JNCC guidelines for minimising the risk of injury to marine mammals from explosive use and unexploded ordnance clearance in the marine environment

Annex

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Marine mammals and offshore industries | JNCC

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1. Summary of legal protection for marine mammals in UK waters

Regulations by UK and Devolved Governments. These make it an offence to deliberately kill, injure, capture or disturb European Protected Species, which includes all cetaceans and marine turtles (Table 1). The Directive has also been transposed into industry specific legislation for activities relating to oil and gas exploration and production. Amendments to these pieces of legislation following the UK's exit from the European Union maintains much of the original terminology including the term European Protected Species (EPS).

The Wildlife and Countryside Act 1981 (as amended), sets out protection for animals listed on Schedule 5 in English and Welsh territorial waters and includes all cetaceans. It makes it an offence to intentionally or recklessly disturb whales and dolphins but not porpoise (Table 2).

The Conservation of Seals Act (1970), the Conservation of Offshore Marine Habitats and Species Regulations 2017, the Marine Scotland Act (2010), and The Wildlife (Northern Ireland) Order 1985, all set out offences relating to seals, protecting them from capture, killing or injury, and prohibit disturbance and harassment in Northern Ireland and some parts of Scotland (Table 3). Basking sharks are also protected under the Northern Ireland Order from intentional or reckless disturbance.

Table 1. Breakdown of the Conservation of Habitats and Species Regulations relating to cetaceans in the individual countries of the United Kingdom of Great Britain and Northern Ireland (Note 1).

English and Welsh territorial waters	Scottish territorial waters	Northern Irish territorial waters	Offshore waters (> 12 nm)
The Conservation of Habitats and Species Regulations 2017 (as amended) (Note 2)	**The Conservation (Natural Habitats &c) Regulations 1994 (as amended)**	**The Conservation (Natural Habitats, etc) Regulations (Northern Ireland) 1995 (as amended)**	**The Conservation of Offshore Habitats and Species Regulations 2017 (as amended)** (Note 3)
Part 3 Protection of Species 43(1) A person who a) deliberately captures, injures, or kills any wild animal of an EPS b) deliberately disturbs wild animals of any EPS is guilty of an offence. 43(2) Disturbance on animals includes any disturbance which is likely to a) impair their ability to survive, to breed or reproduce, to rear or nurture their young; or to migrate b) affect significantly the local distribution or abundance of the species to which they belong.	***Part 3 Protection of Species*** 39(1) It is an offence to a) deliberately or recklessly capture, injure or kill a wild animal of an EPS b) deliberately or recklessly i) harass a wild animal or group of EPS iii) disturb such an animal while rearing or caring for its young v) disturb such an animal in a manner that is likely to significantly affect the local distribution or abundance of the species to which it belongs vi) disturb such an animal in a manner that is likely to impair its ability to survive, to breed or reproduce, to rear or otherwise care for their young. 39(2) it is an offence to deliberately or recklessly disturb any dolphin, porpoise or whale (cetacean).	***Part 3 Protection of Species*** 34(1) It is an offence to a) deliberately take or kill a wild animal of an EPS b) Deliberately disturb any such animal	***Part 3 Protection of Species*** 45(1) A person who a) deliberately captures, injures or kills any wild animal of an EPS b) deliberately disturbs wild animals of any such species is guilty of an offence. 45(2) Disturbance of animals includes any disturbance which is likely to: a) impair their ability to survive, to breed or reproduce or rear or nurture their young; or to migrate b) affect significantly the local distribution or abundance of the species to which they belong

Note 1: European Protected Species (EPS) is the term used to describe species listed on Schedule 2 of these regulations (Schedule 1 of the offshore regulations); these schedules list those species of animals listed in Annex IV of the Habitats Directive whose natural range includes any area in Great Britain and includes all species of cetacean (but not seals). Further protection is afforded to harbour porpoise, bottlenose dolphin, grey seal and common (harbour) seal under this legislation through the designation of Special Areas of Conservation (SAC).

Note 2: This legislation consolidates and updates the Conservation of Habitats and Species Regulations 2010 (as amended).

Note 3: This legislation consolidates and updates the Conservation of Offshore Marine Conservations (Natural Habitats &c) Regulations 2007.

Table 2. Breakdown of the Wildlife and Countryside Acts in the four countries of the United Kingdom.

English and Welsh territorial waters	Scottish territorial waters	Northern Irish territorial waters	Offshore waters (> 12 nm)
Wildlife and Countryside Act 1981 (as amended for England and Wales)	**Wildlife and Countryside Act 1981 (as amended in Scotland)**	**The Wildlife (Northern Ireland) Order 1985 (as amended)**	N/A
Regulation 9 Protection of certain wild animals Section 4A: Any person who intentionally or recklessly disturbs any wild animal included in Schedule 5 as - A dolphin or whale (cetacea, all species) or is guilty of an offence Note 1) All species of dolphin or whale but not porpoise; although porpoise are listed on Schedule 5, it is only in relation to Section 9(5), an offence to sell, offer or expose for sale, or have on one's possession or transport for the purpose of sale, any live or dead wild animal listed on Schedule 5. Note 2) Bottlenose dolphin, common dolphin and harbour porpoise are also listed on Schedule 6, Animals which may not be killed or taken by certain methods	Scottish ministers have powers under Section 22(1)(a) of the WCA to vary schedules Cetaceans are no longer listed in Schedule 5 of the Act in Scotland.	Cetaceans not protected by the Wildlife Order.	Not appliable in offshore waters

Table 3. Breakdown of the legislation protecting seals in the four countries of the United Kingdom.

English and Welsh territorial waters	Scottish territorial waters	Northern Irish territorial waters	Offshore waters (> 12 nm)
Conservation of Seals Act (1970)	**Marine (Scotland) Act 2010**	**The Wildlife (Northern Ireland) Order 1985 (as amended)**	N/A
Provision 1 Prohibited methods of killing seals A person commits an offence if the person intentionally or recklessly kills, injures, or takes a seal	***Part 6 Conservation of Seals*** Killing, injuring or taking a live seal (intentionally or recklessly) is an offence (Section 107) unless in accordance with a seal licence (Section 109). Harassing a seal (intentionally or recklessly) at a haul-out site is an offence (Section 117) Note: Haul-out site means any place which Scottish ministers, by order designate for the purpose of this section.	***Protection of certain wild animals*** Any person who intentionally or recklessly kills, injures or takes any animal included in Schedule 5 shall be guilty of an offence (Section 10(1)) Any person who intentionally or recklessly disturbs any wild animal included in Schedule 5 as (a) a seal (pinniped) or (c) a basking shark (*Cetorhinus maximus*) shall be guilty of an offence (section 10 (4a)).	Not appliable in offshore waters

2. Additional information to support JNCC mitigation guidelines

The primary aim of the JNCC mitigation guidelines is to reduce the potential for deliberate injury occurring to marine mammals by ensuring a defined area (the mitigation zone) is clear of marine mammals prior to the explosive source being activated. The full extent of the mitigation zone will be defined during the planning and application process following review of the impact assessment, particularly the predicted injury ranges.

Prior to licence applications being submitted, applicants should have made every effort to plan their activity in such a way to minimise potential injury ranges, and mitigation methods should be utilised to reduce residual impacts. Section 3 provides a summary of options to consider when planning opertions that include explosive use or involve the clearance of unexploded ordnance by detonation.

The following provides further detail regarding the implementation of pre-activity searches and supplementary mitigation options.

2.1. Visual and Passive Acoustic Monitoring

The simplest way to minimise the risk of injury is by visually observing a defined area for a defined period prior to the detonation occurring and delaying operations should a marine mammal be observed. As predicted injury ranges from explosive use can extend further than can easily be monitored (either visually or acoustically), minimum search areas are defined in the guidelines with the assumption that additional methods will be applied to mitigate the remainder of the mitigation zone if it is larger can be monitored.

Visual monitoring (of a defined search area) should be undertaken by trained Marine Mammal Observers (MMOs). Observations should be undertaken from a vantage point as close to the noise source as possible and on a platform enabling the best view of the visual search area. How close this platform is to the detonation point will depend on the operation in question, and the platform may have to move away prior to detonation for safety. It is acknowledged that weather and sea conditions influence an observer's ability to visually detect marine mammals (for example, Hammond *et al.* 2013, Northridge *et al.* 2015), as does available daylight. Consequently, detonations should be undertaken during daylight hours, and maximum sea state 4.

The minimum size of mitigation zone when using explosives or clearing UXO is 1 km. In these circumstances, at least two marine mammal observers (MMOs) will be required. The exception to this is when charges are placed more than 10m below the level of the seabed, in which case a smaller mitigation zone is acceptable and a single MMO may be used. Observers should work together to monitor the search area, and they will advise crew if any marine mammals are observed within the area during the pre-detonation search. If predicted injury ranges (and consequently the mitigation zone) are greater than 1 km, the visual search is still required and the MMO (and PAM operative if applicable) should focus their search efforts to within 1 km but also record any animals seen outside of this range. If it appears the animal is moving towards the detonation location, the MMO should monitor the movement and behaviour of the animal and use their expert judgement to determine a delay in detonation is required.

MMOs should be equipped with binoculars and a tool to estimate distance (i.e. range finding stick or binoculars with reticles). The ability to determine range is a key skill for MMOs and a proven tool for distance estimation should be used. These guidelines do not specify a method, rather the most appropriate tool for the operation and observer in question should

be used. Instructions on how to make and use a range finding stick are available on the JNCC website.

No one method of detecting marine mammals is 100% effective for all species, consequently this visual search may be supplemented by other methods including **Passive Acoustic Monitoring** (PAM). For example, if operating in areas where species may be present which are difficult to detect visually.

Specialist trained PAM system operatives are needed to set up and deploy the equipment and to interpret detected sounds. It is acknowledged that current PAM systems are not suitable for detecting seals and some cetaceans (e.g. baleen whales) and have limited range for others (e.g. harbour porpoise); however, it is considered a viable monitoring method when mitigating impacts of noise on other marine mammals (Stone 2015).

Further guidance on the use of PAM as a mitigation tool has been developed by JNCC which should be used in conjunction with these guidelines. When a PAM system is used, it should be able to:

- Detect the range of frequencies of marine mammal vocalisations expected to be present in the survey area, noting that PAM is not effective for some species.
- Detect and identify vocalising marine mammals and ideally, establish bearing and range.
- Immediately communicate relevant information to the PAM operator (real time) so appropriate and timely mitigation measures can be undertaken (e.g. delay detonation).

Both the MMO and PAM operative should ensure their search efforts are concentrated on the mitigation period (i.e. the pre-, during and post-detonation searches). Note: the PAM operator should not be monitoring with headphones on at the time of detonation due to the risk of hearing damage but should continue to watch the spectrogram for dolphin whistles. However, they should attempt to keep monitoring to as close to the time of detonation as is safe to do so.

The guidelines should not be interpreted to imply that MMO/PAM operatives should continue a visual/acoustic search during all available hours, unless specified as a licence condition. MMO/PAM operatives should manage their time to ensure that they are available to carry out their duties to the best of their ability during the required mitigation periods. Whilst JNCC appreciates the efforts of MMO/PAM operatives to record valuable data at other times, this should be managed to ensure those observations are not detrimental to their ability to undertake duties during mitigation periods.

In addition to conducting visual/acoustic searches, the MMO/PAM operatives will advise the crew on the procedures set out in the JNCC guidelines and provide advice to ensure the operations are undertaken in accordance with the guidelines and any relevant licence conditions. It is essential that MMO/PAM operatives are provided with a copy of the licence and approved marine mammal mitigation plans prior to operations commencing.

Clear communication channels between the mitigation team and relevant crew must be established prior to the commencement of any operations. The mitigation team (or nominated lead) must be aware of the timings of the proposed operations and sufficiently in advance of detonations so that the full pre-detonation search can be completed prior to the operations commencing and where appropriate, an Acoustic Deterrent Device (ADD) deployed. It is recommended that MMO/PAM operatives attend pre-mobilisation meetings, to discuss working arrangements and their role while on the vessel. Clear and effective

channels of communication will help minimise the potential for non-compliance with the guidelines and relevant consent conditions.

The mitigation team and/or licence holders can contact JNCC at seismic@jncc.gov.uk to seek advice in relation to aspects of these guidelines, including topics that could affect compliance with the guidelines. Note this inbox is only monitored during office hours.

For queries in relation to compliance with licence conditions, the appropriate regulator should be contacted.

All MMO and PAM operatives are required to be trained (i.e. the individual must have undertaken formal training on a JNCC approved course, which focus on how to implement the JNCC mitigation guidelines and record mitigation effort). Further information on JNCC recognised course providers is available (see https://jncc.gov.uk/our-work/marine-mammal-observer-training/).

MMOs should also have some experience of visually spotting marine mammals, although this doesn't need to be gained while implementing the JNCC guidelines. For example, it can be from other types of at sea survey work. A PAM operative should also be able to assemble and deploy PAM equipment, configure the software, identify acoustic signals, and interpret bearing and range information. Note, JNCC do not approve specialist PAM courses (e.g. those which teach how to operate PAM systems), however, several training courses are available covering both basic hardware and the use of specialist software.

JNCC recommend newly qualified MMOs and PAM operatives do not work in isolation for their first few jobs (i.e. they are not the sole MMO/PAM operative on board a vessel). Rather they work alongside personnel who can act as mentors while they gain experience of implementing the guidelines.

The use of **experienced MMO and PAM operators** is essential in areas of importance for marine mammals. An experienced MMO/PAM operator should have a minimum of 20 weeks' experience of implementing any of the JNCC noise mitigation guidelines (noting the principles are the same regardless of the activity) in UK waters over the previous ten years, and preferably within the previous five. Furthermore, they will be experienced at identifying UK marine mammal species (visually and/or acoustically depending on the role) and be familiar with their behaviour.

The guidelines recommend a **minimum** number of MMOs required for each operation, and if PAM is used, at least one PAM operative must be available. The SNCBs may provide regulators with further guidance during the licence application process. This will consider, as a minimum, the size of the mitigation zone, the operation location, duration, time of year, volume and the number of detonations, and species sensitivities.

Note, it is the licence holder's responsibility to ensure licence conditions are adhered to, with supporting advice provided by the MMO/PAM operative(s). It is also the operator's responsibility to employ sufficient MMO/PAM personnel to cover all mitigation periods, taking account of the specific requirements and logistics of their operations, thus removing the potential for operative fatigue and meeting health and safety requirements.

2.2. Acoustic Deterrent Devices

When predicted injury ranges are greater than 1 km from the detonation, deployment of an Acoustic Deterrent Device (ADD) should be considered to mitigate the area beyond that being visually/acoustically monitored. A review of the evidence base for ADDs as marine mammal mitigation can be found on the JNCC website (Phillips *et al.* 2024).

ADDs have previously been used to deter seals and harbour porpoise from specified areas by various marine industries and are commonly used prior to piling (see Phillips *et al.* 2024 for review of evidence supporting their effectiveness). Their purpose is to discourage animals from a wide radius around the noise source and the duration for which they are activated should provide sufficient time for animals to swim outside of the predicted injury range (the mitigation zone). However, their use should always be balanced against introducing unnecessary noise into the marine environment. The time for which an ADD is deployed should be carefully considered when developing mitigation plans and every effort should be made in the field to ensure they are not deployed for longer than is necessary. Further guidance on deploying ADDs is currently being developed by JNCC and will be published in our webpage once complete.

Whilst most ADDs emit medium to high frequency sounds, the acoustic characteristics of each device differ in terms of the sound levels produced, frequency range, temporal pattern/duty cycle and harmonics. In addition, there are also differences in the method of deployment and operating functions (Phillips *et al.* 2024). Evidence to support the effectiveness of specific ADDs for the species of concern for the distances required is important when choosing a device.

Current evidence suggests exclusion of harbour porpoises can be achieved up to approximately 1 km from an ADD; beyond this, 100% exclusion cannot be assumed (e.g. Brandt *et al.* 2012; Brandt *et al.* 2013; Dähne *et al.* 2017). However, the consensus is that certain devices can deter harbour porpoise to approximately 7.5 km (Brandt *et al.* 2012; 2013). The evidence for other species is limited. McGarry *et al.* (2017) suggest minke whales react strongly to a specified ADD, moving away to at least 5 km when the ADD brand used was activated 1 km from the animals. Some devices have also been shown to deter seals to approximately 1 km (Götz & Janik 2010; Gordon *et al.* 2015). No evidence is currently available for dolphin species.

Care must be taken however, when considering what ADD to use and how long to deploy it for. Habituation is a concern, which has been noted in several studies with seals, particularly where food motivation is involved (Götz 2008; Götz & Janik 2010; Sparling *et al.* 2015). The use of some types of ADD has led to reduced detection rates of harbour porpoise at greater distances than are generally required to mitigate auditory injury (Thompson *et al.* 2020; Voss *et al.* 2023). There is also some evidence that suggests ADDs themselves have the capacity to cause hearing damage (Hiley *et al.* 2021). However, the overarching conclusion from peer-reviewed literature and industry reporting has been auditory injury from ADD use is predominantly through the continuous activation of devices (cumulative Sound Exposure Level (SEL), rather than instantaneous peak Sound Pressure Level (SPL_{pk}), and can be avoided by the judicious and proportionate use of ADDs (Boisseau *et al.* 2021; Schaffeld *et al.* 2019; Thompson *et al.* 2020).

Only ADDs that have been proven effective for the marine mammal species likely to be found within the operational area should be used. When selecting the brand of ADD to use, consider the injury ranges predicted in the impact assessment and whether the chosen device is effective to this range. Where practical, tailor the choice of ADD to match the predicated injury ranges.

The deployment of ADDs will not guarantee the safety of all animals, as not all individuals will react with avoidance behaviours (Brandt *et al.* 2012), however they can still be considered a viable mitigation tool. Consequently, they should only be used in conjunction with visual surveys. They should not be deployed as a sole mitigation option.

The mitigation plan should identify the best location from which to deploy the ADD. Ideally it should be as close to the centre of the mitigation zone as possible to ensure even coverage

however, safety considerations may restrict this. The location from which it will be deployed should be considered at the planning and application stages and the duration of activation prior to detonation will be agreed with the regulator and relevant SNCB. The mitigation plan should also include details of how the device will be tested prior to deployment to ensure it is working correctly, plus back-up procedures should it fail.

The ADD should be timed to coincide with the visual search rather than starting once the search duration is completed. However, the visual search must already be underway for 30 minutes prior to ADD activation. If the ADD is to be active for more than 30 minutes, the visual search should be extended to match the duration of ADD deployment plus 30 minutes. This is to ensure no marine mammals are close when it's switched on. If a marine mammal is detected in the search zone during this initial 30 minutes, ADD activation should be delayed.

Note: The ADD should not be active longer than is required to prevent introducing unnecessary noise into the marine environment. The duration of ADD activation will vary depending on the size/type of explosive being used and the predicted injury ranges; clear communication channels between the mitigation team are essential to ensure it is deployed for the correct length of time.

Even with ADD usage, the potential for injury will remain for clearance operations with very large, predicted injury zones (> 7.5 km). Consequently, operations may need to be undertaken in conjunction with an EPS licence for injury, to avoid committing an offence under UK Habitats Regulations.

2.3. Noise reduction and abatement

When developing work scopes, every effort should always be taken to ensure the required activity is conducted as quietly as possible. For example, by refining the work scope to use the smallest volume of explosive material as possible. For UXO clearance, in line with the Government Joint Position Statement, low noise methods of clearance should always be prioritised.

Noise abatement involves restricting sound propagation from the noise source through the water column. Several noise abatement systems are commercially available. These have been used effectively for piling operations however evidence of effectiveness during explosive use is limited. It is unlikely these methods would be required for general explosive use (e.g. cutting), but they may be required when clearing UXOs. This should be agreed with the regulator/SNCB at the licence application stage and incorporated into the marine mammal mitigation plan. While the MMO team will not have direct involvement with the deployment of the noise abatement system, they will need to be aware of when they will be deployed in case this impacts the pre-detonation searches and ADD deployment.

Applicants are welcome to propose alternative noise abatement methods provided there is suitable independent evidence to support claims of reduced environmental impacts. Note, the level of supporting evidence for any noise abatement method proposed will help inform mitigation requirements.

A detailed review of noise abatement systems can be found in Verfuss *et al.* (2019). Currently, the primary option available is bubble curtains.

Bubble curtains are formed by compressed air that is pumped through one or more nozzle hoses laid on the seafloor around the noise source. The air ascends through the nozzles into the water column up to the water surface and thereby builds a curtain of bubbles. Impulsive

sound will be absorbed, reflected and scattered from the ascending air bubbles, reducing the overall propagation of the sound.

The use of bubble curtains during explosive use has been tested in the German Baltic Sea (Schmidtke 2009, 2010, 2012), which indicated they do reduce noise levels in the water column. However, with larger charges (e.g. 300 kg sea mine) their effectiveness was nullified by water displaced from the explosion if the bubble curtain radius was too small.

Local water depths and hydrographic conditions need to be considered before deciding whether bubble curtains are appropriate for a particular project. For example, hydrostatic pressure and prevailing currents restrict existing systems for piling to an operational depth of 40–50 m (Nehls *et al.* 2016). The frequency of sound dampened is inversely proportional to bubble size, which decreases with water depth due to water pressure. In addition, air bubbles are exposed to the prevailing current and drift away in the direction of the current during their ascent to the water surface. A flow velocity of up to 0.75 m/s can mostly be compensated by an elliptical deployment of the nozzle hoses in the direction of the current (Bellman *et al.* 2020). It's worth noting however, that the curtain, will be required for less time than during piling, when it is required for hours.

A future option may be resonators. These consist of an array of resonating units deployed around a noise source to absorb the emitted sound. Again, they were designed for use during piling and some providers are considering if they could be used during explosive work, however this is still at an experimental stage. To date, only one system has been tested in tank trials (Wochner *et al.* 2017a & b). At this stage there is insufficient evidence to demonstrate their effectiveness during explosive use, particularly UXO clearance as current designs require the system to be positioned near the sound source and pressure from the detonation may demolish it. However, this may be a useful tool in the future.

2.4. Scare charges

Following noise monitoring of scare charges during a UXO clearance campaign (Robinson *et al.* 2022), they are **not** recommended as a mitigation option for marine mammals and should not be used for this purpose. Historically, small explosive devices known as scare charges have been used to deter fish away from a planned explosive detonation, to reduce the number of fish kills. These charges have also been included in marine mammal mitigation plans for UXO clearance as a deterrent, usually in addition to an ADD. However, their scaring effect is not proven (Lewis 1996; Keevin & Hempen 1997). If they are required to mitigate impacts to fish, their use should be considered alongside the marine mammal mitigation requirements and the mitigation team should be made aware of when they will be deployed.

3. Information to assist with planning

JNCC is currently developing guidance on how to undertake noise assessments for injury, which will be published on the JNCC webpage when complete. Guidance to support those applying for licences to clear UXO can be found on the Defra webpage (Defra 2025).

The following information is provided to further assist those involved with planning explosive use in the marine environment, including UXO clearance. It is presented from an SNCB perspective and considers their advisory role in the licensing process. It should not be viewed as definitive advice and advice should be sought from the appropriate regulator. All explosive use should be assessed on a case-by-case basis. This guidance refers to marine mammals only and additional guidance should be obtained with regard potential impacts to other features.

3.1. Planning stage

When planning, the lowest volume of explosive material needed to achieve the objectives should always be used as reducing the charge weight will reduce the amount of energy released into the marine environment (Keevin & Hempen 1997). This can consider the type of charge to be used as well as volume as, for example, the use of shape charges can significantly reduce the required amount of explosive (Spence *et al.* 2007). This is an explosive charge shaped to focus the effect of the explosive energy. Used to cut and form metal, penetrate metal and perforate wells in the oil and gas industry. If methods are proposed that will result in reduced noise levels (e.g. deflagration), provide evidence in the application to support these claims, as this can influence what mitigation is required (e.g. methods supported by robust evidence may require less mitigation).

It is important to consider mitigation requirements early in the planning process to effectively incorporate them into the operation, although some planning will require the impact assessment to have been completed. As a minimum, consider whether a particular species is expected to be present in high abundance, or will operations occur during sensitive periods for marine mammals (e.g. breeding/pupping season). Whenever possible, plan operations to avoid areas/periods of high abundance and sensitivity.

Also consider how big will the mitigation zone be as this will determine what mitigation will be required. The JNCC guidelines can be used as a starting point and mitigation plans refined during the planning and pre-application process through consultation with the relevant regulator/SNCB(s).

3.2. Licence application considerations

When reviewing licence applications, regulators will consult SNCBs who will advise the regulator if further assessment of potential impacts is required, and/or additional mitigation to reduce the risk deliberate injury and/or deliberate or reckless disturbance to marine mammals.

If impacts can't be mitigated fully, additional licences may be needed (e.g. wildlife licence or European Protected Species (EPS) licence). Guidance is available which can assist with determining risk of injury or disturbance (JNCC *et al.* 2010; Marine Scotland 2020). Early consultation with the appropriate regulator and SNCB(s) is encouraged, particularly for situations not specifically covered in these guidelines.

3.2.1. Marine mammal baseline

Applications should identify what marine mammal species are likely to be present in the area and if operations are to occur within or near an area of importance for marine mammals (including Marine Protected Areas). The application should also identify sensitive seasons (for example, seal pupping), migration periods or routes and seasonal abundance in areas of importance, and whether the timing of the proposed operations will avoid these or not.

3.2.2. Describing the activity

Clear justification as to why explosives are needed should be included in the licence application, and the applicant must assess all potential impacts of any proposed operations. The applicant should demonstrate they have made every possible effort to design operations in a way that minimises impacts to the marine environment, including minimising the sound generated and potential impacts to marine mammals.

Operations involving the use of explosives for cutting

The volume of explosive material and location of where it will be placed (e.g. in the water column, below the surface of the seabed) should be clearly presented in the application. Outline the procedure for detonation, including anything that may influence when the detonation will take place, for example, is it reliant on another activity being completed? This will help inform the mitigation plan and enable the MMOs to plan their pre-detonation searches effectively.

If the explosive material will be below the level of the seabed, ensure the depth of all charges is provided as this will determine whether marine mammal mitigation is needed.

UXO clearance

The Defra guidance supporting UXO clearance applications (Defra 2025) should be read when planning UXO clearance campaigns which includes details on how to describe the proposed clearance activities.

3.2.3. Assessing injury and disturbance

Applications should always include an assessment of the likelihood of deliberately or recklessly injuring or disturbing marine mammals because of noise produced during the operation.

JNCC is currently developing guidance on how to undertake noise assessments for injury, which will be published on the JNCC webpage when complete. Details of how injury and disturbance as defined in the regulations has been interpreted can be found in the SNCB EPS guidance and Marine Scotland EPS guidance. Please contact the appropriate SNCB for further advice.

Auditory injury is defined as permanent threshold shift (PTS). Criteria were first introduced to assess this in 2002 which introduced the concept of frequency weighted hearing groups and presented thresholds above which a sound is thought to cause auditory injury. The hearing groups and injury thresholds were last updated in Southall *et al.* (2019) and these should be used to predict distances at which injury to marine mammals could begin to occur. Explosive use can result in other forms of physical injury and death, however, the distances at which these can happen are typically less than for auditory injury, therefore by assessing PTS, other forms of injury should automatically be mitigated.

Disturbance is highly context specific and currently there are no agreed thresholds. Sinclair *et al.* (2023) includes a review of different methods that can be used to assess disturbance. Marine Scotland 2020 guidance (for Scottish territorial waters) describes factors that can be used to determine if disturbance to cetaceans may occur and what this may mean. SNCB guidance (JNCC *et al.* 2010) on assessing disturbance to marine mammals in English and Welsh territorial waters, and UK offshore waters, considers a disturbance offence unlikely from a single, short-term operation as such activities would likely result in temporary disturbance which on its own would not be likely to impair the ability of an animal to survive, reproduce, etc., nor result in significant effects on the local abundance or distribution.

3.2.4. Marine protected areas

The application should consider potential impacts on the integrity of any MPAs the activity may be in or near, noting sound outside a site can disturb features inside. Sufficient information will be needed to enable the regulator to undertake a Habitats Regulation Assessment (HRA) or Marine Conservation Zone (MCZ)/ Nature Conservation Marine Protected Area (NCMPA) Assessment.

For harbour porpoise Special Areas of Conservation in English, Welsh and Northern Irish waters, a noise management approach is applied which uses temporal/spatial thresholds to determine whether an adverse effect on these sites may result from proposed operations. This should be considered when assessing potential impacts to these sites. NRW provide separate advice for assessing disturbance to harbour porpoise from underwater noise.

Note, site management measures may necessitate additional mitigation.

3.2.5. Mitigation requirements

The JNCC mitigation guidelines should be considered when explosive use or UXO clearance has the potential to result in injury to marine mammals.

As the scale of explosive use will be different for each operation, variations to the guidelines can be proposed to ensure mitigation plans are appropriate for the planned activity, and variations to them may be required in consent conditions which are developed on a case-by-case basis. Some projects may be better supported by a draft marine mammal mitigation plan specific to the project, rather than simply referring to the JNCC guidelines. These should, however, use the JNCC guidelines as a starting point. Draft mitigation plans will be reviewed and approved by the regulator following consultation with the SNCB. In some instances, the final mitigation plan may be agreed post-consent, however sufficient information should always be provided at the application stage to provide confidence that appropriate mitigation is possible.

Things to consider when identifying mitigation include:

- Can the proposed activity be refined further to reduce potential risks of injury?
- Is a particular species expected to be present in high abundance, or will operations occur during sensitive periods for marine mammals (e.g. breeding/pupping season). Whenever possible, plan operations to avoid areas/periods of high abundance and sensitivity.
- How big will the mitigation zone be? This is usually based on predicted injury ranges in the impact assessment and will determine what mitigation will be required.

- Do the mitigation methods proposed have sufficient evidence to be deemed effective for the marine mammal species most likely to be found within the operational area. Options for deployment of these methods should be considered early in the planning stage to ensure it can be used effectively (i.e. discuss with equipment supplier/operative/ vessel operator, etc.).
- Ensure sufficient mitigation operatives (i.e. Marine Mammal Observer (MMO) / Passive Acoustic Monitoring (PAM) operatives) are employed. Consider, for example, the number and location of the detonations, and duration of daylight hours when determining the number of personnel required to prevent observer fatigue.
- Reliable lines of communication must be established between the mitigation operatives and crew. Consider how this will be achieved and include this in the proposed mitigation plan.

4. Wind and sea state scales

This information has been provided as a reference for in the field, to allow MMOs to compare the JNCC sea state categories on the recording forms with the Beaufort scale.

Table 4. Wind and sea state scales (for more information on the Beaufort Scale visit http://en.wikipedia.org/wiki/Beaufort_scale).

The Beaufort Scale						Sea state on JNCC recording form	
Beaufort number	**Name of wind**	**Wind speed**		**Average wave height (m)**	**Description of sea surface at this wind speed**	**Category**	**Description**
		Knots	Km/h				
0	Calm	< 1	< 2	0	Sea like a mirror	g	Sea is calm, glassy like a mirror
1	Light air	1–3	2–5	0–0.3	Ripples with appearance of scales are formed, without foam crests	-	-
2	Light breeze	4–6	6–11	0.3–0.6	Small wavelets still short but more pronounced; crests have a glassy appearance but do not break	s	Sea is slight with no or few white caps
3	Gentle breeze	7–10	12–19	0.6–1.2	Crests begin to break. Any foam has glassy appearance, scattered whitecaps.	-	-

The Beaufort Scale						Sea state on JNCC recording form	
Beaufort number	**Name of wind**	**Wind speed**		**Average wave height (m)**	**Description of sea surface at this wind speed**	**Category**	**Description**
		Knots	Km/h				
4	Moderate breeze	11–16	20–28	1–2	Small waves becoming longer; fairly frequent white horses	c	Sea is choppy with many white caps
5	Fresh breeze	17–21	29–38	2–3	Moderate waves taking a more pronounced long form; many white horses are formed; chance of some spray	-	-
6	Strong breeze	22–27	39–49	3–4	Large waves begin to form; the white foam crests are more extensive everywhere; spray is present	r	Sea is rough, with large waves, foam crests and probably some spray
7	Near gale	28–33	50–61	4–5.5	Sea heaps up and white foam from breaking waves begins to be blown in streaks along the direction of the wind; spindrift begins to be seen	-	-
8	Gale	34–40	62–74	5.5–7.5	Moderately high waves of greater length; edges of crests break into spindrift; foam is blown in well-marked streaks along the direction of the wind	-	-

The Beaufort Scale						Sea state on JNCC recording form	
Beaufort number	**Name of wind**	**Wind speed**		**Average wave height (m)**	**Description of sea surface at this wind speed**	**Category**	**Description**
		Knots	Km/h				
9	Severe gale	41–47	75–88	7–10	High waves; dense streaks of foam along the direction of the wind; sea begins to roll; spray affects visibility	-	-
10	Storm	48–55	89–102	9–12.5	Very high waves with long overhanging crests. Large patches of foam blown in dense white streaks. Sea surface takes white appearance, tumbling of sea is heavy and shock like.	-	-

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Weblinks

Table 5. Full URLS for weblinks used in the text.

Weblink text	Full URL
JNCC webpage: Marine mammals and noise mitigation	https://jncc.gov.uk/our-work/marine-mammals-and-noise-mitigation/
JNCC guidance for the use of passive acoustic monitoring in UK waters for minimising the risk of injury to marine mammals from offshore activities	https://hub.jncc.gov.uk/assets/fb7d345b-ec24-4c60-aba2-894e50375e33
JNCC webpage: Marine mammal observer training course providers	https://jncc.gov.uk/our-work/marine-mammal-observer-training/
Phillips *et al.* 2024: Evidence base for the application of acoustic deterrent devices as marine mammal mitigation (version 5)	https://hub.jncc.gov.uk/assets/e2d08d7a-998b-4814-a0ae-4edf5d887a02
Government joint UXO position statement – Marine environment: unexploded ordnance clearance joint interim position statement	https://www.gov.uk/government/publications/marine-environment-unexploded-ordnance-clearance-joint-position-statement
Defra 2025: Minimising environmental impacts from unexploded ordnance clearance.	https://www.gov.uk/government/publications/supporting-minimising-environmental-impacts-from-unexploded-ordnance-clearance
JNCC *et al.* 2010: The protection of marine European Protected Species from injury and disturbance: guidance for the marine area in England and Wales, and the UK offshore marine area	https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/850708/Draft_Guidance_on_the_Protection_of_Marine_European_Protected_Species_from_Injurt_and_Disturbance.pdf
Marine Scotland 2020: The protection of marine European protected Species from injury and disturbance: guidance for Scottish inshore waters	https://www.gov.scot/binaries/content/documents/govscot/publications/advice-and-guidance/2020/07/marine-european-protected-species-protection-from-injury-and-disturbance/documents/marine-european-protected-species-guidance-july-2020/marine-european-protected-species-guidance-july-2020/govscot%3Adocument/EPS%2Bguidance%2BJuly%2B2020.pdf
Guidance on noise management in harbour porpoise SACs	https://hub.jncc.gov.uk/assets/2e60a9a0-4366-4971-9327-2bc409e09784
NRW's position on assessing behavioural disturbance of harbour porpoise (*Phocoena Phocoena*) from underwater noise	https://naturalresources.wales/media/696755/ps017-nrws-position-on-assessing-behavioural-disturbance-of-harbour-porpoise-phocoena-phocoena-from-underwater-noise-30.pdf