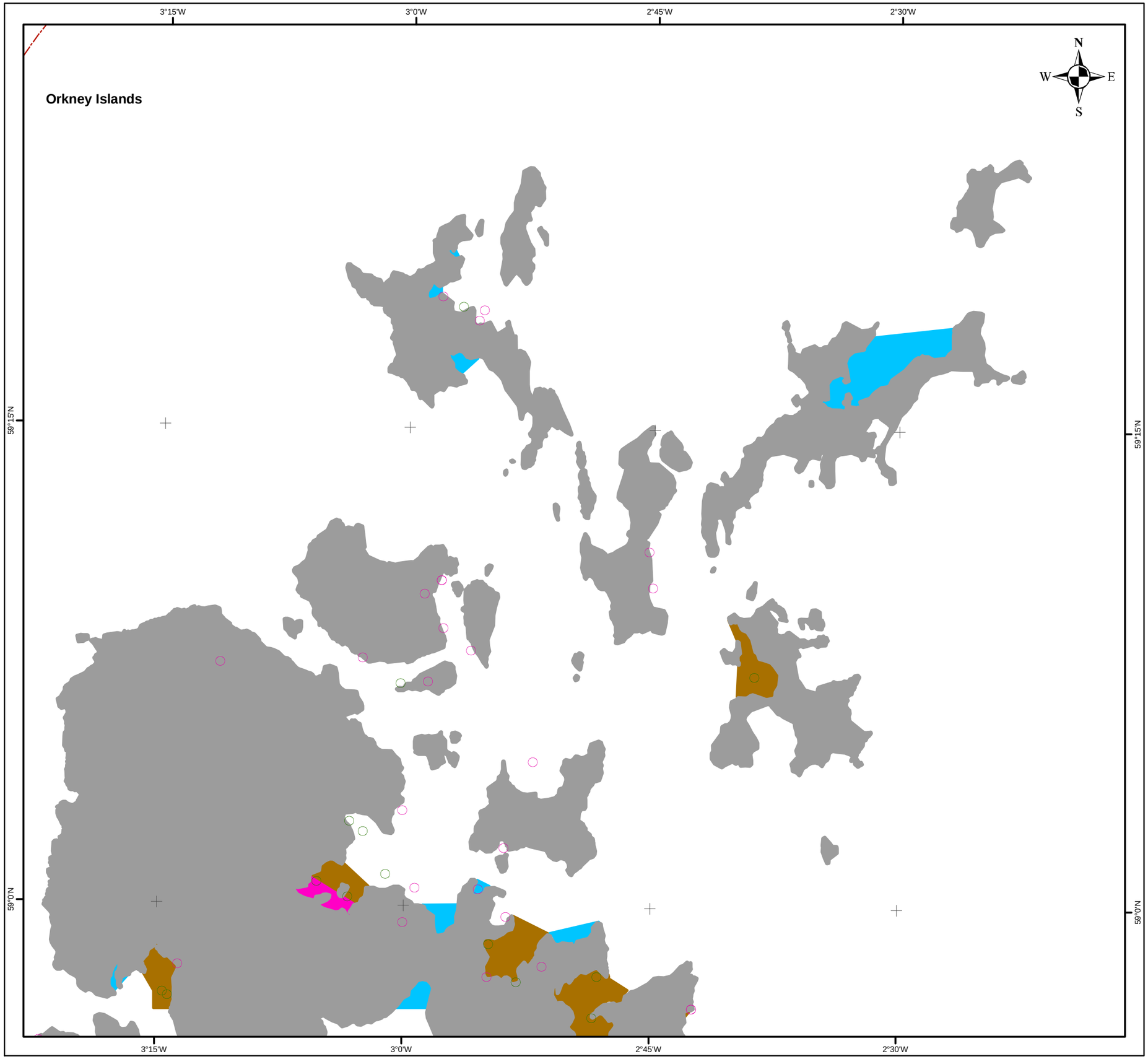
PENTLAND FIRTH AND ORKNEY WATERS MSP FRAMEWORK AND LOCATIONAL GUIDANCE

Figure Appendix D20a: Mariculture



Legend

- UK Land
- MSP Study Area
- Shellfish farms
- Finfish farms
- Harvesting areas
- Growing water designated
- Growing waters
- Production areas

Date	Wednesday, May 20, 2009 17:35:29	
Projection	British National Grid	
Spheroid	Airy 1830	
Datum	D_OSGB_1936	
Data Source	TCE, OS, SeaZone, SEPA	
File Reference	J:\P1199\Mxd\Reports\Details\ Figure_2-19_Mariculture_OI.mxd	
Checked	Produced By	Harshal Galgale
	Reviewed By	David Wotherspoon

AECOM METOC

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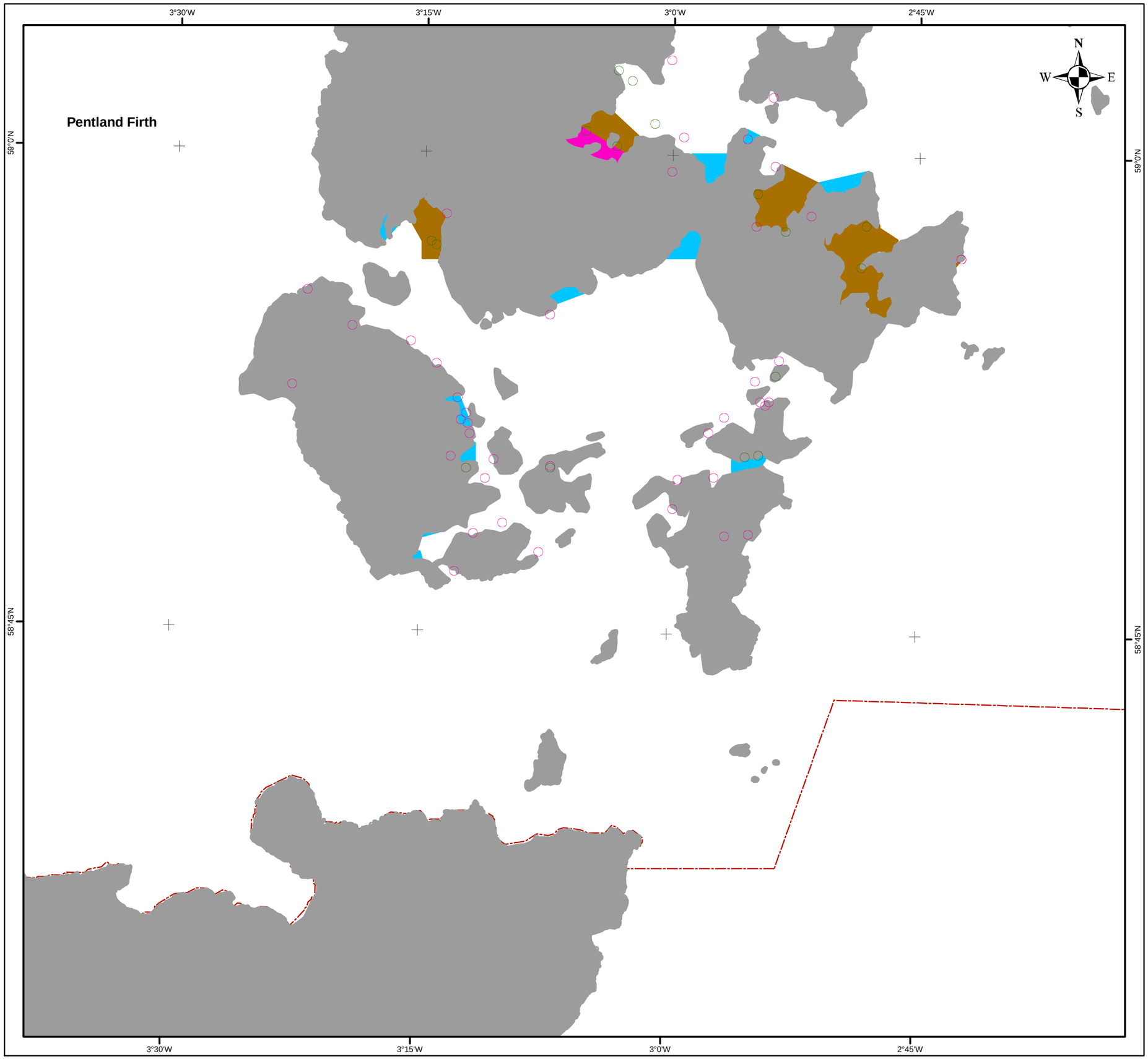
PENTLAND FIRTH AND ORKNEY WATERS MSP FRAMEWORK AND LOCATIONAL GUIDANCE

Figure Appendix D20b: Mariculture



Legend

- UK Land
- MSP Study Area
- Shellfish farms
- Finfish farms
- Harvesting areas
- Growing water designated
- Growing waters
- Production areas

Date	Wednesday, May 20, 2009 17:33:55	
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Spheroid	Airy 1830	
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	Reviewed By	David Wotherspoon

AECOM METOC

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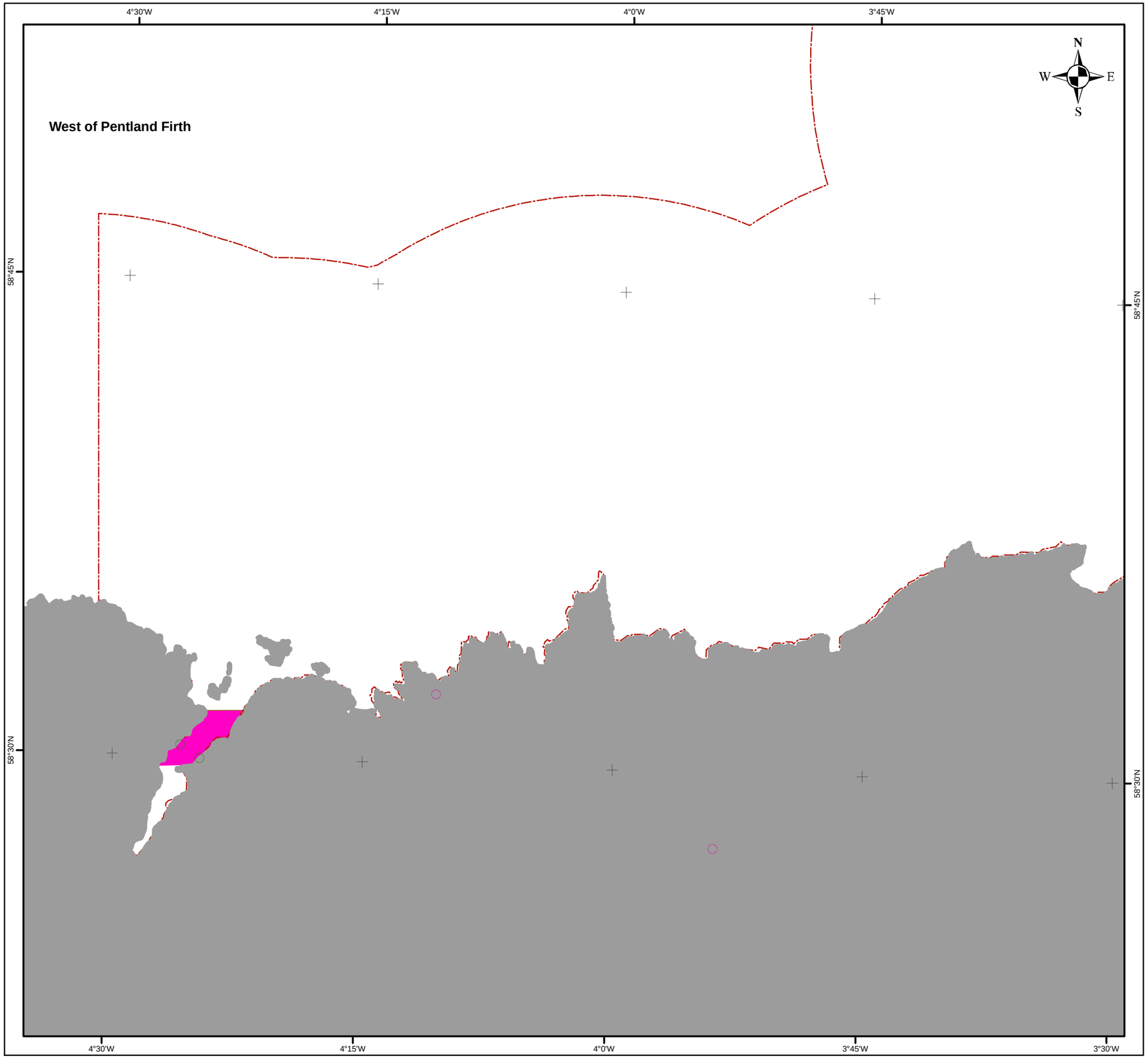

PENTLAND FIRTH AND ORKNEY WATERS MSP FRAMEWORK AND LOCATIONAL GUIDANCE

Figure Appendix D20c: Mariculture

Legend

- UK Land
- MSP Study Area
- Shellfish farms
- Finfish farms
- Harvesting areas
- Growing water designated
- Growing waters
- Production areas

Date	Wednesday, May 20, 2009 17:34:15	
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Spheroid	Airy 1830	
Datum	D_OSGB_1936	
Data Source	TCE, OS, SeaZone, SEPA	
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	Reviewed By	David Wotherspoon

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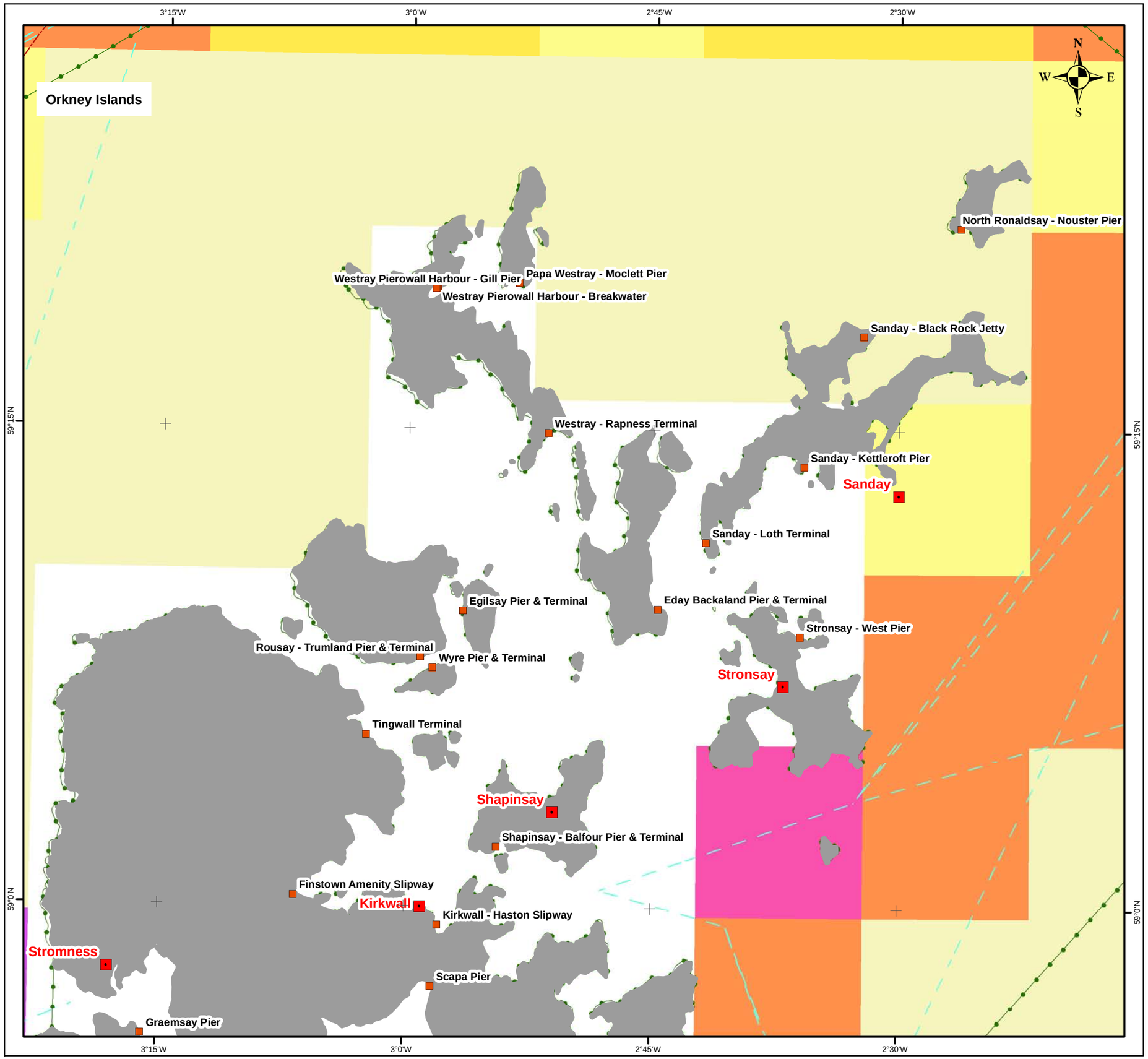
METOC

0 1.5 3 6 9 12 Km

PENTLAND FIRTH AND ORKNEY WATERS MSP FRAMEWORK AND LOCATIONAL GUIDANCE

Figure Appendix D21a: Shipping & Navigation, Ports & Harbours



Legend

- UK Land
- MSP Study Area
- Ports
- Piers & Harbours
- Indicative sea lanes
- Areas to be avoided
- Key shipping routes

Shipping intensity (Ships per Year)

- 0 - 86
- 87 - 172
- 173 - 344
- 345 - 688
- 689 - 1375
- 1376 - 2750
- 2751 - 5500
- <11100

Date	Wednesday, May 20, 2009 17:34:42	
Projection	British National Grid	
Spheroid	Airy 1830	
Datum	D_OSGB_1936	
Data Source	TCE, OS, SeaZone	
File Reference	J:\P1199\Mxd\Reports\Details\ Figure_2-20_Shipping_Navigation_OI.mxd	
Checked	Produced By	Harshal Galgale
	Reviewed By	David Wotherspoon

AECOM

METOC

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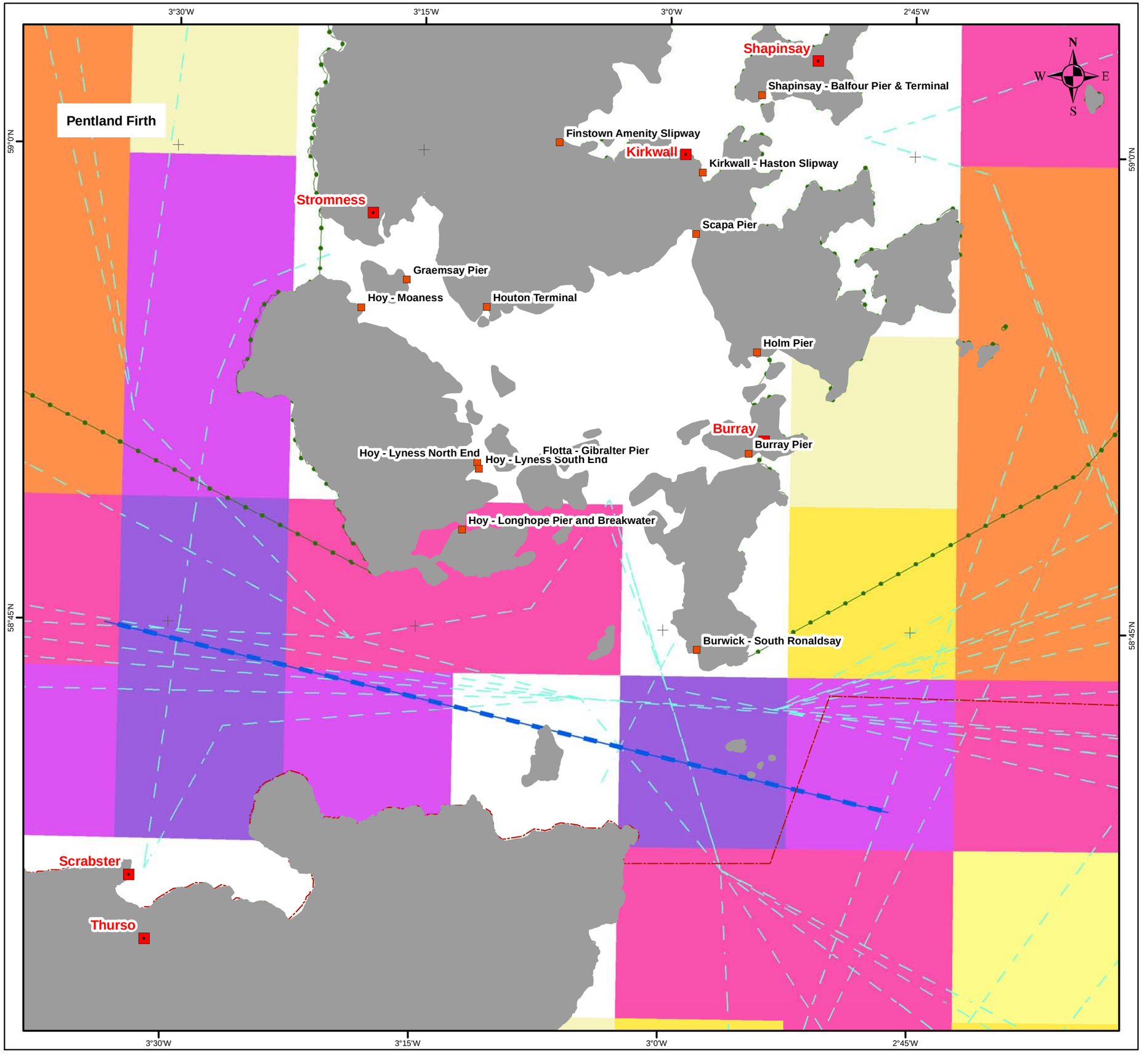
PENTLAND FIRTH AND ORKNEY WATERS MSP FRAMEWORK AND LOCATIONAL GUIDANCE

Figure Appendix D21b: Shipping & Navigation, Ports & Harbours



Legend

- UK Land
- MSP Study Area
- Ports
- Piers & Harbours
- Indicative sea lanes
- Areas to be avoided
- Key shipping routes

Shipping intensity (Ships per Year)

- 0 - 86
- 87 - 172
- 173 - 344
- 345 - 688
- 689 - 1375
- 1376 - 2750
- 2751 - 5500
- <11100

Date	Wednesday, May 20, 2009 17:34:34	
Projection	British National Grid	
Spheroid	Airy 1830	
Datum	D_OSGB_1936	
Data Source	TCE, OS, SeaZone	
File Reference	J:\P1199\Mxd\Reports\Details\ Figure_2-20_Shipping_Navigation_PF.mxd	
Checked	Produced By	Harshal Galgale
	Reviewed By	David Wotherspoon

AECOM

METOC

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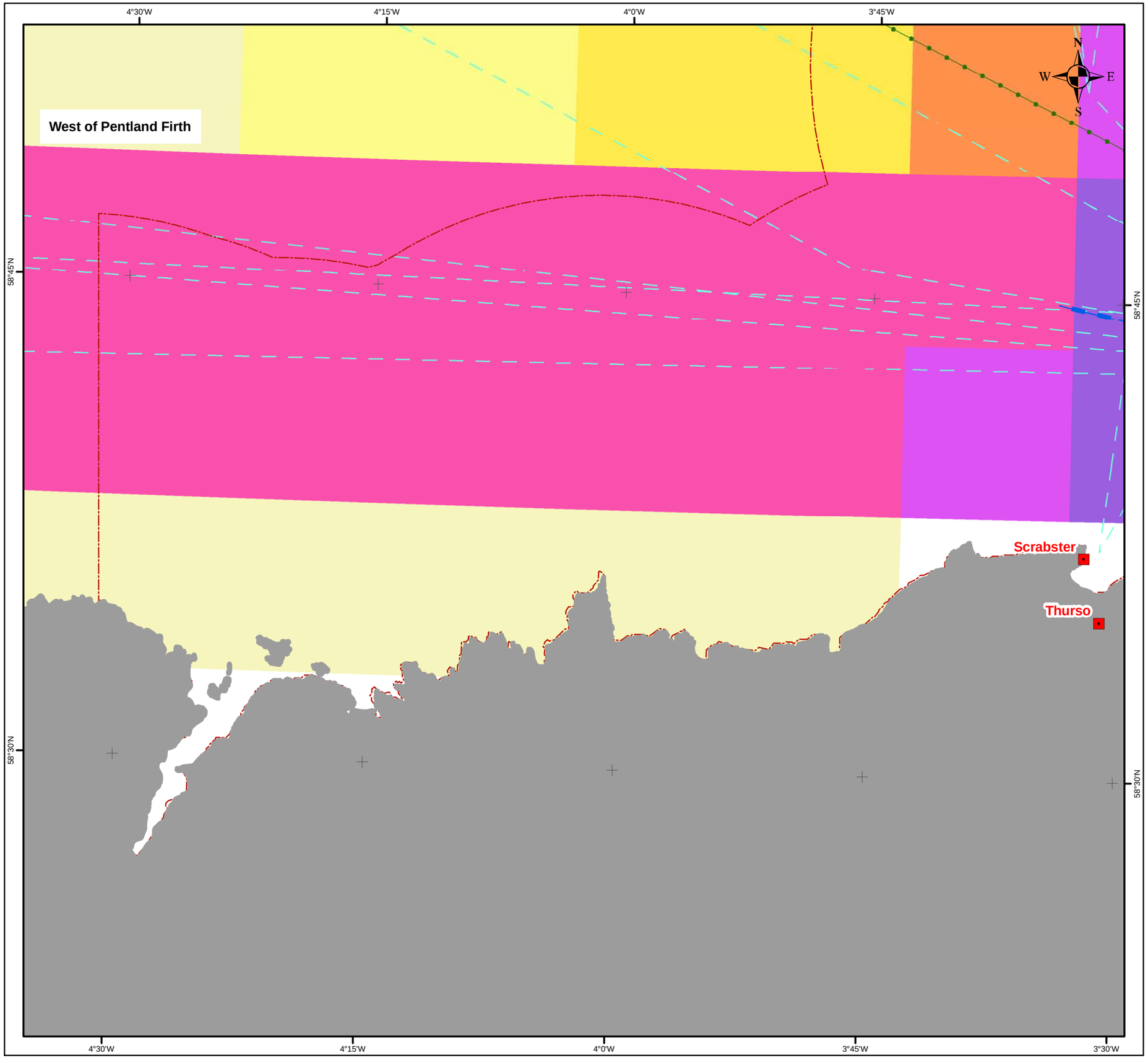
PENTLAND FIRTH AND ORKNEY WATERS MSP FRAMEWORK AND LOCATIONAL GUIDANCE

Figure Appendix D21c: Shipping & Navigation, Ports & Harbours



Legend

- UK Land
- MSP Study Area
- Ports
- Piers & Harbours
- Indicative sea lanes
- Areas to be avoided
- Key shipping routes

Shipping intensity (Ships per Year)

- 0 - 86
- 87 - 172
- 173 - 344
- 345 - 688
- 689 - 1375
- 1376 - 2750
- 2751 - 5500
- <11100

Date	Wednesday, May 20, 2009 17:34:52	
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Datum	D_OSGB_1936	
Data Source	TCE, OS, SeaZone	
File Reference	J:\P1199\Mxd\Reports\Details\ Figure_2-20_Shipping_Navigation_WS.mxd	
Checked	Produced By	Harshal Galgale
	Reviewed By	David Wotherspoon

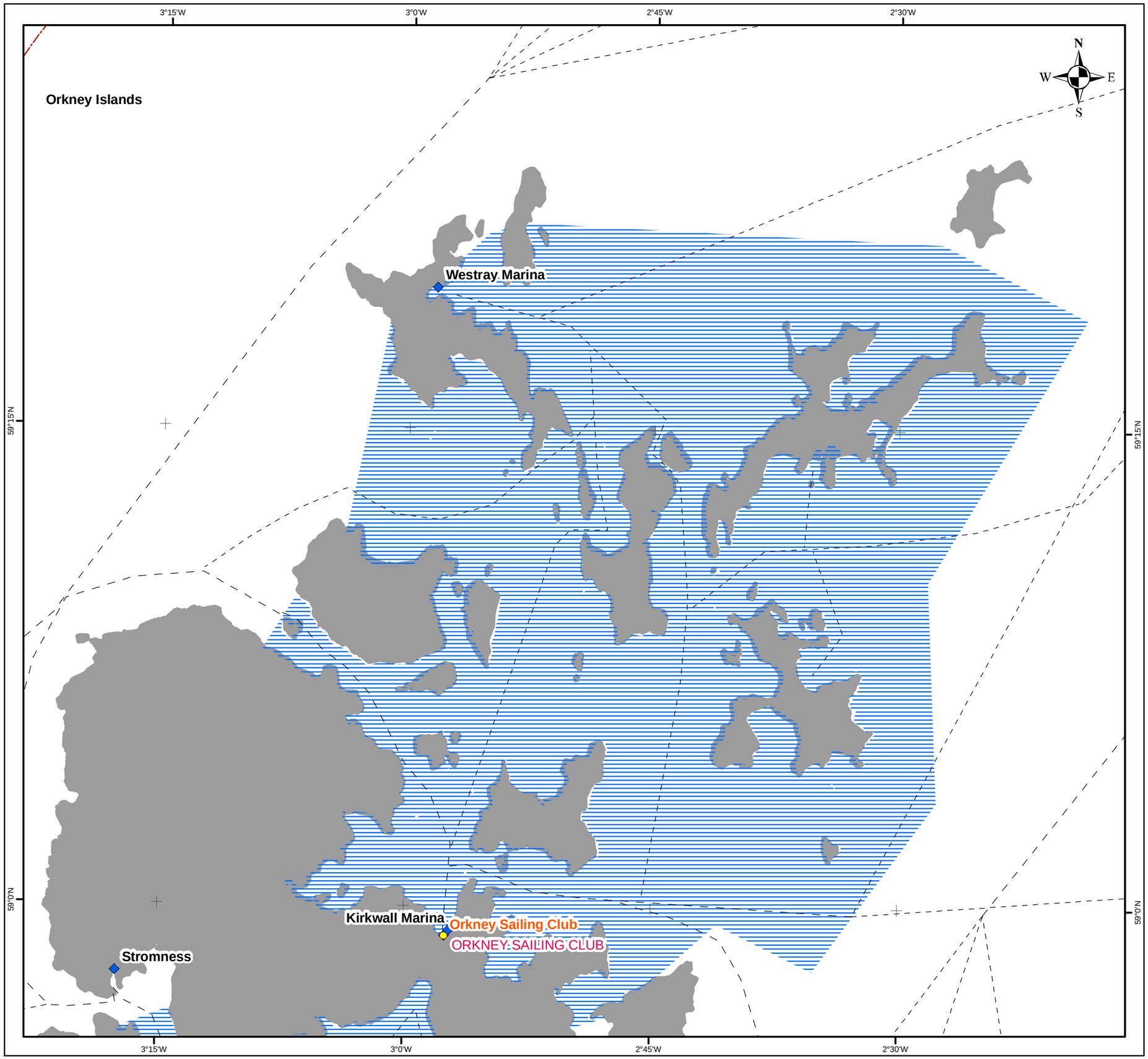
AECOM

METOC

0 1.5 3 6 9 12 Km

PENTLAND FIRTH AND ORKNEY WATERS MSP FRAMEWORK AND LOCATIONAL GUIDANCE

Figure Appendix D22a: Recreation and Tourism



Legend

- UK Land
- MSP Study Area
- RYA Club
- Marina
- RYA Training Centre

UK Crusing Routes - 2008

- Medium Recreational Use
- Light Recreational Use
- General Sailing Area
- Racing Sailing Area

Date	Wednesday, May 20, 2009 17:09:39	
Projection	British National Grid	
Spheroid	Airy 1830	
Datum	D_OSGB_1936	
Data Source	TCE, OS, RYA	
File Reference	J:\P1199\Mxd\Reports\Details\ Figure_2-21_Recreation_Tourism_OI.mxd	
Checked	Produced By	Harshal Galgale
	Reviewed By	David Wotherspoon

AECOM

METOC

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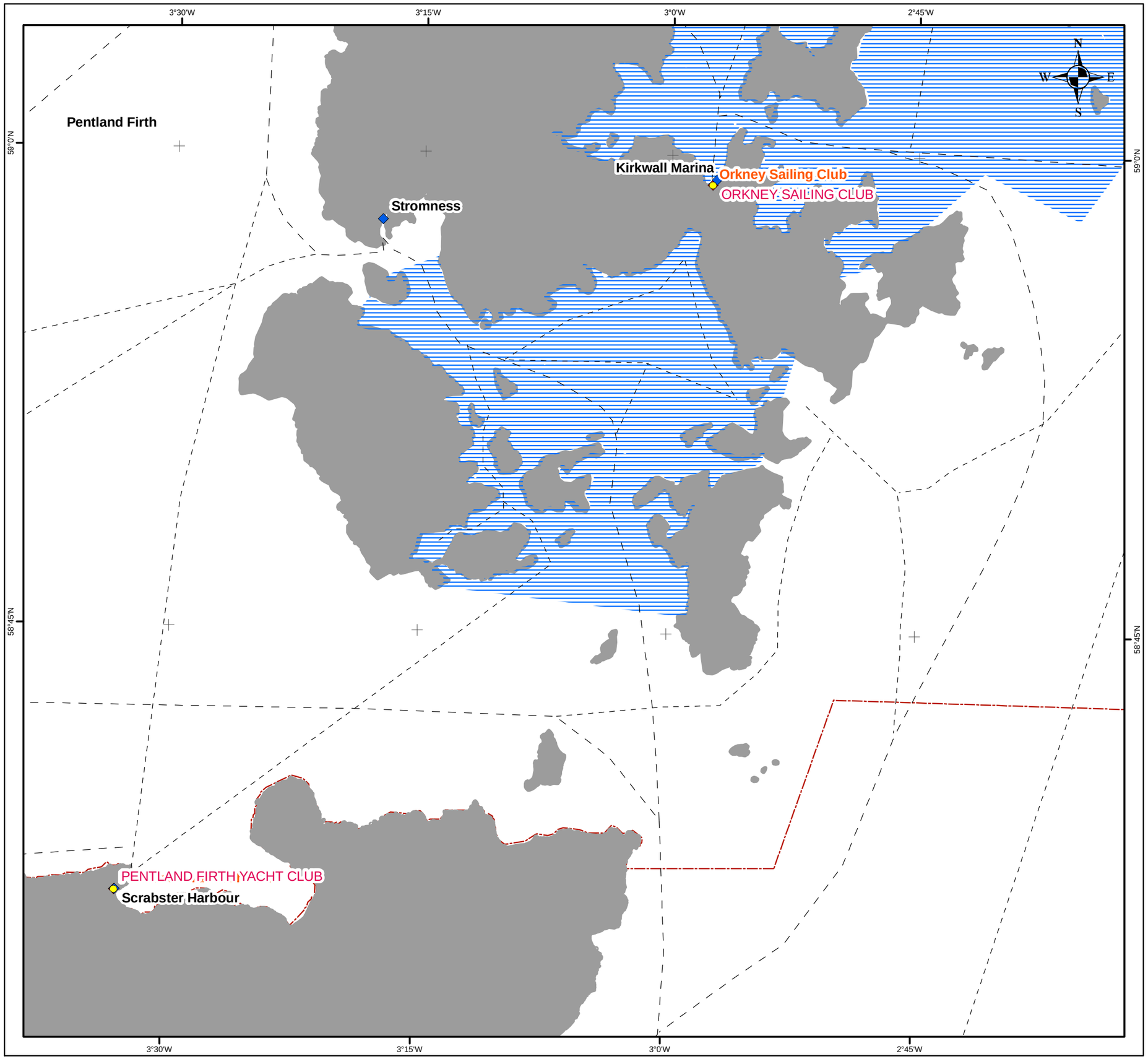

PENTLAND FIRTH AND ORKNEY WATERS MSP FRAMEWORK AND LOCATIONAL GUIDANCE

Figure Appendix D22b: Recreation and Tourism

Legend

- UK Land
- MSP Study Area
- RYA Club
- Marina
- RYA Training Centre

UK Crusing Routes - 2008

- Medium Recreational Use
- Light Recreational Use
- General Sailing Area
- Racing Sailing Area

Date	Wednesday, May 20, 2009 17:13:42	
Projection	British National Grid	
Spheroid	Airy 1830	
Datum	D_OSGB_1936	
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File Reference	J:\P1199\Mxd\Reports\Details\ Figure_2-21_Recreation_Tourism_PF.mxd	
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	Reviewed By	David Wotherspoon

AECOM

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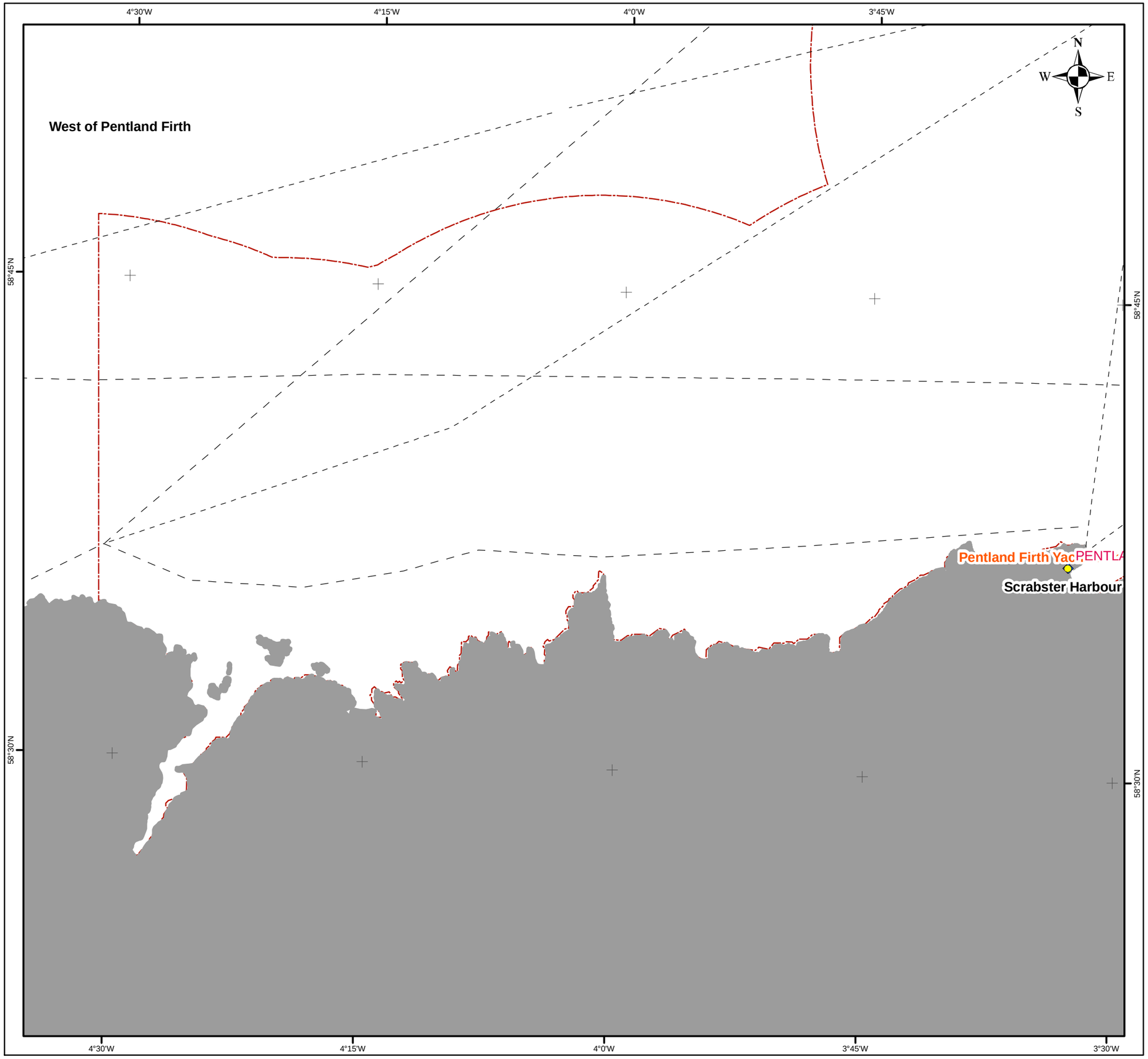


PENTLAND FIRTH AND ORKNEY WATERS MSP FRAMEWORK AND LOCATIONAL GUIDANCE

Figure Appendix D22c: Recreation and Tourism

Legend

- UK Land
- MSP Study Area
- RYA Club
- Marina
- RYA Training Centre

UK Crusing Routes - 2008

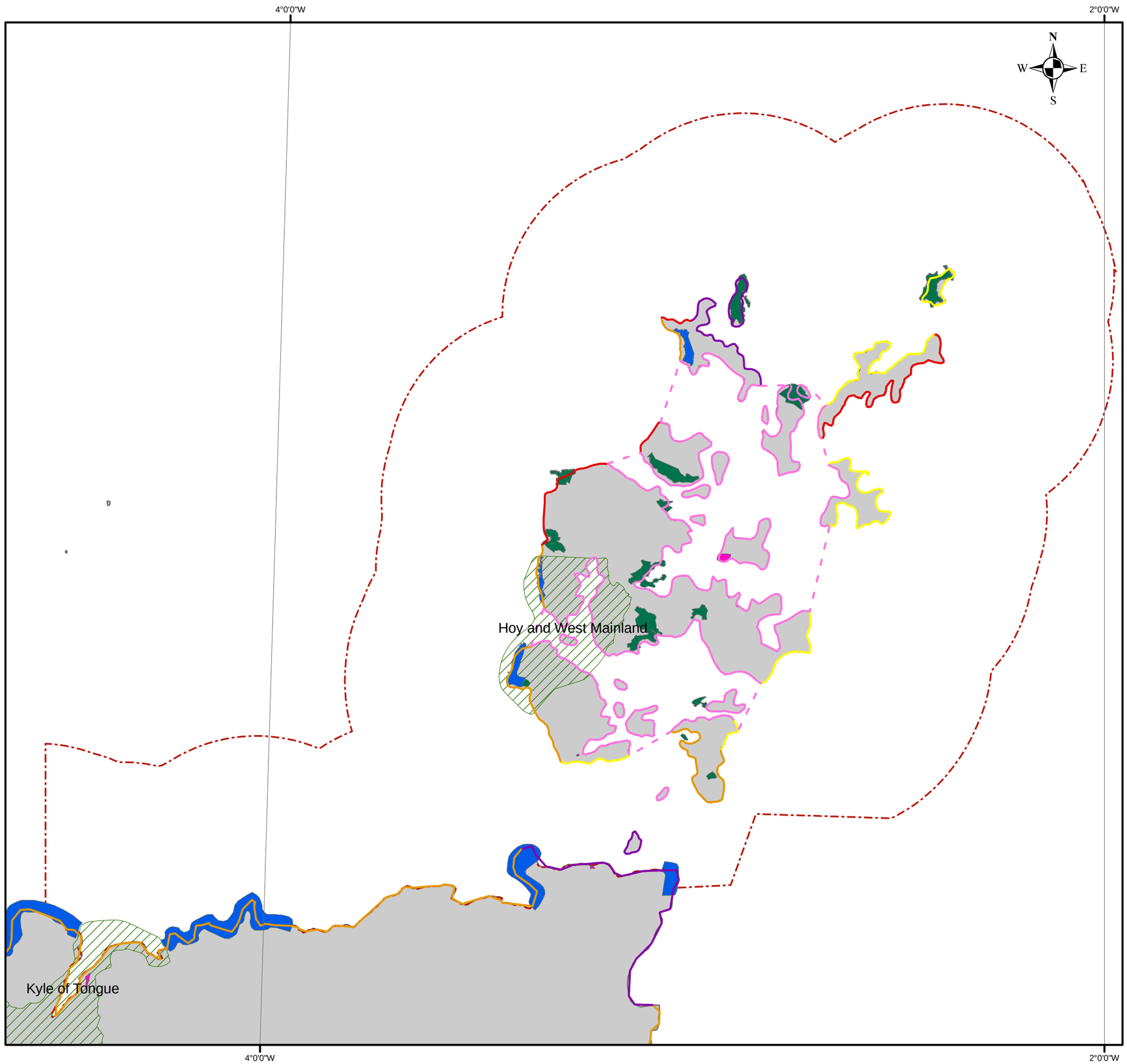
- Medium Recreational Use
- Light Recreational Use
- General Sailing Area
- Racing Sailing Area

Date	Wednesday, May 20, 2009 17:03:02	
Projection	British National Grid	
Spheroid	Airy 1830	
Datum	D_OSGB_1936	
Data Source	TCE, OS, RYA	
File Reference	J:\P1199\Mxd\Reports\Details\ Figure_2-21_Recreation_Tourism_WS.mxd	
Checked	Produced By	Harshal Galgale
	Reviewed By	David Wotherspoon

AECOM

METOC

0 1.5 3 6 9 12 Km



PENTLAND FIRTH AND ORKNEY WATERS MSP FRAMEWORK AND LOCATIONAL GUIDANCE

Fig: D23 Seascape Types and National Senic Areas

Key

Seascape Type

- Low Coastal Sands and Flats
- High Cliffs
- Inter-Island associated with Outer Island Chains
- Low Lying Agricultural Coastal Fringe
- Rugged Coastal Shelf and Headlands with Wide Open Views to Sea
- 12 Nautical mile limit (study area)
- UK Land
- National Scenic Area (NSA)
- Areas of Great Landscape Value
- Areas of Attractive Settled Landscape
- Gardens and Designed Landscape

Date	May 2009	
Projection	British National Grid	
Spheroid	Airy 1830	
Datum	OSGB36	
Data Source	Scottish Natural Heritage Faber Maunsell	
File Reference	F:\PROJECTS\Marine Spatial Plan - Pentland Firth\ArcView\Layouts	
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AECOM METOC

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