

# **The Moray Firth**

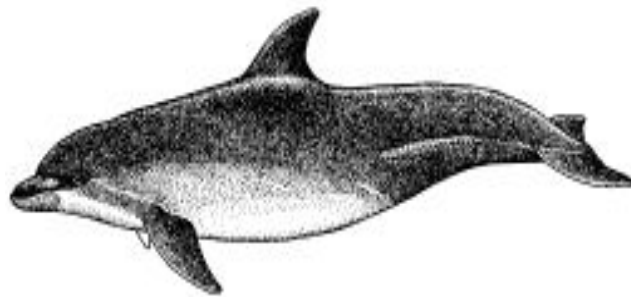
## **Special Area of Conservation**

### **Management Scheme**

#### **REVISION 2**

This document has been prepared by the Moray Firth SAC Management Group

Please note this is a “live” document to be updated as and when required



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The Moray Firth Partnership has facilitated the work of the SAC Management Group

## FOREWORD

As with 'Revision 1', 'Revision 2' of 'The Management Scheme for the Moray Firth Special Area of Conservation (SAC)' sets out a framework for the co-operative management of our activities affecting this major body of water. The 'Conservation Objectives' have now been widened to both achieve the establishment and maintenance of a viable population of bottlenose dolphins, and to conserve the condition of subtidal sandbanks ('sandbanks which are slightly covered by sea water all the time'), within the Firth.

The SAC was designated under the Scottish Executive and UK Government's implementation of the European Habitats Directive. Government guidance suggests an approach to achieving the 'Conservation Objectives', under which those organisations that have existing powers and responsibilities ('Relevant Authorities') work together within a management group, co-operating with organisations and individuals who have an interest in activities on and around the Firth, to establish a scheme of management for the SAC. The Moray Firth SAC Management Group exists to represent all the 'Relevant Authorities', to decide how we are going to best meet our obligations under the Directive. Any 'Relevant Authority' may represent itself on the group and it is their decision as to how much or how little they get involved in the actual decision making process. On the whole, the choice is based on the degree of involvement of each Authority.

The development of Revision 2 of the management scheme has been conducted using the same principles as earlier revisions. It has again required many hours of hard work by individuals coupled with extensive consultation, collective discussion and debate whilst maintaining the spirit of joint working achieved with Revision 1. Our guiding principles continue to be to seek to achieve the 'Conservation Objectives' whilst avoiding the introduction of unnecessary additional regulation and/or prohibitions; to look for different, sustainable where practicable, ways of doing things; and to identify the opportunities and benefits generated by the SAC for the community and users of the Firth.

This revision includes information on progress with the implementation of the management actions, the removal of some actions which were no longer relevant and the addition of new actions covering activities that were not considered to be significant when earlier revisions were prepared, a good example being offshore renewables. We have also rationalised the list of actions to make the document more focussed on the priority areas of work.

This document is a distillation of an ever-widening range of expertise and we are indebted to the many individuals and organisations that have contributed their experience, knowledge and resources to the process.

This document is also a 'live', revisable document. As more information is gathered, further revisions will be produced, going forward as always in consultation and in partnership with all those who have an interest or stake in what happens in and around the Moray Firth.



**Jim McKie**  
**Chairman**  
**The Moray Firth SAC Management Group**

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## 1. Management Scheme - SUMMARY

This is 'Revision Two' of the Management Scheme for the Moray Firth Special Area of Conservation (SAC). Revision One (2003) was undertaken to update the dolphin management strategy to include the qualifying interest feature, subtidal sandbanks. The main focus of the Management Scheme is the Moray Firth SAC although some management actions may extend outside the area.

### **The Moray Firth Dolphins**

It is well known that the Moray Firth hosts a population of bottlenose dolphins and that these dolphins are an important asset to the area, not only in terms of their contribution to the biodiversity of the marine ecosystem, but also because of the social and economic benefits that they provide both locally and further afield. It is less well known that, within Europe, they are considered rare. They are also the last remaining resident population of bottlenose dolphins in the North Sea. For this reason, the inner Moray Firth has been designated as a Special Area of Conservation (SAC) to protect this small, isolated and vulnerable population. Bottlenose dolphins are also a European protected species and in addition to the protection provided within the SAC, Articles 12 & 14 of the EU Habitats Directive offer a strict level of protection throughout Scottish and UK waters. (i.e. they are protected in the wider marine environment, not just within the boundary of the SAC).

### **The Moray Firth Subtidal Sandbanks**

Subtidal Sandbanks or "Sandbanks which are slightly covered by seawater all of the time" are the additional qualifying interest feature of the Moray Firth marine SAC. This site is considered to support a significant area of Subtidal Sandbanks, representative of this region of the UK. Sandbanks occur widely on the Atlantic coasts of northwest Europe and around the UK coast. Sandbanks have an important role in maintaining sediment balance within the Firth and provide the spawning grounds and habitats of a variety of invertebrate and fish communities.

### **The SAC**

The Moray Firth SAC is a "triangular" area of water extending from the inner firths to Helmsdale on the Sutherland coast and Lossiemouth on the Moray coast (see Appendix A).

### **Aims of the Management Scheme**

This scheme aims to set out a management strategy to help maintain the integrity of the SAC area, so that the dolphin population is maintained, significant disturbance of the dolphins is avoided and the subtidal sandbanks and the habitats for the dolphins are maintained. The scheme, where possible, takes account of the economic, cultural, social, recreational and scientific needs of all those who live and work in the Moray Firth area, and in a way that promotes sustainable development of all existing legal activities and interests, having regard to the qualifying features.

### **Public Consultation**

The activities and management actions listed in this document have been compiled by the SAC Management Group with the help of a large number of people who live and work around the Firth. A public consultation took place on the draft Revision Two Scheme between July and October 2008 to ensure that everyone with a stake in the Moray Firth had an opportunity to comment on the proposals before the Scheme was finalised.

## 2. Introduction

### 2.1 Aims of the management scheme

The primary aim of the Moray Firth Special Area of Conservation (SAC) management scheme is to deal with a complex interaction of different management issues. Plans and projects will be assessed against the Conservation Objectives for this site (see Section 4.1).

The scheme, where possible, will take account of economic, cultural, social, recreational and scientific needs of all those who live and work in the Moray Firth area, and in a way that promotes sustainable development of all existing legal activities and interests, with regard to the qualifying features.

Although the management scheme has a legislative basis (see Section 2.3), it seeks to focus on **voluntary** management measures that involve **widespread co-operation and consensus** between organisations and individuals. This scheme is not adding new bureaucracy to existing processes but simply reinforcing existing arrangements in light of the SAC interest.

This document should not be seen as cast in stone; it will be reviewed and amended on a regular basis to make sure that it is kept up to date and relevant. This version of the scheme is "Revision Two" which was undertaken to update the management strategy and streamline and re-prioritise the work that needs to be done to look after this valued site.

### 2.2 EU Directives

The Moray Firth SAC is part of a network of sites - Natura 2000 - set up to help maintain the diversity of wildlife found across Europe. Natura 2000 sites are designated under the 1979 "Wild Birds Directive" (79/409/EEC) and the 1992 "Habitats Directive" (92/43/EEC).

The Habitats Directive is one of the EC's major contributions to the Biodiversity Convention agreed by over 150 countries at the 1992 Rio Earth Summit. Its main aim is to ensure that biodiversity is maintained through conservation of important, rare or threatened habitats and species and the habitats of certain species. In terms of UK legislation, the Habitats Directive is implemented through "The Conservation (Natural Habitats &c.) Regulations 1994" (as amended), hereafter referred to as "the Regulations".

As a result of the Regulations all Scottish Ministers and all relevant public authorities are required to exercise their functions relevant to marine conservation so as to secure compliance with the requirements of the Habitats Directive.

As far as the Moray Firth SAC is concerned, this means that Ministers and all relevant authorities (such as harbour authorities, local authorities, SEPA, etc.) are obliged to protect the integrity of European interests identified within the Moray Firth SAC.

"The Marine Strategy Framework Directive" (2008/56/EC) (MSFD) aims to protect, preserve and, where practicable, restore the marine environment with the aim of maintaining biodiversity and provide seas that are clean, healthy and productive. It was introduced in 2008 and encompasses EU waters out to 200 nm from the baseline.

It supports the establishment of marine protected areas and those areas already established under the Habitats Directive. It introduces a requirement to meet Good Environmental Status for a number of descriptors by 2020 (listed in Annex I of the Directive). Where there is an overlap between the requirements of the Habitat Directive and the MSFD, for example, maintaining biological diversity and the quality and occurrence of habitats and species, the management plan should support the more stringent requirement of the two Directives. However, the MSFD has a larger scope than the Habitats Directive. It encompasses all biological diversity and all elements of the food web rather than specific species and habitats listed in the Habitats Directive. It also introduces targets to reduce certain pressures and impacts on the marine environment, such as marine litter and noise,

which would not be covered under the Habitats Directive unless those pressures affect the qualifying features of the SAC.

The Water Framework Directive (2000/60/EC) (WFD) came into force in 2000 and is a major driver for achieving sustainable water management in the EU. It applies to all surface water, groundwater, estuarine and coastal waters (out to 3 nm in Scotland) and therefore applies to the inshore areas of the Moray Firth SAC. The WFD is designed to improve management in order to prevent deterioration, enhance and restore water bodies by preventing and reducing pollution; promoting sustainable water use; protecting and improving the status of aquatic environment and mitigating the effects of floods and droughts. Member states must aim to achieve at least 'good' chemical and ecological status in inland and coastal waters by 2015. For areas of the Moray Firth SAC that also come under the jurisdiction of the WFD, the stricter of the actions proposed by either the WFD or the Moray Firth SAC management plan, should be adhered to.

### **2.3 Development of the management scheme**

**Responsibility for managing the SAC lies with the 'relevant authorities'**. These are all organisations with powers to regulate activities that may interact with or influence the dolphins or the sandbanks.

Government guidance (Revised Circular 6/95 – as amended) states that the relevant authorities should work together within a management group to develop a management scheme for sites where there is a complex interaction of different management issues. A management group was set up for the Moray Firth SAC in November 1999 (see Appendix B for current members).

Their work was initiated and facilitated by the Moray Firth Partnership, a voluntary company of numerous individuals and organisations, all with an interest in future sustainable management of the Moray Firth.

In order for the management scheme to reflect the needs and interests of all people who live and work around the Firth, various working groups were formed and a series of meetings were held that brought together representatives from a wide range of interest groups, including fishing, the oil industry, the military, recreational users and wildlife watching. These groups drafted the management scheme, – 'Revision 0', to address the dolphin interest, and the scheme was then the subject of a series of public meetings and extensive consultation exercise, carried out in May and June 2001. This process enabled everyone with an interest in the area to contribute towards the production of this document.

The qualifying interest feature "sandbanks which are slightly covered by sea water all the time" was added to the Moray Firth SAC in March 2001 following a public consultation exercise in 2000 carried out by SNH on behalf of the Scottish Executive.

Work by the SAC Management Group on the sandbanks management strategy was initiated in January 2002 and was facilitated by the Moray Firth Partnership – following the approach adopted for the dolphin management section. Drawing on experience gained from the workshops held to write the 'Revision 0' together with information received from many sectors of activities (e.g. commercial fishing) the SAC Management Group drafted the sandbank management strategy, which was out for public consultation in October 2002.

### **2.4 Consequences of Failure**

If we don't succeed in protecting the dolphins and the sandbanks, we stand to lose not just a fascinating species and an important habitat, but important economic assets for the area and an opportunity to enhance the reputation of the Moray Firth as an area of good environmental quality.

In addition to this, the UK government has an obligation to ensure that the Conservation Objectives (see Section 4.1) are achieved. If they are not achieved then the EU may take action against the UK government which has charged the relevant authorities, with the responsibility of ensuring that

the Habitats Directive is implemented. It is important therefore that all relevant authorities fulfil their statutory requirements in relation to the SAC.

### 3. The Moray Firth marine Special Area of Conservation

#### 3.1 Reasons for the designation

The Moray Firth hosts one of only two known resident populations of bottlenose dolphins in UK waters, the last remaining resident population of bottlenose dolphins in the North Sea, and the most northerly resident population in the world. In a European context, they are considered rare and are therefore listed under Annex II of the Habitats Directive as a species whose conservation requires the designation of Special Areas of Conservation.

As the Moray Firth is an outstanding location within the UK for bottlenose dolphins, a large part of it qualified and was accepted by the European Commission as a marine SAC, in October 1996. This site is one of 2 SACs designated for bottlenose dolphins within the UK; the other site is “Cardigan Bay SAC” in Wales. While the individuals using the two sites may range further afield during certain times of the year, dolphins are present throughout the year and individuals have been seen over periods of many years.

“Sandbanks which are slightly covered by sea water all the time” is a natural habitat listed in the Annex I of the EC Habitats Directive and therefore a qualifying feature. This habitat occurs widely on the Atlantic coasts of Northwest Europe and extensively around the UK coast. The Moray Firth SAC is one of 25 sites within the UK that have been designated for sandbanks, and is representative of sublittoral sandbanks on the East Coast of Scotland. The sandbanks feature within this large site is considered to contribute significantly to the suite of sites representing this type of habitat within the UK and Europe.

#### 3.2 Location and description of the site

The UK Government is required to identify and select sites as SACs according to the criteria detailed in the Habitats Directive and in a way that is consistent throughout the UK. Under Article 4 of the Habitats Directive, for species ranging over wide areas, sites selected shall correspond to the places, within the natural range of such species, which present the physical or biological factors essential to their life and reproduction. For aquatic species which range over wide areas, sites should only be selected if there is a clearly identifiable area representing the physical and biological factors essential to their life and reproduction, thus they do not necessarily need to encompass the whole known range of the species in question.

The management actions presented in this document apply primarily to the area within the Moray Firth SAC boundary but they do extend outwith the boundary for activities that have implications for the interests protected within the site.

The designated site is one of the largest marine SACs in the UK. It comprises the ‘triangular’ area of water west of a line between Helmsdale on the Sutherland coast and Lossiemouth on the Moray coast, including the Beaulay/Inverness Firths, and the outer reaches of the Dornoch and Cromarty Firths. The marine boundary extends seaward from the tidal level of Mean Low Water Mark of Spring tides unless otherwise specified (Figure 1 and Appendix A). Much of the coastline is characterised by sweeping sandy beaches and dunes that lie within a fertile lowland strip although cliffs and rocky shores occur where high ground extends to the coast.

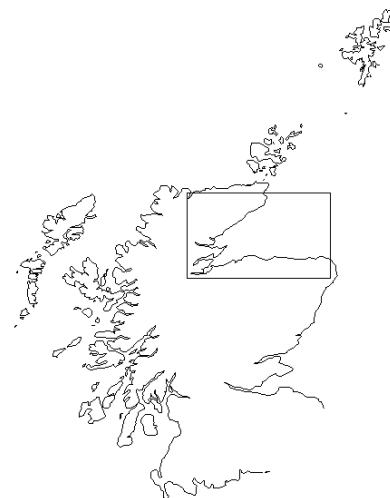


Figure 1. Location of the Moray Firth  
(see Appendix A for details on the SAC boundary)

The coastal fringe of the Moray Firth supports a population of more than 150,000 people living in villages, towns and the city of Inverness. The Firth has a long social and cultural history relating to the marine environment, much of which provides the basis for its current status as a thriving economic centre. Until the 1950s the Firth was a focus of the Scottish fishing industry for both pelagic and demersal sectors, although this has declined in the latter part of last century. Since the 1970s, oil and gas exploration and development have become a major industry in the area. Other marine-related industries include manufacturing and processing, shipping, port and harbour activities and transport. The coastal and inshore waters are used for a wide range of recreational water sports and the area attracts a large number of tourists and visitors throughout the year.

### 3.3 Conservation Features of the Moray Firth SAC

#### **Bottlenose dolphins – Qualifying Annex II Species**

The bottlenose dolphins, *Tursiops truncatus*, that inhabit waters around the UK, are considerably larger than individuals of the same species in most parts of the world, reaching up to around 4 m in length. It is primarily an inshore species, with most sightings within 10 km of land, but they can also occur offshore, often in association with other dolphins or whales. Large aggregations of many hundreds of individuals have been recorded off the Atlantic coast of Ireland, but typically single animals or small groups of up to 25 animals are sighted. Bottlenose dolphins have a near-global distribution (except the Polar Regions), and are widely distributed in North Atlantic, West African, Mediterranean and UK waters<sup>1</sup>. They begin to breed between about 5 and 12 years of age, with females having a single calf every 2-3 years. Each calf usually stays with its mother for around 4 years. Dolphins communicate with one another using a combination of body movements and sound. The sounds produced by dolphins often extend beyond the range audible to the human ear, and include whines, groans and whistles.

In 1992, there were estimated to be between 110 and 175 individual dolphins in the East coast of Scotland population, all of which were recorded using the inner Moray Firth at certain times of year. During the 1990's, the range of the population expanded southwards<sup>2</sup>. Many individuals that continue to use the Moray Firth SAC occasionally are now seen more frequently in areas off the Aberdeen and Fife coast, and some have even been reported in English waters. Dolphins are still seen regularly in core-areas within the SAC, but their use of the Kessock Narrows has declined markedly in parallel with this range expansion.<sup>3</sup> This shift in distribution has made monitoring abundance more complex, and now requires large scale surveys to estimate the overall size of the population. Although the inner Firth and southern Moray Firth coast remain an important part of the population's range there is evidence that their range may be changing. A project funded by the Scottish Government and SNH will report, in 2009, on the distribution and abundance of dolphins throughout Scottish coastal waters and provide estimates of movement rates between areas.

Based upon the best available information at the time, it was originally considered that the population fell into the category 'unfavourable - declining', as described in the framework of Common Standards Monitoring. In particular, this drew upon results of a modelling exercise that predicted a declining population based upon data collected up until 1997.<sup>4</sup> Subsequent results from the monitoring programme that SNH established to follow changes in the number of dolphins using the SAC indicated that, whilst the numbers had declined during the 1990's, these appeared to be stabilising by 2004. As a result, the condition was assessed as "unfavourable recovering" in 2005.<sup>5</sup>

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<sup>1</sup> JNCC's electronic information resource, 'The Habitats Directive: Selection of Special Areas of Conservation in the UK'.

<sup>2</sup> Wilson, B., Thompson, P.M. and Hammond, P.S. 1999. Estimating size and assessing status of a coastal bottlenose dolphin population. *Ecological Applications*. 2:288-300.

<sup>3</sup> Thompson, P.M., Tufft, N.S., Grellier, K & Durban, J.W. 2000a. Evaluation of techniques for monitoring the abundance and behaviour of bottlenose dolphins – The Kessock channel as a case study, Rep. No. F99LE01. Scottish Natural Heritage, Dingwall.

<sup>4</sup> Sanders-Reed C, Hammond P, Grellier K, Thompson P. 1999. Development of a population model for bottlenose dolphins. SNH Research, Survey and Monitoring Report No 156.

<sup>5</sup> Thompson, P.M., Cheney, B., Cândido, A.T. & Hammond, P.S. (2009). Site Condition Monitoring of bottlenose dolphins within the Moray Firth Special Area of Conservation: Interim report 2005-2007. Scottish Natural Heritage Commissioned Report. (ROAME No. F02AA409).

### **Moray Firth Dolphins - scientific and educational importance**

The bottlenose dolphin population is a valuable asset to the area in terms of the contribution to the biodiversity of the marine ecosystem. Furthermore, as top marine predators, their presence is seen as a positive indicator of the status of the marine environment, and management measures that aim to improve the environment for dolphins will benefit many other wildlife species.

Valuable research work is carried out in the area enhancing our understanding of dolphins and marine mammals in general, and improving our knowledge of the wider marine environment. The Firth has been established as a centre of excellence for the scientific study of marine mammals, with scope to further expand research in the future.

Potential also exists to tap into the considerable interest in the dolphins by local groups and visitors through, for example, the co-ordination of volunteer groups to collect and gather data. Information gleaned from formal and informal monitoring efforts could usefully be fed back into education and interpretative programmes around the Firth, through for example a network of land-based watching and listening stations which could provide a focus for educational and tourist based activities. All these initiatives provide the opportunity for the Moray Firth to be promoted as a place of world class calibre for marine wildlife watching and study, and this in turn provides considerable marketing and tourism possibilities.

### **Moray Firth dolphins - socio-economic importance**

It is in everyone's interest to keep the dolphin population healthy. The dolphins are considered a positive indicator of the status of the marine environment and this is good for business and tourism development. The significance of the dolphins in attracting visitors and boosting tourism, as well as being there for local people to enjoy, is widely recognised. A survey<sup>6</sup> of people in Inverness undertaken in 1996, found that of the tourist respondents (81% of all participants), 28% said that the presence of dolphins had been the sole or principal reason for visiting the area, while 14% said it was a factor.

The attraction of the dolphins was estimated to generate a significant figure to the local economy, and supports many jobs. The success of this management scheme is important for both conservation and socio-economic reasons and everyone that has a stake in the Firth has a role to play in managing the area in a way that helps to protect the dolphins. The Moray Firth Partnership is currently undertaking a Bottlenose Dolphin Economic Survey the results of which will be made available in due course.

### **Sandbanks –Qualifying Annex I Habitat**

“Sandbanks which are slightly covered by sea water all the time” is a natural habitat listed in the Annex I of the EC Habitats Directive and therefore a habitat type of community interest, whose conservation requires the designation of Special Areas of Conservation. This habitat is defined as consisting of soft sediment types (including sand predominantly in the size range 0.06mm to 2 mm - see Appendix I) that are permanently covered by shallow seawater generally (but not exclusively) in waters up to 20m below chart datum. Sandbanks are elevated, elongated, rounded or irregular topographic features, permanently submerged and predominantly surrounded by deeper water. They consist mainly of sandy sediments, but larger grain sizes, including boulders and cobbles, or smaller grain sizes including mud may also be present on a sandbank. Banks where sandy sediments occur in a layer over hard substrata are classed as sandbanks if the associated plants and animals are dependent on the sand rather than on the underlying hard substrata.

Sandbanks often support rare, endangered or vulnerable species such as maerl beds or sea grasses<sup>7</sup>. There are four sub-categories, two of which occur in the Moray Firth: gravelly and clean sands; and muddy sands (the others are eelgrass and maerl).

<sup>6</sup> SNH. 1998. Jobs and the Natural Heritage. Natural Heritage Management Series - ISBN 1 85397 298 3.

<sup>7</sup> JNCC, 1997. The Habitats Directive: selection of Special Areas of Conservation in the UK. JNCC Report 270. Brown AE, Burn AJ, Hopkins JJ, Way SF, (eds.), Peterborough. 297p.

The Moray Firth SAC site is considered to support a significant representation of the sandbank feature and encompasses a broad range of submerged sediments that are subject to a wide variety of environmental conditions. The distribution of shallow water sediments is closely linked to bathymetry and a close correlation exists between increased depth and decreasing grain size, with the exception of fine sand accumulating in the shallow sheltered waters of the Inner Firths. Muddy sands and sandy sediments are dominant in the area seaward of the Inner Firths (see Appendix I.)

Tide-swept mixed sediments within the site are colonised by distinctive groups of algae and invertebrates, including the polychaete worms, bivalves and amphipods. Coarse sublittoral sediments, for example in the Dornoch Firth, have been found to support high numbers of the sand mason, the banded wedge-shell and the clam. Fine unstable sands, off Whiteness, exposed to wave action, contain sparse associated fauna dominated by bivalves.

Within the Cromarty Firth, the firm and sandy bottom sediments support some species of polychaete worms, with a small sub-community within coarse deposits comprising other species of polychaete worms. Gravel sediments here are also colonised by the horse mussel, dead men's fingers, hydroids, bryozoans and barnacles. The sediment is finer in the open Moray Firth, 6 km east of the Sutors. At a depth of 20m, the diversity is lower than within the Cromarty Firth, but includes some additional species of molluscs, sea potatoes, polychaete worms and amphipods.

Pockets of coarse sediment occur in fast currents in the narrows between Chanonry and Fort George and contain communities characterised by polychaete worms. Just outside the Inverness Firth at Fort George the sediment is sandy and dominated by clams. In stable areas of the open coast within the site, the shallow sandy sediments support populations of bivalves, with the sea potato, the razor shells and the sabellid polychaete found at depth. A broad scale habitat map was drafted by SNH in 2006, copies of which are available upon request. This map provides the best information gathered to date on the underwater habitats and species present within the SAC.

### **Current status of the sandbank feature in the Moray Firth**

Based on existing information as part of routine monitoring, the sandbank feature is considered by SNH to be favourable and representative of the sandbanks found within this region of the UK. See section 6 for details on how monitoring is carried out and whether or not targets have been met. Under the present 'management regime' activities in the SAC are unlikely to cause impact to the sandbank feature and therefore no restoration action is currently required to achieve the Conservation Objectives.

### **Moray Firth Sandbanks - Scientific and conservation importance**

Subtidal sandbanks are often high-energy, mobile environments, and robust communities of amphipods, bivalves and polychaetes develop in these environments. These sandbank habitats may also be spawning grounds and nursery areas for juvenile fish species and may support large populations of sandeels. This productivity in turn becomes an important food source for marine mammals and seabirds such as puffins, guillemots and razorbills.

The biological conservation importance of these habitats centres on their intrinsic value in supporting their own biological communities together with their support for the predators dependent on those communities. Subtidal sandbanks also have an important role in maintaining sediment balance. In scientific terms they have provided, amongst others, a better understanding of the interactions between biological and environmental features and an increase in our understanding of the physical nature and dynamics of marine systems, for example their role in coastal protection<sup>8</sup>.

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<sup>8</sup> M.Elliott, S.Nedwell, N.V.Jones, S.J.Read, N.D.Cutts, K.L.Hemingway. 1998. Intertidal Sand and Mudflats & Subtidal Mobile Sandbanks (volume II). An overview of dynamic and sensitivity characteristics for conservation management of marine SACs. Scottish Association for Marine Science (UK Marine SACs Project). 151 Pages.

**Moray Firth Sandbanks - Economic importance**

Subtidal sandbanks are generally of economic importance wherever they occur. Sandbanks can support large nursery populations of flatfishes and roundfishes prior to their movement offshore and eventual commercial exploitation. Sandbanks support commercial fisheries for scallops or other bivalve shellfish. Sandbanks can provide minerals for extraction, possibly for building but also for beach nourishment. The subtidal mobile sandbanks may occur in areas subject to oil and gas exploration and exploitation. Finally, subtidal sandbanks provide nearshore protection against shore-eroding conditions<sup>6</sup>.

## 4. Conservation Objectives and Advice on Operations

### 4.1 Conservation Objectives

Scottish Natural Heritage is required by the UK Government to provide conservation objectives for the Moray Firth SAC and to advise as to operations that may cause damage or deterioration to the dolphins or their habitat and to the sandbanks – see Appendix F.

The conservation objectives set out what needs to be done in order to ensure that the qualifying features do not suffer deterioration or significant disturbance and thus contribute to the overall favourable conservation status. These objectives define the condition in which Moray Firth European marine site is to be maintained.

The conservation objectives for the Moray Firth SAC are as follows:

To avoid deterioration of the habitats of qualifying species (**Bottlenose dolphins**, *Tursiops truncatus*), or significant disturbance to the qualifying species, thus ensuring that the integrity of the site is maintained and the site makes an appropriate contribution to achieving Favourable Conservation Status (FCS) for each of the qualifying features.

To ensure for the qualifying species that the following are established then maintained in the long term:

- Population of the species (including range of genetic types *where relevant*) as a viable component of the site
- Distribution of the species within site
- Distribution and extent of habitats supporting the species
- Structure, function and supporting processes of habitats supporting the species
- No significant disturbance of the species

To avoid deterioration of the qualifying habitat (**sandbanks which are slightly covered by sea water all the time**) thus ensuring that the integrity of the site is maintained and the site makes an appropriate contribution to achieving FCS for each of the qualifying features.

To ensure for the qualifying habitat that the following are maintained in the long term:

- Extent of the habitat on site
- Distribution of the habitat within the site
- Structure and function of the habitat
- Processes supporting the habitat
- Distribution of typical species of the habitat
- Viability of typical species as components of the habitat
- No significant disturbance of typical species of the habitat

### 4.2 Interim Advice on Operations

SNH provided advice as to operations that have the potential to cause deterioration or disturbance to the dolphin or sandbank interests. The advice formed the starting point for the list of activities, issues and opportunities discussed throughout the remainder of this document. It includes operations with the potential to affect the dolphins and/or the sandbanks, both within and adjacent to the site. Other operations, which may not occur in the Firth at present, but which may become significant in the future, are also addressed.

This report complements the other requirements laid down in the Regulations and the Scottish Executive guidance document on the implementation of the Habitats and Birds Directives<sup>9</sup>.

<sup>9</sup> Scottish Executive, June 2000, Revised Guidance updating Scottish Office Circular No. 6/1995. 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 Bird Directives).

### 4.3. Summary of the main impact mechanisms - dolphins

#### Human induced effects

There are a range of operations and activities that take place in the Moray Firth which have the potential to affect the dolphin population. These include activities that may cause disturbance or direct harassment, contamination, reduction in food availability and traumatic death and injury<sup>10</sup>. The nature of these impacts and their effects on the Moray Firth dolphins are summarised below, in no particular order, and the activities that may cause them are discussed throughout the remainder of the document. Please note considerably more research has been done in some areas than others and this is reflected in the length and detail of potential impacts.

#### *Disturbance*

Cetaceans (whales, dolphins and porpoises) can be disturbed by a range of human activities although their effects can be difficult to quantify. Disturbance can disrupt the time dolphins spend foraging, socialising or breeding - all critical behaviours important to their survival. For the purposes of this document, the term "disturbance" is used to refer to any action that results in a change in the behaviour or physiology of a dolphin or group of dolphins. This document focuses on two forms of disturbance, harassment and marine noise.

#### *Harassment*

The presence, activity and volume of boat traffic have the potential to disturb dolphins inadvertently or directly through harassment. For example, boats travelling at high speeds or behaving erratically in the vicinity of dolphins are known to cause changes in the dolphins' observable and acoustic behaviour<sup>11</sup>. Although it is difficult to assess the long term effects of these changes, it is likely that they can interfere with feeding, communication and navigation, disrupt social and familial bonds and may cause dolphins to move out of an area. Furthermore, it may elicit a stress response in the dolphins<sup>12</sup>. Recent research has shown that the repeated exposure of individual animals to boat interactions may lead to significant displacement, and potentially lower viability of some coastal bottlenose dolphin populations<sup>13</sup>.

#### *Marine Noise*

Sound is the primary means by which dolphins, other marine mammals and some fish species communicate, orientate, navigate and locate prey. Dolphins utilise a wide range of frequencies from a few Hz to hundreds of kHz. Sound travels four times faster in water than in air and low frequency sound waves can travel thousands of miles. Therefore dolphins, like other marine mammals, are particularly vulnerable to marine noise even when emanating from some distance away. Physical injury or deafening can occur in proximity to intense pressure waves (e.g. from explosions, pile driving, military sonar, seismic blasts, etc.). JNCC is developing guidance on the protection of cetaceans from injury and disturbance, mainly from noise, and this will include an update on seismic guidelines and new protocols for the mitigation of noise from pile driving and explosive use. [See http://www.jncc.gov.uk/page-4227](http://www.jncc.gov.uk/page-4227)

<sup>10</sup> Curran, S., Wilson, B. and Thompson, P. 1996. Recommendations for the sustainable management of the bottlenose dolphin population in the Moray Firth. Scottish Natural Heritage Review. No. 56.

<sup>11</sup> Janik, V.M. and Thompson, P.M. 1996. Changes in surfacing patterns of bottlenose dolphins in response to boat traffic. Marine Mammal Science 12(4); 597-602.

<sup>12</sup> Arnold, H. 1997. The Dolphin Space Programme: The development and assessment of an accreditation scheme for dolphin-watching boats in the Moray Firth. A report for Scottish Wildlife Trust, Scottish Natural Heritage and the EU LIFE Programme. Inverness.

<sup>13</sup> Bejder, L, Samuels, A, Whitehead, H and Gales, N. 2006 Interpreting short-term behavioural responses to disturbance within longitudinal perspective. Animal Behaviour, 72, 1149-1158

Bejder, L, Samuels, A, Whitehead, H, Gales, N, Mann, J, Connor, R, Heithaus, M, Watson-Capps, J, Flaherty, C and Krutzen, M. 2006 Decline in relative abundance of bottlenose dolphins exposed to long-term disturbance. Conservation Biology, 20, 1791-1798.

Lusseau D, Slooten, E, Dawson, S. M. and Higham, J. 2002 The effects of tourism activities on bottlenose dolphins (Tursiops spp.) in Fiordland: working towards sustainable solution. Wellington, New Zealand, Final report on the New Zealand Department of Conservation.

Lusseau, D. 2003 Effects of tour boats on the behaviour of bottlenose dolphins: Using Markov chains to model anthropogenic impacts. Conservation Biology, 17, 1785-1793.

Lusseau, D. 2004 The hidden costs of tourism: Detecting long-term effects of tourism using behavioural information. Ecology and Society, 9

Lusseau, D, Slooten, L and Currey, R. J. C. 2007 Unsustainable dolphin-watching tourism in Fiordland, New Zealand. Tourism in Marine Environment, 3.

Lower intensity noise (from ships, boats, planes, pingers, etc.) could result in behavioural responses being inhibited: the dolphin's ability to use echolocation to find prey, habitat exclusion, social disruption and physiological stress. The sound may also be audible but have no actual effect. Other marine species are affected by noise such as adult fish and shellfish (including potential prey items for dolphins), fish eggs and larvae. Fish emit and detect low frequency sounds. Sound is especially important in the spawning behaviour of cod, haddock, and other species. Either habituation or sensitisation may occur for animals that use areas where noise levels are continuous or regular.

Marine mammals have evolved to operate within a background of ambient noise produced by wind, waves, earthquakes, etc. Anthropogenic noise is a major contribution to ambient noise in many areas. Although much is now known about the levels of noise discharged into the oceans, it has proved difficult to quantify their actual impact on marine animals, particularly on the long-term. Sources of noise within the SAC include the oil and gas industry, dredging and sea disposal operations, underwater and coastal construction, military activities and boat traffic. However, the significance of these to dolphins varies even from a specific source. For example, shipping is distributed widely within the Moray Firth but types vary depending on location.

Levels and spectra of noise are well documented and relate approximately to ship size and speed, but there are significant variations among vessels of similar classes. For any given vessel, noise levels generally increase with speed and loading. Sound primarily comes from propeller cavitation, propeller singing and the machinery within the hull. In general, the engines of small vessels emit higher frequency sound waves.

Noise-producing recreational activities are most likely to involve small power and personal watercraft. Unlike other traffic, wildlife watching and research vessels may be directed specifically towards marine mammals, thus running the risk of accentuating levels of disturbance. Although the volume of traffic is likely to determine the level of disturbance to dolphins, a single irresponsible user can create a considerable amount of distress to the animals. Speedboats can impact greatly on dolphins and in all motorised boats, poorly maintained propellers and machinery and sudden changes in propeller rate pose potential risks.

However, traffic can be concentrated within specific areas (e.g. the Kessock Channel) when both vessel numbers and time spent in an area increase. This often coincides with times of greatest dolphin usage (e.g. the summer months). Noise is generally less of a problem from vessels with inboard engines as these create lower frequency noise than outboard engines and may therefore cause fewer disturbances to dolphins. However, noise from these sources will contribute to the cumulative background noise levels in the Moray Firth.

Oil related activities in the Moray Firth could potentially produce noise, for example from drilling rigs or fixed platforms and from the multiple operations supplying them, including shipping, helicopter traffic and heavy machinery. The carrying out of geological surveys and shallow drilling will also result in the generation of underwater noise, as will the possible use of explosives for decommissioning work.

#### *Contamination*

Contamination can come from various sources, some of which are natural while others are discharged into the marine environment as part of industrial operations and processes. Contaminants can directly impact on the dolphins by affecting their health or indirectly by reducing the availability of their food or affecting their habitat. The main sources of contamination in the Moray Firth are from organochlorine compounds, heavy metals, oil and radionuclides.

The effects are varied: e.g. organochlorines such as PCBs can impair reproductive and immune systems, heavy metals can accumulate in lipid (fat) tissues and in the internal organs particularly if contaminated prey is regularly consumed, oil can be carcinogenic and highly toxic and radionuclides can cause tissue and genetic damage. Historical contamination remains a threat to the dolphins as many contaminants such as organochlorines degrade very slowly and activities such as dredging

could theoretically disturb or redistribute previously contaminated sediments. Heavy metals can have long term effects as they can persist in the environment for many decades or even centuries.

There are conflicting reports on the level of contamination in the Moray Firth, coupled with the fact that the effects on the dolphins are poorly understood. It is likely that dolphins that use areas known to have comparatively elevated levels of contamination are particularly vulnerable, but even low level exposure may result in subtle effects.

#### *Disease*

Bottlenose dolphins, like most wild animals, are susceptible to a range of pathogens (viruses, bacteria and parasites) that pose a natural threat to some individuals and populations. In addition, dolphins can be exposed to new pathogens when human sewage or animal wastes are discharged into watercourses or directly into the sea. Although no studies have been carried out to assess whether sewage discharges result in marine mammals becoming infected with human or other animal pathogens, it is well known that dolphins can be infected by a range of pathogens that also infect humans and that high concentrations of these pathogens are found in sewage.

#### *Prey Depletion*

There is no information on whether or not the prey requirements of the Moray Firth dolphins are being fulfilled at present. Furthermore, little is known about what the Moray Firth dolphins eat. However, data from the stomach contents of dead dolphins recovered from the Moray Firth indicate that they are opportunistic feeders<sup>14</sup>. The species identified in the stomachs include: bullrout, cod, crustaceans, dab, dragonet, haddock, hake, ling, octopus, plaice, saithe, salmon, sandeel, scad, sprat, squid and whiting.

A reduction in the range, abundance and size of prey available to dolphins or a change in their distribution will have detrimental effects on the dolphins' energy budget and could result in reduced growth, reproductive success and ultimately survival. An indirect effect of an insufficient food supply is that dolphins resort to using up their fat (or blubber) reserves, which in turn can lead to the mobilisation of any contaminants that have accumulated in these tissues.

Prey depletion may arise directly, through removal of prey through fishing activity or indirectly through activities that affect prey species such as noise disturbance and pollution or through marine habitat loss. While some of the prey species found in the stomachs of dolphins overlap with commercially sought fish stocks, the commercial fishery for those species is currently very limited in the SAC and the wider Moray Firth. Therefore, commercial fisheries in the Firth are not considered to have a significant impact on the dolphins or their dietary requirements. However, fishing activity in the waters beyond the Firth may have a more significant effect on the dolphins through its overall impact on North Sea stocks and the availability of fish stocks in inshore areas.

#### *Traumatic Death and Injury*

Bottlenose dolphins can be killed or seriously injured through collisions with boats, underwater explosions, and entanglement in fishing gear or marine debris and, in some parts of the world, through being the target of hunting.

#### *Collisions*

The likelihood of bottlenose dolphins colliding with boats is considered to be low, with the main risk coming from fast moving water craft that change speed or direction erratically. In the Moray Firth there are no records of any dolphins being killed by boats but there is evidence of possible propeller injuries, which suggests that collisions do occur here<sup>15</sup>. The risk of collisions may increase in the

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<sup>14</sup>Santos, MB, Pierce, GJ, Ross, HM, Reid, RJ, Wilson, B. 1994. Diets of small cetaceans in Scottish waters. ICES CM 1994/N:11.

<sup>15</sup>Curran, S., Wilson, B. and Thompson, P. 1996. Recommendations for the sustainable management of the bottlenose dolphin population in the Moray Firth. Scottish Natural Heritage Review. No. 56.

future in parallel with the growing trend of fast moving watercraft use in the Moray Firth and elsewhere<sup>16</sup>.

### *Underwater Explosions*

Underwater explosions can either injure or kill marine mammals through the underwater shock wave that is generated, or have more subtle effects on the dolphins' ability to hear. Underwater explosions can occur naturally from earthquakes but human sources result from seismic exploration or military activity. Short-term responses of marine mammals to seismic noise have been repeatedly documented but the long-term implications of these are unknown<sup>17</sup>.

Airgun arrays are now used for most marine seismic exploration. They emit underwater pulses with extremely high peak levels but of short duration. Pulses are often detectable from 50-100 km away from the survey ship. Marine geophysical surveys may use a suite of other techniques that may include side scan sonar, swathe bathymetry and use of transponders, amongst others. The Moray Firth was extensively surveyed in previous decades and whilst future applications for seismic surveys may be received by DECC, the Department is actively encouraging operators to defer individual applications with a view to participating in the research project the Department is funding (see Dolphins Activity D13: Energy Industry and Related Activities for further information).

### *Entanglement and Ingestion*

Entanglement in fishing gear and marine debris is a well-known cause of accidental death in marine mammals. Entanglement can lead to death through drowning, choking or restriction of blood vessels, or injury when animals struggle to free themselves. Although there is considerable evidence from elsewhere that discarded fishing gear causes death amongst marine mammals, there is little direct evidence to indicate that discarded nets pose a significant risk for the Moray Firth dolphins.

Animals caught in fishing nets, referred to as by-catch, often drown while underwater or are killed when fishermen try to free them from the gear. Recently, the design of fishing gear and controls on the types of nets used have removed some of the danger to dolphins from entanglement, however, the threat still exists where illegal salmon netting takes place. There have been two reported cases since 1996 in which dolphins are thought to have died through entanglement with illegal fishing nets in the Moray Firth.

Small pieces of plastic have been found in the gut of stranded dolphins but these are likely to have been ingested via prey species and are not considered dangerous. Large pieces of floating debris are thought to pose the greatest marine litter risk to dolphins. Dolphins can move at speeds of up to 20 knots and could be injured by collision with any large floating object, e.g. a broken fish box. Two dolphins have been seen in the Moray Firth with clean wounds that are likely to have been caused by collision with a static object.

### **Natural effects**

This management scheme addresses human activities taking place in the Moray Firth. However it is acknowledged that the dolphin population is also subject to natural effects such as 'climate change', changes in water temperature and salinity and competition for food with other marine species. The significance of these "natural" effects and how they interrelate with human activities in the Firth is highly complex and poorly understood. Natural effects, particularly climatic factors, are also extremely difficult to manage and therefore fall outwith the primary focus of this scheme.

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<sup>16</sup> Simmonds, M. 2000. Chasing dolphins! A preliminary report on the failure of existing legislation to protect whales and dolphins from harassment and injury in UK waters. Whale & Dolphin Conservation Society.

<sup>17</sup> Mate, B. R., Stafford, K. M. & Ljungblad, D. K. 1994. A change in sperm whale (*Physeter macrocephalus*) distribution correlated to seismic surveys in the Gulf of Mexico. In: Proceedings of the 128th Meeting of the Acoustical Society of America, pp. 3268-3269. Texas. Goold, J. C. 1996. Acoustic assessment of populations of common dolphin, *Delphinus delphis* in conjunction with seismic surveying. J.Mar.Biol.Assoc. UK, 76/3, 811-820.

#### 4.4. Summary of the main impact mechanisms – sandbanks

##### Human induced effects

There is a range of operations and activities that take place in the Moray Firth that have the potential to affect the sandbank interest. However, the current level of activities in the area is not thought to significantly impact on the sandbanks feature within the site. Additionally, subtidal sandbanks are subject to natural disturbance (e.g. as the result of wave action, water movement and storm events) and as such they have adapted to a level of perturbation.

The ability of the seabed communities to recover from sediment disturbance is high because of the predominant mobile nature of the component species. Similarly the influx of material either by natural phenomena or man-induced conditions such as dredge spoil, will, depending on scale and frequency, be accommodated by the community. Communities within subtidal sandbanks tend to recover relatively quickly from physical disturbance of the substrate caused by activities such as navigational dredging or bottom trawling. However, sea grasses such as *Zostera* (which are predominantly found in the intertidal area in the Moray Firth) are more sensitive to this form of disturbance. Similarly, the effects of smothering from, for example, dredge spoil, will depend upon the communities present and the local hydrodynamic regime. In general, sandbanks in more physically stable areas will be more sensitive to disturbance; hence will be re-established more slowly than those in higher energy locations.

##### *Physical loss/removal of substrate*

Coastal development, aggregate extraction, dredging or some fishing techniques may cause direct loss of habitat and changes in the physical integrity of the sediment system, resulting in disruption of benthic communities or spawning areas. Other potential effects are the selective elimination of fragile and sedentary species.

##### *Physical damage – abrasion or siltation*

Physical damage may cause reduction in species diversity and abundance due to habitat disruption and smothering as well as the elimination of vulnerable biotopes. The use of anchors and chains on the seabed, dredge disposal operations, oil and gas exploration, development and production and some fishing techniques are amongst the activities with such a potential impact, although location, scale and frequency of activities will determine the level of any impact.

##### *Toxic contamination*

Toxic contamination may cause the elimination of vulnerable biotopes to which the toxins are most available as well as a decrease in species richness and increase in opportunistic species tolerant of pollution. Toxic contamination can also cause lethal and sublethal effects to communities, including bioaccumulation and reproduction failure. Sublethal effects of pollution may have a synergistic effect with other stressors. Other effects may include the reduction of specific prey species, the loss of resource for harvesting and possible tainting of prey. Industrial and domestic discharge, oil and gas exploration are amongst the activities with such a potential impact.

##### *Nutrient/organic enrichment*

Organic matter may be as particulates or dissolved, including nutrient enrichment and can be derived from many sources: sewage, either discharged as domestic or industrial effluent to intertidal and inshore areas, or as sludge dumped to subtidal areas, food and waste from aquaculture, and degraded petroleum hydrocarbons. The major causes of organic enrichment are point sources in which the assimilative capacity of the receiving waters is insufficient to degrade the organic matter. In essence, high organic inputs, coupled with poor oxygenation leading to conditions of slow degradation will produce anaerobic chemical conditions in the sediments. This will decrease species richness and increase opportunistic species indicative of organic enrichment.

*Introduction of non-native species*

There is currently increasing concern about the effects on marine ecosystems arising from the introduction of non-native species through ballast water discharges and also aquaculture. The effects of introducing new animal and plants can be almost undetectable, or conversely they can completely dominate and displace native communities (e.g. non-native species may compete with native benthic species).

*Removal of species*

The removal of non-commercially sized fish (especially juveniles) will affect the nursery function of the sandbank community. The removal of species (both commercial and non-commercial) will also have an impact on community diversity and species richness on an ecological and genetic level. Recreational diving and shellfish harvesting are amongst the activities with such a potential impact.

*Interference with hydrographic patterns*

Changes in hydrographic patterns can lead to the reduction in certain species and to increased instability or changes in environmental parameters. Coastal development could potentially have such an effect.

**Natural effects**

This management scheme addresses human activities taking place in the Moray Firth. However it is acknowledged that the sandbank feature is also subject to natural effects such as climate change. The significance of these and how they interrelate with human activities in the Firth is highly complex and poorly understood. Natural effects, particularly climatic factors, are also extremely difficult to manage and therefore fall outwith the primary focus of this scheme.

The natural influences affecting subtidal mobile sandbanks vary depending on their location. Sandbanks occurring in estuarine or semi-estuarine conditions may be subject to some fluctuation in salinity and temperature. Fully marine sandbanks generally will be less affected by these parameters.

Important natural parameters, which influence the sandbank feature, are hydrographical regime, temperature and salinity, water activity (e.g. wave action, tidal currents) and concomitant sediment change, predator changes and storms. The results of disturbance differs depending on the nature of the biotope and may range from short to longer term changes in diversity and species richness. The subtidal mobile sandbanks may be defined by transitional communities, which are subject to a high degree of natural variability.

## 5. The Management Scheme - ACTIONS

### 5.1 Introduction

This section contains the management scheme actions for bottlenose dolphins (**D**) and the sandbanks (**S**). The review of progress on actions within Revision One highlighted the problems in reporting back on long term actions, such as monitoring, where the outcomes are less measurable. The actions have therefore been split into two sections, **NEW and ONGOING**.

The New list comprises actions that can be completed within a three to five year time frame, and have been designed to be SMART (Specific, Measurable, Achievable, Realistic and Time related). The ongoing list captures those actions that are still current and relevant to the management of activities in the SAC, but are not time specific or measurable due to their ongoing nature.

All the actions will be monitored on an annual basis, with a 3 yearly review cycle. The New Action list shows the expected timeframe within which each action should be completed, and progress will be reported against that.

A summary of each of the main activity headings, which have been carried forward from Revision 1, is shown in Appendix C for dolphins and Appendix D for sandbanks. These activities with their corresponding issues, impacts, opportunities and benefits carried forward to Revision 2 have the potential to impact on the qualifying features and therefore potentially compromise the Conservation Objectives of the SAC. The addition of new actions in Revision 2 covers some issues and activities that were not considered to be significant when earlier revisions were prepared, for example offshore renewables.

Where possible, only one **Lead Body** is shown against each action. These lead organisations have undertaken to co-ordinate and take forward the action, in conjunction with other contributors, and to be responsible for monitoring and reporting back on progress. The Moray Firth SAC Management Group will collate the information relating to compliance monitoring of the scheme from each of the lead bodies and include this information in an annual progress report.

### 5.2 Moray Firth – key drivers for marine management

The introduction of a Scottish Marine Bill and implementation of the Strategic Framework for Inshore Fisheries in Scotland are likely to drive most of the change in marine management in the Moray Firth over the next five to ten years.

By 2010 the Scottish Government plans to introduce a Scottish Marine Bill, with the aim of delivering its vision of clean, safe, healthy, productive and biologically diverse oceans and seas. The main areas to be covered by the Bill include: the introduction of a marine planning system; a more streamlined and effective marine licensing and enforcement regime; improved marine management arrangements, potentially through the formation of a Scottish Marine Management Organisation; and new provisions for marine conservation.

The Moray Firth Inshore Fisheries Group (MF IFG) was established in March 2009 under the Strategic Framework for Inshore Fisheries in Scotland. It is the main fora for addressing the local fisheries management issues. The Scottish Government has established the Scottish Fisheries Council to address issues at a national level. Amongst other things, work has started on national strategies for key fisheries (including Nephrops, scallops and crab/lobster fisheries). At the international level the North Sea Regional Advisory Council (NSRAC), established under the 2002 Common Fisheries Policy Regulation, provides for greater stakeholder involvement in the Common Fisheries Policy process.

The Scottish Government has a stated presumption against the development of further finfish farms on the east coast of mainland Scotland, a policy which is supported by the members of the Moray Firth SAC Management Group.

New coastal developments (including new marinas, housing developments, golf courses and related infrastructure) are creating fresh challenges for the regulatory authorities / coastal/marine planning illustrated by the influence of the Whiteness development and A96 corridor expansion. Plus an increased interest in energy development in the Moray Firth – oil and gas and renewables. The Scottish Government's Scottish Climate Change Bill is expected to set out clear targets on emissions for Scotland and therefore to drive further interest in renewable energy developments.

## 5.3 New Management Actions ~ Dolphins [D]

| ACTIVITY: (USE OF) ANTI-FOULING PAINTS<br>ACTIVITY: OIL INDUSTRY AND RELATED ACTIVITIES (defouling and shot-blasting)  |  |           |   |  |
|--|--|-----------|---|--|
| No.  | MANAGEMENT ACTIONS   | Lead Body | Issue   | Potential Impact   |
| D01<br>[New]   | <p>(a) Develop and disseminate best practice guidelines on the use of anti-fouling paints and the disposal of waste from de-fouling to minimise the discharge of old paint into the Firth.</p> <p>Timescale: July 2010</p> <p>(b) Distribute copies of the guidance to all retail outlets, boat clubs, chandlers, marinas etc., for free issue.</p> <p>Timescale: July 2010</p> <p>(c) Develop and disseminate good practice guidelines for de-fouling and shot-blasting operations, including guidelines to minimise the discharge of old paint into the Firth.</p> <p>Timescale: July 2010</p> | SEPA      | <p>Use and discharge of anti-fouling coatings particularly in relation to leisure craft</p> <p>De-fouling of rigs</p> | <p>Impairment of dolphin reproductive or immune systems</p> <p>Damage/alteration of seabed habitat &amp; communities may lead to subsequent changes in prey availability</p> |
| <p>Note: Modern anti-fouling paints and legislation have moved on considerably since the original action was raised, but there is still an issue regarding the disposal of old paint. There are no TBTs or biocides in paint sold in the UK; they are now illegal. Copper is still used in some anti-fouling paints. Anti-fouling systems info on the <a href="http://www.internationalmaritimeorganisation.org">International Maritime Organisation</a> website<br/>Web portal to TBT-free anti-fouling paint and related information can be found at : <a href="http://www.antifoulingpaint.com/">http://www.antifoulingpaint.com/</a></p> <p>De-fouling and shot-blasting operations are exempt from regulatory control except bye-laws. The <a href="http://www.maritime.co.uk">Maritime Coastguard Agency</a> publishes best practice guidance for use within the Harbour and Port Authorities and oil companies.</p> |  |           |   |  |

| <b>ACTIVITY: BALLAST WATER DISCHARGE</b>  |  |                  |                                     |  |
|---|--|------------------|-------------------------------------|--|
| <b>No.</b>  | <b>MANAGEMENT ACTIONS</b>  | <b>Lead Body</b> | <b>Issue</b>                        | <b>Potential Impact</b>  |
| <b>D02 [New]</b>  | <p>MS, in association with Pas, MCA and SNH will undertake a review of common ballast water issues in the Moray Firth. The review will include:</p> <ul style="list-style-type: none"> <li>(a) The likely threats that discharges might have on the SAC,</li> <li>(b) Listing potential mitigation measures,</li> <li>(c) Identifying the provenance of ballast water and to what extent discharges take place,</li> <li>(d) Investigating the potential impact that emerging legislation might have on their control and</li> <li>(e) Considering the potential links that can be established with other current and emerging biodiversity initiatives in the Moray Firth.</li> <li>(f) Investigating introduction of non-native species by other means.</li> </ul> <p style="text-align: right;">Timescale: September 2010</p> | MS               | Introduction of non-native species. | <p>Introduction of diseases</p> <p>Toxic effects of algal blooms</p> <p>Impacts on prey availability</p> |
| <p>Links: Marine Information Note (MIN) 305 M+F “The Control and Management of Ships Ballast Water and Sediments”. Available on the MCA website at <a href="http://www.mcga.gov.uk">www.mcga.gov.uk</a></p> |  |                  |                                     |  |

| <b>ACTIVITY: BOAT TRAFFIC – ALL</b>  |  |                  |   |  |
|--|--|------------------|---|--|
| <b>No.</b>   | <b>MANAGEMENT ACTIONS</b>  | <b>Lead Body</b> | <b>Issue</b>  | <b>Potential Impact</b>  |
| <b>D03<br/>[New]</b>   | <p>(a) Make the findings of the “Moray Firth Sound Project” report available to a wide audience. This report provides information on the known impacts of noise on cetaceans, with particular reference to bottlenose dolphins, what some of the known sources of noise are in the Moray Firth and how the impact of some of these noises can be mitigated.<br/>Timescale: December 2009</p> <p>(b) Disseminate a summary of the report to ports and harbours, yacht clubs and marinas and through the Dolphin Space Programme membership.<br/>Timescale: December 2009</p> <p>(c) Assess the effectiveness of the Dolphin space Programme.<br/>Timescale: March 2011</p> <p>(d) Invite a specialist to talk on the impact of noise on cetaceans, with particular reference to bottlenose dolphins, at a MFP annual conference.<br/>Timescale: December 2010</p> | SNH              | <p>Boat traffic may impact on dolphins through</p> <ul style="list-style-type: none"> <li>• Noise sources i.e. engine, propeller, flow and towed gear.</li> <li>• Presence and movement of boats resulting in possible collisions.</li> </ul> | <p>Noise disturbance may cause marine mammals to relocate, interfere with communication, navigation, foraging, and may disrupt social bonds.</p> <p>Many forms of harassment may elicit a stress response.</p> <p>Collision may cause traumatic injury or death.</p> |
| <p>Note: JNCC is developing guidance on the protection of cetaceans from injury and disturbance, mainly from noise, and this will include an update on seismic guidelines and new protocols for the mitigation of noise from pile driving and explosive use. <a href="http://www.jncc.gov.uk/page-4227">See http://www.jncc.gov.uk/page-4227</a></p> |  |                  |   |  |

| <b>ACTIVITY: BOAT TRAFFIC - MOTORISED SPORT AND RECREATION</b> |  |                       |   |                         |
|--|--|-----------------------|---|-------------------------|
| <b>No.</b>   | <b>MANAGEMENT ACTIONS</b>  | <b>Lead Body</b>      | <b>Issue</b>  | <b>Potential Impact</b> |
| <b>D04<br/>[New]</b>   | <p>(a) Set up a working group and<br/>Timescale: April 2009</p> <p>(b) Collate existing data showing boat movements within the SAC area, through the Marine Traffic Survey, and<br/>Timescale: July 2009</p> <p>(c) Assess the need and potential for further mapping activity by partners<br/>Timescale: December 2009</p>  | MFP                   | <p>Motorised water sports may impact on dolphins through</p> <ul style="list-style-type: none"> <li>• Noise sources i.e. engine, propeller and flow</li> <li>• Movement and presence of boats</li> <li>• collision</li> </ul> | As for D03              |
| <b>ACTIVITY: BOAT TRAFFIC - MOTORISED SPORT AND RECREATION</b> |  |                       |   |                         |
| <b>No.</b>   | <b>MANAGEMENT ACTIONS</b>  | <b>Lead Body</b>      | <b>Issue</b>  | <b>Potential Impact</b> |
| <b>D05<br/>[New]</b>   | <p>(a) Raise the profile of the Dolphin Space Programme and the Scottish Marine Wildlife Watching Code through a press release and further dissemination in the Moray Firth area.<br/>Timescale: August 2009</p> <p>(b) Circulate and raise awareness of the procedures to be followed in the event of witnessing a wildlife crime. Raise awareness of the Police Intelligence Submission Form in the Moray Firth area and encourage it to be used where cases of disturbance and/or harassment are witnessed.<br/>Timescale: May 2010</p> | <p>SNH</p> <p>PAW</p> | See D03 and D04   | See D03                 |
| Links: <a href="#">Scottish Marine Code</a>                    |  |                       |   |                         |

| <b>ACTIVITY: BOAT TRAFFIC - DOLPHIN RESEARCH AND WATCHING VESSELS</b> |   |                                  |                               |
|---|---|----------------------------------|-------------------------------|
| <b>No.</b>  | <b>MANAGEMENT ACTIONS</b>   | <b>Lead Body</b>                 | <b>Potential Impact</b>       |
| <b>D06<br/>[New]</b>  | <p>(a) Make an assessment of the sustainable carrying capacity for marine traffic in the SAC.</p> <p>Timescale: September 2009</p> <p>(b) To minimise the need for research, filming, press and photography trips, create links to existing archive material sources via the MFP, Film Commission and other suitable web sites. (Subject to funding).</p> <p>Timescale: December 2010</p> | <p>SNH</p> <p>SNH</p> <p>MFP</p> | <p>See D03</p> <p>See D04</p> |

| <b>ACTIVITY: DREDGING AND DISPOSAL OF DREDGED MATERIAL</b> |  |                  |   |
|--|--|------------------|---|
| <b>No.</b>   | <b>MANAGEMENT ACTIONS</b>  | <b>Lead Body</b> | <b>Potential Impact</b>   |
| <b>D07<br/>[New]</b>                                       | <p>(a) MS to devise, with SNH, PA's and public input, a set of mitigation measures that should be attached to sea disposal licences.</p> <p>Timescale: January 2010</p> <p>(b) Produce advice on potential sea disposal site monitoring studies.</p> <p>Timescale: May 2010</p> <p>(c) MS to give presentation, of the findings of a study at Guillam Bank disposal site, to the SAC MG.</p> <p>Timescale: 2009 - 2010</p> | <p>MS</p>        | <p>As for D03 also:</p> <p>Disturbance and injury:<br/>Dredging, engine &amp; propeller noise, movement &amp; presence of boats and collisions with dolphins.</p> <p>Disposal of dredged material when dolphins are in the immediate vicinity of a vessel could cause direct disturbance and/or injury.</p> <p>Direct injury from disposal of material</p> <p>Collisions may cause traumatic injury or death.</p> |

| <b>ACTIVITY: FISHING</b> |   |  |  |
|--------------------------|---|--|--|
| <b>No.</b>               | <b>MANAGEMENT ACTIONS</b>   | <b>Lead Body</b>   | <b>Issue</b>   |
| <b>D08 [New]</b>         | <p>(a) Provide, in discussion with all relevant stakeholders, information on how fishing activities may impact on (i) dolphins and (ii) fishery management within the Moray Firth.</p> <p>(b) Identify and attempt to quantify the interactions between commercial and recreational fishing activity and their impacts on the dolphins.</p> <p>(c) Identify, through risk assessment, potentially damaging methods of fishing and seek to have their use managed within the SAC.</p> <p>(d) Ensure potential opportunities, through the Scottish Marine Bill, are recognised.</p> <p style="text-align: right;">Timescale: September 2010</p> | <p>MS (with the possibility of the Moray Firth Inshore Fisheries Group taking over once established)</p> | <p>The taking of fish as a commercial or recreational activity.</p> <p>This includes: prawn &amp; squid trawls, white / demersal fish, scallop dredging, commercial salmon fishing.</p> <p>Direct Impact: By catch, dolphins can become entangled in fishing gear.</p> <p>Indirect Impact: Competition for food resources may lead to a reduction in prey availability and thus reduced survival and breeding success amongst dolphins, and/or may result in relocation of dolphins to other areas.</p> <p>Bottom trawling such as scallop dredging, creates underwater noise and disturbs the seabed.</p> |

| <b>ACTIVITY: FISHING – ENTANGLEMENT IN ILLEGAL SALMON NETTING</b> |   |   |
|---|---|---|
| <b>NO</b>   | <b>ONGOING MANAGEMENT ACTION</b>  | <b>Lead Body</b>  |
| <b>D09 [New]</b>  | <p>Re-launch "Operation Fishnet" targeting and making leisure and recreational fishing the focus for leaflet distribution.</p> <p style="text-align: right;">Timescale: February 2010</p> | <p>PAW</p>  |
|   |   | <p><b>ISSUES and IMPACTS</b></p> <p>Issue: Entanglement of dolphins in illegal salmon netting.</p> <p>Impact: Entanglement may lead to physical injury and often leads to drowning.</p> |

| <b>ACTIVITY: ENERGY INDUSTRY AND RELATED ACTIVITIES - UNDERWATER NOISE</b>   |   |                  |  |  |
|--|---|------------------|--|--|
| <b>NO</b>  | <b>MANAGEMENT ACTION</b>  | <b>Lead Body</b> | <b>ISSUES</b>  | <b>IMPACTS</b>   |
| <b>D10<br/>[New]</b>   | <p>Ensure the consenting regime is informed by and promotes the use of existing good practice guidelines for minimising the risk of disturbance and injury to dolphins as a result of underwater noise.</p> <p>Timescale: 3 years to be completed by 2011</p> | DECC             | Noise associated with seismic surveys, pile driving, explosive use, vessel activity during transport, servicing of rigs and platforms, laying or maintenance of pipelines, mobile drilling, platform production and decommissioning. | <p>As for D03 also :</p> <p>Possible disturbance of fish stocks leading to changes in distribution and subsequent reductions in food availability.</p> |
| <p>Note: JNCC is developing guidance on the protection of cetaceans from injury and disturbance, mainly from noise, and this will include an update on seismic guidelines and new protocols for the mitigation of noise from pile driving and explosive use. See <a href="http://www.jncc.gov.uk/page-4227">http://www.jncc.gov.uk/page-4227</a></p> |   |                  |  |  |

| <b>ACTIVITY: OIL INDUSTRY AND RELATED ACTIVITIES – OIL SPILLS</b> |  |                  |   |  |
|---|--|------------------|---|--|
| <b>No.</b>  | <b>MANAGEMENT ACTIONS</b>  | <b>Lead Body</b> | <b>Issue</b>  | <b>Potential Impact</b>  |
| <b>D11<br/>[New]</b>  | <p>(a) Update the “Proposed Guidelines for Dealing with Cetaceans in the Event of an Oil Spill in the Moray Firth, Scotland” and ensure that these are effectively applied in Oil Spill Contingency Plans and exercises throughout the Moray Firth area.</p> <p>Timescale: March 2010</p> <p>(b) PAs and MS (in discussion with DECC, Oil and Gas UK and SEPA) to ensure that best practice guidance is made available to contractors and their agents.</p> <p>Timescale: Best practice guidance documents to be agreed and distributed by March 2010.</p> | SNH, MS and DECC | <p>Accidental discharge of oil during exploitation and transportation – leaks and spills: transfer of oil to and from vessels; damage to pipelines; collision/damage to transport vessels; risks associated with drilling</p> <p>Risks associated with on land storage of crude oils; bunker oil; refined oil</p> <p>Licensed discharge of cuttings and water based muds may contain numerous contaminants including hydrocarbons, heavy metals, surfactant/detergents, biocides and lubricants</p> | <p>Inhalation, ingestion and skin contact by dolphins - may lead to irritation of mucus membranes, neurological disorders, liver damage, alimentary lesions, skin irritation, skin necrosis, carcinogenic effects, and mortality.</p> <p>Toxic impacts on prey availability. Water-based muds may have smothering effects.</p> |

## 5.4 New Management Actions ~ Sandbanks [S]

| <b>ACTIVITY: ANCHORING OF BOATS &amp; RIGS</b> |   |                  |  |  |
|--|---|------------------|--|--|
| <b>No.</b>                                     | <b>MANAGEMENT ACTIONS</b>   | <b>Lead Body</b> | <b>Issue</b>   | <b>Potential Impact</b>  |
| <b>S01</b><br>[New]                            | <p>(a) In consultation with harbour and port authorities, determine risks to areas of high sandbank quality in relation to both physical damage and chemical contaminant aspects e.g. defouling, maintenance, shot blasting.<br/>Timescale: March 2010</p> <p>(b) Map the anchor areas against the sandbank survey – formalising the process.<br/>Timescale: April 2010</p> <p>(c) SNH to make the MF sub tidal sandbank survey available to all interested parties.<br/>Timescale: June 2009</p> | SNH              | The use of mooring anchors and chains on the seabed. | Anchors and chains may cause localised physical disturbance or damage (abrasion) to the substrate and sensitive benthic communities. |

| <b>ACTIVITY: DREDGING, DISPOSAL OF DREDGED MATERIAL AND AGGREGATE EXTRACTION</b> |  |                  |  |  |
|--|--|------------------|--|--|
| <b>No.</b>   | <b>MANAGEMENT ACTIONS</b>  | <b>Lead Body</b> | <b>Issue</b>   | <b>Potential Impact</b>  |
| <b>S02</b><br>[New]  | <p>(a) Prepare a rolling programme to compile monitoring data from sea disposal sites and determine whether there are any signs of impacts.<br/>                     Timescale: March 2010</p> <p>(b) The assessment should determine if sites showing the most impact coincide with areas of high sandbank quality.<br/>                     Timescale: March 2010</p> <p>(c) Progress report will be submitted annually to the SAC MG.<br/>                     Timescale: Dec of every year</p> <p>Linked to [S01NEW]</p> | MS               | Dredged material may contain contaminants e.g. heavy metals, oils, TBTs, PCBs, pesticides. | Dredging will directly remove part of the plant and animal communities present. Increased scour and erosion on artificially steep slopes may cause further loss or damage. Increase in suspended particles may influence turbidity, light penetration and primary production. Modification of sediment composition may occur as a result of disposal. Water quality may be affected by the mobilisation of suspended organic matter and nutrients and sediment bound contaminants. Dredging may interfere with hydrographic patterns, which will influence deposition and erosion processes and the delivery of colonising organisms and organic matter. Seabed diversity may be reduced and thus the number of niches available for colonisation. |

| <b>ACTIVITY: SEA FISHING</b> |   |   |  |  |
|------------------------------|---|---|--|--|
| <b>No.</b>                   | <b>MANAGEMENT ACTIONS</b>   | <b>Lead Body</b>  | <b>Issue</b>   | <b>Potential Impact</b>  |
| <b>S03</b><br>[New]          | <p>(a) Provide, in discussion with all relevant stakeholders, information on how fishing activities may impact on (i) sandbanks and (ii) fishery management</p> <p>(b) Identify and attempt to quantify the interactions between commercial and recreational fishing activity and their impacts on the sandbanks.</p> <p>(c) Identify, through risk assessment, potentially damaging methods of fishing and seek to have their use managed within the SAC.</p> <p>(d) Ensure potential opportunities, through the Scottish Marine Bill, are recognised.</p> <p style="text-align: right;">Timescale: September 2010</p> | MS (with the possibility of the Moray Firth Inshore Fisheries Group taking over once established) | Scallop Dredging,<br>Beam Trawling,<br>Otter Trawling and<br>Suction/Hydraulic<br>Dredging | These fishing methods are thought to cause some disturbance to the seabed, water column, target species and associated animal communities they support |

## 5.5 Ongoing Management Actions ~ Dolphins (blue) Sandbanks (yellow)

| ACTIVITY – AGRICULTURAL AND FORESTRY RUN-OFF |  |  |
|--|--|--|
| NO   | ONGOING MANAGEMENT ACTION  | ISSUES and IMPACTS   |
| D01<br>O/G                                   | Monitor the main rivers that flow into the Moray Firth for the input and impact of pollutants. | <p>Lead Body<br/>SEPA</p> <p>Issues:<br/>Pesticide run-off</p> <p>Impact:<br/>Impairment of reproductive or immune systems &amp; toxic impacts on prey availability.</p> |

| ACTIVITY: BOAT TRAFFIC – MOTORISED SPORT AND RECREATION   |   |   |
|---|---|---|
| NO  | ONGOING MANAGEMENT ACTION   | ISSUES and IMPACTS  |
| D02<br>O/G  | Identify a mechanism to ensure that all organised major sporting events in the SAC are required to undertake a prior environmental appraisal. | <p>Lead Body<br/>SNH</p> <p>Issues: Boat traffic may impact on dolphins through:<br/>Noise sources i.e. engine, propeller, flow and towed gear.<br/>Presence and movement of boats resulting in possible collisions.</p> <p>Impacts: Noise disturbance may cause marine mammals to relocate, interfere with communication, navigation, foraging, and may disrupt social bonds.</p> <p>Many forms of harassment may elicit a stress response.<br/>Collision may cause traumatic injury or death.</p> |
| Links: <a href="#">Scottish Marine Code</a> . RYA has drawn up new guidelines as a result of lessons learnt from the 2008 Round Britain Power Boat Race. These new measures will ensure that future race events will take the natural environment fully into account and take enforcement action against competitors who breach the mitigation measures put in place. |   |   |

| <b>ACTIVITY: BOAT TRAFFIC - DOLPHIN RESEARCH AND WATCHING VESSELS</b> |   |   |
|---|---|---|
| <b>No.</b>  | <b>ONGOING MANAGEMENT ACTIONS</b>   | <b>ISSUES and IMPACTS</b>   |
| <b>D03<br/>O/G</b>  | <p>(a) Ensure that licensing of research vessels is reviewed regularly.</p> <p>(b) The Scottish Marine Code will continue to be promoted.</p> <p>(c) Ensure professional film makers and photographers either acquire a licence from SNH if they carry out disturbing activities that have an educational or research focus or ensure that they use land-based sites or Dolphin Space Programme accredited operators.</p> | <p>Noise disturbance may cause marine mammals to relocate, interfere with communication, navigation, foraging, and may disrupt social bonds</p> <p>All forms of harassment may elicit a stress response.</p> <p>Collision may cause traumatic injury or death</p> |

| <b>ACTIVITY: COASTAL AND MARINE DEVELOPMENT</b> |  |  |
|---|--|--|
| <b>NO</b>                                       | <b>ONGOING MANAGEMENT ACTION</b>   | <b>ISSUES and IMPACTS</b>  |
| <b>D04<br/>O/G</b>                              | <p>(a) Ensure that nature conservation requirements of the marine SAC are given consideration during planning process</p> <p>(b) Ensure that the Moray Firth SAC qualifying features are included in EIA scoping documents and fully addressed in Environmental Statements where applicable.</p> | <p>THC</p> <p>SG,<br/>Crown<br/>Estate,<br/>MS and<br/>DECC</p> <p>Construction and maintenance of jetties, piers, harbours and sea defences, etc. Offshore developments (e.g. wind farms, petrochemical pipelines, fibre-optic and electricity cables).</p> <p>Marine construction works take place frequently at numerous locations within and adjacent to the SAC boundary.</p> <p>Like other marine activities, coastal construction can produce a wide variety of noises, but the amount conducted into the marine environment depends on the type, duration, location and frequency of the works.</p> <p>Pile driving and the use of explosives at harbours, seafronts and construction yards are likely to create the greatest disturbance.</p> |

| <b>ACTIVITY: FISHING – BY-CATCH / ENTANGLEMENT IN LEGAL NETTING</b> |  |  |
|---|--|--|
| <b>NO</b>   | <b>ONGOING MANAGEMENT ACTION</b>   | <b>ISSUES and IMPACTS</b>  |
| <b>D05<br/>O/G</b>  | Keep a watching brief on the use of new fishing methods and techniques in the Moray Firth. | <p><b>Lead Body</b></p> <p>MS / Fisheries and Offshore Operators Consultative Group (FOOCG)</p> <p><b>ISSUES and IMPACTS</b></p> <p>Issues: By-catch / entanglement of dolphins in legal netting</p> |

| <b>ACTIVITY: MARINE LITTERING - FROM LAND and SEA</b> |  |  |
|---|--|--|
| <b>NO</b>   | <b>ONGOING MANAGEMENT ACTION</b>   | <b>ISSUES and IMPACTS</b>  |
| <b>D06<br/>O/G</b>                                    | <p>Continue a systematic programme of work, through the MFP and other relevant bodies to:</p> <p>(a) help engender a culture change and reduce deliberate littering behaviour;</p> <p>(b) increase public awareness of the environmental effects of fly-tipping;</p> <p>(c) increase public awareness of the environmental effects of inappropriate litter disposal e.g. the Bag It and Bin It campaign;</p> <p>(d) encourage the public to pick up rubbish and lost gear, to recycle and dispose at designated centres and to participate in beach clean ups;</p> <p>(e) encourage joint working and media events between organisations, both public and private;</p> <p>(f) monitor improvements and the effects of different schemes, where possible;</p> <p>(g) ensure that work undertaken by relevant bodies is recorded and recognised.</p> | <p><b>Lead Body</b></p> <p>SEPA</p> <p><b>ISSUES and IMPACTS</b></p> <p>Issue: Discard of litter and garbage from boats including all commercial and recreational vessels.</p> <p>Issues: Land based sources of marine litter, including non-degradable waste from fly tipping, sewerage discharges and coastal landfill.</p> <p>Impact: plastic debris may cause injury or death through entanglement or ingestion.</p> |

The disposal of waste generated by the Shipping and Ports industries is now subject to statutory Waste Management Plans for both ships and Ports. There are a number of marine litter projects that target commercial and recreation fishing including [Save the North Sea](#) and the [Fishing for Litter Scotland](#) projects.

Scottish Water teamed up with the Scottish Executive and Clean Coast Scotland to publicise a campaign using the "We'll Meet Again" theme. See link [Scottish Water Info Hub](#)

| <b>ACTIVITY: MILITARY ACTIVITY AND CIVIL AVIATION</b> |  |  |
|---|--|--|
| <b>NO</b>   | <b>ONGOING MANAGEMENT ACTION</b>   | <b>ISSUES, IMPACTS</b>   |
| <b>D07<br/>O/G</b>                                    | Record instances when jettison of fuel occurs within the SAC and review existing guidance to ensure that it is adequately preventing aircraft fuel contaminating coastal waters. | Issue: Jettison of aircraft fuel.<br>Impact: Carcinogenic effects as for humans and other mammals.<br>Toxic impacts on prey availability |
|   |  |  |
|   |  |  |

| <b>ACTIVITY: OIL INDUSTRY AND RELATED ACTIVITIES - SEISMIC SURVEY</b>   |  |  |
|---|--|--|
| <b>NO</b>   | <b>ONGOING MANAGEMENT ACTION</b>   | <b>ISSUES &amp; IMPACTS</b>                                |
| <b>D08<br/>O/G</b>  | Incorporate emerging understanding of seismic survey impacts on cetaceans, with particular reference to bottlenose dolphins, to produce a model for the possible effect of seismic activity on the dolphins. | Issues: Geological surveys.<br>Impacts: Noise disturbance. |
| <p>Note: <i>The oil and gas companies have formed an international consortium and are carrying out some good work in this field e.g. recording the noise from a complete airgun array rather than just one airgun. For a summary of the work achieved so far see the annual report at <a href="http://www.soundandmarineife.org">http://www.soundandmarineife.org</a></i></p> |  |  |

| <b>ACTIVITY: OIL INDUSTRY AND RELATED ACTIVITIES</b> |  |                  |                             |
|--|--|------------------|-----------------------------|
| <b>NO</b>  | <b>ONGOING MANAGEMENT ACTION</b>   | <b>Lead Body</b> | <b>ISSUES &amp; IMPACTS</b> |
| <b>D09<br/>O/G</b>                                   | PAs and MS to ensure that where regulatory controls cannot be put in place, for exempted operations, that operators and contractors work to best practice standards. | MS               | Issue: Rig defouling        |

| <b>ACTIVITY: TRADE AND SEWAGE DISCHARGES</b> |   |                  |  |
|--|---|------------------|--|
| <b>NO</b>                                    | <b>ONGOING MANAGEMENT ACTION</b>  | <b>Lead Body</b> | <b>ISSUES and IMPACTS</b>  |
| <b>D10<br/>O/G</b>                           | SEPA will continue to monitor significant sewage and trade discharges to the MF SAC.<br>The SAC MG will continue to encourage the safe disposal of potentially polluting materials through awareness raising initiatives. | SEPA             | Issues: Distillery discharges – copper and other heavy metals including zinc and lead.<br>Impacts: Toxic effects of heavy metals as for humans and other mammals.<br>Issues: Discharge of chemical pollutants e.g. organohalogenated compounds and hydrocarbons.<br>Impacts: Impairment of reproductive or immune systems. |

| <b>ACTIVITY: AGRICULTURE AND FORESTRY RUN-OFF</b>  |  |  |  |
|--|--|--|--|
| <b>NO</b>  | <b>ONGOING MANAGEMENT ACTION</b>   | <b>Lead Body</b>   | <b>ISSUES and IMPACTS</b>  |
| <b>S01 O/G</b>   | Review existing data on sediment run-off. If significant, as defined by Natura legislation, impacts on the sandbanks are identified then introduce measures to reduce the problem.   | SEPA   | Issue: Sediment run-off. Impact: Large scale run-off could cause smothering of the benthos which may clog the feeding and respiration apparatus of some invertebrate species. Increase in suspended particles may influence turbidity, light penetration and primary production. Contamination may also occur.   |
| <b>ACTIVITY: AQUACULTURE</b>   |  |  |  |
| <b>NO</b>  | <b>ONGOING MANAGEMENT ACTION</b>   | <b>Lead Body</b>   | <b>ISSUES and IMPACTS</b>  |
| <b>S02 O/G</b>   | <p>Finfish Farming:</p> <ul style="list-style-type: none"> <li>(a) Encourage best husbandry practice to minimise the use of chemical treatments and medicine use.</li> <li>(b) Encourage use of appropriate feeding technology to minimise waste feed.</li> <li>(c) Continue to monitor the seabed in the vicinity of the fish farm.</li> </ul> <p>Shellfish Farming</p> <ul style="list-style-type: none"> <li>(d) Avoid sensitive areas when leasing (shell) fish farm sites</li> <li>(e) Ensure any future mussel farms are located in areas able to accommodate them in terms of water quality, depth and movement.</li> </ul> | <p>Moray Firth SAC MG</p> <p>Moray Firth SAC MG</p> <p>SEPA</p> <p>THC</p> <p>MS</p> | <p>Issues: Discharge of chemical treatments and medicines.<br/>Impact: toxic effects</p> <p>Issues: Fish food waste plus fish faeces. Impact: Organic enrichment and or smothering can cause localised impacts upon the benthic community. Localised changes to species richness, biomass and abundance.</p> <p>Issues: Shellfish farming – pseudo-faeces and introduction of non-native species. Impact: smothering, loss of habitat.</p> |
| <p>Note: There are no such finfish activities in the Moray Firth, at present, and there is a policy presumption against further aquaculture development regarding finfish. Please see Strategic Framework for Scottish Aquaculture. Document can be downloaded from <a href="#">Scottish Government website</a>.</p> |  |  |  |

| <b>ACTIVITY: AQUACULTURE</b> |   |                  |   |
|------------------------------|---|------------------|---|
| <b>NO</b>                    | <b>ONGOING MANAGEMENT ACTION</b>  | <b>Lead Body</b> | <b>ISSUES and IMPACTS</b>   |
| <b>S03<br/>O/G</b>           | MS to provide an annual report to the SAC MG on the current status and developments in UK policy on non-native species and advise on the implications for the MF SAC. | MS               | Issue: Introduction of non-native species. Impacts: The intro of non-native species and pathogens may change community structure and dynamics with potential consequences for predators and commercial fisheries. |

## 6. Monitoring and Review

### 6.1 Introduction

The aim of this management scheme is to meet the objectives of the Habitats Directive - conserve the Moray Firth SAC site and its qualifying features – the bottlenose dolphin population and the subtidal sandbanks - through implementation of the agreed management actions. In order to ensure that the relevant authorities fulfil their requirements under the Habitats Directive it is important to monitor the site<sup>18</sup>. Monitoring will address both the condition of the dolphins and sandbanks in the SAC (biological monitoring with reference to the Conservation Objectives for the site), and the implementation of the management arrangements (compliance monitoring).

### 6.2 Biological Monitoring

#### *Dolphins*

Scottish Natural Heritage leads on co-ordinating biological monitoring for the dolphin interest of the SAC. This has resulted in SNH contracting the University of Aberdeen to expand its ongoing monitoring programme of the bottlenose dolphins in order for the condition of the site to be assessed. This programme looks at the number of dolphins within the SAC, the importance of the SAC for the dolphin population; the population size and the population viability using photo-identification and mark and re-capture techniques.

Table 6.1 contains the attributes, targets and prescriptions for monitoring the dolphin population and the results of this monitoring programme to 2005. The attributes and targets presented here are still under development and may be reviewed and revised at a later stage to reflect additional data collected and to incorporate future advances in statistical analysis and modelling techniques. A decline in dolphins using the SAC between 1990 and 2002 with subsequent evidence of a slight increase and stabilisation led to the condition of the bottlenose dolphin feature being assessed as 'unfavourable recovering' in 2005.

#### *Sandbanks*

Scottish Natural Heritage also leads on co-ordinating biological monitoring for the sandbank interest of the SAC. Monitoring of this feature seeks to ensure that the composition of biological communities and habitat characteristics, including the structure and function of the habitats, do not significantly alter over time, subject to natural change.

Table 6.2 lists the attributes and targets for monitoring the subtidal sandbank features, specifically their extent, topography, sediment type and distribution of biotopes. An assessment of whether the targets are being met is also presented in table 6.2. The condition assessment of '*Favourable - Maintained*' for the sandbanks feature is based solely on the information collected during the 2004 broadscale mapping exercise and the absence of any reported anthropogenic activities likely to adversely affect the feature. It is anticipated that the attributes, targets and prescriptions will be revised and refined during a monitoring assessment in the future.

### 6.3 Compliance Monitoring

Each lead body will be responsible for monitoring compliance with the management actions they have signed up to. The Moray Firth SAC Management Group will collate the information relating to compliance monitoring of the scheme from each of the lead bodies and include this information in an annual progress report.

<sup>18</sup> Member states are obliged to report to the European Commission every 6 years. It is expected that SNH's monitoring programme will inform this report on the condition of the site and qualifying features within the Moray Firth SAC. The SAC Management Group will oversee the monitoring of the site on three aspects:

1. *Site condition or biological monitoring*: assesses the site features against the Conservation Objectives for the site.
2. *Compliance monitoring*: determines whether the agreed management measures are in place.
3. *Management measures*: the management scheme will be regularly reviewed to ensure that it adequately addresses the issues and activities which impact on the conservation features of the site.

#### **6.4 Review of the Management Scheme**

The management scheme is not a static document; as activities, issues and conditions within the SAC change, their management will also evolve to accommodate this. Thus, there will be a regular review of the scheme to assess its effectiveness, and it will be revised where necessary to maintain its relevance to the SAC. Any changes to the management scheme will generally be carried out in consultation with those relevant bodies likely to be most affected. The SAC Management Group will jointly prepare and discuss an annual progress report on implementation of the management scheme and any new findings about the state of the bottlenose dolphin population and the sandbanks within the Moray Firth SAC.

**Table 6.1 Site Attribute Table for the Moray Firth SAC bottlenose dolphin population.**

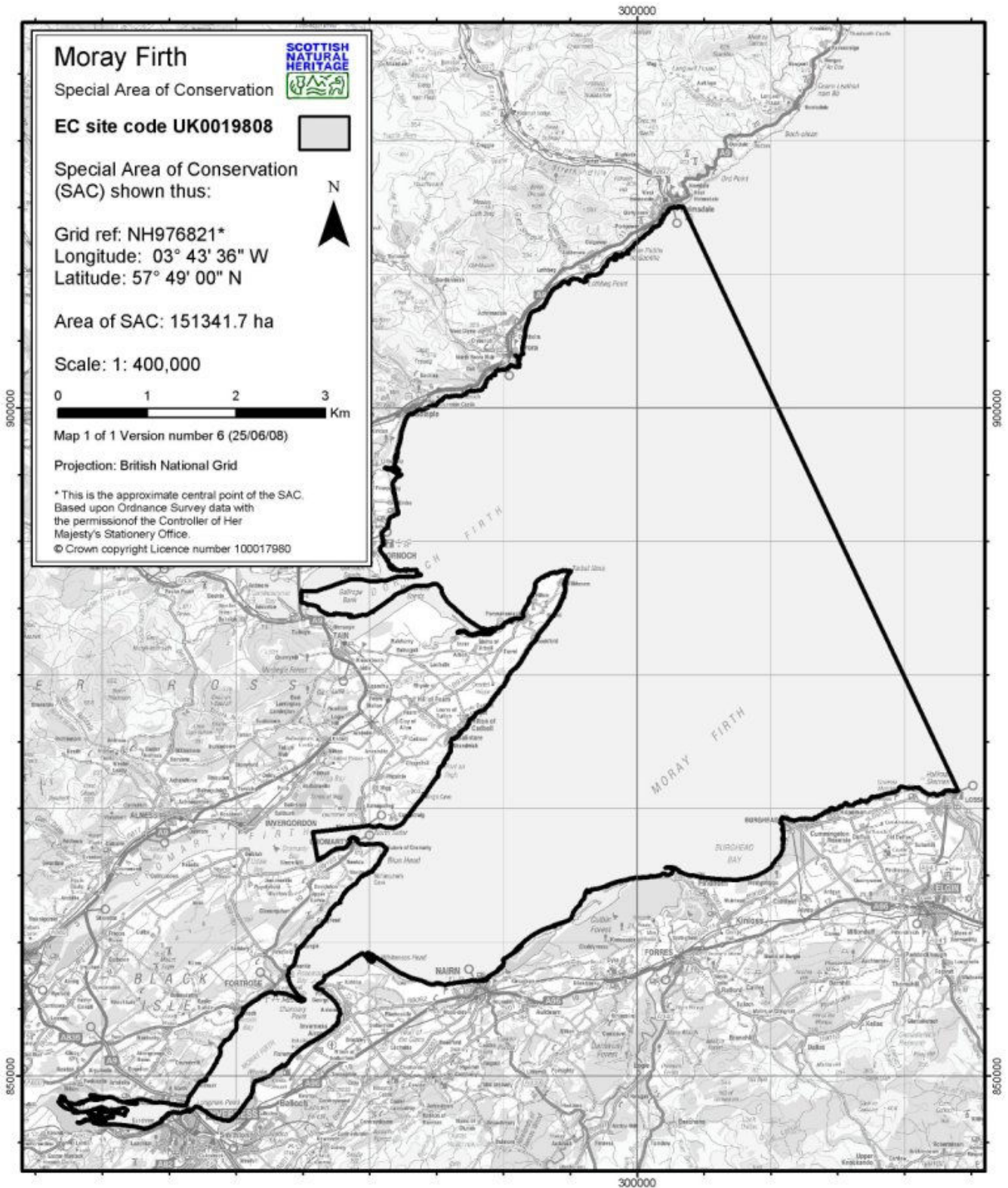
It should be noted that this table contains draft proposals; formal guidance has yet to be agreed by the Inter Agency Monitoring Group for monitoring this species.

| Attribute                                   | Target  | Prescription   | Result of Monitoring   | Target met? (Y/N)   |
|---|---|--|--|---------------------|
| Number of individual dolphins using the SAC | A stable or increasing number of dolphins using the SAC.  | Apply photo-ID and mark-recapture extrapolation techniques to annual observations.   | Between 1990 and 2002, annual estimates of the number of dolphins using the SAC ranged between 58 and 195 individuals (Thompson et al., 2004). Although the distribution of dolphins changes from year to year with areas outside the SAC being used on a more regular basis, the target for this attribute has been met. This is because the number of animals using the SAC between 2000 and 2004 is stable and the SAC remains a core area for them and is critical for their survival.   | Y                   |
| Importance of SAC to dolphin population     | Maintain or increase the level of use of the SAC.   | Over a three-year period determine the probability of sighting different individuals and social groups within the <b>core areas</b> of the SAC using photo-ID and mark-recapture. Other methods may be subsequently developed. | Photo-ID data collected across the east coast of Scotland indicate that some dolphins have only been observed within the SAC (Group 1) whilst others range over a much wider area (Group 2). Between 1990 and 2000 there was a statistically significant decline in the proportion of animals observed within the SAC that were members of Group 2. Between 2002 and 2004 there was an increase in the number of dolphins using the SAC concurrent with increased observations of Group 2 members. On balance, this suggests that the decline in use of the SAC by Group 2 has not continued. The status of Group 1 is unclear at this time. | Y                   |
| Dolphin population size                     | Maintain a stable or increasing bottlenose dolphin population.  | Every three years evaluate trends in population size using photo-ID and mark-recapture.  | Data in the process of collection.   | Target not assessed |
| Dolphin population viability                | Maintain the probability of population extinction within 100 years at less than 10% (following IUCN category) | Carry out population viability analyses (PVA) by estimating mortality rate, birth rate & population size. Methods will incorporate photo-ID, mark-recapture and analysis of strandings.  | Refined methods of assessment are under development. This attribute may be revised in the next reporting cycle. Every 6 years the SG (with advice from SNH) has to report to Europe on the condition of European sites.  | Target not assessed |

**Table 6.2 Site Attribute Table for the Moray Firth SAC that defines the condition of 'Sandbanks which are slightly covered by sea water all the time' (Subtidal sandbanks).**

| Attribute                | Target  | Prescription                                   | Result of Monitoring  | Target met? (Y/N) |
|--------------------------|---|--|---|-------------------|
| Extent                   | No reduction in extent of inshore sublittoral sediment habitat, allowing for natural succession/known cyclical change.<br>Note – Subtidal sandbanks extent & the implications of activities should be assessed against Foster-Smith <i>et al</i> (in press), SNH commissioned research report   | Assessment based on broadscale biotope mapping | The feature's extent was mapped using the Broadscale methodology, and a baseline was established. No direct monitoring was undertaken. However there seem to be no evidence to suggest that there has been any loss of extent.<br>To the best of our knowledge there are no known cases of activities which may reduce the extent of the sublittoral sediment feature.  | Y                 |
| Topography               | No alteration in topography of the inshore sublittoral sediment, allowing for natural variation /seasonal changes or known cyclical change.<br>Note – Subtidal sandbanks topography & the implications of activities should be assessed against the baseline established during the broadscale mapping visit (2004) using sidescan and AGDS. Foster-Smith <i>et al</i> (in press), SNH commissioned research report       | Assessment based on broadscale biotope mapping | The feature's topography was mapped using the Broadscale methodology, and a baseline was established. No direct monitoring was undertaken. However there seem to be no evidence to suggest that there have been alterations in topography of the inshore sublittoral sediment, other than that of natural variation.<br>To the best of our knowledge there are no known cases of activities which may alter the topography extent of the sublittoral sediment feature.  | Y                 |
| Sediment type            | No change in composition and distribution of sediment types across the feature, allowing for natural succession/known cyclical change.<br>Note – Subtidal sandbanks sediment type & their distribution, as well as the implications of activities should be assessed against the baseline established during the broadscale mapping visit in 2004. Foster-Smith <i>et al</i> (in press), SNH commissioned research report | Assessment based on broadscale biotope mapping | The sediment types and their distribution were mapped using the Broadscale methodology, and a baseline was established. No direct monitoring was undertaken. However there seem to be no evidence to suggest that there have been alterations in the overall sediment character and the spatial arrangement of sediment types, other than that of natural variation.<br>To the best of our knowledge there are no known cases of activities which may alter sediment character and the spatial arrangement of the sublittoral sediment feature. | Y                 |
| Distribution of biotopes | Maintain the distribution of biotopes, allowing for natural succession/ known cyclical change.<br>Note – Subtidal sandbank's biotope distribution, as well as the implications of activities should be assessed against the baseline established during the broadscale mapping visit in 2004. Foster-Smith <i>et al</i> (in press), SNH commissioned research report  | Assessment based on broadscale biotope mapping | The feature's biotopes were mapped using the Broadscale methodology, and a baseline was established. No direct monitoring was undertaken. However there seem to be no evidence to suggest that there have any loss of the variety of biotopes.<br>To the best of our knowledge there are no known cases of activities which may alter the distribution of biotopes of the sublittoral sediment feature.   | Y                 |

## Appendix A - Map of the Moray Firth Special Area of Conservation



**NOTE: Subtidal sandbanks are afforded special protection wherever they occur within the Moray Firth SAC. This covers areas of sand that are permanently covered by shallow seawater, typically at depths of less than 20m below chart datum. A habitat map detailing the exact location and extent of the sandbanks was drafted by SNH in 2006, copies of which can be made available on request.**

## Appendix B - Current Members of the Moray Firth SAC Management Group

|                     |  |
|---------------------|--|
| James McKie (Chair) | Marine Scotland, Marine Laboratory   |
| Paul Bancks         | The Crown Estate   |
| Doreen Bell         | Scottish Water   |
| Colin Craig         | Scottish Environment Protection Agency   |
| Jim Dickson         | Maritime and Coastguard Agency   |
| Capt. Ken Gray      | Cromarty Firth Port Authority  |
| Martin Latimer      | Whiteness Property Company<br>(CSM Scotland – Marine and Leisure<br>Consultants) |
| Ben Leyshon         | Scottish Natural Heritage  |
| Donald Lunan        | Moray Council  |
| Capt. Ken Maclean   | Inverness Harbour Trust  |
| Sonia Mendes        | Joint Nature Conservancy Committee   |
| Michael Middlehurst | Grampian Police  |
| Inger Soderstrom    | Dept. of Energy & Climate Change   |
| Colin Wishart       | The Highland Council   |

### Non-Members (Advisors)

|   |                                 |
|---|---------------------------------|
| Roddy McColl (Fisheries Advisor)                            | Fishermen's Association Limited |
| Until June 2009-06-29<br>Paul Thompson (Scientific Advisor) | Aberdeen University             |

## Appendix C - Summary of Issues (from Revision 1) ~ Dolphins

### ACTIVITY D1: AGRICULTURAL AND FORESTRY RUN-OFF

#### **Key Issues:**

- D1.1 Pesticide run-off.
- D1.2 Fertiliser run-off.

#### **Extent of activity:**

The land area around the SAC is used extensively for agriculture and forestry.

#### **Existing control of activity:**

- 1992 EC Habitats Directive; The Conservation (Natural Habitats &c.) Regulations 1994
- Water Framework Directive, 2000/60/EC. The Scottish Executive transposed this directive by means of primary legislation in 2003.
- Forest and Water Guidelines (3<sup>rd</sup> Edition) regulates forestry activity
- Prevention of Environmental Pollution from Agricultural Activity (PEPFAA) code
- SEPA's "Pollution Prevention Guidelines" – PPG09 Pesticides
- Control of Pollution Act (1974)

#### **Additional information:**

Diffuse pollution is projected by SEPA to be the most important cause of river pollution in Scotland by 2010, which is likely to have repercussions in the water body of the Moray Firth. At present, 25% of diffuse river pollution is related to agriculture and 1% is related to forestry. SEPA licenses helicopter/plane applications of herbicides but codes of good practice are the only control on land-based applications.

SNH launched the "Targeted Inputs for a Better Rural Environment" initiative in 1997, which provides information on farming practices for farmers and advisers in Scotland and pulls together existing information, highlighting ways in which technology can be used to protect the environment and reduce costs to farmers. The use of pesticides is already being minimised and consequently the discharge of redundant contaminants is also minimised. In addition, facilities are in place for the safe disposal of banned chemical stocks from farms. Concurrently, the UK Forestry Standard sets out what good practice entails and organises seminars aimed at contractors. Any person applying pesticides receives full training and has a certificate of competence. All pesticides used have undergone tests for efficacy and safety (to humans and the general environment) while alternatives to pesticides are being actively sought. Under the UK Woodland Assurance Scheme (UKWAS) forest managers must keep records of fertiliser use and review the use of pesticides in order to avoid or reduce it. All Forest Enterprise forests have received UKWAS approval and the proportion of forests registered with UKWAS is growing.

MS, ML holds information on heavy metals and persistent organic compounds in a range of marine samples collected from the Moray Firth. The data set includes samples of biological tissue collected from stranded dolphins.

Under the "Designation of Nitrate Vulnerable Zones (Scotland) Regulations 2002" the Moray Coast has been designated as a Nitrate Vulnerable Zone (NVZ) where mandatory Action Programmes for farmers must be established. These promote best practice in the use and storage of fertiliser and manure. Certain areas (e.g. the Black Isle) were targeted for further data collection on the presence of nitrates but no case found for designating as NVZs. The relevant authorities will work with farmers in these areas to ensure that good practice is adhered to and that voluntary preventative measures are put in place, where appropriate. The Scottish Government's Agriculture and Environment Working Group Report "Custodians of Change" supports a number of key approaches to environmental management and the development of sustainable agriculture in Scotland.

The Moray Firth EU Life Environment project commissioned a review, in 2001, entitled "The impact of environmental contaminants on bottlenose dolphins (*Tursiops truncatus*) and other proxy species: A summary of information". This is a reference document and first point of information to aid the relevant authorities in decision-making processes relating the use or discharge of potential contaminants.

**ACTIVITY D2: ANCHORING OF BOATS AND RIGS**

See sandbanks section – Activity S2.

**ACTIVITY D3: ANTI-FOULING: USE OF****Key Issues:**

D3.1 Use and discharge of anti-fouling coatings in relation to shipping, rigs and aquaculture, shipbuilding and repair.

**Extent of activity:**

There is moderate use of anti-fouling at boat yards and by individuals within the SAC. Much application of anti-fouling takes place at shipyards outwith the site boundary, but within areas used by the dolphins. Some ships passing through the site are treated with anti-fouling paints. Organotin TBT based anti-foulants are no longer used on rigs, although contamination could occur during shot blasting and the exposure of old layers of anti-foulants. There is only one operational fish farm within or near the boundary of the SAC; copper-based anti-foulant is used.

**Existing control of activity:**

- 1992 EC Habitats Directive; The Conservation (Natural Habitats &c.) Regulations 1994.
- The Control of Pollution (Antifouling Paints and Treatments) Regulations 1987
- In the UK there is an existing ban on the use of anti-fouling products containing triorganotins for vessels under 25 m and for fish farming equipment.
- IMO adopted (October 2001) an International Convention on the Control of Harmful Anti-Fouling Systems on Ships, which prohibits the use of harmful organotins in anti-fouling paints used on ships and establishes a mechanism to prevent the potential future use of other harmful substances in anti-fouling systems.
- The International Antifouling Systems Convention (AFS) came into force in September 2008, which bans the use of organotin compounds as antifouling paints and ensures appropriate measures are taken to dispose of any associated waste materials. This covers any vessel whatsoever operating in the marine environment.
- The European Union (EU) adopted Regulation (EC) No.782/2003 on the prohibition of organotin compounds on ships in 2003. This regulation prohibits the application or reapplication of organotin compounds acting as biocides in antifouling systems on ships flying the flag of an EU Member State from 1 July 2003. It also contains provisions which do not allow any ship with a tin-based anti-fouling system to enter any EU port or offshore terminal from 1 January 2008.
- At the IMO's Marine Environment Protection Committee 57, it was considered that MEPC 57/INF.2 (Secretariat) (which contains interim advice on the management of waste streams resulting from the removal of anti-fouling systems from ships and the plan under the London Convention and Protocol) provide comprehensive advice on the Best Management Practices for the removal of anti-fouling paints on ships.
- IMO are currently developing guidelines for minimising hull fouling which will take into account the guidelines drafted at the 2007 meeting of ICES, Working Group on Ballast Water and Other Ship's Vectors.
- Application of anti-fouling at boat and rig yards is carried out under PPC Regulations, under SEPA control.
- Development of alternative anti-fouling systems has been and will continue to be carried out.

**Additional information:**

Whilst licensed users may behave responsibly, there is a perception that illegal use of TBT anti-fouling occurs for boats under 25 m and may continue.

DEFRA, through the Cetacean Stranding Scheme, funds the analysis of 60 animals per year, including bottlenose dolphins and porpoises, for pollutants (organochlorines - PCB, DDT, Pesticides, etc.; heavy metals - Hg, Cd, etc.; PBFR; and butylins - TBT, etc.). The present contract commenced in 2007 and is due to continue for 3 years.

## ACTIVITY D4: AQUACULTURE

### **Key Issues:**

- D4.1 Discharge of chemical treatments and medicines.
- D4.2 Feeding of discarded fish to dolphins.
- D4.3 Methods used for protection of fish farm stock from predators.

### **Extent of activity:**

Aquaculture currently has a very low profile in the Moray Firth. There are no active licensed finfish farms located within the SAC at present. The last operational fish farm was situated in the bay at Avoch in the Inverness Firth and it closed in 2002. The lease for a site at Red Nose, near the South Sutor, was never developed and expired in 2005.

There is only one shellfish farm in the area, which is currently non-operational and also a classified shellfish harvesting area and exploited natural beds in the Dornoch Firth. The deliberate introduction of non-native species is not known to have occurred within the Moray Firth SAC through a shellfish farm.

The Scottish Government's locational guidelines for marine fish farming include a general presumption against the further development of finfish farms off the east coast of mainland Scotland - this policy is supported by the members of the Moray Firth SAC Management Group.

### **Existing control of activity:**

- 1992 EC Habitats Directive; The Conservation (Natural Habitats &c.) Regulations 1994.
- Discharge consent is given by SEPA under the Control of Pollution Act 1974.
- Environmental Impact Assessment (Fish Farming in Marine Waters) Regulations 1999.
- The local authority issues new planning consents and consent for alterations to existing sites following consultation and recommendation from the relevant statutory bodies. This arrangement has been in place since April 2007.
- The local authority is the nominated competent authority with regard to the Environmental Impact Assessment Regulations.
- A lease from the Crown Estate is required for all fish farming developments affecting seabed and Crown Estate owned foreshore.
- There is currently no statutory control on escaped fish but fish farmers are encouraged to follow best practice through accreditation schemes. The Registration of Fish Farming and Shellfish Farming Businesses Amendment (Scotland) Order 2008 (Scottish Statutory Instrument 222) requires the mandatory notification of all escapes of farmed fish.
- Any farmed animals that have died are classified as high risk waste under The Animal By-products Order 1999. As such they must be disposed of by rendering, incineration or, as a last resort, by burial.
- The Food Standards Agency (FSA) and the Veterinary Medicines Directorate (VMD) monitors chemical residues in wild caught fish and aquaculture
- The Scottish Government's locational guidelines were updated in 2009 and are available at: [http://www.frs-scotland.gov.uk/Delivery/Information\\_Resources/information\\_resources\\_view\\_document.aspx?contentid=1416](http://www.frs-scotland.gov.uk/Delivery/Information_Resources/information_resources_view_document.aspx?contentid=1416)

### **Additional information:**

The Scientific Committee of the IWC has recently repeated its advice that wild dolphins should not be fed, as it is widely held to be harmful to them.

Seal scarers are specifically designed to deter seals from approaching fish farms and nets. Their success is variable, and concerns have been raised about their potential to also exclude seals and cetaceans from neighbouring habitats. Unlike seal scarers, pingers are small acoustic devices, intended to stop those animals from becoming entangled and drowning in set nets. Deterrent pingers have not yet been deployed in the Moray Firth. SNH has commissioned the following report: "Gordon J. & Northridge S. 2002. Potential impacts of Acoustic Deterrent Devices on Scottish Marine Wildlife.

SNH Commissioned Report F01AA404.” The report recommends a precautionary approach in the use of acoustic deterrents.

Marine Scotland issued The Registration of Fish Farming and Shellfish Farming Businesses Amendment (Scotland) Order 2008 (Scottish Statutory Instrument 222) in June 2008, which requires the mandatory notification of all escapes of farmed fish. This further amended The Registration of Fish Farming and Shellfish Businesses Order 1985 (amended 2002). Any suspected escape or circumstances which gives rise to a significant risk of escape, must be reported to the Scottish Government. Methods used for recapture of escaped fish will necessarily vary, depending on the location of the farm site and the local topography, the size of the fish involved, and implications for other wildlife (such as wild salmon and other fish species, birds and marine mammals). In many instances the appropriate recapture method would involve rapid deployment of gill nets of appropriate mesh size. It should be noted that a fish farmer or other person seeking to recapture or catch escaped fish might need temporary local exemption from conservation regulations. There are two provisions that allow for this. Advice about this will be provided following notification of an escape. In almost all cases, continuing action will require permission from Scottish Ministers. Scottish Quality Salmon (SQS) also produces a code of best practice on the containment of farmed fish, official notification following the escape of fish and possible measures to be employed to attempt recapture.

## ACTIVITY D5: BALLAST WATER DISCHARGE

### **Key Issues:**

- D5.1 Introduction of non-native species.
- D5.2 Introduction of contaminants.

### **Extent of activity:**

Tankers at berths at Invergordon and Nigg Oil Terminal in the Cromarty Firth transport oil to many parts of the world and as a consequence the Firth receives discharges of ballast water that originate from Europe, the USA and Canada. In recent years, increases in the number of vessels arriving at the Cromarty Firth have resulted in increased ballast water discharges. Nigg Oil Terminal has facilities for collection of ballast water from oil tankers.

### **Existing control of activity:**

- 1992 EC Habitats Directive; The Conservation (Natural Habitats &c.) Regulations 1994.
- United Nations Conference on Environment and Development 1992 - requested IMO to consider the adoption of appropriate rules on ballast water discharge to prevent the spread of non-indigenous organisms. IMO has published guidelines on the discharge of ballast water (A.868 (20)) and these are highlighted in the MCA's Marine Guidance Note (MGN) 81 (M+F). IMO has also adopted, in 2004, an International Convention for the Control and Management of Ships' Ballast Water and Sediments, which is currently in the process of being ratified.
- During the time the BW Convention is being ratified OSPAR has prepared recommendations for the control of introductions through ballast water that will result in a voluntary code of practice on the "Introduction and Transfers of Marine Organisms" relating to ballast water discharges in the north Atlantic (See MGN 363 (M + F)).
- Article 196 of UNCLOS - provides that States shall take all measures necessary to prevent the intentional and accidental introduction of species, alien or new, to a particular part of the marine environment, which may cause significant and harmful changes thereto.
- Convention on Biological Diversity; Bonn Convention; Bern Convention - all include provisions that require Member States to control the introduction of, or control already introduced, exotic species which may threaten native or protected species.
- Principle 15 of the Rio Declaration on Environment and Development - calls for the application of the precautionary principle.

### **Additional Information:**

The introduction of any new species may have a significant impact on the ecosystem, for example the impact of discharging ballast water collected in other parts of the world is difficult to predict. It is impossible to predict which species will survive the journey in the ballast tank and, if an introduced species does become established, what effect this will have on the environment. The majority of vessels which enter the SAC and which may discharge ballast water come from ports in Northern Europe. This may present a threat to Scottish ecosystems from secondary introductions of non native species i.e. if a species has been introduced into ports within Northern Europe then it is possible that ballast water could then be the vector that spreads the new species further. IMO has discussed the potential for biofouling on vessels and is currently developing international measures to reduce the risk of introducing non native species *via* this sector. Viruses and other pathogenic organisms may also be introduced via ballast water and could cause deleterious effects on dolphins and elements of their food chain. Of particular concern is the introduction of *Gyrodactylus salaris* by boats from the Baltic ports and Norway. This pathogen could wipe out all wild salmonids within the system. Although fisheries have been affected by non-native species in other parts of the world, there is very little evidence for direct effects on marine mammals. Controlling ballast water discharges is a highly complex issue because ships can take on ballast water from a variety of sources many of which may be untraceable. However as the BW Convention comes into force all ballast water will be treated before discharge.

ACTIVITY D6: BOAT TRAFFIC**Key Issues:**

- D6.1 Commercial vessels.
- D6.2 Motorised water sports.
- D6.3 Dolphin research and wildlife-watching vessels.
- D6.4 Sonar systems

- engine, propeller, flow and towed fishing gear noise
- movement and presence of boats
- collision with dolphins

Boat traffic has been separated into three categories: (a) commercial vessels (which includes scientific research vessels used by government bodies e.g. Marine Scotland); (b) motorised water sports and (c) dolphin research and wildlife-watching boats. Although there are shared issues between the three categories, they are distinguished through their behaviour in relation to dolphins, and thus their potential impact on them. For example, commercial vessels tend to travel on predictable courses at constant speeds and their activities occur regardless of whether or not the dolphins are present. Boats involved in motorised water sports tend to move erratically and at varying speeds and may also approach or follow the dolphins. Dolphin research and wildlife-watching boats focus specifically on the dolphins and operators may wish to approach or follow dolphins.

**Extent of activity:**

**(a) Commercial vessels:** a maximum of 410 ships is recorded annually in Inverness harbour. In the Cromarty Firth a considerable amount of commercial boat traffic is associated with the oil industry. One ferry operates between Cromarty and Nigg and cruise liners visit the Moray Firth regularly. Local fisheries, aquaculture, fisheries protection boats, naval craft, RNLI, HM Custom's boats and airboats also contribute to the boat traffic in the SAC. Concentrations of small and high speedboats occur in coastal waters, fishing boats are widespread, whilst large ships occur throughout, but concentrate around ports and offshore installations. It should be noted that commercial boat traffic is increasing.

**(b) Motorised water sports:** Water-skiing, diving, power boats and personalised water craft (PWC) are seen within the SAC although the extent of their use is not fully known. Diving interests in the SAC are mainly concentrated on offshore wrecks although some diving takes place on inshore reefs. The weather conditions and water temperature in the Firth probably limit the number of PWC users. Non-motorised water sports such as sailing (dinghies and yachts) and sea kayaking are popular in many areas of the Firth but management of these activities was not considered necessary. Recreational boat traffic enters the SAC from coastal launch points within and outwith the Firth and via the Caledonian Canal, where between 800 and 1000 licences are issued to pleasure craft (motorised and non-motorised) annually.

**(c) Research and wildlife-watching vessels:** The University of Aberdeen Lighthouse Field Station carries out boat-based surveys of dolphins, the Moray Firth Wildlife Centre and Friends of the Moray Firth Dolphins carry out research via dolphin-watching boats. The Cetacean Research and Rescue Unit carry out research in the Banff area. Film crews and photographers visit the area occasionally, tending to use local operators for boat services. Wildlife-watching boat businesses work within the SAC throughout the year, a number of which are currently accredited through the Dolphin Space Programme. Fare-paying passengers may also be taken on wildlife-watching cruises by unaccredited operators and by operators licensed for other activities. A variety of recreational craft are also used as a vehicle for wildlife-watching although for non-fare paying passengers.

**Existing control of activity:**

- Legislation covering shipping and boat traffic: 1992 EC Habitats Directive; The Conservation (Natural Habitats &c.) Regulations 1994. Wildlife and Countryside Act 1981. Wild Mammals Act. The Merchant Shipping (Vessels in Commercial Use for Sport or Pleasure) Regulations 1998. The Merchant Shipping (Life Saving Appliances for Passenger Ships of Classes 111 to V (A)) Regulations 1992. The Merchant Shipping Act 1995. Under the Civic Government (Scotland) Act 1982, local authorities can licence boats carrying between 0 and 12 fare-paying passengers and those under hire that do not go "to sea" (i.e. remain west of the North Sutor-Nairn line). Boats that

carry more than 12 fare-paying passengers or those which go “to sea” are required to have a MCA licence.

- Bylaws: IHT bylaws, CFPA Confirmation Act. Civic Government (Scotland) Act 1982 covers the creation of bylaws for craft up to 1000 m beyond low-water mark. Under the National Port Waste Management Strategy, all ports are required to have a Port Waste Management Plan. SNH can make bylaws for the protection of a European marine site under Section 37 of the Wildlife and Countryside Act 1981.
- Agreements and Guidelines relating to cetaceans: The Agreement on the Conservation of Small Cetaceans of the Baltic and North Seas (ASCOBANS). The Bern Convention. DETR Guidelines for minimising disturbance to cetaceans from whale-watching operations 1999, and from recreation at sea 1999. MCA support the voluntary registration of recreational craft.
- Local initiatives relating to wildlife: The “Dolphin Awareness” initiative covers motorised water sports and other boat traffic. The Moray Firth “Dolphin Space Programme” is a voluntary accreditation scheme for wildlife-watching boat tour operators in the Moray Firth. Wildlife-watching boats are licensed by HC and MCA, while research vessels are licensed by SNH.
- National initiatives relating to wildlife: WDCS “Sail to Save” scheme covers the leisure industry and combines cetacean spotter guides with advice about responsible behaviour of boats around cetaceans; Whale Watching Guidelines. Civic Government (Scotland) Act; MCA posters.
- Offshore Petroleum Activities (Conservation of Habitats) Regulations 2001. Food and Environment Protection Act 1985, Part II (as amended), Licensing conditions.

**Additional information:**

There is evidence from the Moray Firth and other parts of the world that boats travelling at high speeds or behaving erratically in the vicinity of dolphins cause changes in their behaviour. In addition, recreational speedboats can disturb or collide with dolphins. Although the volume of traffic in the Moray Firth is likely to determine the level of disturbance to dolphins, a single irresponsible user can create a considerable amount of distress to the animals. Some incidents have been reported in the Moray Firth and in one recent case a successful prosecution made. Boat traffic is concentrated in certain areas with recreational craft being more prevalent during the summer months. In addition, large scale events involving many craft occur in the SAC on a regular basis. In summer 2008 around 50 high speed vessels passed through the SAC as part of the Round Britain Power Boat Race. As a result of the lessons learnt from this event, the Royal Yachting Association has drawn up new measures to ensure that future race events take the natural environment fully into account. The new measures will also ensure timely consultation with the statutory conservation bodies and take enforcement action against competitors who breach the mitigation measures put in place.

## ACTIVITY D7: COASTAL DEVELOPMENT

### **Key Issues:**

D7.1 Construction and maintenance of jetties, piers, harbours and sea defences, etc.

D7.2 Offshore developments (e.g. wind farms, petrochemical pipelines, fibre-optic and electricity cables)

### **Extent of activity:**

Marine construction works take place frequently at numerous locations within and adjacent to the SAC boundary. In any given year as many as 10 marine construction licences are issued under "The Food and Environment Protection Act 1985, Part II (As Amended). The magnitude of the works ranges, for example, from simple repairs to existing structures to the construction of a new quay. Like other marine activities, coastal construction can produce a wide variety of noises, but the amount conducted into the marine environment depends on the type, duration, location and frequency of the works. Pile driving and the use of explosives at harbours, seafronts and construction yards are likely to create the greatest disturbance.

### **Existing control of activity:**

- 1992 EC Habitats Directive; The Conservation (Natural Habitats &c.) Regulations 1994.
- Coast Protection Act 1949; Environmental Protection Act 1990; The Food and Environment Protection Act (FEPA) 1985, Part II (As Amended); Electricity Act 1989; Town and Country Planning Act; Private Legislation Procedures Act 1936; The Environmental Impact Assessment (Scotland) regulations 1999; Harbours Act 1964; The Harbour Revision Order; various local harbour powers.
- SEPA's "Pollution Prevention Guidelines" – PPG05 Work in near or liable to affect watercourses; PPG23 Maintenance of structures over water.
- Water Bill 2003
- A Crown Estate consent is required, where foreshore within its ownership, or any area of seabed, will be affected by the construction or maintenance of jetties, slipways or other structures and for the laying of cables and pipelines

### **Additional information:**

There is known to be interest in the possibility of developing offshore wind farms in the Moray Firth. The Crown Estate, as landowner of the seabed out to the 12 nautical mile territorial limit also plays an important role in the development of the offshore wind industry by leasing areas of seabed for the placing of turbines. But the Crown Estate will grant a lease only when the developer has obtained all the necessary statutory consents from the responsible Government Departments. The Scottish Government is responsible for administering offshore windfarm applications and consents in Scottish waters, while the DECC will also be a regulating authority if wind farms are to be developed beyond the 12-nm line.

SEPA is developing best practice guidance on coastal development in the scope of the Habitat Enhancement Initiative (HEI).

See section S7 (sandbanks). Consideration to be given to wildlife at the planning and implementation stages and mitigation measures to be put in place if appropriate.

**ACTIVITY D8: DREDGING, DISPOSAL OF DREDGED MATERIAL & AGGREGATE EXTRACTION****Key Issues:**

- D8.1 Contaminants.
- D8.2 Disturbance and injury.
- D8.3 Turbidity/Smothering: disposal of sediment.

**Extent of activity:**

**Within the site:** Dredging takes place periodically at a number of sites within the SAC boundary (Helmsdale, Dornoch Firth, Cromarty Firth, Beaulie Firth, Inverness Firth, Burghead, Hopeman Harbour and Lossiemouth). There are 8 licensed sea disposal sites within the SAC boundary: Helmsdale, Inverness, Burghead, Lossiemouth, Nairn, Dornoch, Sutors and Whiteness Sands. Sites at Evanton, a second site at Inverness, Cromarty (Red Nose) and Riff Bank Buoy are now closed; the latter two sites have been superseded by the Sutors. A licensed site in the Dornoch Firth has never been used. The bulk of dredged material deposited in the Moray Firth is silt and sand, although some sand and shingle can occur. The quantity of material deposited varies annually: in 1998 a total of 337,400 bulked wet tonnes (mainly sand) was deposited within the SAC boundary at two of the licensed sites (contact MS, ML for further information). The majority of sea disposal sites within the Moray Firth (both within and out with the SAC) are in water depths greater than 20 m (with the exception of disposal sites at Whiteness Sands and Nairn) and the bulk of dredging operations are undertaken as part of the routine maintenance of harbours, piers, navigation channels, etc.

**Outwith the site:** There are a number of areas dredged and a number of sea disposal sites in the area outwith the SAC boundary (Wick, Buckie, Macduff and Fraserburgh). In 1998, a total of 38,696 bulked wet tonnes of dredged material was deposited in the area adjacent to the SAC at three of the sea disposal sites.

**Existing control of activity:**

- 1992 EC Habitats Directive; The Conservation (Natural Habitats &c.) Regulations 1994.
- Coast Protection Act 1949; Env. Protection Act 1990; Food and Env. Protection Act (FEPA) 1985 Part II (As Amended); To dispose of dredged material at sea a FEPA licence is required from MS, ML; Harbours Act 1964; The Harbour Revision Order; various local harbour powers.
- Dredging for commercial gain is regulated by Scottish Executive Development Department.
- See sandbank section - Activity S8

**Additional Information:**

Dredged materials may contain contaminants, such as PCBs, TBT, heavy metals and pesticides and therefore, where dredged materials are disposed of at the same location over a period of time there is a possible risk of cumulative effects arising. The disposal of dredged material can result in a suspension of fine material at the water surface, through the water column and just above the seabed. When disposal operations occur repeatedly over a period of time the layer of disturbed material just above the seabed can persist, under certain circumstances, until operations are completed. This may affect the presence of prey species at the seabed and the ability of the dolphins to catch them.

On occasion, dolphins are known to approach dredging vessels during disposal operations and there is a possibility of direct injury to animals occurring if dredged material is dumped close to or directly on top of them. Although the risk is considered to be small, if it were to occur, it could affect the dolphin population as a whole given its vulnerability. There is a "Dolphin Watch" system in place for all dredging and disposal operations within the SAC that aims to minimise the risk of dolphins being in the vicinity of dredgers at the time of disposal.

Although dredging/disposal takes place only periodically, vessel movements can be intensive during these periods. The noise from dredging activity contributes to the cumulative effects of noise disturbance. Dredgers can be a significant source of continuous noise in nearshore regions. These typically produce broadband sounds that can be detectable up to 20 -25 km from the source. Unlike routine shipping activity, dredging often continues in a localised area for days or weeks at a time.

The UK Marine SACs Project published "Good practice guidelines for ports and harbours operating within or near UK European marine sites" in 1999 including a section on dredging and sea disposal.

**ACTIVITY D9: FISHING****Key Issues:**

- D9.1 The taking of fish as a commercial activity.
- D9.2 By-catch and entanglement of dolphins in legal netting.
- D9.3 Illegal salmon netting causing entanglement of dolphins.

**Extent of activity:**

Commercial sea fishing and salmon fishing take place within the SAC throughout the year. The fishing activities (techniques) in the Moray Firth SAC may include: otter trawl for nephrops, beam trawl, seine net, scallop dredge/trawl, mussel & oyster dredge, cockle dredge, salmon netting, creeling for lobsters, crabs and whelks, hand line, and semi-pelagic fishing for squid. Commercial diving for shellfish is not known to occur to any great extent within the Moray Firth site. The level of fishing effort within the Moray Firth SAC is highly variable on an annual basis and also varies seasonally. There is no commercial salmon netting on the Moray Firth south coast at present. Illegal salmon netting takes place but has declined in recent years because of the drop in the price of salmon.

**Existing control of activity:**

- 1992 EC Habitats Directive; The Conservation (Natural Habitats &c.) Regulations 1994.
- The administration of Sea Fisheries Regulation is carried out by Marine Scotland. Marine Scotland's Inshore Fisheries Team processes applications for Regulating and several Orders under the Sea Fisheries (Shellfish) Act 1967 and advise ministers in regard to inshore fishing prohibitions under the Inshore Fishing (Scotland) Act 1984. The MS, ML carries out monitoring of all commercially landed species throughout the year. In Scotland there are two key approaches to regulation of sea fisheries:
  - a. The Common Fisheries Policy (CFP) of the EU. All national regulation measures conform to the requirements of the CFP. The CFP seeks to manage stocks of fish in EU waters principally by implementing catch quota measures, by setting agreed annual Total Allowable Catches (TAC) for particular stocks of commercial fish and by means of technical conservation measures such as minimum landing sizes and fishing gear restrictions. The CFP came into effect in 1983, was subject to review in 1993 and 2002. In 2008 a further review of the CFP was launched with the view of a reform of the CFP being in effect from 2013.
  - b. The Inshore Fishing (Scotland) Act 1984. This covers a number of closures in the Moray Firth, including full year closure to mobile gear in the Dornoch, Cromarty and Inverness Firths. The Act is subject to triennial review. The closure to sprat fishing from October 1 to March 31 in the Inner Moray Firth is made under Council Regulation (EC) No 850/98.
- Salmon and Sea trout stocks are managed by the District Salmon Fishery Boards, one for each 'River Catchment'. The DSFBs are privately funded statutory bodies made up of proprietors and relevant authority representatives. Each DSFB has powers to employ River Bailiffs - these have similar powers to the Police with respect to fish regulation. Legislation affecting salmon and sea trout fishing includes: Salmon and Freshwater Fisheries (Protection) (Scotland) Act 1951; Salmon and Freshwater Fisheries Act 1975; Wildlife and Countryside Act 1981; Diseases of Fish Act 1983; Salmon Act 1986; The Salmon Conservation (Scotland) Act 2001 inserted new provisions into the Salmon Act 1986; The Environment Act 1995; it is likely that all salmon legislation will be brought together under one consolidation Act. Total Allowable Catches (TACs) are not set for salmon and sea trout, but voluntary measures are used to reduce the number of salmon killed, including local agreements to restrict rod and line fishing at certain times of year and agreements to return rod caught fish alive. A ban on the sale of salmon and sea trout caught by rod and line was introduced in October 2002, in a bid to help conserve freshwater fish stocks in Scotland. The ban will apply only to the sale of rod caught fish. Net fishermen, who make their living from selling the fish they catch, will not be affected.
- The SFPA runs a voluntary reporting scheme for by-catch of marine mammals.

**Additional information:**

Dolphins can become entangled in a range of fishing gear, including drift nets, bottom set gill nets, pair trawls, lost and discarded gear, commercial salmon nets and illegal salmon nets. Bottlenose dolphins are most likely to become entangled in gear used in coastal areas, and located near the surface, or just above the seabed, where they are most likely to feed.

There is little evidence of entanglement of dolphins in the SAC or wider Moray Firth by either commercial fishing activity or discarded/lost fishing gear. The commercial fishing methods that pose the greatest risk of by-catch to bottlenose dolphins (drift nets and large, fast pair-trawls) are not currently used in the SAC or adjacent waters and there are strict restrictions on their use. The use of bottom set tangle nets in the Moray Firth is legal provided that the appropriate mesh size is used (see list in Council Regulation 850-98, Annex 6). Their use is illegal for salmon and sea trout. In addition, there is little evidence of a commercial fishery by-catch problem for bottlenose dolphins further south along their range, towards the Firth of Forth.

**Illegal salmon netting is a separate entanglement issue to commercial fishing activity. There is evidence that this activity poses a very significant threat to the bottlenose dolphins in the Moray Firth. The direct removal of only a few dolphins could have severe consequences in the viability of the population as a whole.**

The UK Marine SACs project published "Natura 2000: a review of the effects of fishing within UK European marine sites" in 1999. The sea fish industry authority has been involved in European research initiatives looking at ghost fishing preventors for shellfish traps, studies into lost gillnets and shellfish dredge selectivity.

**ACTIVITY D10: MARINE LITTERING****Key Issues:**

- D10.1 Discarded litter/garbage from shipping.
- D10.2 Land-based sources of marine litter.
- D10.3 Discarded fishing gear

**Extent of activity:**

- *Within the site:* Details on the quantity, distribution and sources of marine litter within the SAC are as yet unknown. Individual instances of death/injury of marine mammals in the Moray Firth have been recorded, including seals, a minke whale and a bottlenose dolphin.
- *Adjacent to the site:* Since 1993, the MCS Beachwatch campaign has consistently recorded plastic as the most prevalent debris material on UK beaches. The four sources identified in 2007, as major contributors to the amount of litter on UK beaches are recreational beach users, the fishing industry, sewage outfalls and shipping. On a global scale, an estimated 100,000 marine mammals and sea turtles die each year from entanglement or ingestion of plastic. Debris found inside marine mammals has included plastic jugs, disposable gloves, plastic bags and monofilament fishing line.

**Existing control of activity:**

- 1992 EC Habitats Directive; The Conservation (Natural Habitats &c.) Regulations 1994. Environmental Protection Act 1990; International Convention on the Prevention of Pollution from Ships (MARPOL 73/78); Merchant Shipping (Prevention of Pollution) (Limits) Regulations 1996; Merchant Shipping (Prevention of Pollution by Garbage) Regulations 1998; Merchant Shipping (Port Waste Reception Facilities) Regulations 1997; Wildlife and Countryside Act 1981. Rules to prevent ships from discharging sewage at sea (Annex IV of the MARPOL convention on marine pollution) came into force for most new ships in 2003 and in 2008 for existing ones.
- EC Directive 2000/59/EC on port reception facilities for ship-generated waste and cargo residues. This directive applies to all ships, including fishing vessels and recreational craft, which must deliver waste to port reception facilities. This is implemented in the UK through the Merchant Shipping and Fishing Vessels (Port Waste Reception Facilities) Regulations 2003.
- National initiatives: Keep Scotland Beautiful published a leaflet in 2009 entitled 'Litter & Scottish Beaches: a guide for the public and practitioners' and annually conduct the National Spring Clean Campaign. MCS 'Adopt-a Beach'; MCS 'Beachwatch' - annual beach clean and survey. SW and SEPA's "Think before you flush" campaign.
- Local initiatives: HC leaflet on reducing marine litter; MCA established the Marine Litter Campaign in 2002 targeting yacht/small vessel users and encouraging use of biodegradable litter bags. The MFP ran [Beach Guardians](#) coastal litter project from 2005 – 2007 and continues to promote a range of beach clean and other activities supporting MCA "Adopt a Beach" and "Beach Watch" campaigns.

**Additional information:**

There appears to be increasing awareness of the threats posed by discarded fishing gear, although accidentally lost gear also poses a potential threat and is not so readily addressed. Large pieces of floating debris are thought to pose the greatest marine litter risk to dolphins and at least two dolphins have been seen in the Moray Firth with clean wounds that are likely to have been caused by collision with a static object. MCA is including environmental training, including information on the proper disposal of garbage, in safety courses for fishermen. The UK Marine SACs Project published "Good practice guidelines for ports and harbours, operating within or near UK European marine sites" in 1999 including a section on waste management.

## ACTIVITY D11: MILITARY ACTIVITY AND CIVILIAN AVIATION

### **Key Issues:**

- D11.1 Jettison of aircraft fuel.
- D11.2 Run-off from airfields of oil and de-icing chemicals.
- D11.3 Aircraft noise.

### **Extent of activity:**

Military ranges in the Moray Firth are situated at Tain, Rosehearty and Fort George. Rosehearty is closed and is therefore discounted as a source of military noise, Tain is used for air-to-ground target practice, although concrete, not exploding bombs, are used. Fort George is used as a rifle range for infantry training – noise produced here results from the sound of bullets entering a bank. Low flying aircraft are active throughout the Moray Firth, close to coastal airports (military at RAF Lossiemouth and Kinloss, civilian at Dalcross), bombing ranges (Tain) and training manoeuvre areas.

### **Current controls:**

- EC Habitats Directive; The Conservation (Natural Habitats &c.) Regulations 1994.
- Please contact RAF Kinloss for details of the regulations which apply to military activity.
- Naval Activity is internally regulated by the Navy, IMO, and MCA.

### **Additional information:**

The jettisoning of aviation fuel is a safety requirement applicable to all forms of aviation but is only carried out in emergency situations. Jettisoning of military aviation fuel is carried out according to strict guidelines and only at a height that ensures dispersal of the fuel in order to avoid contamination. Control of run-off from airfields has been greatly enhanced through improved drainage. The de-icing chemical used on runways has been changed to a more environmentally friendly alternative and oil interceptors have been installed to address the issue of oil and fuel run-off. MoD has successfully installed a reed bed facility at RAF Kinloss to treat surface water run off, in particular de-icing chemicals. Surface water from the airfield is collected and piped to the reed bed, where any contaminants are removed and the resultant treated water discharged by means of two outfall pipes into Burghead Bay. The reed bed became operational in late 2006. Other actions include: construction and installation of enlarged fuel interceptors; provision of specially designed and dedicated fire training areas which prevents pollution following the discharge of fire fighting foams, including specialist training formulas; disposal of aircraft washing waste water which is now being routed via the foul drainage system; and the development of more environmentally friendly chemicals for aircraft washing. HIAL have also installed reed bed treatment systems further reducing the environmental impact of run-off from Inverness Airport.

Aircraft noise is intermittent and the current level of risk is considered minimal, although it contributes to cumulative noise levels. In terms of underwater noise it is thought that only passive sonar is used by the RAF in the Moray Firth. It should be noted that the MoD has confirmed that there is "no Anti Submarine Warfare training within the SAC and therefore there is no intention to use such equipment." There are no official munitions dumpsites in the Moray Firth but anecdotal evidence and unofficial reports suggest it is possible that munitions were dumped in the area. However the MoD believes that virtually no live ammunition has been dropped in the Firth since the Second World War.

## ACTIVITY D12: OIL POLLUTION: SHIPPING, BOATING AND LAND RUN-OFF

### **Key Issues:**

- D12.1 Accidental/deliberate discharge of oil.
- D12.2 Engine emissions directly into the water.
- D12.3 Flushing of storage tanks and pumping out of oily bilges.
- D12.4 Discard of oily waste material.
- D12.5 Chronic oil pollution.

### **Extent of activity:**

The potential of oil pollution from shipping and boating comes from a variety of sources. Oil is transported to and from the Cromarty Firth and is also transported to the oil terminal at Inverness Harbour. Other motorised craft also pose a potential risk. Run-off from land is another possible source of oil pollution, for example from industrial estates, where accidental spills can contaminate surface water that eventually runs into the SAC.

### **Existing control of activity:**

- EC Habitats Directive; The Conservation (Natural Habitats &c.) Regulations 1994.
- Bylaws for the IHT and CFPA will control discharges within the harbour jurisdiction.
- Under the MS (Port Waste Reception Facilities) Regulations 1997, all ports and harbours must have port waste management plans (Oil Pollution Preparedness plan) that must be approved by MCA. MCA will be regularly auditing Port/Harbour Authority OPRC plans (after the NAO audit) in order to minimise the effects of oil pollution where it occurs.
- The international convention for the prevention of oil pollution (MARPOL Convention 1973/78) and the UK implementation in national regulations.
- The Merchant Shipping (Prevention of Oil Pollution) Regulations 1996
- Control of Pollution Act 1974 for discharges from on-shore premises. Oily waste material is covered by garbage controls.
- Agreements and Guidelines: All ports, harbours and offshore installations (subject to certain criteria) are required to submit oil spill contingency plans under the SI Oil Pollution Preparedness Response and Co-operation Convention 1998. These are consistent with the National Contingency Plan. The "Guidelines for Dealing with Cetaceans in the Event of an Oil Spill in the Moray Firth" developed by Talisman Energy (UK) Ltd and SNH in 1999 provide advice on how best to deal with cetaceans in the event of an oil spill in the Moray Firth. These guidelines are due to be updated by March 2010. The "Moray Firth Duncansby Head to Rattray Head Shoreline Protection Strategy Plan" has also been produced by Talisman Energy (UK) Ltd. Applying the concept of Sustainable Urban Discharge System on the advice of the local authority and SEPA. SEPA's "Pollution Prevention Guidelines"

### **Additional Information:**

The Scottish Oil Care Campaign raises awareness and produces guidelines on oil disposal. A related project, the "Yellow Fish" initiative (SW and SEPA) focuses on the problem of oil pollution from industrial estates and involves schools and communities. Oily waste material is covered by garbage controls.

**ACTIVITY D13: ENERGY INDUSTRY AND RELATED ACTIVITIES****Key Issues:**

- D13.1 Sources of underwater noise production.
- D13.2 Seismic survey.
- D13.3 Contaminants; risks associated with licensed and accidental discharge and storage of oil.
- D13.4 Disturbance from increased vessel movements and physical disturbance of the seabed.
- D13.5 De-fouling of rigs.
- D13.6 De-commissioning of installations and infrastructure.

**Extent of activity:**

There is a 60 km oil pipeline, used to transport oil from the Beatrice oil field to Nigg Oil Terminal, part of which lies within the SAC. The old pipeline was decommissioned in April/May 2001 but remains in situ. The Beatrice oil field and associated platforms are situated adjacent to the SAC. Boat traffic associated with the oil industry is also present within the SAC (e.g. to transport oil; sea tugs towing semi-submersible rigs). The Cromarty Firth is used to anchor rigs undergoing maintenance or which are not in service. Decommissioning of oil rigs is also a potential future activity at Nigg.

**Existing control of activity:**

- Oil and Gas is a reserved matter and is regulated by the UK Government (DECC). However the Scottish Government has authority for Scottish Controlled Waters and therefore any deposits, discharges or emissions from oil and gas activities within the 3 nm limit are regulated by the Scottish Government or non governmental agencies such as the Scottish Environmental Protection Agency under the following legislation: Control of Pollution Act 1974; The Pollution Prevention and Control (Scotland) Regulations 2000; Food and Environment Protection Act 1985, Part II.
- Oil and gas exploration and production are regulated primarily through a cradle-to-grave environmental regulatory regime from exploration to decommissioning managed by the Energy Development Unit of DECC and in particular the Offshore Environment and Decommissioning Unit. The Department (DECC) consults widely with environmental authorities including JNCC and other relevant conservation agencies, e.g. Scottish Natural Heritage (SNH), in relation to all oil and gas applications received. Satisfactory completion of an Environmental Assessment and the provision of details of the Company Environmental Policy and Management System are taken into account prior to awarding of licences. DECC also undertakes a Strategic Environmental Assessment (SEA) to assess the potential implications of the exploration and production activities which could arise from any licensing round offered by the Department. An appropriate assessment is currently being undertaken for block 17/03 following the 24<sup>th</sup> Licensing Round and the Department expects this assessment to be informed by the results of the proposed research which is scheduled for 2009 (see below for further details). The SEA for the 25<sup>th</sup> Round Licensing has recommended that the blocks in or overlapping the Moray Firth should be withheld from licensing for the present pending the outcome of the 24<sup>th</sup> License Round Appropriate Assessment process.

**Legislation affecting oil related development and activities:**

- Petroleum Act 1998, Offshore Petroleum Production and Pipelines (Assessment of Environmental Effects) Regulations 1999 (as amended) (EIA Regs) (does not cover seismic surveys); Offshore Petroleum Activities (Conservation of Habitats) Regulations 2001 (regulates seismic surveys). The Offshore Combustion Installations (Prevention & Control of Pollution) (Amendment) Regulations 2007 (Integrated Pollution Prevention Control Regulations) applying to atmospheric emissions from combustion plant. The Offshore Chemicals Regulations 2002 regulate chemical use and discharge. The Offshore Petroleum Activities (Oil Pollution Prevention & Control) Regulations 2005 regulate the discharges of oil to sea. Food and Environment Protection Act 1985, Part II. (e.g. for deposits in the sea). The Merchant Shipping (Oil Preparedness, Response Co-operation Convention) Regulations 1998 requires every offshore installation and oil handling facility to have an approved Oil Pollution Emergency Plan setting out arrangements for responding to incidents which cause or may cause marine pollution by oil, with a view to preventing such pollution or reducing or minimising its effect.
- Other initiatives include: Prohibition of diesel-oil based drilling fluids and the discharge of whole organic-phase fluids OSPAR Decision 2000/3 also reflects the discharge of mud cuttings

contaminated with oil based fluids to <1% by weight on dry cutting and synthetic drilling muds shall only be discharged in exceptional circumstances. Routine drilling discharges now only consist of water based muds or treated oil based mud (OBM) cuttings, however the majority of OBM cuttings are contained and shipped to shore for treatment.

- OSPAR recommendation 2001/01 promotes the principles of ‘best available technology’ to minimise oil content of water discharges. This requires a 15% reduction of 2000 figures of oil in produced water and reduced the performance standard for oil in produced water discharged into the sea to 30mg/l. OSPAR 2001/01 also introduces the presumption to re-inject produced water for new developments. These recommendations are being taken forward by the DECC.
- OSPAR Recommendation 2003/5 promoting the use and implementation of Environmental Management Systems by the offshore industry are being implemented by DECC.
- The Petroleum Operations Notices (PONs) – a system of applications and notifications to the Department of Energy and Climate Change, by which licensees are required to apply for the relevant environmental consent/approval prior to operations commencing and are a means of fulfilling the obligations set in a legal framework of Acts and Regulations for activities of the oil and gas industry in the UK.

#### **Available Guidance:**

- JNCC “Guidelines for minimising the risk of disturbance and injury to marine mammals Seismic Surveys”. Available at <http://www.jncc.gov.uk/page-4227>; DECC Guidelines Notes for Oil and Gas Surveys and Shallow Drilling – advice on geological surveys including seismic surveys. ([www.og.berr.gov.uk/environment/opachr.htm](http://www.og.berr.gov.uk/environment/opachr.htm)).
- DECC Guidance Notes on the Decommissioning of Offshore Oil and Gas Installations. Environmental Assessment Directive and Regulations (DECC), Decommissioning plans.
- Agreements and Guidelines: All ports, harbours and offshore installations (subject to certain criteria) are required to submit oil spill contingency plans under the SI Oil Pollution Preparedness Response and Co-operation Convention 1998. These are consistent with the National Contingency Plan. Talisman Energy (UK) Ltd and SNH “Guidelines for Dealing with Cetaceans in the Event of an Oil Spill in the Moray Firth 1999”, oil spill contingency plans and shoreline protection plans, oil spill response exercises.

#### **Additional information:**

Underwater noise is produced through seismic surveys, pile driving, explosive use, boat traffic, laying and maintenance of pipelines, drilling etc., all of which will contribute to the cumulative levels of noise. Seismic activity associated with oil exploration which occurs within or adjacent to the site will contribute further to the cumulative levels of noise in the SAC. All seismic activity is carried out in accordance with the available guidelines and there is a formal consultation and regulatory procedure. An Environmental Impact Assessment conducted for an Oil industry development in the Moray Firth enabled appropriate actions to be taken to minimise risks to cetaceans. Furthermore, as there is little data defining the noise from offshore operations, studies were also conducted in an attempt to make calibrated measurements of noise levels in the vicinity of the operations. The Department of Energy and Climate Change is currently funding a research programme to be undertaken by the University of Aberdeen, which aims to provide baseline data on cetacean distribution in the Moray Firth’s offshore waters, using passive acoustic monitors, and to establish ambient noise levels. The research is planned to commence in the summer of 2009 and if the study supports existing data, then the second part of the research will involve a single integrated seismic survey programme. This will enable an assessment of the impacts of seismic exploration on the distribution and behavioural responses of cetaceans using the area. Whilst future applications for seismic surveys may be received, DECC is actively encouraging operators to defer individual applications and to participate in the second phase of the research project. This position will be reviewed following the outcome of the research project.

“Ship to Ship transfer of oil” legislation does not apply to outside territorial limits or to any fixed installations as these are not classed as ships. An exception would be an installation being refurbished, repaired or waiting for orders.

Strict regulations are in place with respect to bunding of on-shore oil storage tanks.

## ACTIVITY D14: TRADE AND SEWAGE DISCHARGES

### **Key Issues:**

- D14.1 Discharge of heavy metals from distilleries.
- D14.2 Discharge of chemical pollutants.
- D14.3 Discharge from fish processing.
- D14.4 Discharge of human and livestock pathogens.
- D14.5 Discharge of hormone disrupting chemicals.
- D14.6 Discharge of organic material.

### **Extent of activity:**

There are many sewage discharges both within and outwith the SAC.

### **Existing control of activity:**

- EC Habitats Directive; The Conservation (Natural Habitats &c.) Regulations 1994.
- Control of Pollution Act 1974.
- The Scottish Executive transposed this directive by means of the WEWS Act in 2003.
- Urban Waste Water Treatment Directive, 91/271/EEC.
- EC Bathing Waters Directive, 76/160/EEC.
- EC Shellfish Waters Directive, 79/923/EEC.

### **Additional information:**

There is no direct evidence of the Moray Firth dolphins being infected by any human pathogens. However, there is little chance of detecting such infections if they do occur. It is known that dolphins in captivity can be infected by certain human pathogens and that these pathogens are common in untreated sewage. Ongoing improvements to sewage treatment in the Moray Firth will reduce the level of risk to dolphins presented by human pathogens. Nairn beach has been designated a "UK sensitive area (bathing waters) 2002". Water authorities already have - or are planning to have - more stringent tertiary sewage treatment. This includes a final disinfection process for any discharges which might affect the quality of the bathing water in these areas.

Hormone disrupting chemicals are environmental estrogens primarily related to mammalian hormones (e.g. from sewage discharges) and commercial detergents. Little is known about their effects in marine ecosystems. There is ongoing research on the issue funded by DEFRA who are to produce guidelines based on the findings of the work (EDMAR Project). A review of water quality management within designated sites has been undertaken by UK Marine SAC LIFE Project Report ("Guidelines for managing water quality impacts within UK European Marine Sites"). SW has undertaken the "Moray Coast Project" which involves collecting and treating discharges to coastal waters between Burghead and Macduff; the scheme was in operation by September 2003.

The Moray Firth EU LIFE Environment project commissioned a review entitled "The impact of environmental contaminants on bottlenose dolphins (*Tursiops truncatus*) and other proxy species: A summary of information". This is a reference document and first point of information to aid the relevant authorities in decision-making processes relating the use or discharge of potential contaminants.

### Additional Activity - Road and rail traffic

**Key Issues:**

- Noise

**Extent of activity:**

It is postulated that noise from land based traffic is likely to enter the marine environment particularly where highways come into direct contact with the sea, for example at bridges. As bridges are often situated at bottlenecks in waterways they have the potential to form barriers to transiting or disorientated animals. In the SAC there is one bridge (the Kessock Bridge) that links Inverness with the Black Isle.

No management actions are recommended.

### Additional Activity - Radionuclides

**Key Issues**

This activity is currently being reviewed by SEPA. If there are any specific questions please contact SEPA directly.

### Additional Activity - Waste Landfill

**Key Issues:**

- Leachate pollution to the sea from the Longman landfill site.

**Extent of activity:**

There are no active waste landfill sites on the shores of the Moray Firth. The Longman landfill site in Inverness was closed in March 2003 and is in the process of being restored. Historically a second site, based at Muir of Ord, discharged leachate into the Beaully Firth at Tarradale. This site has been closed for several years.

**Existing control of activity:**

- EC Habitats Directive; The Conservation (Natural Habitats &c.) Regulations 1994.
- Local authority planning controls. Local authorities are responsible for the management of waste landfills.
- Control of Pollution Act 1974.
- Landfill Directive.
- National and Area Waste Strategies.
- Environmental Protection Act 1990.

**Additional information:**

The Longman landfill site was unlined and leachate diffused into the Firth through the ground water and the bund wall. It is not known if the levels of leachate posed any risk to the dolphins. Most leachate from the site stemmed from decomposition of domestic waste - there was no known discharge of heavy metal or oily waste from this site. Historically, the site may have contained PCBs but there has been no evidence of elevated levels in the area. The leachate reached a peak 1 to 2 years following closure of the site, but has gradually reduced.

Under the new National Waste Strategy a new Energy from Waste plant is likely to be built in the Inner Moray Firth. This plant will take wastes which would otherwise have gone to landfill, thus reducing dependence on landfill, recovering value from the waste and securing compliance with the Landfill Directive. Additionally a new landfill site is likely to be developed in the Inner Moray Firth.

No management actions are recommended.

## Appendix D: Summary of Issues (From Revision 1) ~ Sandbanks

### ACTIVITY S1: AGRICULTURAL AND FORESTRY RUN-OFF

**Key Issues:**

- S1.1 Pesticide run-off
- S1.2 Fertiliser run-off
- S1.3 Sediment run-off

**Extent of activity:**

The land around the SAC is used extensively for agriculture and forestry.

**Existing control of activity:**

- See dolphin section - Activity D1

**Additional information:**

Current evidence indicates that the major causes of organic enrichment of sedimentary systems and their benthos are point source discharges in which the assimilative capacity of the receiving waters is insufficient to degrade the organic matter. Diffuse pollution is projected by SEPA to be the most important cause of river pollution in Scotland by 2010, which is likely to have repercussions in the water body of the Moray Firth. At present, 25% of diffuse river pollution is related to agriculture and 1% is related to forestry. SEPA licenses helicopter/plane applications of herbicides but codes of good practice are the only control on land-based applications.

SNH launched the “Targeted Inputs for a Better Rural Environment” initiative in 1997, which provides information on farming practices for farmers and advisers in Scotland and pulls together existing information, highlighting ways in which technology can be used to protect the environment and reduce costs to farmers. Concurrently, the UK Forestry Standard sets out what good practice entails and organises seminars aimed at contractors. Under the UK Woodland Assurance Scheme (UKWAS) forest managers must keep records of fertiliser use. All Forest Enterprise forests have received UKWAS approval and the proportion of forests registered with UKWAS is growing.

Under the “Designation of Nitrate Vulnerable Zones (Scotland) Regulations 2002” the Moray Coast has been designated as a Nitrate Vulnerable Zone (NVZ) where mandatory Action Programmes for farmers must be established. These promote best practice in the use and storage of fertiliser and manure. Certain areas (e.g. the Black Isle) were targeted for further data collection on the presence of nitrates but no case found for designating as NVZs. The relevant authorities will work with farmers in these areas to ensure that good practice is adhered to and that voluntary preventative measures are put in place, where appropriate. The Scottish Executive’s Agriculture and Environment Working Group Report “Custodians of Change” supports a number of key approaches to environmental management and the development of sustainable agriculture in Scotland.

**ACTIVITY S2: ANCHORING OF BOATS AND RIGS****Key issues:**

S2.1 The use of mooring anchors and chains on the seabed

**Extent of activity:**

CFPA limits extend to the east of the entrance to the Cromarty Firth for about 2.5 miles, and oil rigs and vessels regularly anchor in this area. Additionally, vessels anchor in the Moray Firth outwith this area, or CFPA jurisdiction. The IHT jurisdiction extends from the Caledonian Canal to Fort George/Chanonry Point. Boats normally wait between Fort George and Munloch Bay on tides. There is an anchor point just outside the canal mouth. There are no anchor points in the inner Beaully Firth. There are mooring associations with numerous moorings at Findhorn Bay and at Chanonry. There are relatively few either individual moorings or a collection of less than 5 in the Cromarty and Dornoch Firths and the general Moray Firth area. There is one salmon fish farm located within the SAC, currently on fallow. There are 2 other sites for fin-fish farming with consent but no equipment on-site and unlikely to change given current presumption against fish farming on East Coast. There is also one shellfish site with consent but no equipment.

**Existing control of activity:**

- Port Authorities and Harbour Trusts control anchorages within their jurisdiction. Work boat code of practice: An operator's guide (MCA 1998).
- Shipping and the Environment, a code of practice (International Chamber of Shipping 1997).
- Section 34 Consents under the Coast Protection Act 1934
- A Licence from the Crown Estate is required for all moorings laid on Crown Estate owned seabed.

**Additional information:**

The use of anchorages at current locations and intensity is not considered to have a significant detrimental effect on the Moray Firth SAC sandbank feature. Unless otherwise stated on the chart, the master of a ship is free to anchor without hindrance. This is an international agreement and applies anywhere outwith port areas, or those with military restrictions. It is recognised that care should be taken by vessel operators when anchoring in marine SACs to ensure that anchors do not drag and damage sensitive animals and plants of designated subtidal habitats. Where anchoring is a matter of safety, anchoring restrictions do not usually apply. Most navigational charts show areas where anchoring is not permitted, such as areas where there are power or telephone cables, and pipelines for oil or gas. Such restrictions are so evidently sensible, and in the interests of the vessel operator that they are accepted by the marine community at large. Anchoring is also inadvisable in areas of 'foul ground', which are marked 'foul' on the chart, and generally consist of areas containing wreckage or debris. Other areas can be designated for commercial shellfish and where users also understand that anchoring may result in damage. The anchoring of individual swing moorings, particularly where they have been in place for a long period of time, is unlikely to have much of an effect on sediment disturbance as they use 'clumps' or sometimes chains which are buried and very rarely drag. However, any drag that may be caused by anchorages can have localised impacts on sediment and benthic communities and this may be amplified in those areas that experience a large increase in swing mooring provision. This issue may also have some relevance to temporary anchorages. However, most locations within the UK are not currently experiencing significant growth in such provision.

**ACTIVITY S3: ANTI-FOULING: USE OF**

See dolphin section – Activity D3

## ACTIVITY S4: AQUACULTURE

### **Key issues:**

S4.1 Fin-fish farming: discharge of chemical treatments and medicines.

S4.2 Fin-fish farming: fish food waste plus fish faeces.

S4.3 Shellfish farming: pseudo-faeces and introduction of non-native species.

### **Extent of activity:**

Aquaculture currently has a very low profile in the Moray Firth. There are no active licensed finfish farms located within the SAC. The last operational fish farm was situated in the bay at Avoch in the Inverness Firth and closed in 2002. The lease for a site at Red Nose, near the South Sutor, was never developed and expired in 2005.

There is only one shellfish farm but it is currently not operational. The deliberate introduction of non-native species is not known to have occurred within the Moray Firth SAC through a shellfish farm.

There is also a classified shellfish harvesting area and exploited natural beds in the Dornoch Firth.

The Scottish Government's Locational Guidelines for Marine Fish Farming make a general presumption against further development of finfish farms off the east coast of mainland Scotland – this policy is supported by the members of the Moray Firth SAC Management Group. See [http://www.frs-scotland.gov.uk/Delivery/Information\\_Resources/information\\_resources\\_view\\_document.aspx?contentid=1416](http://www.frs-scotland.gov.uk/Delivery/Information_Resources/information_resources_view_document.aspx?contentid=1416)

### **Existing control of activity:**

- See dolphin section - Activity D4

### **Additional information:**

Finfish farming can have a detrimental impact on the sediment and associated biota through deposition of therapeutants, sea lice treatments and occasional waste feed and faeces. Impact tends to be localised to the immediate vicinity of the cage group. Effects may be exacerbated in areas of low current speeds. Shellfish farming can have limited localised detrimental effects on the marine environment. These impacts are proportionately much less than those associated with finfish farming. Impacts on the water may arise from nutrient inputs from the fish farm. Finfish and shellfish farming development are subject to appropriate assessment and monitoring. In general, impacts are likely to be minimal unless the finfish farm is located in shallow or sheltered water directly above sensitive sandbank habitat.

It is a concern that diseases imported with non-native species might spread to native populations. Additionally it is a potential risk that escapees will become established and displace native species. DEFRA is reviewing UK policy on non-native species. The International Council for Exploration of the Sea (ICES) "1994 Code of Practice on the Introductions and Transfers of Marine Organisms", recommends practices and procedures to diminish risks of detrimental effects from the introduction and transfer of marine organisms. It provides recommendations for new intentional introductions and suggests that member countries submit proposals to ICES for an opinion on a proposed introduction.

## ACTIVITY S5: BALLAST WATER DISCHARGE

### **Key Issues:**

S5.1 Introduction of non-native species

S5.2 Introduction of contaminants

### **Extent of activity:**

*Ballast Water Discharge:* Tankers at berths at Invergordon and Nigg Oil Terminal in the Cromarty Firth transport oil to many parts of the world and as a consequence the Firth receives discharges of ballast water that originate from northern and southern Europe, the USA and Canada. In recent years, increases in the number of vessels arriving at both Invergordon and Nigg have resulted in increased ballast water discharges. Nigg Oil Terminal has facilities for collection of ballast water from oil tankers.

### **Existing control of activity:**

- See dolphin section - Activity D5
- Any proposal to deliberately introduce a non-native species would be subject to appropriate assessment
- The Convention on Biological Diversity
- The Bonn Convention
- The Berne Convention
- The Wildlife and Countryside Act 1981
- Quarantine regulations since 1960s and the Molluscan Shellfish (Control of Deposit) Order 1965

### **Additional information:**

The introduction of any new species may have a significant impact on the ecosystem; for example, the impact of discharging ballast water collected in other parts of the world is difficult to predict. The majority of vessels which enter the SAC and which may discharge ballast water come from ports in Northern Europe. This may present a threat to Scottish marine ecosystems as imported organisms from there may have a greater likelihood of survival than introductions from warmer waters. Controlling ballast water discharges is a highly complex issue because ships can take on ballast water from a variety of sources many of which may be untraceable.

## ACTIVITY S6: BOAT TRAFFIC

See dolphin section – Activity D6

## ACTIVITY S7: COASTAL DEVELOPMENT

### **Key Issues:**

S7.1 Construction and maintenance of jetties, piers, harbours and sea defences, etc.

S7.2 Offshore developments (e.g. wind farms, petrochemical pipelines, fibre-optic & electricity cables)

### **Extent of activity:**

Marine construction works take place frequently at numerous locations within and adjacent to the SAC boundary. In any given year as many as 10 marine construction licences are issued under the Food and Environment Protection Act 1985, Part II (As Amended). The magnitude of the works ranges, for example, from simple repairs to existing structures to the construction of a new quay.

### **Existing control of activity:**

- See dolphin section - Activity D7

### **Additional information:**

The construction of structures that project out into the sea can have an effect on coastal processes and prevailing tidal currents in addition to the direct loss of habitat. The current levels of sea defence, road and pier maintenance are not thought to have a detrimental impact on the sandbank features. Such developments may be the subject of an appropriate assessment.

There is known to be interest in the possibility of developing offshore wind farms in the Moray Firth. The Crown Estate, as landowner of the seabed out to the 12 nautical mile territorial limit also plays an important role in the development of the offshore wind industry by leasing areas of seabed for the placing of turbines. But the Crown Estate will grant a lease only when the developer has obtained all the necessary statutory consents from the responsible Government Departments. The Scottish Government is responsible for administering offshore windfarm applications in Scottish waters, while the DECC will also be a regulating authority if wind farms are to be developed beyond the 12-nm line.

SEPA is developing best practice guidance on coastal development in the scope of the Habitat Enhancement Initiative.

## ACTIVITY S8: DREDGING, DISPOSAL OF DREDGED MATERIAL AND AGGREGATE EXTRACTION

### **Key Issues:**

S8.1 Contamination.

S8.2 Turbidity/Smothering: disposal of sediment.

S8.3 Extraction of sand and gravel.

### **Extent of activity:**

*Dredging and disposal of dredged material:* Dredging takes place periodically at a number of sites within the SAC boundary (Helmsdale, Dornoch Firth, Cromarty Firth, Beaully Firth, Inverness Firth, Burghead, Hopeman Harbour and Lossiemouth). There are 8 licensed sea disposal sites within the SAC boundary: Helmsdale, Inverness, Burghead, Lossiemouth, Nairn, Dornoch, Sutors and Whiteness Sands. Sites at Evanton, a second site at Inverness, Cromarty (Red Nose) and Riff Bank are now closed; the latter two sites have been superseded by the Sutors. A licensed site in the Dornoch Firth has never been used. The bulk of dredged material deposited in the Moray Firth is silt and sand, although some sand and shingle can occur. The quantity of material deposited varies annually: in 1998 a total of 337,400 bulked wet tonnes (mainly sand) was deposited within the SAC boundary at two of the licensed sites (contact MS, ML for further information). The majority of sea disposal sites within the Moray Firth (both within and outwith the SAC) are in water depths greater than 20 m (with the exception of disposal sites at Whiteness Sands and Nairn) and the bulk of dredging operations are undertaken as part of the routine maintenance of harbours, piers, navigation channels, etc.

### *Aggregate Extraction:*

Extraction of sand and gravel is not known to be a current or past activity in the SAC. Tenders have however recently been invited by the Crown Estate Commissioners for any extraction proposals in Scottish territorial waters in conjunction with other locations around the UK.

### **Existing control of activity:**

- See dolphin section - Activity D8
- Any proposal to extract sand and gravel from the seabed will require a licence from the Crown Estate and would be subject to appropriate assessment. The Crown Estate acts solely as landowner but monitors tonnage removal and compliance with licence conditions. The Licence would only be granted following a favourable "Government View". Scottish Government's Directorate of the Built Environment would assess any proposal. This includes EIAs from the developer, public consultation and consultation with SEPA, SNH and Marine Scotland. Scottish Government's Directorate of the Built Environment forms advice for the incumbent environment minister who issues a positive or negative "Government View". Other consents such as permission under the Food and Environment Protection Act 1985, Part II (As Amended), and Coast Protection Act may also be required as appropriate.

### **Additional information:**

Dredged materials may contain contaminants, such as PCBs, TBT, heavy metals and pesticides and therefore, where dredged materials are disposed of at the same location over a period of time; there is a possible risk of cumulative effects arising.

The disposal of dredged material can result in a suspension of fine material at the water surface, through the water column and just above the seabed. When disposal operations occur repeatedly over a period of time the layer of disturbed material just above the seabed can persist, under certain circumstances, until operations are completed.

The UK Marine SACs Project published "Good practice guidelines for ports and harbours operating within or near UK European marine sites" in 1999 which includes a section on dredging and disposal. It is emphasised that subtidal sandbanks are the result of relatively high-energy conditions. They are naturally disturbed by large changes in hydrographic conditions and the community is usually well able to recover from sediment disturbance and influx. It is likely that the effects of dredging are limited to the selective removal of some fragile and sedentary species and the destruction of larger organisms such as crustaceans and burrowing sandeels.

The UK Marine SACs Project published “Guidelines on the impact of aggregate extraction on European marine sites” in 2001. The demand for aggregate extraction depends on the relative mixture of coarse and medium sand and the size depth and nature of the deposit. Aggregate extraction may be of particular concern to commercial crustacean populations; spawning areas occur where sandbanks meet rocky areas and thus they are affected by changes to the sandbanks.

These operations have a destructive, but localised impact on the sandbank feature.

### ACTIVITY S9: FISHING (SEA)

**Key Issues:**

S9.1 Scallop dredging

S9.2 Beam Trawling

S9.3 Creeling

S9.4 Otter trawling

S9.5 Suction/hydraulic dredging

**Extent of activity:**

Commercial sea fishing takes place within the SAC throughout the year. The fishing activities (techniques) in the Moray Firth SAC may include: otter trawl for nephrops, beam trawl, seine net, scallop dredge/trawl, mussel & oyster dredge, cockle dredge, salmon netting, creeling for lobsters, crabs and whelks, hand line, and semi-pelagic fishing for squid. Commercial diving for shellfish is not known to occur to any great extent within the Moray Firth site. The level of fishing effort within the Moray Firth SAC is highly variable on an annual basis and also varies seasonally.

**Existing control of activity:**

- See dolphin section - Activity D9
- All bivalve mollusc harvesting, with the exception of scallop and queen fishing is also controlled by the classification requirements of The Food Safety (Fishery Products and Live Shellfish) (Hygiene) Regulations 1998.
- Ban on suction dredging in Beaully Firth out to Chanonry Point under the Inshore Fishing (Prohibition of Fishing and Fishing methods) (Scotland) Order 1989.

**Additional information:**

The UK Marine SACs Project published "Natura 2000: A review of the effects of fishing within UK European Marine sites" in 1999. The impact of fishing activity will mainly depend on the type, scale and frequency of fishing activity on the sandbank habitat. For instance, diving for shellfish (mostly scallop), salmon netting and pelagic/semi-pelagic fishing may have localised impact on the target species depending on intensity, but causes no impact on the sandbanks habitat, and therefore these activities (techniques) are not given any further consideration at this time. The Sea Fish Industry Authority has been involved in European research initiatives looking at ghost fishing preventors for shellfish traps, studies into lost gillnets and shellfish dredge selectivity.

### ACTIVITY S10: MARINE LITTERING

See dolphin section – Activity D10

### ACTIVITY S11: MILITARY ACTIVITY AND CIVILIAN AVIATION

See dolphin section – Activity D11

## ACTIVITY S12: OIL POLLUTION: SHIPPING, BOATING AND LAND RUN-OFF

### **Key Issues:**

- S12.1 Accidental/deliberate discharge of oil
- S12.2 Engine emissions directly into the water
- S12.3 Flushing of storage tanks and pumping out of oily bilges
- S12.3 Discard of oily waste material – rags etc.
- S12.4 Chronic oil pollution: Infrastructure developments, e.g. drainage from roads;

### **Extent of activity:**

The potential of oil pollution from shipping and boating comes from a variety of sources. Oil is transported to and from the Cromarty Firth and is also transported to the oil terminal at Inverness Harbour. Other motorised craft also pose a potential risk. Run-off from land is another possible source of oil pollution, for example from industrial estates, where accidental spills can contaminate surface water that eventually runs into the SAC.

### **Existing control of activity:**

- See dolphin section – Activity D12

### **Additional Information:**

The Scottish Oil Care Campaign raises awareness and produces guidelines on oil disposal. A related project, the “Yellow Fish” initiative (SW and SEPA) focuses on the problem of oil pollution from industrial estates and involves schools and communities.

Oil-spills resulting from tanker accidents can cause large-scale deterioration of communities in intertidal and shallow subtidal sedimentary systems<sup>19</sup>. Subtidal sandbanks will be less at risk from oil spills unless dispersants are used in clean-up operations or if wave action allows sediment mobility and thus oil to be incorporated into the sediments.

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<sup>19</sup> Majeed, S.A. (1987). Organic-matter and biotic indexes on the beaches of North Brittany. Mar. Poll. Bull. 18 (9) p490-495

## ACTIVITY S13: OIL INDUSTRY AND RELATED ACTIVITIES

### **Key Issues:**

S13.1 Laying and maintenance of oil pipelines and cables

S13.2 Seismic survey

S13.3 Accidental discharge of oil

S13.4 Discharges related to: - drilling; pipelines; platforms; production facilities

S13.5 De-fouling of ships and rigs: removal and deposition of marine growth; risk of removing paint along with marine growth

### **Extent of activity:**

There is an existing 60 km oil pipeline, used to transport oil from the Beatrice oil field to Nigg Oil Terminal, part of which lies within the SAC and a decommissioned line which remains insitu. The Beatrice oil field and associated platforms are situated adjacent to the SAC. Boat traffic associated with the oil industry is also present within the SAC (e.g. to transport oil). The Cromarty Firth is used to anchor drilling rigs undergoing maintenance or which are not in service. Decommissioning of oil facilities is also a potential future activity.

### **Existing control of activity:**

- See dolphin section – Activity D13

### **Additional information:**

Activities such as the laying of oil pipelines have a destructive, but localised impact on the sandbank feature where this operation occurs, however the impact of existing oil pipelines and their maintenance is not thought to be significant on the sandbank feature.

Drilling discharges are localised and such discharges arising from existing facilities are unlikely to affect the sandbank feature of the SAC. Produced water will be diluted to undetectable levels by the time it reaches the SAC boundary from Beatrice A.

In addition the Strategic Environmental Assessment for the 25<sup>th</sup> Licence Round recommended that the blocks in or overlapping the Moray Firth SAC should be withheld pending the outcome of the 24<sup>th</sup> Licence Round Appropriate Assessment.

Seismic testing for oil and gas exploration can affect fish spawning areas on coarse substrata,<sup>20</sup> however this activity is regulated by DECC and a consent is required prior to the activity proceeding. Please also see dolphin section – Activity D13 for further information on proposed DECC research project.

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<sup>20</sup> IECS (1993). Winter Seabird Survey: Block 41/30 Flamborough Head and Bridlington Bay. Institute of Estuarine and Coastal Studies, University of Hull.

## ACTIVITY S14: TRADE AND SEWAGE DISCHARGES

### **Key Issues:**

S14.1 Discharge of chemical pollutants, e.g. organohalogenated compounds; hydrocarbons

S14.2 Discharge of organic material

### **Extent of activity:**

There are many sewage discharges both within and outwith the SAC.

### **Existing control of activity:**

- See dolphin section – Activity D14

### **Additional information:**

A review of water quality management within designated sites has been undertaken by UK Marine SAC LIFE Project Report "Guidelines for managing water quality impacts within UK European Marine Sites".

In September 2003, SW undertook the "Moray Coast Project", a three year scheme, which involved collecting and treating discharges to coastal waters between Burghead and Macduff.

Industrialised and urbanised estuaries and coastlines receive effluent discharges, which contain conservative contaminants, i.e. those with a long half-life, are likely to bioaccumulate (remain within the food-chain) and thus have a toxic effect. The lethal and sub-lethal effects of these pollutants vary according to the state and availability of the compound and the characteristics and organisms of the receiving systems. Higher-energy sedimentary biotopes such as subtidal sandbanks are less likely to receive and/or retain contaminants.

## Appendix E – Summary of Revision 1 Management Scheme Action Implementation

### SAC Compliance Monitoring

In 2006 there were 29 lead bodies with a lead role in delivering sections in the Management Scheme. All 29 lead bodies were contacted for an update on progress with their actions. Of the lead bodies contacted, 15 responded covering 97 out of the 133 actions in the Management Scheme.

Some form of progress had been made on 71% of the actions reported on. However, 23% of actions had “negligible” or no progress and a further 5% were considered to be “non valid”. As a result 35 actions were deemed effectively complete and therefore deleted from the Management Scheme. The remainder, were added to the ongoing actions list for further review.

A further compliance monitoring exercise was undertaken in September 2007, where the remaining 98 actions were discussed, assessed and categorised, in preparation for the management group review of the actions.

As a result of this exercise 18 actions were deleted due to being considered complete. This represented 18% of the management scheme actions. 34 actions were categorised as being actions ‘ongoing’ and a further 20 new actions were created. These were as a result of existing actions being replaced or enhanced, combining several actions or brand new actions created after discussions.

### Action Implementation Highlights

The compliance monitoring returns highlighted a number of particularly successful projects and outcomes and these achievements resulting from the management scheme are described below:

#### **Activity D4 Aquaculture: Action D4.3.1 Review research on the effect of seal scarers on cetaceans and other marine species**

A comprehensive report on Acoustic Deterrent Devices (ADDs) was commissioned by SNH in 2002. This has been made available to Management Group members and is available as a published SNH research report<sup>21</sup>.

#### **Activity D6 Boat Traffic: Actions D6.1.1, 6.1.3, 6.1.4, 6.1.6 For boats which regularly enter the Moray Firth SAC, encourage the use of engines and propellers which minimise noise in frequencies most likely to disturb marine mammals. In particular encourage the use of large engines with low revving propellers and specify minimum standard noise levels for wildlife watching and research boats.**

SNH and the University of Aberdeen are undertaking a research project looking at mapping sound sources across the Moray Firth. This exercise will create a “sound map” of the Firth and it will also create a library of sound that will record and measure different sound sources from different human activities – including boats. This work will help to further inform our understanding about the implications of different types of sound occurring in the Firth and this in turn will enable predictions to be made about the implications of this for the dolphins. Work carried out as part of the proposed marina development at Whiteness has also helped to shed light on the impact of boat numbers and behaviour on the dolphins.

#### **Activity D6 Boat Traffic: D6.2.1 Review and expand the SNH Dolphin Awareness Initiative and seek experience from other areas where noise control procedures are adopted by boat users. Raise awareness locally and identify examples of schemes elsewhere.**

The Dolphin Awareness Initiative provides a code of conduct for recreational craft in the Moray Firth. This code was used in the creation of the new Scottish Marine Wildlife Watching Code (see <http://www.marinecode.org/>) and provides guidance for all water users in Scotland.

#### **Activity D6 Boat Traffic: Action D6.3.1 Ensure that licensing of research, wildlife-watching and other boats is strongly linked to responsible actions towards marine mammals, promotes quiet engine and transmission systems and use of propeller guards, provides advice on vessel construction, is reviewed regularly and is open to external scrutiny, can respond quickly to applications.**

A licensing scheme is now in place for research boats operating in the Moray Firth with possibilities to expand this to other areas across Scotland and the UK being considered. The licences are reviewed annually and all records are available to the public. Licence conditions cover best practice and reduce potential disturbance. The positive outcome of this action means that research activities are now regulated and standardised and the end of year reports produced by licensees are publicly available. All research boats in the MF are now licensed and this regulates their activity in a way that minimises disturbance to the dolphins.

<sup>21</sup> Gordon, J. & Northridge, S. (2002) Potential impacts of Acoustic Deterrent Devices on Scottish Marine Wildlife. Scottish Natural Heritage Commissioned Report F01AA404.

**Activity D6 Boat Traffic: Action D6.3.4 Consider the environmental carrying capacity for research and wildlife watching vessels in the SAC and, if appropriate, advise the authorities that no further licences be issued to wildlife watching boats in sensitive areas.**

The whole concept of carrying capacity has been picked up by the Dolphin Space Programme - this initiative works with operators to ensure that there is minimal overlap between commercial tour boat operators. Where there is overlap then tighter constraints in terms of operating practices are applied. The notion of carrying capacity has also been considered as part of the Whiteness Head marina proposal. The success of this action is evident as wildlife operators are adhering to the measures in the DSP for the majority of the time and the Whiteness proposal are taking boat numbers and dolphins very seriously.

**Activity D6 Boat Traffic: Action D6.3.5 Review and consolidate the Dolphin Space**

An extensive exercise is underway to progress this action and the Whale and Dolphin Conservation Society (WDCS) and SNH have appointed a project officer to take this work forward. This has led to substantial progress. The DSP Project Officer prepares regular updates on progress and these are available from [Deborah.benham@wdcs.co.uk](mailto:Deborah.benham@wdcs.co.uk) on request. This action has had the desired effect in that significant changes have been made to the way boats operate in the Firth, together with improved training of operators and availability of education/interpretive materials.

**Activity 9: Moray Firth Fisheries Action Group**

Relevant to actions under Activity 9 of the Management Scheme. The MFP have organised 2 meetings of the MF FAG and following this a 5 year Action Plan has been prepared for local fisheries management in the Moray Firth. At the request of the FAG, the MFP has secured funding to look at how the Action Plan might be implemented.

**Activity D10, Marine Littering**

Moray Council have completed all their associated actions and are now seeing real positive outcomes as a result. Beach clean-ups are a regular feature of the work of the Moray Coast Ranger with assistance from the Council's waste service which picks up the collected waste and provide bags, gloves etc. The North East Waste Strategy lays great emphasis on waste prevention and this is supported by the Waste Aware campaign that has had wide publicity.

MFP have secured funding for Beach Guardians – a 3 year programme to identify the types and likely sources of litter on the beaches, find ways of cleaning it up, especially by involving local business, schools and community groups and reduce the amount of litter finding its way onto beaches in the future through training events and special events.

**Dolphin Defenders**

Following publication of Management Scheme, a sub group of the SAC MG identified a list of actions that communities could help deliver – these were generally actions that 'fell between' the agency led actions. These were packaged and built into a project called 'Dolphin Defenders' supported by BP and managed by the MFP. Dolphin Defenders was launched in June 2004 and it asked all residents and visitors of the Moray Firth to pledge to change something about their behaviour that could affect the dolphins and their environment. The project has been a huge success and over 3,000 pledges were made, on poster and website, exceeding original expectations. 39 schools had a free workshop, and 8 of these entered the MFP's competition for the best dolphin defenders team; the winning team was from Portgordon Primary school.

**Dolphin Echo**

The Dolphin Echo newsletter provides lively and current information for anyone with an interest in the Moray Firth dolphins including where and how to see them, recent sightings and research. Four editions of the newsletters have been produced. SAC Management Group members have contributed to articles regarding actions in the SAC Management Scheme.

**Operation Fishnet**

In 2002 Partnership for Action Against Wildlife Crime (PAW) launched Operation Fishnet to combat the problem of illegal salmon poaching nets being used in Scottish waters. These illegal nets have been known to cause the deaths of dolphins and porpoises that have been caught up in them in the Moray Firth. There have been 55 of these illegal nets recovered in the past 2 years since operation was launched, most of which have been in areas of the Moray Firth that are used by the dolphins. Operation Fishnet will continue to operate and run awareness events until these illegal salmon nets are no longer posing a significant threat to the dolphin population. A free and confidential phone line has been set up for anyone to report sightings of these illegal nets: 0800 085 8217.

**Subtidal sandbank survey**

A comprehensive survey of the subtidal sandbanks of the Moray Firth SAC has been carried out. The report is currently going through SNH's QA process and it will be published in due course.

**Feedback and Rate of Returns**

Finally, the volume of compliance monitoring returns and the nature of comments received as part of the feedback process illustrates that it may be useful to review the Management Scheme to agree which actions are still relevant and up to date and if modifications to existing actions are required. Further work is required in order to improve the SAC Management Action Implementation database, as it does not include the sandbanks. Updating the database will improve the management of the compliance monitoring returns and better track the achievements to date.

## Appendix F - Scottish Natural Heritage - Regulation 33(2) advice for the Moray Firth marine Special Area of Conservation (SAC) – Conservation Objectives

### Introduction

This section provides conservation objectives and advice as to operations which may cause deterioration or disturbance; they have been developed by SNH and are to be provided to the Relevant Authorities in fulfilment of the requirements under Regulation 33(2) of The Conservation (Natural Habitats, &c.) Regulations 1994 (as amended).

Conservation objectives and advice as to operations are derived from the aims of the Habitats Directive, under which European marine sites are designated. Specifically, they are derived from the general objectives given in Article 2, and therefore contribute to the overall aim of the Habitats Directive, e.g. to maintain or, where appropriate, restore at a favourable conservation status, the habitats and species listed as being of Community interest. They are also derived from the specific requirements of Article 6.2, to avoid, within European marine sites, the deterioration of natural habitats and species and the disturbance of species for which the areas have been designated, so far as such disturbance could be significant in relation to the general objectives of the Directive.

The Moray Firth European marine site has been designated for the species 'Bottlenose dolphin, *Tursiops truncatus*' which is listed on Annex II of the Habitats Directive, as well as for the Annex I habitat 'Sandbanks which are slightly covered by sea water all the time'. The Moray Firth SAC comprises entirely of marine features.

This advice package fulfils Scottish Natural Heritage's duties under Regulation 33(2) of The Conservation (Natural Habitats, &c.) Regulations 1994 (Habitats Regulations) (as amended by The Conservation (Natural Habitats, &c.) Amendment (Scotland) Regulations 2004). This requires that SNH advises other relevant authorities as to the conservation objectives of the site (see Section 2 of advice package) and any operations which may cause deterioration of natural habitats or the habitats of species, or disturbance of species, in so far as such disturbance could be significant, for which the site has been designated (see Section 3 of advice package).

### Moray Firth SAC – Conservation Objectives

To avoid deterioration of the habitats of the qualifying species (Bottlenose dolphin *Tursiops truncatus*) or significant disturbance to the qualifying species, thus ensuring that the integrity of the site is maintained and the site makes an appropriate contribution to achieving favourable conservation status for the qualifying interest.

To ensure for the qualifying species that the following are established then maintained in the long term:

- Population of the species as a viable component of the site
- Distribution of the species within the site
- Distribution and extent of habitats supporting the species
- Structure, function and supporting processes of habitats supporting the species
- No significant disturbance of the species

To avoid deterioration of the qualifying habitat (Sandbanks which are slightly covered by sea water all the time) thus ensuring that the integrity of the site is maintained and the site makes an appropriate contribution to achieving FCS for each of the qualifying features

To ensure for the qualifying habitat that the following are maintained in the long term:

- Extent of the habitat on site
- Distribution of the habitat within site
- Structure and function of the habitat
- Processes supporting the habitat
- Distribution of typical species of the habitat
- Viability of typical species as components of the habitat
- No significant disturbance of typical species of the habitat

### Statutory Advice given by SNH under Regulation 33(2) - Operations to be Considered by Relevant Authorities

The following advice as to or on operations, is provided by SNH to the Relevant Authorities with respect to Moray Firth European marine site in fulfilment of the requirements under Regulation 33(2)(b) of The Conservation (Natural Habitats, &c.) Regulations 1994. The advice identifies those activities that may cause deterioration of the marine natural habitats and marine communities. These include operations that may not be occurring at present within Moray Firth European marine site.

The following list of operations are those that SNH are required to draw to the attention of the relevant authorities. The purpose of this advice is to act as an alert list of operations which the relevant authorities are advised may, under some circumstances, have the capacity to cause deterioration to the conservation features of the site. This advice is provided to assist and focus the relevant authorities in their consideration of the management of these operations.

| Operations                 | Non statutory explanatory notes and comments  |
|----------------------------|---|
| <b>Aquaculture</b>         |   |
| Finfish farming            | Dolphins: Finfish farming has the potential to cause deterioration of the habitat supporting the dolphins mainly through discharge of toxic chemicals and fish medicines. These may affect water quality and subsequently affect dolphins using waters adjacent to finfish farm cages through impairment of reproductive or immune systems. Discharge of chemical treatments and medicines also has the potential to affect the distribution or abundance of dolphin prey species. In addition, hand-feeding discarded fish to dolphins may cause behavioural changes and lead to the transfer of fish pathogens and human pathogens to dolphins, and toxic chemicals or medicines along the food chain. Finfish farming also has the potential to cause disturbance to dolphin populations through the use of acoustic deterrent devices (ADDs) or the use of nets to re-capture escaped fish, the latter of which could result in entanglement.<br>Sandbanks: Finfish farming has the potential to cause deterioration of sandbank habitats and communities through changes in water quality (organic enrichment), smothering from waste material and physical disturbance from moorings. There is also potential for accidental introduction of new non-native species and increasing the spread of existing non-native plants and animals (e.g. <i>Caprella mutica</i> , Japanese skeleton shrimp), which are already widely distributed in teak (although there are no records of this non-native occurring in the Moray Firth SAC). Invasive species have the potential to cause deterioration of the qualifying interests by altering community structure and quality. The associated environmental effects mentioned above are usually localised and may be exacerbated in areas of low tidal exchange. |
| Shellfish farming          | Sandbanks: This activity has the potential to cause deterioration of the sandbank habitats and communities through physical disturbance (e.g. installation of mooring blocks and continued scouring by riser chains) and changes in community structure caused by smothering from pseudo-faeces (undigested waste products) and debris (including dead shells) falling from the farm. There is also potential for accidental introduction of new non-native species and increasing the spread within the UK of existing non-native plants and animals (e.g. <i>Sargassum muticum</i> , Wireweed) through importation and translocation of shellfish stocks. Invasive species have the potential to cause deterioration of the qualifying interests by altering community structure and quality. The associated environmental effects mentioned above are usually localised and may be exacerbated in areas of low tidal exchange.   |
| <b>Coastal Development</b> |   |
| Agriculture                | Dolphins: Diffuse run-off from agricultural practices (such as pesticides and fertilisers) has the potential to cause deterioration through impairment of dolphins' reproductive or immune systems. There is also potential to affect prey availability through toxic impacts caused by nutrient enrichment from discharge of organic and inorganic pollutants.<br>Sandbanks: Diffuse run-off from agricultural practices has the potential to cause deterioration of sandbank habitats and communities through the smothering of qualifying interests, and / or altering water quality through discharge of organic and inorganic pollutants.  |
| Civil engineering          | Dolphins: The construction and maintenance of structures, both within and adjacent to the sea have the potential to cause disturbance to dolphin populations, especially if undertaken at critical times of the year. Excessive underwater noise has the potential to cause   |

|  |  |
|--|--|
|  | <p>disturbance to dolphin populations through: interference with communication, navigation and foraging; or disruption of social bonds. Sudden loud noise or harassment may elicit a stress response in the dolphins. Increased / prolonged periods of turbidity resulting from civil engineering activities may affect availability of prey species or the dolphins' ability to catch them. Impoverishment of seabed communities may lead to degradation of food chains.</p> <p>Sandbanks: The construction and maintenance of structures, both within and adjacent to the sea have the potential to cause direct loss and / or disturbance of sandbank habitats and communities as tidal currents, and therefore coastal processes, may be affected. For example coastal structures such as linear coastal defences or erosion control measures (e.g. gabions) can affect local sediment suspension and deposition patterns and therefore have the potential to cause deterioration of sandbank habitat through smothering. Installation, replacement and maintenance of undersea cables or pipes have the potential to cause direct loss or disturbance of sandbank habitats as well as local deterioration of associated habitats and communities.</p> |
| <b>Discharges / Waste Disposal</b>       |  |
| Discharge of commercial effluent         | <p>Dolphins: Commercial effluent has the potential to cause deterioration of dolphin populations through impairment of their reproductive or immune systems, carcinogenic effects, increased risk of disease, or through toxic impacts on prey species. This would be through the effects of toxic effluents and / or nutrient enrichment, which may cause subsequent changes in community structure.</p> <p>Sandbanks: Commercial effluent has the potential to cause deterioration of sandbank habitats and communities. This would be through the effects of pollution and / or nutrient enrichment, which may cause subsequent changes in community structure.</p>   |
| Discharge of sewage                      | <p>Dolphins: Sewage effluent (whether treated or untreated) has the potential to cause deterioration of dolphin populations, particularly in areas frequented by this species, through increased risk of disease or through adverse impacts on prey species. This could be through the effects of toxic effluents or chemicals used in the treatment process, pathogens and / or nutrient enrichment, which may cause subsequent changes in community structure.</p> <p>Sandbanks: Sewage effluent (whether treated or untreated) has the potential to cause deterioration of sandbank habitats and communities. This would be through the effects of pollution and / or nutrient enrichment, which may cause subsequent changes in community structure.</p>   |
| Marine litter                            | <p>Dolphins: Marine litter has the potential to cause deterioration of the dolphin population through entanglement or ingestion. Larger pieces of debris floating on the surface or on the seabed may cause injury through collision.</p>  |
| <b>Fishing</b>                           |  |
| N.B. Dolphins: Availability for dolphins | <p>The taking of fish as a commercial activity can result in increased competition for food resources and this in turn may lead to a reduction in prey availability for dolphins. This could result in reduced survival and breeding success of the dolphins and / or the relocation of dolphins to other areas.</p>   |
| Hydraulic fishing                        | <p>Sandbanks: Hydraulic fishing has the potential to cause deterioration of the sandbank habitats and communities by disturbing large volumes of sediment, which could result in smothering or direct loss of the qualifying interests. This activity also has the potential to cause deterioration of sandbanks by affecting target species and associated communities.</p>   |
| Mobile gear: Dredging                    | <p>Sandbanks: Benthic dredging has the potential to cause deterioration of sandbank habitats and communities through direct contact with dredge gear. Other issues include impacts on water quality or target species, which may indirectly cause deterioration to the sandbanks.</p>  |
| Mobile gear: Trawling                    | <p>Sandbanks: Benthic trawling has the potential to cause deterioration of sandbank habitats and communities through direct contact with trawling gear, and disturbance and affects on the water column, target species and associated animal and plant communities.</p>   |
| Static gear: Netting                     | <p>Dolphins: Activities involving nets, particularly gill, tangle, drift and bottom set nets have the potential to cause disturbance, injury and mortality to dolphins through entanglement.</p>   |
| <b>Marine Development</b>                |  |
| Aggregate extraction                     | <p>Sandbanks: Extraction of subtidal sand and gravel has the potential to cause deterioration of the sandbank habitats and communities through direct loss and impact within the extraction site. Such operations could also result in the redistribution and deposition of fine particulate sediment, which could alter the sediment characteristics of adjacent areas and their associated plant and animal communities.</p>   |

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|---|---|
| Maintenance dredging                          | <p>Dolphins: Dredging and disposal of materials containing contaminants e.g. heavy metals, oils, TBTs, PCBs and pesticides have the potential to cause deterioration through impairment of dolphins' reproductive or immune systems, particularly in areas frequented by this species, and / or at times of the year when dolphins are most likely to be present. Disposal of material could result in physical injury or mortality through collisions. Excessive underwater noise has the potential to cause disturbance to dolphin populations through: interference with communication, navigation and foraging; or disruption of social bonds. Sudden loud noise may elicit a stress response in the dolphins. Increased / prolonged periods of turbidity resulting from maintenance dredging activities could affect availability of prey species or the dolphins' ability to catch them. Impoverishment of seabed communities may lead to degradation of food webs.</p> <p>Sandbanks: Capital and maintenance dredging and subsequent disposal has the potential to cause deterioration of sandbank habitats and communities through direct loss, smothering, possible contamination and disturbance of the qualifying interests.</p> |
| <b>Offshore renewable energy developments</b> |   |
|   | <p>Dolphins: Offshore renewable energy developments e.g. wind farms, both within and adjacent to the SAC, have the potential to cause disturbance or injury to dolphins during construction, maintenance and operation of such developments.</p>  |
|   | <p>Sandbanks: Offshore renewable energy developments e.g. wind farms, both within and adjacent to the SAC have the potential to cause direct loss and / or deterioration of sandbank habitats and communities as tidal currents, and therefore coastal processes, are affected.</p>   |
| <b>Oil exploration</b>                        |   |
|   | <p>Dolphins: Oil exploration has the potential to cause disturbance or deterioration of dolphin populations or their prey through oil-related development and activities, especially those that may result in seismic activities, the accidental discharge of oil, increased vessel movements, de-fouling of rigs and de-commissioning of installations and infrastructure. Local authority emergency plans and oil spill contingency plans should take into account specific qualifying interests and recognise the importance of marine SACs should such incidents occur.</p>   |
|   | <p>Sandbanks: Activities associated with oil exploration and maintenance includes the laying and maintenance of oil pipelines, defouling of ships and rigs and transfer of oil from vessels. Such activities have the potential to cause deterioration of sandbank habitats and communities through direct loss and localised impact. These activities may also affect hydrographic patterns of erosion and deposition. Accidental or deliberate discharge of oil by any type of operation has the potential to cause deterioration of sandbanks through toxic contamination of seabed communities, or the smothering of the seabed. Seismic surveys associated with oil exploration can affect fish spawning areas on coarse substrate. Local authority emergency plans and oil spill contingency plans should take into account specific qualifying interests and recognise the importance of marine SACs should such incidents occur.</p>  |
| <b>Marine Traffic</b>                         |   |
| Boat maintenance & antifoulant use            | <p>Dolphins: Most antifoulant products are designed to kill or discourage naturally occurring organisms and, as such, cause damage to the water environment if used carelessly. Under such circumstances use of antifoulant has the potential to impair dolphin reproductive or immune systems or cause toxic impacts on prey species.</p>  |
|   | <p>Sandbanks: Most antifoulant products are designed to kill or discourage naturally occurring organisms and, as such, cause damage to the water environment if used carelessly. Under such circumstances use of antifoulant has the potential to cause deterioration of sandbank habitats and communities.</p>   |
| Commercial vessels                            | <p>Dolphins: The introduction of non-native species through discharge of ballast or through attachment to ships' hulls could occur within or close to this SAC. The introduction of non-native species has the potential to cause deterioration of the dolphin population through the spread of disease or toxic effects in the receiving waters, or impacts on prey availability. General activity of commercial vessels has the potential to cause disturbance to dolphins through noise interference, collision, and the use of sonar systems, navigational depth sounders, or other fish finding devices. Noise interference may mask marine mammal communication, navigation, foraging, and may disrupt social bonds. All forms of disturbance or harassment may elicit a stress response.</p> <p>The pumping of bilges, discharge of ballast, accidental grounding or spillage of oil (or other chemical) could occur within or close to this SAC. Such incidents have the potential to harm dolphins. Local authority emergency plans and oil spill contingency plans should take into account specific qualifying interests and recognise the importance of marine SACs should such incidents occur.</p>                            |

|   |  |
|---|--|
| Commercial vessels                            | <p>Sandbanks: The introduction of non-native species through, for example, the discharge of ballast and attachment to ships' hulls could occur within or close to the SAC. Such introductions are already known to have occurred (e.g. Australian barnacle, <i>Elminus modestus</i> – now widespread and common throughout the UK, and the South American or Magellan mussel, <i>Aulacomya ater</i> – found within the Moray Firth). Non-natives have the potential to cause deterioration of sandbank habitats and communities through alteration of community and substrate characteristics (e.g. through stabilising former mobile areas / destabilising former stable areas) or through competing with native species.</p> <p>The pumping of bilges, accidental grounding, or accidental oil (or other chemical) spillage from commercial vessels could occur within or close to this SAC. Such incidents have the potential to cause deterioration of sandbank habitats and communities through direct and / or indirect impacts. Local authority emergency plans and oil spill contingency plans should take into account specific qualifying interests and recognise the importance of marine SACs should such incidents occur.</p> |
| <b>Military Activity &amp; Civil Aviation</b> |  |
| Discharges & run-off                          | <p>Dolphins: Jettison of aircraft fuel and run-off of fuel or de-icing chemicals from airfields have the potential to cause deterioration of dolphins by causing direct carcinogenic effects or having toxic impacts on their prey.</p> <p>Sandbanks: Run-off of fuel or de-icing chemicals from airfields has the potential to cause deterioration of the plant and animal communities associated with the sandbank habitat.</p>  |
| Sonic pollution                               | <p>Dolphins: Noise from low flying jets or helicopters, or noise from explosives have the potential to cause deterioration of dolphin populations through: direct disturbance; interference with communication, navigation and foraging; disruption of social bonds. All forms of disturbance may also elicit a stress response in the animals.</p>  |
| <b>Recreational Activities</b>                |  |
| Boat anchorages                               | <p>Sandbanks: Anchors and continual scouring by riser chains have the potential to cause deterioration of sandbank habitats and communities through direct contact with the qualifying interests and associated sensitive seabed communities.</p>  |
| Boat moorings                                 | <p>Sandbanks: Moorings and continual scouring by riser chains have the potential to cause deterioration of sandbank habitats and communities through direct contact with the qualifying interest.</p>  |
| Other recreational activities                 | <p>Dolphins: Motorised water sports and wildlife cruise boats have the potential to cause disturbance to dolphins through the creation of underwater noise, movement and presence of boats, and the use of sonar systems and navigational depth sounders. Such activities may result in noise disturbance, harassment or collision with the dolphins. Human contact, including swimming with or feeding dolphins, has the potential to cause disturbance by disrupting normal dolphin behaviour patterns.</p>  |
| <b>Scientific Research</b>                    |  |
|   | <p>Dolphins: Boat-based scientific research activities have the potential to cause disturbance or deterioration through underwater noise or collision with dolphins, particularly if boats spend long periods of time in the vicinity of dolphins or where craft actively follow the animals.</p> <p>Disturbance may also result from sonar systems, navigational depth sounders, and other fish-finding devices. Dolphins are a European Protected Species, as well as a qualifying interest within this SAC. Researchers may require a licence; advice should be sought from SNH accordingly if there is any doubt as to this requirement.</p>   |

## Appendix G - Acronyms

### List of Organisations and Acronyms used in this document

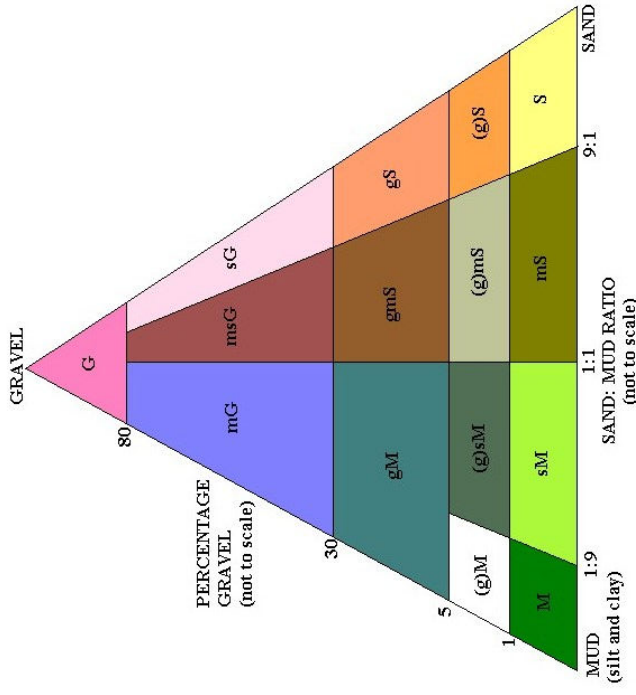
|          |   |             |  |
|----------|---|-------------|--|
| ADD      | Acoustic Deterrent Device   | MS          | Marine Scotland                                      |
| ASCOBANS | The Agreement on the Conservation of Small Cetaceans of the Baltic and North Seas | MS, ML      | Marine Scotland, Marine Laboratory                   |
| CAA      | Civil Aviation Authority  | NAO         | National Audit Office                                |
| CE       | Crown Estate  | NC          | Northern Constabulary                                |
| CFPA     | Cromarty Firth Port Authority   | NoSYA       | North of Scotland Yachting Association               |
| DECC     | Department of Energy and Climate Change formerly BERR/DTI                         | OPRC        | Oil Pollution Preparedness, Response and Cooperation |
| DEFRA    | Department of Environment Food and Rural Affairs                                  | OSCP        | Oil Spill Contingency Plans                          |
| DSP      | Dolphin Space Programme   | OSPAR       | Oslo Paris Convention                                |
| EC       | European Commission   | PAs         | Port Authorities                                     |
| EDMAR    | Endocrine Disruption in the Marine Environment                                    | PAW         | Partnership Against Wildlife Crime                   |
| EIA      | Environmental Impact Assessment   | PCB         | Polychlorinated biphenyls                            |
| EU       | European Union  | PPGs        | Pollution Prevention Guidelines                      |
| FAL      | Fishermen's Association Limited   | RAF         | Royal Air Force                                      |
| GP       | Grampian Police   | RBMP        | River Basin Management Plans                         |
| HAS      | Harbour Authorities   | ROS         | Renewable Obligation (Scotland)                      |
| HIAL     | Highlands and Islands Airports Ltd  | RYA         | Royal Yachting Association                           |
| IHT      | Inverness Harbour Trust   | SAC         | Special Area of Conservation                         |
| IMO      | International Maritime Organisation   | SAC MG      | Special Area of Conservation Management Group        |
| IMP      | Integrated Maritime Policy  | Scot Gov    | Scottish Government                                  |
| IWC      | International Whaling Commission  | SEPA        | Scottish Environment Protection Agency               |
| JNCC     | Joint Nature Conservation Committee   | SFC         | Scottish Fisheries Council                           |
| LAS      | Local Authorities   | SFPA        | Scottish Fisheries Protection Agency                 |
| MBIP     | Marine Biodiversity Implementation Plan   | SMMO        | Scottish Marine Management Organisation              |
| MC       | Moray Council   | SNH         | Scottish Natural Heritage                            |
| MCA      | Maritime and Coastguard Agency  | SSTF        | Sustainable Seas Task Force                          |
| MCS      | Marine Conservation Society   | SW          | Scottish Water                                       |
| MF IFG   | Moray Firth Inshore Fisheries Group   | TBT         | Tributyltin (organotin compound)                     |
| MFP      | Moray Firth Partnership   | THC         | The Highland Council                                 |
| MFWC     | Moray Firth Wildlife Centre   | UKWAS       | UK Woodland Assurance Scheme                         |
| MIN      | Marine Information Note   | Uni of Abdn | University of Aberdeen                               |
| MoD      | Ministry of Defence   | WDCS        | Whale and Dolphin Conservation Society               |
| MSFD     | Marine Strategy Framework Directive   | WFD         | Water Framework Directive                            |

## Appendix H - Glossary

|               |   |
|---------------|---|
| Acoustic      | Relating to sound.  |
| Amphipods     | Amphipoda are an order of animals that includes over 7,000 described species of shrimp-like crustaceans ranging from 1 mm to 140 mm in length (Britannica, 2008). Most amphipods are marine; although a small number of species are limnic or terrestrial. Marine amphipods may be pelagic (living in the water column) or benthic (living on the ocean bottom).  |
| Anthropogenic | Of, or relating to humans.  |
| Aquaculture   | The practise of using the sea, lochs or rivers, etc, for fish farming, shell fish cultivation, the growing of plants etc.   |
| Ballast water | Water which is held in a ships tanks to aid stability.  |
| Biodiversity  | Short for biological diversity and means the richness of nature or the variety of plant and animal life.  |
| Bivalves      | Bivalves are molluscs belonging to the class Bivalvia. They have two-part shells, and typically both valves are symmetrical along the hinge line. The class has 30,000 species, including scallops, clams, oysters and mussels.   |
| Bunding       | Man-made embankment of dam.   |
| Cetacean      | The order <i>Cetacea</i> that contains the only completely marine mammals – whales, dolphins and porpoises. The body is fusiform (spindle-shaped), nearly hairless and insulated by a thick layer of blubber; forelimbs are modified into flippers; hind limbs are tiny and vestigial (they do not attach to the backbone and are hidden within the body) and the tail has horizontal flukes. As a group, they are noted for their high intelligence. |
| Demersal      | Fish that live in the lower water column e.g. cod and haddock.  |
| Dredging      | Dredging is an excavation activity or operation usually carried out at least partly underwater, in shallow seas or fresh water areas with the purpose of gathering up bottom sediments and disposing of them at a different location, mostly to keep waterways navigable or provide aggregate for construction.   |
| Drift Net     | A large fishing net that is allowed to drift with the tide or current.  |
| Echo location | A system of locating objects involving sound  |
| Ecosystem     | A natural unit consisting of all plants, animals and micro-organisms (biotic factors) in an area functioning together with all of the non-living physical (abiotic) factors of the environment.   |
| Flora         | Plant life  |
| Fauna         | Animal life   |

|                          |  |
|--------------------------|--|
| Leachate                 | Incidental leakage from land.  |
| Lipid tissues            | Tissues in which fat is stored.  |
| Habitat                  | The natural environment in which an organism lives, or the physical environment that surrounds (influences and is utilised by) a species population.   |
| Nutrient enrichment      | The enrichment of water by nutrients, especially compounds of nitrogen and phosphorus, which encourage growth of algae and other forms of plant life, if no other factors are limiting, to produce an undesirable disturbance of the balance of organisms and the quality of the water concerned.  |
| Organochlorine compounds | A broad range of compounds which are synthesised from chlorinated petroleum chemicals e.g. PCB.  |
| Pathogens                | An infectious biological agent that causes disease or illness to its host.   |
| PCBs                     | Polychlorinated biphenyls (PCBs) are a class of organic compounds that were used in many industrial applications such as stabilizing additives in flexible PVC coatings of electrical wiring and electronic components, pesticide extenders, cutting oils, flame retardants, hydraulic fluids, sealants (used in caulking, etc), adhesives, wood floor finishes, paints, de-dusting agents, and in carbonless copy paper. PCB production was banned in the 1970s due to the high toxicity of most PCB congeners and mixtures. PCBs are classified as persistent organic pollutants which bioaccumulate (when an organism absorbs a toxic substance at a rate greater than that at which the substance is lost) in animals. |
| Pelagic                  | Inhabiting open upper waters rather than the sea or ocean bed. Pelagic animals may be divided into plankton and nekton.  |
| Pingers                  | An acoustic device to warn marine mammals of presence of fishing equipment or nets.  |
| Polychaete worm          | A class of annelid worms, generally marine. Each body segment has a pair of fleshy protrusions called parapodia that bear many bristles, called chaetae, which are made of chitin. The polychaetes are sometimes referred to as bristle worms. More than 10,000 species are described in this class. Common representatives include the lugworm ( <i>Arenicola marina</i> ) and the sandworm or clam worm <i>Nereis</i> .  |
| Radionuclides            | An atom (the smallest particle that constitutes a chemical element) with an unstable nucleus that undergoes radioactive decay. Radionuclides are often referred to by chemists and physicists as radioactive isotopes.   |
| Seismic                  | Relating to or caused by earthquakes or artificially produced earth tremors.   |
| Toxin                    | A poisonous substance produced by living cells or organisms that is active at very low concentrations.   |

### Appendix I - Sediment size classification



The above classification is modified after that of R. L. Folk. (1954, J. Geol., 62, pp. 344-359)

- M ..... Mud
- sM ..... Sandy mud
- (g)M ..... Slightly gravelly mud
- (g)sM ..... Slightly gravelly sandy mud
- gM ..... Gravelly mud
- S ..... Sand
- mS ..... Muddy sand
- (g)s ..... Slightly gravelly sand
- (g)mS ..... Slightly gravelly muddy sand
- gmS ..... Gravelly muddy sand
- gS ..... Gravelly sand
- G ..... Gravel
- mG ..... Muddy gravel
- msG ..... Muddy sandy gravel
- sG ..... Sandy gravel

| SEDIMENT SIZE |             |        |
|---------------|-------------|--------|
| phi value     | SIZE CLASS  |        |
|               | WENTWORTH   | FOLK   |
| -8            | Boulder     | Gravel |
| -6            | Cobble      |        |
| -2            | Pebble      |        |
| -1            | Granule     |        |
| -0.5          | Very coarse | Sand   |
| 0             | Coarse      |        |
| 1             | Medium      |        |
| 1.5           | Fine        |        |
| 2             | Very fine   | Mud    |
| 3             | Silt        |        |
| 3.5           | Clay        |        |
| 4             |             |        |
| 8             |             |        |