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Conservation and Management Advice

SHIANT EAST BANK POSSIBLE MPA

JUNE 2019

DRAFT

This document provides advice to Public Authorities and stakeholders about the activities that may affect the protected features of Shiant East Bank possible Marine Protected Area (pMPA). It provides advice from Scottish Natural Heritage (SNH) under Section 80 of the Marine (Scotland) Act 2010 to public authorities as to matters which are capable of damaging or otherwise affecting the protected features of MPAs, how the Conservation Objectives of the site may be furthered or their achievement hindered, and how the effects of activities on MPAs may be mitigated. It covers a range of different activities and developments but is not exhaustive. It focuses on where there is a risk to achieving the Conservation Objectives. The paper does not attempt to cover all possible future activities or eventualities (e.g. as a result of accidents), and does not consider cumulative effects.

Further information on marine protected areas and management is available at -

https://www2.gov.scot/Topics/marine/marine-environment/mpanetwork

For the full range of MPA site documents and more on the fascinating range of marine life to be found in Scotland's seas, please visit -

www.nature.scot/mpas or http://www.jncc.defra.gov.uk/scottishmpas

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Contents

1 Overview of document

This document provides details of the Conservation and Management Advice for Shiant East Bank possible Marine Protected Area (pMPA) and it is divided into eight main sections. The introduction in section 2 gives an overview of Shiant East Bank pMPA and its contribution in terms of conservation and wider benefits. Section 3 provides an overview of the roles of the various bodies involved with advising, regulating and managing the marine protected area. Section 4 describes the protected features and their condition and section 5 introduces the Conservation Objectives for the site. Section 6 describes the threats and pressures to which the protected features are sensitive and section 7 provides the management advice for these activities. Section 8 identifies what further research and surveys may be required to increase our understanding of how the protected features utilise the site for which they are designated.

2 Introduction

2.1 Purpose statement

The Shiant East Bank pMPA has been proposed to protect three biodiversity features: circalittoral sands and mixed sediment communities, northern sea fan and sponge communities and shelf banks and mounds as well as the geodiversity feature Quaternary of Scotland. By doing so it contributes to the Scottish, UK and OSPAR MPA networks, the conservation of the wider marine environment around Scotland and progress towards Good Environmental Status. The main purpose of the Shiant East Bank pMPA is to conserve the protected features in favourable condition. This makes a contribution to the OSPAR MPA network in the North-East Atlantic.

2.2 Conservation benefits

Shiant East Bank pMPA provides conservation benefits by affording protection to circalittoral sands and mixed sediment communities, northern sea fan and sponge communities and the geodiversity feature. In summary the conservation benefits of this designation are:

- Protection of the shelf banks and mounds ensures that this structure can continue to provide its key functions of habitat provision and enhancing local productivity.
- The high quality examples of circalittoral sands and mixed sediment communities and diverse northern sea fan and sponge communities complement examples already in the MPA network.
- To afford protection to an outstanding range of glacial bedforms that are of international scientific importance for our understanding of these historic processes and also underpin the other habitats within the site.

2.3 Wider benefits

The protected features of the pMPA provide ecosystem services locally and to the wider marine environment. We describe these ecosystem services in terms of their functions and natural resources, which in turn lead to benefits for people.

Figure 1 illustrates how the protected features of Shiant East Bank pMPA contribute to benefits for people. There can be many complex interactions and dependencies amongst the protected features, their functions, associated natural resources and the benefits we gain from them.

The functions associated with the protected features of Shiant East Bank pMPA are described in Annex 1 as part of the site's Conservation Objectives. The features together, especially when taken within the context of the whole MPA and/or local ecosystem, contribute to certain functions more than others, e.g. nutrient cycling. The functions of the protected features are fundamental to the continued supply of natural resources and benefits associated with this pMPA and to the long-term health of the protected features.

Located between the mainland and the Isle of Lewis, Shiant East Bank pMPA is focussed around a large shelf bank feature which rises up from the seabed in the middle of the Minch. Having been carved by ice over thousands of years the site has a seabed resource composed of a variety of sediment types, ranging from sands and gravels to large outcrops of hard bedrock where diverse and productive biological communities flourish. Furthermore, the bank feature creates turbulence and increases productivity thus boosting the availability of food in the area. This supports a range of bird and marine mammal species which are attracted to the feeding opportunities in the pMPA. Widely known as a productive fishing ground, the waters around the Shiant East Bank pMPA are valued by local west coast communities, who have fished the waters of the pMPA for many years.

Despite its fairly remote location the pMPA contributes towards a number of benefits for people. As a productive fishing ground the pMPA provides food as well as jobs and business to local people. The site provides a contribution to wider functions such as nutrient cycling, waste breakdown and carbon storage help to maintain clean water and sediments and pollutant immobilisation and contribute to health and well-being. At a wider scale the drumlinoid forms, glacial lineations, iceberg ploughmarks and streamlined bedrock that make up the Quaternary of Scotland geodiversity feature help us in reconstructing past ice sheets, telling a story of past global climate change that is useful for future projections of climate change.

The benefits that arise from the functions and natural resources of the pMPA are typically small in the context of the whole of Scotland, but some are of greater importance for this pMPA and the people that use it. There is potential for benefits to be enhanced. This may be achieved by improving the quantity or quality (health) of the protected features themselves and/or through promoting the use of natural resources that is compatible with the site's Conservation Objectives.

Figure 1 *Benefits to people associated with protected features of the Shiant East Bank pMPA.*
*Imagery prepared by the British Geological Survey, with bathymetry data provided courtesy of the Maritime and Coastguard Agency's UK Civil Hydrography Programme © Crown copyright.

2.4 Community aspirations

This section will be completed in the future following discussions with communities that come through the MarPAMM project[1] in the Outer Hebrides.

2.5 Contribution to policy commitments

Managing this pMPA to conserve the circalittoral sands and mixed sediment communities, northern sea fan and sponge communities and shelf banks and mounds as well as the Quaternary of Scotland geodiversity feature will ensure the continued provision of the benefits above as well as the site's contribution to:

- An ecologically coherent network of MPAs which are well managed under the OSPAR convention and national legislation.
- Progress towards achieving Good Environmental Status in relation to biological diversity and seafloor integrity.
- Protection, enhancement and health of the marine area under the Marine (Scotland) Act 2010.
- Restoring marine and coastal ecosystems and increasing the environmental status of our seas under the Scottish Biodiversity Strategy.
- Helping to adapt to climate change under The Scottish Climate Change Adaptation Programme by increasing the resilience of habitat and species in the area.

3 Roles

This document provides advice for Shiant East Bank pMPA in relation to activities that may affect the protected features. More detailed advice can be provided to public authorities to inform their decision making as required. In doing this, our aim is to ensure the Conservation Objectives for the protected features are met.

Section 80 of the Marine (Scotland) Act 2010 gives Scottish Natural Heritage (SNH) the remit to provide advice and guidance to public authorities as to the matters which are capable of damaging or otherwise affecting the protected features of Nature Conservation MPAs, how the conservation objectives of the site maybe furthered or their achievement hindered and how the effects of activities on MPAs may be mitigated.

It is the role of public authorities to ensure that the activities they regulate, permit or licence do not hinder the achievement of the Conservation Objectives of Shiant East Bank pMPA. The management advice in this document is provided to assist public authorities in managing the activities outlined in Table 2 and carrying out their duties under Section 82 and 83 of the Marine (Scotland) Act 2010.

Stakeholders can provide additional evidence to support the development of management including local knowledge of the environment and of activities. This will contribute to the development of well-designed and effective management measures.

[1] http://www.mpa-management.eu/

4 Protected features and status

The Shiant East Bank pMPA has been selected to become part of Scotland's MPA network which in turn has been established to help conserve and recover a range of Scotland's important marine habitats, wildlife, geology and landforms.

Table 1 provides a summary of the protected features within the pMPA, their condition within the site and the broader conservation status of the protected features.

The locations and extent of the protected features within the Shiant East Bank pMPA are shown on Figure 2. This may have been superseded by more up-to-date information on extent/distribution of features since the publication of this document. The most up-to-date distribution of the features described is available to view at National Marine Plan Interactive[2].

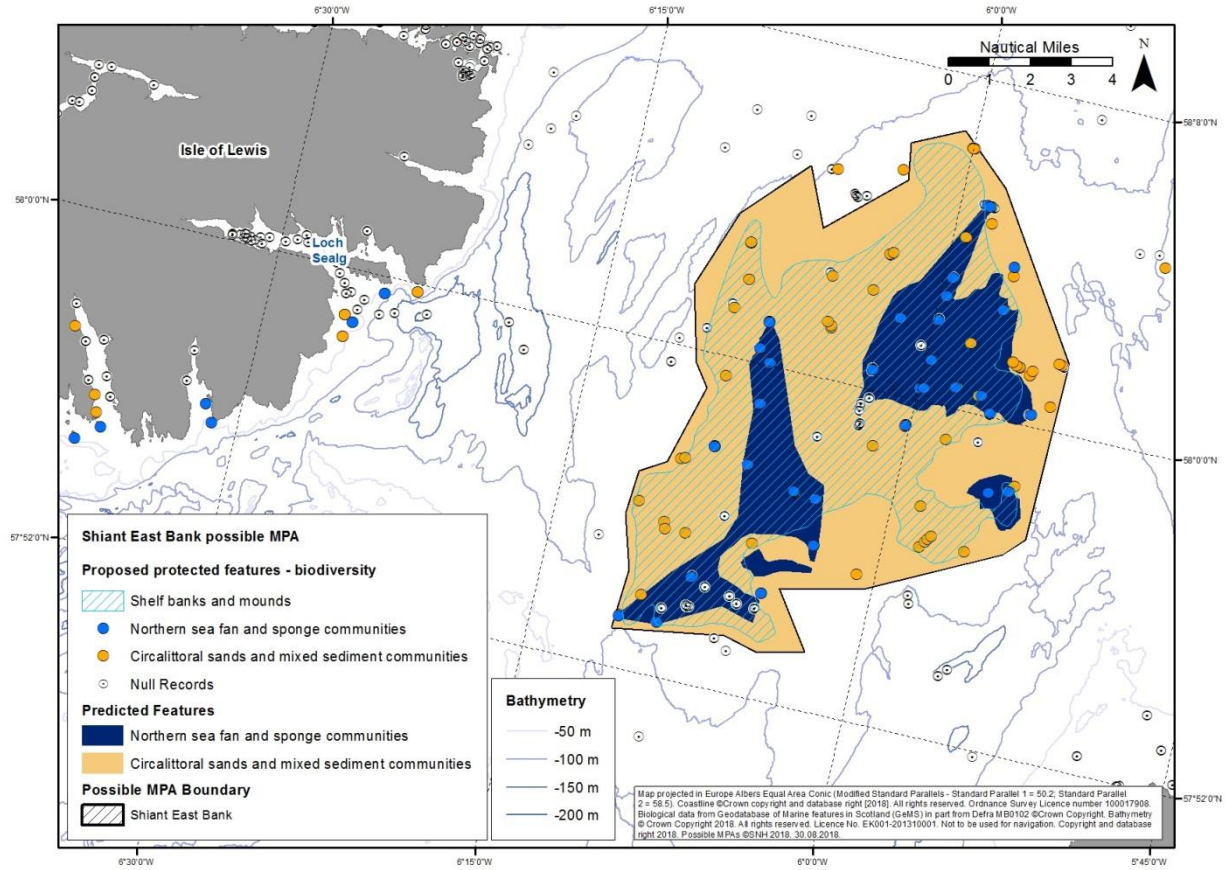
Table 1. Protected features and condition for the Shiant East Bank pMPA. Feature condition refers to the condition of the protected feature assessed at a site level. Broader conservation status is the overall condition of the feature throughout its range as outlined by the footnotes.

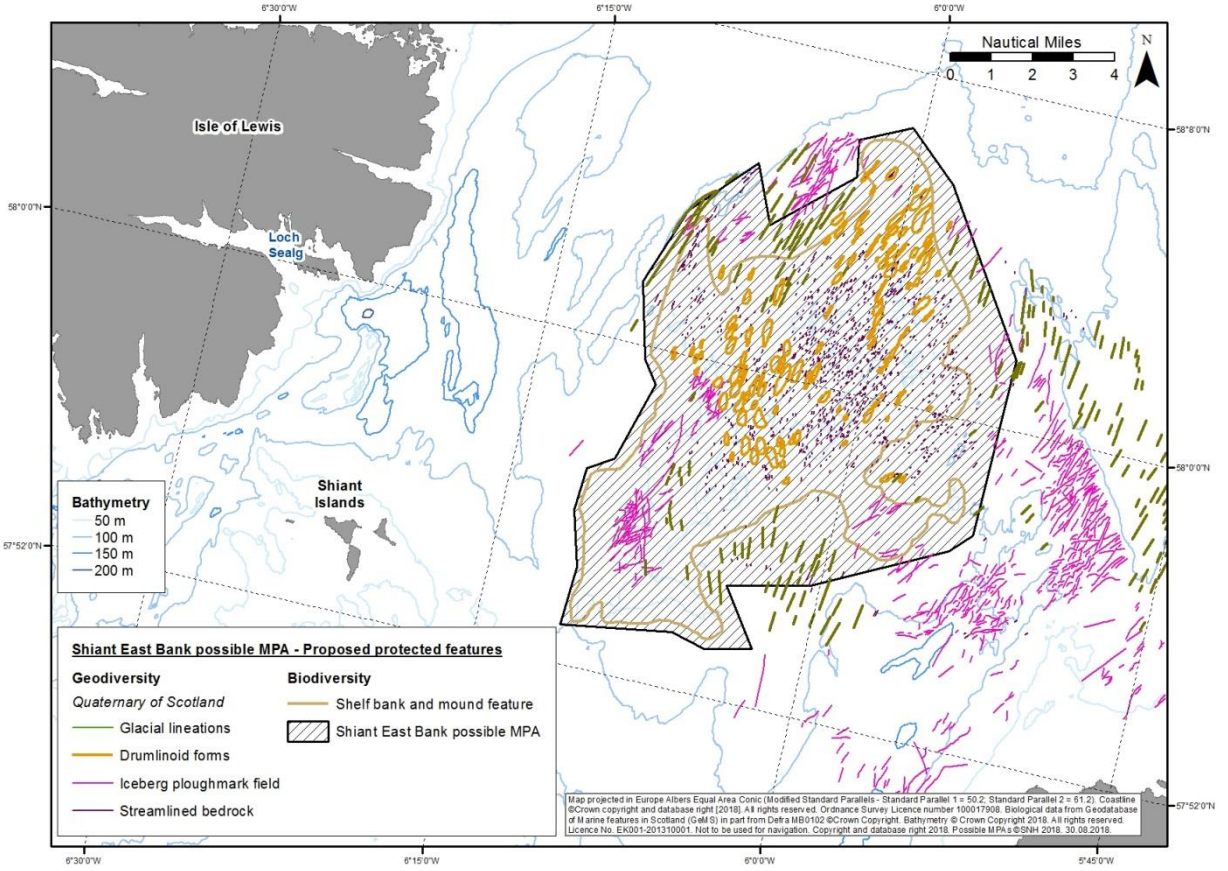
Protected Features	Feature condition	Assessment date	Broader conservation status*
Circalittoral sands and mixed sediment communities	Favourable	2019	Good Environmental Status has not yet been achieved
Northern sea fan and sponge communities	Favourable	2019	Good Environmental Status has not yet been achieved
Shelf banks and mounds	Favourable	2019	N/A
Quaternary of Scotland	Favourable	2019	N/A

*For circalittoral sands and mixed sediment communities and northern sea fan and sponge communities this is the broad Marine Strategy Framework Directive status of 'Circalittoral mixed sediment' and 'Circalittoral rock and biogenic reef' respectively.

[2] https://marinescotland.atkinsgeospatial.com/nmpi/

Figure 2 *Location of the Shiant East Bank pMPA and distribution of the proposed protected features*





5 Conservation objectives

5.1 Background

Conservation Objectives set out the desired quality of the protected features within the Shiant East Bank pMPA (Annex 1) and they are in place at the time the site is formally designated. They provide the framework for the setting of site conservation measures (management) and for public authorities in managing the activities outlined in Table 2 and carrying out their duties under Section 82 and 83 of the Marine (Scotland) Act 2010.

5.2 Relationship between feature condition and Conservation Objectives

The Conservation Objectives seek to *conserve* protected feature(s) of an MPA where evidence exists that it is in favourable condition in the site, or where there is uncertainty concerning the assessed condition of a feature (see section 4) but no reason to suspect deterioration in condition since designation. Where evidence exists that a feature is declining and/or damaged and therefore is in unfavourable condition in the site, the Conservation Objectives will seek to *recover* the protected feature.

All of the biodiversity and geodiversity features are in favourable condition at Shiant East Bank pMPA and therefore the Conservation Objectives seek to conserve this condition.

6 Feature sensitivity

The following sections provide an overview of the pressures most relevant to the protected features. Further information on feature sensitivity, can be found at Marine Scotland's Feature Activity Sensitivity Tool (FEAST)[3] and also for the features not covered by FEAST, Marine Evidence based Sensitivity Assessment (MarESA)[4]. The information in FEAST reflects our current understanding of the interactions between activities, pressures and features. It highlights that activities can give rise to a range of pressures which the protected features may be sensitive to. Our assessment of sensitivity is based on a feature's tolerance (response to change) and its ability to recover.

6.1 Circalittoral sands and mixed sediment communities

Circalittoral sands and mixed sediment communities are highly sensitive to physical disturbance[5]. Many of the characterising species associated with this feature are infaunal, burrowing species with some sessile/slow moving epifaunal key species. Information on the likely sensitivity of this feature shows a low to moderate sensitivity to abrasion and physical disturbance (Hill, 2001; Hiscock, 2002; Tyler-Walters, 2002; Hill and Wilson, 2004). Burrowing species can have a high tolerance to displacement, though many species may be damaged by impact and subsequently die. Some species such as brittlestars can tolerate considerable damage without suffering mortality. Changes in sediment type and/ or the removal of substratum will

[3] http://www.marine.scotland.gov.uk/feast/
[4] https://www.marlin.ac.uk/sensitivity/sensitivity_rationale
[5] Includes Physical removal (extraction of substratum) and sub-surface abrasion/ penetration pressures in FEAST.

disturb or remove burrowing infaunal species characteristic of circalittoral sands and mixed sediment communities (Kröncke,1990). Some species within this habitat can be sensitive to organic enrichment, whilst others may see an increase in numbers and biomass. Typically increasing organic enrichment results in a reduction of species biomass and abundance (Pearson and Rosenberg, 1978). Changes in siltation rates can also have an impact on the species associated with this habitat. Many of the species in circalittoral sands and mixed sediment communities can be slow growing with patchy and intermittent recruitment and so the recovery from loss of these species is likely to take longer than five years.

6.2 Northern sea fan and sponge communities

As a number of the species present within northern sea fan and sponge communities are fragile, slow growing and long-lived, the feature is considered to have a high sensitivity to a number of pressures. These pressures include organic enrichment, physical disturbance and siltation changes. Species characteristic of these communities are also predominantly sessile and attach to rocks and boulders. A change to or the removal of such substrate would therefore lead to the loss of the majority of species in the community, with recovery being dependent on the availability of hard substrate and viable adults in surrounding areas. *Swiftia pallida* (the northern sea fan) are considered to have some resilience to physical disturbance through regenerative growth, however in cases where whole individuals are removed recovery is likely to be very low due to low recruitment and slow growth rates. As filter feeders, sea fan and sponge species are also highly sensitive to burial, particularly where smothering exceeds 5 cm and recovery is likely to be low.

6.3 Shelf banks and mounds

As an active feature maintained by hydrodynamic and sedimentary processes, the feature is sensitive to activities causing changes in local water flow and those involving physical change/ and or removal of seabed sediment. The recovery potential of the feature is dependent on the duration and scale of the activity in question, as well as any potential permanent changes to local water hydrodynamic and sediment supply.

6.4 Quaternary of Scotland (drumlinoid forms, glacial lineations, iceberg ploughmarks, streamlined bedrock)

In the vast majority of instances, most pressures associated with marine anthropogenic activities will not be sufficient to impact geological and geomorphological seabed features (Brooks, 2013). However as all the landforms comprising this feature are relicts of past processes, they are considered to have no resilience or recovery potential.

As landforms eroded by the movement of a fast flowing ice stream, glacial lineations and streamlined bedrock are highly resistant to human activities and are either considered not sensitive or to have a low sensitivity to pressures arising from human activities. Drumlinoid forms are considered to have varying sensitivity to physical disturbance as they may occur in variably consolidated sediment or in bedrock. Iceberg ploughmarks are considered to have a high sensitivity to physical disturbance due to their generally unconsolidated substrate.

7 Management

7.1 Advice to support management

Table 2 provides SNH's advice to support management for activities where we consider this may be necessary to achieve the Conservation Objectives for the protected features. The advice is focused on the activities that cause an effect (a pressure) that a feature is sensitive to. Pressures can be physical (e.g. abrasion of the seabed), chemical or biological. Different activities may cause the same pressure, e.g. fishing using bottom gears and aggregate dredging both cause abrasion which can damage the surface of the seabed.

Our advice takes a risk-based approach, i.e. we are focusing on providing advice where we believe there is a risk to achieving the Conservation Objectives. We have identified risks to achieving the Conservation Objectives where there is an overlap between protected features and activities associated with pressures that the features are sensitive to. We have provided management advice to support public authorities and others in managing these risks. Our advice is based on existing data and information on protected features and relevant activities and our understanding of the relationships between the features and activities. We have identified a range of management advice:

- management to remove or avoid pressures;
- management to reduce or limit pressures; or
- no additional management required.

For our advice on fisheries management we have also stated where we think this should be 'considered' or 'recommended'. The term 'considered' is included to highlight that a fishery-feature interaction exists, but circumstances mean that a specific recommendation for action cannot / or need not be made at this point. However, there is sufficient cause to make fishery managers aware and for them to consider if a fishery management measure may be helpful in achieving conservation objectives – particularly where there may be a synergy between the benefits of management actions for the fishery and the conservation objectives for the feature. The term 'recommended' highlights than a fishery-feature interaction exists, there is a reasonable evidence base and a specific recommendation can action can be made/ justified.

New or other activities would need to be considered on a case-by-case basis. In particular seaweed harvesting has not been included within our management advice at the current time because the activity is new. Whilst it is recognised that there is potential for a variety of impacts, e.g. species disturbance, abrasion of seabed habitats and changes to trophic links, there are uncertainties about how significant these impacts could be and the evidence base is still being developed.

We recognise that stakeholders can provide local environmental knowledge and more detailed information on activities, including in relation to intensity, frequency and methods. This additional information will help public authorities and others develop more specific management, focussed on the interaction between features

and activities. If new information becomes available our management advice may be revised.

Activities that are considered not likely to affect the protected features (other than insignificantly) are listed in Table 3. Spatial data relating to the location and extent of the activities listed can be accessed on Marine Scotland's National Marine Plan Interactive[6] (where available).

7.2 Best Practice

In our management advice for activities in Annex 3 we refer to the development, adoption or use of 'best practice' as a way of managing interactions between activities and the features. Best practice is taken to mean approaches or procedures that are developed and accepted by regulators and relevant stakeholders as being an effective way of dealing with an interaction between a habitat or species and the pressures created by an activity. Much of this best practice is already being implemented by sectors and regulators, e.g. pre-application discussions between developers and regulators, the Scottish Marine Wildlife Watching Code and Technical Standards for Scottish Finfish Aquaculture.

7.3 Conservation Measures

Activities and developments subject to licensing that could affect the protected features of the pMPA also need to be assessed. Authorities need to determine whether if by carrying out their duties e.g. permitting an activity to take place, it would hinder the achievement of the Conservation Objectives of the pMPA. This is referred to as an assessment under Section 82 or Section 83 of the Marine (Scotland) Act 2010.

There are currently no site-specific conservation measures in place yet for the protected features of the site but the need for additional measures will be considered if the pMPA is designated.

Further information relevant to management of this MPA will be available in the Outer Hebrides Regional MPA Management Plan to be developed with stakeholders through the MarPAMM project, and added to this document as required.

8 Research and survey requirements

We recognise that there are still gaps in our understanding and knowledge of the features of this site. We will identify research and survey projects to inform our understanding of these aspects. The requirements identified below are not a commitment to undertake this work. However, by highlighting these gaps we hope to inform future discussions with parties interested in undertaking research in this site and/or on these features, to help direct research and aid monitoring priorities.

1. Continued focus of contingency benthic sampling on an opportunistic basis in order to refine known distribution of the sites biodiversity features.

[6] https://marinescotland.atkinsgeospatial.com/nmpi/

2. Combining monitoring efforts outlined within the Priority Marine Feature review to map and refine the distribution of the sensitive marine habitats within the site e.g. northern sea fan and sponge communities.

Table 2. SNH's advice to support management for Shiant East Bank possible MPA for activities which are considered capable of affecting the proposed protected features.

Where a cell is coloured grey this indicates that management is already in place and/or no additional management is considered to be required to achieve the Conservation Objectives. The potential for cumulative effects needs to be taken into account. Whilst shelf banks and mounds are a proposed protected feature of the pMPA, they are not included in this table because no additional management is currently required.

Activities considered capable of affecting the proposed protected features	**Advice to support management**	
	Circalittoral sand and mixed sediment communities	**Northern sea fan and sponge communities**
Cables and pipelines	**No additional management required** for existing cable and pipeline infrastructure. **Reduce or limit pressures** Reduce or limit the impact of new cables and pipelines on circalittoral sand and mixed sediment communities and northern sea fan and sponge communities via the existing licensing process. This should include appropriate siting of new cables and pipelines to avoid impacts in areas where there are aggregations of more sensitive epifauna. Early discussion of siting, design and construction is recommended to reduce potential impacts. Key details which should be discussed will include pre-application surveys, siting and installation techniques.	
Fishing - demersal mobile/active gear	**Remove or avoid pressures** The exclusion of mobile/active gears from northern sea fan and sponge communities ***is recommended***. **Reduce or limit pressures** Management measures to reduce or limit demersal/mobile active gear from circalittoral sand and mixed sediment communities ***should be considered***.	
Fishing – static gear	**Reduce or limit pressures** Management measures to reduce or limit static fishing gear from circalittoral sand and mixed sediment communities and northern sea fan and sponge communities ***should be considered***.	
Scientific survey/research	**Reduce or limit pressures** Pressures associated with survey work in areas where there would be likely to be an impact upon circalittoral sand and mixed sediment communities and northern sea fan and sponge communities should be minimised, particularly at locations with aggregations of more sensitive epifauna. Early discussion of the survey/research proposals is recommended to reduce potential impacts.	

Table 3. Activities that are considered not likely to affect the proposed protected features (other than insignificantly)[7]

Activity	Comments
Boat use associated with both commercial and recreational activities	Overlap of site boundary with Ullapool to Stornoway passenger ferry route is considered not likely to affect the sites proposed protected features.
Fishing – pelagic	The site is a favoured location for pelagic fisheries however the activity is considered unlikely to affect the pMPA's benthic features and communities.

[7] Only the specific examples of activities listed in the table have been excluded, rather than the broad activity types. New plans or projects will still need to be considered by the relevant competent authority (see Table 2 for further details).

Annex 1. Shiant East Bank possible MPA Conservation Objectives

The box below provides the high-level Conservation Objective statements. The full Conservation Objectives, which includes site-specific advice and information on the features that form part of this possible MPA, are provided in the tables that follow. These tables are grouped split by feature type, i.e. habitats, species, large-scale features, and geomorphology. The site specific advice and information provides more detail in relation to each of the high level Conservation Objective statements for each feature type, e.g. detail on the extent of a habitat within a site and what the supporting features are for a species.

Information is also provided below on how minor changes to features should be considered and the influence of environmental change on features, particularly in relation to climate change for context.

A definition of the terms used is in the Glossary (Annex 2).

A map of the possible MPA, the location of the features and the place names mentioned in the site-specific information is provided in Figure 2.

Shiant East Bank possible MPA

Protected features:
Habitats - Circalittoral sands and mixed sediment communities, Northern sea fan and sponge communities
Geomorphological features – Quaternary of Scotland (drumlinoid forms, glacial lineations, iceberg ploughmarks, streamlined bedrock)
Large-scale features – Shelf banks and mounds

The Conservation Objectives of the Shiant East Bank possible MPA, are that the protected features

- so far as already in favourable condition, remain in such condition; and
- so far as not already in favourable condition, be brought into such condition, and remain in such condition.

“Favourable condition”, with respect to a marine habitat, means that

a) its extent is stable or increasing; and
b) its structures and functions, its quality, and the composition of its characteristic biological communities are such as to ensure that it is in a condition which is healthy and not deteriorating.

Any temporary deterioration in condition is to be disregarded if the habitat is sufficiently healthy and resilient to enable its recovery from such deterioration.

“Favourable condition”, with respect to a feature of geomorphological interest, means that

a) its extent, component elements and integrity are maintained;
b) its structure and functioning are unimpaired; and
c) its surface remains sufficiently unobscured for the purposes of determining

whether the criteria in paragraphs (a) and (b) are satisfied.

For the purpose of determining whether a feature of geomorphological interest is sufficiently unobscured under paragraph (3)(c), any obscuring of that feature entirely by natural processes is to be disregarded.

“Favourable condition”, with respect to a large-scale feature, means that

a) the extent, distribution and structure of that feature is maintained;
b) the function of the feature is maintained so as to ensure that it continues to support its characteristic biological communities and their use of the site including, but not restricted to, feeding, spawning, courtship or use as nursery grounds; and
c) the processes supporting the feature are maintained.

For the purpose of determining whether a protected feature is in favourable condition any alteration to that feature brought about entirely by natural processes is to be disregarded.

Interpretation of temporary deterioration in condition (for marine habitats) and consideration of minor changes

For marine habitats any temporary deterioration in condition is to be disregarded if the marine habitat is sufficiently healthy and resilient to enable its recovery from such deterioration. In order to determine what “temporary deterioration” is we must know the longevity of the habitat and timescales involved to enable a habitat (protected feature) to fully recover. Resilience can vary widely between ecosystems and ecological resilience has been defined as "the capacity of a system to absorb disturbance and reorganize while undergoing change so as to still retain essentially the same function, structure, identity, and feedbacks". It is generally recognised that high biodiversity in a system makes it more resilient to some forms of disturbance.

For the other features (large-scale and geomorphological features) temporary short-term and/or minor changes in the proposed protected features due to human activity may be considered not to compromise the Conservation Objectives and will be considered on a case by case basis.

Assessments should consider the timing, duration and scale of the impact on the features and their ability to recover. Factors determining the potential for features to recover following temporary deterioration vary between features. These are described in more detail in Annex 2 ‘‘*Factors determining the potential for features to recover’*.

Environmental change

The Conservation Objectives recognise and acknowledge that the protected features of the pMPA are part of a complex, dynamic and multi-dimensional marine environment. Marine habitats are exposed to a wide range of drivers of change. This may include changes to the habitats that reflect their natural cycle, and also broader environmental changes, i.e. those related to climate change and environmental

variability that are beyond the scope of the pMPA.

Any alterations to the proposed protected features that are brought about by entirely by natural processes are to be disregarded with when assessing against the Conservation Objectives.

In relation to the Shiant East Bank pMPA and its protected features, the following effects of climate change are relevant as outlined below. These effects should be taken into account when considering plans and projects within Shiant East Bank pMPA as additional pressures may reduce the protected features resilience to climate change, and additionally climate change impacts may start to hinder their ability to recover from human activities.

Circalittoral sands and mixed sediment communities	Circalittoral sands and mixed sediment communities are dynamic by nature and some change in their status is inevitable with time. However, climate change may drive more rapid and pronounced change through a variety of pathways which has the potential to influence the growth and fecundity of some species. For example, changes in salinity may occur on the sea bed if the stratification of the water column is broken down by storm events. Variations in temperature may also have significant effects on diversity and can affect the succession of macrobenthic species with the occurrence or survival of different groups of species related to periods of mild or colder winter temperatures (Elliot *et al*.,1998). Many species characteristic of the feature have a planktonic phase therefore variations in the hydrodynamic regime driven by climate change will influence the distribution of larvae. This, in turn, may modify the connectivity between subpopulations and the long-term viability of sink populations. Despite these factors, most species associated with the habitat type are likely to be able to colonise new substrata and tolerate changing conditions to some degree.
Northern sea fan and sponge communities	Increased water temperatures associated with climate change will likely drive variation in the extent and distribution of northern sea fan and sponge communities. As a community characterised by a species believed to be at the southern limit of their range in Scotland, it is thought that water temperature increases would lead to a reduction or loss of northern sea fans in Scottish waters (northwards retreat). It is thought that colonization of the Shetland Islands has been prevented by geographical barriers which would likely continue even in a situation of climate induced retreat (Hiscock *et al*., 2001).
Shelf banks and mounds	Having been shaped by glacial activity the position of the feature and the bedrock highs are unlikely to shift under natural change or climate change. Discontinuous sediments lying over the bedrock may be sensitive to large-scale changes in water flow, wave exposure and sedimentation deposition driven by climate change pressures such as an increase in mean annual maximum wave height, and a change in wind speed (Palmer *et al.*, 2018). As such it is likely that the feature will change to some degree in response to variations in current speed and sediment supply driven by both natural changes over time and

	climate change.
Quaternary of Scotland	As erosional features formed by ice over millennia the glaciated channel/troughs and landscape of areal glacial scour are likely to be highly resistant to climate change. The resilience of the megascale glacial lineations is highly variable and depends upon the composition and level of consolidation sediment. Lineations formed in well consolidated sediment can be considered highly resistant to climate change. Those preserved in poorly consolidated sediment may well be sensitive to large-scale changes in water flow, wave exposure and sedimentation deposition associated with climate change. Such sensitivities constitute a worthy consideration, particularly given that climate change is expected to drive an increase in mean annual maximum wave height and a change in wind speed over the century (Palmer *et al*, 2018).

HABITATS

Extent		
Feature	**Site specific advice**	**Site specific information**
Circalittoral sands and mixed sediment communities	Conserve the current extent and distribution of circalittoral sand and mixed sediment communities within the site so that they are stable or increasing.	Circalittoral sands and mixed sediment communities are widespread throughout the pMPA across a range of depths (Miller *et al.,* 2017). Silty sands occur widely below 50 m to the maximum recorded depth of 91 m and at many locations are accompanied by significant proportions of gravel, pebbles, cobbles and sometimes boulders. Assessments should focus on activities involving significant abrasion or disruption of seabed sediments and those which lead to an increase in organic particulate matter in the immediate area.
Northern sea fan and sponge communities	Conserve the current extent and distribution of northern sea fan and sponge communities within the site so that they are stable or increasing.	There are three distinct areas of northern sea fan and sponge communities in the site, in the north-east, south-east and west which are associated with topographic highs and exposed rock in these areas (Miller *et al*., 2017; Moore and Atkinson, 2012; Moore 2012, 2014). They are recorded in deeper water from 44 - 91 m on substrates of bedrock, cobbles and boulders in dense fields or scattered over sandy sediments. Assessments should focus on activities which may significantly alter water flow and sedimentation characteristics, involve significant abrasion or disruption of the seabed and those which lead to an increase organic particulate matter in the immediate area.

Structures		
Feature	**Site specific advice**	**Site specific information**
Circalittoral sands and mixed sediment	Conserve the physical structure of the circalittoral sand and mixed sediment communities.	The physical structure of the circalittoral sands and mixed sediment communities is provided by the cobbles, pebbles and shells interspersed amongst the mosaic of sand and gravel sediments. The proposed protected feature incorporates three discrete biotope complexes: circalittoral mixed sediment (**SS.SMx.CMx**); offshore circalittoral

communities	Conserve the three dimensional structure created by fauna and flora (e.g. infaunal burrowing species and sessile/slow moving epifauna) that are associated with this habitat	mixed sediment (**SS.SMx.OMx**) and offshore circalittoral sand (**SS.SSa.OSa**). The physical structure of the circalittoral sands and mixed sediment communities is influenced by coastal processes and water movements that may change overtime naturally. The three dimensional structure created by flora and fauna is influenced additionally by supply of recruits and a variety of interconnected physical, chemical and biological components. The biological component will include the microflora, meiofauna, macrofauna and megafauna (both resident and transient) and further details are provided under *'Composition of characteristic biological communities'*. All of these components are interdependent and must be present in a suitable condition for the overall habitat structure to be considered in favourable condition. Assessments should focus on activities which may significantly alter water flow characteristics as well as those involving significant abrasion, removal or disruption of seabed sediments.
Northern sea fan and sponge communities	Conserve the physical structure of the northern sea fan and sponge communities. Conserve the three dimensional structure created by fauna and flora (e.g. kelp, sponges, seafans) that are associated with this habitat.	The northern sea fan and sponge communities have formed on the boulders, bedrock and cobbles of the shelf banks and mounds feature and the geodiversity features. These rocky areas create a complex environment resulting in a number of ecological niches, i.e. crevices, overhangs, under boulder areas, bedrock. Boulders are colonised by the sea fan *S. pallida* along with other soft corals. On the rocky surfaces a variety other of epibionts can be found such as bryozoans, echinoderms such as *Echinus esculentus*, *Luidia ciliari*s and *Henricia sp,* whilst overhangs and cracks shelter *Munida rugose and* axinellid sponges e.g. *Axinella infundibuliformis* and *Phakellia ventilabrum* (Moore, 2012). With increasing depth the abundance of sea fans declines and axinellid sponges e.g. *Axinella infundibuliformis* and / or *Phakellia ventilabrum*, became more prevalent. Assessments should focus on activities which may significantly alter water flow and sedimentation characteristics, involve significant abrasion or disruption of the seabed and increase in organic particulate matter in the immediate area.

Function and quality

The boxes below provide the site specific advice on the '**function of the habitat and its quality'** element of this conservation objective.

'Quality' in this context is taken to mean the processes relevant to the features e.g. water movement, chemical water quality parameters etc and are referred to as environmental conditions in the table below. Consideration of the functioning of the habitat and supporting environment on which it relies needs to take into account the wider functioning and environmental conditions within this site. Shiant East Bank pMPA is a biologically diverse and dynamic marine environment situated in the Minch. The complex seabed topography creates a range of environmental conditions including varied depth and substrate type which function together to support habitats and species. Shiant East Bank pMPA has been assessed as having 'good' overall water body status in 2016 in relation to the assessments for the Water Environment and Water Services (Scotland) Act 2003. This assessment includes consideration of water chemistry, pollutants, the physical condition of the water body, plant and animal communities, including plankton and the risk from invasive non-native species.

There is inter-dependence between the habitats in Shiant East Bank pMPA and the surrounding environment, with the habitats providing functions that support the wider environment and the environment providing conditions that support the habitats. Together, the habitats and supporting environment lead to direct and indirect benefits for people. The sections below identify key functions associated with each habitat; different habitats contribute to different functions to different degrees. It is also useful to consider some functions at the scale of the whole site / local ecosystem, such as resilience to invasive non-native species (INNS) and disease and carbon storage and climate regulation. For resilience to INNS and disease, the combined function of healthy and biodiverse habitats in Shiant East Bank pMPA is likely to contribute to the ability of the local ecosystem to resist, recover from or adapt to the introduction of a non-native or disease/pathogens. In terms of carbon storage and climate regulation, the pMPA makes a local contribution via its sediments and fauna that lock up and utilise carbon respectively. Waste breakdown and detoxification of water and sediments also occurs locally within the pMPA via the filter feeding animals living on and within the habitats (e.g. anthozoans, ascidians, hydrozoans and poriferans) that filter detritus and bacteria alongside their food (phytoplankton and zoo plankton, Officer *et al*., 1982).

Feature	**Site specific advice**		**Site specific information**
Circalittoral sand and mixed	Conserve the functions provided by the	<u>Key functions</u> • Biomass production • Habitat for other	Circalittoral sand and mixed sediment communities are characterised by a variety of sediments that provide a habitat for a range of infanual and epifaunal species which subsequently contribute to biomass

sediment communities	circalittoral sand and mixed sediment communities and the environmental conditions that support them.	species (supporting biodiversity) <u>Environmental conditions</u> • Water quality • Water movement • Coastal processes	production in the area. Conserving these functions requires the maintenance of suitable environmental conditions. The overall condition of Shiant East Bank pMPA was 'good' under the assessment conducted by SEPA for the Water Framework Directive in 2016. If any one of the environmental conditions were to be significantly altered it could detrimentally affect the quality and variety and therefore functions of circalittoral sand and mixed sediment communities. Therefore the overall 'good' water body status for Shiant East Bank pMPA should be conserved.
Northern sea fan and sponge communities	Maintain the functions provided by the Northern sea fan and sponge communities and the environmental conditions that support them.	<u>Key functions</u> • Habitat for other species (supporting biodiversity) • Larval/ gamete supply <u>Environmental conditions</u> • Water quality • Water movement • Coastal processes	Northern sea fan and sponge communities key function is supporting biodiversity by providing habitat to a range of other organisms which are outlined in *Composition of its characteristic biological communities* below. Many of the species within this habitat have a planktonic larval stage and therefore there is potential for the larval/gamete supply to support the development of the habitat within and potentially outside the pMPA. Conserving these functions requires the maintenance of suitable environmental conditions. The overall condition of Shiant East Bank pMPA was 'good' under the assessment conducted by SEPA for the Water Framework Directive in 2016. If any one of the environmental conditions were to be significantly altered it could detrimentally affect the quality and variety and therefore functions of northern sea fan and sponge communities. Therefore the overall 'good' water body status for Shiant East Bank pMPA should be maintained.

Composition of its characteristic biological communities		
Consideration of characteristic biological communities should not be limited to the list provided below. However it does give an indication of the main species we would expect to be present.		
Feature	**Site specific advice**	**Site specific information**
Circalittoral sand and mixed sediment communities	Conserve the diversity, abundance and distribution of the characteristic biological communities associated with the circalittoral mixed sediment communities (including both infauna and epifauna)	Across the three biotopes present in this habitat (circalittoral mixed sediment, offshore circalittoral mixed sediment and offshore circalittoral sand) the diversity indices ranged from 3.63 to 4.86 (Shannon Wiener diversity index H') (Allen, 2015). The infauna is characterised by oweniid polychaetes such as *Chaetozone gibber* and *Owenia fusiformis* along with bivalves such as *Yoldiella philippiana* and *Abra spp*.. Polychaete species such as *Laonice bahusiensis* and *Aonides paucibranchiata* were also present as several locations. Epifaunal species were observed in greater abundance at greater depth, with motile forms of *Porania pulvillus* and *Pagurus prideaux* apparent on the sediment surface and numerous *Munida rugosa* on scattered gravel and larger stones (Moore, 2012, 2014). The majority of species identified as being faithful and frequent residents of the feature have a larval phase in their development and so are capable of potentially dispersing over large distances. In the absence of significant disturbance, the feature is considered stable and expected to persist. Assessments should focus on activities which involve physical change to and/ or the removal of substratum, those which may significantly alter local hydrographic and sedimentary processes and those which may lead to an increase in organic particulate matter in the immediate area.
Northern sea fan and sponge communities	Conserve the diversity, abundance and distribution of typical species associated within the	The fauna is dominated by sponges, principally *Axinella infundibuliformis* and *Phakellia ventilabrum* and accompanied by *Lophon nigricans, Polymastia boletiformis, Tetilla zetlandica* and *Hymedesmia paupertas*. High densities of *Porella compressa*, hydroid / bryozoan clumps and sparse serpulid worms were also present. The northern

	northern sea fan and sponge communities (including *Axinella infundibuliformis*, *Phakellia ventilabrum, Lophon nigricans, Porella compressa* and *Swiftia pallida).*	sea fan *Swiftia pallida* was observed at many sites across the survey area (Moore and Atkinson, 2012; Moore 2012, 2014). Sponges were predominantly recorded from the eastern side of the site down to a depth of 94 m and predominantly composed of axinellid sponges *Axinella infundibuliformis* and *Phakellia ventilabrum* (Moore, 2012). Assessments should focus on activities involving significant abrasion or disruption of seabed sediments, those which may significantly alter local hydrographic and sedimentary processes and those which may lead to an increase in organic particulate matter in the immediate area.

GEOMORPHOLOGICAL FEATURES

a) Extent, component elements and integrity		
Feature	**Site specific advice**	**Site specific information**
Quaternary of Scotland - *drumlinoid forms, glacial lineations, iceberg ploughmarks, streamlined bedrock*	Conserve the features extent, component elements and integrity of the Quaternary of Scotland feature.	'Component elements' refers to the landforms which make up the feature, namely drumlinoid forms (rounded elongate hummocks), glacial lineations, iceberg ploughmarks and streamlined bedrock, whilst integrity relates to the collective assemblage of these landforms and their inter-relationships. The extent of the features component elements is spread throughout the site (figure 2ii). Drumlinoid forms are largely grouped to the centre and north of the pMPA and are roughly north-south in orientation. Glacial lineations are clustered in both the south and north and extend out with the sites boundaries. Iceberg ploughmarks and streamlined bedrock are also grouped together, mostly concentrated in the south west of the site but also extending outside the sites boundaries. Having been created by the channelled flow of ice over bedrock, the glacial lineations and streamlined bedrock are characterised by erosion resistant geology (Summerfield, 1991). As a result, they are considered to be highly resistant to human activities and are either considered not sensitive or to have a low sensitivity to pressures arising from human activities. Therefore, a loss in the extent of these elements of the Quaternary of Scotland feature is not anticipated. As drumlinoid forms are preserved in variably consolidated sediment or in bedrock, their resistance to pressures is likely to be highly variable. Iceberg ploughmarks have lower resistance due to their generally unconsolidated substrate. Activities involving the physical removal of sediments, sub-surface abrasion/ penetration of the seabed or changes to local tidal currents may lead to a loss in the extent of these elements of the Quaternary of Scotland feature. Assessments should focus on activities which may significantly alter water flow characteristics as well as those involving significant abrasion or disruption of seabed

		sediments. A consideration of the scale of the impact or activity in relation to individual component elements and to the full feature should be undertaken in assessments in order to conserve the integrity of the feature.

(b) Its structure and functioning are unimpaired		
Feature	**Site specific advice**	**Site specific information**
Quaternary of Scotland - *drumlinoid forms, glacial lineations, iceberg ploughmarks, streamlined bedrock*	Conserve the structure and functioning of the feature so that they are unimpaired.	Structurally the Quaternary of Scotland feature is preserved in unsorted mixed sediment and in bedrock. Given its static and relict status, the feature has few active functions. The structure of the Quaternary of Scotland feature is considered not sensitive where the landforms are in bedrock. In contrast, the structure of landforms consisting of sediment is likely to have a highly variable sensitivity to pressures arising from human activities. Activities involving the physical removal of sediments, sub-surface abrasion/ penetration of the seabed or changes to local tidal currents may lead to a loss of structure in such landforms. In its entirety the feature has a function of 'scientific importance' for the understanding of Quaternary ice sheet dynamics and late glacial climate change (Brooks, 2013; Stoker *et al*., 2009). This is largely due to the exceptional quality and continuity in which the Quaternary of Scotland feature is preserved. The feature's function of scientific importance may be impaired by activities which are detrimental to its extent, component elements and integrity, as set out above under (a). Assessments should focus on activities which may significantly alter water flow characteristics as well as those involving significant abrasion or disruption of seabed sediments. A consideration of the scale of the impact or activity in relation to of individual component elements and to the full feature should be undertaken in assessments in order to conserve the integrity of the feature.

(c) Its surface remains sufficiently unobscured for the purposes of determining whether the criteria in paragraphs (a) and (b) are satisfied.		
Feature	**Site specific advice**	**Site specific information**
Quaternary of Scotland - *drumlinoid forms, glacial lineations, iceberg ploughmarks, streamlined bedrock*	Conserve the surface of the feature so that it remains sufficiently unobscured for the purposes of determining whether the criteria in conservation objectives (a) and (b) are satisfied.	Assessments should focus on whether the activity or development has the potential to significantly obscure the surface of the drumlinoid forms, glacial lineations, iceberg ploughmarks, or streamlined bedrock to the extent that conservation objectives (a) and (b) could not be fully assessed. Whilst the feature as a whole is of a size which is unlikely to be obscured, assessments should consider the degree to which any of the component landforms might be obscured. This will vary greatly according to the size and nature of the component elements concerned. Therefore the type of data and/or assessment required will vary likewise.

LARGE-SCALE FEATURES

Extent, distribution and structure		
Feature	**Site specific advice**	**Site specific information**
Shelf banks and mounds	Conserve the extent, distribution and structure of the shelf banks and mounds feature.	The boundary of the pMPA encompasses the known extent of the Shiant East Bank shelf banks and mounds feature. The feature is distributed over an area of ~ 205 km^2 and is one of the largest of its kind in Scottish inshore waters. The mounds vary in length and width and are between 5 and 15m in height (Bradwell and Stoker, 2015). The structure of the shelf banks and mounds is thought to be comprised on an area of discontinuous sediments overlain upon a broad bedrock high. As an active feature maintained by hydrodynamic and sedimentary processes, significant alterations to the features extent, component elements and integrity may arise from activities that cause changes in local water flow and/or involve physical change/ and or removal of seabed sediment. The degree of change in response to these pressures is dependent on the duration and scale of the activity in question, as well as any potential permanent changes to local water hydrodynamics and sedimentary dynamics. Assessments should focus on activities which may significantly alter water flow characteristics as well as those involving significant abrasion or disruption of seabed sediments.

Function			
Feature	**Site specific advice**		**Site specific information**
Shelf banks and mounds	Conserve the function of the shelf banks and mounds feature so as to ensure that it continues to support its	<u>Key functions</u> • Biomass production • Habitat for other species (supporting diversity)	Shelf banks and mounds support seabed species typical of coarse sediments, and mixed sediment communities. The hard substrate of the feature enables a range of species to colonise, in particular northern sea fan and sponge communities, which may in turn provide increased shelter for other species, thereby supporting a localised increase in biodiversity. The passing of tidal currents across the surface of banks and mounds can create

	characteristic biological communities (northern sea fan and sponge communities and circalittoral sand and mixed sediment communities).	• Nutrient cycling	turbulence leading to the formation of internal waves. This allows relatively cooler, nutrient-rich deeper waters to mix with relatively warmer, nutrient-depleted waters serving to increase primary and secondary production (Scott *et al*., 2010; Yen *et al*. 2004). Increased productivity can lead to prey aggregations, for example of sandeels. The shallower nature of shelf banks and mounds can make prey more available for predators such as seabirds and other predators, such as seals and cetaceans, may also be attracted to prey concentrations associated with the feature (Cox *et al.* 2018).

Processes supporting the feature		
Feature	**Site specific advice**	**Site specific information**
Shelf banks and mounds	Conserve the processes which support the shelf banks and mounds feature.	The shelf banks and mounds feature is maintained by local hydrodynamic and sedimentary processes, specifically an adequate supply of sediments and a relatively high current velocity. These processes which support the feature may be compromised by activities causing large-scale changes in local water flow and those involving the physical change/ and or removal of seabed sediment. The degree of change in response to these pressures is dependent on the duration and scale of the activity in question, as well as any potential permanent changes to local water hydrodynamic and sediment supply. Assessments should focus on activities which may significantly alter water flow characteristics as well as those causing changes to sediment supply.

Annex 2. Supporting information

Factors determining the potential for features to recover

Circalittoral sands and mixed sediment communities

Many of the species in circalittoral sands and mixed sediment communities can be slow growing with patchy and intermittent recruitment. Recovery from loss of these species is likely to be low and take longer than five years. Despite this, the majority of species have a larval phase in their development and so are capable of dispersing over large distances allowing potential recruitment from outside the site. Further still, species associated with the habitat may have a comparatively high natural resilience to disturbance because the associated communities are adapted to life in the unstable and often shifting sediments.

Northern sea fan and sponge communities

Re-colonisation and recovery of these delicate, long-lived and slow growing suspension feeders is variable and depends on the intensity and frequency of disturbance. *Swiftia pallida* (the northern sea fan) has some resilience to damage through regenerative growth, however in cases where whole individuals are removed recovery is likely to be very low. A limited potential for larval dispersal in species such as *S. pallida* suggests that the population at Shiant East Bank pMPA may be self-sustaining, indicating a low recovery potential if removed from the area. Where smothering exceeds 5 cm recovery is also likely to be low. If lost, northern sea fan communities may take many years or decades to recover. Growth rates for branching sponges have also been described as irregular, very slow, with apparent shrinkage in some years. Given the slow growth rates and long life spans of the rich, diverse fauna, it is likely to take many years for deep sponge communities to recover if adversely affected by physical damage or smothering.

Shelf banks and mounds

If damaged the recovery of the shelf banks and mounds feature will depend partly on local hydrodynamic and sedimentological processes. Recovery is likely to be limited in instances involving large changes to local water flow and sediment transport, and will depend not only on the scale and duration of alteration but also the nature of the substrate.

Quaternary of Scotland (drumlinoid forms, glacial lineations, iceberg ploughmarks, streamlined bedrock

The processes which formed the component elements of the Quaternary of Scotland geodiversity feature no longer exist and therefore the feature has no recovery potential.

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Glossary for Conservation Objectives

Conservation Objective term	Definition
Composition of characteristic biological communities	This should include a reference to the diversity and abundance of species forming part of, or inhabiting, that habitat. In particular this includes those species that are especially relevant to the habitat's definition, e.g. species that form the structure of a bivalve bed, or sea pens on burrowed mud. In ecological terms, "community composition" means the number and abundance of flora and fauna included in the habitat. This is also referred to as biodiversity - the variety of life in a particular habitat.
Extent (and distribution)	The "extent" of a feature is the total area that it covers. This should also include consideration of the "distribution" i.e. how it is spread out within the MPA. A feature could be continuous and contained within one area, dispersed in smaller patches over a wider area, or as a mosaic with other habitats/features. Indeed, it could also be a combination of these.
Favourable condition	Favourable condition for each protected feature type for NC MPAs is defined in the box at the start of Annex 1 which summarises the conservation objectives for the site.
Function	The habitat must be able to be maintained in terms of the growth and reproduction of the habitat-forming species (e.g. through self-recruitment of larvae) and also help to maintain the provision of essential ecosystem services that the habitat provides. The text within the supplementary advice explains function in relation to both of these factors for the feature concerned where information is available.
Integrity (geodiversity)	For geodiversity features, integrity is the way the component elements make up the full extent of the feature. Integrity relates to the relationship between the component elements, where the whole is greater than the sum of the parts. In other words integrity refers to the full assemblage of component elements.
Quality / Processes	Quality outlines the processes relevant to the habitat/feature and include but are not limited to hydrography and supporting water currents, chemical water quality parameters, suspended sediment levels, radionuclide levels.
Supporting environment	This includes the following environmental conditions (but is not limited to) which are important for maintaining/restoring the protected features, e.g. hydrography and supporting water currents, chemical water quality parameters, suspended sediment levels, radionuclide levels.
Structure	The structure of a habitat/feature includes what it is created from and what it requires to exist, e.g. habitat forming species, geological features or sediment; the depth of the substrate or thickness or height of the biogenic structures from the seabed; biogenic material forming the structure should still retain a live component where this exists at baseline.