

Offshore and inshore Special Area of Conservation: Solán Bank Reef

Draft Conservation Objectives and Advice on Operations



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* Cover photo illustrates *Alcyonium digitatum* and encrusting coralline algae on bedrock reef with dense *Ophiocomina nigra* and *Ophiothrix fragilis*.

Document version control

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Solan Bank Reef Draft Conservation Objectives and Advice on Operations v2.0 (27/10/11)	Minor text amendment in light of comments received from MPA Sub-Group & JNCC Committee	Formally recommended to Scottish Government (27/10/11)
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Summary of Draft Conservation Objectives and Advice on Operations for Solan Bank Reef Special Area of Conservation (SAC)

This advice is based on information on the draft SAC presented in SNH and JNCC's "Solan Bank Reef: SAC Selection Assessment" (version 2.0 October 2011) and the boundary version therein. SNH and JNCC's Conservation Objectives and Advice on Operations is site and feature specific, and has been developed using best available scientific information and expert interpretation as at October 2011. The advice is generated through a coarse grading of sensitivity and exposure of site interest features to physical, chemical and biological pressures associated with human activity. Sensitivity and exposure have been combined to give a measure of the vulnerability of an interest feature to operations which may cause damage or deterioration, and which therefore may require management action.

The Conservation Objective for Solan Bank Reef is to maintain or restore the reef at/to favourable condition.

The exact impact of any operation will be dependent upon the nature, scale, location and timing of events. This Advice on Operations for the Solan Bank Reef site will be kept under review and will be periodically updated to reflect new evidence that suggests changes in either sensitivity or exposure.

Management actions should ensure the reef of the Solan Bank Reef SAC does not deteriorate from Favourable Condition. This will require assessment and management of human activities likely to affect the feature adversely, and of activities likely to impact natural environmental quality and environmental processes upon which the features are dependent.

Solan Bank Reef is currently moderately vulnerable to the following pressures. Therefore to fulfil the conservation objectives for the **Annex I Reefs**, the competent authorities for this area are advised to investigate and, if necessary, manage human activities within their remit such that they do not result in deterioration or disturbance of this feature through any of the following:

- i. **Physical damage** by physical disturbance or abrasion (**demersal fishing**);
- ii. **Biological disturbance** by selective extraction of species (**demersal fishing**).

Risk of damage to Solan Bank Reef SAC

There is a lack of detailed information on levels of exposure to human activities and their ecological impact on the feature at this site. Further information will be required to assess and monitor the condition of Annex 1 reef at this offshore SAC.

Within the Solan Bank Reef SAC, the following offshore activities may result in damage to the interest feature, and are not subject to prior authorisation or licensing. They are, therefore, currently considered to pose a medium-high risk of damage to the interest feature:

- **Demersal fishing**

Competent Authorities are advised to consider introducing management actions to reduce the risk of damage to the feature from this activity.

Risk to the feature of damage or deterioration associated with hooklining currently occurring over the

feature remains unknown as is the risk associated with fishing activities of vessels <15m.

The above is not a prohibition but rather indicates that some form of management measure(s) may be required or further measures where actions are already in force. This advice is indicative and does not remove the need for formal consultation on individual plans and projects.

DRAFT

Solan Bank Reef SAC: Draft Conservation Objectives and Advice on Operations

1 Introduction

1.1 Scottish Natural Heritage and JNCC's role

The Solan Bank Reef SAC, as outlined in the SAC Selection Assessment document prepared by Scottish Natural Heritage (SNH) and JNCC, lies across both Scottish territorial and offshore waters.

The Offshore Marine Conservation (Natural Habitats &c.) Regulations 2007 (as amended) transpose the Habitats Directive into law for UK offshore waters (from 12-200 nm from the coast or the UK Continental Shelf). These Regulations give JNCC a statutory responsibility to i) establish conservation objectives for SACs, ii) inform Competent Authorities of these conservation objectives and iii) advise Competent Authorities of any operations which may adversely affect the integrity of the site. This draft document for Solan Bank Reef SAC is therefore prepared by JNCC in fulfilment of requirements under Regulation 18 of the Offshore Marine Conservation (Natural Habitats &c.) Regulations 2007 (as amended).

The Conservation (Natural Habitats &c.) Regulations 1994 (as amended in Scotland) transpose the Habitats Directive into law on land and in territorial waters of Scotland (out to 12 nautical miles from the coast). The Habitats Regulations give SNH a statutory responsibility to advise relevant authorities on the conservation objectives and operations which may cause deterioration of natural habitats or the habitats of species, or disturbance of species for which the sites have been designated, for European marine sites in Scotland.

This advice is based on information on the SAC presented in SNH and JNCC's "Solan Bank Reef: SAC Selection Assessment" (version 2.0 October 2011) and the boundary version therein. SNH and JNCC's Conservation Objectives and Advice on Operations are site and feature specific, and has been developed using best available scientific information and expert interpretation as at October 2011. The advice is generated through a coarse grading of sensitivity and exposure of site interest features to physical, chemical and biological pressures associated with human activity. Sensitivity and exposure have been combined to give a measure of the vulnerability of an interest feature to operations which may cause damage or deterioration, and which therefore may require management.

This advice is also required under the Offshore Petroleum Activities (Conservation of Habitats) Regulations (as amended); and the Marine Works (Environmental Impact Assessment) Regulations 2007 (as amended).

SNH and JNCC are required, for inshore and offshore SACs respectively, to provide conservation objectives and advice on operations once a site has been submitted by Government to the European Commission (i.e. becomes a candidate SAC).

1.2 Offshore (12 – 200 nautical miles): The role of competent authorities

Regulations 22 and 23 of the Offshore Marine Conservation (Natural Habitats &c.) Regulations 2007 (as amended) require competent authorities to ensure compliance with the Habitats Directive. Competent authorities must, within their jurisdiction, have regard to both direct and indirect effects on interest features of the site. This may include consideration of issues outside the boundary of the SAC.

1.3 Inshore (0 – 12 nautical miles): The role of competent and relevant authorities

Regulation 3 (3) of the Conservation (Natural Habitats &c.) Regulations 1994 (as amended in Scotland) require competent authorities to exercise their functions so as to secure compliance with the Habitats Directive. Regulation 48 (1) requires competent authorities to make an appropriate assessment of the implications for the site in view of that site's conservation objectives before deciding to undertake, or give any consent, permission or other authorisation for, a plan or project which is likely to have a significant effect on a European site in Great Britain or a European offshore marine site (either alone or in combination with other plans or projects); and is not directly connected with or necessary to the management of the site.

A single management scheme may be drawn up by relevant authorities under Regulation 34 for the European marine site, which would provide a framework through which compliance with the Habitats Directive could be achieved and should be based on the advice in this document. Relevant authorities must, within their areas of jurisdiction, have regard to both direct and indirect effects on interest features of the site. This may include consideration of issues outside the boundary of the SAC.

1.4 Role of conservation objectives

The conservation objectives set out what is needed to ensure Favourable Condition of the Annex I feature. The UK conservation agencies use the term "favourable condition" to represent the concept of Favourable Conservation Status for the interest features of an individual SAC (Davies *et al.*, 2001). For an Annex I habitat, Favourable Conservation Status under the Habitats Directive occurs when: i) its natural range and area it covers within that range are stable or increasing; and ii) the specific structure and functions, which are necessary for its long-term maintenance, exist and are likely to continue to exist for the foreseeable future; and iii) the conservation status of its typical species is favourable¹ (Article 1e) Conservation objectives are the starting point from which management measures and monitoring programmes may be developed as they provide the basis for determining what currently, or may in the future, impact the site. The SAC Conservation Objectives will also inform appropriate assessment under the Habitats Regulations.

1.5 Role of advice on operations

Under the Habitats Directive, Member States are required to take appropriate steps to avoid the deterioration or disturbance of interest features within SACs (Article 6.2). The advice on operations set out in Section 2 provides the basis for discussion about the nature and extent of the operations taking place within or close to the site and which may have an impact on its interest features. The advice should also be used to identify the extent to which existing measures of control, management and forms of use are, or can be made, consistent with the conservation objectives, and thereby focus the attention of competent authorities on areas that may need management measures. This operations advice may need to be supplemented through further discussions with the competent and relevant authorities.

This document will also inform the scope and nature of any appropriate assessment which the Directive requires to be undertaken for a plan or project (Regulation 25 of the Offshore Regulations) or in the inshore area (Regulation 48 of the Scottish Habitat Regulations)³ that:

- either alone or in-combination with other plans or projects would be likely to have a *significant*

¹ The term Favourable Conservation Status relates to the individual habitats and species over their natural range within the European Union. However, because the selection of the European network of SACs is seen as fundamental to achieving Favourable Conservation Status, the European Commission considers that the concept should also be applied at the site level.

³ In Scotland, the EU Habitats Directive is transposed through a combination of the Habitats Regulations 2010 (in relation to reserved matters) and the 1994 Regulations, the Habitats (Scotland) Regulations, 1994.

- *effect* on a European Site; and
- is not directly connected with the management of the site for nature conservation.

Where a project is likely to undermine the site's conservation objectives, it is likely to have a significant effect on the site and therefore require an appropriate assessment. The scope and content of any appropriate assessment will depend upon the location, size and significance of the proposed project and JNCC for offshore waters and SNH for territorial waters will jointly advise on a case by case basis.

Through an appropriate assessment, competent authorities are required to ascertain the effect on the integrity of the site in view of the site's conservation objectives (Article 6.3). The integrity of the site is defined as 'the coherence of its ecological structure and function, across its whole area, that enables it to sustain the habitat, complex of habitats and/or the levels of populations of the species for which it was classified'²

Although closely linked, the judgement of effect upon site integrity is subtly different to determination of favourable condition of a specific feature. An assessment of favourable condition determines the current status of a feature. Any evaluation of effects on site integrity needs to consider whether the plan or project in question is compatible with the long-term maintenance of the site's features. For example, there may be a time-lag between a plan or project being initiated and a consequent adverse effect upon integrity becoming manifest in the condition assessment. In such cases, a plan or project may have an adverse effect upon long-term site integrity even though the features remain in favourable condition in the short term.

1.6 Solan Bank Reef SAC conservation objectives

The conservation objectives for the Solan Bank Reef SAC interest features are provided below. These are high level objectives for the site features, and JNCC and SNH may refine them in future as our understanding of the features improves. They should be read in the context of (and in conjunction with) other advice given, particularly the Site Selection Assessment document which provides more detailed information about the site and evaluates its interest features according to the Habitats Directive selection criteria.

Within the objectives below superscript letters refer to explanatory text provided in section 1.7.

² Nature Conservation: Implementation in Scotland of EC Directives on the Conservation of Natural Habitats and of Wild Flora and Fauna and the Conservation of Wild Birds ('The Habitats and Birds Directives') (Revised Guidance Updating Scottish Office Circular No.6/1995), Scottish Executive, June 2000; Institute of Ecology and Environmental Management (2010). Guidelines for Ecological Impact Assessment in Britain and Ireland.

The Conservation Objectives for the Annex I reef at Solan Bank Reef are:

Subject to natural change, maintain or restore^a the reef to favourable condition, such that:

The natural environmental quality^b is maintained or restored

The natural environmental processes^c are maintained

The extent^d, physical structure^e, diversity^f, community structure^g and typical species^h representative of the **reef** in the Scottish Continental Shelf Regional Sea are maintained or restored

The Conservation Objectives for Solan Bank Reef SAC set out to maintain or restore⁴ the reef to favourable condition. There is currently no direct evidence to date that the feature has been damaged by human activities, however best available evidence indicates that demersal fishing occurs over the reef feature, exposing it to pressures to which it is sensitive and subsequently it is assessed as moderately vulnerable.

Although it is likely that bottom trawlers avoid the hard substrate to prevent damage to their gear, the best available evidence is not of sufficient spatial resolution to confirm this and so the objective has been set to maintain or restore. Should further information become available which indicates the assessment is incorrect the objective may be changed.

The feature's vulnerability to human pressure is further documented in section 2.5. However there is a lack of detailed information on levels of exposure to human activities and their ecological impact on the feature at this site. As outlined in section 1.8 below, further information will be required to assess and monitor favourable condition of the reef at this offshore SAC. In particular, the following activities require further investigation in order to be able to assess their impacts on the feature; mobile demersal fishing, hooklining, and creeling as well as the fishing activity of the <15m fleet within the site.

1.7 Explanation of terms used in the Conservation Objectives

a) Maintain or restore

Maintain implies that, based on our existing understanding, the feature is regarded as being in **favourable condition** and will, subject to natural change, remain at its condition at designation.

Restore implies that the feature is likely to have been degraded to some degree or, in the absence of evidence, that activities generating pressures to which the feature is sensitive overlap with the feature and that activities may have to be managed to reduce or eliminate potential negative impact(s). The first step for a restore objective may be to seek new information on the current condition of the site feature. Restoration in the marine environment generally refers to natural recovery to favourable condition through the reduction or removal of impacts.

JNCC consider that maintenance or restoration of the following parameters (b - h) will take account of the maintenance or restoration of natural structures and functions and ecological

⁴Solan SAC lies across both Scottish territorial waters and Scottish offshore waters, falling within the remit of SNH and JNCC respectively. JNCC and SNH differ slightly in respective approaches to setting objectives. SNH may set a recover objective in instances where they have direct evidence that the feature is in unfavourable condition, whereas JNCC may take a more precautionary approach; where if according to best available evidence we are aware that potentially damaging activities are occurring (exposing the feature to pressures to which it is moderately or highly sensitive) over the feature, we set a precautionary restore objective. This is based on the thinking that the feature may be damaged or deteriorated as a result of exposure to these activities and their associated pressures and we therefore cannot be certain that the feature is in favourable condition and it would not be precautionary to assume that it is, in the absence of direct evidence. A way forward was agreed jointly by SNH and JNCC, in which the objective would be set to 'maintain or restore' as opposed to 'restore' as initially recommended by JNCC.)

processes.

- b) **Natural environmental quality** e.g. chemical quality parameters of water, suspended sediment levels, radionuclide levels etc should not deviate from baseline at designation (if available) or reference conditions
- c) **Natural environmental processes** e.g. circulation, sediment deposition and erosion etc. should not deviate from baseline at designation (if available) or reference conditions
- d) **Extent** - the area covered by the habitat and communities
- e) **Physical structure** - the shape, form and composition of the habitat and its substrata.
- f) **Diversity** - the number of different biological communities or number of species within a given community.
- g) **Community structure** e.g. age classes, sex ratios, distribution of species, abundance, biomass, reproductive capacity, recruitment, range and mobility
- h) **Typical species** – see Appendix IV for criteria for identifying typical species.

1.8 Favourable condition

Conservation objectives for inshore SACs have been provided in association with a “favourable condition” table, which outlines how to recognise favourable condition for the interest features in question. However, understanding the functioning and condition of complex and dynamic offshore marine sites, which experience a variety of pressures resulting from historic and current activities, is difficult. For offshore sites, there is presently insufficiently detailed information on i) the existing condition of qualifying interest features and ii) the preferred or target condition of interest features. This currently limits the identification of measures and associated targets for condition monitoring. It is anticipated that further information on the condition of interest features will be obtained through baseline surveys and monitoring.

2 Advice on operations

2.1 Purpose of advice

The aim of this advice is to enable all competent authorities to prioritise management of activities that currently pose a threat to the interest features of the Solan Bank Reef site and to inform them of which activities may cause deterioration of the site's features in the future. The advice is linked to the conservation objectives outlined in the section above, and will help provide the basis for detailed discussions on management of activities that may affect the features of the site.

2.2 Methods for assessment of vulnerability to pressures

Six broad Pressure Categories which may cause i) deterioration of natural habitats or the habitats of species, or ii) disturbance of species, (either alone or in combination), are considered in SNH and JNCC's Advice on Operations:

- Physical loss
- Physical damage
- Non-physical disturbance
- Toxic contamination
- Non-toxic contamination
- Biological disturbance

Example sources of pressures are provided (See Table 1), although these examples are not inclusive of all potentially detrimental activities.

A three-step process is used to assess the vulnerability of the site's features (**reef**) to the above pressures (see flow diagram in Appendix I):

1. An assessment of the **sensitivity** of the interest feature to the listed pressures (2.3);
2. An assessment of the current **exposure** of the interest feature to the pressures (2.4); and
3. An assessment of the **vulnerability** of the interest feature to the pressures. Vulnerability occurs where sensitivity to a given pressure is combined with exposure to that pressure.

This approach is sufficiently robust to take into account the effects of new activities or changes in patterns of usage. By assessing sensitivity, exposure and vulnerability independently, the reasoning behind current (and any future) advice is made clear. If an interest feature is known or thought to be sensitive to a particular pressure category, new activities or changes in patterns of activities which result in that pressure are likely to cause deterioration or disturbance.

All the scores of relative **sensitivity**, **exposure** and **vulnerability** are derived using best available scientific data and expert judgement. This method uses a coarse categorisation system, reflecting the current state of our understanding of the marine environment. It should be recognised that data for offshore habitats are sparse and assessments are likely to need revision in light of new research.

2.3 Sensitivity assessment

This assessment evaluates the relative sensitivity of the features of the Solan Bank Reef SAC to the effects of physical, chemical and biological pressures. Sensitivity is defined here as 'intolerance of a

habitat, community or individual (or individual colony) of a species to damage, or death, from an external factor and the time taken for its subsequent recovery' (MarLIN, 2006). For example, a very sensitive species or habitat is one that is very adversely affected by an external factor arising from human activities or natural events (killed/destroyed, high intolerance) and is expected to recover over a very long period of time, i.e. >10 or up to 25 years ('low' recoverability) (MarLIN, 2006). The sensitivity of interest features (and scientific understanding of sensitivity) may change over time. Hence, an operation which is not currently deemed to have a negative effect may do so in the future.

Table 1 (column 3) shows the sensitivity assessments for the features of the Solan Bank Reef SAC. They are drawn principally from MarLIN's (2004) evaluation of the sensitivity of the following biotope (which is not identical, but is comparable in terms of functionality to that present within the SAC):

- **Erect sponges, *Eunicella verrucosa* and *Pentapora fascialis* on slightly tide-swept moderately exposed circalittoral rock CR.HCR.XFa.ByErSp.Eun)**

The applicability of the MarLIN assessments of sensitivity is dependent on the quality of available scientific information on these biotopes and their characterising species. In addition, both the biotope classification system and the MarLIN sensitivity assessments primarily rely on inshore biological data, so although the biotope sensitivity assessments are applicable to habitats in offshore waters, confidence in these assessments in an offshore context is necessarily lower. SNH and JNCC have in some cases, therefore, adjusted the assessments of sensitivity to be more precautionary, in order that the feature's sensitivity is not underestimated.

Several biotopes were found to be present within the site, the most sensitive of which (CR.HCR.FaT.CTub.Adig) MarLIN does not provide a sensitivity assessment. In the absence of a sensitivity assessment for the most sensitive biotope present in the site, the biotope highlighted above was instead chosen on which to base the feature's sensitivity. This biotope was chosen because it was thought to best represent the sensitivity of the most sensitive biotope present in the site, taking into consideration the functionality of species present.

Further detail on our approach to evaluating sensitivity can be provided on request.

The interest features and associated biological communities of the Solan Bank Reef site are sensitive to: **physical loss, physical damage, non-toxic contamination, and biological disturbance.**

Further detail on sensitivities of the reef to these pressures is provided in Table 1 and the activities which may be associated with these pressures is given in Appendix I.

Physical loss

Many of the species within the biotope are attached to the substratum or are slow moving so that substratum removal would result in loss of most faunal populations. With the loss of adult populations, recovery depends upon recolonisation by larvae during the breeding season. For species representative of the CR.HCR.XFa.ByErSp.Eun biotope, recovery by recolonisation is likely to be slow, particularly for characteristic species such as axinellidae sponges.

Physical damage

Erect epifaunal species are particularly vulnerable to physical disturbance. Sponges, hydroids and bryozoans are likely to be removed or damaged by bottom trawling or dredging (Holt *et al.*, 1995). Veale *et al.* (2000) reported that the abundance, biomass and production of epifaunal assemblages decreased with increasing fishing effort. Hydroid and bryozoan matrices were reported to be greatly reduced in fished areas (Jennings & Kaiser, 1998 and references therein). The removal of rocks or boulders to which species are attached by the passage of mobile fishing gears (Jennings & Kaiser, 1998) may also result in substratum loss.

The majority of the characterising species in this biotope are sessile, attached to the substratum and so are unable to move away and are likely to be physically removed or damaged by a passing trawl or

dredge. Therefore, given the evidence above, an overall intolerance of high has been recorded. Recovery of the biotope is likely to be high as effects are local and partial.

Toxic and non-toxic contamination

The feature and associated communities are considered sensitive to various types of chemical disturbance. Assessing the effects of toxic contamination on biotopes is extremely difficult because varying quantities of different contaminants can have very different effects (including antagonistic and synergistic effects) on marine organisms. There is currently no information available to quantify sensitivity to toxic contamination and non-toxic contamination through changes in nutrient levels and thermal regime. The feature and associated communities are considered sensitive to changes in salinity and oxygen levels but these pressures are generally considered irrelevant to features in the offshore region. As such the biotope's sensitivity to toxic contamination and non-toxic contamination through changes in nutrient levels and thermal regime is considered to be unknown as there is insufficient information to make an assessment.

Biological disturbance

The biological effects of fisheries can include:

- Removal of target species
- Mortality of non-target species

These effects can lead to shifts in community structure (e.g. if predators are removed from the system) which then lead to indirect effects on the food web as a whole.

In addition, many of the species targeted by fisheries in deep water areas are especially vulnerable to the effects of over fishing due to their long life histories (Pauly *et al.*, 2002; Sewell and Hiscock, 2005).

It has not been possible to determine whether the interest feature is sensitive to introduction of toxic contaminants, introduction of radionuclides, changes in nutrient loading, changes in thermal regime, introduction of microbial pathogens or introduction of non-native species.

2.4 Exposure assessment

Table 1 (column 4) shows the relative exposure of the Solan Bank Reef interest features to physical, chemical and biological pressures. This assessment is based on known current human activities operating in or adjacent to the site, and the anticipated pressures associated with these activities.

As offshore sites cover a relatively large geographical area and precise information on operations within SAC boundaries is not yet available, assigning scores for exposure carries certain assumptions about the spatial extent, frequency and intensity of the pressures associated with offshore activities. Expert judgement was used to determine where onsite and offsite activities are likely to expose interest features physical, chemical and/or biological pressures.

Spatial data on offshore industry activities has been provided by the Crown Estate for aggregate extraction and windfarm development, UK Deal for oil and gas industry activities and the United Kingdom Cable Protection Committee for submarine cable distribution. UK-wide fisheries data for offshore waters are not yet available to JNCC at sufficient resolution to enable a full assessment of exposure to different types of fishing activities.

Fishing exposure was derived from work on a Defra marine biodiversity research programme (MB106)⁵.

⁵ Cefas (2010) Report no. 1: Objective 1 – Provision of geo-database containing standardised layers showing the distribution of specified activities, sites and resources with associated metadata and comments. Project MB106: Further development of marine pressure data layers and ensuring the socio-economic data and data layers are developed for use in the planning of marine protected area networks

Estimations of fishing activity were derived from Vessel Monitoring System (VMS) data and are available for 2006-9. The derived surfaces represent activity from all vessels (both UK and non-UK registered vessels) of at least 15m length. VMS data for UK vessels were linked to skipper logbook information in order to determine the fishing gear being employed. For non-UK registered vessels where logbook information is not available information on fishing gear employed has been obtained from 'primary gear' listed on the EU vessel register. Unprocessed VMS data have been filtered using a simple speed rule of between 1 and 6 knots to indicate fishing activity for all gear types. Date and time information attached to unprocessed VMS data were used to determine elapsed time between consecutive VMS locations for each vessel (usually 2 hours) and summarised at a resolution of 0.05 decimal degrees. The same programme recorded distribution of creeling/potting activity, though it should be noted that many vessels undertaking creeling/potting and also mobile demersal gear (e.g. trawling) may be less than 15m in length and as such not recorded in this dataset.

From landings data, information is available on which species are removed from the ICES rectangle within which the site is located, using particular gear types and the size of the vessel used. We can therefore take into consideration the importance of these target species in the functioning of the biotope when assessing the level of biological disturbance through selective extraction of species. Landings data, however, does not provide information on the possible mortality/extraction of non-target species. Additional research to assess the distribution of static/set demersal gear use and the intensity of its physical and biological impacts is needed. Interest feature exposure and vulnerability to static/set demersal gears are therefore difficult to assess using VMS and landings data.

The exposure assessment is based on best available information on the levels of pressures associated with activities at the Solan Bank Reef site. If new information becomes available this may lead to modification of the advice on operations presented herein. In addition, an activity may not currently be occurring on the site but may do in future. As such, competent authorities will need to take into account both the sensitivity of the feature and the conservation objectives outlined in section 1.7 whenever a new activity is proposed⁶. A list of operations that may generate pressures to which the feature is sensitive in the future is given in Annex II.

The interest features and associated biological communities of the Solan Bank Reef site are exposed to the following pressures:

- **Physical loss** through **obstruction** (from wrecks);
- **Physical damage** through **physical disturbance and abrasion** (mobile and static demersal fishing) at low levels;
- **Biological disturbance** through **selective extraction of species** (possible mobile demersal fishing at low levels).

Physical loss

The reefs may be exposed to very low levels of **obstruction** from historic wrecks. There are two wrecks within the site boundary dating from 1917 and 1944.

Physical damage

The reefs may be exposed to **physical disturbance and abrasion** at low levels due to otter trawling and creeling. VMS data indicates that the region is fished at very low levels by UK demersal otter trawls (up to approximately 50 hrs cumulatively over 2006-09) with the effort distributed unevenly throughout the site. VMS data indicates that creeling occurs over the entirety of the site. This is likely to be targeting the edible crab, *Cancer pagarus*, Velvet Swimming crab, *Necora puber* and lobster, *Homarus gammarus*, however, it is possible to undertake only a very coarse assessment of exposure to abrasion or physical damage from creeling, based on the area of the site exposed as indicated by VMS gridded

⁶ For a list of activities that may contribute to the listed pressures, but that are not comprehensive, see Annex II

data. VMS indicates creeling is focussed on the eastern half of the site, abrasion from creeling is likely to be much lower than that associated with benthic trawling. It must be noted, however, that low confidence accompanies this portion of the assessment.

Otter trawling is likely to be targeting mainly *Nephrops norvegicus*, among other demersal species. VMS data indicates that the trawling extends over the reef feature and is also conducted over a wider area around the site and appears to be focused in deeper waters surrounding the reef. VMS data is inconclusive as to the exact location of fishing effort in relation to the reef, although it is likely that trawlers would avoid trawling over the reef to prevent loss or damage of gear.

Vessels using midwater otter trawls and creeling are much more significant in terms of the value of their catch, but are unlikely to cause as much physical abrasion to the seabed as bottom trawling gears. The total exposure score for abrasion is assessed as moderate.

The feature is also unlikely to be exposed to **changes in suspended sediment** due to mobile demersal fishing activity on or near the feature. A veneer of sand is present over the flat bedrock surfaces, indicating that sediment scour is a significant factor across the site (Whomersley *et al*, 2010), it is therefore likely that the feature and its communities are naturally exposed to elevated levels of suspended sediment. It is not expected that changes in suspended sediment associated with demersal trawling would exceed ambient levels.

VMS data may not be a comprehensive indicator of all fishing activity for areas in close proximity to the coast where vessels <15m can easily access the site and subsequently this effort is not captured in VMS data. The contribution of <15m vessels to this pressure therefore cannot currently be assessed.

Biological disturbance

VMS data indicates that the reef feature may be exposed to a low level of **selective extraction of species** through demersal trawling (see information on effort provided under physical damage).

The contribution of the fishing effort of <15m vessels to this pressure cannot currently be assessed, as is the case with creeling which is widespread over the feature, likely targeting crabs *C. pagurus* and *N. puber* and lobster *H. gammarus*.

It has not been possible to determine whether the interest features are exposed to the introduction of non-native species.

2.5 Vulnerability assessment for current activities

The vulnerability of the interest feature to external pressures is determined by integrating the sensitivity evaluation with that of exposure. Only if a feature is both sensitive *and* exposed to a human activity is it considered vulnerable. In this context, therefore, **vulnerability** has been defined as the **exposure** of the habitat, community or individual (or individual colony) of a species to an external factor to which it is **sensitive** (Hiscock, 1996). An assessment of interest features' vulnerability (Table 2.1) helps to guide site management decisions by highlighting potentially detrimental activities that may need to be managed (or continue to be managed) by the competent authorities.

The **Solan Bank Reef reefs** and associated biological communities are moderately vulnerable to:

- **Physical damage** through **physical disturbance or abrasion** (demersal fishing) and **Biological disturbance** through **selective extraction of species** (demersal fishing).

Moderate vulnerability of the reef to physical disturbance or abrasion and selective extraction of species is based on low exposure to demersal fishing which may be occurring over the feature. We do not think that trawling occurs on reef feature itself but the data we have available is not of sufficient resolution to confirm this. If exposure to pressures associated with demersal fishing is shown to be absent then the

vulnerability would be reduced to none.

Vulnerability to physical removal through obstruction is considered to be low given that the exposure of the feature to this pressure is very low in relation to the size of the feature; from 2 wrecks. The feature's overall structure and function is not considered to be affected by this obstruction and so the overall vulnerability has been reduced from moderate to low.

Vulnerability to pressures associated with the following activities occurring on the site cannot be quantified given the data available:

- Hooklining;
- Creeling; and
- Fishing activity of vessels <15m.

Vulnerability to introduction of non-native species remains unknown for this interest feature.

2.6 Risk of damage or disturbance

JNCC considers 'risk' to be the likelihood of deterioration of the feature due to an activity. It is the vulnerability of the feature to an activity, assessed against the level of management of that activity. Given the limitations of current data available, it is not possible to undertake a detailed quantitative risk assessment.

High risk activities will be those to which the feature is highly or moderately vulnerable, and for which there is insufficient management. For example, industries which are not location specific and not subject to prior consent procedures or reliable enforcement are more likely to cause damage/disturbance to the interest feature. These industries include fishing and shipping. However, clearly not all activities associated with these industries are detrimental to interest features.

Low risk activities will be those where there is no feature vulnerability (i.e. the activity does not interact with the feature) or where the moderate or high vulnerability is mitigated for by management. For example, for industries which are location specific, are always subject to prior consent and have clear reliable methods of enforcement, there is generally a lower likelihood of causing damage or disturbance to interest features. This includes the activities of the oil and gas, aggregates and renewable energy industry sectors. Only high or medium-high risk activities are noted here.

Within the Solan Bank Reef site, the following offshore activity is currently considered to pose a moderate risk to the interest features:

- **Demersal fishing**

The feature's risk to pressures associated with the following activities is unknown because although vulnerability has been identified it cannot be quantified as exposure cannot be assessed given the available information:

- Hooklining
- Creeling; and
- Fishing activity of vessels under 15m within the site.

Competent Authorities are advised to consider management actions that might need to be taken to assess and, if necessary, reduce the risk of damage associated with this activity to the SAC features.

The vulnerability of the SAC to climate change is not considered in the tables below, given the uncertainties surrounding the effects of global change on the oceans.

Table 1: Sensitivity, exposure and vulnerability of the Solan Bank Reef reef to physical, chemical and biological pressures

Sensitivity key: *** = High sensitivity ** = Moderate sensitivity • = Low sensitivity, ○ = No known sensitivity and ? = Insufficient information to make assessment
Exposure key: High = High exposure, Medium = Medium exposure, Low = Low exposure, None = No known exposure, Unknown level = Exposure of an unknown level and ? = Insufficient information to make assessment.

List of pressures which may cause deterioration or disturbance (with example activities)		Solan Bank Reef: rocky and stony reef		
		Sensitivity	Exposure	Vulnerability
Physical loss	Removal (e.g. aggregate dredging, isolated rock dump, infrastructure development)	***	None	No known vulnerability
	Obstruction (e.g. permanent constructions [oil & gas infrastructure, windfarms, cables] & wrecks)	***	Low	No known vulnerability*
	Smothering (e.g. drill cuttings)	**	None	No known vulnerability
Physical damage	Changes in suspended sediment (e.g. screening plumes from aggregate dredging)	**	None	No known vulnerability
	Physical disturbance or abrasion (e.g. mobile benthic fishing, anchoring, windfarm scour pits, pipeline burial, potting)	***	Low	Moderate
Non-physical disturbance	Noise (e.g. boat activity, seismic)	○	?	No known vulnerability
	Visual presence (e.g. recreational activity)	○	None	No known vulnerability
Toxic contamination	Introduction of synthetic compounds (e.g. TBT, PCBs, industrial chemical discharge, produced water, fuel oils)	**	None	No known vulnerability
	Introduction of non-synthetic compounds (e.g. heavy metals, crude oil spills)	**	None	No known vulnerability
	Introduction of radionuclides (e.g. nuclear energy industry)	?	None	No known vulnerability
Non-toxic contamination	Changes in nutrient loading (e.g. outfalls)	?	None	No known vulnerability
	Changes in thermal regime (e.g. cooling water discharges)	?	None	No known vulnerability
	Changes in turbidity (e.g. laying of pipelines, aggregate dredging)	•	None	No known vulnerability
	Changes in salinity (e.g. outfalls from rigs, ships)	***	None	No known vulnerability
Biological	Introduction of microbial pathogens (e.g. outfalls)	?	None	No known vulnerability
	Introduction of non-native species and translocation (e.g. ballast water, hull fouling)	?	?	Insufficient information

	Selective extraction of species (e.g. bioprospecting, scientific research, demersal fishing)	...	Low	Moderate
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Table 2: Risk of damage to Pobie Bank reefs from current or planned activities (based on vulnerability identified in Table 1).

Risk key: Low=low risk of damage to feature; Moderate=moderate risk of damage to feature; High=high risk of damage to feature.

List of pressures which may cause deterioration or disturbance (with example activities)		Pobie Bank: rocky and stony reef				
		Vulnerability	Activity associated with pressure	Current management	Level of risk	Action advised
Physical Damage	Physical disturbance or abrasion	Moderate vulnerability	demersal fishing (otter trawling & creeling)	No site-specific management of this activity currently in place.	High	Competent Authority to assess and consider need for demersal fisheries management measure(s)
Biological disturbance	Selective extraction of species	Moderate vulnerability	demersal fishing (otter trawling & creeling)	No site-specific management of this activity in place.	High	Competent Authority to manage within remit

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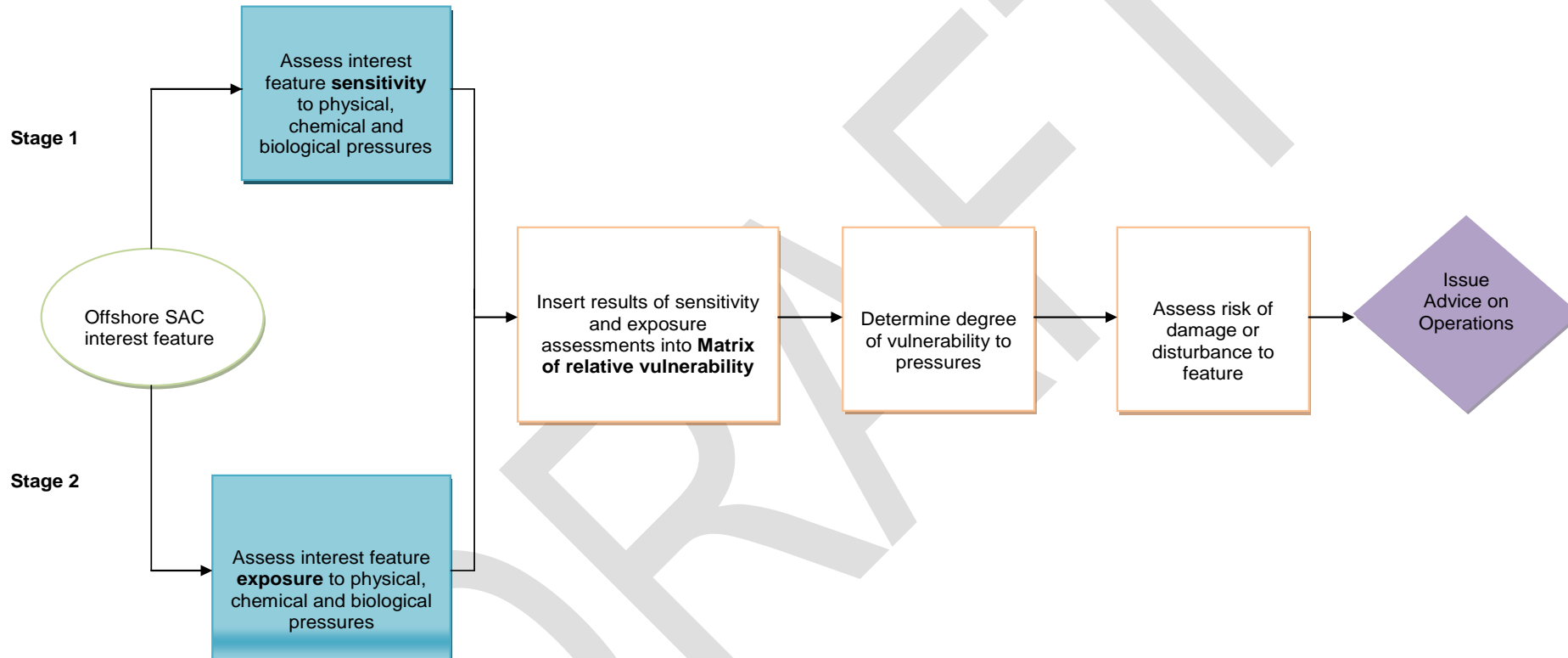
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DRAFT

Appendix I: Flow diagram illustrating process of determining vulnerability of interest features



Appendix II: Associated activities that contribute to pressures to which reef feature of site is sensitive:

This list is draft, not definitive, and intends merely to provide Relevant/Competent Authorities with an indication as to the type of activities which may cause damage or deterioration to the feature for which the site is designated. These include activities which may not currently be affecting the site.

Physical loss

Removal

Aggregate dredging, isolated rock dump, infrastructure development and ship wrecks

Obstruction

Permanent constructions [oil & gas infrastructure, offshore windfarms, wave and tidal renewable developments, cables and pipelines] & wrecks

Smothering

Drill cuttings

Physical Damage

Changes in suspended sediment

Screening plumes from aggregate dredging

Physical disturbance or abrasion

Mobile benthic fishing, anchoring, windfarm scour pits, pipeline burial, creeling/potting

Toxic contamination

Introduction of synthetic compounds

TBT, PCBs, industrial chemical discharge, produced water, fuel oils

Introduction of non-synthetic compounds

Heavy metals, crude oil spills

Introduction of radionuclides

Nuclear energy industry

Non-toxic contamination

Changes in nutrient loading

Outfalls

Changes in thermal regime

Cooling water discharges

Changes in turbidity

Laying of pipelines, aggregate dredging

Changes in salinity

Outfalls from rigs, ships

Biological disturbance

Introduction of microbial pathogens

Outfalls

Introduction of non-native species and translocation

Ballast water, hull fouling

Selective extraction of species

Bioprospecting, scientific research, demersal fishing

Appendix III: Matrix of relative vulnerability

The relative vulnerability of an interest feature is determined by combining the sensitivity and exposure assessments according to the table below.

		Relative sensitivity of the interest feature			
		High ●●●	Moderate ●●	Low ●	None ○
Relative exposure of the interest feature	High (3)	9	6	3	0
	Medium (2)	6	4	2	0
	Low (1)	3	2	1	0
	Unknown				0
	None (0)	0	0	0	0

Note: if there is insufficient information to assess either exposure **or** sensitivity of a given interest feature, vulnerability will always be categorised 'insufficient information to make any assessment'.

Categories of relative vulnerability

High vulnerability	6 to 9
Moderate vulnerability	3 to 5
Low vulnerability	1 to 2
Vulnerability identified, but not quantified as level of exposure unknown	
No known vulnerability	0
Insufficient information to make any assessment	

Appendix IV: Typical species criteria

Identification of a species as typical is not in itself sufficient to indicate the importance of the species or any need for management. The importance of the species should be judged on the contribution made by the species to ecological integrity of the feature. These criteria are intended to help identify or classify typical species and are not limited to the benthos. They are relevant to the Annex I habitat feature and its component parts at the *site* level.

A typical species should meet one or more of the following criteria a – e below:

- a) Consistently associated with, but not necessarily restricted to, the feature
For example:
 - Can be predicted to occur at certain seasons/times (e.g. seasonal & temporal)
 - Stages of life cycle associated with the feature (e.g. spawning)
 - Species is dependent upon feature (for food, shelter, nest)
- b) A species on which identification of the habitat is founded
This criterion is unlikely to apply to complex physiographic features which may be composed of or include other Annex 1 features (e.g. H1130 Estuaries, H1160 Large Shallow Inlets and Bays which may include H1170 Reefs, H1110 Sandbanks which are slightly covered by seawater all the time etc.)
- c) Characteristic of the habitat
For example:
Ammodytes tobianus, *Zostera marina* for 'H1110 Sandbanks which are slightly covered by seawater all the time'
- d) An integral part of the structure of the habitat
For example:
 - Any species that gives the habitat structural complexity (e.g. kelp)
 - Any species that forms the habitat (e.g. biogenic reef species, maerl)
- e) A species which influences the habitat's structure and function
For example:
 - Bioturbators
 - Grazers
 - Animals which bore into the substratum
 - Predators
 - Keystone species (i.e. A species that influences the ecological composition, structure, or functioning of its community far more than its abundance would suggest (EEA, 2008)

Note: above criteria should not be used to describe non-natives as typical; these are marine species and plants and algae transported from their native range to 'new' areas. Introductions and transfer of non-native marine species to their non-native environment mainly occurs by the transport and discharge of ballast water, and to a lesser extent by transport of fouling organisms on hulls or through aquaculture (JNCC, 2008b).