# Environment Bulletin

Underwater sound impact evaluation -

Auditory effects criteria for marine mammals and turtles

NOPSEMA
Australia's offshore energy regulator

18/02/2026

## Background

The evaluation of environmental impacts from anthropogenic underwater sound often involves a comparison between predicted sound levels and threshold criteria for effects, as well as consideration of contemporary published science, guidance and standards.

Significant updates to auditory-effects technical guidance and scientific information were published in late 2024 and early 2025.

These included:

i) United States (U.S.) National Marine Fisheries Service (NMFS) 2024 update to *Technical Guidance for Assessing the Effects of Anthropogenic Sound on Marine Mammal Hearing* (NMFS (2024) Technical Guidance).

ii) U.S. Navy Phase 4 Report on *Criteria and Thresholds for U.S. Navy Acoustic and Explosive Effects Analysis* (Revision 2025.1) (Accomando *et al*. 2025).

The NMFS (2024) Technical Guidance was published in October 2024 as an update to the previous NMFS (2018) Technical Guidance and provides updated auditory effects criteria for permanent threshold shift (PTS)[1] and temporary threshold shift (TTS) in cetaceans and pinnipeds.

The U.S. Navy Phase 4 Report was initially released in 2024, but was revised and republished in April 2025 (Accomando *et al*. 2025)[2]. Accomando *et al.* (2025) presents updated auditory effects criteria for PTS[1] and TTS that are relevant to both marine mammals and turtles, which supersede previous criteria in the U.S. Navy's Phase 3 Report (Finneran *et al.* 2017).

Therefore, both publications provide contemporary scientific information and threshold criteria for auditory effects that may arise from exposure to underwater sound.

NOPSEMA has prepared this Bulletin in response to queries received regarding the two publications. The Bulletin provides further information and advice regarding the application of the NMFS (2024) Technical Guidance and Accomando *et al.* (2025) in environmental impact and risk assessments for marine mammals and turtles in Offshore Project Proposals (OPPs) and Environment Plans (EPs) under the Offshore Petroleum and Greenhouse Gas Storage (Environment) Regulations 2023 (Environment Regulations).

[1] Note that PTS is termed a form of "auditory injury" according to U.S. definitions adopted in the NMFS (2024) Technical Guidance and U.S. Navy Phase 4 Report. In Australia, the Blue Whale Conservation Management Plan and associated Australian government 'Guidance on key terms within the Blue Whale Conservation Management Plan' provide for a different definition of injury in respect to PTS and TTS in blue whales that could be confused by the adoption of the U.S. definition of 'Auditory Injury'. Therefore, in the Australian regulatory context, 'PTS' and 'TTS' continue to be appropriate terms.

[2] When applying the U.S. Navy Phase 4 Report, titleholders should ensure they refer to the latest revision of the report (i.e. Revision 2025.1; Accomando *et al*. 2025).

NOPSEMA encourages titleholders to use this guidance, although it is not mandatory.

## The issue

***Differences in hearing group classifications, auditory weighting and exposure functions, and new turtle criteria in NMFS (2024) Technical Guidance and Accomando et al. (2025) may lead to changes in predicted impact ranges (PTS and TTS) compared with earlier assessment approaches adopted by titleholders.***

**Auditory Effects Criteria for Marine Mammals**

The NMFS (2024) Technical Guidance includes auditory weighting functions, exposure functions and effect thresholds for PTS and TTS. These are provided for marine mammal hearing groups, including 'low-frequency cetaceans' (i.e. mysticetes/baleen whales), 'high-frequency cetaceans' (i.e. most odontocetes, including dolphins, toothed whales, beaked and bottlenose whales), very high-frequency cetaceans (some specialised species of dolphin, porpoise, and pygmy/dwarf sperm whales), otariid and phocid pinnipeds.

Accomando *et al.* (2025) also recommends auditory weighting functions, exposure functions and effect thresholds for PTS and TTS that are consistent with the NMFS (2024) Technical Guidance for the 'high-frequency cetaceans', 'very high-frequency cetaceans' and the pinniped groups. However, Accomando *et al.* (2025) sub-divides mysticete species into two hearing groups, the 'very low-frequency cetaceans' (e.g. blue, right and fin whales) and the 'low-frequency cetaceans' (e.g. other mysticetes such as humpback, sei, Bryde's, Omura's, minke, and pygmy right whales). This more detailed categorisation is based on recent hearing measurement data for mysticetes, which was not available when the NMFS (2024) Technical Guidance was peer-reviewed[3].

Accomando *et al.* (2025) applies PTS and TTS thresholds for their 'very low-frequency cetaceans' and 'low-frequency cetaceans' groups that are numerically the same as those in the NMFS (2024) Technical Guidance 'low-frequency cetacean' category but applies different auditory weighting and exposure functions for their 'very low-frequency cetaceans' and 'low-frequency cetaceans' groups.

Accomando *et al.* (2025) also provides auditory weighting functions, exposure functions and effect thresholds for PTS and TTS effects for sirenians (e.g. dugongs).

[3] The NMFS (2024) Technical Guidance acknowledges that the Technical Guidance would likely necessitate updating once the mysticete hearing data were available, but there are currently no timeframes stipulated by NMFS for such updates.

**Auditory Effects Criteria for Marine Turtles**

Accomando *et al.* (2025) includes new auditory weighting functions, exposure functions and PTS and TTS thresholds for turtles. The updated criteria may result in increased PTS and TTS effects ranges, compared with the U.S. Navy's Phase 3 Report criteria (Finneran *et al.* 2017) that have been applied by titleholders previously.

## What is needed?

***Titleholders should apply the latest auditory effects criteria from NMFS (2024) Technical Guidance and Accomando et al. (2025) in underwater sound assessments to ensure modelling and control measures reflect contemporary science and to support demonstrating that impacts and risks are reduced to as low as reasonably practicable (ALARP) and an acceptable level.***

The prediction and evaluation of environmental impacts and risks from underwater sound emissions should be supported by the best available science (i.e. relevant, applicable, contemporary, peer-reviewed and published by reputable sources) and appropriate impact threshold criteria (IP1765). Both NMFS (2024) Technical Guidance and Accomando *et al.* (2025) include contemporary science and threshold criteria relevant to evaluating the effects of PTS and TTS.

It is expected that titleholders consider the relevance and application of these two publications when evaluating underwater sound impacts and risks from their activities to marine mammals and turtles.

Consideration of the latest science and threshold criteria is particularly important where:

- Proposed control measures (e.g. observation, shut down or avoidance zones) rely on predicted PTS or TTS effects ranges.
- PTS and TTS predictions provide critical information to support the demonstration that activities will be carried out in a manner in which environmental impacts and risks will be of an acceptable level and not inconsistent with relevant threatened species recovery plans.

**Marine mammals**

NOPSEMA advice is that all new EP or OPP submissions that include an assessment of PTS and TTS effects to marine mammals should select and apply the auditory effects criteria presented in either the NMFS (2024) Technical Guidance or Accomando *et al.* (2025). Assessments should consider both the auditory weightings and threshold values. The application of the auditory weighting functions in addition to the effects thresholds is important as it accounts for the overlap in the frequency range of a sound source with the biologically-important frequencies of the relevant marine mammal hearing groups. Specifically, where titleholders are relying on acoustic modelling to inform their impact assessments and design of mitigation measures for the effects of sound on marine mammals, the modelling should apply either the NMFS (2024) Technical Guidance or Accomando *et al.* (2025) auditory weightings, exposure functions and thresholds.

Noting the different groupings and criteria available for mysticetes in the NMFS (2024) Technical Guidance and Accomando *et al.* (2025), titleholders may select which publication's criteria are applicable to their impact and risk assessments. The selected thresholds need to be justified in the submission as to their suitability for the receptors, sound source and the effect that is being evaluated in the context of the best available science (IP1765).

**Marine turtles**

NOPSEMA advice is that all new EP or OPP submissions that include an assessment of PTS and TTS effects to marine turtles should consider the auditory effects criteria presented in Accomando *et al.* (2025). Assessments should consider both the auditory weightings and threshold values. Specifically, where titleholders are relying on acoustic modelling to inform their impact assessments and design of mitigation measures for the effects of sound on marine turtles, the modelling should apply the Accomando *et al.* (2025) auditory weightings, exposure functions and thresholds.

**Other considerations for titleholders**

The use of the auditory effects criteria discussed in this Bulletin is typically only a part of a comprehensive evaluation of potential underwater sound impacts and risks, and associated control measures for a proposed activity. Rather, auditory effects criteria serve as one tool to help evaluate the potential for auditory effects to occur. Other contextual and scientific information may also be relevant to evaluate and understand the potential for exposure, as well as the impacts that such auditory effects may have on individual animals or at a population level.

The level of detail and rigour to be applied to the assessment of impacts and risks must be commensurate to the nature and scale of the activity and its sound sources, and the potential for fauna to be exposed to the effects of sound. A greater level of detail and rigour may be required in situations where fauna may be exposed to underwater sound while undertaking biologically important behaviours, such as in biologically important areas (BIAs) and habitat critical to survival (HCTS). For example, animals within these areas for biologically important behaviours such as foraging, resting, or reproducing may be more susceptible to sound exposures with the potential to result in PTS or TTS than transient individuals, highlighting the importance of undertaking a thorough assessment based on the latest science and threshold criteria.

Titleholders should exercise caution if referring to historical acoustic modelling and impact predictions that are based on outdated auditory weightings and thresholds, as these may not be directly comparable with model outputs and predictions generated using the latest criteria. For example, this circumstance may arise when preparing an EP for an activity that is part of an offshore project considered within an OPP accepted before the updated criteria were published.

Titleholders may discuss their specific circumstances with NOPSEMA to understand potential regulatory implications of any proposed approach/es to considering and addressing new information.

For EPs that have already been accepted by NOPSEMA, titleholders should apply processes within their implementation strategy for review of new information and management of change, as appropriate to understand if there is any significant new or significant increase in environmental

impact or risk arising from the activity. Refer to NOPSEMA's When to Submit a Proposed Revision of an EP Guideline for further information.

## The legislation

The Environment Regulations require that any petroleum activity or greenhouse gas activity carried out in an offshore area is:

- Carried out in a manner consistent with the principles of ecologically sustainable development (ESD) in section 3A of the *Environment Protection and Biodiversity Conservation Act 1999*;
- Carried out in a manner by which the environmental impacts and risks of the activity will be reduced to ALARP; and
- Carried out in a manner by which the environmental impacts and risks of the activity will be of an acceptable level.

Sub-regulation 13(4) of the Environment Regulations sets out the acceptance criteria for an OPP. This includes for example, the requirement to appropriately identify and evaluate the environmental impacts and risks of the activities that are part of the project and demonstrate that the environmental impacts and risks of the project will be managed to an acceptable level.

Sub-regulation 34(c) of the Environment Regulations sets out the acceptance criteria for an EP. This includes for example, the requirement to demonstrate that the environmental impacts and risks of an activity will be of an acceptable level.

Regulation 19 of the Environment Regulations requires that operations must not continue if a significant new or significant increase in environmental impact or risk is identified as arising from the activity.

## Related documents

Click here to view the NMFS (2024) update to *Technical Guidance for Assessing the Effects of Anthropogenic Sound on Marine Mammal Hearing*.

Click here to view the U.S. Navy Phase 4 Report on *Criteria and Thresholds for U.S. Navy Acoustic and Explosive Effects Analysis* (Revision 2025.1; Accomando *et al*. 2025).

## Contact

Enquiries should be directed to environment@nopsema.gov.au and quote 'Environment Bulletin – Auditory effects criteria for marine mammals and turtles'.

Titleholders are also able to reach out to their respective NOPSEMA focal points or assessors to discuss their specific circumstances and proposed approaches to addressing the issue.