The Scottish Government
Riaghaltas na h-Alba

PILOT PENTLAND FIRTH AND ORKNEY WATERS MARINE SPATIAL PLAN

CONSULTATION DRAFT

Socio-Economic Baseline Review

marinescotland

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The Scottish Government
Riaghaltas na h-Alba

The Highland Council
Comhairle na Gàidhealtachd

Orkney Islands Council

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1 INTRODUCTION

1.1.1 This report provides a regional socio-economic baseline review of the Pentland Firth and Orkney Waters (PFOW) area for the pilot PFOW Marine Spatial Plan. It addresses, on a sector by sector basis, all marine users within the PFOW area. This report informs the PFOW Sustainability Appraisal and provides a basis for future assessments that may be required in the area. There are many interdependencies between marine activities in the area that are critical to the viability of a wide range of services and jobs that greatly benefit its fragile coastal communities. The list of marine uses from Scotland's Marine Atlas[1] has been used as a starting point as it provides a comprehensive categorisation of marine uses in Scotland's seas. The following marine sectors have been analysed:

- Aggregates and Dredging
- Aquaculture (finfish and shellfish)
- Aviation
- Carbon Capture and Storage
- Coast Protection and Flood Defence
- Commercial Fisheries
- Energy Generation (and offshore renewables supply chains)
- Military Interests
- Oil and Gas
- Power Interconnectors, Distribution and Telecom Cables
- Shipping, Ports and Harbours
- Tourism (including heritage assets)
- Water Sports and Recreational Boating

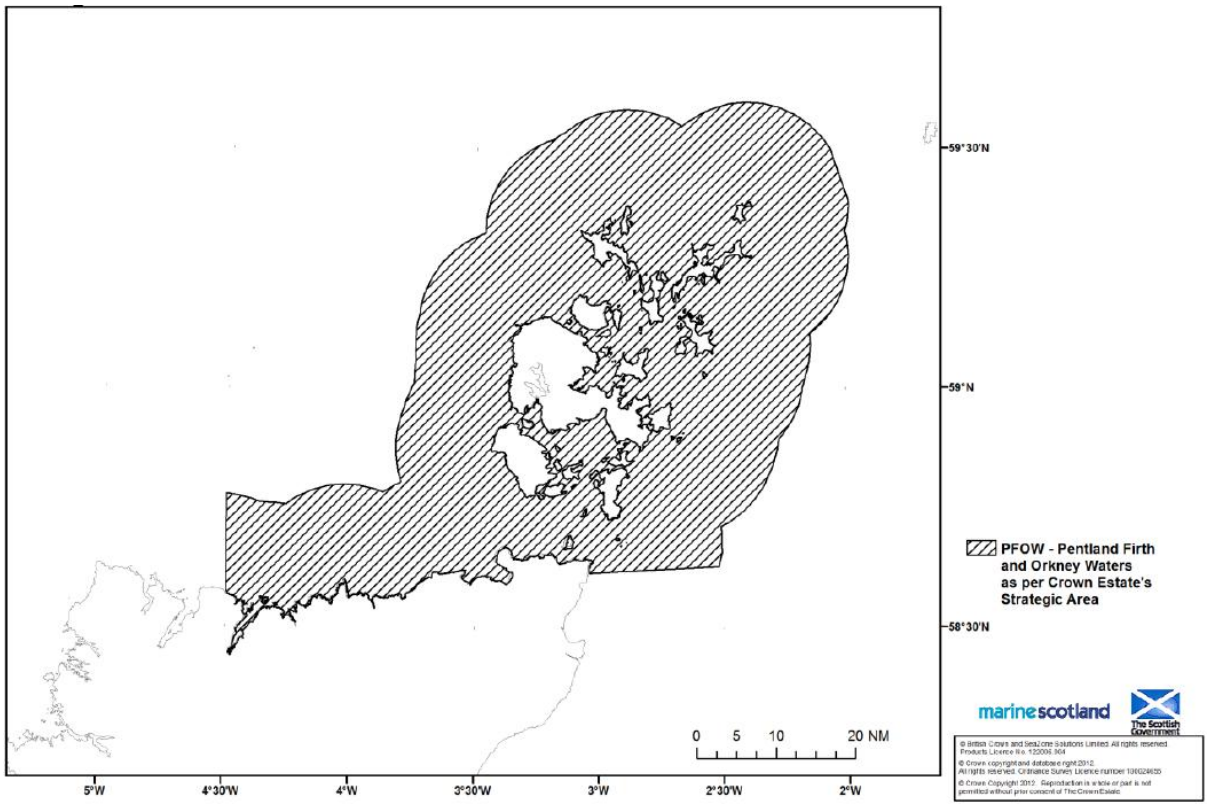
2 PFOW REGIONAL OVERVIEW

2.1 PFOW Geographical Coverage

2.1.1 Geographically, the pilot Pentland Firth and Orkney Waters Marine Spatial Plan (PFOW MSP) framework covers the Pentland Firth and the waters around Orkney, from the mean high water mark out to the 12 nautical mile territorial limit. When the pilot marine spatial planning process for Pentland Firth and Orkney Waters commenced in 2009/10, the boundaries of the proposed Scottish Marine Regions had not been identified and the pilot Pentland Firth and Orkney Waters Marine Spatial Plan area (Figure 1) at this time was based on The Crown Estate strategic area for the Round 1 leasing of wave and tidal development.

[1] Scotland's Marine Atlas Information for The National Marine Plan(2013) (http://www.gov.scot/Publications/2011/03/16182005/0)

Figure 1 Pentland Firth and Orkney Waters Marine Spatial Plan - Based on The Crown Estate's Strategic Area[2]

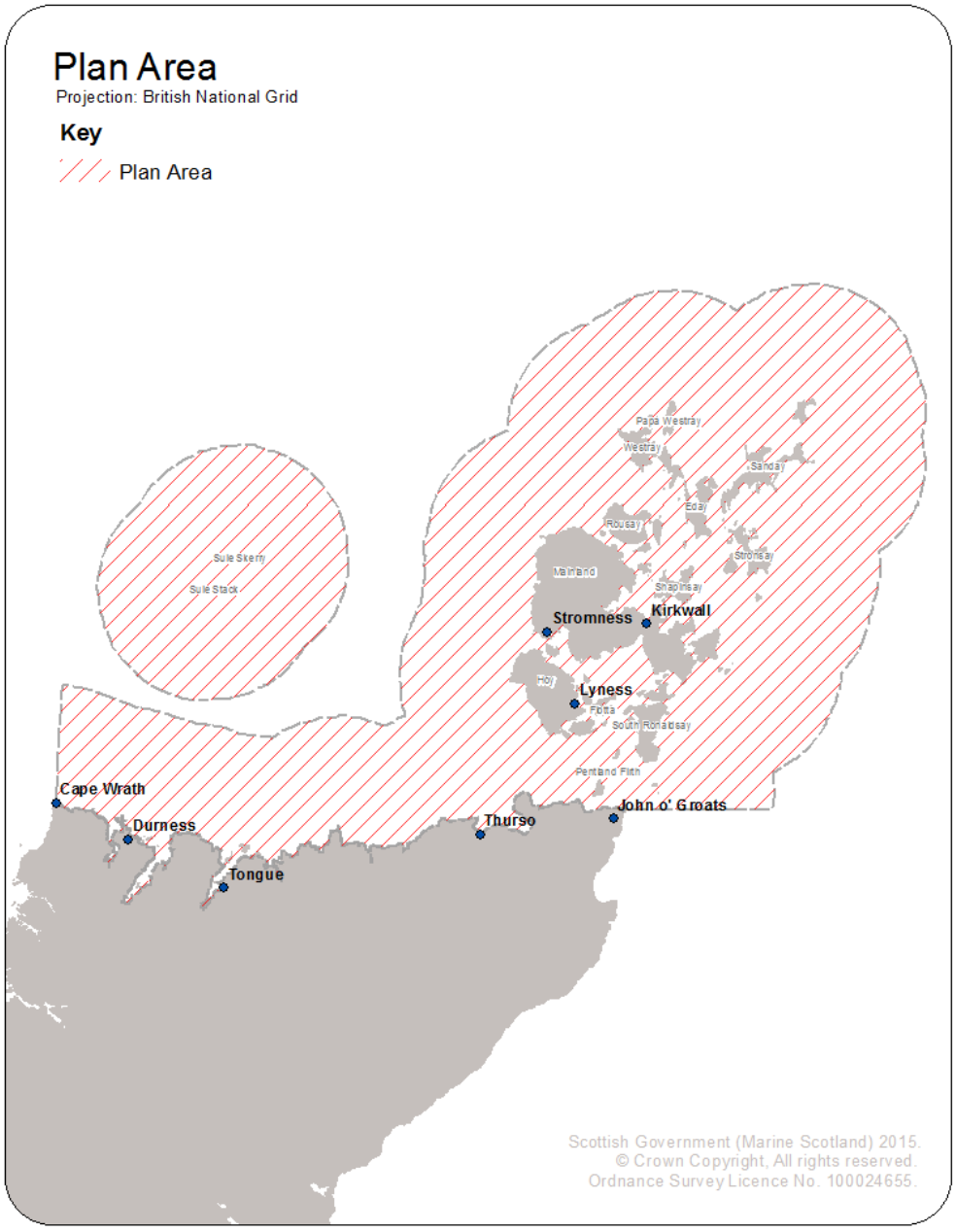


2.1.2 Now that the Scottish Marine Region boundaries have been identified the opportunity to align the pilot Marine Spatial Plan boundary with the proposed boundaries for the Orkney and North Coast marine regions can be considered. Realigning the boundaries for the plan assists with the successful migration of the pilot Marine Spatial Plan towards becoming a regional marine plan.

2.1.3 Figure 2 illustrates a proposed area for the pilot Marine Spatial Plan based on Scottish Marine Regions.

[2] Pilot Pentland Firth Orkney Waters Marine Spatial Plan. The Plan Scheme (2012) Marine Scotland (http://www.gov.scot/Resource/0040/00408910.pdf)

Figure 2 **Pentland Firth and Orkney Waters Marine Spatial Plan – proposed area based on Scottish Marine Region[3]**



[3] Marine Scotland (2014)

2.2 Population

2.2.1 Census data show that in 2011 Orkney had a total population of 21,349. This was an increase of 10.9% from 2001, which is significantly above the population increases across the Highlands and Islands (7.5%) and Scotland (4.6%). In 2011, Caithness and Sutherland had a total population of 39,732. This was an increase of 3.3% from 2001, which was below the population increase across the Highlands and Islands and Scotland. Table 1 shows the population of Orkney and Caithness & Sutherland, along with the population of the Highlands and Islands and Scotland to put the figures in context.

Table 1 Total Population in PFOW area[4]

Total Population	2001	2011	Percentage Change
Orkney	19,245	21,349	10.9%
Caithness and Sutherland	38,462	39,732	3.3%
Highlands and Islands	433,524	466,112	7.5%
Scotland	5,062,011	5,295,403	4.6%

2.3 PFOW Area Economic Profile

2.3.1 The following section gives an overview of the PFOW socio-demographics. Data from the 2001 and 2011 Census have been utilised by Highlands and Islands Enterprise (2014) to produce area profiles for Orkney[5] and Caithness & Sutherland[6]. The findings from these area profiles are summarised to help to contextualise the socio-economic baseline review for the PFOW area.

2.3.2 The Nomenclature of Territorial Units for Statistics (NUTS) is a hierarchical classification of administrative areas, used across the European Union for statistical purposes. The largest area classifications are NUTS1 and the smallest area classifications are NUTS3. Scotland is one of twelve NUTS1 areas in the UK. Highlands and Islands is the NUTS2 area relevant to the PFOW broken down into four NUTS3 areas; two of these areas are directly relevant to the PFOW:

- Caithness & Sutherland and Ross & Cromarty
- Orkney Islands

The Office for National Statistics provides NUTS3 level data for Gross Value Added (GVA), shown in Table 2.

[4] Census 2001 and 2011 (HIE, 2014)
[5] http://www.hie.co.uk/regional-information/area-information/orkney/economic-profile.html
[6] http://www.hie.co.uk/regional-information/area-information/caithness-and-sutherland/economic-profile.html

Table 2 Workplace based GVA at current basic prices[7]

Workplace based GVA at current basic prices	£million		
Region	2011	2012	2013
Scotland (NUTS1)	111,535	113,819	117,116
Highlands and Islands (NUTS2)	8,340	8,211	8,469
Caithness & Sutherland and Ross & Cromarty (NUTS3)	1,339	1,281	1,319
Orkney Islands (NUTS3)	354	367	385

2.3.3 ONS also provide data on GVA per head, as shown in Table 3.

Table 3 Workplace based GVA at current basic prices[7]

Workplace based GVA per head at current basic prices	GVA per head (£)		
Region	2011	2012	2013
Scotland (NUTS1)	21,045	21,420	21,982
Highlands and Islands (NUTS2)	17,856	17,616	18,123
Caithness & Sutherland and Ross & Cromarty (NUTS3)	14,032	13,452	13,882
Orkney Islands (NUTS3)	16,534	17,036	17,853

2.4 Employment

2.4.1 Official Labour market statistics show that between January and December 2014 13,000 people in the Orkney Islands local authority were economically active. This represented 91.7% of 16-64 year olds, and was above the Scotland rate of 77.5%. 124,800 were economically active in 2014 in the Highland local authority, comprising 81% of 16-64 year olds. 2014 Labour market data is not available for Caithness and Sutherland, however 2011 census data shows that some 68.3% of the Caithness and Sutherland population, aged 16 to 74, was economically active. This was below both the Highlands and Islands and Scotland rates of 71.3 % and 69.0 % respectively.[8]

2.4.2 Table 4 shows Highlands and Island Enterprise data on the number of active enterprises and business starts in the area surrounding PFOW.

[7] Regional Gross Value Added (Income Approach), December 2014 (http://www.ons.gov.uk/ons/rel/regional-accounts/regional-gross-value-added--income-approach-/december-2014/stb-regional-gva-dec-2014.html)
[8] http://www.nomisweb.co.uk/reports/lmp/la/1946157427/report.aspx & Census 2001 and 2011 (HIE, 2014)

Table 4 Total Employment, Active Enterprises and Business Starts, 2012[9]

	Number			Per 10000 Adults		
	Total Employment	**Active Enterprises**	**Business Starts**	**Total Employment**	**Active Enterprises**	**Business Starts**
Orkney	10,200	830	77	5,667	461	43
Caithness & Sutherland	15,300	NA	NA	4,799	NA	NA
Highlands and Islands	201,600	17,575	1,627	5,519	479	44
Scotland	2,425,900	158,320	13,856	5,540	362	32

2.4.3 Labour market profile data are also available at a local authority level for Highlands and Orkney Islands from the ONS website.[10] Table 5 shows Employee jobs by industry for Orkney. This data cannot be disaggregated for Highland but there is 2011 Census data for the nine Settlement Zones on the North Coast of the Highland local authority area and this has been aggregated as shown in Table 6. It should be noted that these figures do not include self-employment, including certain types of sea-fishing, and thus will understate total employment.

Table 5 Employee Jobs by Industry – Orkney Islands (2013)[11]

Industry	**Number**	**Percentage**	**Scotland (%)**
Total Employee Jobs	9400	100%	100%
Primary Services (A-B: agriculture and mining)	400	4.0%	1.7%
Energy and Water (D-E)	100	0.6%	1.4%
Manufacturing (C)	400	3.8%	7.4%
Construction (F)	800	8.9%	5.5%
Services (G-S)	7800	82.8%	84.0%
Wholesale and retail, including motor trades (G)	1200	13.2%	14.7%
Transport storage (H)	700	7.7%	4.0%
Accommodation and food services(I)	1000	10.5%	7.8%
Information and communication (J)	100	1.2%	2.7%
Financial and other business services(K-N)	1000	10.4%	19.6%
Public admin, education and health (O-Q)	3300	35.3%	30.4%
Other Services (R-S)	400	4.6%	4.8%

[9] Business Register and Employment Survey (Datazone definition), ONS Business Demography 2012 (LA definition), and Committee of Scottish Bankers New Businesses statistics (LA definition).Note: Enterprise data refers to VAT/PAYE registered enterprises. (HIE, 2014)
[10] NOMIS (https://www.nomisweb.co.uk/reports/lmp/la/1946157421/report.aspx?town=highland)
[11] https://www.nomisweb.co.uk/reports/lmp/la/1946157427/report.aspx?town=orkney#tabjobs

Table 6 Employee Jobs by Industry – PFOW 'Highland North Coast' (2011)[12]

Industry	Number	Percentage	Scotland (%)
Total Employee Jobs	6977	100%	100%
Primary Services (A-B: agriculture and mining)	458	6.8%	3.4%
Energy and Water (D-E)	484	7.1%	1.6%
Manufacturing (C)	397	5.8%	7.7%
Construction (F)	597	8.8%	8.0%
Services (G-S)	4862	71.5%	79.5%
Wholesale and retail, including motor trades (G)	817	12.0%	15.0%
Transport storage (H)	301	4.4%	5.0%
Accommodation and food services(I)	470	6.9%	6.3%
Information and communication (J)	228	3.4%	2.7%
Financial and other business services(K-N)	932	13.7%	15.2%
Public admin, education and health (O-Q)	1875	27.6%	30.4%
Other Services (R-S)	239	3.5%	4.9%

2.4.4 Further information on labour market supply figures such as economic activity for Highland and Orkney Islands can be found on the ONS website.

3 AGGREGATES AND DREDGING

3.1 Spatial Extent and Intensity of Activity and Interests

3.1.1 Marine aggregates are sand, gravel or crushed rock used in construction, principally as a component of concrete or for land reclamation projects. Most aggregates come from land-based sources, although developers have been increasingly reliant on marine sources to supplement demand and meet national construction needs. Aggregate extraction has taken place at two sites in Scottish waters to date: the Firth of Forth and the Firth of Tay. However, there is currently no marine aggregates extraction taking place or planned in the PFOW area. Figure A1 in the Appendix shows the location of marine aggregates in the PFOW area which could potentially be extracted in the future.

3.1.2 Dredging is an activity that involves the extraction of sediments from the seabed and disposing of them at a different location to maintain safe port operations and keep waterways navigable. The activity of dredging may require a licence from Marine Scotland, which normally defines the geographical extent of the area

[12] Census (2011) The PFOW "Highland North" includes the 9 Settlement Zones on the North Coast areas: Durness, Tongue, Bettyhill/Farr, Melvich, Reay, Thurso, Castletown, Dunnet, John O'Groats.

permitted to be dredged, along with the term, the maximum tonnage to be dredged during that term and the maximum tonnage to be dredged in a single year. Consents are typically accompanied by conditions which define the management, mitigation and monitoring controls. Extracted materials are usually deposited at recognised disposal sites, an activity for which a marine licence from Marine Scotland is needed and would be combined with any licence to dredge. Dredging takes place in the PFOW area waters to maintain safe port operations and keep waterways navigable.

3.2 Economic value and employment

3.2.1 As there is no marine aggregates extraction taking place in Scottish waters at the moment there is no economic value associated with it.

3.2.2 Table 7 shows the historic records of material from dredging activity disposed at each disposal site within the PFOW area, provided by Marine Scotland Licensing Operations Team. National Marine Plan interactive data are available but given the size of each site and the spatial resolution this has not been included in this plan. The status of Open refers to sites in use; disused to sites not in use for at least five years; and closed to sites not in use for at least ten years or specifically closed e.g. a sewage sludge site which is no longer permitted for sea disposal.

Table 7 Dredging level within the PFOW area (2001-2013)[13]

			Quantity Tonnes Disposed					
Disposal Site Name	**Area KM²**	**Status**	**2013**	**2012**	**2011**	**2005**	**2002**	**2001**
DOUNREAY MICROSITE	0.092	Open						
SCRABSTER EXTENSION	0.068	OPEN (used in error)		422408				
SCRABSTER	0.196	CLOSED						
THURSO	0.97	Disused						
KIRKWALL	0.674	DISUSED				19100		
ORKNEY	0.673	CLOSED						
GILLS BAY	0.211	CLOSED						
STROMNESS A	0.276	OPEN	36950		1696			
STROMNESS C	0.276	CLOSED					55679	66
STROMNESS B	0.211	CLOSED						
SCAPA	0.211	OPEN	4975		6550	29176		
Total KM²	**3.858**	**Total Tonnes**	**41925**	**422408**	**8246**	**48276**	**55679**	**66**

3.2.3 It is not possible to calculate the GVA associated with dredge spoil disposal. However, it is clear that without dredging, including disposal at sea, access to ports and harbours would either be limited or face costly alternative means of disposal, which could affect the maritime transport sector's contribution to the economy. Beneficial use of dredged material in construction or beach replenishment can save costs associated with such projects, supporting coastal protection and recreation. There are no available data of employment directly linked to this activity.

[13] Marine Scotland, Licensing Operations Team

3.3 Historic and future trends

3.3.1 There will be requirements for appropriate dredging activities at ports and harbours in the plan area on an on-going basis. The expansion of ports within the PFOW area is covered in more detail in the Ports and Harbours section.

3.4 Data Gaps and Limitations

3.4.1 Marine Scotland has accurate data covering location, area covered and volumes of disposed material. However, from these available data it is not possible to place a value on the contribution the sector makes to the wider economy. It is also not clear how significant this sector is in facilitating the operational feasibility of other sectors (e.g. ports and harbours).

4 AQUACULTURE (FINFISH AND SHELLFISH)

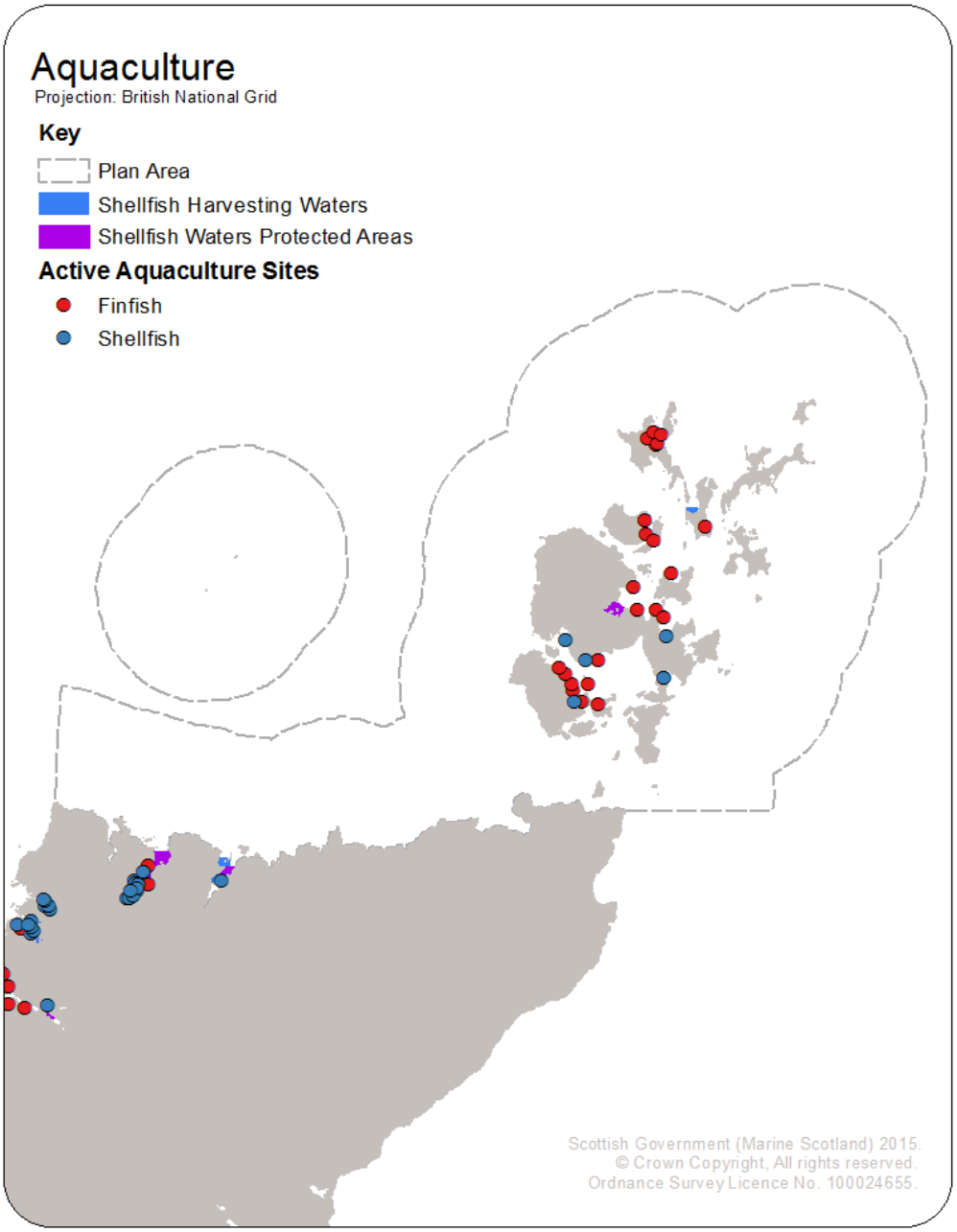
4.1 Spatial Extent and Intensity of Activity and Interests

4.1.1 Aquaculture involves the farming or culturing of fish, molluscs, crustaceans and seaweed. Shellfish aquaculture relates to the production of marine shellfish within aquaculture installations excluding cultivated shellfish beds, which are covered under the commercial fishing chapter. It also includes long-line cultivation of mussels and oyster cultivation on shoreline trestles. Finfish aquaculture relates to the production of marine finfish species within aquaculture installations for food for human and other consumption. Figure 3 shows the aquaculture sites in the PFOW area.

4.1.2 According to Scottish Finfish[14] and Shellfish[15] Farm Production Survey there are 29 aquaculture sites (22 finfish and 7 shellfish) located within the PFOW area. In 2013, there were 6 active shellfish sites (and 5 businesses) located on Orkney, 2 of which were producing (harvesting for market). Active sites are defined as farms which are in a production growth cycle, which may include holding stock or a routine fallow period. There were 27 companies actively involved in the freshwater production of Atlantic salmon (ova and smolts) across Scotland, farming 102 active sites. There were 21 companies actively involved in Atlantic salmon production across Scotland, farming 257 active sites.

[14] Scottish Fish Farm Production Survey 2013 (http://www.gov.scot/Publications/2014/10/7776)
[15] Scottish Shellfish Farm Production Survey 2013 (http://www.gov.scot/Resource/0045/00450622.pdf)

Figure 3 Active Aquaculture Sites in the PFOW Area[16]



[16] National Marine Plan interactive, Marine Scotland (2014). Active refers to site that has either actively produced fish or shellfish for the table market, for ongrowing elsewhere or for restocking purposes, in the last 3 years or which is fallow as a part of a planned production cycle.

4.2 Economic value and employment

4.2.1 In 2013 there was no production (i.e. harvesting for market) from Orkney shellfish sites. There are a number of reasons why sites may not be currently producing shellfish for market. Sites may for example hold stocks that are not yet ready for market, be fallow, or be positioned in remote areas where cost-effective production and marketing is difficult.

Table 8 Scottish Shellfish Production by Production Area, 2013[17]

Region	Businesses	Mussel (tonnes)		Pacific oyster (000s)		Native oyster (000s)		Queen (000s)		Scallop (000s)	
		Table [18]	On-growing [19]	Table	On-growing	Table	On-growing	Table	On-growing	Table	On-growing
Highland	45	1,096	67	369	3,102	0	977	1	0	38	1,470
Orkney	5	0	0	0	0	0	0	0	0	0	0
Scotland	142	6,757	1,281	1,891	6,216	260	1,015	33	1,490	40	1,470
Weight (tonnes)	-	6,757	1,281	151	-	21	-	1	-	5	-

4.2.2 Orkney shellfish sites employed 3 workers in 2013 (2 on a part-time basis and 1 on a causal basis). This accounted for 0.9% of total Scottish shellfish employment.

Table 9 Scottish Shellfish Employment by Production Area, 2013[17]

Region	Full-time		Part-time		Casual		Total
	Male	Female	Male	Female	Male	Female	
Highland	31	5	30	3	6	1	76
Orkney	0	0	2	0	1	0	3
Scotland	145	15	103	20	47	3	333

4.2.3 Data are available and are presented for shellfish sites in the Highlands. However, it should be noted that, unlike data for Orkney, the data for the Highland region do not offer good spatial precision (for the purposes of this review) for disclosure reasons which makes it largely inadequate for analysis relating specifically to the PFOW area.

4.2.4 Orkney salmon ova (eggs) and smolt (juvenile salmon ready to be transferred or to migrate to sea) production sites employed 2 workers in 2013 (1 on a full-time basis and 1 on a part-time basis). Sites involved in the production of ova and smolts across Scotland as a whole employed 285 workers.

[17] Scottish Shellfish Farm Production Survey 2013 (http://www.gov.scot/Resource/0045/00450622.pdf)
[18] Table production refers to sales made directly for human consumption.
[19] On-growing production refers to sales made to other businesses for on-growing.

Table 10 Employment and Production of Ova and Smolts by Production Area, 2013[17]

Region	Employment		Ova laid down to hatch (000s)	Smolt production (000s)
	Full-time	Part-time		
North West	125	17	34,090	24,451
Orkney	1	1	55	142
Scotland	237	48	66,574	40,457

4.2.5 Orkney Atlantic salmon production sites employed 78 workers in 2013 (76 on a full-time basis and 2 on a part-time basis). This accounted for 7.1% of Scottish Atlantic salmon production employment. The annual production of Atlantic salmon from Orkney sites accounted for 7.0% of total Scottish production in 2013. The number of smolts put to sea by Orkney sites accounted for 5.1% of the Scottish total in 2013.

Table 11 Atlantic Salmon Manpower and Production by Production Area, 2013[17]

Region	Employment		Annual Production	Productivity (t/person)
	Full-time	Part-time		
North West	335	46	43,320	114
Orkney	76	2	11,479	147
Scotland	992	94	163,234	150

Table 12 Number of Smolts Put to Sea by Region, 2013[17]

Region	Smolts put to sea (000s)
North West	10,975
Orkney	2,104
Scotland	40,936

4.2.6 Data are available and are presented for finfish sites in the North West region. However, it should be noted that, unlike data for Orkney, the data for the North West region do not offer good spatial precision (for the purposes of this review) due to disclosure reasons and are largely inadequate for analysis relating to the PFOW area.

4.3 Historic and future trends

4.3.1 The Scottish Government supports Scotland's aquaculture industry to achieve sustainable growth targets, with due regard for the marine environment. The targets are, by 2020, to increase:

- marine finfish production sustainably to 210,000 tonnes
- shellfish production (especially mussels) to 13,000 tonnes

4.3.2 According to Scottish Shellfish Farm Production Survey shellfish table production has, over the last 10 years, remained broadly consistent.[17] Oyster, queen and scallop table production has fallen by 54.6% over this period while mussel production has increased by 60.0%. Revenue from shellfish production has, over the last 10 years, increased by 36.1% in real terms from £6.5m to £8.9m, though this masks trends across species. The number of authorised shellfish aquaculture businesses in Scotland has fallen from 175 in 2004 to 142 in 2013.

4.3.3 According to Marine Scotland data smolt production has, over the last 10 years, remained broadly consistent. Ova production has, over the same time period, fallen by 55.8%. The number of authorised finfish aquaculture businesses involved in the production of ova and smolts in Scotland has fallen from 48 in 2004 to 27 in 2013. The number of sites engaged in the production ova and smolts has fallen from 172 in 2004 to 102 in 2013.

4.3.4 According to Marine Scotland data Atlantic salmon production has, over the last 10 years, remained broadly consistent. Atlantic salmon revenue, in real terms, increased by 90.6% between 2004 and 2013, from around £355m to around £677m. The number of businesses engaged in the production of Atlantic salmon has fallen from 69 in 2004 to 21 in 2013. The number of sites engaged in the production of Atlantic salmon has fallen from 315 in 2004 to 257 in 2013.

4.3.5 Employment across the aquaculture sector has, over the last 10 years, fallen by 11.8% from just over 2,100 to just under 1,900. In 2013, 80.8% for aquaculture employment was on a full-time basis. 16.5% was on a part-time basis with the remaining on a casual basis.

4.4 Data Gaps and Limitations

4.4.1 Marine Scotland Science production surveys[20] offer a comprehensive overview of aquaculture production and employment within Scotland. For Orkney the spatial precision of such data are good as Orkney is defined in its own right as a production area. For the Northern Highlands component of the PFOW area the spatial precision is not available due to disclosure reasons. This component of the PFOW area is classified under the Highland or North West production area making it largely inadequate for analysis relating to the PFOW area.

4.4.2 Marine Scotland Science production surveys collect data primarily on the volume of production. With the exception of farm gate value estimates present in the Scottish Shellfish Farm Production Survey there are limited data collected on the value of this production. In order to value aquaculture production activity, and hence estimate the economic contribution the sector makes, assumptions have to be made regarding prices and costs. More geographic-specific data on these economic metrics would be helpful in better assessing the value that the sector adds to the local economy.

4.4.3 Beyond the available data sources which cover the aquaculture sector a key data gap is the extent to which there is a dependency on aquaculture sites, particularly in rural areas. Recent research conducted for Marine Scotland[21] provides an

[20] http://www.gov.scot/Topics/marine/Fish-Shellfish/FHI/surveys

[21] An Assessment of the Benefits to Scotland of Aquaculture: http://www.gov.scot/Topics/marine/Publications/publicationslatest/farmedfish/AqBenefits

overview of the value of aquaculture to Scotland and Scottish communities, including some specific detailed case studies, but otherwise detailed regional-level data and analyses are limited. Understanding such linkages between aquaculture activity and other onshore businesses and communities is crucial in order to better contextualise available production and employment data.

5 AVIATION

5.1 Spatial Extent and Intensity of Activity and Interests

5.1.1 Highland and Islands Airports Limited (HIAL) manages 11 Scottish Airports, 2 of which are within and adjacent to the PFOW area; Kirkwall Airport and Wick John O'Groats. Kirkwall airport is the main airport servicing the Orkney Islands. Flights are available from the Scottish Mainland, Shetland and Norway. Through a franchise partnership with Flybe, Loganair operate services to Inverness, Aberdeen, Glasgow, Edinburgh, Sumburgh and Shetland, as well as some internal island 'hops' to Sanday, Stronsay, Eday, Westray, Papa Westray, North Ronaldsay and Fair Isles (Figure 4).

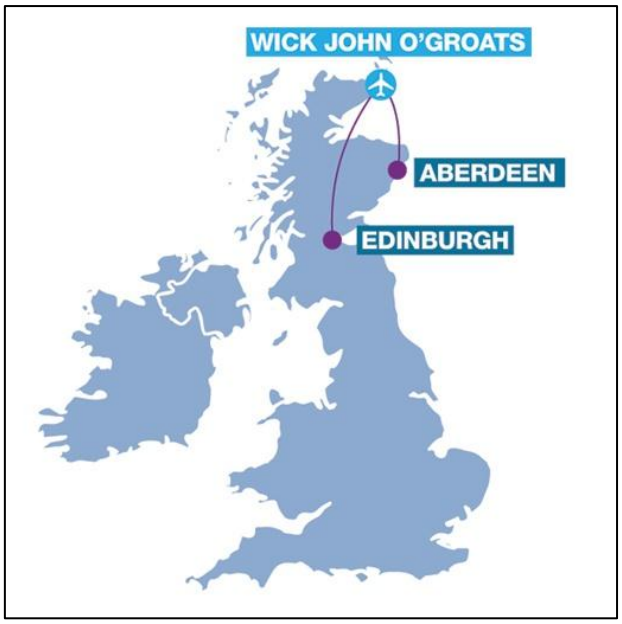
Figure 4 Kirkwall Airport destinations[22]

5.1.2 Kirkwall Airport offers the quickest means of getting to Orkney from Edinburgh, Aberdeen, Inverness and Glasgow and is an important transport link for business and leisure tourism.

[22] Highlands and Islands Airports, 2014 (http://www.hial.co.uk/)

5.1.3 Wick John O'Groats Airport is the most northerly airport on the Scottish Mainland, which connects rural communities in the north of Scotland with Aberdeen and Edinburgh (Figure 5). It is an important hub for oil and gas operations in Caithness.

Figure 5 Wick John O'Groats destinations[23]



5.2 Economic value and employment

5.2.1 HIAL airports support the vital air links to otherwise remote communities across the Highlands and Islands, including the provision of Scottish Air Ambulance and Search and Rescue services. HIAL operate at a loss and are supported by subsidies from the Scottish Government. The airports also serve the economic and commercial interests of regional Scotland, supporting oil and gas helicopter operations, lighthouse maintenance and Royal Mail services. Table 13 summarises the volume of the annual aircraft and passenger movement from Kirkwall and Wick Airport.

Table 13 Total passenger and aircraft movement for Kirkwall and Wick Airport[23]

	Total Passenger Movement			Aircraft Movement		
	2013/14	**2012/13**	**2011/12**	**2013/14**	**2012/13**	**2011/12**
Kirkwall	177,899	164,228	158,616	14,651	14,122	14,004
Wick	41,281	33,921	28,876	7,378	6,001	4,976

*Total passengers consist of arriving and departing terminal and transit passengers (Highlands and Islands Airport Limited, 2013)[24]

[23] Highlands and Islands Airports, 2014 (http://www.hial.co.uk/)
[24] HIAL, (2013) Annual Report and Group Financial Statements http://ripassetseu.s3.amazonaws.com/www.hial.co.uk/_files/documents/oct_13/hia__1381234814_2012-13_-_HIAL_Group_signed_An.pdf

5.2.2 There are 57 staff employed at Kirkwall Airport and 42 at Wick John O'Groats Airport. The breakdown of employment by job role is summarised in Table 14.

Table 14 Airport staff employment, 2014[23]

	Admin	Airport Fire Service	Air Traffic Control	Engineering	Security	Manager	Total
Kirkwall Airport	2	21	12	3	18	1	57
Wick John O'Groats Airport	2	18	7	1	14	0	42

5.3 Historic and future trends

5.3.1 The data available shows a rise in both passenger and aircraft movements over the last few years. Given that at a national level there is a high propensity to fly[25] and a lack of viable alternatives for island communities it seems to assume that this trend will continue in the future for Kirkwall, resulting in a gradual increase in movements. Wick passenger numbers have fluctuated over the last ten years and are more dependent on the quantity of oil sector related opportunities that the airport is able to capture within the region. Highland and Islands Airports have no expansion plans at present.

5.4 Data Gaps and Limitations

5.4.1 There is a lack of spatial and economic information on aircraft and helicopter routes. The information available on passenger movement gives an indication as to the importance of these airports to local communities.

6 CARBON CAPTURE AND STORAGE

6.1 Spatial Extent and Intensity of Activity and Interests

6.1.1 Carbon capture and storage (CCS) is an approach being developed to manage emissions of carbon dioxide (CO2). If it proves to be technically feasible and economically viable, CCS could capture approximately 80-90% of CO2 emissions produced by fossil fuel power plants and heavy industry, transport them in liquid form by pipeline or ship, and subsequently inject them into geological formations deep underground where they are stored permanently below the earth's surface.[26]

[25] Propensity to fly measures the number of return air trips in an area per head of the population
[26] Scotland's Marine Atlas Information for The National Marine Plan(2013) http://www.gov.scot/Publications/2011/03/16182005/0

6.1.2 Geological reservoirs suitable for storage of CO2 are classified according to whether they contain (or have contained) oil, gas, or saline water. Saline aquifers have the largest storage potential but there is uncertainty about the storage capacity of individual sites.

6.1.3 Currently within the PFOW area there are no known hydrocarbon sites or saline aquifers suitable for CCS.

6.2 Economic value and employment

6.2.1 There is no CCS activity within the PFOW.

6.3 Historic and future trends

6.3.1 CCS could have an important role to play in meeting Scotland's climate change targets. However, it is unlikely that there will be any CCS activity within the PFOW in the near future given that there is currently no known suitable infrastructure present. One of the key elements of CCS is economic viability - it is more cost-effective to use existing pipelines where possible. It is likely that in the short term, at least, CCS activity will be focussed around existing infrastructure such as the Feeder 10 pipeline which runs from the Central Belt to St Fergus.

6.4 Data Gaps and Limitations

6.4.1 There is no CCS activity within the PFOW area.

7 COASTAL PROTECTION AND FLOOD DEFENCE

7.1 Spatial Extent and Intensity of Activity and Interests

7.1.1 Coastal erosion and flooding pose a threat to people and their property in coastal locations. For generations, society has built defences to prevent erosion and protect land from flooding. Examples of these include groynes, sea walls and embankments (termed hard engineering). Present day approaches also include soft engineering such as replenishing eroding beaches with sand, referred to as beach replenishment. Also, nature is occasionally allowed to take its course through managed retreat or coastal realignment, where existing hard defences are intentionally or naturally allowed to breach so recreating natural saltmarsh. This provides a place for high tides to spread out and would be most effective in firths.

7.1.2 Currently within the PFOW both the Orkney and Highland Local Development Plans have policies that support flood avoidance. In Orkney, a Strategic Flood Risk Assessment has been undertaken that supports the identification of flood risk areas in more detail. In Highland, the Council has adopted supplementary guidance on flood risk that outlines how proposals that may be at risk of flooding,

or cause flooding, will be considered. Development applications on the coast may require to be supported by a Flood Risk Assessment.

7.2 Economic value and employment

7.2.1 There is no coastal protection and flood defence activity within the PFOW area.

7.3 Historic and future trends

7.3.1 With the rise in global sea-levels and a predicted increased risk of storm surges, Scotland's coastal infrastructure and habitats may be placed under increasing threat.

7.4 Data Gaps and Limitations

7.4.1 There is no coastal protection and flood defence activity within the PFOW area.

8 COMMERCIAL FISHERIES

8.1 Spatial Extent and Intensity of Activity and Interests

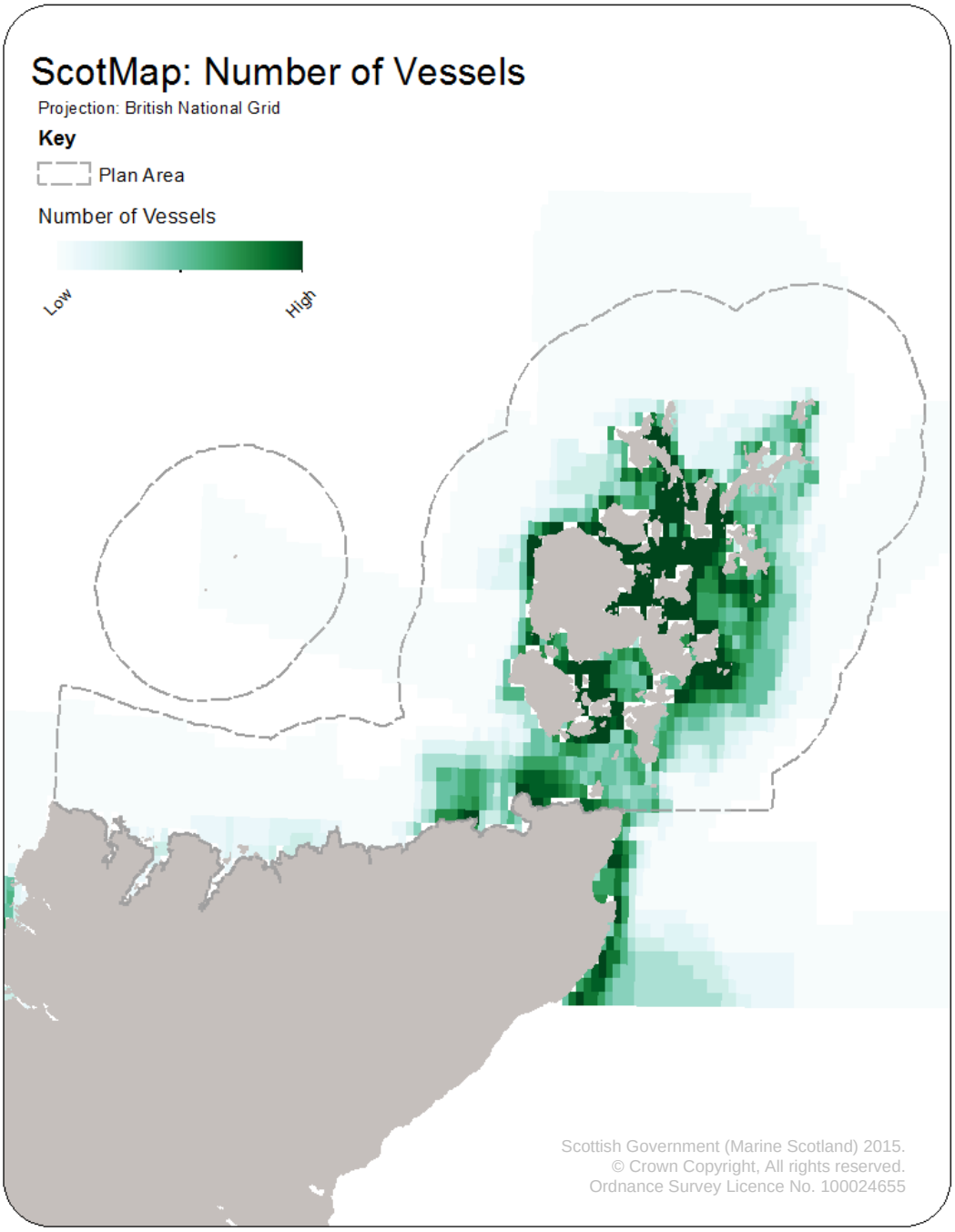
8.1.1 The waters surrounding Orkney and the Northern Highlands are ripe fishing grounds which help support local employment and aid social cohesion. The region is known for quality fishing grounds and is often marketed in relation to this. The local fisheries also provide an important service to local onshore businesses - many of whom are dependent on locally caught produce. Figure 6 shows ScotMap[27] data for fishing vessels active in the PFOW area.

8.1.2 230 fishing vessels were registered to the administrative areas[28] of Scrabster and Orkney in 2013, according to Scottish Sea Fisheries Statistics. The Scottish fleet, as a whole, comprised of 2,020 vessels in 2013. Scrabster and Orkney vessels accounted for 11.4% of the fleet. The majority of vessels in Scrabster and Orkney are small in terms of size. In 2013, 77.0% of Scrabster and Orkney vessels were less than 10 metres in length. Only 13 vessels were greater than 15 metres in length.

[27] http://www.gov.scot/Topics/marine/science/MSInteractive/Themes/ScotMap/scotmap-description

[28] Scottish Sea Fisheries Statistics (2013) (http://www.gov.scot/Publications/2014/09/7931)
It reports ports by district. Orkney and Scrabster are the relevant districts in relation to the PFOW region. The Orkney district includes the following ports: Hoy, Kirkwall, Rousay, South Ronaldsay, Sanday, Stromness, Stronsay, Tingwall and Westray. The Scrabster district includes the following ports: Dunbeath, Helmsdale, John O'Groats, Keiss, Lybster, Portskerra, Scrabster and Wick.

Figure 6 Vessel Activity In PFOW Area[29]



[29] http://www.gov.scot/Topics/marine/science/MSInteractive/Themes/ScotMap/scotmap-description

Table 15 Length of Active Scottish Vessels by District, 2013[30]

District	Vessel Length (metres)						
	≤10	>10-12	>12-15	>15-24	>24-40	>40	Total
Scrabster	82	4	2	2	2	-	92
Orkney	95	25	9	5	4	-	138
Total	177	29	11	7	6	-	230

8.2 Economic value and employment

8.2.1 Scrabster and Orkney vessels employed 429 fishermen on a regular basis and 164 fishermen on an irregular (or part-time) basis in 2013.[30] Orkney administered vessels employed a significant amount of irregular workers compared to Scrabster. 36.4% of fishermen employed on Orkney vessels in 2013 were employed on an irregular basis. Only 2.0% of fishermen employed on Scrabster vessels were employed on an irregular basis.

Table 16 Employed Fishermen on Scottish Vessels by District, 2013[30]

District	Regularly Employed	Irregularly Employed
Scrabster	148	3
Orkney	281	161
Total	429	164

8.2.2 Scrabster and Orkney port districts received landings from 5,500 voyages in 2013. The total value of landings by Scottish vessels into Scrabster and Orkney district ports was £27.1m in 2013. Although the number of voyages received into Scrabster and Orkney district ports was similar there was a significant divergence in terms of the value and quantity of the fish that was landed. In 2013, landings by Scottish vessels into Scrabster district ports were worth £19.9m, with a weight of 12,724 tonnes. Landings into Orkney were worth £7.2m, with a weight of 3,836 tonnes.

[30] Scottish Seas Fisheries Statistics (2013) (http://www.gov.scot/Publications/2014/09/7931)

Table 17 Number of Voyages and the Quantity and Value of Landings by Scottish Vessels by District, 2013[30]

District	Number of Voyages	Quantity (tonnes)	Value (£000)
Scrabster	2,800	12,724	19,952
Orkney	2,700	3,836	7,226
Total	5,500	16,560	27,178

8.2.3 Landings into Scrabster district ports in 2013 were predominantly made up of demersal species. By quantity, 74.8% of landings into Scrabster district ports were demersal species, 25.0% of landings were shellfish species. By value, 74.0% of landings into Scrabster district ports were demersal species, 25.8% were shellfish species. Landings into Orkney district ports in 2013 were predominantly made up of shellfish species. By quantity, 98.9% of landings into Orkney district ports were shellfish species. By value, 99.4% of landings into Orkney district ports were shellfish species. By species, the value per quantity of shellfish landed across both Scrabster and Orkney district ports was £1,822 per tonne in 2013. For demersal species the value per quantity was £1,660 per tonne. For pelagic species the value per quantity was £400 per tonne.

Table 18 Quantity of all Landings by District and Main Species, 2013[30]

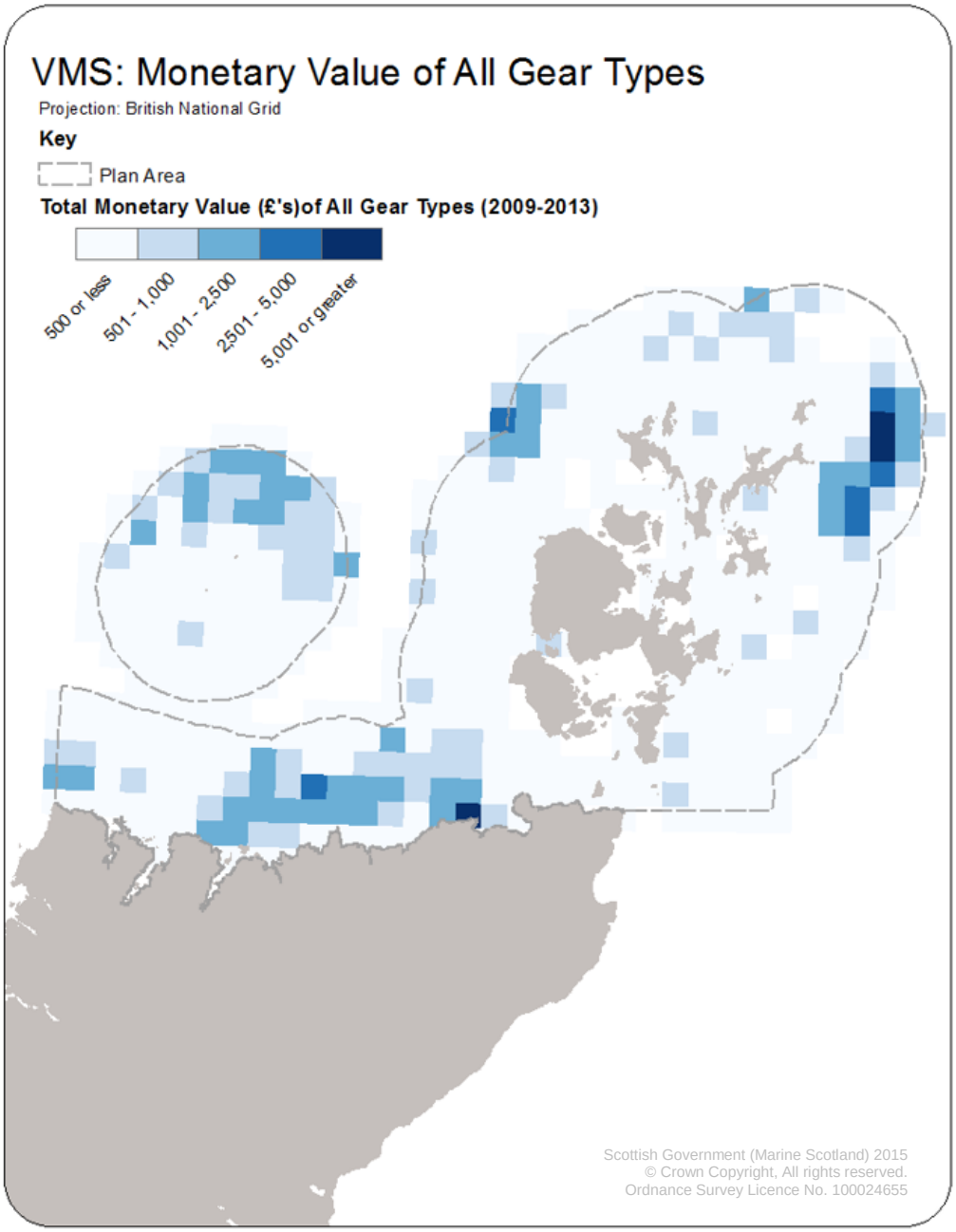
District	Quantity (tonnes)			
	Demersal	Pelagic	Shellfish	Total
Scrabster	11,552	18	3,862	15,433
Orkney	33	7	3,806	3,847

Table 19 Value of all Landings by District and Main Species, 2013[30]

District	Value (£000)			
	Demersal	Pelagic	Shellfish	Total
Scrabster	19,196	6	6,708	25,911
Orkney	38	4	7,268	7,311

8.2.4 Figure 7 shows Vessel Monitoring System (VMS) data in the PFOW area. VMS is a form of satellite tracking using transmitters on board fishing vessels. It is required for EU vessels over 12m as of 2012 and provides an estimate of fishing intensity. It can then be combined with landings data to provide monetary estimates. A further breakdown by gear type of VMS monetary value estimates is provided in the Appendix.

Figure 7 VMS Monetary Value Estimates for PFOW area (2009-14)[31]



[31] Marine Scotland (http://www.gov.scot/Topics/marine/Compliance/satellite)

8.2.5 While district level landings data gives an indication of fishing activity within the vicinity of a district it is necessary to look at actual catch data in order to gain a more focussed overview of the fishing activity taking place within the PFOW area. Vessels may land into the PFOW area but their fishing activity may take place further afield. It is important to distinguish between where fishing activity takes place and where that fish is landed. For the purposes of this baseline review the PFOW area is defined, by International Council for the Exploration of the Sea (ICES) rectangle, as: 46E5, 46E6, 46E7, 47E6 and 47E7.[32]

8.2.6 On average, between 2009 and 2013, £17.2m worth of fish was landed annually from within the PFOW defined rectangles. This is inclusive of all UK vessels (i.e. Scottish and rest of UK vessels) regardless of where they landed and non-UK vessels who landed into UK ports. Shellfish species were the main component, by value, of the landings composition from within the PFOW rectangles, accounting for 50.1% of total landings. Pelagic species accounted for 26.0% of total landings by value. Demersal species accounted for 23.9% of total landings by value.

Table 20 Average Landings Value by Main Species and ICES Rectangle (2009-13)[33]

Species Type	Value (£000)				
	46E5	46E6	46E7	47E6	47E7
Demersal	248	961	156	2,614	138
Pelagic	1,191	249	230	927	1,893
Shellfish	861	2,387	1,009	1,715	2,666
Total	**2,300**	**3,597**	**1,395**	**5,257**	**4,697**

8.2.7 On average, between 2009 and 2013, 16,378 tonnes of fish was landed from within the PFOW defined rectangles. Again, this is inclusive of all UK vessels (i.e. Scottish and rest of UK vessels) regardless of where they landed and non-UK vessels who landed into UK ports. Pelagic species were the main component, by quantity, of the landings composition from within the PFOW rectangles, accounting for 60.7% of total landings. Shellfish species accounted for 24.7% of total landings by quantity. Demersal species accounted for 14.5% of total landings by quantity. The value per quantity of fish landed across the PFOW rectangles between 2009 and 2013 was, on average, £1,052 per tonne. By species, the value per quantity for shellfish was £2,131 per tonne. For demersal species the value per quantity was £1,728 per tonne. For pelagic species the value per quantity was £451 per tonne.

[32] National Marine Plan Interactive (http://www.gov.scot/Topics/marine/seamanagement/nmpihome/nmpi)
[33] Marine Scotland

Table 21 Average Landings Quantity by Main Species and ICES Rectangle (2009-13)[30]

Species Type	Quantity (tonnes)				
	46E5	46E6	46E7	47E6	47E7
Demersal	209	544	142	1,377	109
Pelagic	2,640	591	547	2,386	3,780
Shellfish	452	1,094	551	842	1,113
Total	**3,301**	**2,230**	**1,240**	**4,605**	**5,002**

8.2.8 The commercial fisheries sector within the PFOW area naturally supports onshore processing businesses, via the downstream supply chain, which are reliant on high-quality, locally-sourced catch. Recent Marine Scotland research[34] provides an overview of the dependency of processors on landings into the PFOW area. The research found that for the Orkney Islands, the bulk of landings (crustaceans) go into the Mainland (Stromness, Tingwall and Kirkwall) where a good road network allows the product to be transported to the main processing facility. The other bulk of landings (crustaceans) go directly to a processing facility on Westray. It is estimated that a significant proportion of value of landings into these onshore businesses comes from the PFOW area (35% of crustaceans come from inside the PFOW area). Using input-output analysis the report estimated that the initial £2.5m of raw material from PFOW Study Area contributes, directly and indirectly, to £10.4m in output at the local level and £18.4m at the Scottish level. This output supports £2.9m in income and 159 full time equivalent (FTE) jobs at the local level. At the Scottish level output supports £5.7m in income and 244 FTE jobs. The research found that in the Northern Highlands the majority of landings going into processing facilities comes from out with the PFOW area.

8.3 Historic and future trends

8.3.1 Over the last nine years Scotland's commercial fishing fleet, in terms of active fishing vessels, has shrunk by 13.1% from 2,325 vessels to 2,020 vessels. Generally, over time, vessels have become bigger, more powerful and more efficient. Employment with the commercial fisheries sector has fallen by 5.3% since 2004 from 5,275 to 4,992. From 2004 to 2013 the value of landings by Scottish vessels, in real terms, increased by 15.3% between. This was driven largely by a rise in the value of pelagic species (44.6%). The value of shellfish and demersal species landed by Scottish vessels increased by 6.6% and 0.9% respectively, in real terms, over the same period. The volume of fish landed, overall, by Scottish vessels has decreased by 14.2% since 2004, though has remained broadly flat since 2007. From 2004 to 2013 the volume of pelagic

[34] Pentland Firth Orkney Waters Marine Spatial Plan: Value Added in the Fish Supply Chain in Orkney and Northern Highlands: http://www.gov.scot/Resource/0046/00465932.pdf

species landed by Scottish vessels decreased by 25.4%. The volume of demersal and shellfish species increased by 0.8% and 13.6% over the same period.

8.4 Data Gaps and Limitations

8.4.1 In broad terms the availability of data which covers the commercial fisheries sector is good relative to other sectors where data are sparser. However there are a number of limitations which affect the ability to assess the location and intensity of fishing activity within the PFOW region. Value and effort data are available at the ICES rectangle level for UK over-10m vessels (effort) and all UK vessels landing into the UK and abroad, and foreign vessels landing into the UK (value). While these data gives an overview of fishing activity the spatial precision it offers lacks detail. For example, ICES level data assumes effort (and hence value) is distributed evenly across each rectangle. Clearly this assumption is too broad-brush for analysis that focusses on a specific area or region. For over 15m vessels VMS data offers precise spatial data on where vessels are presumed to be fishing. Though assumptions are made as to the definition of fishing activity (generally it is assumed that the speed of a vessel can be used as a proxy for when fishing is taking place). This effort data must also be linked to landings data in order to associate a value with each fishing ping. VMS estimates are just that - estimates. For under 15m vessels Scotmap data offers more spatial precision than ICES-rectangle-level data. Regarding limitations of the ScotMap data it should be noted that rasterised monetary value data and the monetary value maps are based on information provided during face-to-face interviews with individual vessel owners. Their estimates of average earnings for the preceding five years (not vessel earnings as recorded on the Fisheries Information Network) and the spatial information they provided, which was defined with variable precision. The data relate to the period 2007-2011. A proportion of skippers declined to be interviewed or to give earnings information. There also appears to be some regional bias in the refusal / no contact rate. The data coverage varies across regions - 72% of the vessels on the target list were interviewed, although the vessel coverage for Orkney was 100%.

8.4.2 Beyond the available data sources which cover the commercial fisheries sector the key data gap is the extent to which there is a dependency on specific fishing grounds. Recent research conducted for Marine Scotland provides an overview of the supply-chain links between the fish-catching sector and the onshore processing sector in Orkney and the Northern Highlands. Other than this little data or analysis is available, at an appropriate regional scale, covering the socio-economic linkages between fishing activity and onshore businesses and communities. Understanding such linkages is crucial in order to better contextualise available landings value and effort data.

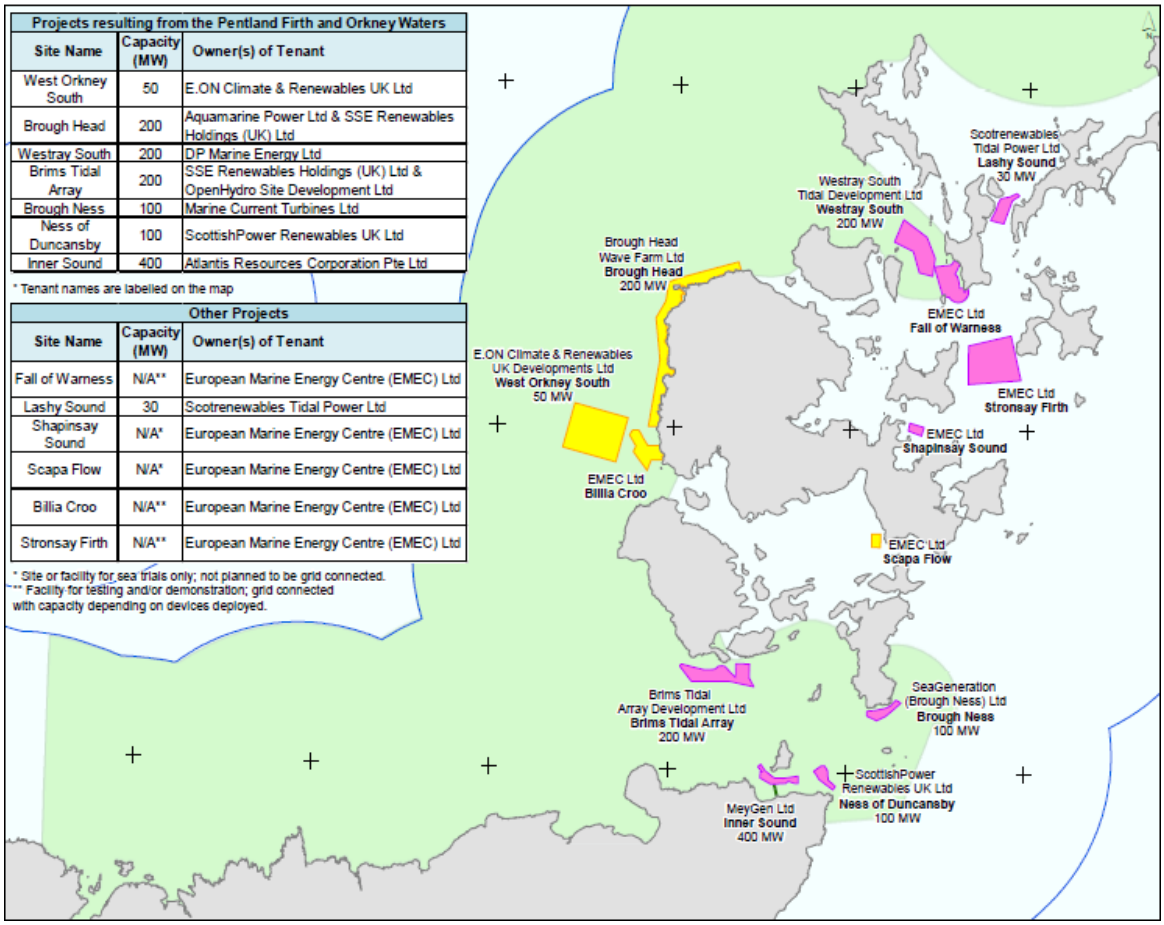
9 ENERGY GENERATION

9.1 Spatial Extent and Intensity of Activity and Interests

9.1.1 Scotland and the PFOW area in particular is a leading location for the development of the offshore renewable energy industry. Scotland has tremendous wave and tidal resources off its coasts and state of the art testing facilities, such as the European Marine Energy Centre. PFOW has been identified as a region with a significant wave and tidal stream resource which has led to the first commercial leasing round for wave and tidal energy.

9.1.2 The Crown Estate has entered into Agreements for Lease for a number of projects in the PFOW, some of which are being actively progressed by the developers. This followed a competitive leasing round for demonstration and commercial scale project sites. Figure 8 shows the geographic distribution of wave and tidal projects in the PFOW. A further 30MW project at Lashy Sound was leased in autumn 2012 for a commercial tidal demonstrator array.

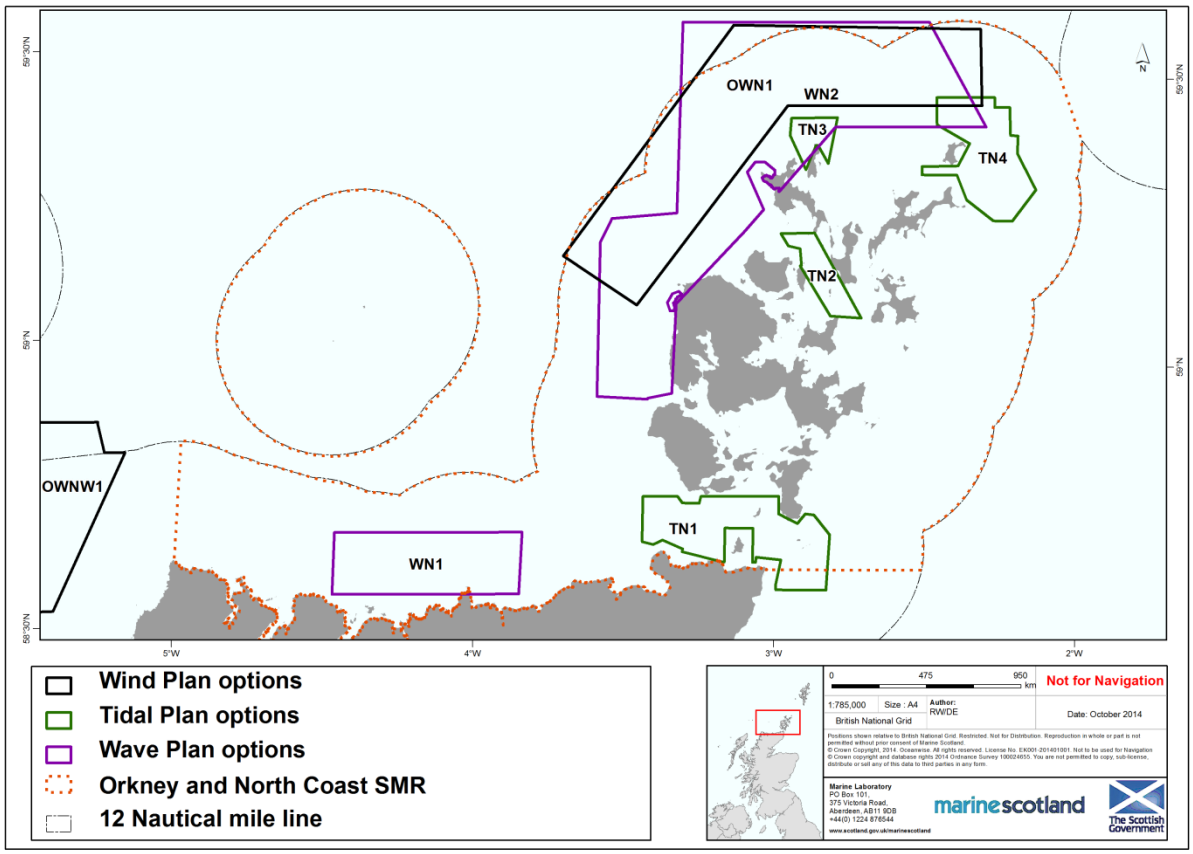
Figure 8 Map of Wave and Tidal projects in PFOW[35]



[35] The Crown Esate (http://www.thecrownestate.co.uk/media/5729/ei-pentland-firth-and-orkney-waters.pdf)

9.1.3 The Blue Seas – Green Energy - A Sectoral Marine Plan for Offshore Wind Energy in Scottish Territorial Waters[36] identified one medium term area of search for offshore wind. Following review and development of the Draft Sectoral Marine Plans for Offshore Renewable Energy as part of Planning Scotland's Seas[37] the previous areas of search were refined. This resulted in a number of Plan Options being developed. Each of these represents a development zone for wind, wave and tidal energy respectively, a proportion of which could be used for development. In the PFOW area the Plan Options are: one offshore wind site (OWN 1), two wave sites (WN1 and WN2) and four tidal sites (TN1, TN2, TN3 and TN4) as shown in Figure 9.

Figure 9 Offshore Wind, Wave and Tidal Energy Plan Options - North Region[37]



9.2 Economic value and employment

9.2.1 The Crown Estate has committed to invest and manage £5.7 million in an Enabling Actions fund for project development in the PFOW. Its aim is to accelerate and de-risk the development of the wave and tidal projects in the Pentland Firth and Orkney waters and facilitate the successful and timely construction and operation.

[36] http://www.gov.scot/Resource/Doc/346375/0115264.pdf
[37] Draft Sectoral Marine Plans for Offshore Renewable Energy in Scottish Waters, Marine Scotland (http://www.gov.scot/Publications/2013/07/8702/7)

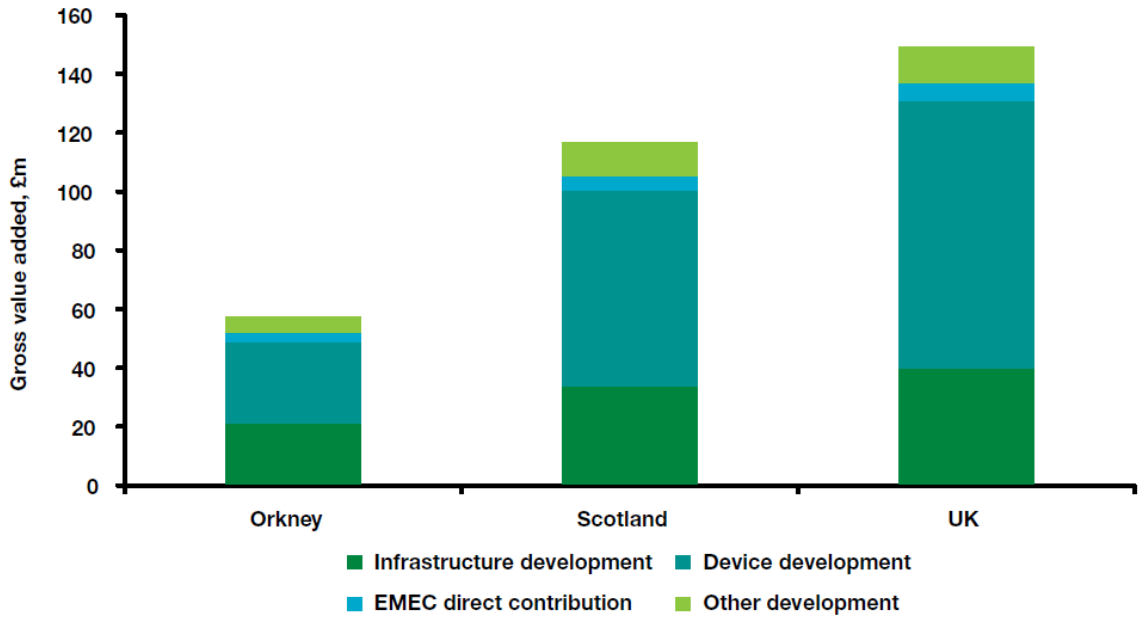
9.2.2 £23 million has been invested by Orkney Islands Council and Highlands and Islands Enterprise in supporting infrastructure for the marine energy sector.

9.2.3 The European Marine Energy Centre (EMEC) was established in 2003 to provide developers of both wave and tidal energy converters with purpose-built, accredited open-sea testing facilities. Located in Orkney, EMEC has access to the excellent wave regime, strong tidal currents, grid connection, sheltered harbour facilities and the renewable, maritime and environmental expertise that exists within the local community.

9.2.4 Many of EMEC's clients are technology developers with an Agreement for Lease with the Crown Estate for developments in the PFOW. With 14 full-scale test berths, there have been more grid-connected marine energy converters deployed at EMEC than any other single site in the world, with developers attracted from around the globe. These developers use the facilities to prove what is achievable in some of the harshest marine environments, while in close proximity to sheltered waters and harbours.

9.2.5 EMEC was founded with public money, to date receiving £36 million, and has been self-supporting since 2010. The investment attracted to Orkney alone by EMEC has far exceeded the initial investment in establishing the facilities and, when the entire UK is considered, the gross value added to the economy has been calculated to be 4.5 times the initial investment cost. RenewableUK reports that GVA into the economy associated with EMEC to the end of 2011 was £149 million (Figure 10)[38].

Figure 10 Economic Impact of EMEC, 2003 – 2012[38]



[38] RenewableUK (2013) Wave and Tidal Energy in the UK: Conquering Challenges, Generating Growth. (http://www.renewableuk.com/en/publications/index.cfm/wave-and-tidal-energy-in-the-uk-2013)

9.2.6 EMEC employs 27 staff directly and approximately 300 people are employed in Orkney in the marine renewables sector in around 40 different local companies. It has attracted developers from all around the globe. EMEC has become a centre of expertise and is at the forefront of the development of international standards for the testing of marine technologies. EMEC has established a number of international collaborations with organisations in Canada, China, Japan, USA, South Korea, Taiwan and work closely with entities in Chile and New Zealand.

9.2.7 EMEC has created employment and expertise in Orkney and is a hub for wave and tidal energy in the UK, Europe and Worldwide.

9.2.8 In July 2014, EMEC was awarded the seabed rights for a new demonstration site in the Stronsay Firth, south east of EMEC's existing tidal test site at the Falls of Warness, and will offer additional testing facilities for tidal energy devices, components, subsystems, arrays and array enabling technology.

9.2.9 The Pentland Firth and Orkney Waters Marine Energy Park which was launched in 2012 to offer a coherent, supportive business environment designed to accelerate the commercialisation of wave and tidal stream technologies. The PFOW Marine Energy Park is the first marine energy park in Scotland and the second in the UK. The park designation was designed to link university researchers (including those at Heriot Watt International Centre for Island Technology in Stromness and the Environmental Research Institute in Thurso) and private companies working in marine energy.

The Crown Estate Lease Sites

9.2.10 Table 22 provides a summary of the current status of The Crown Estate wave and tidal lease sites in the PFOW area.

9.3 Data Gaps and Limitations

9.3.1 Given the level of activity within the PFOW area there is a wealth of economic information available. The main limitation of the data involves the uncertainty attached to future projections of offshore renewable projects as their success relies on many factors including the continued improvement of wave and tidal technology.

Table 22 Wave and Tidal lease sites in the PFOW[39]

Site Name	Development Type	Lease Capacity (MW)	Planned Capacity (MW)		Jobs
Farr Point	Wave	50	10 MW		Operational: 16 Construction: 200+
West Orkney South	Wave	50	Scoping	Consenting applications under development (2014)	
West Orkney Middle South	Wave	50	Scoping	Phase 1: 10 MW	
Marwick Head	Wave	50	Scoping Stage/Consenting	Phase 1: 10 MW	
Brough Head	Wave	200	Scoping Stage/Consenting	Phase 1: 9 MW. Phase 2: up to 50 MW	
Costa Head	Wave	200	10 MW	Phase 1: 30 - 50 MW	
Westray South	Tidal	200	60 MW	Phase 1: 60MW. Phase 2: 140 MW	
Brims Tidal Array (previously Cantick Head)	Tidal	200	Currently in scoping and consenting phase	Consent application	
Brough Ness	Tidal	100	66 SeaGen devices (99 MW)	First turbines expected in 2019	
Ness of Duncansby	Tidal	100	Scoping Stage - 95 x 1 MW	Planning and consent 2015. Construction 2016. Phase 1 deployment 2017	
Inner Sound	Tidal	400	4 MW (2015)	Phase 1: 30 MW. Further 65 MW	Current Staff: ~20
Lashy Sound	Tidal	30	10 MW (2017)	86 MW (2016). 398 MW (2020)	Current Staff: 9

[39] Marine Scotland. Those Agreements for Lease in italics were removed in May 2015 due to some sites being handed back to the Crown Estate in addition to a number of lapsed option periods

10 MILITARY INTERESTS

10.1 Spatial Extent and Intensity of Activity and Interests

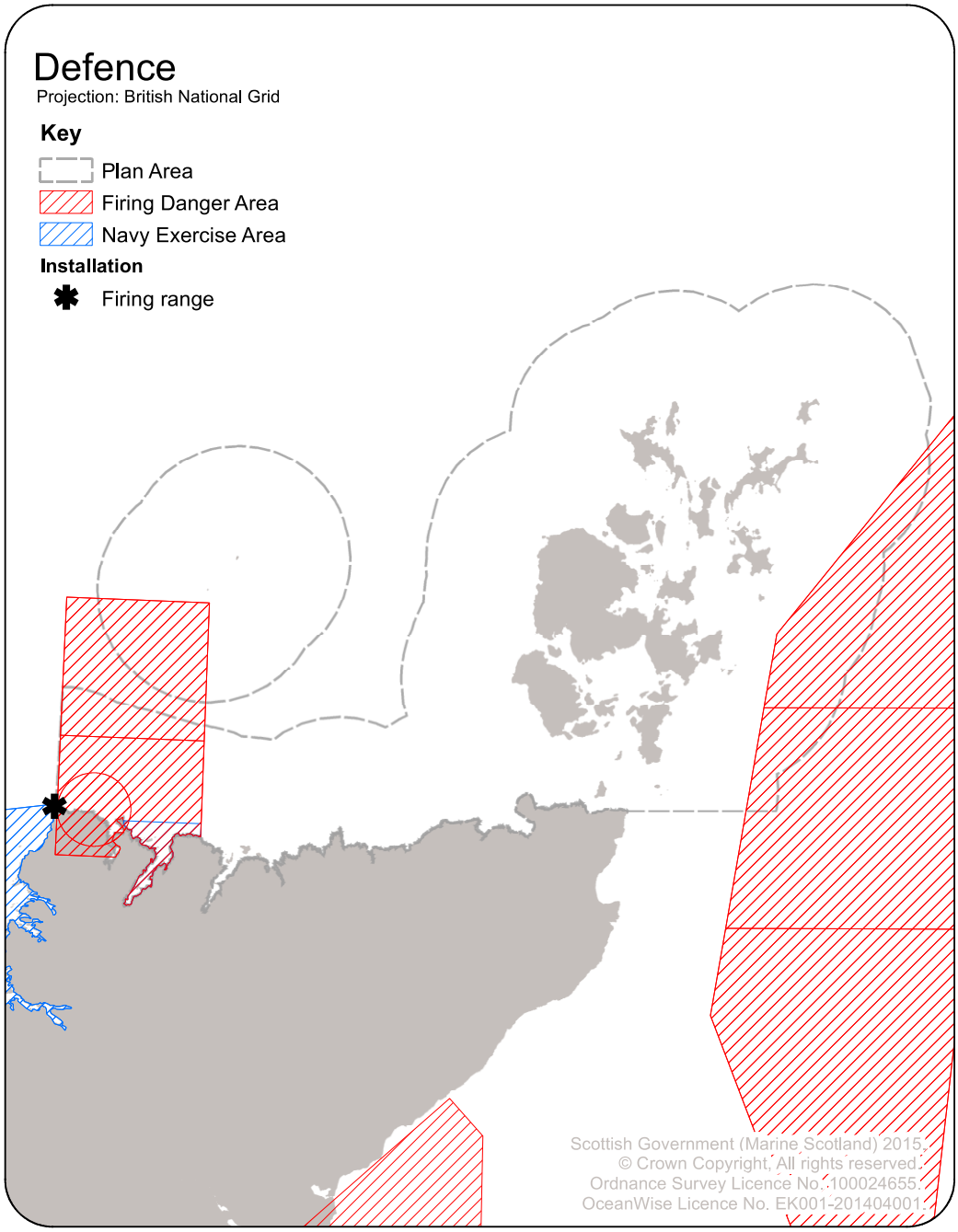
10.1.1 The Ministry of Defence (MoD) uses several areas in or adjacent to the PFOW, mainly for training purposes. In particular, Cape Wrath is an exercise area, firing range and a firing danger area, along with a Navy exercise area immediately west of the PFOW, which extends right down the west coast. There is also an exercise area and a firing danger area which covers sections of the Moray Firth and runs parallel offshore up to the north east tip of the Orkney Islands. Figure 11 summarises the military activity in the PFOW and adjacent waters. The Vulcan Naval Reactor Test Establishment, operated by the MoD is located next to the Dounreay site in Caithness. Management and operation of the Royal Navy's land based nuclear reactor (Vulcan Shore Test Facility) is undertaken by Roll-Royce.[40]

10.2 Economic value and employment

10.2.1 Detailed information about the intensity of defence use of the seas in the PFOW area is not available for reasons of national security.

[40] http://www.rolls-royce.com/marine/about/market_sectors/submarines/submarines_propulsion/shore-based_testing.jsp

Figure 11 Defence Locations in the PFOW area[41]



[41] Marine Scotland (2014)

10.3 Historic and future trends

10.3.1 MoD personnel data are available by local authority area.[42] This gives total military and civilian employment in Highland (660) and Orkney Islands (0) for 2014. Unfortunately these data cannot be disaggregated further to the PFOW area. These figures have remained relatively constant over the last five years so it seems reasonable to assume- in the absence of further information- that current activity level and type will continue in the PFOW area. However this is will be heavily influenced by the nature of any future MoD spending decisions.

10.4 Data Gaps and Limitations

10.4.1 As mentioned above, detailed information about the intensity of defence use of the seas in the PFOW area is not available for reasons of national security. It is likely that this will remain a data gap that cannot easily be addressed in future.

11 OIL AND GAS

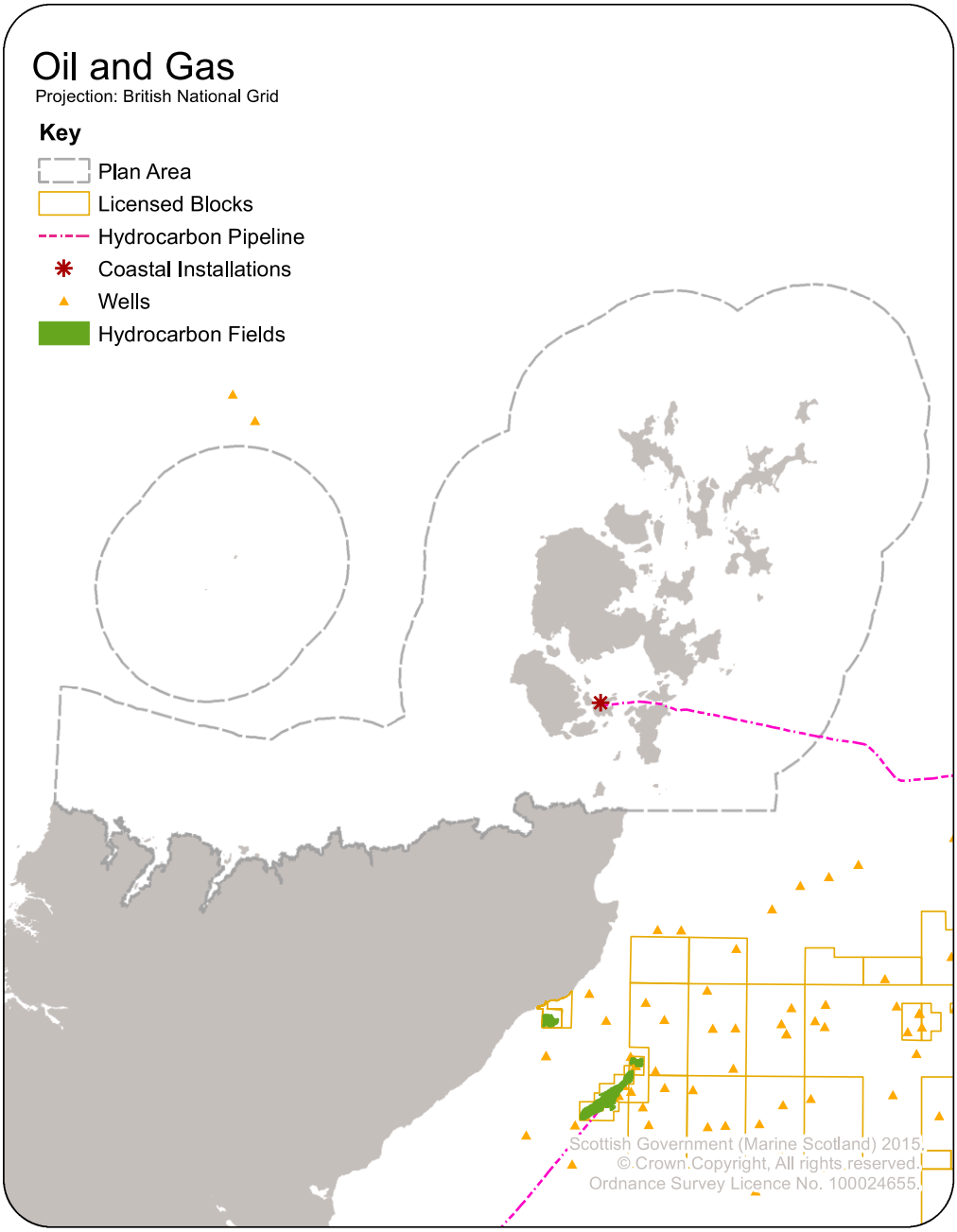
11.1 Spatial Extent and Intensity of Activity and Interests

11.1.1 There are no hydrocarbon fields in the PFOW area. Nonetheless the oil and gas industry has a significant presence in Caithness and north Sutherland, with Wick and Scrabster harbours providing services and support for the sector. Scrabster Harbour is the nearest port of call on the Scottish mainland for oil fields to the west of Shetland. The Invest Caithness Oil & Gas Directory 2012[43] identifies around 20 businesses in Caithness and north Sutherland involved in the oil & gas supply chain. Figure 12 shows Oil and Gas activity in the PFOW area.

11.1.2 The Flotta Terminal is a crude oil storage and processing terminal, located on the island of Flotta in the Orkney Islands (the coastal installation identified in Figure 12). It hosts the sole oil and gas pipeline in the PFOW area. It was commissioned in January 1977, with Talisman Sinopec Energy (UK) becoming the major shareholder and operator in May 2000. The terminal covers a 395-acre site, approximately one sixth of the area of Flotta Island. Crude oil is imported to the Flotta Oil Terminal from several offshore installations through a 30" subsea pipeline. The pipeline is fed from fields in the Flotta Catchment Area [44].

[42] https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/376061/QLS_Quarterly_Location_Statistics__October_2014.pdf
[43] http://www.investcaithness.com/key-sectors/energy/oil-gas
[44] Flotta Oil Terminal, Infrastructure Code of Practice http://www.talisman-sinopec.com/pdfs/uploads/Flotta_2013.pdf

Figure 12 Oil and Gas Activity in the PFOW Area[45]



[45] Marine Scotland (2014)

11.2 Economic value and employment

11.2.1 Scottish Annual Business Statistics data provides figures for Highland and Orkney Islands Local Authorities for both Oil and Gas Extraction and Oil and Gas Services. There is one business site registered in Orkney Islands and one in Highland for Oil and Gas extraction. However as these cover five or fewer business sites this data are disclosive. Oil and Gas services are classified under "Mining support service activities" which also includes "support activities for other mining and quarrying". Given the low level of business sites this is unable to be disaggregated further meaning that the statistics in Table 23 below will necessarily be an overestimate. There were two mining and quarrying support services units in 2012 and one in 2011 in Highland. For the most recent year available (2012) there were 6 business sites involved in Oil and Gas services in Highland. Between 2008 and 2012 there have been none in Orkney Islands.

Table 23 Highland Local Authority Mining Support Service Activities[46]

Year	Total	Total	Gross Value Added	Gross Wages & Salaries
	Employment	Turnover	at Basic Prices	Per Head
		£m	£m	£
2009	90	50.3	30.1	45,346
2010	38	17.8	9.4	61,004
2011	33	12.1	*	71,522
2012	62	5.6	2.9	21,660

* Denotes that data are disclosive

11.2.2 Further information is available from Oil & Gas UK's estimates of employment attributable to the oil and gas sector, shown in Table 24. These are calculated using expenditure levels to other industries in the UK economy. These are then converted into employment figures using turnover per employee estimates for each recipient industry. The sources of data for this are the ONS UK input-output tables, the Annual Business Survey and Oil & Gas UK's estimates for operating and capital expenditure. The employment estimates are not based on a survey of employment levels but are linked to the sector's spending on capital goods, operational expenditure and wages. The impact of profit, income and tax revenue has been excluded.

Table 24 Employment Impacts by Parliamentary Constituency[47]

Location	Direct	Indirect	Induced	Total
Orkney and Shetland	170	630	300	1100
Caithness, Sutherland and Easter Ross	30	290	140	460

Direct employment - Those employed directly by oil and gas companies and their major contractors.
Indirect employment- Those employed in the wider supply chain through contracts with oil and gas companies.
Induced employment - Jobs supported by economic activity induced by employee's spending throughout the economy.

[46] Annual Business Survey (http://www.ons.gov.uk/ons/rel/abs/annual-business-survey/index.html)
[47] Oil and Gas UK (2010) http://www.oilandgasuk.co.uk/cmsfiles/custom/map/atlas.html

11.3 Historic and future trends

11.3.1 Whilst there is no known oil and gas extraction planned for the PFOW area, the future trends in Oil and gas services will be heavily dependent on future investment decisions in the North Sea.

11.4 Data Gaps and Limitations

11.4.1 In addition to the aforementioned issue regarding the inclusion of some mining sites, taking the total figure for Highlands is also likely to be an overestimate given that the southern inland part of the local authority is not within the PFOW area.

11.4.2 The Oil and Gas UK figures provide an indication of the potential supply chain impacts of the industry but the estimates will overstate the impact on the PFOW area due to the inclusion of Shetland and other areas.

12 POWER INTERCONNECTORS, DISTRIBUTION AND TELECOM CABLES

12.1 Spatial Extent and Intensity of Activity and Interests

12.1.1 A number of subsea power cables are laid within the PFOW area including two 33 kV cables connecting Orkney with mainland Scotland. Due to the increasing quantity of renewable energy generation which has been connected or is contracted to be connected, the connection has now reached full capacity[48].

12.1.2 In the PFOW area Scottish and Southern Energy Power Distribution (SSEPD) has been undertaking work in relation to the 'Orkney Caithness' 132kV reinforcement connection since the Crown Estate Leasing Round in 2010. The existing cable between Orkney and Caithness is at full capacity and SSEPD are looking at options to develop a new connection to allow marine renewable energy developers to connect to the transmission network in Caithness. This will provide grid access for marine renewable energy projects and, potentially, onshore wind projects across the whole of Orkney. SSEPD has undertaken planning and consultation in Orkney regarding grid capacity and landfall for cables.

12.1.3 There are four international telecom cables intersecting the PFOW area. The Northern Lights telecom cable owned by BT was installed in June 2008. The Northern Lights connects Orkney to the Scottish mainland, intersecting West Orkney South, West Orkney Middle South and Brough Head wave energy sites. The cable has sections which are buried and sections which are surface laid. The

[48] http://www.ssepd.co.uk/OrkneyCaithness/

section of cable which intersects with the wave lease sites present within the PFOW is surface laid.

12.1.4 Figure 13 shows the telecommunication and power cables intersecting the PFOW.

12.2 Economic value and employment

12.2.1 No data are currently available on the economic value specifically associated with power interconnectors and telecom cables in the PFOW area. Industry GVA data (e.g. for the oil and gas sector) will be inclusive, in part, of the value added as a result of such assets.

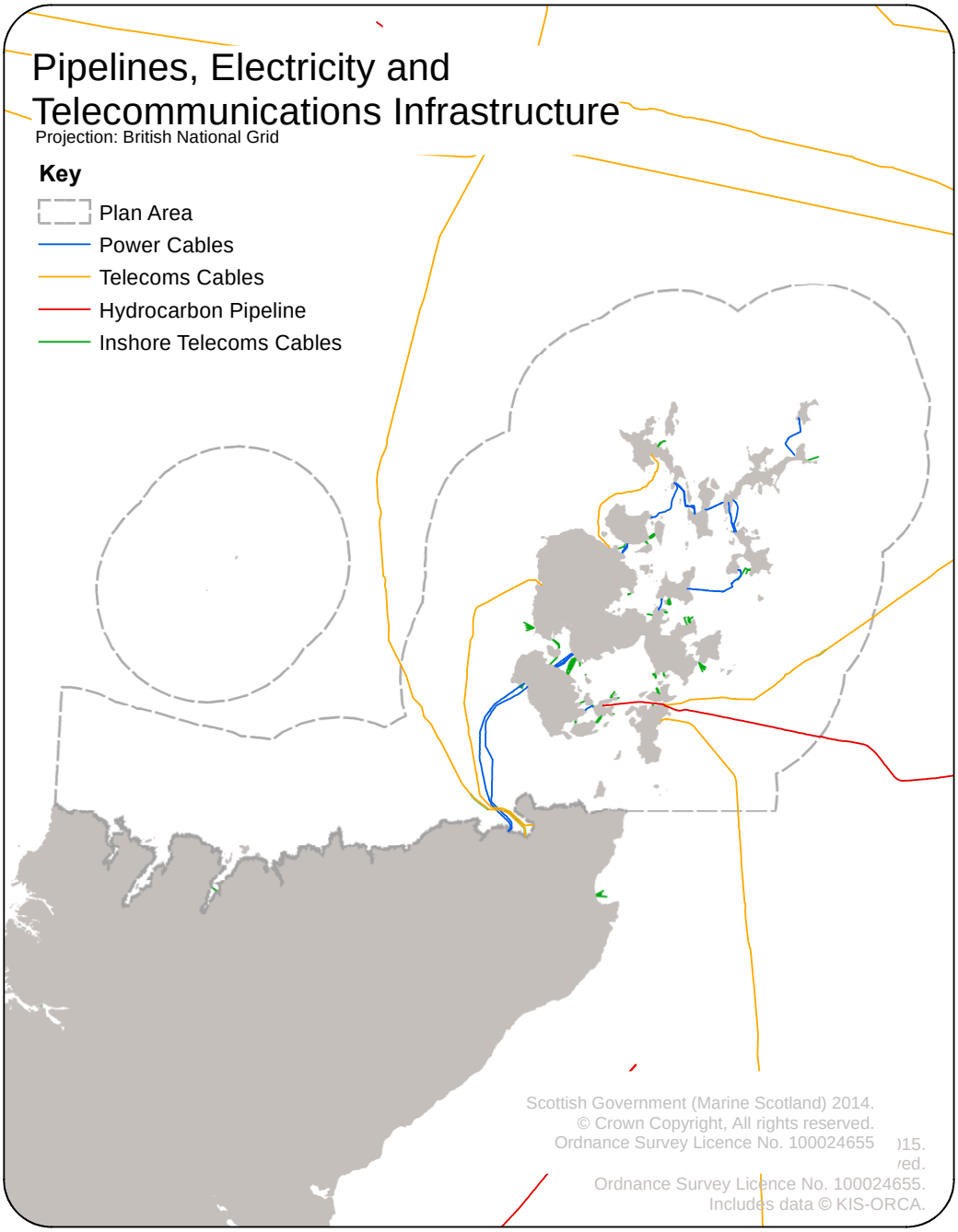
12.3 Historic and future trends

12.3.1 Future trends for power interconnectors will naturally be dependent on future energy development. The extent to which new telecommunication cables which will be laid within the PFOW area is not known.

12.4 Data Gaps and Limitations

12.4.1 There is currently no agreed method for valuing the services provided by cables as they form part of a wider infrastructure network. Given the uncertainty over what and where new cables may be placed, the costs associated with future cable development are difficult to predict and are thus best treated on a case by case basis at an individual project level.

Figure 13 Telecom and power cables in the PFOW[49]



[49] Marine Scotland (2014)

13 MARINE TRANSPORT, PORTS AND HARBOURS

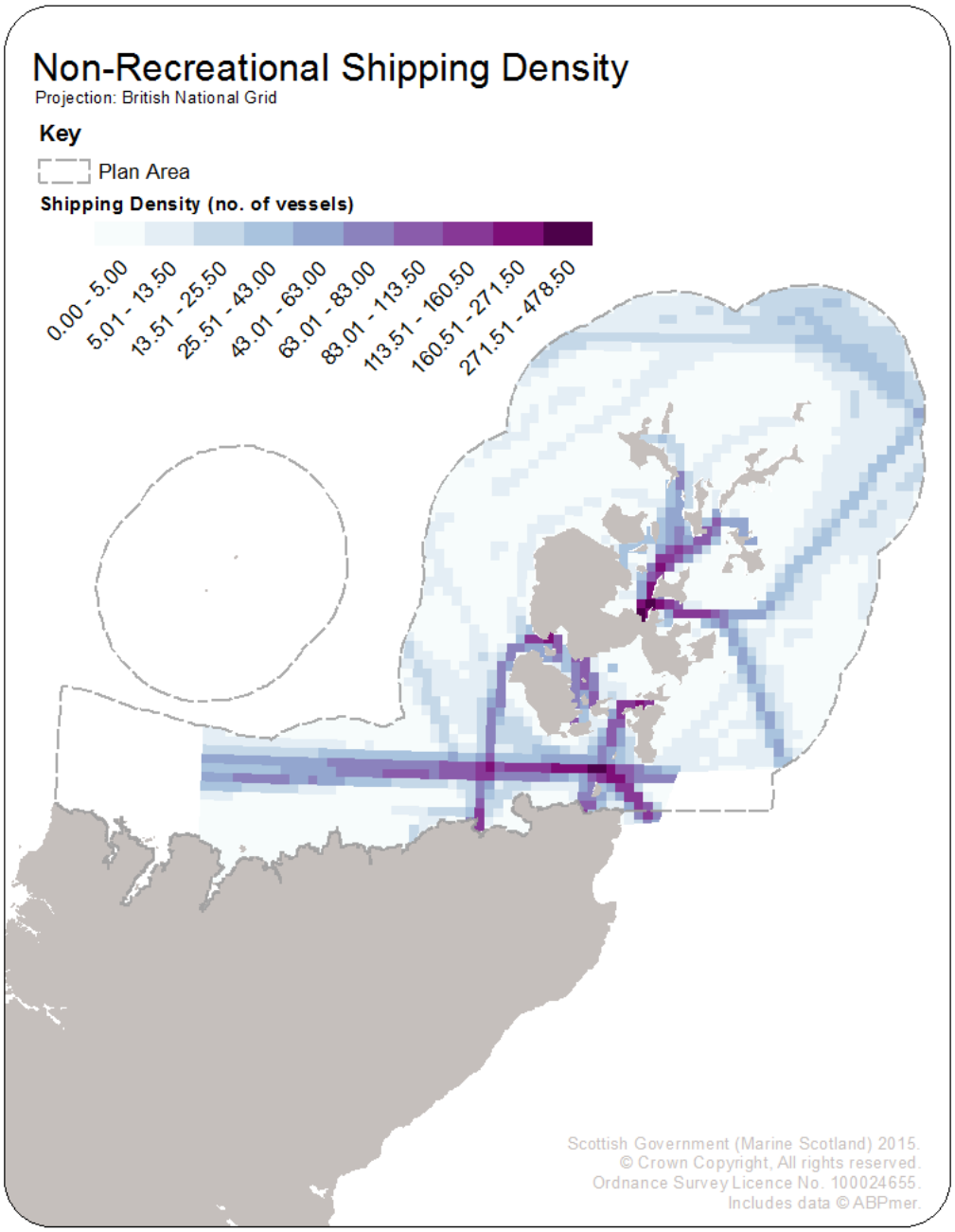
13.1 Spatial Extent and Intensity of Activity and Interests

13.1.1 The Pentland Firth is recognised as a route of international importance for navigation and is considered to be crucial for shipping and navigation, despite being one of the most dangerous and unpredictable stretches of water in the UK due to it being prone to strong tides, heavy seas and poor weather conditions.

13.1.2 The Marine Scotland Shipping Study of the Pentland Firth and Orkney Waters[50] gives an overview of the shipping activity in the PFOW. Figure 14 shows the intensity of shipping activity. There is a clear band of shipping activity transiting the PFOW in an East-West / West-East bearing. The intensity is greatest where there is an overlap between transiting ships and the passenger services connecting Orkney Mainland to the Scottish mainland. Figure 15 shows ferry routes in the PFOW area.

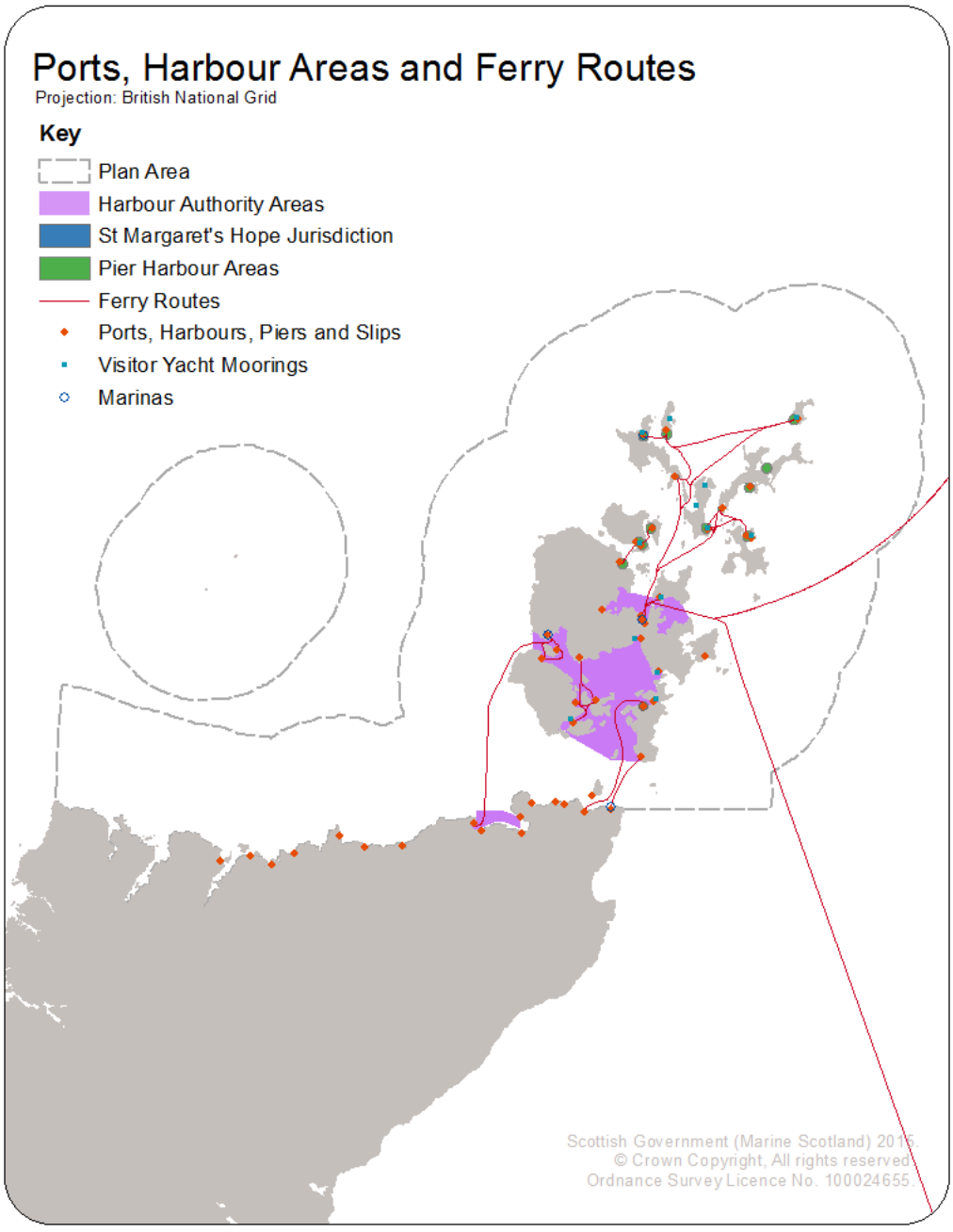
[50] Marine Scotland (2012) Shipping Study of the Pentland Firth and Orkney Waters http://www.gov.scot/Publications/2012/12/1868/0

Figure 14 Shipping density in PFOW area[51]



[51] Marine Scotland (2014)

Figure 15 Ferry routes in the PFOW Area[52]



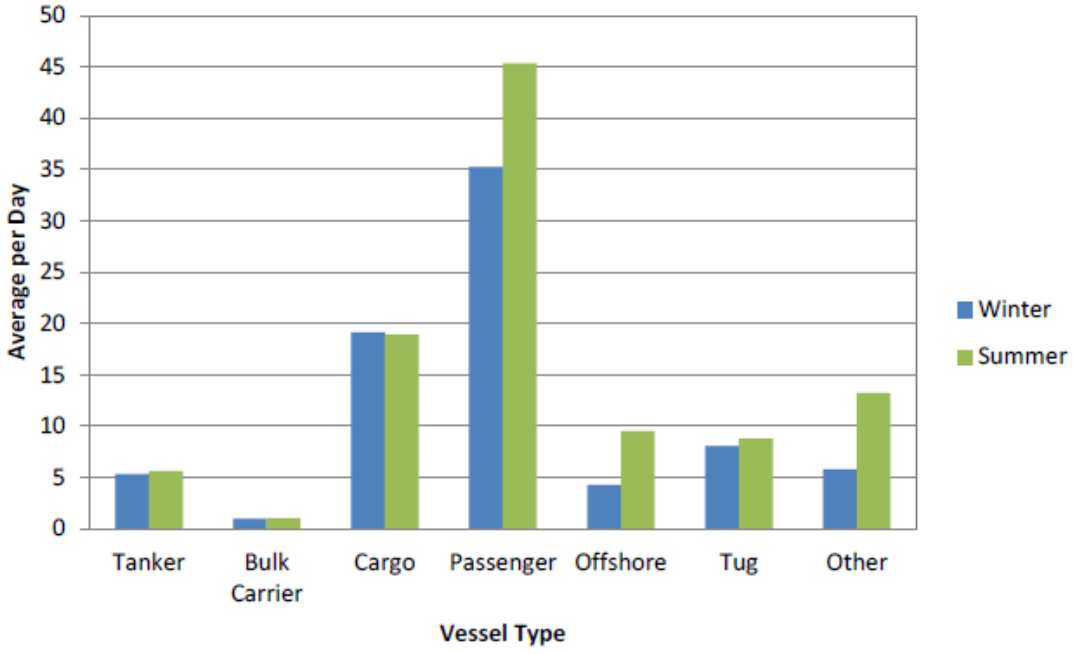
[52] Marine Scotland (2014)

13.1.3 The area is used extensively by commercial cargo vessels as the main route from the North Atlantic to the North Sea. It is also used by oil tankers entering and exiting the main oil terminals at Flotta at the southern end of Scapa Flow. This combination of cargo traffic and oil tankers leads to very high numbers of vessel movements occurring within the main central channel. Very high densities of shipping also occur within Orkney waters, in particular within the Scapa Flow area, the Stronsay Firth and around Kirkwall Harbour.[53]

13.1.4 A 'Shipping Study of the Pentland Firth and Orkney Waters'[54] was commissioned by Marine Scotland, published in 2012. The study gave a detailed description of the shipping activity in the PFOW, covering commercial shipping, recreation vessel activity, ports & harbours and other recreational activity. The report concluded:

- Distribution of vessel types is similar in winter and summer, with passenger vessels being the most common type, followed by cargo vessels (Figure 16 below shows results from the Automatic Identification System (AIS)). There were a slightly higher average number of vessels per day during the summer period for the vessel categories of passenger, offshore and other. Commercial shipping in the Strategic Area tended to follow well defined tracks for the different vessel types.

Figure 16 Vessel Length Distribution by Season[54]



- The most common category of vessel draught was 4-6m. There were a higher proportion of deep draught vessels in summer compared to winter, due to an increase in the number of large cargo ships. As with length, the deepest draught vessels tended to be transiting the Outer Sound of the Pentland Firth or the Fair Isle Channel.

[53] Scotland's Marine Atlas (2011) (http://www.gov.scot/Publications/2011/03/16182005/0)
[54] Marine Scotland (2012) Shipping Study of the Pentland Firth and Orkney Waters http://www.gov.scot/Publications/2012/12/1868/0

- The pattern of vessel tonnage is similar to that observed in length and draught analysis. The most common category was 300-1,500 GT, with regular runners in this category including the Pentalina passenger ferry and Orkney Islands inter-island ferries. The heaviest vessels transited the Outer Sound and the Fair Isle Channel. Vessels over 15,000 GT tracked within the Orkney Islands were passenger cruise vessels and tankers associated with Flotta Marine Terminal.
- Tankers tracked within the Strategic Area were mainly transiting through the Outer Sound or through the Fair Isle Channel to a variety of destinations. Over the timescale of the project six tankers were tracked at harbours within the Strategic Area (Scrabster, Kirkwall, Flotta Marine Terminal and Scapa Bay).
- The most common destinations of vessels tracked within the PFOW area were Kirkwall, Scrabster and Stromness. Lerwick and Aberdeen were the most common destinations beyond the area.

13.1.5 There are a number of ferry services connecting Orkney to mainland Scotland, as well as inter-island ferries. NorthLink Ferries connect Orkney with mainland Scotland and Shetland, sailing from Scrabster to Stromness, and Aberdeen to Kirkwall and onwards to Lerwick, Shetland. As well as transporting passengers, Northlink provides transport of commercial goods and freight. A summary of the NorthLink Ferries carrying statistics is shown in Table 25.

Table 25 NorthLink Ferries carrying statistics (NorthLink Ferries, 2013)[55]

Route	Total Passengers 2013	Total Cars 2013	Total Coaches 2013	Total Commercial Vehicle Lane Meterage 2013
Aberdeen - Kirkwall	34,179	4,794	16	131,765
Aberdeen - Lerwick	116,800	16,889	126	304,119
Kirkwall - Lerwick	16,269	2,242	64	15,789
Stromness - Scrabster	115,616	31,733	197	52,261
Summary	282,864	55,658	403	503,934

13.1.6 Orkney Ferries operate 9 inter-island ferries between Orkney Mainland and 13 Orkney islands. The Orkney Ferries fleet transports over 82,000 vehicles, undertaking around 320,000 passenger journeys annually[56]. Pentland Ferries - a private enterprise not subsidised by the Scottish Government - offer the shortest passenger and car ferry service, from Gills Bay to St Margaret's Hope. There is also a May-September service between John O'Groats and Burwick (South Ronaldsay), which is the shortest passenger-only service.[57]

[55] NorthLink Ferries Carrying Statistics 2013 http://www.northlinkferries.co.uk/wp-content/uploads/2014/03/Carrying-Statistics-SNF-25032014.pdf
[56] http://www.orkneyferries.co.uk/company_profile.php
[57] www.jogferry.co.uk

13.1.7 The location of all of the ports and harbours in the PFOW can be found on the ports and harbours of the UK website[58]. There are 18 harbours along the north Caithness Coast (Figure 17). Scrabster is the main harbour on the North Coast- this is an active fishing port and is the main port for sea angling. Scrabster has recently undergone a number of improvements and has plans for further extensions to support the growth of the renewable energy industry.

13.1.8 There are 29 piers, harbours and slipways in Orkney. The main ports are Hatston Pier, Kirkwall Pier and Stromness. The ports receive a variety of ships including cruise ships with up to 3,500 passengers, oil tankers, cargo and freight vessels and other ships. Crude oil is imported to the Flotta Oil terminal on the north coast of Flotta, through a 30" pipeline from several offshore facilities. Transhipment by tankers also takes place. Scapa Flow itself provides a large sheltered anchorage and a number of ship-to-ship transfers take place within it.

13.2 Economic value and employment

13.2.1 The Scottish Ferries Review (2010) provides ferry services employment data for the Highlands and Islands as shown in Table 26. There are 2,169 jobs supported by Scottish Ferry services: 1,325 of these are in Highlands and Islands with an additional 774 in the rest of Scotland and 70 outside Scotland. Company level employment data for services within the PFOW area is confidential.

Table 26 Ferry operations direct employment within the Highlands and Islands[59]

Area	Number of Jobs	Share of Jobs
Argyll and Bute	423	32%
Orkney	278	21%
Shetland	227	17%
Outer Hebrides	208	16%
Highland	177	13%
Moray	12	1%
Total	1,325	100%

13.2.2 Whilst shipping intensity levels and ferry routes provide an indication of the volume of activity, at a spatial level the economic value of marine transport passing within the PFOW area is difficult to calculate. Despite economic data being largely limited to the traffic statistics that Transport Scotland holds[60], it is clear that this economic activity provides an important function to the secondary markets through the transport of individuals or freight.

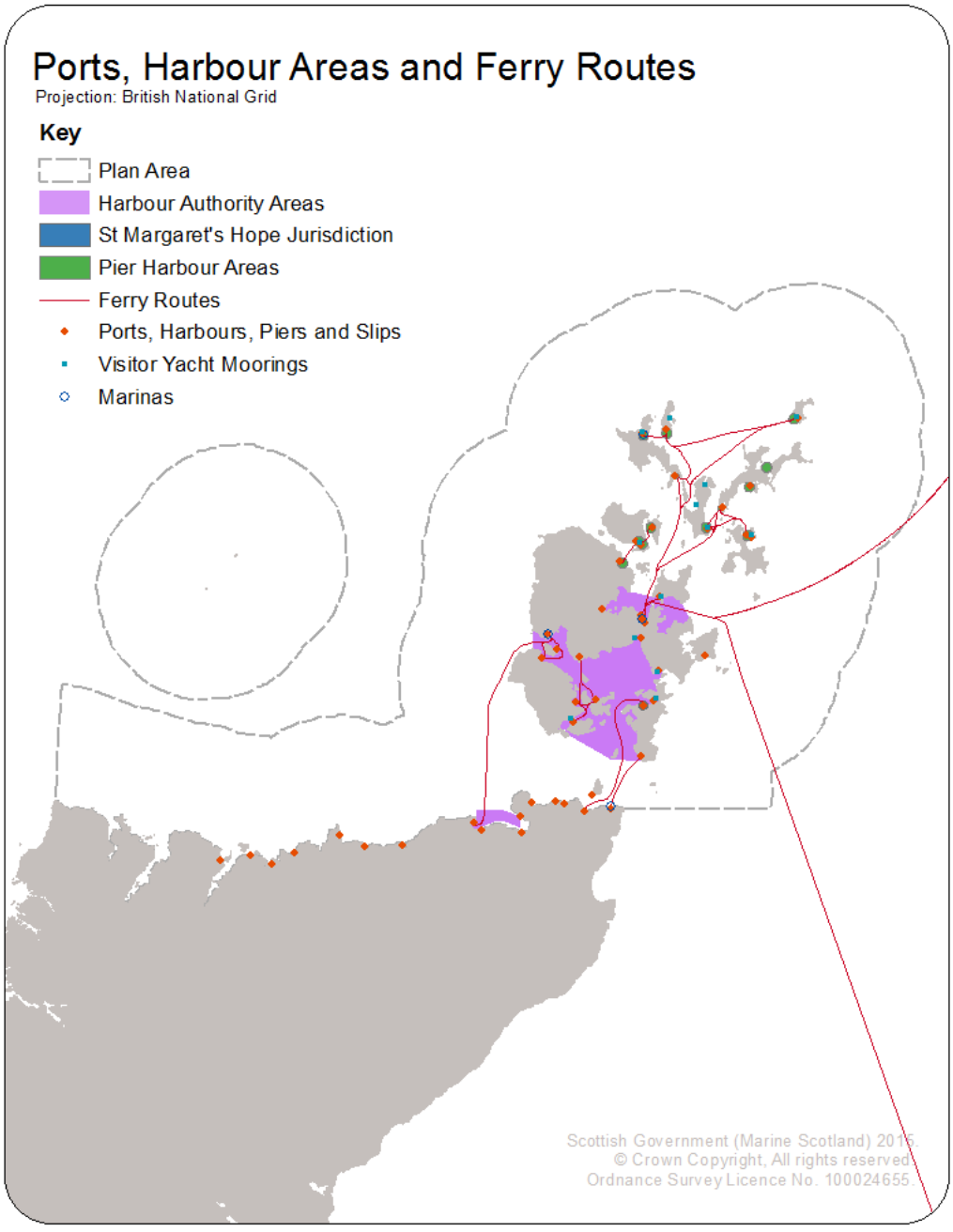
13.2.3 Scrabster Harbour is an established commercial port and hub of economic activity which occupies a strategically important location within the Pentland Firth. The total annual economic output of Scrabster Harbour in 2008 was £39 million. The gross value added (GVA) impact of the activities of Scrabster retained in Caithness was £14.6 million, with the total employment impact of Scrabster being

[58] Ports and Harbours of the UK PFOW covers 50,51, 54 http://www.ports.org.uk/allareas.asp
[59] Scottish Ferries Review (2010) http://www.gov.scot/Resource/Doc/935/0099984.pdf
[60] http://www.transportgov.scot/statistics/scottish-transport-statistics-all-editions

339 full time equivalent (FTE) jobs. Harbour activities generate over £6 million in wages and salaries within Caithness[61].

[61] Scrabster : Economic Impact Assessment, Scrabster Harbour Trust (2008) (www.scrabster.co.uk)

Figure 17 Location of ports and harbours in the PFOW[62]



[62] Marine Scotland (2014)

13.2.4 Orkney's Three Port Strategy[63] is the Orkney Islands Plan for investment and development for Lyness, Hatston and Coplands Dock, Stromness in Orkney. £22 million investment from the Orkney Islands Council, European Regional Development Fund and the Scottish Government has been allocated to promote Orkney's strategic location and deep water facilities in support of existing oil and gas industries and the emerging marine renewables industry. The breakdown of this investment is shown in Table 27.

Table 27 Harbour investment in PFOW[64]

Location	Investment (£m)
Scrabster Harbour	20
Lyness	2.97
Hatston Pier, Kirkwall	10.1
Coplands Dock	9.5
Total	42.57

13.2.5 Gills Harbour is the most northerly port on the Scottish Mainland, and is where Pentland Ferries connect Orkney to the Scottish Mainland. The harbour is the closest on the Scottish mainland to the tidal developments in the Pentland Firth (Ness of Duncansby, Brims Tidal Array, Inner Sound and Brough Ness) leased by the Crown Estate. Gills Harbour has been utilised for surveys, instrument-monitoring and is currently upgrading its facilities to allow installation by work vessels for marine renewable developments in the Pentland Firth.

13.2.6 Although not directly adjacent to the PFOW area, Wick Harbour[65] provides a marina for recreational boating berths and a commercial harbour suited to the marine renewable energy industry and oil & gas. It is strategically located to provide services to oil & gas developments in the Moray Firth and West of Shetland, along with marine renewable energy developments in the Pentland Firth.

13.3 Historic and future trends

13.3.1 Shipping volumes bear a direct relationship to the global economic market. As markets react to the changing financial situation, shipping lines respond with services to move goods and people. The most notable variable to affect the volume and intensity of shipping into the future will be the technology and innovations used to design future shipping. Ship design seeks for bigger, faster and more economic transhipment of goods and people. The introduction of bigger ships places expectations that existing ports will increase the depth of water in entrance channels and alongside berths to accommodate changing ship requirements. This implies that investment is necessary in port infrastructure, both in terms of shore side facilities and access to the ports, in addition to the need for further port development and services to support the offshore renewable sector within the region as mentioned above. Channel widths may need to increase to take account of the wider ship beam, which in addition may lead to the

[63] Orkney's Three Port Strategy http://www.orkneyharbours.com/pdfs/1130-MS%203%20PORT%20STRATEGY.pdf
[64] Orkney's Three Port Strategy, Scottish Government (2013) (http://www.orkneyharbours.com/pdfs/1130-MS%203%20PORT%20STRATEGY.pdf)
[65] http://www.wickharbour.co.uk/newsletters/harbour-brochure-april-2011.pdf

requirement for turning circles to be enlarged to take account of greater vessel length. Although all of these pressures have to be taken into account, probably the most significant factor to challenge traditional ports in the context of their ability to accommodate bigger ships is sea access, and in particular vessel draught.

13.4 Data Gaps and Limitations

13.4.1 With the exception of GVA and employment data for ports available economic data are limited.

14 TOURISM

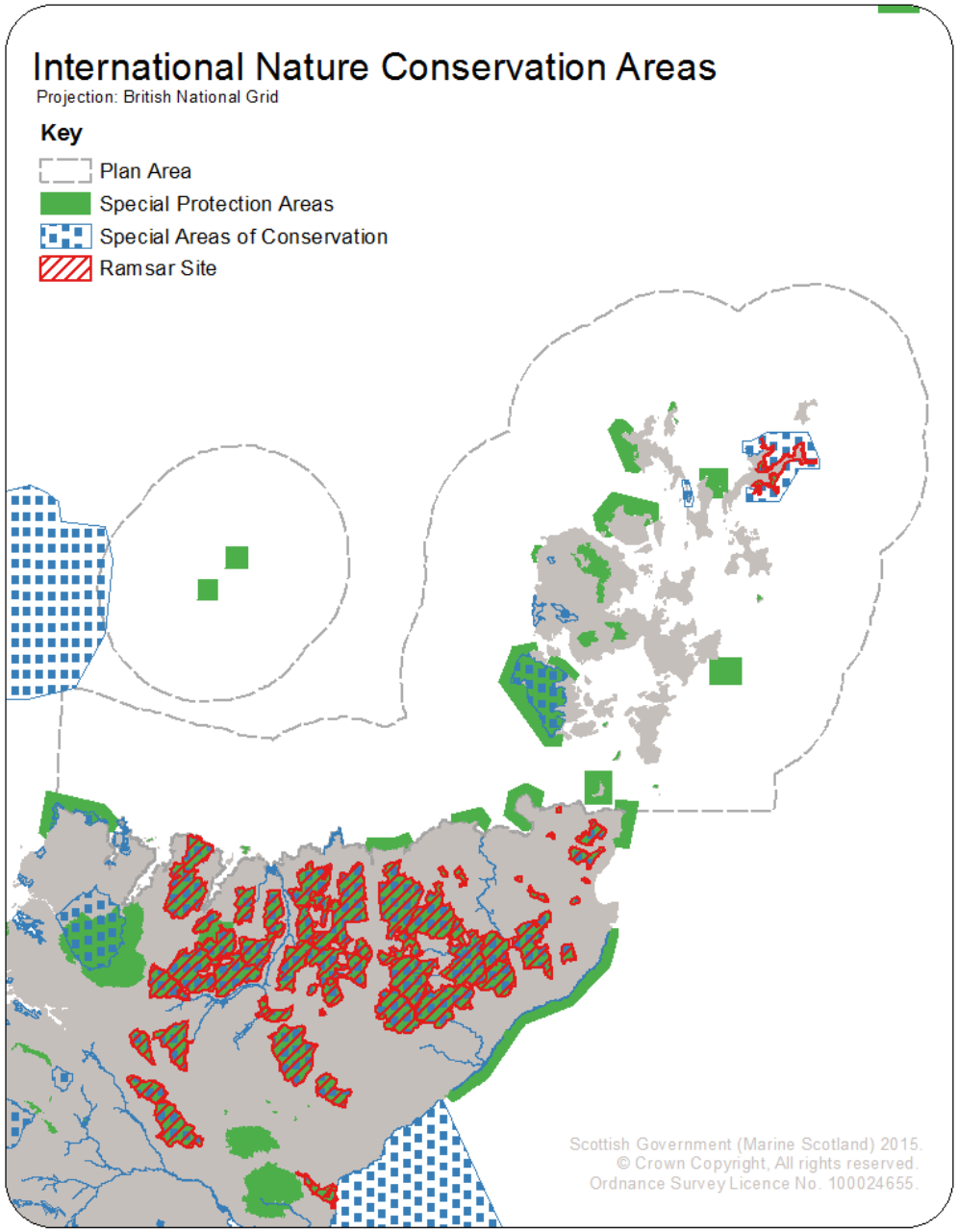
14.1 Spatial Extent and Intensity of Activity and Interests

14.1.1 This section provides information relating to the national and regional value of general tourism. Tourism is often associated with other specific recreational activities including marine ecotourism, tourism associated with cultural heritage, recreational boating and a range of other water sports. This section gives a descriptive overview of general tourism, ecotourism and tourism associated with cultural heritage.

14.1.2 There are several Special Protection Areas (SPAs) and Special Areas of Conservation (SACs) in the PFOW area. Special Protection Areas (SPAs) are classified under the Birds Directive, which requires the Member States of the European Community to identify and classify the most suitable territories, in size and number, for certain rare or vulnerable species and for regularly occurring migratory species. SPAs are intended to safeguard the habitats of the species for which they are selected and to protect the birds from significant disturbance. These are shown in Figure 18.

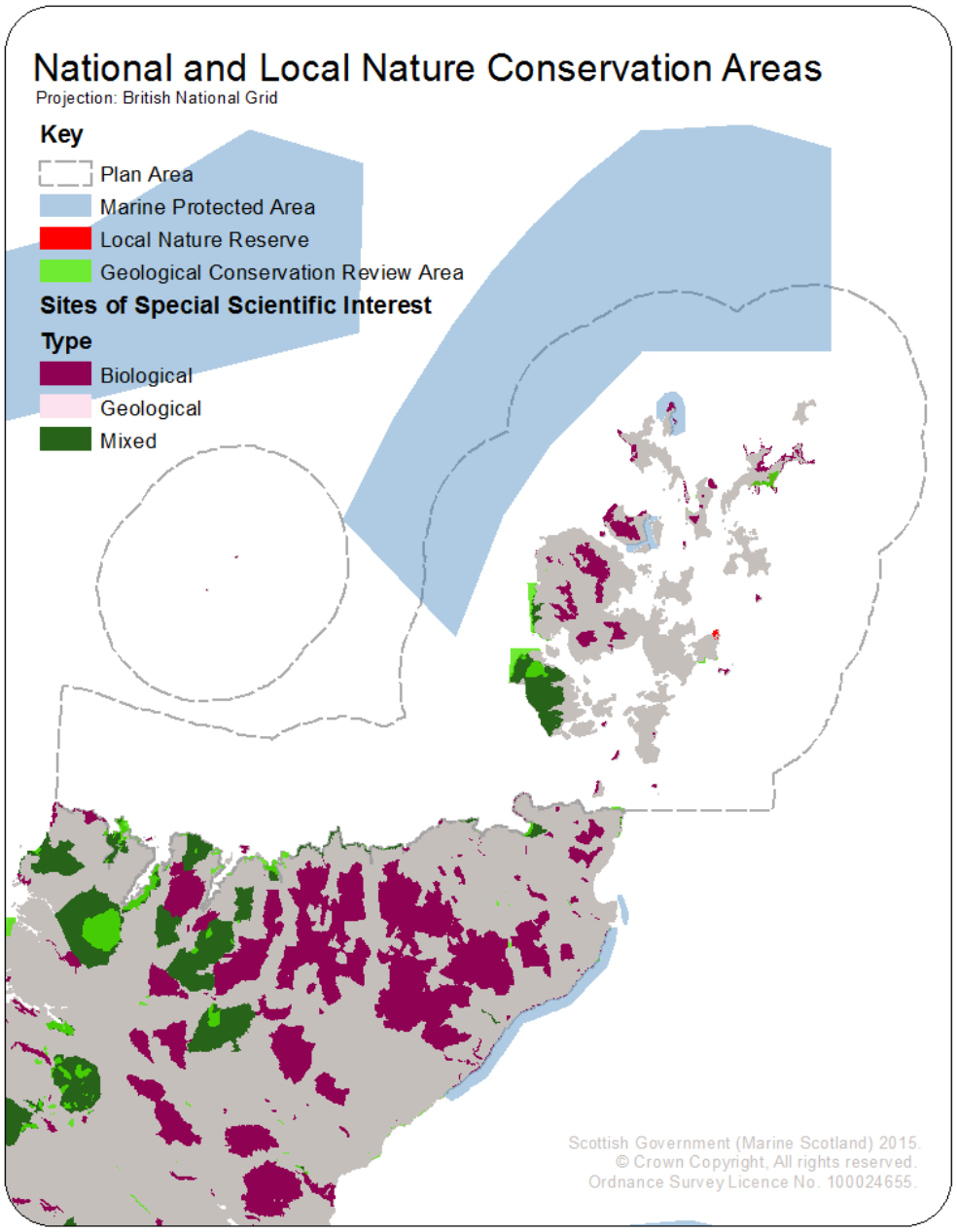
14.1.3 Nature based tourism in Orkney and Caithness is a vital component of the tourism industry in the region. This includes wildlife reserves and nature trails in the coastal areas of Dunnet Head and Duncansby Head. Royal Society for the Protection of Birds reserves are popular bird watching attractions for tourists. Figure 19 shows the national nature conservation locations and Figure 20 the landscape designations in the PFOW area.

Figure 18 International Nature Conservation Areas in PFOW area[66]



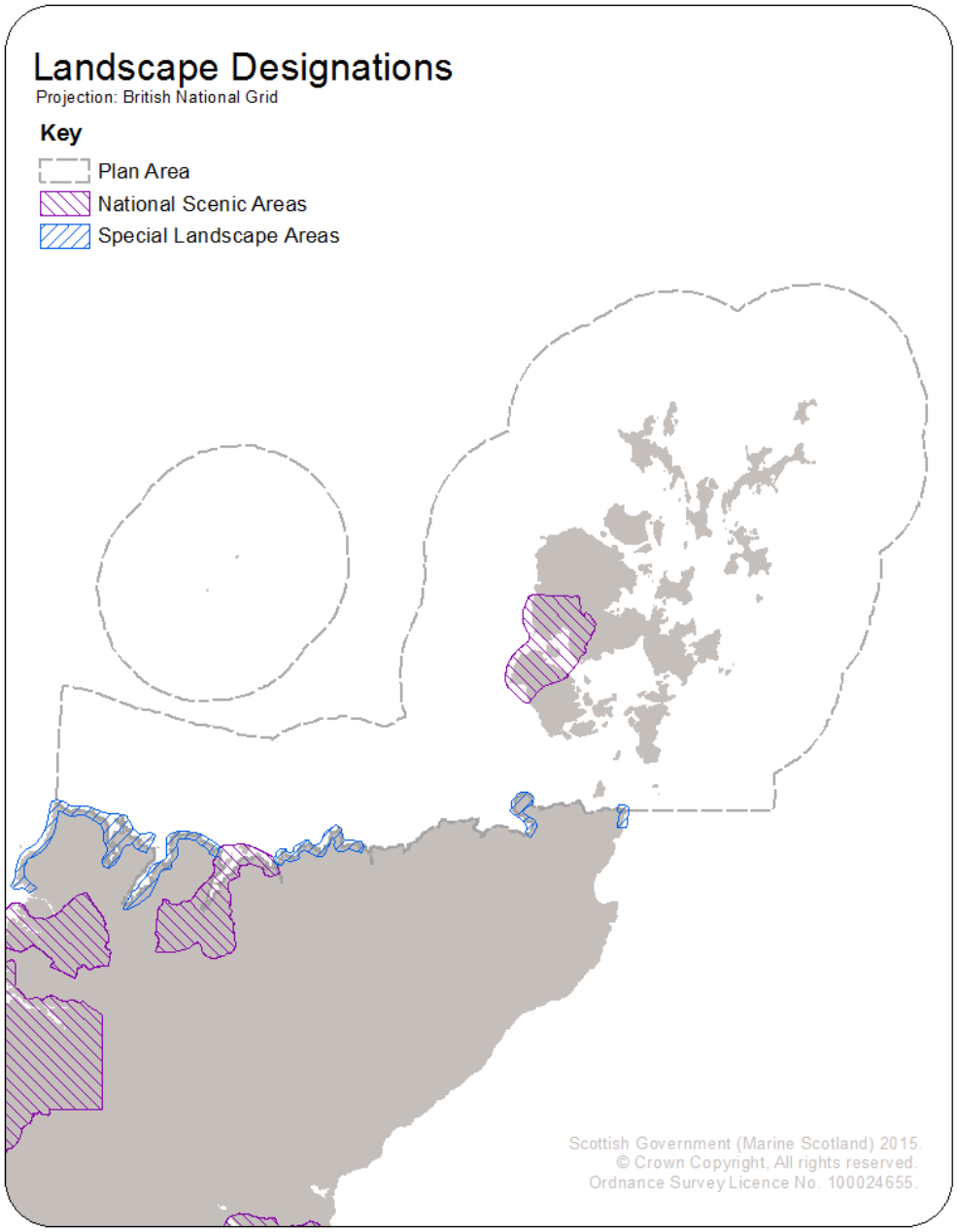
[66] Marine Scotland (2014)

Figure 19 National Nature Conservation Areas in the PFOW area[67]



[67] Marine Scotland (2014)

Figure 20 Landscape Designations in the PFOW area[68]

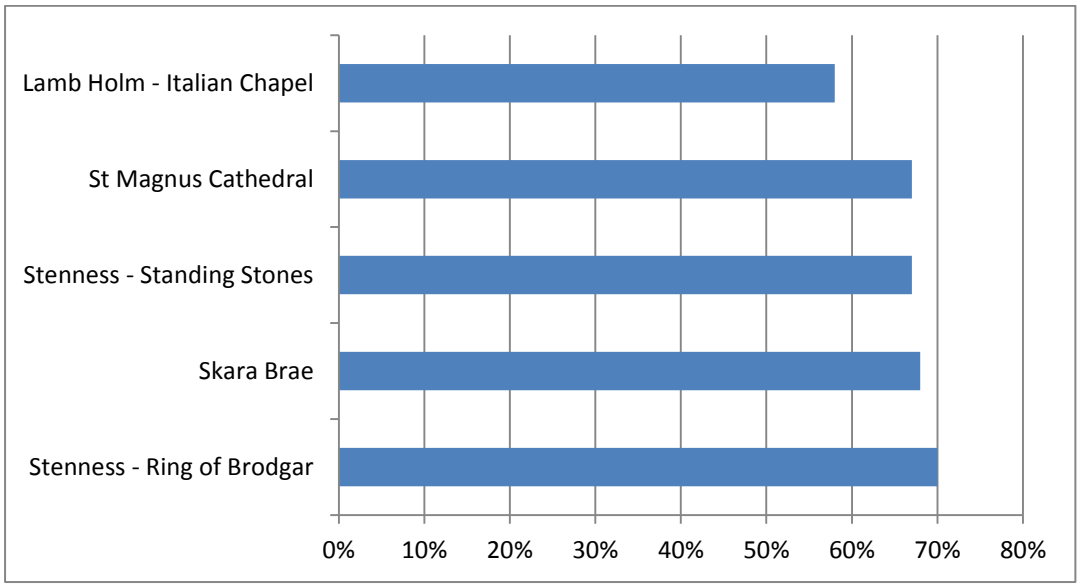


[68] Marine Scotland (2014)

14.1.4 There are a number of wildlife cruise operators in Caithness such as John O'Groats Ferries which provide wildlife cruises and day trips to Orkney. The Caithness coast and Orkney are also prime spots in the UK to observe the Northern Lights (Aurora Borealis).

14.1.5 The Heart of Neolithic Orkney World Heritage Site (HONO WHS) comprises a group of sites on Mainland Orkney which date from 3,000 – 2,000 BC. The sites are: Skara Brae settlement, Maeshowe chambered tomb and the Barnhouse Stone, the Stones of Stenness and the Watch Stone, and the Ring of Brodgar and associated monuments. The Orkney 2012/2013 Visitor Survey[69] identified the visitor attractions most likely visited; Figure 28 highlights the importance of cultural heritage sites to the tourism industry in Orkney.

Figure 21 Most visited attractions Orkney (2013/14)[69]



14.2 Economic value and employment

14.2.1 The Orkney Visitor Survey involved a face-to-face exit survey of visitors to Orkney, a post-visit online survey and a face-to-face calibration survey of visitors to inform volume and value estimates. It showed that Orkney attracted 142,816 overnight/day visitors in 2012 – 2013 (Oct 2012 – Sept 2013). By trip purpose, 65% were holiday visitors, 18% business visitors and 17% visiting friends and relatives (VFR). Total expenditure was estimated to be £31 million (shown in Table 28).

[69] OIC, VisitScotland, HIE (2014) Orkney Visitor Survey 2012/2013http://www.visitscotland.org/pdf/Orkney%202013%20Visitor%20Survey_Final%20report.pdf

Table 28 Total annual volume and value (2013)[69]

Purpose	Number of visitors	Average spend per trip (£)	Total spend (£)	Share of total spend (%)
Holiday	92,268	217	20,061,116	65
VFR	24,437	238	5,821,934	19
Business	26,111	200	5,214,987	17
Total	142,816	218	31,098,038	100

14.2.2 The 2013 Orkney Cruise Survey[70] sampled 10 Cruise ships; 2,511 passengers and 659 crew members responded to the survey. The report estimated that the cruise ship industry generated £3.1m for the local Orkney economy through passenger and crew expenditure from 73 Cruise Ship visits with 51,000 passengers. The findings of the direct impacts are summarised in Table 29 below.

Table 29 Cruise Ship Economic Impact in Orkney[69]

Industry	Direct Expenditures	Direct Employment	Direct Compensation
Wholesale & Retail Trade	€ 187,047	7	€ 123,300
Transportation & Utilities	€ 1,438,636	11	€ 376,700
Hospitality	€ 795,280	3	€ 50,800
All Others	€ 323,208	4	€ 114,200
Total	**€ 2,744,171**	**25**	**€ 665,000**

14.2.3 Direct expenditure has been calculated by multiplying the average expenditure of passengers and crew by the estimated number of passengers and crew (€55 and €10 respectively) with the survey estimating that this output resulted in the direct employment of 25 residents of the Orkney Islands (with wages totalling €665,000).

14.2.4 Tourism in Caithness and North Sutherland (CNS) is dominated by overnight tourists and day visitors. A visitor is classified as a tourist if his/her trip includes an overnight stay. Overnight tourism demand driven by two main sectors: Non-Discretionary Business Tourism; and the Leisure Tourism / Visiting Friends and Relatives (VFR) sector. Ambitious for Tourism Caithness and North Sutherland estimate that the total direct expenditure from the overnight tourism sector in CNS is calculated as £35.2 million.[71] This accounts for 6.2% of all overnight tourism expenditure in the Highlands (see Table 30). However given that only a small part

[70] Orkney Islands Council (2013) Orkney Cruise Survey Indicates Huge Benefits for Local Economy http://www.orkney.gov.uk/OIC-News/cruise-survey-indicates-huge-benefits-for-local-economy.htm

[71] Ambitious for Tourism Caithness and North Sutherland (ATCNS) (2011) http://www.hie.co.uk/regional-information/area-information/caithness-and-sutherland/our-approach.html

of CNS covers north coast this figure will overestimate the direct impact on the PFOW area.

Table 30 Total expenditure from overnight tourism in CNS[71]

Type	Expenditure
Leisure	£18,268,155
Business	£9,206,158
VFR	£7,763,879
Total	£35,238,192

14.3 Historic and future trends

14.3.1 There is no information specific to the PFOW area on future trends in tourism, however these will be dependent on trends in the wider economy.

14.4 Data Gaps and Limitations

14.4.1 Whilst many of the popular tourist attractions in the PFOW are in coastal locations, the tourism figures in this section will naturally overstate the impact of tourism on the marine sector. Caution must be applied to these figures particularly with regard to double counting the impacts of recreational activities covered in the next section. Research commissioned by Marine Scotland is underway which aims to add greater data coverage to the marine tourism and recreation sector across Scotland, with the PFOW area being used as a case study.

15 WATER SPORTS AND RECREATIONAL BOATING

15.1 Spatial Extent and Intensity of Activity and Interests

15.1.1 The main water sports undertaken in the PFOW area are recreational angling, surfing, windsurfing, sea kayaking, small sail boat activities (such as dinghy sailing) and scuba diving.[72] Orkney has three marinas; Kirkwall, Stromness and Westray, which also cater for larger cruising, sailing and powered recreational craft, along with local piers and visitor moorings throughout the islands.

[72] Scotland's Marine Atlas (2011) (http://www.gov.scot/Publications/2011/03/16182005/0)

Table 31 Orkney Marinas -Number of berths[73]

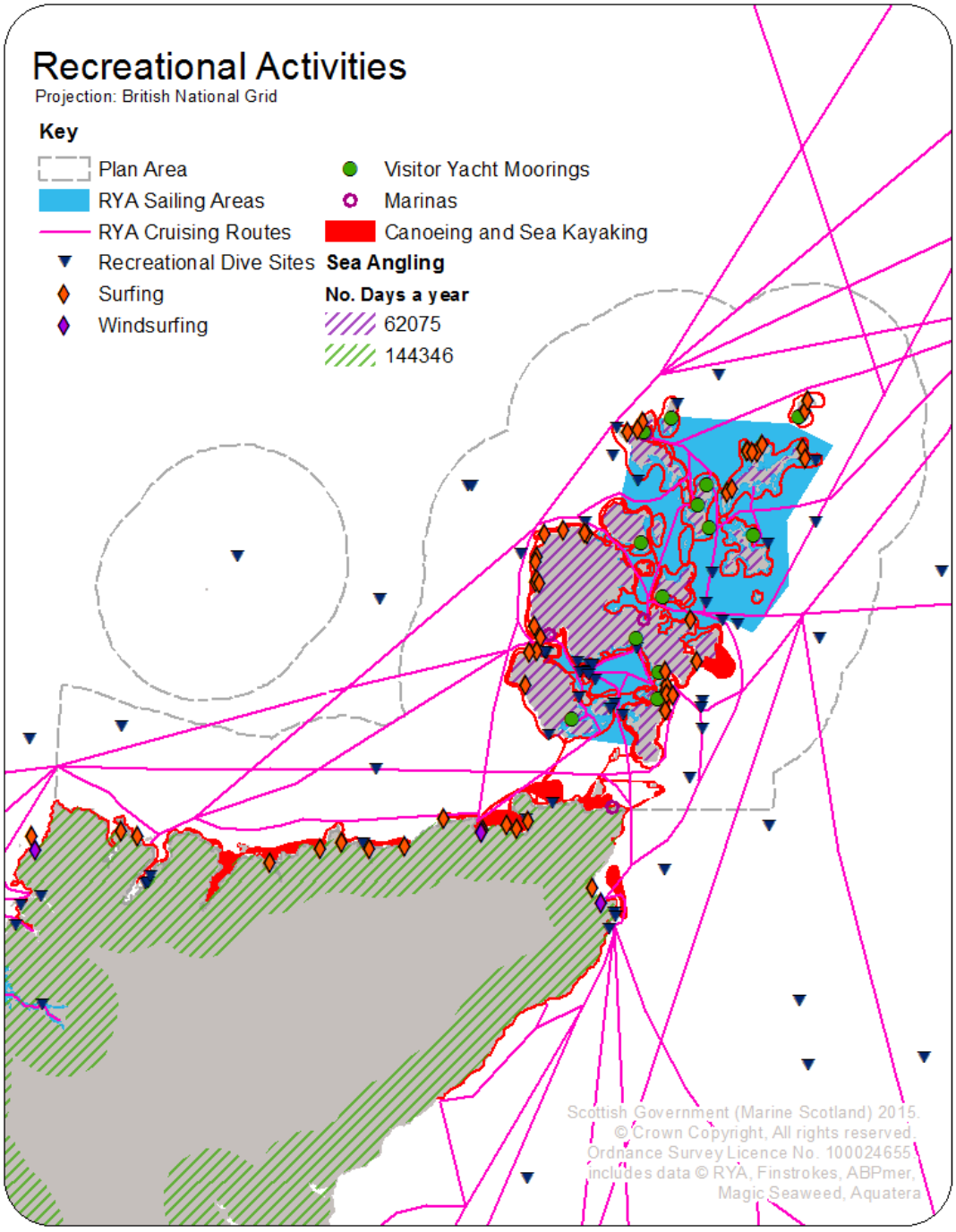
Orkney Marinas	No. of berths
Kirkwall	95
Stromness	72
Westray	17

15.1.2 Wick harbour has a 70 berth marina providing a strategic link to enable yachts to sail around the North of Scotland.

15.1.3 Figure 22 shows the locations of various recreational activities that take place in the PFOW area.

[73] Orkney Marinas (2014) (http://www.orkneymarinas.co.uk/)

Figure 22 Recreation Activities in the PFOW area[74]



[74] Marine Scotland (2014)

15.2 Surfing

15.2.1 Some of the UK's best surfing breaks are situated along the north coast of Scotland. The region receives strong, powerful swells and provides a number of high quality surfing spots. In particular according to environmental charity Surfers against Sewage (SAS), the reefs situated around Brims Ness and Thurso are considered to be world-class.[75] Orkney also has good quality surfing locations although participant numbers are less than on the mainland, primarily due to accessibility.

15.2.2 The Scottish Surfing Federation (SSF) conducted a survey on the impact of surfing at a national level[76]. The number of regular surfers is summarised in Table 32 below. The results show a total surfing population of 65 for the PFOW area.

Table 32 Estimate of the number of surfers at regional level[76]

Marine Region	Number of surfers
Orkney Islands	16
North Coast	49

15.2.3 Windsurfing in Orkney is a popular activity at Kirkwall's Scapa Beach and Orphir's Waulkmill Bay. In addition, on the west coast of mainland Orkney, the storm beach of Skaill Bay, in Sandwick, is also popular.[77]

15.3 Sea Angling

15.3.1 The main launch spots for charter based angling are Thurso in North Scotland and Stromness in Orkney.[78] Wreck angling is popular in Scapa Flow and also on other wrecks found offshore from Orkney. Shore angling is undertaken at many locations around Orkney.[79] In Caithness, shore fishing is popular in Thurso Bay and Dunnet Head. Cod, pollack and mackerel are the most popular target species in Caithness and Sutherland. There is also evidence of sport fishing for rarer species such as porbeagle shark becoming more popular. In Orkney, conger eel is found amongst the wrecks of Scapa Flow and is the most popular target species, followed by coley, mackerel and bass.

15.4 Sailing

15.4.1 The Orkney Sailing Club (OSC)[80] runs Royal Yachting Association (RYA) approved sailing courses and has several RYA instructors and senior instructors in

[75] Surfers against Sewage (http://www.sas.org.uk/)
[76] Scottish Marine Recreational Resources: Assessment of the Sport of Surfing within Scottish Waters (2013)
[77] Visit Orkney (2009)
[78] Radford et al., (2009) Technical Report Economic Impact of Recreational Sea Angling in Scotland http://www.gov.scot/Resource/Doc/280648/0084568.pdf
[79] http://www.seaanglingorkney.com
[80] http://www.orkneysailingclub.co.uk

its ranks. The OSC has a number of dinghies such as wayfarers, albacores, 505s and lasers and operates out the port of Kirkwall. There are currently about 200 members. In addition, the Pentland Firth Yacht Club operates out of Scrabster and uses a range of Topper Fleet.

15.5 Scuba Diving

15.5.1 The most popular area for scuba diving in the region is around Scapa Flow in Orkney. This body of water is considered one of the finest wreck diving sites in Europe and has ranked among the top five wreck diving areas of the world.[81] Scapa Flow covers some 190 km² (73 miles) and is completely protected by a ring of islands.

15.5.2 Recreational diving is predominantly charter based with approximately 12 diveboats and an estimated 3,000 visiting divers annually.[82] Diving is also undertaken on the mainland with the Caithness Diving Club operating in the region, which has around 30 members. The Caithness Diving Club has 230 'likes' on their Facebook page – an indicator of the number of affiliated members. Dive locations include offshore from Holborn Head, Portskerra, Scrabster, Dunnet Head, Scarfskerry and Duncansby.[83] Information on the contribution of scuba diving to the economy of Caithness and Sutherland is limited although the intensity of diving in the area is less than around Orkney.

15.6 Kayaking

15.6.1 Kayaking on the sea can involve several different forms. Sea kayaking, river kayaking, surf kayaking, and kayak fishing, with this section focusing specifically on sea and surf kayaking in the PFOW area. Within the PFOW area, the main sea kayaking season takes place between March and November. The majority of sea kayaking is undertaken close inshore, exploring interesting aspects of the coast such as sea caves, inlets and wildlife. Safety issues and a lack of interesting features generally limit kayaking further offshore. However, open crossings (between two points such as a headland and an offshore island) often through strong tidal currents are regularly undertaken by more experienced sea kayakers. The Pentland Firth is an area of particular interest to experienced sea kayakers. The Inner Sound between Stroma and the Scottish Mainland is an area of strong tidal currents which offer challenging conditions, providing a training ground and assessment area for the top kayaking award, the British Canoe Union 5 Star Leader Award.

15.6.2 Surf kayaking takes place at the same locations as surfing on the North Coast of Scotland, given the necessity for waves. The Scottish Surf Kayak Championships have taken place at Thurso since 1984. Various other kayak competitions are held in the area, including International and European events. Kayaking has the potential to be undertaken along all of the PFOW area and is only constrained by the availability of suitable launching spots such as beaches or slipways.

[81] Scotland's Marine Atlas (2011) (http://www.gov.scot/Publications/2011/03/16182005/0)
[82] The Orkney Hyperbaric Trust
[83] Caithness Diving Club (http://www.caithnessdivingclub.co.uk/)

15.6.3 A number of clubs regularly operate sea kayaking in the region.[84] These include:

- The Caithness Kayak Club, Wick
- The Pentland Canoe Club, Thurso
- The Orkney Sea Kayaking Association
- The Kirkwall Kayak Club (KKC)

15.7 Economic value and employment

Surfing

15.7.1 Few studies have been undertaken in the PFOW area on the economic contribution of surfing activities. While no estimates of the total value of surfing in Orkney or Caithness/Sutherland exists, the value of Scotland's largest surfing event, the O'Neill Coldwater Classic at Thurso East has been calculated. The annual competition ran between 2006 and 2011, with the 2010 event attracting estimated spectator numbers of 5,500 over the 8-day event.[85] The 2010 event resulted in an estimated expenditure of £440,000 to the local economy. In 2014, Thurso was meant to host the 'Scottish National Surf Championships' but this was cancelled.

Sea Angling

15.7.2 The Economic Impact of Recreational Sea Angling in Scotland study estimated the sea angling activity and economic value in eight regions of Scotland.[86] Two of these regions, 'North Scotland' and 'Orkney and Shetland', fall within the PFOW region. As these areas do not fully align with the PFOW area the values should only be taken as indicative values for comparison between areas.

15.7.3 The total estimated regional sea angling activity and expenditure within these two regions is shown in Table 33.

[84] Canoe Scotland (www.CanoeScotland.org)
[85] A socio-economic methodology and baseline for Pentland Firth and Orkney Waters Wave and Tidal Developments http://www.thecrownestate.co.uk/media/152036/socio-economic-methodology-and-baseline-for-pfow-wave-tidal-developments.pdf
[86] Radford et al., (2009) Technical Report Economic Impact of Recreational Sea Angling in Scotland http://www.gov.scot/Resource/Doc/280648/0084568.pdf

Table 33 Total estimated expenditure and employment from regional sea angling activity[86]

Region	Number of Resident Sea Anglers	Annual Sea Angler Days in Region	Annual Trip Expenditure in Region	Annual Capital Expenditure in Region	Total Annual Sea Angler Expenditure	Number of Jobs Supported
Northern Scotland	7,894	144,346	£8,909,000	£2,251,000	£11,160,000	299
Orkney & Shetland	2,823	74,640	£3,949,000	£2,153,000	£6,102,000	145

15.7.4 Given that Orkney's population is approximately half that of Orkney and Shetland an approximation of the expenditure attributable to the PFOW area could be around £2m.

15.7.5 The Economic Impact of Recreational Sea Angling in Scotland report also includes a case study of Orkney which gives the number of local and visitor anglers and the annual sea angler days for Orkney, summarised in Table 34 below.

Table 34 Number of angler days in Orkney[86]

	Number	Days	Charter Days	Own/Friends Boat
Local	1,134	25,000	400	9,459
Visitors	1,000	4,500	800	500

15.7.6 These figures can also be used to determine annual sea angling expenditure for Orkney. Comparing the proportion of angler days in the two tables above gives an estimate of total annual expenditure for sea angling in Orkney of £2.4m, relatively similar to the above £2m approximation.

Sailing

15.7.7 The Sailing Tourism in Scotland (2010) report[87] by Scottish Enterprise provides estimates for Scotland and regional (North) expenditure generated by resident (home port) and visitor berths. The report suggests that Scotland's sailing tourism sector generates total expenditure in excess of £100 million in Scotland. In this study, The North is defined as Gairloch – Helmsdale, Orkney / Shetland and

[87] Sailing Tourism in Scotland (2010) http://www.evaluationsonline.org.uk/evaluations/Browse.do?ui=browse&action=show&id=369&taxonomy=SEC

Helmsdale – Peterhead. Expenditure in the North of Scotland is estimated to be in excess of £10 million.

Scuba Diving

15.7.8 Kenter et al. (2013)[88] reported on the recreational use and non-use values of UK divers and sea anglers for 25 Scottish potential Marine Protected Areas (pMPAs). 3 of the MPAs fall within the PFOW region: North-west Orkney, Papa Westray and Wyre and Rousay Sounds. The study gives visitor number estimates, travel cost expenditure and a contingent valuation Willingness to Pay (WTP) value (see Appendix). The study has a number of limitations and should therefore be treated with caution when considering the estimates. However, there is a clear message that divers (and anglers) place a high value on the marine environment.

15.8 Historic and future trends

15.8.1 Whilst there is no specific information on future trends, there is no reason to expect that current activity level will not continue, particularly the continued growth of the well-established North Coast surfing scene.

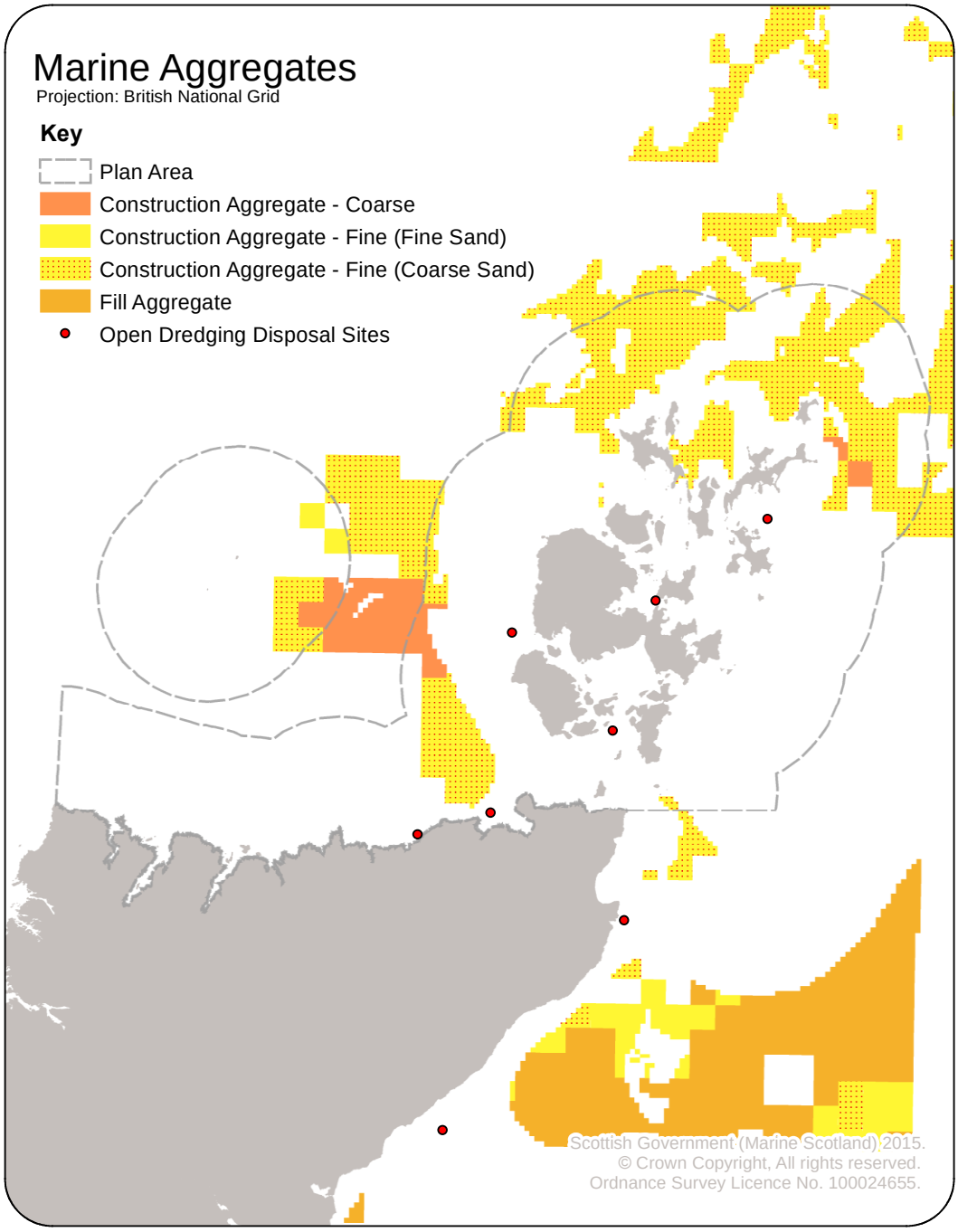
15.9 Data Gaps and Limitations

15.9.1 There is lack of economic information at the PFOW area level. Most data sources that provide regional data have been commissioned on behalf of the sports they pertain to so care must be taken when interpreting these results as methodological issues such as the representativeness of the sample can cause substantial upward bias in the estimates. As mentioned in the tourism section, Marine Scotland have recently commissioned a research project which aims to add greater data coverage to the marine tourism and recreation sector across Scotland, with the PFOW area being used as a case study.

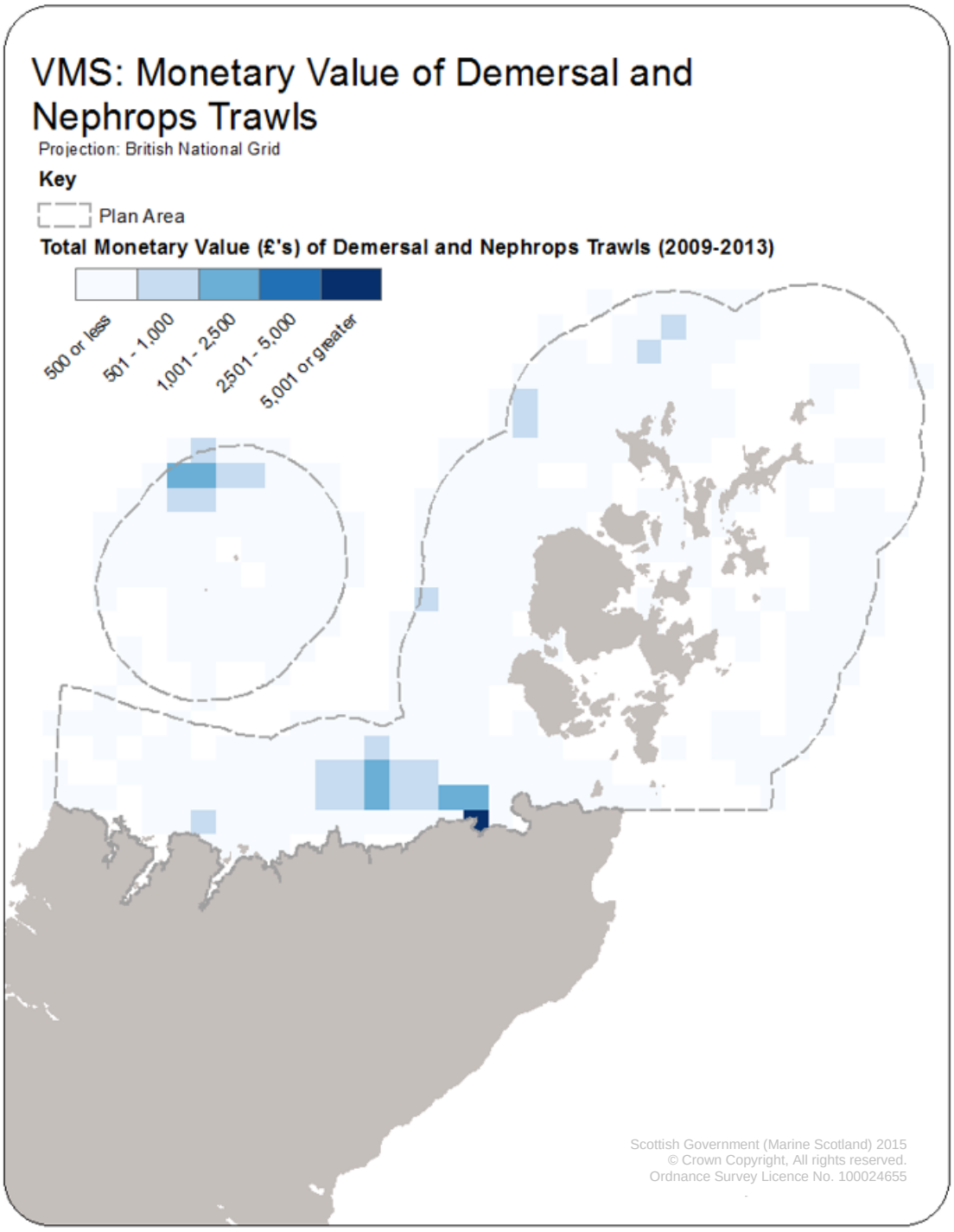
[88] Kenter, J. O. et al., (2013)The value of potential marine protected areas in the UK to divers and sea anglers http://uknea.unep-wcmc.org/LinkClick.aspx?fileticket=Mb8nUAphh%2BY%3D&tabid=82

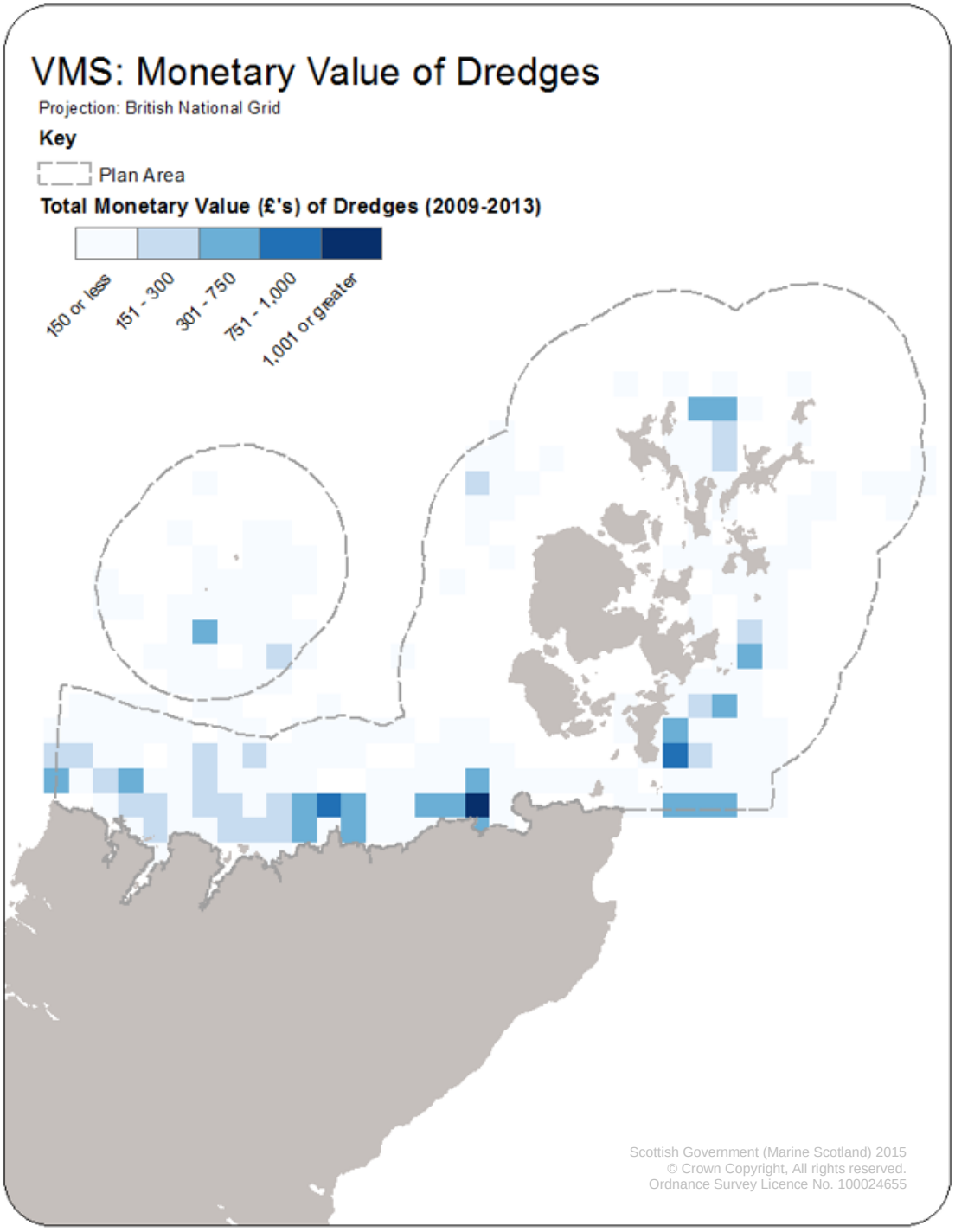
16 APPENDIX

A1 – Marine Aggregates in PFOW area



A2 VMS Monetary Value estimates by gear type for PFOW area (2009-14)




VMS: Monetary Value of Dredges
Projection: British National Grid
Key
Plan Area
Total Monetary Value (£'s) of Dredges (2009-2013)
150 or less
151 - 300
301 - 750
751 - 1,000
1,001 or greater
Scottish Government (Marine Scotland) 2015
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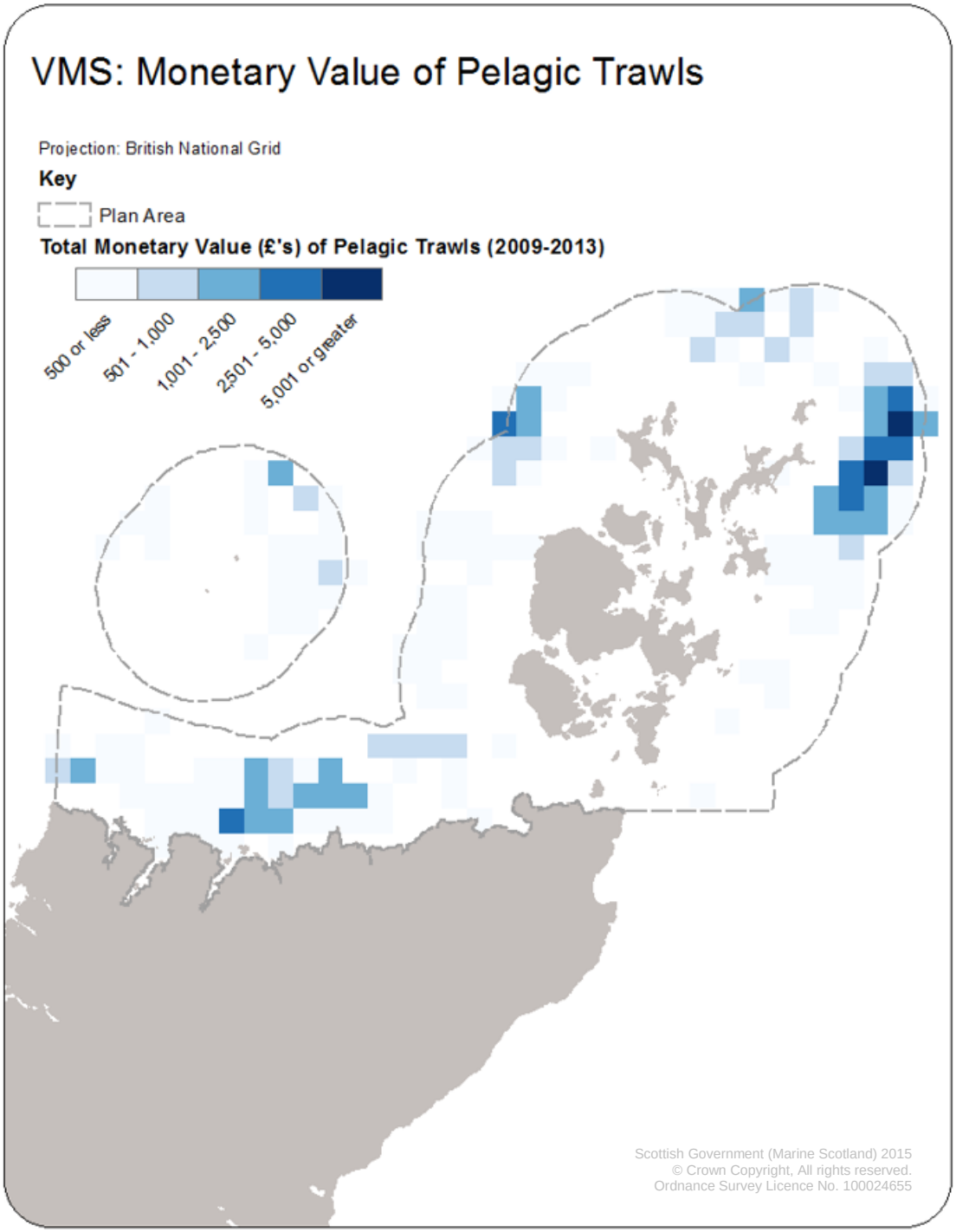
VMS: Monetary Value of Pelagic Trawls
Projection: British National Grid
Key
Plan Area
Total Monetary Value (£'s) of Pelagic Trawls (2009-2013)
500 or less
501 - 1,000
1,001 - 2,500
2,501 - 5,000
5,001 or greater
Scottish Government (Marine Scotland) 2015
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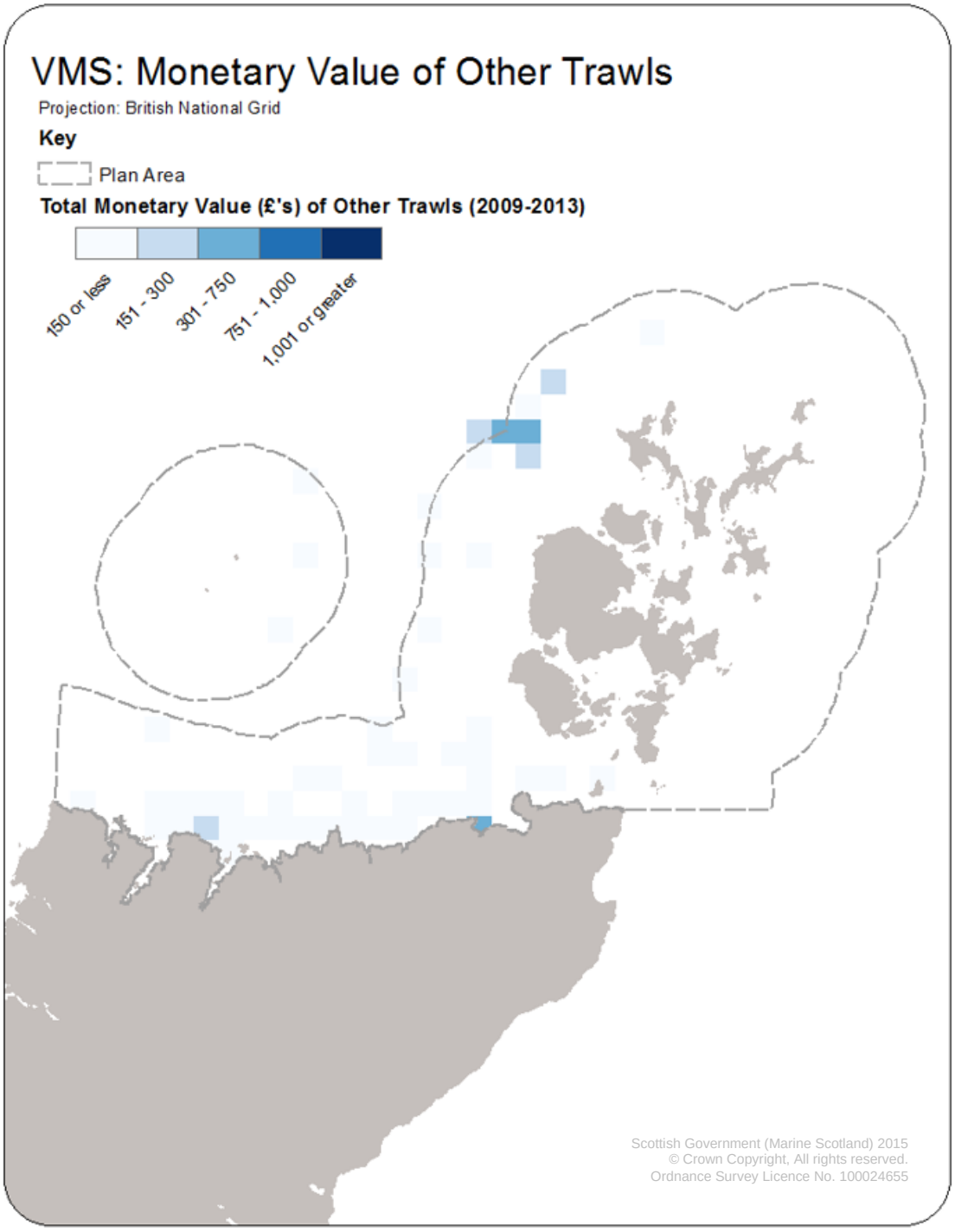
VMS: Monetary Value of Other Trawls
Projection: British National Grid
Key
Plan Area
Total Monetary Value (£'s) of Other Trawls (2009-2013)
150 or less
151 - 300
301 - 750
751 - 1,000
1,001 or greater
Scottish Government (Marine Scotland) 2015
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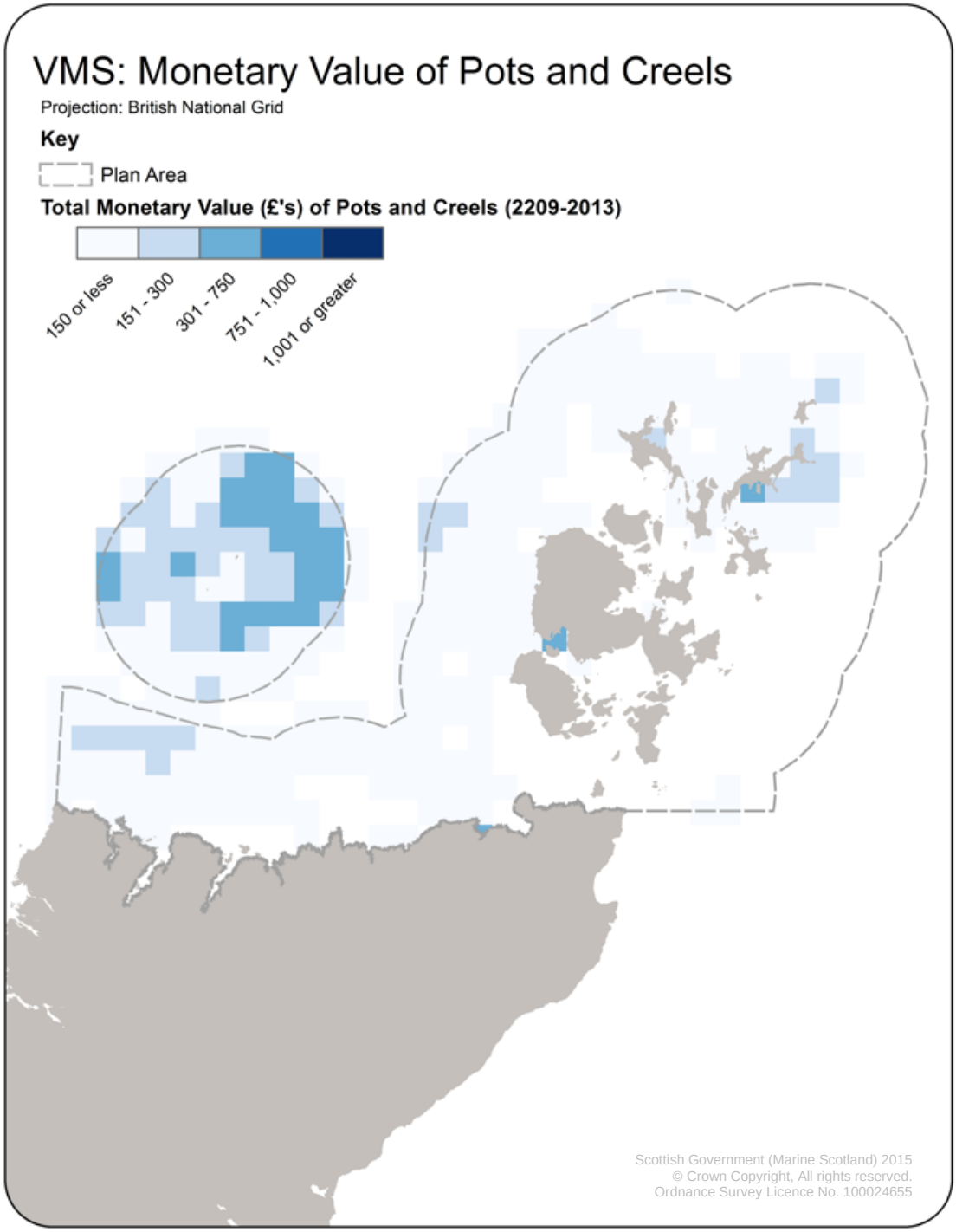
VMS: Monetary Value of Pots and Creels
Projection: British National Grid
Key
Plan Area
Total Monetary Value (£'s) of Pots and Creels (2209-2013)
150 or less
151 - 300
301 - 750
751 - 1,000
1,001 or greater
Scottish Government (Marine Scotland) 2015
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A3 Willingness to Pay Estimates (Kenter et al 2013)

Diver number estimates, Travel costs and Contingent Valuation for 3 pMPAs in Orkney

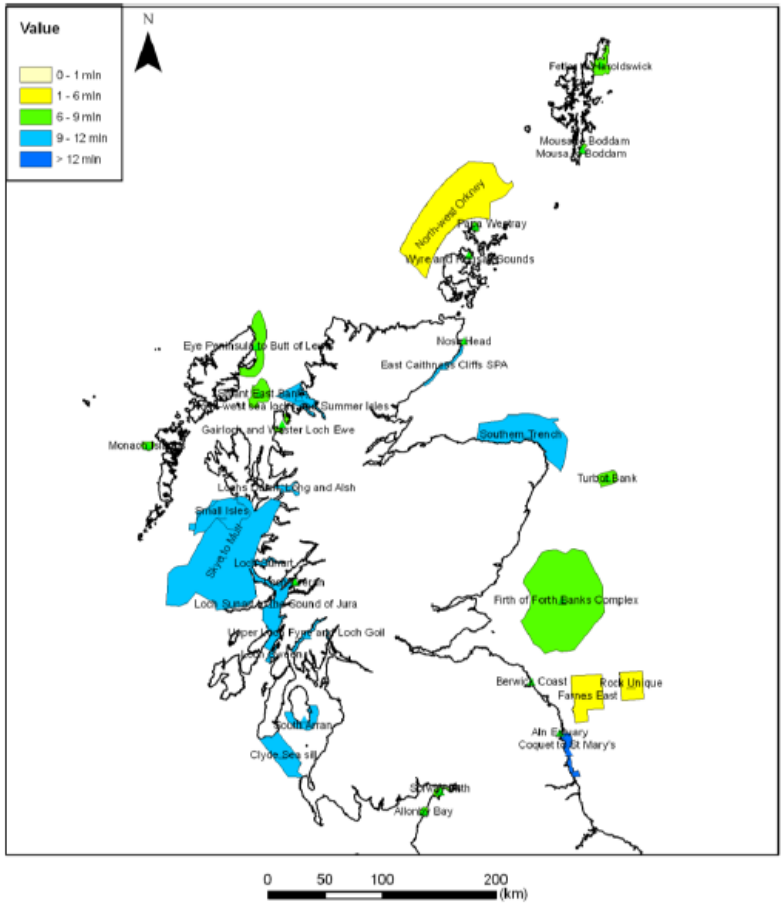
Diver	pMPA	Visitor estimates		Travel cost									Contingent valuation								
	pMPAs within the PFOW	LB: Lower Bound	UB: Upper Bound	Mean Individual WTP	No Restrictions	No Restrictions	No DT	No DT	No DTPG	No DTPG	No DTAM	No DTAM	Mean Individual WTP	No Restrictions	No Restrictions	No DT	No DT	No DTPG	No DTPG	No DTAM	No DTAM
					LB	UB	LB	UB	LB	UB	LB	UB		LB	UB	LB	UB	LB	UB	LB	UB
NOW	North-west Orkney	8	14	50	417	695	417	695	453	754	468	780	4.22	633	1,056	725	1,209	747	1,245	703	1,172
PWY	Papa Westray	1	2	57	77	128	77	128	83	138	85	142	4.87	730	1,216	833	1,389	858	1,429	808	1,347
WYR	Wyre and Rousay Sounds	2	3	56	106	176	106	176	114	190	117	195	4.92	738	1,231	843	1,405	867	1,446	818	1,363
TOTAL		11	19	/	600	999	600	999	650	1082	670	1117		2101	3,503	2,401	4,003	2,472	4,120	2,329	3,882
MEAN		3.66666667	6.333333	54.3333333	200	333	200	333	216.6667	360.6667	223.3333	372.3333	4.67	700.333333	1167.66667	800.33	1334.3	824	1373.333	776.3333	1294

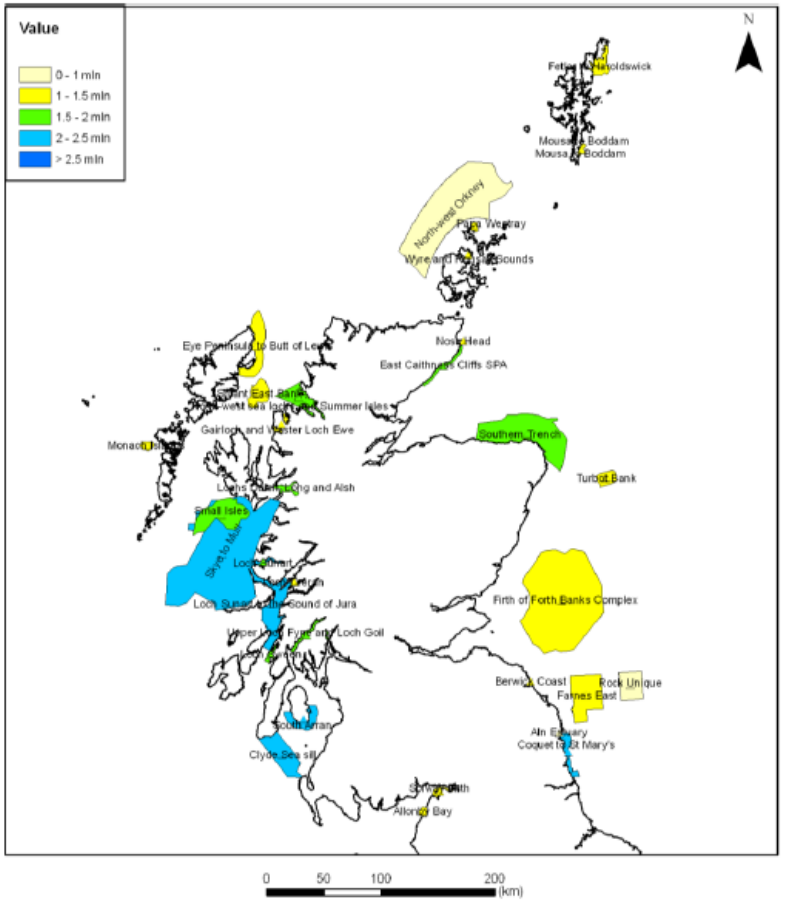
LB: lower bound UB: upper bound
D: dredging T: trawling A: anchoring
M: mooring P: potting G: gillnetting
All figures in £1000s except indiv. WTP in £1, and where indicated m: £millions. - : no visitor estimate.

Angler number estimates, Travel costs and Contingent Valuation for 3 pMPAs in Orkney

Angler	pMPA	Visitor estimates		Travel cost									Contingent valuation								
		LB: Lower Bound	UB: Upper Bound	Mean Individual WTP	No Restrictions	No Restrictions	No DT	No DT	No DTPG	No DTPG	No DTAM	No DTAM	Mean Individual WTP	No Restrictions	No Restrictions	No DT	No DT	No DTPG	No DTPG	No DTAM	No DTAM
					LB	UB	LB	UB	LB	UB	LB	UB		LB	UB	LB	UB	LB	UB	LB	UB
NOW	North-west Orkney	/	/	19	/	/	/	/	/	/	/	/	3.09	3,400	6,181	3,928	7,142	4,053	7,369	3,801	6,910
PWY	Papa Westray	/	/	16	/	/	/	/	/	/	/	/	3.82	4,203	7,643	4,826	8,775	4,974	9,043	4,676	8,502
WYR	Wyre and Rousay Sounds	/	/	16	/	/	/	/	/	/	/	/	3.87	4,256	7,738	4,885	8,882	5,034	9,153	4,733	8,606
TOTAL														11,859	21,562	13,639	24,799	14,061	25,565	13,210	24,018
MEAN				17									3.593333333	3953	7187.33333	4546.33	8266.3	4687	8521.667	4403.333	8006

LB: lower bound UB: upper bound
D: dredging T: trawling A: anchoring
M: mooring P: potting G: gillnetting
All figures in £1000s except indiv. WTP in £1, and where indicated m: £millions. - : no visitor estimate.





Left: Anglers' aggregate willingness to pay (mln £) for protection of sites with no dredging, trawling, potting and gillnetting (highest value scenario) based on a central estimate of total population of UK anglers.

Right: Divers' aggregate willingness (mln £) to pay for protection of sites with no dredging, trawling, potting and gillnetting (highest value scenario) based on a central estimate of total population of UK dive

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