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Marine Scotland

Development of a Deep Sea Marine Reserve West of Scotland

SUSTAINABILITY APPRAISAL

June 2019

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SA of Proposed Deep Sea Marine Reserve

Sustainability Appraisal

June 2019

Report prepared by:

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For:

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1 Introduction

1.1 Background

1.1.1 The Scottish Government has made a long-term commitment to ensuring the sustainable management of the marine environment by balancing the competing interests of use and protection of the sea. This has included developing and implementing a coherent network of Marine Protected Areas (MPAs) to benefit the conservation of vulnerable and characteristic marine species and habitats in Scottish waters. The designation of MPAs is a high policy priority and fulfils duties in domestic and European legislation, as well as contributing to wider UK and international networks of protected areas.

1.1.2 The deep seas around Scotland are home to some of the most vulnerable habitats and species on earth[1,2]. A deep sea marine reserve is proposed for designation to prevent the further decline of these globally threatened habitats and species and facilitate their recovery. This will also protect the range of ecosystem services that deep sea ecosystems provide, including nutrient cycling and carbon storage[3]. When designated, the reserve will complement and form part of Scotland's existing Marine Protected Area (MPA) network.

1.1.3 The proposal for a deep sea marine reserve is intended to build on the EU Deep Sea Fisheries Regulation 2016/2336[4] which bans deep sea trawling in EU waters at depths greater than 800 m and closes vulnerable marine ecosystems to bottom gear fishing at depths greater than 400 m. The use of gillnets and entangling nets are also banned at depths greater than 600 m and restricted at depths between 200 and 600 m, according to EU Regulation 227/2013[5]. These EU Regulations complement other international regulations that ensure emerging extractive activities are appropriately managed in the context of the status of vulnerable habitats and species in deep seas around Scotland.

1.1.4 The proposed location for a deep sea marine reserve has not yet been finalised. Three boundary options for the proposed reserve are being

[1] Scottish Government (2011). Scotland's Marine Atlas: Information for The National Marine Plan. Deep Sea Habitats. Available at: https://www2.gov.scot/Publications/2011/03/16182005/49 (accessed 20/11/2018).

[2] JNCC (2012). Nature News Issue 27: Winter 2012. Improving our understanding of deep sea marine habitats. Available at: http://jncc.defra.gov.uk/page-6038 (accessed 20/11/2018).

[3] Hanley, Nick; Hynes, Stephen; Patterson, David; and Jobstvogt, Niels (2015). "Economic Valuation of Marine and Coastal Ecosystems: Is it currently fit for purpose?" Journal of Ocean and Coastal Economics: Vol. 2, Article 1. DOI: http://dx.doi.org/10.15351/2373-8456.1014

[4] Regulation (EU) 2016/2336 of the European Parliament and the Council of 14 December 2016 establishing specific conditions for fishing for deep sea stocks in the north-east Atlantic and provisions for fishing in international waters of the north-east Atlantic and repealing Council Regulation (EC) No 2347/2002. Available at: https://ec.europa.eu/fisheries/better-future-eu-deep-sea_en (accessed 14/11/2018)

[5] Regulation (EU) No 227/2013 of the European Parliament and of the Council of 13 March 2013 amending Council Regulation (EC) No 850/98 for the conservation of fishery resources through technical measures for the protection of juveniles of marine organisms and Council Regulation (EC) No 1434/98 specifying conditions under which herring may be landed for industrial purposes other than direct human consumption. Available at: https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A32013R0227 (accessed 21/11/2018)

considered by Marine Scotland based on advice from the Joint Nature Conservation Committee (JNCC) and Marine Scotland Science (MSS). These comprise the Faroe Shetland Reserve (FSR) (Area 1), the West of Scotland Reserve (WSR) (Area 2) and a combination of both options (Areas 1 and 2). These areas are shown on Figure 1. Whilst the reserve builds on the deep sea fisheries closures it would include the whole water column and not just the waters below 800 metres.

1.1.5 It is anticipated that a deep sea marine reserve would be underpinned by designating it as an MPA under the Marine and Coastal Access Act 2009. Sites designated in this manner are protected by provisions in s125 and 126 of the Act which places legal duties on public authorities not to put protected features at significant risk through their decision making. In addition, s140 provides general protection against intentional or reckless damage or destruction. Although a number of fishing activities are already banned or restricted in deep sea areas by existing EU Regulations, the establishment of an MPA will ensure that vulnerable deep sea habitats and species are protected from other activities that do not currently take place but that may occur in the future (e.g. deep sea mining).

1.1.6 The proposal to designate a deep sea marine reserve as an MPA is the subject of this Sustainability Appraisal, summarising the results of the Strategic Environmental Assessment[6] (SEA) and Socio Economic Impact Assessment[7] (SEIA).

[6] Scottish Government, (2019) Proposed Deep Sea Marine Reserve: Strategic Environmental Assessment, Environmental Report. June 2019.

[7] Marine Scotland (2019) Socio-Economic Impact Assessment for Proposed deep sea marine reserve, June 2019.

1.2 Sustainability Appraisal

1.2.1 The Marine and Coastal Access Act 2009 (Schedule 6 s10) requires that "a marine plan authority preparing a marine plan must carry out an appraisal of the sustainability of its proposals for inclusion in the plan". Whilst this applies to the statutory marine planning undertaken through the National Marine Plan process, the designation of the deep sea marine reserve as an MPA has also been subject to a Sustainability Appraisal (SA) for consistency in approach and in accordance with Marine Scotland practice.

1.2.2 The SA considers the potential environmental, social and economic effects of the designation of the deep sea marine reserve and potential management scenarios and alternatives to them drawing on information contained in the SEA[8] and SEIA[9]. It ensures that decision-making is informed by relevant environmental and socio-economic information. The SA also provides opportunities for the public to consider this information and use it to inform their views.

1.2.3 The SEA has been undertaken in fulfilment of The Environmental Assessment (Scotland) Act 2005 ("the 2005 Act") which requires that certain public plans, programmes and strategies be assessed for their potential effects on the environment[10].

1.2.4 The SEIA has been undertaken as a matter of Scottish Government policy. The assessment aims to identify and assess the potential economic and social effects of a proposed development or policy on the lives and circumstances of people, their families and their communities. The SEIA investigates the potential cumulative economic benefits and costs, and associated potential social impacts, of designating the deep sea marine reserve and subsequently implementing potential management scenarios.

1.2.5 The findings from both the SEA and the SEIA have been combined to provide an overall SA of the designation of the deep sea marine reserve, to accompany the consultation document. The inputs from the SEA[11] constitute the 'Environment' sections of the SA. The inputs from the SEIA[12] inform the 'Economy and Other Marine Users' and 'People, Population and Health' sections of the SA.

[8] Marine Scotland (2019) Strategic Environmental Appraisal Environmental Report for Proposed deep sea marine reserve, Strategic Environmental Assessment, Environmental Report, June 2019.

[9] Marine Scotland (2019) Socio-Economic Impact Assessment for Proposed deep sea marine reserve, June 2019.

[10] Environmental Assessment (Scotland) Act 2005, asp 15 [online] Available at: https://www.legislation.gov.uk/asp/2005/15/introduction (accessed 04/09/2017)

[11] Marine Scotland (2018) Strategic Environmental Appraisal Environmental Report for Proposed deep sea marine reserve, Strategic Environmental Assessment, Environmental Report, June 2019.

[12] Marine Scotland (2018) Socio-Economic Impact Assessment for Proposed deep sea marine reserve, June 2019.

1.2.6 The views of the public, the Consultation Authorities and the Consultation Bodies on the proposed designation of the deep sea marine reserve and the findings of this SA Report are now being sought.

1.2.7 The remainder of this report is structured as follows:

- Section 2 provides information on the wider MPA network, the proposed designation of the deep sea marine reserve and its policy context;
- Section 3 presents the approach to the SA and the methods used;
- Section 4 sets out the results of the SA; and
- Section 5 considers the next steps.

2 Proposals for a Deep Sea Marine Reserve

2.1 Background

2.1.1 The deep waters of Scotland support a rich diversity of life[13]. Deep sea habitats occur beyond the continental shelf break at depths typically greater than around 200 metres. The inaccessibility of these areas means that research is limited[14]. Although knowledge of these habitats is very patchy and limited, it is growing all the time.

2.1.2 Deep sea habitats are found offshore to the north-east and west of Scotland and comprise cold water coral reefs, coral carbonate mounds, submarine canyons, sea mounts and deep sea sediments. Deep sea habitats and species that are listed as Priority Marine Features (PMFs) include seamount communities, coral gardens, deep sea sponge aggregations, offshore deep sea muds and cold-water coral reefs.

2.1.3 Deep sea habitats can provide spawning, nursery and refuge areas for many fish[15], as well as support a wide range of invertebrates[16]. Cold water coral reefs are slow growing, fragile and easily damaged, and thousands of years of growth can be rapidly destroyed by activities that cause direct physical disturbance of the seabed along with the associated increase in turbidity and subsequent sedimentation. Spawning areas and spawning aggregations of fish present in the deep sea areas of Scotland, for example anglerfish, are vulnerable to targeted fishing[17]. Deep sea fish species for which there is already a zero Total Allowable Catch (TAC), for example Portuguese dogfish, are also vulnerable to bycatch[18].

2.1.4 There is therefore a need to protect these particularly vulnerable habitats and species from activities that currently take place or could take place there in the future, including deep sea mining activities, deep sea oil and gas exploration and development and deep sea fishing.

2.1.5 The MPA network is intended to benefit the marine environment, historic features, coastal communities, marine industries and recreational users[19]. In

[13] Scottish Government (2011). Scotland's Marine Atlas: Information for The National Marine Plan. Deep Sea Habitats. Available at: https://www2.gov.scot/Publications/2011/03/16182005/49 (accessed 03/12/2018).

[14] JNCC website. Nature News 27. Deep sea marine habitats. Available at: http://jncc.defra.gov.uk/page-6038 (accessed 03/12/2018).

[15] Priede, I.G. (2018) Deep sea Fishes Literature Review. JNCC Report No. 619. JNCC, Peterborough. ISSN 0963-8091.

[16] SNH website. Cold water coral. Available at: https://www.nature.scot/landscapes-and-habitats/habitat-types/coast-and-seas/marine-habitats/cold-water-coral (accessed 03/12/2018).

[17] Priede, I.G. (2018) Deep sea Fishes Literature Review. JNCC Report No. 619. JNCC, Peterborough. ISSN 0963-8091.

[18] Ibid.

[19] ibid

total, it consists of 231 sites covering over 22% of Scotland's seas[20]. The network comprises Special Areas of Conservation (SAC), Special Protection Areas (SPAs), Sites of Special Scientific Interest (SSSI) and MPAs, Historic and Demonstration and Research)[21].

2.1.6 MPAs seek to ensure that nationally important marine wildlife, habitats, geology and undersea landforms receive adequate protection against disturbance and degradation. Specifically, they aim to either conserve features or remove pressures in order to allow them to recover. They also contribute to the survival and maintenance of species of international significance by complementing other systems of protection, both spatially and through the alignment of conservation objectives[22]. For example, Scotland's MPAs form part of the wider OSPAR network of marine protected areas that are found across the North East Atlantic[23]. In addition, they contribute to achieving Good Environmental Status (GES) as set out by the Marine Strategy Framework Directive 2008/56/EC[24].

2.2 Designation of the MPA network to date

2.2.1 The Marine (Scotland) Act 2010[25] and the Marine and Coastal Access Act 2009[26] gave Scottish Ministers powers to designate MPAs in Scottish territorial and offshore waters, respectively. To inform this process, the Scottish MPA Project was established to ensure MPAs are designated in the most appropriate locations for their particular objectives. Scottish Natural Heritage (SNH) is responsible for providing advice on MPAs in Scottish territorial waters, while the JNCC advise on possible designations in the offshore environment, including the proposed deep sea marine reserve that is the topic of this assessment[27].

2.2.2 In 2012, SNH and JNCC submitted advice to the Scottish Government on 33 proposed MPAs in both the inshore and offshore environment, as well as four areas of search[28]. The proposals were subject to public consultation in the summer of 2013 as part of Marine Scotland's integrated 'Planning Scotland's

[20] SNH (2017) Nature Conservation Marine Protected Areas [online] Available at: http://www.snh.gov.uk/protecting-scotlands-nature/protected-areas/national-designations/mpas/ (accessed 04/11/2018)

[21] Scottish Government (2017) Marine Protected Areas (MPAs) [online] Available at: http://www.gov.scot/Topics/marine/marine-environment/mpanetwork (accessed 04/11/2018)

[22] Scottish Government (2017) Marine Protected Areas (MPAs) [online] Available at: http://www.gov.scot/Topics/marine/marine-environment/mpanetwork (accessed 04/11/2018)

[23] OSPAR Commission (2015) Marine Protected Areas [online] Available at: https://www.ospar.org/work-areas/bdc/marine-protected-areas (accessed 04/11/2018)

[24] Scottish Government (2011) Marine Protected Areas in Scotland's Seas – Guidelines on the selection of MPAs and development of the MPA network [online] Available at: http://www.gov.scot/resource/doc/295194/0114024.pdf (accessed 04/11/2018)

[25] Scottish Government (2017) Marine (Scotland) Act [online] Available at: http://www.gov.scot/Topics/marine/seamanagement/marineact (accessed 04/11/2018)

[26] Scottish Government (2014) Marine and Coastal Access Act 2009 [online] Available at: http://www.gov.scot/Topics/marine/seamanagement/marineact/ukbill (accessed 04/11/2018)

[27] SNH/JNCC (2012) Commissioned Report No. 547: Advice to the Scottish Government on the selection of Nature Conservation Marine Protected Areas (MPAs) for the development of the Scottish MPA network [online] Available at: http://www.snh.org.uk/pdfs/publications/commissioned_reports/547.pdf (accessed 04/11/2018)

[28] ibid

Seas' process, which sought views on marine planning, Sectoral Marine Plans for offshore renewable energy, MPAs and PMFs[29]. An SEA Environmental Report, which looked at the potential environmental effects of the designations, was among the suite of consultation documents made available at this time[30].

2.2.3 Following on from this consultation and additional advice received from SNH and JNCC[31], 30 of the original 33 prospective MPAs were formally designated by Scottish Ministers in July 2014: 17 in the inshore environment and 13 in the offshore environment.

2.2.4 Draft management measures were subsequently developed and an addendum to the original 2013 Environmental Report was published in November 2014[32]. The Environmental Report addendum and the outputs of additional consultations fed into the finalisation of the first phase of fisheries management measures, which were implemented in early 2016[33].

2.2.5 The SEA of the second phase of management measures commenced in October 2017 and work on both the development of the management measures and the SEA is ongoing. The management measures are expected to come into force in 2019.

2.2.6 In addition to the 30 MPAs designated in 2014, Ministers issued an Order to immediately designate an additional emergency MPA in Loch Carron following damage to the world's largest expanse of flame shell beds from commercial fishing (scallop dredging) in 2017[34]. This designation was temporary and due to expire in 2019[35]. The Loch Carron MPA was permanently designated in May 2019, along with associated fisheries management measures[36],following a public consultation which ran to 13 June 2018[37],

[29] Scottish Government (2015) Planning Scotland's Seas [online] Available at: http://www.gov.scot/Topics/marine/seamanagement/national/marine-consultation (accessed 04/11/2018)

[30] Scottish Government (2013) Planning Scotland's Seas: 2013 - Possible Nature Conservation Marine Protected Areas Consultation Overview - Strategic Environmental Assessment Report [online] Available at: http://www.gov.scot/Publications/2013/08/2591 (accessed 04/11/2018)

[31] SNH (2014) SNH's advice on selected responses to the 2013 Marine Scotland consultation on Nature Conservation Marine Protected Areas (MPAs) [online] Available at: https://www.nature.scot/sites/default/files/2017-07/Publication%202014%20-%20SNH%20Commissioned%20Report%20747%20-%20SNH%27s%20advice%20on%20selected%20responses%20to%20the%202013%20Marine%20Scotland%20consultation%20on%20Nature%20Conservation%20Marine%20Protected%20Areas%20%28MPAs%29.pdf (accessed 04/11/2018)

[32] Scottish Government (2014) MPA/SAC Consultation Environmental Assessment [online] Available at: http://www.gov.scot/Topics/marine/marine-environment/mpanetwork/MPAMGT/consultation2014/ManagementSEA (accessed 04/11/2018)

[33] Scottish Government (2017) Inshore MPAs/SACs [online] Available at: http://www.gov.scot/Topics/marine/marine-environment/mpanetwork/inshorempas (accessed 04/11/2018)

[34] Scottish Government (2018) Protection for world's biggest plan shell bed [online] Available at: https://news.gov.scot/news/protection-for-worlds-biggest-flame-shell-bed (accessed 04/11/2018

[35] SNH (2017) Loch Carron possible MPA [online] Available at: https://www.nature.scot/loch-carron-possible-mpa (accessed 04/11/2018)

[36] Scottish Government (2019). The Loch Carron Marine Conservation Order 2019, made 20 March 2019, coming into force 19 May 2019 https://www2.gov.scot/Resource/0054/00546857.pdf

[37] Scottish Government (2019) The Loch Carron Nature Conservation Marine Protected Area Order 2019, made 20 March 2019, coming into force 19 May 2019. https://www2.gov.scot/Resource/0054/00546856.pdf

2.2.7 A description of these 31 existing inshore and offshore NC MPAs, including their respective protected features and conservation objectives, can be found in Table 1.

2.2.8 In addition to MPAs, Fair Isle was designated in 2016 as a Demonstration and Research MPA under the Marine (Scotland) Act 2010[38]. There are also eight historic MPAs (HMPAs) that are designated for nationally important historic assets, predominately shipwrecks[39].

2.2.9 Four additional proposed MPAs (pMPAs) that were initially introduced for consideration as areas of search in 2013 have now been recommended for designation[40]. These pMPAs would extend protection to basking shark, minke whale, Risso's dolphin, burrowed mud, shelf banks and mounds, and shelf deeps. Table 2 below provides a description of the four pMPAs, including their general location, proposed protected features, and draft conservation objectives. A Sustainability Appraisal, comprising an SEA and SEIA, is currently being consulted on to inform the designation of these four pMPAs[41].

[38] Marine Scotland (2016) Fair Isle Demonstration and Research MPA Consultation [online] Available at: https://www.gov.scot/Topics/marine/marine-environment/mpanetwork/DandRMPAs/FairIsleDRMPA (accessed 17/11/2018)

[39] Historic Environment Scotland (2016). Scotland's Historic Marine Protected Areas 2016.

[40] SNH (2017) Scottish Marine Protected Areas Project [online] Available at: https://www.nature.scot/professional-advice/safeguarding-protected-areas-and-species/protected-areas/national-designations/marine-protected-areas/scottish-marine-protected-0 (accessed 04/11/2018)

[41] Marine Scotland (2019). Four Additional pMPA Consultation [online] Available at: https://consult.gov.scot/marine-scotland/four-new-marine-protected-areas/.

Table 1 Existing MPAs in Scotland

MPA	Year designated	Protected features	Draft conservation objectives
Inshore			
Loch Sunart	2014	Biodiversity: flame shell beds; northern feather star aggregations on mixed substrata; serpulid aggregations	Conserve
Lochs Duich, Long and Alsh	2014	Biodiversity: burrowed mud, flame shell beds	Conserve
Loch Creran	2014	Biodiversity: flame shell beds	Conserve
		Geodiversity: Quaternary of Scotland	
Small Isles	2014	Biodiversity: black guillemot; burrowed mud; circalittoral sand and mud communities; fan mussel aggregations; horse mussel beds; northern feather star aggregations on mixed substrata; northern sea fan and sponge communities; shelf deeps; white cluster anemones	Conserve
		Geodiversity: Quaternary of Scotland – glaciated channels/troughs, glacial lineations, meltwater channels, moraines, streamlined bedforms	
Wyre and Rousay Sounds	2014	Biodiversity: kelp and seaweed communities on sublittoral sediment; maerl beds	Conserve
		Geodiversity: marine geomorphology of the Scottish shelf seabed	
East Caithness Cliffs	2014	Biodiversity: black guillemot	Conserve
Loch Sunart to the Sound of Jura	2014	Biodiversity: common skate	Conserve
		Geodiversity: Quaternary of Scotland – glaciated channels/troughs	
Monach Isles	2014	Biodiversity: black guillemot	Conserve
		Geodiversity: marine geomorphology of Scottish shelf seabed; Quaternary of Scotland – landscape of areal glacial scour	
Noss Head	2014	Biodiversity: horse mussel beds	Conserve

MPA	Year designated	Protected features	Draft conservation objectives
South Arran	2014	Biodiversity: burrowed mud; kelp and seaweed communities on sublittoral sediments; maerl beds; maerl or coarse shell gravel with burrowing sea cucumbers; ocean quahog aggregations; seagrass beds; shallow tide-swept coarse sands with burrowing bivalves	Recover maerl beds, conserve other features
Fetlar to Haroldswick	2014	Biodiversity: black guillemot; circalittoral sand and coarse sediment communities; horse mussel beds; kelp and seaweed communities on sublittoral sediment; maerl beds; shallow tide-swept coarse sands with burrowing bivalves	Conserve
		Geodiversity: marine geomorphology of the Scottish shelf seabed	
Clyde Sea Sill	2014	Biodiversity: black guillemot; circalittoral and offshore sand and coarse sediment communities; fronts	Conserve
		Geodiversity: marine geomorphology of the Scottish shelf seabed – sand banks; sand ribbon fields; sand wave fields	
Loch Sween	2014	Biodiversity: burrowed mud; maerl beds; native oysters; sublittoral mud and mixed sediment communities	Conserve
Mousa to Boddam	2014	Biodiversity: sandeels	Conserve
		Geodiversity: marine geomorphology of the Scottish shelf seabed	
Papa Westray	2014	Biodiversity: black guillemot	Conserve
		Geodiversity: marine geomorphology of the Scottish shelf seabed – sand wave field	
Upper Loch Fyne and Loch Goil	2014	Biodiversity: burrowed mud; flame shell beds; horse mussel beds; ocean quahog aggregations; sublittoral mud and specific mixed sediment communities	Recover flame shell beds, conserve other protected features
Wester Ross	2014	Biodiversity: burrowed mud; circalittoral muddy sand communities; flame shell beds; kelp and seaweed communities on sublittoral sediment; maerl beds; maerl or coarse shell gravel with burrowing sea cucumbers; northern feather star aggregations on mixed substrata	Recover maerl beds and flame shell beds, conserve other features
		Geodiversity: marine geomorphology of the Scottish shelf bed – banks of unknown substrate; Quaternary of Scotland – glaciated channels/troughs, megascale glacial lineations, moraines; seabed fluid and gas seep – pockmarks; submarine mass movement – slide scars	

MPA	Year designated	Protected features	Draft conservation objectives
Loch Carron	2019	Biodiversity: flame shell beds	Recover
Offshore			
Central Fladen	2014	Biodiversity: burrowed mud	Conserve
		Geodiversity: sub-glacial tunnel valley	
East of Gannet and Montrose Fields	2014	Biodiversity: offshore deep sea muds; ocean quahog aggregations	Conserve
Faroe-Shetland Sponge Belt	2014	Biodiversity: deep-sea sponge aggregations; offshore subtidal sands and gravels; continental slope	Conserve
		Geodiversity: continental slope channels; iceberg plough marks; prograding wedges and slide deposits	
Firth of Forth Banks Complex	2014	Biodiversity: ocean quahog aggregations; offshore subtidal sands and gravels; Shelf Banks and Mounds	Conserve
		Geodiversity: moraines	
Geikie Slide and Hebridean Slope	2014	Biodiversity: burrowed mud (seapens and burrowing megafauna); offshore subtidal sands and gravels; offshore deep-sea muds; continental slope	Conserve
		Geodiversity: slide deposit and slide scars	
Hatton-Rockall Basin	2014	Biodiversity: deep-sea sponge aggregations; offshore deep sea muds	Conserve
		Geodiversity: sediment drifts; polygonal faults	
North-east Faroe-Shetland Channel	2014	Biodiversity: deep-sea sponge aggregations; offshore deep-sea muds; offshore subtidal sands and gravels; continental slope	Conserve
		Geodiversity: range of features representative of the West Shetland Margin Palaeo-depositional, Miller Slide and Pilot Whale Diapirs Key Geodiversity Area	
North-west Orkney	2014	Biodiversity: sandeels	Conserve
		Geodiversity: sand banks, sand wave fields and sediment wave fields	
Norwegian Boundary Sediment Plain	2014	Biodiversity: ocean quahog aggregations (including sands and gravels as their supporting habitat)	Conserve

MPA	Year designated	Protected features	Draft conservation objectives
Rosemary Bank Seamount	2014	Biodiversity: deep-sea sponge aggregations; seamount communities; seamount	Conserve
		Geodiversity: range of features representative of the Rosemary Bank Seamount (and adjacent sea floor) Key Geodiversity Area, including iceberg ploughmark fields, slide scars, sediment drifts, sediment wave fields and the seamount scour moat	
The Barra Fan and Hebrides Terrace Seamount	2014	Biodiversity: burrowed mud (seapen and burrowing megafauna communities); seamount communities; offshore deep-sea muds; offshore subtidal sands and gravels; orange roughy; continental slope; seamounts	Conserve
		Geodiversity: iceberg ploughmark field; prograding wedges; continental slope turbidite canyons; slide deposits; scour moat; continental slope; Hebrides Terrace Seamount	
Turbot Bank	2014	Biodiversity: sandeels	Conserve
West Shetland Shelf	2014	Biodiversity: offshore subtidal sands and gravels	Conserve

Table 2 Characteristics of the four pMPAs

pMPA	Proposed protected feature	Draft conservation objectives
North-east Lewis	Biodiversity: Risso's dolphins; sandeels	Conserve
	Geodiversity: marine geomorphology of the Scottish shelf bed (*longitudinal bedform field*); Quaternary of Scotland (*glaciated channels/troughs, landscape of areal glacial scour, megascale glacial lineations*)	
Sea of the Hebrides	Biodiversity: basking sharks; minke whales; fronts	Conserve
	Geodiversity: marine geomorphology of the Scottish shelf seabed (*Inner Hebrides Carbonate Production Area*)	
Shiant East Bank	Biodiversity: circalittoral sands and mixed sediment communities; Northern sea fan and sponge communities; Shelf banks and mounds	Conserve

pMPA	Proposed protected feature	Draft conservation objectives
	Geodiversity: Quaternary of Scotland (*drumlinoid forms, glacial lineations, iceberg ploughmarks, streamlined bedrock*)	
Southern Trench	Biodiversity: burrowed mud; minke whales; fronts; shelf deeps	Conserve
	Geodiversity: Quaternary of Scotland (*subglacial tunnel valleys and moraines*); Submarine Mass Movement (*slide scars*)	

2.3 Proposed deep sea marine reserve

2.3.1 The Scottish Government's Programme for Scotland 2017-18 included a commitment to 'evaluate options to create a deep sea national marine reserve'. The designation of a deep sea reserve would complement the existing MPA network in Scottish waters and provide a legal framework for the protection of additional deep sea marine habitats and species against emerging threats.

2.3.2 Marine Scotland and JNCC have recently undertaken a scoping exercise to identify the deep sea features of interest and evaluate options for creating a deep sea marine reserve to the north-west and north-east of Scotland in waters deeper than 800 metres[42]. The 'study area' for the potential deep sea marine reserve is divided into two distinct biogeographic areas either side of the Wyville-Thomson Ridge, with different hydrographic and thermal regimes resulting in distinct community types north and south.

2.3.3 Numerous deep sea habitats and species could be appropriate for spatial protection, many of which are already PMFs or correlate with existing PMF descriptions. Features of interest include deep sea sedimentary habitats, specifically the PMFs 'offshore deep sea muds' and 'offshore subtidal sands and gravels', and associated biodiversity, specifically sea pens, including the tall sea pen (*Funiculina quadrangularis*). There are also a number of fish species that are regarded as potential features of designation interest for the proposed large-scale deep sea MPAs[43], such as porbeagle (*Lamna nasus*) and monkfish/anglerfish (*Lophius piscatorius*).

2.3.4 The proposal for a deep sea marine reserve has been informed by the EU Deep Sea Fisheries Regulation 2016/2336[44]. This EU Regulation bans deep sea trawling below 800 metres depth in EU waters and closes vulnerable marine ecosystems below 400 metres to bottom gear fishing. In addition, the use of gillnets and entangling nets are also banned at depths greater than 600 m and restricted at depths between 200 and 600 metres, according to EU Regulation 227/2013[45]. Further, designation of the reserve as an MPA under the Marine and Coastal Access Act 2009 will safeguard the site against disturbance by any future activities, such as deep sea mining.

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[42] Doggett, M., Baldock, B. & Goudge, H. (2018). A review of the distribution and ecological importance of seabed communities in the deep waters surrounding Scotland. JNCC Report No. 625, JNCC, Peterborough, ISSN 0963-8091.

[43] Priede, I.G. (2018) Deep sea Fishes Literature Review. JNCC Report No. 619. JNCC, Peterborough. ISSN 0963-8091.

[44] Regulation (EU) 2016/2336 of the European Parliament and the Council of 14 December 2016 establishing specific conditions for fishing for deep sea stocks in the north-east Atlantic and provisions for fishing in international waters of the north-east Atlantic and repealing Council Regulation (EC) No 2347/2002. Available at: https://ec.europa.eu/fisheries/better-future-eu-deep sea_en (accessed 14/11/2018]).

[45] Regulation (EU) No 227/2013 of the European Parliament and of the Council of 13 March 2013 amending Council Regulation (EC) No 850/98 for the conservation of fishery resources through technical measures for the protection of juveniles of marine organisms and Council Regulation (EC) No 1434/98 specifying conditions under which herring may be landed for industrial purposes other than direct human consumption. Available at: https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A32013R0227 (accessed 21/11/2018)

2.3.5 The proposed designation of a deep sea marine reserve MPA is the subject of this present assessment. The boundary options for a proposed deep sea marine reserve that are being considered by Marine Scotland, informed by advice received from JNCC, are as follows:

- Faroe Shetland Reserve (Area 1);
- West of Scotland Reserve (Area 2); and
- West of Scotland and Faroe Shetland Combined (Areas 1 and 2).

2.3.6 Table 3 below provides a description of the boundary options for a proposed deep sea marine reserve, including proposed protected features and draft conservation objectives. Figure 1 provides a map of the location of the boundary options.

Table 3 Characteristics of the proposed deep sea marine reserve boundary options under assessment

Boundary option	Proposed protected features
Faroe Shetland Reserve (Area 1)	Burrowed mud (including sea pens)
	Deep sea sponge aggregations
	Atlantic-influenced offshore deep sea muds
	Atlantic-influenced offshore subtidal sands and gravels
	Geodiversity features
West of Scotland Reserve (Area 2)	Burrowed mud (including sea pens)
	Coral gardens
	Cold-water coral reefs (including *Lophelia pertusa* reefs)
	Deep sea sponge aggregations
	Atlantic-influenced offshore deep sea muds
	Atlantic-influenced offshore subtidal sands and gravels
	Seamount communities
	Seamounts
	Blue Ling (*Molva dypterygia*)
	Leafscale gulper shark (*Centrophorus squamosus*)
	Gulper shark (*Centrophorus granulosus*)
	Orange roughy (*Hoplostethus atlanticus*)
	Portuguese dogfish (*Centroscymnus coelolepis*)
	Roundnose grenadier (*Coryphaenoides rupestris*)
	Geodiversity features
West of Scotland and Faroe Shetland Combined (Areas 1 and 2)	All features listed above under areas 1 and 2.

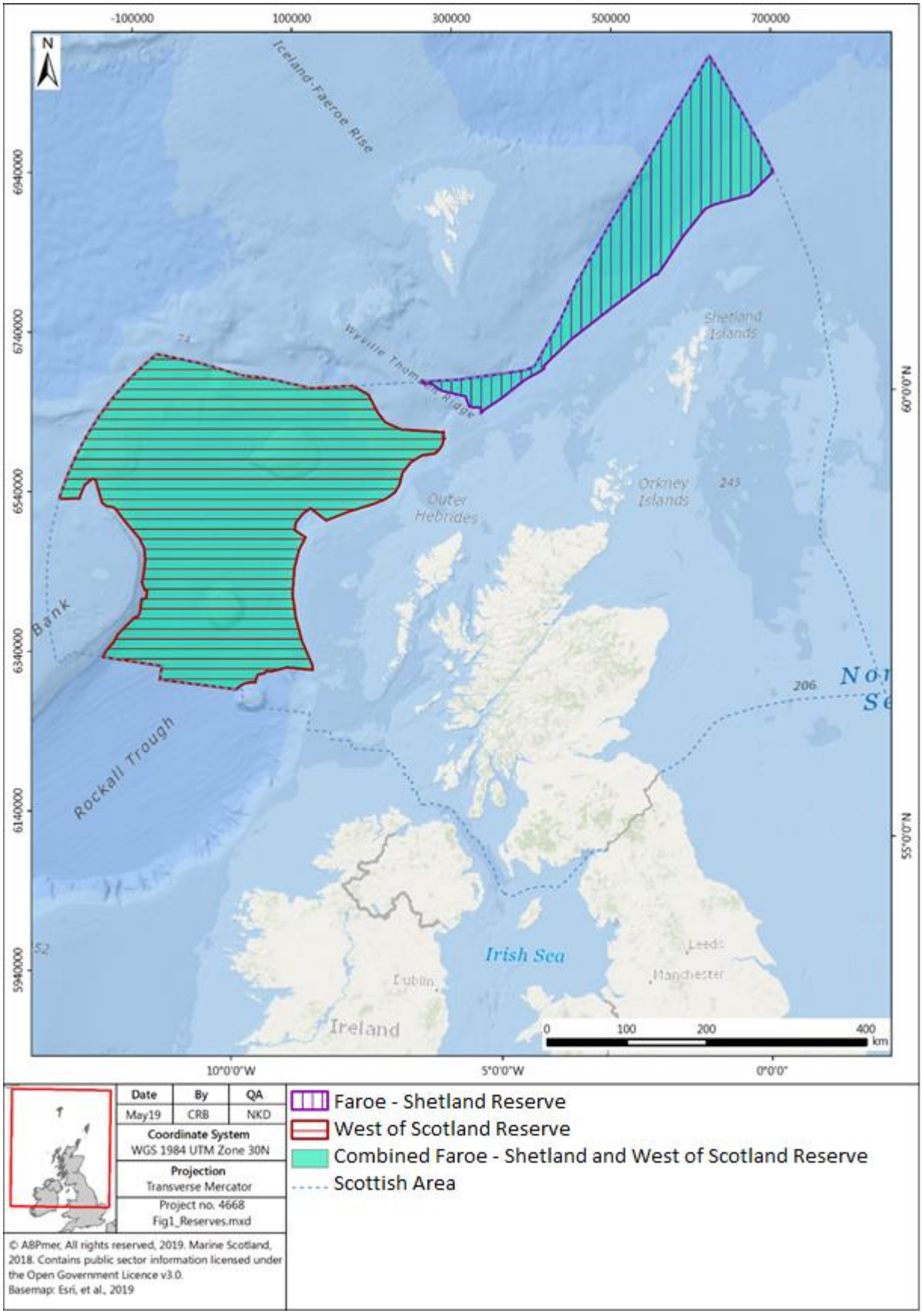

Figure 1 Map of proposed deep sea marine reserve boundary options

2.4 Policy context overview of the pMPAs

2.4.1 The 2005 Act requires Responsible Authorities to define the plan's broader policy context, particularly any relevant environmental protection objectives that will influence the plan's development and implementation.

2.4.2 This section sets out the immediate policy context for the designation of the proposed deep sea marine reserve as an MPA. This policy context is illustrated in Figure 2. Appendix A of the SEA Environmental Report (ER)[46] includes a detailed review of the overarching marine policy objectives and the environmental protection objectives covering the SEA topics that have been scoped into the assessment.

MPA network

2.4.3 NC MPAs are one example of an MPA in Scotland, the others being SACs, SPAs, SSSIs, Historic MPAs, and Demonstration and Research MPAs[47]. The overall MPA network is intended to help protect nationally and internationally important marine wildlife, habitats and underwater geodiversity, while also benefiting the greater marine environment, historic features, coastal communities, marine industries and recreational users[48].

2.4.4 The MPA network fulfils a number of legislative and conservation needs. They are a key element of the Scottish Government's commitment to ensuring the sustainable management of the marine environment and balancing the competing interests of use and protection of the sea. They contribute to progress towards Good Environmental Status (GES) as set out by the Marine Strategy Framework Directive 2008/56/EC[49]. They also form part of the OSPAR Convention network of protected sites found throughout the North East Atlantic Ocean[50]. In addition, they aim to maintain and enhance biodiversity, which is a focus of the Habitats (92/43/EEC)[51] and Birds (2009/147/EC)[52] Directives.

2.4.5 Sites designated as MPAs under the Marine and Coastal Access Act 2009 are protected by provisions in s125 and s126 of the Act which place legal duties on public authorities not to put protected features at significant risk through their

[46] Marine Scotland (2018) Strategic Environmental Appraisal Environmental Report for Proposed deep sea marine reserve, Strategic Environmental Assessment, Environmental Report, June 2019.

[47] Scottish Government (2017) Marine Protected Areas (MPAs) [online] Available at: http://www.gov.scot/Topics/marine/marine-environment/mpanetwork (accessed 17/10/2018)

[48] SNH (2017) Nature Conservation Marine Protected Areas [online] Available at: http://www.snh.gov.uk/protecting-scotlands-nature/protected-areas/national-designations/mpas/ (accessed 17/10/2018)

[49] Scottish Government (2011) Marine Protected Areas in Scotland's Seas – Guidelines on the selection of MPAs and development of the MPA network [online] Available at: http://www.gov.scot/resource/doc/295194/0114024.pdf (accessed 17/10/2018)

[50] OSPAR Commission (2015) Marine Protected Areas [online] Available at: https://www.ospar.org/work-areas/bdc/marine-protected-areas (accessed 17/10/2018)

[51] European Commission (1992) The Habitats Directive [online] Available at: http://ec.europa.eu/environment/nature/legislation/habitatsdirective/index_en.htm (accessed 20/12/18)

[52] European Commission (2009) The Birds Directive [online] Available at: http://ec.europa.eu/environment/nature/legislation/birdsdirective/index_en.htm (accessed 20/12/18)

decision making. In addition, s140 provides general protection against intentional or reckless damage or destruction. Although a number of fishing activities are already banned or restricted in deep sea areas by existing EU Regulations, the establishment of a deep sea marine reserve as an MPA will ensure that vulnerable deep sea habitats and species are protected from other activities that do not currently take place but that may occur in the future (e.g. deep sea mining).

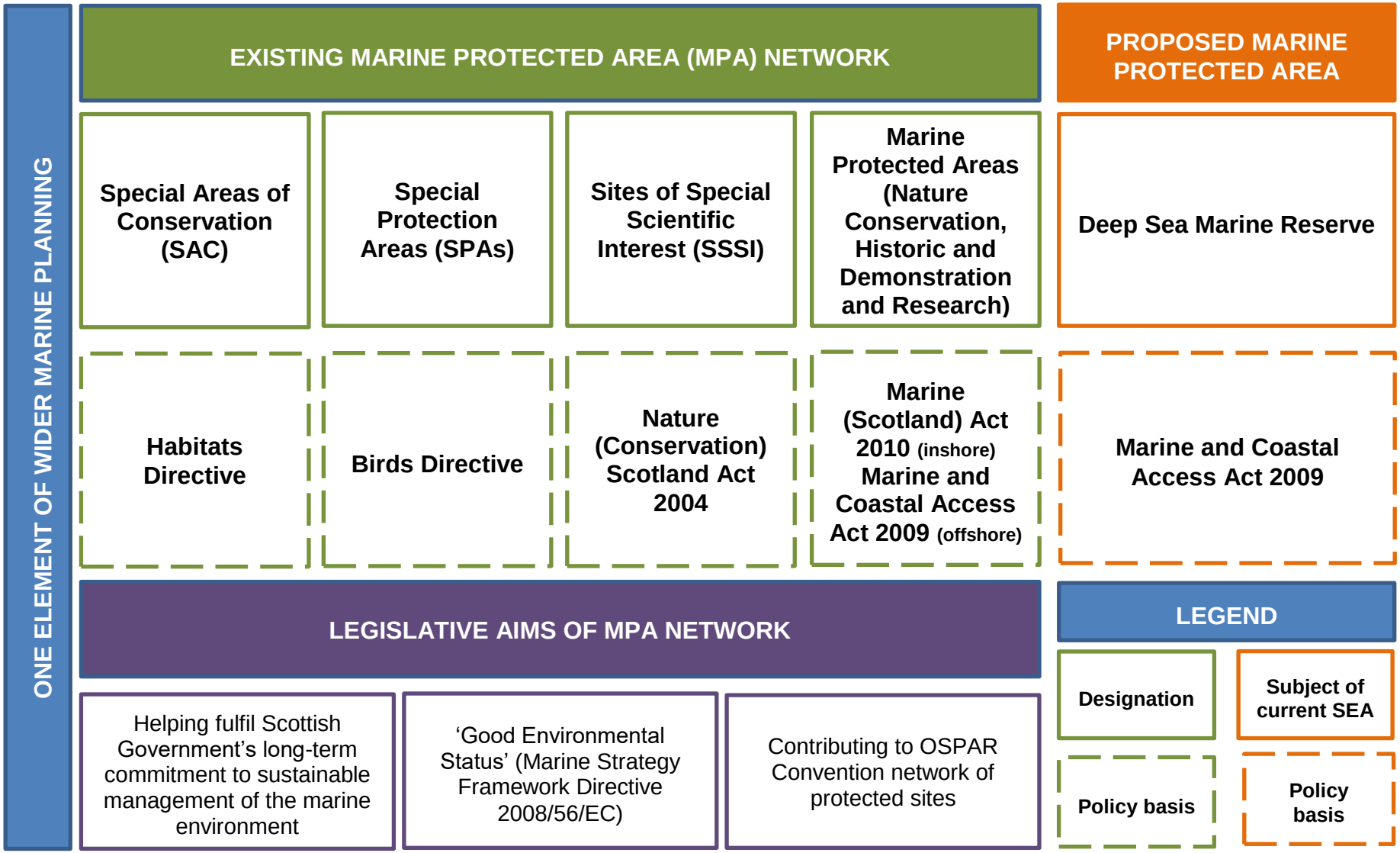

Figure 2 Policy context of the MPA network in Scotland

3 Approach to the Sustainability Appraisal

3.1 Introduction

3.1.1 The following sections set out a brief overview of the processes used in the SEA and SEIA. Full details are provided in the SEA ER[53] and SEIA[54].

3.2 SEA Approach

3.2.1 The SEA has built on the following SEAs of relevant Scottish Government marine conservation work:

- The designation of the first round of NC MPAs (assessed in 2013)[55];
- Proposals for an additional suite of marine SPAs (currently under assessment)[56];
- Phase one (assessed in 2014)[57] and proposals for phase two (currently under assessment) of the implementation of MPA management measures;
- Proposals for four additional nature conservation MPAs (currently under assessment)[58]; and
- Proposals for management measures applying to PMFs (currently under assessment)[59].

3.2.2 The SEA presents a high level and qualitative account of the type and potential magnitude of environmental effects that might be expected to arise from the designation of the deep sea marine reserve alone. The SEA also assessed the potential effects that could arise from the management scenarios that were developed as reasonable alternatives.

3.2.3 The SEA objectives that were developed to reflect the proposed scope of the SEA and the environmental protection objectives are set out in Table 4.

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[53] Marine Scotland, 2018. SEA of deep sea marine reserve, Strategic Environmental Assessment, Environmental Report, June 2019.

[54] Marine Scotland (2018). Socio-Economic Impact Assessment for proposed deep sea marine reserve, June 2019

[55] Scottish Government (2013) Planning Scotland's Seas: 2013 – Possible Nature Conservation Marine Protected Areas Consultation Overview – Strategic Environmental Assessment Report [online] Available at: http://www.gov.scot/Publications/2013/08/2591/0 (accessed 18/10/2018)

[56] Scottish Government (2018) SEA of Marine Proposed Special Protection Areas Strategic Environmental Assessment Environmental Report August 2018. Available at: https://consult.gov.scot/marine-scotland/sea-for-15-proposed-special-protection-areas/supporting_documents/Marine%20SPA%20SEA%20%20Consultation%20document%20%20September%202018.pdf (accessed 18/10/2018)

[57] Scottish Government (2014) Proposals for statutory management measures in Marine Protected Areas and Special Areas of Conservation Environmental Report Addendum. November 2014. Available at: https://www2.gov.scot/Resource/0046/00464215.pdf (accessed 18/10/2018)

[58] Marine Scotland, 2018. SEA of Proposed Marine Protected Areas, Strategic Environmental Assessment, Environmental Report, February 2019.

[59] Marine Scotland (2019). Four Additional pMPA Consultation [online] Available at: https://consult.gov.scot/marine-scotland/four-new-marine-protected-areas/.

Table 4 SEA objectives

SEA Topics	SEA Objective
Biodiversity, Flora, and Fauna	▪ To safeguard and enhance marine and coastal ecosystems, including species, habitats, and their interactions; ▪ To maintain and protect the character and integrity of the seabed; ▪ To avoid the pollution of seabed strata and/or bottom sediments; ▪ To avoid pollution of the coastal and marine water environment; ▪ To maintain or work towards achieving 'Good Environmental Status' of water bodies; and ▪ To preserve and enhance existing marine carbon stocks and carbon sequestration potential.
Soil	▪ See Biodiversity, Flora, and Fauna.
Water	▪ See Biodiversity, Flora, and Fauna.
Climatic Factors	▪ See Biodiversity, Flora, and Fauna.

3.2.4 Information about the existing marine environment was used to inform the assessment and define the SEA objectives. The assessment identified the individual and collective effects of the proposals on a number of topics scoped into the SEA, specifically Biodiversity, Flora and Fauna, Soil (geodiversity), Water (the ecological status of water bodies) and Climatic Factors (carbon cycling, storage and sequestration). In order to recognise the interlinkages of these SEA topics, these were collectively given consideration under the overarching Biodiversity, Flora and Fauna topic.

3.2.5 The SEA identified positive and negative effects, including 'cumulative' effects. The scope of any potentially significant environmental effects was largely limited to beneficial effects for species and habitats that fall within the deep sea marine reserve or regularly use them; spillover benefits beyond site boundaries; and potential adverse effects outwith the deep sea marine reserve as a result of the displacement of activities and the intensification of activities in areas where they already occur. Consideration was also given to the potential for increased fishing effort in the deep sea marine reserve from other gear types that are not targeted by any potential future management measures.

Reasonable alternatives

3.2.6 In accordance with the 2005 Act, there is a requirement to consider reasonable alternatives as part of the SEA. Within this report, the different boundary options (Faroe Shetland Reserve, West of Scotland Reserve and both areas combined) form one set of reasonable alternatives. In addition, the different ways in which the proposed deep sea marine reserve might be managed in the future to support the achievement of site conservation objectives are considered reasonable alternatives. As part of the development of the proposal

for a deep sea marine reserve, Marine Scotland has developed lower, intermediate and upper scenarios for managing pressures/activities within the proposed deep sea marine reserve options:

- Lower Scenario: Existing fisheries management and consenting processes;
- Intermediate Scenario: No extractive activities that affect the seabed (e.g. demersal fisheries, oil and gas development, deep sea mining, etc.); and
- Upper Scenario: No extractive activities that affect the seabed or the water column (e.g. demersal and pelagic fisheries, oil and gas exploration and development, deep sea mining, etc.).

3.2.7 These management scenarios will be considered as reasonable alternatives for each of the potential boundary options for a designated deep sea marine reserve (see Table 7).

3.2.8 These management scenarios are provided for indicative purposes and do not constrain future decisions or represent the final management measures that may be adopted by the Scottish Government for individual sites. Any specific management measures that are subsequently required to meet the conservation objectives of the deep sea marine reserve will be subject to further consideration under the 2005 Act.

3.3 SEIA Approach

3.3.1 The SEIA methodology applied built on previous marine socio-economic assessments for MPAs, particularly the assessment of Scottish NC MPAs[60], the assessment of phase 2 fisheries management measures in NC MPAs[61], and the assessment of four new NC MPAs[62]. It is consistent with Better Regulation Executive guidance on impact assessment, the Green Book methodology[63] for economic assessment and Scottish Government guidance on Business and Regulatory Impact Assessment (BRIA)[64].

3.3.2 The methodology sets out:

- General project assumptions;
- Establishing a baseline against which impacts can be assessed;
- Assessment of costs and benefits for each site; and

[60] Marine Scotland, 2013. Planning Scotland's Seas: 2013 - The Scottish Marine Protected Area Project – Developing the Evidence Base tor Impact Assessments and the Sustainability Appraisal Final Report.

[61] Marine Scotland, 2018. Proposed Inshore MPA/SAC Fisheries Management Measures – Phase 2. Socio-Economic Impact Assessment. October 2018. Report prepared by ABPmer & eftec for the Scottish Government.

[62] Marine Scotland, 2019. SEIA of Proposed Marine Protected Areas. Socio-Economic Impact Assessment. January 2019. Prepared by ABPmer & eftec for Marine Scotland.

[63] HM Treasury, 2018. The Green Book. Central Government Guidance on Appraisal and Evaluation. Available at: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/685903/The_Green_Book.pdf

[64] https://beta.gov.scot/publications/bria-guidance/.

- Combined assessment.

Collation and preparation of baseline information

3.3.3 A range of baseline information was collated, including:

- The distribution of biodiversity features within the potential deep sea marine reserve areas;
- The distribution and intensity (number of locations/volume/value) of human activities within and adjacent to the pMPAs and how this might change over the assessment period (in the absence of the intervention); and
- Information on ecosystem service values associated with the marine environment and how these may change over the assessment period (in the absence of the intervention).

Biodiversity and geodiversity features

3.3.4 JNCC has undertaken thorough literature reviews of the seabed communities[65] and deep sea fisheries[66], of the two areas being considered for designation. Rather than reproducing this work in detail, a summary of the relevant baseline information to support the SEA is presented in the SEA. The reports are both publicly available and can be referred to for further detail if required.

3.3.5 These data sources were used to develop a best understanding of the spatial distribution of the biodiversity and geodiversity features for which each site is being proposed.

Human Activities

3.3.6 Relevant data on the spatial distribution and intensity of marine activities occurring within and adjacent to the sites was collated within ArcGIS. This included the following scoped-in activities:

- Commercial Fisheries;
- Military Interests;
- Oil and Gas (including exploration, production, interconnectors, gas storage);
- Power Interconnectors;
- Seabed Mining; and
- Telecom Cables.

3.3.7 Other sectors were also considered but were scoped out of the assessment and not taken forward in the SEIA. This was either due to there being no overlap with existing or proposed activity (e.g. aquaculture, marine aggregate

[65] Doggett, M., Baldock, B. & Goudge, H. (2018). A review of the distribution and ecological importance of seabed communities in the deep waters surrounding Scotland. JNCC Report No. 625, JNCC, Peterborough, ISSN 0963-8091.

[66] Priede, I.G. (2018) Deep sea Fishes Literature Review. JNCC Report No. 619. JNCC, Peterborough. ISSN 0963-8091

extraction, energy generation), or no management would be required for the sector (e.g. aviation, ports and harbours, recreational boating, tourism).

3.3.8 The baseline took account of possible changes in the distribution and intensity of human activity over the time period of the assessment to provide a dynamic baseline. This drew on previous work to develop a dynamic baseline for the MPA assessment[67]. In considering potential future development activity, various assumptions were made, and these are documented in Appendix A of the SEIA report[68].

Quantification of Potential Impacts (Costs and Benefits)

3.3.9 Lower, intermediate and upper estimates have been developed to assess the potential range of impacts, which reflect a range of possible management options that may be applied. The management scenarios have been developed for the purposes of the SEIA and SEA assessments by Marine Scotland and are set out above. They do not anticipate final advice on management measures, nor do they reflect the management measures that may be adopted by the Scottish Government. The assumptions used for each sector and each estimate are documented in Appendix C of the SEIA[69]. Impacts have been assessed for the lower, intermediate and upper scenarios compared to the 'do nothing' option, i.e. not to proceed with the proposed designations.

3.3.10 All the methods generally entail making estimates of the cost of implementing management scenarios and/or the impact of implementing the management scenarios on operating revenues. Consistent unit costs have been used within most marine activity sectors as a basis for estimating these impacts, although it is recognised that the actual costs that may be incurred by specific activities within individual areas may be higher or lower than these 'average' values.

3.3.11 For some sectors, there may also be impacts associated with delays in consenting as a result of the designations or impacts on investor confidence, and opportunity costs for activity foregone where scenarios preclude the presence of activities within the proposed reserve areas. However, it has not been possible to quantify these potential impacts as it is not possible to predict whether or where they might occur. It is recognised that these costs could potentially be large for some sectors and possibly larger than some of the costs that have been quantified.

3.3.12 Where possible, impacts have been quantified in monetary terms, with these values converted to 2019 prices using the relevant Gross Domestic Product (GDP) deflators. Where impacts on economic activities have the potential to give rise to a change in the level of output, direct and indirect impacts on Gross Value Added (GVA) and employment have been estimated using appropriate

[67] Marine Scotland, 2013. Planning Scotland's Seas: 2013 - The Scottish Marine Protected Area Project – Developing the Evidence Base tor Impact Assessments and the Sustainability Appraisal Final Report.

[68] Marine Scotland (2018). Socio-Economic Impact Assessment for Proposed deep sea marine reserve, June 2019.

[69] ibid

multipliers. This is only the case for the fisheries sector, which is the only sector for which the management scenarios have the potential to affect output through loss of landings.

3.3.13 Following a decision to designate the deep sea marine reserve, costs may be incurred by the public sector in the following broad areas, although not all measures listed will be needed at all sites, i.e. these requirements are site-specific:

- Preparation of Marine Management Schemes;
- Preparation of Statutory Instruments;
- Site monitoring; and
- Regulatory and advisory costs associated with licensing decisions and review of consents.

3.3.14 The social impacts generated by the proposed management scenarios will be strongly connected to the nature, scale and distribution of the economic impacts (on both income and employment). Any significant change in employment, for example generated as a result of restrictions on fishing activity, can have significant social impacts (e.g. on health, crime). Economic and social impacts have been assessed through a distributional analysis.

3.3.15 In assessing the impacts on ecosystem services, the SEIA provides a qualitative description of the potential changes in ecosystem service provision associated with the implementation of indicative management measures to support the achievement of conservation objectives for individual features. The analysis of changes to ecosystem services has considered both on-site and off-site positive and negative impacts of management scenarios.

3.3.16 For further detail on the SEIA methodology see the full SEIA report[70].

[70] Marine Scotland (2018). Socio-Economic Impact Assessment for Proposed deep sea marine reserve, June 2019.

4 Results of the Sustainability Appraisal

4.1 Environment

Environmental Effects

4.1.1 The designation of a deep sea marine reserve in Scottish waters is likely to have significant environmental effects on the environment. The initial designation only of either Faroe Shetland Reserve (FSR), the West of Scotland Reserve (WSR), or both, without further management, will not directly exclude activities from the reserve, however it will support the development of more effective Environmental Impact Assessments (EIAs).

4.1.2 EIAs are required to be undertaken on regulated activities such as oil and gas or marine renewables. These assess the significant environmental effects of a project, including on current and proposed nature conservation sites such as pMPAs. The designation of the deep sea marine reserve as an MPA will provide developers with a better understanding of the species and habitats that need to be protected. This greater clarity and confidence will help to ensure that developers undertake more effective EIAs for future developments. This in turn may reduce pressures associated with regulated activities in the deep sea marine reserve. This is particularly the case for features that are not currently protected (e.g. Atlantic-influenced offshore deep sea muds and Atlantic-influenced offshore subtidal sands and gravels).

4.1.3 Alternatively, developers may look to avoid progressing consented developments that have not been built and re-locating regulated activities away from the deep sea marine reserve as they will require further assessment and the consideration of appropriate mitigation measures. The avoidance of the proposed reserve by potentially harmful activities would therefore result in future environmental benefits within the deep sea marine reserve.

4.1.4 In addition to the potential benefits afforded by the designation of the reserve described above, the manner in which the site is managed to ensure that the conservation objectives for the protected features are achieved has the potential to result in significant environmental changes. The effects of the various management scenarios that have been developed by Marine Scotland for each of the potential boundary options for a designated deep sea marine reserve (see Section 3.2) are considered as a part of the reasonable alternatives assessed below.

4.1.5 In generic terms, any management measures that might be implemented in the future have the potential to result in overall beneficial effects on the overarching topic Biodiversity, Flora and Fauna and contribute to the achievement of the SEA objectives where these target specific activities and pressures that currently, or might in the future, occur within the deep sea

marine reserve. In turn, these may also result in the potential for marginal spillover benefits beyond boundaries of the reserve. For example, avoiding certain harmful activities in sensitive areas may result in the potential spillover of species from protected areas into unprotected areas if there is a population surplus and the carrying capacity of the protected area is surpassed[71,72]. The implementation of management measures may, however, result in the potential displacement of an activity and its associated pressures outwith the boundaries of the deep sea marine reserve resulting in potential adverse environmental effects in other areas, where such activities are not managed. It is also possible that management measures targeting specific fishing activities could result in increased levels of non-targeted fishing activities within the reserve although this is considered unlikely and as such, the effect is considered negligible.

4.1.6 The following sections assess the effects of designating either the FSR or the WSR. The potential impact of the de-designation of current MPAs where these overlap with the deep sea marine reserve options are also considered. Where current MPAs are already considering management measures, there is potential for a negative effect from the non-implementation of these measures as a result of the de-designation of the site. Whilst this is a potential effect from the designation of the deep sea marine reserve, it is recognised that it is likely in the medium term, that similar management measures will be identified and implemented for the deep sea marine reserve, and hence these effects will only be realised in the short term.

Faroe Shetland Reserve

4.1.7 Within the FSR the increased protection that will result from the designation of the deep sea marine reserve will provide potential long term environmental benefits for the overarching topic Biodiversity, Flora and Fauna and contribute to the achievement of the SEA objectives (Table 5), by supporting more effective EIA as described above.

4.1.8 As part of the designation of the deep sea marine reserve, the overlapping nature conservation MPAs are expected to be de-designated, specifically the majority of the North East Faroe Shetland Channel MPA. Proposals are currently under consideration for the implementation of management measures to exclude some demersal fisheries in the North East Faroe Shetland Channel MPA[73]. The de-designation of this MPA could prevent the implementation of these management measures. Therefore, it is recognised that the designation of the deep sea marine reserve without further

[71] Buxton, C.D., Hartmann, K., Kearney, R. and Gardner, C., 2014. When is spillover from marine reserves likely to benefit fisheries?. PloS One, 9(9), p.e107032.

[72] Kerwath, S.E., Winker, H., Götz, A. and Attwood, C.G., 2013. Marine protected area improves yield without disadvantaging fishers. Nature Communications, 4, p.2347.

[73] JNCC, 2014. Scottish MPA Project, Management Options Paper, North East Faroe Shetland Channel Nature Conservation Marine Protect Area. Available at http://jncc.defra.gov.uk/pdf/North-east_Faroe_Shetland_Channel_Management_Options_Paper_v4_0.pdf

management measures has the potential to lead to less management at this MPA, and as such is likely to have a negative effect on the environment within the current North East Faroe Shetland Channel MPA boundary, which covers approximately two thirds of the FSR area. The magnitude of this negative effect cannot be determined within this assessment but will be proportional to any positive impacts that result from the North East Faroe Shetland Channel MPA management measures.

4.1.9 The effects of potential management scenarios that have been developed by Marine Scotland and identified as reasonable alternatives within the FSR are discussed below.

Table 5 Impact on SEA objectives: Faroe Shetland Reserve

SEA objective	Met/ not met	Rationale
1. To safeguard and enhance marine and coastal ecosystems, including species and habitats, and their interactions	Yes	Protection of marine species and habitats within the deep sea marine reserve could contribute to the achievement of this objective by minimising or avoiding the disturbance and/or damage of marine species and habitats.
2. To maintain and protect the character and integrity of the seabed	Yes	Protection of marine species and habitats within the deep sea marine reserve could contribute to the achievement of this objective by reducing or preventing destruction of the seafloor.
3. To avoid the pollution of the seabed strata and/or bottom sediments	Yes	Protection of marine species and habitats within the deep sea marine reserve could contribute to the achievement of this objective by reducing or preventing the potential disturbance and re-settling of sediment-bound contaminants and reducing contamination from regulated activities e.g. oil and gas activities.
4. To avoid the pollution of the coastal and marine water environment	Yes	Protection of marine species and habitats within the deep sea marine reserve could contribute to the achievement of this objective by reducing disturbance of the seabed and potential for increased suspended sediment levels and sediment-bound contaminants in the water column and reducing contamination from regulated activities e.g. oil and gas activities.
5. To maintain or work towards achieving 'good environmental status' of water bodies	Yes	Protection of marine species and habitats within the deep sea marine reserve could contribute to the achievement of this objective by minimising or avoiding pressures that could result in a change to quality elements used to assess environmental status under the Marine Strategy Framework Directive (MSFD).

SEA objective	Met/ not met	Rationale
6. To preserve and enhance existing marine carbon stocks and carbon sequestration potential	Yes	Protection of areas that include habitats that are blue carbon sinks due to their fixation and sequestration ability could contribute to the achievement of this objective by reducing or preventing damage of these habitats.

West of Scotland Reserve

4.1.10 Within the WSR the increased protection that will result from the designation of the deep sea marine reserve will provide potential long term environmental benefits for the overarching topic Biodiversity, Flora and Fauna and contribute to the achievement of the SEA objectives (Table 6), by supporting more effective EIA as described above.

4.1.11 As part of the designation of the deep sea marine reserve, the overlapping nature conservation MPAs are expected to be de-designated, specifically Rosemary Bank MPA. Proposals are currently under consideration for the implementation of management measures to exclude demersal fisheries in the Rosemary Bank MPA[74]. The de-designation of this MPA could prevent the implementation of these management measures. Therefore, it is recognised that the designation of the deep sea marine reserve without further management measures has the potential to lead to less management at this MPA, and as such is likely to have a negative effect on the environment within the current Rosemary Bank MPA boundary. The magnitude of this negative effect cannot be determined within this assessment but will be proportional to any positive impacts that result from the Rosemary Bank MPA management measures.

4.1.12 The effects of potential management scenarios that have been developed by Marine Scotland and identified as reasonable alternatives within the WSR are discussed below.

Table 6 Impact on SEA objectives: West of Scotland Reserve

SEA objective	Met/ not met	Rationale
1. To safeguard and enhance marine and coastal ecosystems, including species and habitats, and their interactions	Yes	Protection of marine species and habitats within the deep sea marine reserve could contribute to the achievement of this objective by minimising or avoiding the disturbance and/or damage of marine species and habitats.
2. To maintain and protect the character and integrity of the seabed	Yes	Protection of marine species and habitats within the deep sea marine reserve could

[74] JNCC, 2014. Scottish MPA Project, Management Options Paper, North East Faroe Shetland Channel Nature Conservation Marine Protect Area. Available at http://jncc.defra.gov.uk/pdf/North-east_Faroe_Shetland_Channel_Management_Options_Paper_v4_0.pdf

SEA objective	Met/ not met	Rationale
		contribute to the achievement of this objective by reducing or preventing destruction of the seafloor.
3. To avoid the pollution of the seabed strata and/or bottom sediments	Yes	Protection of marine species and habitats within the deep sea marine reserve could contribute to the achievement of this objective by reducing or preventing the potential disturbance and re-settling of sediment-bound contaminants and reducing contamination from regulated activities e.g. oil and gas activities.
4. To avoid the pollution of the coastal and marine water environment	Yes	Protection of marine species and habitats within the deep sea marine reserve could contribute to the achievement of this objective by reducing disturbance of the seabed and potential for increased suspended sediment levels and sediment-bound contaminants in the water column and reducing contamination from regulated activities e.g. oil and gas activities.
5. To maintain or work towards achieving 'good environmental status' of water bodies	Yes	Protection of marine species and habitats within the deep sea marine reserve could contribute to the achievement of this objective by minimising or avoiding pressures that could result in a change to quality elements used to assess environmental status under the MSFD.
6. To preserve and enhance existing marine carbon stocks and carbon sequestration potential	Yes	Protection of areas that include habitats that are blue carbon sinks due to their fixation and sequestration ability could contribute to the achievement of this objective by reducing or preventing damage of these habitats.

Reasonable Alternatives

4.1.13 Further to the potential benefits afforded by the designation of the deep sea marine reserve described above, a detailed assessment of all the potential additional environmental effects that might arise from the lower, intermediate and upper management scenarios that have been identified as reasonable alternatives (see Section 3.2) has been undertaken for each boundary alternative and is included in Appendix C of the SEA. This has included an assessment of the contribution of each management scenario to the achievement of individual SEA objectives. A summary of the overall environmental effects on the overarching topic of Biodiversity, Flora and Fauna is included in Section 4 of the SEA. A full justification for the outcomes of this assessment is provided in Appendix C of the SEA.

4.1.14 The lower management scenario involves the process of designating the deep sea marine reserve, with no further management measures. This scenario is therefore described and assessed above.

Faroe Shetland Reserve

Intermediate Scenario

4.1.15 Under the intermediate scenario, the exclusion of all demersal fishing gears will have a direct impact on currently occurring demersal fishing activities, albeit these currently occur at a low density. There is a very low level of demersal fishing effort within FSR which is close to the boundaries of the site and therefore there is a high likelihood of displacement of effort outwith the deep sea marine reserve. This displacement is into areas of already high density fishing and would form a negligible proportion of fishing on the continental shelf and is therefore not considered to be a significant effect. Where fishing effort is related to foreign fleets there is uncertainty as to the exact gear type deployed but the majority is assumed to be pelagic, therefore it is mostly expected that this fishing would continue under the intermediate scenario.

4.1.16 In addition to the limited benefit described above, there is potential for significant future benefits under the intermediate scenario from the prevention of the establishment of future bottom damaging extractive industry in the deep sea marine reserve.

Upper Scenario

4.1.17 Under the upper scenario, the exclusion of all demersal fishing gears will have the same impacts on the benthic environment and fish populations as those under the intermediate scenario. In addition, the exclusion of pelagic gears, including surrounding nets, midwater trawls and foreign fishing effort, may have some additional benefits on pelagic species within the deep sea marine reserve. It is unlikely, however, to provide additional benefits to the habitats proposed for designation within FSR. Furthermore, it is likely that the majority of pelagic fishing effort excluded will be displaced to other regions outwith the deep sea marine reserve boundary. The overall effect of excluding pelagic fisheries in the wider region is therefore considered to be negligible.

4.1.18 In addition, there is potential for significant future benefits under the upper scenario from the prevention of the establishment of extractive industry in the deep sea marine reserve.

West of Scotland Reserve

Intermediate Scenario

4.1.19 Under the intermediate scenario, the exclusion of all demersal fishing gears will have a direct impact on currently occurring demersal fishing activities,

albeit these currently occur at a low density. Within the WSR this scenario will exclude set netting on George Bligh Bank, which has the potential to have a beneficial impact both on benthic habitat and the fish populations currently targeted by commercial fisheries in the region. The majority of other demersal fishing effort within WSR is close to the boundaries of the site and therefore there is a high likelihood of displacement of effort into shallower water on the continental shelf. This displacement is into an area of already high density fishing and would form a negligible proportion of fishing on the continental shelf and is therefore not considered to be a significant effect. Where fishing effort is related to foreign fleets there is uncertainty as to the exact gear type deployed but the majority is assumed to be pelagic, therefore it is mostly expected that this fishing would continue under the intermediate scenario.

4.1.20 In addition to the benefits described above, there is potential for significant future (long term) benefits under the intermediate scenario from the prevention of the establishment of future bottom damaging extractive industry in the deep sea marine reserve.

Upper Scenario

4.1.21 Under the upper scenario the exclusion of all demersal fishing gears will have the same impacts on the benthic environment and fish populations as those under the intermediate scenario. In addition, the exclusion of pelagic gears, principally UK midwater trawls and foreign fishing effort, may have some additional benefits on pelagic species within the deep sea marine reserve. It is unlikely, however to provide additional benefits to the habitats and species proposed for designation within WSR. Furthermore, it is likely that the majority of pelagic fishing effort excluded will be displaced to other regions outwith the deep sea marine reserve boundary. The overall effect of excluding pelagic fisheries in the wider region is therefore considered to be negligible,

4.1.22 In addition, there is potential for significant future benefits under the upper scenario from the prevention of the establishment of extractive industry in the deep sea marine reserve.

Table 7 Overall assessment of management scenarios

Site name	Management scenario	Assessment
FSR	Lower	The designation of the deep sea marine reserve with no further management measures will have no direct impact on activities currently being undertaken. The designation of the deep sea marine reserve may, however, increase the level of scrutiny applied to developers looking to expand activities which would impact the seabed in the future. The designation will therefore have a **no immediate benefit** with potential for more significant future benefits.
	Intermediate	The designation of the deep sea marine reserve in the FSR and management under the intermediate scenario will exclude a very small amount of UK gears and potentially some foreign fishing gears. However, any benefits from exclusion of activity are likely to be offset by impacts on benthic habitats and fisheries where activity is likely to be displaced. The designation and management in the FSR under the intermediate scenario will also prevent the further development of extractive industry (particularly oil and gas, deep sea mining and demersal fisheries) in the future, providing significant protection to deep sea features. The designation will therefore have a **negligible immediate benefit** with potential for more significant future benefits.
	Upper	The designation of the deep sea marine reserve in the FSR and management under the upper scenario will exclude a very small amount of UK demersal gears, some UK pelagic gear and a more significant volume of foreign fishing gears, potentially both demersal and pelagic. However, any benefits from exclusion of activity are likely to be offset by impacts on benthic habitats and fisheries where activity is likely to be displaced. The designation and management in the FSR under the upper scenario will also prevent the further development of extractive industry (particularly oil and gas, deep sea mining and demersal and pelagic fisheries) in the future, providing significant protection to both deep sea features and pelagic features within the deep sea marine reserve. The designation will therefore have a **minor immediate benefit** with potential for more significant future benefits.
WSR	Lower	The designation of the deep sea marine reserve with no further management measures will have no direct impact on activities currently being undertaken. The designation of the deep sea marine reserve may, however, increase the level of scrutiny applied to developers looking to expand activities which would impact the seabed in the future. The designation will therefore have a **no immediate benefit** with potential for more significant future benefits.
	Intermediate	The designation of the deep sea marine reserve in the WSR and management under the intermediate scenario will exclude set netting around George Bligh Bank and hence reduce pressures on deep sea features, specifically coral gardens.

Site name	Management scenario	Assessment
		The exclusion of demersal trawls and hooks and lines on the edge of the continental shelf slope will have lower impacts, as benefits to benthic habitat and fisheries in this area will be offset by impacts on benthic habitats and fisheries where activity is likely to be displaced into slightly shallower water on the continental shelf. The designation and management in the WSR under the intermediate scenario will also prevent the further development of extractive industry (particularly oil and gas, deep sea mining and demersal fisheries) in the future, providing significant protection to deep sea features. The designation will therefore have a **minor immediate benefit** with potential for more significant future benefits.
	Upper	The designation of the deep sea marine reserve in the WSR and management under the upper scenario will exclude set netting around George Bligh Bank and hence reduce pressures on deep sea features, specifically coral gardens. The exclusion of demersal trawls and hooks and lines, and pelagic fishing gear on the edge of the continental shelf slope will have lower impacts, as benefits to benthic habitat and fisheries in this area will be offset by impacts on benthic habitats and fisheries where activity is likely to be displaced into slightly shallower water on the continental shelf. The designation and management in the WSR under the intermediate scenario will also prevent the further development of extractive industry (particularly oil and gas, deep sea mining and demersal and pelagic fisheries) in the future, providing significant protection to both deep sea features and pelagic features within the deep sea marine reserve. The designation will therefore have a **minor immediate benefit** with potential for more significant future benefits.

Cumulative Effects

4.1.23 There is potential for cumulative effects, both as a result of the combined two boundary areas assessed separately within this report (WSR and FSR), considered to be the third boundary alternative, and with other protected sites or plans and programmes likely to be undertaken in Scottish seas.

Cumulative effects of WSR and FSR boundary areas (Boundary Alternative)

4.1.24 The third boundary alternative is to designate both the WSR and FSR together. This is considered here, as part of the cumulative assessment as the two areas are spatially distinct and have the potential to have interactions and cumulative effects on the wider Scottish marine area.

4.1.25 The two deep sea marine reserve areas have, further to the potential benefits afforded by their designation described above, the potential for additional future benefits under all three management scenarios. There is also the potential for direct immediate benefits under the intermediate and upper management scenarios. The benefits, should both areas be designated, would be additive, as a larger spatial area of habitat would be protected. Whilst deep sea fish are only identified for designation under the WSR, the designation of FSR is also likely to provide some additional benefits to deep sea species in this region.

4.1.26 The designated features vary between the two sites, with offshore deep sponge aggregations identified only in FSR, and a number of deep sea fish only identified in WSR. The designation of both therefore provides for inclusion of a wider range of species and habitats within the wider MPA network.

4.1.27 The designation of either only one, or other area has the potential to displace some fishing activity into the other, and therefore the potentially negative impact of displaced activity is lower under the cumulative scenario where it would be displaced from both areas (and therefore assumed to be away from higher sensitivity habitats), despite the total displaced activity being higher under this scenario. The potential impact of displaced fishing activity is small for UK fleets across both the intermediate or upper scenarios as there is relatively little UK fishing activity in either area. There is, however, greater potential for the displacement of foreign fishing effort, some of which could have the potential to be displaced outwith the deep sea marine reserve, particularly under the upper scenario where pelagic fisheries are excluded from a region. The designation of both areas would therefore protect sensitive deep sea habitat from the displacement of fishing activity.

Cumulative effects of the deep sea marine reserve overlap with potential management measures identified within the current MPA network

4.1.28 Within the boundaries of the deep sea marine reserve there are a number of overlaps with current MPAs, some of which have proposed fisheries management measures. These measures have been assessed separately

and have the potential for cumulative effects with the proposed deep sea marine reserve management measures.

4.1.29 The following areas have been designated and identified for future management:

- North East Faroe Shetland Channel MPA (proposed that use of demersal gears be prohibited in the part of the site where known records of deep sea sponge aggregations are found, falls within the FSR);
- Rosemary Bank MPA (proposed to prohibit all demersal towed and static gears from the MPA, falls within the WSR);
- Anton Dohrn SAC (proposed to prohibit all demersal towed and static gears from the SAC, falls within the WSR and will remain as it is under all scenarios).

4.1.30 It is recognised that the Rosemary Bank MPA would be de-designated in its entirety and boundary of the North East Faroe Shetland Channel MPA would be modified to remove the overlaps with the deep sea marine reserve in the event of the deep sea marine reserve being designated. However, as management measures for these MPAs have been assessed elsewhere, it is more appropriate to consider them cumulatively with the deep sea marine reserve. It is, however, noted that under the lower scenario, the de-designation or modification of the MPAs would lead to less management of these areas than would be taken forwards without the designation of the deep sea marine reserve.

4.1.31 Under the intermediate scenario the proposed management measures for the deep sea marine reserve would be similar to, and overlap with, the management measures for the other designations with demersal gears being excluded from all areas. This includes some UK demersal trawls and hook and line activity around Rosemary Bank MPA. The overall benefits would therefore be greater than those contained in the assessment of the individual MPAs, with larger areas of habitat protected within Scottish Seas as a result of the deep sea marine reserve.

4.1.32 Under the upper scenario, the deep sea marine reserve extends the exclusion of fishing effort to pelagic gear. None of the other designations have proposed the exclusion of pelagic fishing effort, and therefore there is no potential for additional cumulative effects.

<u>Cumulative effects of the deep sea marine reserve within the wider MPA network</u>

4.1.33 The deep sea marine reserve will, together with the wider MPA network and existing protection measures, further benefit the overarching topic of Biodiversity, Flora and Fauna in Scottish waters and contribute to the achievement of SEA objectives.

4.1.34 There may be cumulative adverse effects on the environment from the displacement of fishing activities resulting from previous plans in-combination with the designation and management of the deep sea marine reserve. The previous plans which could lead to cumulative effects and have been assessed are the 30 NC MPAs designated in 2014; the implemented phase 1 measures in inshore MPAs and SACs; the draft (now proposed) SPAs; the proposed phase 2 fisheries management measures in inshore MPAs and SACs; the four proposed MPAs for mobile and benthic features (North-East Lewis, Sea of Hebrides, Shiant East Bank and Southern Trench); the Phase 1 fisheries management measures in MPAs[75] and proposals for Phase 2 fisheries management measures in MPAs.

4.1.35 The NC MPAs and SACs that lie within the proposed deep sea marine reserve area have been taken account of above. Management measures for the NC MPAs that lie adjacent to or in proximity to the proposed deep sea marine reserve area have the potential to result in in-combination impacts on commercial fisheries, and resulting effects on environmental receptors. These are principally beneficial as a result of protection of sensitive species and habitat, with some potential negative effects from cumulative displacement of fishing activity. However, due to the existing restrictions on trawling and netting in deep water, additional impacts on the environment (both beneficial and negative) are expected to be minor or negligible under the intermediate scenario. Under the upper scenario, the impact is mainly on the pelagic sector, and no management measures are anticipated for the pelagic sector in the other designations, therefore there is no cumulative impact.

4.1.36 The Seas off St Kilda and Seas off Foula pSPAs are located on the shelf in proximity to the proposed deep sea marine reserve areas. No management measures have yet been defined for the pSPAs therefore it is not possible to assess the potential for cumulative impacts.

4.2 Economy and Other Marine Users

Commercial fisheries

4.2.1 The proposed management scenarios could result in impacts on GVA as a result of a reduction in output (loss in value of landings), under the intermediate and upper scenarios. The intermediate scenario prohibits all demersal gear (mobile and static), and the upper scenario prohibits all demersal and pelagic gear (mobile and static). Potential impacts to direct GVA for the commercial fisheries sector are summarised in Table 8. The equivalent figures expressed in terms of potential impacts on the annual

[75] Scottish Government (2014) Proposals for statutory management measures in Marine Protected Areas and Special Areas of Conservation Environmental Report Addendum. November 2014. Available at: https://www2.gov.scot/Resource/0046/00464215.pdf (accessed 20/12/18)

value of landings affected are presented in Table 9. These impacts could arise as a result of reduced landings from restrictions to gear types in the proposed deep sea marine reserve under the assessed management options for each area.

4.2.2 The total cost for the combined area of £1.1 million over 20 years (Table 8, intermediate scenario, present value of direct and indirect GVA over 20 years at 2019 prices) is relatively small compared to the GVA of the fishing sector (£296 million annually, 2016[76]). This equates to an annual average value for affected landings of £149,000 per year from the West of Scotland reserve (Table 9), compared to £557 million[77] landings for the Scottish fishing sector as a whole in 2016. The impacts in relation to the value of landings affected by home port and port of landing, are considered in section 4.3.

4.2.3 The estimated impacts on UK vessels are zero under the lower scenario and minor to moderate under the intermediate and upper scenarios respectively. Under the intermediate scenario, the impacts are mainly related to the proposed West of Scotland reserve (impacts from the Faroe-Shetland reserve cannot be disclosed, but are negligible), primarily relating to set nets (which continue to operate in the shallower waters on Rockall Rise) and demersal trawls (which continue to operate along the shelf edge, where the boundary of the proposed reserve crosses into slightly shallower waters above the 800 metres contour in some places).

4.2.4 Under the upper scenario, the impacts arise from both proposed reserve areas, although still mostly from the proposed West of Scotland reserve. The impact is predominantly on the pelagic fishery (midwater trawls, £602,000 of annual landings affected; and 'other gears', £365,000 of annual landings affected – mostly surrounding nets and set nets), together with set nets (£115,000 annual landings). The impact on the pelagic fishery (£850,000 value of annual landings affected) represents 0.5% of the value of annual landings of pelagic species by Scottish vessels to the UK and abroad (£197 million).

[76] Marine Scotland, 2018. Scotland's Marine Economic Statistics. Published by The Scottish Government, October 2018. 77 pages. Available at: https://www.gov.scot/Resource/0054/00542012.pdf. Accessed 22/10/18.

[77] Scottish Government, 2017. Scottish Sea Fisheries Statistics 2016. Available at: https://www.gov.scot/Topics/Statistics/Browse/Agriculture-Fisheries/PubFisheries. Accessed 22/10/2018.

Table 8 Potential GVA impacts to the commercial fisheries sector (direct effect and the combined direct and indirect effect) (present value of total GVA impact, £000s)

Site	Estimate (Direct GVA)			Estimate (Direct + Indirect GVA)		
	Lower	Inter-mediate	Upper	Lower	Inter-mediate	Upper
Faroe-Shetland reserve	0	N.D.	3,180	0	N.D	4,604
West of Scotland reserve	0	1,124	5,646	0	1,628	8,175
Faroe-Shetland and West of Scotland reserve	0	N.D.	8,826	0	N.D.	12,779
N.D. = Value cannot be disclosed, as it relates to the operations of fewer than five vessels. As a result the value for the Faroe-Shetland and West of Scotland reserve also cannot be disclosed.						

Table 9 Potential annual average loss in value of landings for the commercial fisheries sector (£000s, 2019 prices)

Site	Estimate		
	Lower	Intermediate	Upper
Faroe-Shetland reserve	0	N.D.	379
West of Scotland reserve	0	149	621
Faroe-Shetland and West of Scotland reserve	0	N.D.	1,000
N.D. = Value cannot be disclosed, as it relates to the operations of fewer than five vessels. As a result the value for the Faroe-Shetland and West of Scotland reserve also cannot be disclosed.			

4.2.5 Potential direct and indirect impacts on employment for the commercial fisheries sector are summarised in Table 10. These impacts arise as a result of the reduced landings and GVA impacts discussed above, which may have knock-on effects on employment in the catching sector (direct) and the upstream supply chain (indirect).

4.2.6 The total direct and indirect employment impact is between zero and 15 full-time equivalents (FTE), with an expected loss of 2 FTEs under the intermediate scenario. Including induced employment impacts as well, this rises to 2.4 FTEs under the intermediate scenario and 16.4 under the upper scenario.

4.2.7 Impacts mainly arise from the proposed West of Scotland reserve area (2.3 FTE under the intermediate estimate), where the impacts are mostly on set nets followed by demersal trawls, and on vessels registered to North Shields in North East England. Under the upper scenario, the impacts are greater

and are split between the West of Scotland and Faroe-Shetland areas, with the majority from the proposed West of Scotland reserve area. These arise from the pelagic sector – midwater trawls and surrounding nets – followed by set nets and demersal trawls, and include greater impacts in Scotland – in the North East and Shetland.

4.2.8 Impacts on non-UK vessels have not been quantified. The nationalities likely to be most affected are Faroese (28 vessels) and Norwegian (8 vessels) in the Faroe-Shetland reserve (with smaller numbers of French, Dutch, German, Greenland, Danish, Irish, Spanish, Polish and Swedish vessels), and Norwegian (60 vessels), Irish (24 vessels), Faroese (23 vessels) and French (12 vessels) in the West of Scotland reserve (with smaller numbers of Dutch, German, Danish, Spanish, Lithuanian and Polish vessels). If these vessels would normally land to ports in Scotland, there may be knock-on effects on the ports and down-stream supply chains.

Table 10 Potential direct and indirect employment impacts to the commercial fisheries sector (full-time equivalents)

Site	Estimate (Direct and Indirect FTEs)			Estimate (Direct, Indirect and Induced FTEs)		
	Lower	Inter-mediate	Upper	Lower	Inter-mediate	Upper
Faroe-Shetland reserve	0.0	N.D.	5.7	0.0	N.D.	6.2
West of Scotland reserve	0.0	2.3	9.4	0.0	2.4	10.2
Faroe-Shetland and West of Scotland reserve	0.0	N.D.	15.2	0.0	N.D.	16.4
N.D. = Value cannot be disclosed, as it relates to the operations of fewer than five vessels. As a result the value for the Faroe-Shetland and West of Scotland reserve also cannot be disclosed.						

Military activities

4.2.9 Potential quantified cost impacts to military activities at a national level are summarised in Table 11.

4.2.10 The costs are estimated to be the same in each scenario. The costs relate to the need for the Ministry of Defence (MoD) to amend and update its Marine Environment and Sustainability Assessment Tool (MESAT) (and other MoD environmental tools) together with subsequent costs to maintain and comply with these updates. The assessment has been made at a national level because it is not possible to assign these costs to individual site proposals.

4.2.11 Initial revision of MESAT (and other MoD environmental tools) and additions to electronic charting by the Hydrographic Office are estimated to cost £28,000 (at 2019 prices), and this cost would be incurred in 2020. Consideration of MPAs will be undertaken as part of planning for all MoD

maritime activities. It has been estimated that the costs to MoD will be £11,100 per year in the first four years of the assessment period, reducing to £5,600 p.a. from year 5 onwards (at 2019 prices). It may be that these updates can be combined with updates required arising from the designation of other pMPAs at a similar time, and the overall cost may be lower.

Table 11 Potential quantified cost impacts to military activities (present value of total costs over 20 years, £000s)

Site	Estimate		
	Lower	Intermediate	Upper
National assessment	195	195	195
Total	**195**	**195**	**195**

Oil and gas

4.2.12 Potential quantified cost impacts to the oil and gas sector are summarised in Table 12. It has only been possible to quantify cost impacts to the oil and gas industry under the lower scenario, which would relate to additional assessment costs for licensing. These costs are minor, at £63,000 (present value over 20 years at 2019 prices), and mostly arise from the assessed Faroe-Shetland reserve area. However, under the intermediate and upper scenarios, no oil and gas activity would be allowed within the proposed reserve areas, resulting in a (potentially significant) opportunity cost that cannot be quantified.

4.2.13 There is also potential for the oil and gas sector to experience other cost impacts which have not been quantified in this assessment. These include cost impacts associated with any delays in consenting processes and additional costs associated with any future pipeline construction in the proposed reserve areas (under the lower scenario), and deterrent to investment.

Table 12 Potential quantified cost impacts to the oil and gas sector (present value of total costs over 20 years, £000s)

Site	Estimate		
	Lower	Intermediate	Upper
Faroe-Shetland reserve	48	0	0
West of Scotland reserve	14	0	0
Faroe-Shetland and West of Scotland reserve	63	0	0

Power interconnectors and transmission lines

4.2.14 Potential quantified cost impacts to the power interconnectors and transmission lines sector are summarised in Table 13. Cost impacts are only anticipated to occur in relation to the assessed Faroe-Shetland reserve area, related to the proposed IceLink interconnector. The potential quantified costs are associated with the future additional assessment requirements for MPA features to support planning application. The potential quantified costs associated with all scenarios are considered negligible.

4.2.15 There is also potential for the power interconnectors and transmission lines sector to experience other cost impacts which have not been quantified in this assessment. These include cost impacts associated with future as yet unidentified power cable projects, the impact of any delays in consenting processes or deterrent to investment. These cost impacts have the potential to be greater than the quantified cost impacts identified in this assessment.

Table 13 Potential quantified cost impacts to the power interconnectors and transmission lines sector (present value of total costs over 20 years, £000s)

Site	Estimate		
	Lower	Intermediate	Upper
Faroe-Shetland	5	5	5
West of Scotland	0	0	0
Faroe-Shetland and West of Scotland Combined	5	5	5

Seabed Mining

4.2.16 Potential quantified cost impacts to the seabed mining sector are summarised in Table 15. It has only been possible to quantify cost impacts to the seabed mining sector under the lower scenario, which would relate to additional assessment costs for licensing. These costs are negligible, at £3,000 (present value over 20 years at 2019 prices), and arise from the assessed Faroe-Shetland reserve area, as the area in which future mineral extraction is more likely. However, under the intermediate and upper scenarios, no seabed mining activity would be allowed within the proposed reserve areas, resulting in an opportunity cost that cannot be quantified, although there is much uncertainty over the potential for the sector to develop commercially within UK waters.

4.2.17 There is also potential for the seabed mining sector to experience other cost impacts which have not been quantified in this assessment. These include cost impacts associated with future as yet unidentified seabed mining projects, the impact of any delays in consenting processes or deterrent to

investment. However, it is not likely that there will be substantial development of the sector within the timeframe of the assessment.

Table 14 Potential quantified cost impacts to the seabed mining sector (present value of total costs over 20 years, £000s)

Site	Estimate		
	Lower	Intermediate	Upper
Faroe-Shetland reserve	3	0	0
West of Scotland reserve	0	0	0
Faroe-Shetland and West of Scotland reserve	3	0	0

Telecom cables

4.2.18 Potential quantified cost impacts to the telecom cables sector are summarised in Table 15. The identified costs relate to potential replacement of existing telecom cables within the period of impact assessment and the need for assessment of any impacts to protected features.

4.2.19 There is also potential for the telecom cables sector to experience other cost impacts which have not been quantified in this assessment. These include cost impacts associated with future as yet unidentified telecom cable projects, the impact of any delays in consenting processes or deterrent to investment. These cost impacts have the potential to be greater than the quantified cost impacts identified in this assessment.

Table 15 Potential quantified cost impacts to the telecom cables sector (present value of total costs over 20 years, £000s)

Site	Estimate		
	Lower	Intermediate	Upper
Faroe-Shetland reserve	25	25	25
West of Scotland reserve	9	9	9
Faroe-Shetland and West of Scotland reserve	25	25	25

4.2.20 The cost associated with additional assessment is applicable across all three scenarios, and is the same across all three scenarios (£25,000). The telecom cables that cross the proposed West of Scotland reserve also cross the assessed Faroe-Shetland reserve, therefore the impact of the combined area is the same as for the assessed Faroe-Shetland reserve.

Impacts to the Public Sector

4.2.21 Estimated costs to the public sector are shown in Table 16, Table 17 and Table 18, for each boundary option. Potential future monitoring costs comprise the majority of the total public sector costs. Additional costs may be associated with the preparation of statutory instruments for management of fishing activity, the de-designation of existing sites (Rosemary Bank Seamount MPA) and amendments to boundaries of existing MPAs (North-East Faroe-Shetland Channel MPA) and in determining and advising upon licence applications that may affect the proposed sites.

4.2.22 Compliance and enforcement for fisheries, and promotion of public understanding are considered to be part of existing workstreams and extra costs as a result of the MPAs will not apply.

4.2.23 Site monitoring costs are the greatest public sector cost. Costs are relatively higher for the proposed West of Scotland reserve compared to the assessed Faroe-Shetland reserve. There are two reasons for this: West of Scotland reserve requires monitoring of both benthic habitats and deep sea fish communities; and the monitoring costs for benthic habitats in the assessed Faroe-Shetland reserve have been scaled back to account for the fact that two thirds of the site is covered by the North-East Faroe-Shetland Channel MPA which would require monitoring of benthic habitats, therefore there is only an additional marginal cost to extend that monitoring to the full area of the assessed Faroe-Shetland reserve. The monitoring proposals for the proposed reserve areas with deep sea fish features (West of Scotland reserve and Faroe-Shetland and West of Scotland reserve) already envisage the implementation of deep sea fish population monitoring in coordination with the existing deep sea fish surveys, with a marginal additional cost for amendments or additions to haul locations to accommodate monitoring needs for the proposed deep sea marine reserve areas.

Table 16 Potential quantified cost impacts to the public sector by activity (present value of total costs over 20 years, £000s) for assessed Faroe-Shetland reserve

Activity	Quantified Cost Impact		
	Lower Estimate	Intermediate Estimate	Upper Estimate
Preparation of statutory instruments	0	4	4
Changes to designations of existing sites	4	4	4
Site monitoring	749	749	749
Regulatory and advisory costs associated with licensing decisions	8	3	3
Total	**762**	**761**	**761**

Table 17 Potential quantified cost impacts to the public sector by activity (present value of total costs over 20 years, £000s) for proposed West of Scotland reserve

Activity	Quantified Cost Impact		
	Lower Estimate	Intermediate Estimate	Upper Estimate
Preparation of statutory instruments	0	4	4
Changes to designations of existing sites	4	4	4
Site monitoring	2,896	2,896	2,896
Regulatory and advisory costs associated with licensing decisions	2	1	1
Total	**2,903**	**2,906**	**2,906**

Table 18 Potential quantified cost impacts to the public sector by activity (present value of total costs over 20 years, £000s) for proposed Faroe-Shetland and West of Scotland reserve

Activity	Quantified Cost Impact		
	Lower Estimate	Intermediate Estimate	Upper Estimate
Preparation of statutory instruments	0	4	4
Changes to designations of existing sites	8	8	8
Site monitoring	3,646	3,646	3,646
Regulatory and advisory costs associated with licensing decisions	10	3	3
Total	**3,664**	**3,661**	**3,661**

4.3 People, Population and Health

4.3.1 This section summarises the potential distributional and social impacts of the proposed management scenarios that could arise from impacts on other marine activities. It also includes potential costs to government, as these are costs borne by society. More detail on this analysis can be found in the SEIA[78].

4.3.2 This section additionally summarises the review of potential impacts / benefits on ecosystem services.

[78] Marine Scotland (2018). Socio-Economic Impact Assessment for Proposed deep sea marine reserve, June 2019.

Economic Importance of the Commercial Fishing Sector

4.3.3 The designation of the proposed combined deep sea reserve areas is estimated across three scenarios. The lower scenario is estimated to have no significant economic and social impacts on commercial fisheries, and with impacts and other sectors limited to cost impacts related to additional assessment costs for licence applications and updates to the MoD's systems. The intermediate and upper scenarios are estimated to:

- Reduce the average annual value of output landed by the UK commercial fisheries sector by between £0.1 million and £1 million;
- Reduce GVA (direct and indirect) of the UK commercial fisheries sector over the 20-year assessment period by £1.6 million to £12.8 million (present value); and
- Reduce the average employment (mean number of jobs, direct, indirect and induced) of the UK commercial fisheries sector by between 2 and 16 full time equivalents (FTEs).
- Result in a number of non-quantified opportunity costs for sectors that will not be able to operate in the proposed reserve areas (oil and gas, seabed mining), for which the distribution of economic costs and consequent social impacts are not assessed.

4.3.4 The range reflects the different management options and assumptions assessed across the estimates.

Distribution of Economic Costs

4.3.5 The following assessment is mainly based on the intermediate estimate. Significant impacts under the upper estimate are also highlighted, as they represent a worst-case prediction of impacts for decision-makers to be aware of.

4.3.6 Table 19 presents the annual loss of landings affected by region and home port of the vessels affected, providing an indication of where employment impacts may fall. It covers all vessels greater than 12 metres in length. All of the impacts are on over-12m vessels in both the intermediate and upper scenarios. There are no estimated impacts for under-12 m vessels, and no impacts under the lower scenario.

4.3.7 Table 19 shows that:

- In the intermediate scenario, the expected costs of the proposed management scenarios are predominantly on other (non-Scottish) UK ports. It is estimated that over 77% of the total landings lost would be from vessels registered to UK ports outside of Scotland. Losses of landings from vessels registered at Fraserburgh are about 22% of the landings affected under the scenario. Note these totals are not the percentage of landings lost at the respective ports.

- Under the upper scenario, the majority of impacts are felt in the North East region of Scotland (88%), with most losses from vessels registered at Peterhead (49% of total losses under the upper scenario), followed by Fraserburgh (21%) and Lerwick. North Shields accounts for the remainder.

4.3.8 While these ports may bear the greater proportion of the total effects, the significance of impacts depend on their scale relative to the size of the affected port. The impacts per port are calculated as relative to total landings per port, provided by Marine Scotland. The impact on landings is small across all Scottish ports under the intermediate estimate. The highest is Fraserburgh which has less than 0.5% of total landings potentially affected. The employment impacts vary across ports, although they are generally low as a percentage of total employment. In the intermediate scenario, the value of landings potentially lost as a result of the proposed management scenarios represents a very small proportion of total landings by home port for all of Scotland's districts and ports affected. The majority of the impacts on employment under the upper scenario are at Fraserburgh and Peterhead (based on landings affected by registered home port of the vessels). An estimated 10 jobs would be affected in total at these ports, which is 0.5% of the local fishing workforce in Fraserburgh, and 2.1% (7 jobs) in Peterhead.

Table 19 Annual average value (£000) of landings affected by region and home port of vessels affected, 2019 prices

Home Fishing Region/Port		**Scenarios**	
		Intermediate	**Upper**
		Total value of landings affected at port	
North	**North Total:**	**<1**	**<1**
North East	Fraserburgh	N.D.	211
	Peterhead	N.D.	488
	Other	<1	187
	North East Total:	**34**	**885**
West	**West Total:**	**<1**	**<1**
Other UK Ports	**Other UK Ports Total:**	**115**	**115**
	Total	**149**	**1,000**
N.D. = Value cannot be disclosed, as it relates to the operations of fewer than five vessels.			

Consequential Social Impacts

4.3.9 Further potential social impacts in the local communities affected, such as on culture, heritage, crime, health education access to services, or changes to the local environment are not considered likely to occur.

Ecosystem Services Impacts

4.3.10 The ecosystem services changes expected from the proposed management scenarios produce a variety of benefits to people. An attempt can be made to identify the economic value of these benefits. However, much of the valuation evidence available is uncertain, and the evidence base has very significant gaps. When combined with the uncertainties over the levels of ecosystem services changes, this makes accurate valuation of the full benefits of the management scenarios difficult. The timing of realisation of benefits is also uncertain.

Provisioning Services

4.3.11 By their very nature provisioning services are those services most closely tied to the market economy. Goods (fish, shellfish, oil, gas) from marine ecosystems are sold in existing markets and so have a market value: the total value of Scottish fish landings was £560 million in 2017[79]. Such market values do not include the externalities of extracting the good from the ecosystem.

4.3.12 Protection by the proposed management scenarios of features in MPAs that are important for fish and shellfish lifecycles could increase the health and size of stocks. This could benefit commercial fisheries in surrounding areas. However, the actual level of demersal fishing in the proposed deep sea marine reserve areas is very limited and it appears reasonable to assume that the direct impact of protection on current flows of provisioning services would be correspondingly minor.

4.3.13 Other provisioning services are also difficult to quantify. For example, Potts *et al.*[80] identified medicines and blue biotechnology as an important marine service. However, apart from horse mussels, they could only cite expert opinion on the importance of a range of habitats and species for this benefit.

Regulating Services

4.3.14 Marine regulating ecosystem services provide some essential functions. For example, carbon sequestration and storage in the marine environment helps regulate the global climate. Marine regulating services are generally difficult to quantify in scientific terms and therefore are difficult to value in monetary terms.

4.3.15 As discussed above, we lack the data needed to establish any link between changes in management arising from the designation and changes in the regulating services. Some changes could occur, and would likely be positive, through reduced disturbance of sediments and enhanced habitat

[79] Scottish Government (2018). Scottish Sea Fisheries Statistics 2017. Available at: https://www.gov.scot/publications/scottish-sea-fisheries-statistics-2017/

[80] Potts T, Burdon D, Jackson E, Atkins J, Saunders J, Hastings E, Langmead O., 2014. Do marine protected areas deliver flows of ecosystem services to support human welfare? *Marine Policy* 44; 139–148.

protection generally. However, this impact is likely to be limited, in light of the currently low demersal fishing pressures in the areas.

4.3.16 The benefits of protecting the areas against potential future fishing pressures could be significant, but this hypothetical future fishing is speculative.

4.3.17 Consequently, although the UK has official unit values with which we could value carbon sequestration services[81] we lack the physical data to estimate any change in the rate of flow of these services arising as a result of the designation.

Cultural Services

4.3.18 The majority of cultural services from the marine environment are dependent on the quality of the marine environment, which is likely to be enhanced (or is less likely to be degraded) by the proposed management scenarios. However, the extent of this improvement is very hard to predict.

4.3.19 Deep sea sites have essentially no direct recreational activities, however these habitats can support animal populations that are important for recreation, for example whale watching, or fish caught recreationally in shallower waters. While the value of these activities could be enhanced by designation and management if this would result in higher levels of biodiversity and environmental quality for these activities, the proposed changes are not considered likely to have a significant impact on current flows in this respect. They could however protect against future losses.

Recreation and Tourism

4.3.20 The remote, deep nature of the areas under consideration means there are no direct impacts on recreation values. There could be indirect impacts, to the extent that the changes in management might enhance populations of animals that support recreation services – notably whales and dolphins, and perhaps some fish species that could be caught recreationally in shallower waters. The extent of any marginal impact arising from the designation is however likely to be very small.

4.3.21 It should be noted that any socio-economic benefits associated with recreation and tourism will occur in coastal, often remote communities. These communities may be the same as those where many of the costs identified in Section 4.2 occur.

Supporting Services

4.3.22 Supporting services are perhaps the most critical set of services provided by features in MPAs. Supporting services underpin all other ecosystem services, and therefore few studies are able to extract the contribution and therefore value of each ecosystem process. Valuing supporting ecosystem services in general brings a significant risk of double-counting, as they

[81] HMT, 2018. [full ref to be added]

support the provisioning, regulating and cultural services from MPA sites discussed above.

4.3.23 However, as noted above, not valuing supporting services also brings a risk of under-valuing benefits if MPA management measures increase supporting services that give rise to final ecosystem services outside site boundaries, and these values are not captured because the available evidence is applied only to changes in final services inside the boundaries. For example, the support to whale, dolphin and fish populations noted in the previous section, or the provision of habitat and refugia for fish and fish larvae potentially supporting fisheries elsewhere.

4.3.24 Furthermore, since the data are lacking for estimating production functions, in fact there is little risk of double-counting, since we are not able to determine the links between the deep sea and final services with the exception of the direct fisheries service from fishing in the area. This is extremely limited for demersal fishing. It is larger, though still small in the context of fisheries services in general, for pelagic fishing, though the link from this to the sea bed is uncertain and the catches are prevented only in the "upper" protection scenario.

Total Economic Value

4.3.25 For the deep sea, there is very limited evidence on the individual value of different ecosystem services, other than for fisheries. There are, partly as a consequence of the lack of physical data, a few studies that attempt to estimate the total value of the protection of the marine environment. These mostly relate to the whole value of protecting the marine environment via some form of proposed protection measures over a specific area and are therefore in principle rather well suited to the case of designating a MPA and/or excluding damaging activities from all or part of an area.

4.3.26 An international study by Brander *et al.*[82] concluded that the benefits to people of expanding MPAs generally outweighed the costs. They considered the benefits of protection based on a meta-analysis of values. Their meta-analysis function could be used to estimate the benefits of the Scottish MPA network, but not of the proposed management scenarios being assessed.

4.3.27 A study by Gubbay[83] reviewed the evidence for benefits of MPAs set up for the conservation of marine biodiversity. It found that some direct evidence that MPAs can protect and enhance ecosystem services comes from situations where habitats and species protected by MPAs are known to provide specific services. It concluded that highly protected MPAs lead to overwhelming positive effects on biodiversity (i.e. higher densities, biomass, size and diversity of certain species or groups of species). There is some

[82] Brander *et al.,* 2015. The benefits to people of expanding Marine Protected Areas. IVM Institute for Environmental Studies.

[83] Gubbay, S., 2006. Marine Protected Areas. A review of their use for delivering marine biodiversity benefits. English Nature Research Reports, No 688.

evidence of positive species community effects such as greater complexity of food webs and increased primary and secondary productivity in MPAs as a consequence of protection.

4.3.28 Overall there is no way to transfer any of values identified in available literature directly to the current case, other than to observe that they do suggest that the Scottish population hold significant non-use values associated with protection of remote, deep sea environments. This is not based on full understanding of the systems and their services. The values include components of non-use value and of option values for protecting services against uncertain future damage.

4.3.29 In large part, this conclusion is due to the uncertainties in how ecosystem services will change with respect to management measures. The assessment of benefits has focussed on the changes to ecosystem services that are expected to result from the proposed management scenarios. While the sites undoubtedly support a considerable range and value of ecosystem services, evidence on the baseline contribution of the site features to these ecosystem services, and on the expected nature of these changes in scientific or economic terms, is extremely sparse. As a result, the assessment of changes in ecosystem services at individual sites (see Table 9a in Site Reports, Appendix C of the SEIA) is uncertain.

Limitations and Uncertainties in the Assessment

4.3.30 There are limitations and uncertainties data used to underpin assessment of fisheries impacts. Full explanation of the uncertainties is contained within the SEIA. The key limitations and uncertainties are related to: distribution of activity of under-12m vessels from ScotMap; limitations in vessel monitoring system data for over-12m vessels; classification of gear types; extent of displacement of fishing effort rather than loss in the value of landings, and its environmental impacts; potential changes trends in future activity and landings; and changes to fishing patterns in the last five years from implementation of Phase 1 MPA management measures.

4.3.31 A variety of assumptions have been used in order to develop costs to the other sectors. These assumptions have been based, where possible, on available evidence or industry experience, the rationale for which is reported in the SEIA. However, these assumptions introduce limitations in the confidence of the assessments. Specifically, uncertainties in the location and nature of future activity in the marine environment introduce an uncertainty in the estimation of costs and benefits reported.

4.3.32 The application of multipliers to estimate indirect GVA impacts and employment impacts, based on national multipliers applied at a site and gear specific level, introduces some uncertainty and does not account for the potential for reductions in output to be offset by increases in prices due to a reduction in supply.

4.3.33 Within this study, combined effects have been assessed as the sum of the individual impacts on the two sites, which in this case relates to the proposed combined reserve area. The assessment of combined benefits is subject to the same limitations as those identified for the site assessments. However, at this scale, additional evidence on the network value of MPAs is relevant. Due to the unique deep sea ecosystems protected, there are expected to be additional impacts from designation. Furthermore, the sites can cumulatively contribute to the resilience of marine ecosystem services in a way that is greater than the sum of the parts of the network, but there is little if any quantified evidence available to support this.

4.3.34 In general, there is moderate uncertainty on the extent of ecosystem service impacts, although this varies across services. There is high uncertainty in the monetary valuation of these benefits, and robust values are not available to support cost-benefit analysis.

Combined and Cumulative Impacts

Marine Activities

Combined Non-GVA (Cost) Impacts

4.3.35 The proposed Faroe-Shetland and West of Scotland reserve represents the combined impact of the assessed Faroe-Shetland reserve and the proposed West of Scotland reserve. The combined quantified impacts on operating costs (costs which are not expected to affect output and thus not affect GVA) and GVA impacts (impacts which could affect GVA) are presented in Section 4.2 by activity.

4.3.36 The potential total quantified increases in operating costs (non-GVA costs) for the combined reserve (present value over 20-year assessment period at 2019 prices) are estimated to range between £291,000 (lower estimate) and £225,000 (upper estimate) (Table 20). Quantified costs are less in the upper scenario because some activities no longer take place, but there is also an unquantified (potentially significant) opportunity cost.

4.3.37 It has not been possible to quantify a range of other potential cost impacts, such as the cost of uncertainty and delays in the licensing process, and the figures presented therefore represent a partial assessment of cost impacts. In particular, the potential opportunity cost for sectors that would not be able to operate within the proposed reserve areas (oil and gas, seabed mining) under the intermediate and upper scenarios has not been quantified — this results in the intermediate and upper scenarios having a lower cost impact than the lower scenario. The cost impacts of the lower scenario relate to additional assessment costs for marine licences, but in the intermediate and upper scenarios, some activities will not be permitted (e.g. oil and gas exploration, seabed mining), meaning that no licences will be applied for and no additional costs will be incurred.

4.3.38 Most cost impacts are minor, but they vary between sectors. Under the intermediate scenario, the largest costs are estimated to be experienced by the Military sector, related to the cost of amending and updating its Marine Environment and Sustainability Assessment Tool (MESAT) and other Ministry of Defence environmental tools, and additions to electronic charting by the Hydrographic Office. This may overestimate the costs to the Military sector, as these updates may be carried out in conjunction with updates required for other proposed MPAs that may be designated at a similar time to the proposed deep sea marine reserve.

Table 20 Potential total quantified cost impacts by sector (present value of total costs over 20 years, £000s, 2019 prices)

Site	Estimate		
	Lower	Intermediate	Upper
Military activities	195	195	195
Oil and Gas	63	0	0
Power interconnectors and transmission lines	5	5	5
Seabed mining	3	0	0
Telecom cables	25	25	25
Total	**291**	**225**	**225**

Combined GVA Impacts

4.3.39 Table 21 presents information on potential direct and indirect GVA impacts for commercial fisheries, where a change in the value of output (landings) may occur for the commercial fisheries sector. The estimated combined impact on direct GVA for the proposed combined reserve for the commercial fisheries sector varies from £0 (lower estimate), £1.1 million (intermediate estimate) and £8.8 million (upper estimate) (present value, costs discounted over the 20-year assessment period, 2019 prices). These impacts arise as a result of reduced landings from the proposed reserves where fishing effort would be restricted under the assessed management scenarios.

4.3.40 Considering direct and indirect GVA impacts, the total impacts for the proposed combined reserve is a reduction between £0 (lower estimate), £1.6 million (intermediate estimate) and £12.8 million (upper estimate) over the study period. Again, these values are the present value of total impacts over 20 years, and relate to the impacts on commercial fisheries as well as the knock-on impacts on their supply chains (boat building, maintenance etc).

4.3.41 These impacts correspond to a potential loss of jobs of between 0 and 16 full-time equivalents (direct, indirect and induced, lower to upper scenario), with an intermediate estimate of 2 jobs.

Table 21 Potential total GVA impacts by for commercial fisheries (present value of total direct and indirect GVA impact over 20 years, £000s, 2019 prices)

GVA	Estimate		
	Lower	Intermediate*	Upper
Direct GVA	0	1,124	8,826
Direct + Indirect GVA	0	1,628	12,779
* Values for intermediate scenario are those for the West of Scotland reserve only, as the values for Faroe-Shetland cannot be disclosed as they relate to the operations of fewer than five vessels.			

Significance of Combined and Cumulative Impacts on Marine Activities and Regions

4.3.42 This section considers the significance of economic impacts to marine activities and geographic areas taking account of the relative scale of the impacts both on their own and in combination with other marine initiatives, in particular:

- Development of offshore wind farms based on the currently proposed, consented, contracted and under construction wind farms[84];
- Potential future offshore renewables development under the draft plan for wave and tidal energy developments in Scottish waters[85], and the current Areas of Search (AoS) for offshore wind (noting that these will be superseded by new Draft Plan Options during 2019);
- The 30 NC MPAs designated in 2014[86];
- Offshore SACs;
- The implemented phase 1 measures in inshore MPAs and SACs[87,88];
- The impact assessment of the draft (now proposed) SPAs;
- The SEIA of proposed phase 2 fisheries management measures in inshore MPAs and SACs[89]; and
- The SEIA of four proposed MPAs for mobile and benthic features (North-East Lewis, Sea of Hebrides, Shiant East Bank and Southern Trench).

[84] Marine Scotland, 2011. Blue Seas – Green Energy: A Sectoral Marine Plan for Offshore Wind Energy in Scottish Territorial Waters. Part A – The Plan.

[85] Marine Scotland, 2013. Planning Scotland's Seas: Sectoral Marine Plans for Offshore Wind, Wave and Tidal Energy in Scottish Waters - Consultation Draft, July 2013.

[86] Marine Scotland, 2013. Planning Scotland's Seas: 2013 - The Scottish Marine Protected Area Project – Developing the Evidence Base tor Impact Assessments and the Sustainability Appraisal Final Report.

[87] It is recognised that the data used (2012-2016) do not fully take account of changes to fishing patterns as a result of phase 1 MPA measures, therefore it is included in this in-combination assessment and not considered a sunken cost. Due to this the assessment may, therefore under/overestimate impacts.

[88] Marine Scotland Science, 2017. Scotland Marine Protected Areas Socioeconomic Monitoring. 2016 Report. Marine Analytical Unit, Marine Scotland Science, Scottish Government. Available online at http://www.gov.scot/Resource/0051/00514589.pdf. Accessed 19 April 2018.

[89] Marine Scotland, 2018. Proposed Inshore MPA/SAC Fisheries Management Measures – Phase 2. Socio-Economic Impact Assessment. October 2018. Report prepared by ABPmer & eftec for the Scottish Government.

4.3.43 The assessment of management measures for PMFs is ongoing and is yet to be fully consulted upon. In consequence, it is not possible at this stage to determine whether there may be cumulative effects arising from interactions between the designation of a proposed deep sea marine reserve and PMFs, although the first phase of implementation is for inshore PMFs, so interaction is unlikely. This possibility will be assessed by the forthcoming SEIA for the PMF fisheries management measures.

4.3.44 For many of the marine activities, the potential quantified cost impacts associated with the designation of the proposed deep sea marine reserve are minor and will not be significant in their own right or in combination with other initiatives. Commercial fisheries may experience more significant impacts under the upper scenario as a result of designation of the proposed deep sea marine reserve and the cumulative and in-combination impacts for this sector is therefore considered in more detail.

4.3.45 There is potential for cumulative effects on commercial fisheries, particularly with the management of other designations and the potential for restriction on fishing areas due to potential offshore wind Areas of Search and wave Draft Plan Option areas north and east of Lewis, and north of Shetland (Figure 3).

4.3.46 There is potential additional impact on commercial fisheries as a result of management measures in MPAs and SACs that lie within the proposed deep sea marine reserve area. Any additional impact on UK vessels is expected to be minor.

4.3.47 The MPAs and SACs that lie adjacent to or in proximity to the proposed deep sea marine reserve area have the potential to result in in-combination impacts on commercial fisheries, however due to the existing restrictions on trawling and netting in deep water, additional impacts are expected to be minor under the intermediate scenario. Under the upper scenario, the impact is mainly on the pelagic sector, and no management measures are anticipated for the pelagic sector in the other designations, therefore there is no in-combination impact.

4.3.48 The Seas off St Kilda and Seas off Foula pSPAs are located on the shelf in proximity to the proposed deep sea marine reserve. No management measures have yet been defined for the pSPAs therefore it is not possible to assess the potential for in-combination impacts.

4.3.49 The offshore wind Areas of Search[90] are early proposals and likely to be updated in the near future to Development Plan Option areas. The scenarios being considered are for 2, 4 and 8 GW of offshore wind to be developed at national level, whilst the Areas of Search have the capacity to accommodate

[90] Marine Scotland Science, 2018. Scoping 'Areas of Search' Study for offshore wind energy in Scottish Waters, 2018. Available at https://www.gov.scot/binaries/content/documents/govscot/publications/consultation-paper/2018/06/scoping-areas-search-study-offshore-wind-energy-scottish-waters-2018/documents/00536637-pdf/00536637-pdf/govscot%3Adocument.

around 130 GW. There is therefore considerable uncertainty in the location, scale and timing of development within these areas; some areas may not be developed at all, and it is unlikely that large areas within the Areas of Search will be developed during the study period.

4.3.50 Therefore, whilst there is potential for in-combination effects on fisheries, this is considered to be minor.

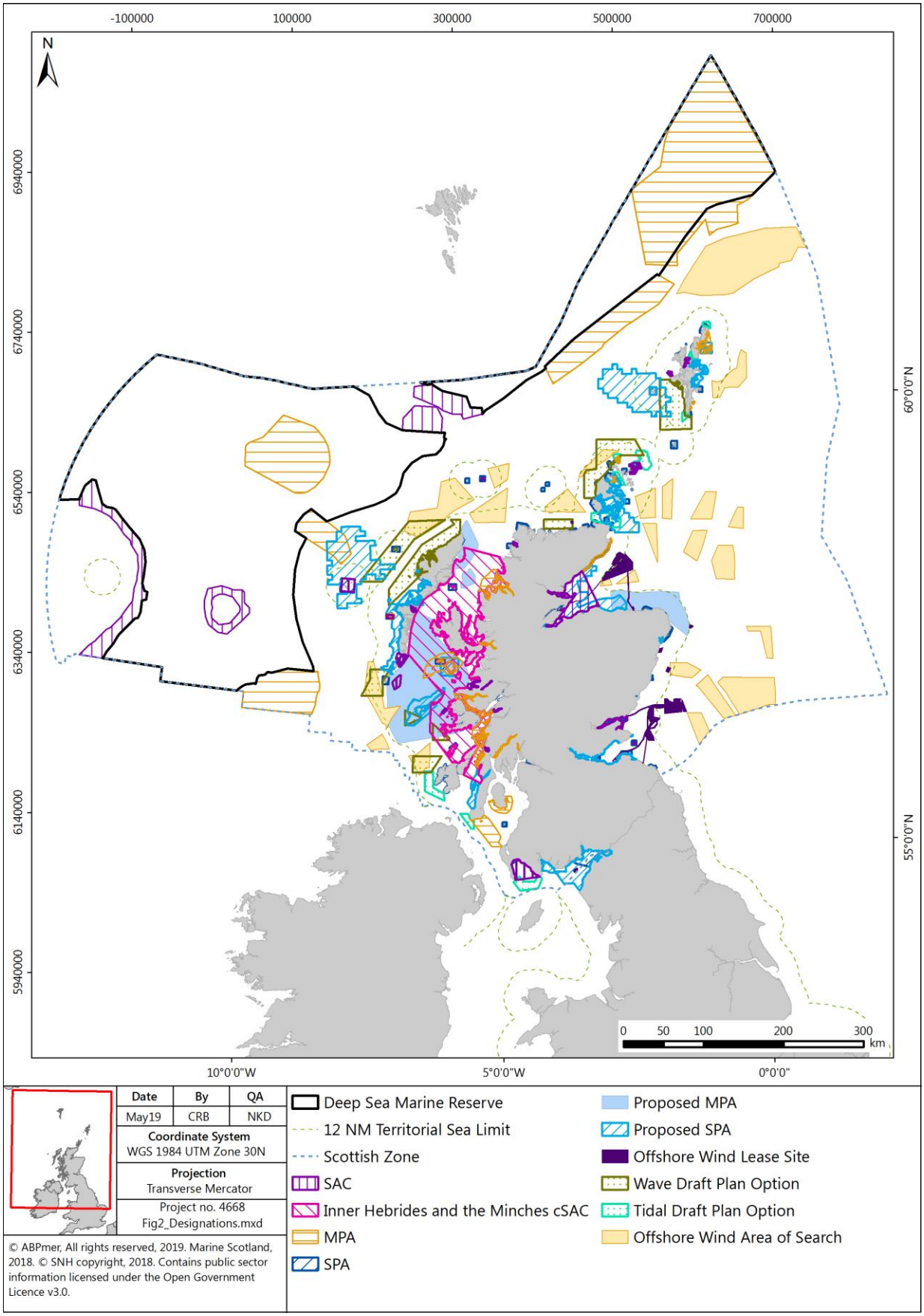

Figure 3 Spatial information on MPAs, SACs and SPAs and sectors with potential for cumulative effects on commercial fisheries

Social Impacts (commercial fisheries)

4.3.51 The two sites (WSR and FSR) are not expected to have significant social impacts, and therefore the combined and cumulative impacts of the combined WSR and FSR site will be similar to the sum of the two sites' impacts. The social impacts are assessed as low.

Public sector

4.3.52 The estimated total costs to the public sector, currently assumed to be centralised and therefore mostly attributed to JNCC and Marine Scotland, are presented in Table 18. Potential future monitoring costs comprise the majority of the total public-sector costs. Additional costs may be associated with the preparation of Management Schemes and in determining and advising upon licence applications within or near to the proposed sites.

4.3.53 The total public sector costs under the intermediate scenario were estimated at around £3.2 million (present value over 20 years (2019 to 2038) at 2019 prices), of which approximately 80% was associated with future monitoring costs of pMPA features.

4.3.54 Should more local management of the sites be pursued, this is considered unlikely to materially change the costs to the public sector but would redistribute costs across a wider range of regulators and authorities.

Potential Benefits

4.3.55 Treating marine protected areas as a collection of individual and separate features providing separate ecosystem services potentially ignores any network effects that could occur from a set of MPAs. A number of adjacent marine reserves may demonstrate network effects, i.e. the benefit from the networks may be greater (or less) than the sum of the benefits from the individual MPAs. Some MPAs will protect replicates of habitats and features, and they may be connected through larval dispersal, thus making the MPA network more resilient to impacts. These effects are potentially of great importance in assessing the benefits of management measures in marine protected areas because of the lack of barriers and mobility of species.

4.3.56 A comparison can be made between the values for designation and management and commercial fisheries costs. The assessment of benefits has focussed on a review of the limited evidence that is available for deep sea ecosystems and services. While the sites undoubtedly support a considerable range and value of ecosystem services, evidence is extremely sparse, and so any assessment of changes in ecosystem services as a result of designation and management of the deep sea marine reserve options is highly uncertain.

4.3.57 The range of valuation evidence available gives indications of which ecosystem services that are impacted by management measures may be valuable to society. The important potential changes include fisheries services, both direct and indirect, climate regulation, and non-use values.

The available evidence does suggest that members of the public are likely to hold non-use values for deep sea protection, associated with the protection of vulnerable species and habitats. The literature does not provide specific value estimates, but do indicate that such values exist and are significant (see Section 7 of the SEIA). It seems highly likely that the average Willingness to Pay (WTP) per household for conservation of the large deep sea areas under consideration would be greater, and possibly substantially greater, than the estimated cost to fisheries, which at approximately £1 million per year in the upper scenario and much less in the others, represents a very small amount per household in Scotland.

5 Next Steps

5.1.1 The consultation on the SEA Environmental Report, SEIA and SA Report is now open. Views and opinions on this are now invited and should be provided by 6 September 2019.

5.1.2 Please respond to the consultation online at: www.scotland.gov.uk/consultations. Access and respond to this consultation online at https://consult.gov.scot/marine-conservation/deep-sea-marine-reserve

5.1.3 Following the consultation period, the responses received will be analysed, and a Post-Adoption Statement will be prepared. The Post-Adoption Statement will explain how issues raised in the assessments, and associated views in response to the consultation, have been addressed.

5.1.4 If you have any enquiries or difficulties accessing these documents please contact: Marine_Conservation@gov.scot

5.1.5 Or send your inquiry by post to:

Marine Conservation
Scottish Government
Area 1A South
Victoria Quay
Edinburgh
EH6 6QQ

Appendix A Abbreviations

Abbreviation	Definition
BRIA	Business and Regulatory Impact Assessment
EC	European Commission
EEC	European Economic Community
EIA	Environmental Impact Assessment
ER	Environmental Report
EU	European Union
FSR	Faroe-Shetland Reserve
FTE	Full-Time Equivalents
GDP	Gross Domestic Product
GES	Good Environmental Status
GVA	Gross Value Added
JNCC	Joint Nature Conservation Committee
MESAT	Marine Environment and Sustainability Assessment Tool
MPA	Marine Protected Area
MSFD	Marine Strategy Framework Directive
MSS	Marine Scotland Science
NC MPA	Nature Conservation MPA
OSPAR	Oslo-Paris Convention
PMF	Priority Marine Features
WSR	West of Scotland Reserve
SA	Sustainability Appraisal
SAC	Special Areas of Conservation
SEA	Strategic Environmental Assessment
SEIA	Socio Economic Impact Assessment
SNH	Scottish Natural Heritage
SSSI	Sites of Special Scientific Interest
TAC	Total Allowable Catch
UK	United Kingdom
WTP	Willingness to Pay