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## **GUIDELINES FOR MINIMISING ACOUSTIC DISTURBANCE TO MARINE MAMMALS FROM SEISMIC SURVEYS**

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These guidelines are aimed at minimising the risk of acoustic disturbance to marine mammals including seals, whales, dolphins and porpoises from seismic surveys. In addition to keeping noise levels at lowest practicable levels the recommendations contained in the guidelines should assist in ensuring that marine mammals in areas of proposed airgun activity are protected against possible injury. These guidelines reflect a precautionary approach that should be used by anyone planning marine operations that could cause acoustic or physical disturbance to marine mammals.

The guidelines have been written for use in the United Kingdom Continental Shelf (UKCS). Whilst we do not object to these guidelines being used elsewhere we would encourage all operators to determine if any special or local circumstances pertain as we would not wish these guidelines to be used where a local management tool has already been adopted (for instance in the Gulf of Mexico OCS Region). We also note that other fauna, for example turtles, occur in waters where these guidelines may be used. We suggest that, whilst the appropriate mitigation may require further investigation, the soft start procedures similar to those followed for marine mammals should also be employed for other fauna.

In relation to oil and gas seismic surveys on the UKCS, it is a legal binding condition of the consent issued for seismic surveys under regulation 4 of the Petroleum Activities (Conservation of Habitats) Regulations 2001 by the Department of Trade and Industry (DTI) that the JNCC Guidelines must be followed at all times for all seismic surveys. It should be noted that it is the responsibility of the company issued consent by the DTI, referred to as 'applicant', to ensure that these guidelines are followed and the relevant marine mammal observer reports submitted to the JNCC. We recommend that a copy of the JNCC guidelines are available onboard all vessels undertaking seismic surveys on UKCS.

## Index

The guidelines are broken down in the following sections:

- Section 1 - Precautions to reduce the disturbance caused by seismic surveys
  - 1.1 The Planning Stage
  - 1.2 During the Seismic Survey
  - 1.3 Report after the survey
- Section 2 - Guidance when carrying out the soft start
  - 2.1 Look and Listen
  - 2.2 Delay
  - 2.3 The Soft Start
  - 2.4 Site survey/Vertical Seismic Profiling and soft starts
  - 2.5 Line Changes
  - 2.6 Undershoot Operations
- Section 3 - Marine Mammal Observers (MMOs)
  - 3.1 Likely Requirements for MMOs
- Section 4 - Acoustic Monitoring
  - 4.1 Use of PAM as a mitigation measure
- Section 5 - Background Information
  - 5.1 Existing legislation
- Section 6 - Further information, comments on these guidelines and contacts

## Terminology

**High Resolution Seismic Site Survey** is defined as those using an airgun array of 180 cubic inches or less.

**Seismic Survey** includes 2D/3D/4D and OBC (Ocean Bottom Cabling) surveys and any similar techniques

**Vertical Seismic Profiling** or **Borehole Seismic** is defined as seismic used in connection with well operations typically with a source size of 500 cubic inches.

**Consent** is the consent issued by the DTI under regulation 4 of the Offshore Petroleum (Conservation of Habitats) Regulation 2001.

**Applicant** is defined as the company who has applied to the DTI for PON 14A consent. This could either be an oil and gas operator or a seismic survey company.

## **Section 1 – General precautions to reduce the disturbance caused by seismic surveys**

### **1.1 The Planning Stage - When a seismic survey is being planned, operators should:**

- Consult relevant literature and if necessary, contact the Joint Nature Conservation Committee (JNCC) to determine the likelihood that marine mammals will be encountered. For instance:  
(<http://www.jncc.gov.uk/Publications/cetaceanatlas/>)
- Plan surveys so that their timing will reduce the likelihood of encounters with marine mammals especially during the breeding and calving seasons. If an area is particularly sensitive due to the species present an assessment of this should be included within the PON 14 application
- Seek to provide the most appropriately qualified and experienced personnel to act as marine mammal observers (MMOs) on board the seismic survey vessel (see Section 4 for further information on MMOs).
- Plan to use the lowest practicable power levels throughout the survey.
- Seek methods to reduce and/or baffle unnecessary high frequency noise produced by airguns or other acoustic energy sources.

### **1.2 During the Seismic Survey - When conducting a seismic survey, operators should:**

- Ensure that the correct 'soft start' procedure is followed. Soft starts are intended as a time period to allow marine mammals to move away from an area should they wish to do so. (See Section 2)
- There should be no shooting apart from that necessary for the normal operations of a seismic survey or for a 'soft start'. Protracted shooting which is not part of a survey line is discouraged.

### **1.3 Report after the survey**

A report detailing marine mammals sighted (standard forms are available from JNCC), the methods used to detect them, problems encountered, and any other comments helps to increase our knowledge and allow us to improve these guidelines. Reports should be sent to the JNCC ideally by e-mail to [seismic@jncc.gov.uk](mailto:seismic@jncc.gov.uk) or faxed/posted to the address at the face of these guidelines. Reports should include the following information:

- The Seismic Survey reference number provided to operators by the DTI
- Date and location of survey
- Number and volume of each airguns used also calculated as total volume.
- Nature of airgun array discharge frequency (in Hz), intensity (in dB re. 1µPa or bar metres) and firing interval (seconds), or details of other acoustic energy used
- Number and types of vessels involved in the survey
- A record of all occasions when the airguns were used, including the watch beforehand and the duration of the soft-start (using standard forms)
- Details of any problems encountered during marine mammal detection procedures, or during the survey
- Marine mammal sightings (using standard forms)

- Details of watches made for marine mammals and the seismic activity during watches (using standard forms)
- Reports from any observers on board

## **Section 2 – Guidance when carrying out a soft start**

If dedicated MMOs are requested to be on board a seismic vessel they should make certain that their efforts are concentrated on keeping a watch prior to the soft start. At no time are these guidelines meant to imply that MMOs should keep a watch during all daylight hours. JNCC strongly encourage all MMOs to manage their time to ensure that they are available and at the best of their ability when carrying out a watch during the crucial time – the 30 minutes before commencement of the use of a seismic source. However, JNCC does appreciate the efforts of MMOs to collect data at other times than prior to the soft start but this should be managed to ensure these observations are not detrimental to the ability of the MMO to watch prior to a soft start. The JNCC will request that two marine mammal observers be used when daylight hours exceed approximately 12 hours per day. Where two MMO's are onboard a seismic vessel we would encourage them to collaborate to ensure cetacean monitoring is undertaken during all daylight hours and to ensure that an observer is always available to undertake a pre-start up search for the required 30 minute.

### 2.1 Look and Listen

Beginning at least 30 minutes before commencement of any use of the seismic sources, the dedicated MMO or if a dedicated MMO has not been requested by the DTI, a nominated member of the ships company should carefully make a visual check from a suitable high observation platform to see if there are any marine mammals within 500 metres (measured from the centre of the array).

### 2.2 Delay

If marine mammals are seen within 500 metres of the centre of the array the start of the seismic sources should be delayed until they have moved away, allowing adequate time after the last sighting for the animals to move away (at least 20 minutes). In situations where seal(s) are congregating immediately around a drilling or production platform, it is recommended that commencement of the seismic sources begin at least 500 m from the platform.

### 2.3 The Soft Start

Power should be built up slowly from a low energy start-up (e.g. starting with the smallest airgun in the array and gradually adding in others) over at least 20 minutes to give adequate time for marine mammals to leave the vicinity. This build up of power should occur in uniform stages to provide a constant increase in output. There should be a 'soft start' every time the airguns are used, even if no marine mammals have been seen.

- We encourage all seismic survey operators to ensure that, as far as possible, soft starts occur during daylight hours when MMO's or the nominated crew member can

carry out the required 30 minute watch. If visual observations can not be made we continue to encourage the use of PAM for acoustic monitoring during this time.

- To minimise additional noise in the marine environment, a 'soft start' (from commencement of soft start to commencement of the line) should take no longer than 40 minutes.
- The 'soft start' procedure should be followed at all times including before test firing of the airguns.
- If, for any reason, firing of the airguns has stopped and not restarted for at least 5 minutes a full 20 minute 'soft start' should be carried out. After any break in firing of any duration a visual check should be made for marine mammals within 500 metres of the centre of the array. If a marine mammal is present then re-commencement of shooting should be delayed as per the Look & Listen, Delay and Soft Start instructions above.
- When time-sharing, where two or more vessels operate in adjacent areas and take turns to shoot to avoid causing seismic interference to each other, all vessels shooting should follow the full 'soft start' procedure for each line start.

#### 2.4 Site Survey / Vertical Seismic Profiling (VSP) and Soft Starts

Whilst we appreciate that high resolution site surveys / VSP operation may produce lower acoustic output than 2D or 3D surveys and that firing of individual airguns may not be possible for technical reasons, we believe it is still necessary to undertake some form of a soft start to allow time for marine mammals to move away from an airgun.

We understand there are a number of options as to how a soft start may be undertaken. For reasons of flexibility we are content for high resolution seismic site surveys and VSP operations to use any of the methods below for a soft start:

- A. The standard method, where power is built up slowly from a low energy start-up (e.g. starting with the smallest airgun in the array and gradually adding in others) over at least 20 minutes to give adequate time for marine mammals to leave the vicinity.
- B. As the relationship between acoustic output and pressure of the air contained in the airgun is close to linear and most site surveys / VSP operations use only a small number of airguns a soft start can be achieved by slowly increasing the air pressure in 500 psi steps. From our understanding the minimum air pressure which the airgun array can be set to will vary, as this is dependent on the make and model of the airgun being used. The time from initial airgun start up to full power should be at least 20 minutes.
- C. If neither of the above techniques (A or B) can be used, over a minimum time period of 20 minutes the airguns should be fired with an increasing frequency until the desired firing frequency is reached.

If an operator of an airgun array is unable to undertake a soft start using the methods above a waiver must be granted in the DTI consent. This must be applied for with the JNCC prior to the actual operation occurring ideally as part of the PON 14A submission or for VSP the PON14A or PON15B. If a waiver has not been agreed by the JNCC, and consented to by the DTI and a soft start is not implemented applicants will be in breach of their consent.

When submitting the MMO report to the JNCC for high resolution seismic site surveys operators should indicate which of the above methods was used to achieve the soft start.

## 2.5 Line Change

Seismic data is usually collected in lines. Line change is the term used to describe the time it takes for a vessel to turn from the end of one line to the start of the next. Depending upon the type of seismic survey being undertaken, the time for a line change can vary between five and ten minutes for site surveys to two to three hours for 3D exploration surveys. In the past this has caused some confusion as to when a soft start will be required. In order to standardise approaches the following guidance is provided:

- A. For line change times greater than the time required to undertake a soft start, airguns should cease firing at the end of each line and commence a full soft start at the appropriate time before commencing the next line (i.e. a soft start of at least 20 minutes prior to commencement of the next line).
- B. For line change which take less time than that required to undertake a soft start, airguns should continue firing the full array during the line turn (i.e. for a site survey line turn of 5 minutes continue firing at full power).
- C. For high resolution site surveys line changes it is also permissible to reduce airgun output at the end of each line to an output of 160dB. The increase from 160 dB to full power, prior to the start of the next line, should be undertaken in a stepped manner similar to a full soft start.

We understand that, depending on the length of line turns for some surveys such as OBC, soft start methods may need to vary from those described above. If an applicant believes that for any survey a line change may not be achieved using the above methods please contact JNCC at the earliest possible opportunity.

## 2.6 Undershoot Operations

During an undershoot operation a second vessel is employed to tow the seismic source or airguns although the main vessel will still tow the hydrophone array. This is to allow shooting under platforms or around any other obstructions at sea. It has been noted that this operation can sometimes lead to difficulties when, as a term of the consent, a dedicated MMO has been requested. The following guidance is provided:

In sensitive areas, the MMO should always be onboard the source vessel. If, following the receipt of a PON 14A application and advice from JNCC, the consent states that dedicated MMO(s) should be placed on board the seismic source vessel this condition of consent applies to all vessels including any source vessel undertaking undershoot operations.

When a dedicated MMO(s) has been requested in other areas operators should aim to ensure that the dedicated MMO is on the source vessel. If, due to difficulties in logistics (usually the health and safety issues of moving a MMO from one vessel to another) this is not possible, the operator should apply for a waiver, ideally at the time of the PON14A submission. If a waiver is given (which will depend upon the sensitivities at the survey location, and duration of undershoot operations) the look, listen and delay procedure

should still be followed prior to commencing a soft start of the airgun source on the vessel undertaking the undershoot operation.

We realise that this guidance may be difficult to implement and therefore strongly encourage those applicants who foresee a problem placing an MMO onboard a vessel undertaking an undershoot operation to consult with DTI and JNCC during the PON 14A application process.

### Section 3 – Marine Mammal Observers or MMOs

- A prerequisite for an MMO is the attendance of a short course on implementing the guidelines and recording procedure. Further details of the courses can be obtained by contacting seismic@jncc.gov.uk.
- For sensitive areas including West of Britain, Moray Firth and Cardigan Bay, the MMO must also be an experienced cetacean biologist or an experienced marine mammal observer (i.e. an observer with at least three seasons worth of experience).
- When a dedicated MMO is requested, the MMO should be employed solely for the purpose of monitoring the applicants implementation of the guidelines and visual observation of marine mammals during periods of active seismic survey.
- All surveys that require MMOs taking place between 1<sup>st</sup> April and 30<sup>th</sup> September north of 57° latitude will require two dedicated MMOs due to the longer daylight hours (more than 12 hours a day at 57° latitude).
- When two dedicated MMOs are requested, the use of a crewmember with other responsibilities as the second observer is not considered an adequate substitute for a dedicated MMO.
- The MMO should be onboard the source vessel. (i.e. the vessel towing the airguns). When time sharing, if an MMO is required by DTI, MMOs should be placed on all source vessels.
- Operators are advised to contact JNCC at the earliest opportunity to request information on the need for MMOs. Every application for consent to carry out a seismic survey will be treated on a case-by-case basis by the JNCC however the following is a guide to our probable advice to the DTI on the need for MMOs.

#### 3.1 Likely requirements for Marine Mammal Observers

Area	Sensitivity / MMO Requirement
<ul style="list-style-type: none"> <li>• Southern North Sea</li> <li>• Irish Sea Basin</li> </ul>	<p><b>Cetacean sensitivities are generally low to moderate.</b></p> <ul style="list-style-type: none"> <li>• Seismic surveys using large sources such as those for 2D or 3D seismic surveys may require a dedicated MMO.</li> </ul> <p>For all other surveys a dedicated MMO is usually not required however</p> <ul style="list-style-type: none"> <li>• A watch should be kept for marine mammals before airgun start up (See section 2)</li> <li>• A report should still be submitted to the JNCC containing location, effort and sighting forms (See Section 2).</li> </ul>
<ul style="list-style-type: none"> <li>• Central and Northern North Sea</li> </ul>	<p><b>Cetacean sensitivities are highly variable.</b></p> <p>Requirements for MMOs are varied according to the energy source volume, energy source pressure level, sound frequency</p>

<ul style="list-style-type: none"> <li>• <b>St Georges Channel</b></li> <li>• <b>South West Approaches</b></li> <li>• <b>English Channel</b></li> </ul>	<p>and survey location however the following guidance is available.</p> <ul style="list-style-type: none"> <li>• Seismic surveys using large sources such as those for 2D or 3D seismic surveys will require a dedicated MMO.</li> <li>• All surveys requiring MMOs taking place between 1<sup>st</sup> April and 1<sup>st</sup> October north of 57° latitude will require two dedicated MMOs due to the longer daylight hours.</li> </ul>
<ul style="list-style-type: none"> <li>• <b>Moray Firth,</b></li> <li>• <b>Cardigan Bay,</b></li> <li>• <b>West of Britain</b> (includes all areas to the north and west of Shetland and to the west of Orkney and the Western Isles)</li> </ul>	<p><b>Cetacean sensitivities are high</b></p> <ul style="list-style-type: none"> <li>• Any seismic operation including site surveys will require dedicated experienced MMOs.</li> <li>• All surveys requiring MMOs taking place between 1<sup>st</sup> April and 1<sup>st</sup> October north of 57° latitude will require two dedicated MMOs due to the longer daylight hours.</li> </ul>

## Section 4 - Acoustic Monitoring

JNCC will advise the DTI that passive acoustic monitoring (PAM) should be used as a mitigation tool if sensitive species are likely to inhabit the proposed survey location. This additional measure is required where there are species of particular conservation importance or where a given species or group is difficult to detect by visual observation alone. Examples of areas where PAM may be required include deep-water areas west of Britain (for large baleen and sperm whales) and the Moray Firth (for bottlenose dolphins).

In all sea areas there is a concern that visual observation can be an ineffective measure, particularly during hours of darkness or poor visibility (such as fog), as marine mammals in the vicinity of airgun sources will not be detected. In line with the revised DTI position and other Government departments, JNCC view PAM as the only available mitigation technique that, at its current stage of development, will increase the detection of marine mammals prior to the soft start whilst having no possible adverse effect on marine mammals of its own. We would therefore encourage applicants to use PAM as it will increase the detection of marine mammals and we expect that as the technology matures over the next few years, PAM will become a requirement on seismic surveys.

### 4.1 Use of PAM as a mitigation tool

The following guidance is provided in regard to PON 14A applications where JNCC request PAM use as a mitigation tool. In many cases, PAM is not as accurate as visual observation when determining range. In practice this will mean that the exclusion zone must reflect the range accuracy of the system and will often be more than 500m. For example, if the range accuracy of a system is +/-300 metres, animals detected within 500 + 300 (800) metres of the source would lead to a delay in the soft start. It is therefore in the operators best interests to use the most accurate system available and to factor in the range inaccuracy. Where PAM is used the PON 14A application must contain an explanation of how the operator intends to deploy PAM to greatest effect.



Some PAM systems do not have accurate range determination facilities or can only calculate range for some species. In such cases, the detection of a confirmed cetacean vocalisation should be used to initiate postponement of soft start based on the expert judgment of the PAM operator who may be able to make a judgement about the range of the marine mammal (dependent on species) from the vessel by differentiating between distant and near-field vocalisations. In the absence of PAM systems capable of range determination this expert judgement may be used to ensure an area is free from cetaceans prior to the soft start.

## **Section 5 - Background Information**

These guidelines were originally prepared by a Working Group convened at the request of the Department of the Environment, developed from a draft prepared by the Sea Mammal Research Unit (SMRU). The guidelines have subsequently been reviewed three times by the Joint Nature Conservation Committee following consultation with interested parties and in the light of experience after their use since 1995.

### **5.1 Existing Protection**

- Section 9 of the Wildlife and Countryside Act 1981 prohibits deliberate killing, injuring or disturbance of any cetacean (equivalent in Northern Ireland is Article 10 of the Wildlife (Northern Ireland) Order 1985).
- This reflects the requirements of the Convention on the Conservation of European Wildlife and Habitats (the Bern Convention) and Article 12 of the EC Habitats and Species Directive (92/43/EEC), implemented by The Conservation (Natural Habitats, etc.) Regulations 1994, The Conservation (Natural Habitats, etc.) Regulations Northern Ireland 1995 and The Offshore Petroleum Activities (Conservation of Habitats) Regulations 2001.
- In addition, the UK is a signatory to the Agreement on the Conservation of Small Cetaceans of the Baltic and North Seas (ASCOBANS) and has applied its provisions in all UK waters. Amongst other actions required to conserve and manage populations of small cetaceans, the Agreement requires range states to "work towards...the prevention of ...disturbance, especially of an acoustic nature".

## **Section 6 - Further information, comments on these guidelines and contacts**

Further information on the DTI's consent procedure is available at [www.og.dti.gov.uk](http://www.og.dti.gov.uk).

A copy of these guidelines, the standard forms (electronic and hard copy) and further background information is available from the above address or on the JNCC website: [www.jncc.gov.uk/marine](http://www.jncc.gov.uk/marine)

If you have any comments or questions on these guidelines, or suggestions on how they may be improved please contact the JNCC Senior Offshore Advisor at the address shown above.