

**Supporting Information for the derogation for testing Acoustic Deterrent Devices
(ADDs) above the sound levels permitted in Irish waters**

1) Introduction

a) Objective of the proposed works (for example, as part of construction of a national road, repair of roofing, undertaking surveys etc.)

The objective of the proposed work is to conduct research under the EU Horizon Marine Beacon project, specifically addressing the efficacy and impact of Acoustic Deterrent Devices (ADDs) with a focus on mitigating the bycatch of Protected, Endangered, and Threatened Species (PETS) in European waters. The aim is to understand the response of PETS to these higher sound levels, thereby informing the development of more functional and effective acoustic mitigation strategies against bycatch. The primary goals include: (1) perform essential fieldwork to collect acoustic data through experimental control trials; (2) conduct noise modelling to precisely assess the acoustic range and potential impact of ADDs on marine mammals and other PETS; and (3) produce an environmental impact assessment and detailed seasonal acoustic soundscape maps related to ADD usage.

b) Name, qualifications and relevant experience of scientific staff, including trainees, (e.g. ecologist) involved in the preparation of the application and those responsible for carrying out the proposed activity

The applicant, Dr Yasmin Viana Pinto, is a Postdoctoral researcher focused on cetacean bioacoustics and responses to anthropogenic noise. Dr Viana has extensive experience in multidisciplinary offshore fieldwork, including studies on the impacts of seismic exploration on cetaceans, as well as coastal acoustic monitoring for behavioural assessments. Dr Sinéad Murphy is a marine mammal ecologist with significant experience advising intergovernmental bodies, including ICES, ASCOBANS, OSPAR, and the European Commission. Skilled in linking research to conservation policy and management frameworks. Dr Joanne O'Brien has extensive expertise in acoustic monitoring of marine mammals. Leads field surveys, manages large acoustic datasets, and applies passive acoustic monitoring to conservation and management. Dr Cólín Minto is a quantitative ecologist specialising in statistical modelling of marine populations. Experienced in hierarchical and longitudinal analysis, mixture modelling, and state-space time series. Contributes to European stock assessments and co-developed the RAM Legacy Stock Assessment Database.

c) If this application is for the carrying out of surveys that may cause disturbance, qualifications of all involved must be provided and trainees must be clearly identified.

A CV of the main applicant is attached to this application which includes information on their qualifications and experience in the field. Due to data protection reasons, please ensure this document is not distributed publicly.

3) Background to proposed activity including location, ownership, type of and need for the proposed activity, planning history, policy context, zoning in relevant Development plan (or equivalent), etc.

The proposed activities directly address a major environmental challenge: the unsustainable and ongoing bycatch of the Common Dolphin (*Delphinus delphis*). Incidental capture in fishing gear is widely recognised as one of the most significant threats affecting this species, with mortality levels in the North-east Atlantic exceeding sustainable thresholds, based on the Potential Biological Removal (PBR) framework. This research aims to generate robust scientific data to assess the range and effectiveness of Acoustic Deterrent Devices (ADDs), underwater sound-emitting devices attached to fishing gear and intended to reduce cetacean bycatch by deterring animals from approaching nets. This derogation request relates to the inclusion of ADDs that fall outside the technical specifications defined in Commission Implementing Regulation (EU) 2020/967. Specifically, this includes devices above the established Sound Pressure Level (SPL: 145 dB re 1 microPa @ 1 m (RMS), outside the permitted 20–160 kHz range, as well as Targeted Acoustic Startle Technology (TAST). TAST is a novel approach that utilises brief, low-dose sound signals at targeted lower frequency bands and low duty cycles to trigger an autonomous startle reflex, thereby preventing habituation while minimising its noise spatial extent and risk of large-scale habitat displacement for non-target species (Table 1).

The use of ADDs with source levels exceeding standard European specifications has been explored in several national mitigation programmes and research trials aimed at reducing cetacean bycatch, particularly for delphinid species such as the Common Dolphin. Under the Commission Implementing Regulation (EU) 2020/967, Member States may authorise the use of devices that do not comply with the standard technical specifications, provided that their effectiveness in reducing incidental catches of cetaceans is demonstrated and appropriately documented (European Commission 2020).

In the North-East Atlantic, mitigation initiatives addressing high bycatch rates in the Bay of Biscay have included the testing and deployment of high-output acoustic deterrent devices, including models such as the STM DDD series (ICES Advice, 2023). In countries outside the EU, such as the United Kingdom, organisations including the Marine Management Organisation and the Department for Environment, Food and Rural Affairs facilitate trials of mitigation technologies under European Protected Species licensing frameworks through programmes such as Clean Catch UK (ICES Report, 2021).

The experience in the UK provides a robust precedent for the use of high-output acoustic deterrents like the STM Products DDD series (Marine Management Organisation, 2022). Conventional pingers, which typically require spacing of 100 to 200 metres, were found to be impractical for offshore fisheries utilising long fleets of nets because they had high failure rates, were prone to breakage during deployment, and posed significant safety risks to crew members (Northridge et al. 2011). Consequently, the UK authorised the use of louder devices with source levels of approximately 165 dB. This technical advantage allows for an increased spacing of up to 2 km between units, which simplifies fishing operations and reduces the total number of devices required per net fleet. The efficacy of this technology is supported by extensive trials conducted with various models in the series. For example, tests involving the DDD-03H in pelagic trawl fisheries showed a significant reduction in dolphin bycatch, while trials with the DDD-02F and DDD-02 models in static net fisheries demonstrated that porpoise bycatch could be reduced by approximately 95% in nets of 4 km or less (Northridge et al. 2011). Research institutions, including the Sea Mammal Research Unit in Scotland, have also conducted experimental evaluations using advanced deterrent technologies such as TAST and high-output acoustic devices. In Ireland, acoustic propagation modelling for TAST was recently approved by NPWS for inshore trials, which were successfully conducted under the derogation licence DER-CETACEAN-2022 (Cox et al., 2024). The French regulatory landscape underwent a drastic change following interventions by the Conseil d'État, which forced the transition from voluntary recommendations to the mandatory use of mitigation devices. In this context, high-output equipment like the STM Devices became standard and compulsory for pair trawling fleets in the Bay of Biscay to ensure a noise exclusion zone compatible with industrial fishing scales (NOAA, 2025). These measures directly address elevated dolphin mortality through national decrees, a path also followed by Spain through the mandatory implementation of devices for specific fleets based on practical necessity (République Française, 2019). Spain has also conducted operational trials and fleet-level applications of high-output acoustic deterrents in fisheries affected by dolphin depredation and

bycatch. Technical reports from initiatives such as MERMACIFRA and CETAMBICION documented that device performance varies by species and fishery type, though higher-output systems, including the DDD series, are generally more effective for large-scale operations (Brotons et al., 2008; Buscaino et al., 2009; Izquierdo et al., 2023). This experience highlights a preference for powerful systems over conventional low-output pingers, a practice similarly reflected in Cyprus where models like the DDD and DiD are utilised across various fishery scales (Papageorgiou et al., 2024).

These regulatory and research frameworks recognise that, when implemented under controlled conditions and appropriate monitoring protocols, the potential conservation benefit of reducing lethal cetacean bycatch may outweigh the short-term acoustic exposure associated with mitigation devices. Testing such devices is necessary to determine whether technologies that fall outside current regulatory parameters could provide more effective bycatch mitigation. It is also essential to assess their potential ecological impact through noise propagation modelling and related evaluations. In summary, this work is required to support evidence-based decision-making on both the effectiveness and potential environmental implications of deploying these ADDs in operational fisheries.

Table 1 – Device specifications

Model	Manufacturer	Source Level (SPL)	Frequency (kHz)	Pulse Length (ms)	Web link	Studies
DDD03N	STM	175	5 - 500	*	https://www.stm-products.com/en/products/fishing-technology	Marçalo et al., 2025
DDD0-3H	STM	175	5 - 500	*	https://www.stm-products.com/en/products/fishing-technology	Puente et al., 2023; Marçalo et al., 2025; Rimaud et al. 2019
DiD	STM	175	5 - 500	*	https://www.stm-products.com/	Marçalo et al., 2025

					en/products/fishing-technology)	
NetShied	Future Oceans	175	60-120	*	https://www.futureoceans.com/our-pingers/	Lawson et al. (2025)
TAST**	GenusWave	175.4	1-1.8 kHz (Center frequency)	200	www.genuswave.com	Whyte et al. (2020)

Both DDD and DiD emit the same ultrasound sequences; they differ only by the duration of the intervals (randomised to avoid habituation). *Values not provided by the manufacturers. **TAST is not a single, rigid device model, but rather a technology (Targeted Acoustic Startle Technology) that has been refined over the years, evolving from laboratory equipment to prototypes in marine farms and now to modular commercial devices aimed at fishing, such as the "FisheryPod" or "SalmonSafe" from GenusWave. Furthermore, the system is programmable, and its levels can be adjusted.

Two to three field campaigns are planned: one in Kilrush Harbour, where conditions allow for a high degree of confidence that marine mammals will not be present during operations, and two in Galway Bay and adjacent shelf areas, where both static and trawl fisheries operate to represent real-world deployment scenarios. The work will be conducted under the responsibility of the applicant institution in collaboration with fisheries stakeholders and is designed to support national and EU conservation obligations regarding protected marine species. Galway Bay supports a diverse assemblage of marine mammal species, each belonging to distinct functional hearing groups as defined by Southall et al. (2019) and the NOAA Technical Guidance (2024).

To interpret the functional hearing groups and their respective TTS (Temporary Threshold Shift, a temporary hearing loss measured where the animal is) and PTS thresholds (Permanent Threshold Shift, a permanent hearing loss measured where the animal is), it is essential to distinguish between the sound emitted by a device and the sound actually received by an animal. The Source Level (SL) describes the device's sound output at 1 m. In contrast, the Received Level (RL) represents the sound level at the animal's location after accounting for transmission loss (TL) (i.e. $RL = SL - TL$), which depends on distance and environmental conditions. In addition to RL, the detectability of a signal depends on the Signal-to-Noise Ratio (SNR), which describes the difference between the received signal and the ambient noise level. In noisy environments such as active trawling operations, elevated

background noise can reduce SNR, meaning that even if a signal is present, it may not be detectable by the animal. This relationship explains why reducing the source level of ADDs is not always a viable mitigation option: Lowering SL reduces RL at all distances, and in high-noise environments, this may result in signals falling below the noise floor, compromising their detectability and effectiveness, without providing meaningful additional protection in relation to TTS or PTS thresholds, which are already based on received levels.

The species most likely to be encountered during the proposed trials, and their respective auditory characteristics, are described below.

The Harbour Porpoise (*Phocoena phocoena*) is classified as a Very High Frequency (VHF) cetacean, with functional hearing extending from approximately 100 Hz to 180 kHz and greatest sensitivity between 16 and 140 kHz. For VHF cetaceans, the NOAA (2024) Technical Guidance and Southall et al. (2019) establish the following weighted cumulative sound exposure level thresholds for non-impulsive sources: PTS onset at 155 dB re 1 $\mu\text{Pa}^2\cdot\text{s}$ and TTS onset at 140 dB re 1 $\mu\text{Pa}^2\cdot\text{s}$, applied using the Mhf weighting function (Table 2).

Grey Seal (*Halichoerus grypus*) and Harbour Seal (*Phoca vitulina*) are classified as Phocid Carnivores in Water (PCW), with functional hearing from approximately 60 Hz to 86 kHz. Both species are present in Galway Bay, with Harbour Seal holding designated protection under the Galway Bay Complex SAC (Site Code: 000268). For this hearing group, SELcum thresholds for non-impulsive sources are: PTS onset at 185 dB re 1 $\mu\text{Pa}^2\cdot\text{s}$ and TTS onset at 170 dB re 1 $\mu\text{Pa}^2\cdot\text{s}$, using the Ppw weighting function (NOAA 2024; Southall et al. 2019). While these thresholds are numerically similar to those for MF cetaceans, pinnipeds exhibit distinct behavioural sensitivities, including susceptibility to acoustic habituation, which is addressed separately in the mitigation framework.

Bottlenose Dolphin (*Tursiops truncatus*) and Common Dolphin (*Delphinus delphis*) are both classified as Mid-Frequency (MF) cetaceans, with functional hearing ranging from approximately 150 Hz to 160 kHz. For MF cetaceans, applicable SELcum thresholds for non-impulsive sources are: PTS onset at 185 dB re 1 $\mu\text{Pa}^2\cdot\text{s}$ and TTS onset at 170 dB re 1 $\mu\text{Pa}^2\cdot\text{s}$, using the Mmf weighting function (NOAA 2024; Southall et al. 2019) (Table 2).

The conservation of the target species, the Common Dolphin in the North-East Atlantic, is regulated through a combination of European and national legislation. Under the EU Habitats Directive (92/43/EEC), the species is listed in Annex IV, which requires strict protection and the preservation of favourable conservation status. Article 12 further obliges Member States to monitor incidental capture and ensure that bycatch does not have a significant negative

impact on the species. The Bycatch Regulation (Council Regulation (EC) No. 812/2004) - which introduced requirements for monitoring and mitigation, including the use of acoustic deterrent devices in specific fisheries - has since been repealed, with its provisions incorporated into the Technical Measures Regulation (Regulation (EU) 2019/1241) and its associated implementing acts, including Commission Implementing Regulation (EU) 2020/967. In parallel, the Marine Strategy Framework Directive requires Member States to achieve Good Environmental Status of their marine waters through coordinated regional action, with indicators of biodiversity – including cetacean abundance and distribution, and bycatch - forming a core part of its assessment framework.

The urgent need to reduce bycatch and strengthen the evidence base for the effectiveness of mitigation measures for Common Dolphins is further underscored by regional agreement bodies such as OSPAR and also ASCOBANS (National Research Council, 1992; ICES Advice, 2023; ASCOBANS, 2024).

The Common Dolphin is a highly mobile pelagic species and one of the most frequently recorded cetaceans in Ireland, possessing a wide distribution across both coastal and offshore Irish waters (NPWS, 2019). Rather than utilising fixed, geographically discrete breeding or resting sites, the species performs essential life-history functions across broad, dynamic marine environments in Irish waters. Extensive baseline studies in Ireland, such as the ObSERVE aerial survey programmes (Paradell et al., 2024) and the Irish offshore marine mammal atlas (Wall et al., 2013), demonstrate that their distribution hotspots and densities vary significantly across seasons and years. Furthermore, while they are known to produce calves during the summer months (Murphy et al. 2006), these breeding activities occur dynamically across their natural pelagic range rather than in strictly defined coastal nursery areas. Although abundance within the Irish Exclusive Economic Zone has increased – likely due to large-scale movements - with an estimate of 594,293 individuals (CV: 28.2) reported in the summer of 2021 (Paradel et al., 2025), bycatch mortality across the wider North-east Atlantic remains unsustainable. For example, at least 5,900 individuals were estimated to have died due to bycatch in the Bay of Biscay alone, highlighting the urgent need for improved mitigation strategies (ICES Advice, 2023b; ASCOBANS, 2024). Recent research indicates that between 2013 and 2023, a total of 1,407 common dolphins were recorded stranded along the Irish coast, with evidence of bycatch identified in approximately 44.66% of examined carcasses (Navarro González, 2024).

Table 2: Non-Impulsive Auditory Injury Thresholds by Hearing Group (NOAA 2024; Southall et al. 2019)

Hearing Group	Bandwidth	Weighting Function	TTS (LE,24h)	PTS (LE,24h)
VHF Cetaceans	200 Hz – 165 kHz	f1 = 9.3 kHz, f2 = 139 kHz, C = 1.14 dB, a = 1.8, b = 2	153 dB	173 dB
HF Cetaceans	150 Hz – 160 kHz	f1 = 8.1 kHz, f2 = 104 kHz, C = 1.25 dB, a = 1.2, b = 2	178 dB	198 dB
Phocid Pinnipeds (PCW)	40 Hz – 90 kHz	f1 = 1.5 kHz, f2 = 27 kHz, C = 0.82 dB, a = 1.0, b = 2	181 dB	201 dB

Note: Table 1. Acoustic thresholds for injury and temporary hearing shifts for non-impulsive underwater sound sources, such as acoustic deterrent devices, based on the NOAA (2024) Technical Guidance Version 3.0. Thresholds for permanent threshold shift (PTS) and temporary threshold shift (TTS) are expressed as cumulative sound exposure levels over a 24-hour period (LE,24h). All values are frequency-weighted according to the specific auditory weighting functions defined for each marine mammal hearing group. For non-impulsive sources, peak sound pressure level criteria are not applicable as the primary risk is associated with the total energy dose received over time.

This project addresses these gaps by collecting empirical acoustic data on ADDs deployed in operational fishing contexts as well as controlled simulations of static gear scenarios. The resulting dataset will support sound propagation modelling and provide evidence to inform mitigation policy, fisheries management, and conservation decision-making in Ireland.

- 4) Full details of proposed activity to be covered by the derogation (including a site plan). The site may be inspected by an NPWS representative, so the details given**

should clearly reflect the extent of the project. This information will be used to compare site conditions with the Method Statement.

There are significant knowledge gaps regarding the understanding of the effects of Acoustic Deterrent Devices (ADDs) on the marine soundscape, including their propagation range, variability across fishing métiers, and their contribution to cumulative underwater noise exposure for protected cetacean species. Modelling devices that operate outside standard acoustic specifications is essential to characterise their noise propagation and better understand whether such technologies can ultimately function as safe and effective bycatch-reduction tools. Empirical field measurements are therefore required to support robust sound propagation modelling and to inform evidence-based bycatch mitigation policy in Irish waters.

The proposed activity involves a series of controlled acoustic trials to evaluate the underwater sound emissions, propagation characteristics, and operational performance of various commercially available Acoustic Deterrent Devices (ADDs), specifically the STM DDD and DiD models, Future Oceans NetShield pinger and TAST devices. The trials will be conducted under two complementary scenarios:

1. Controlled simulations of static gear scenarios, designed to replicate typical configurations of gillnets or anchored gear in a standardised and measurable way; and
2. Operational trawling and static gear deployments, where ADDs are attached directly to active fishing gear during normal towing operations.

The primary objective is to quantify received sound levels at varying distances and depths in order to generate empirical inputs for subsequent underwater sound propagation modelling. The duration of each field campaign will range from one to three days, depending on weather conditions, to ensure suitable recording quality. Two to three field campaigns are planned: one in Kilrush Harbour, where conditions allow for a high degree of confidence that marine mammals will not be present during operations, and two in Galway Bay: one in an opportunistic platform simulating static gear scenario and potentially one conducted in association with fishing operations to represent real-world deployment scenarios.

The fieldwork will utilise a vertical acoustic sampling platform deployed from a research vessel.

Acoustic recordings will be collected using a calibrated SoundTrap ST500 HF autonomous underwater recorder (sampling rate up to 576 kHz), deployed from the research vessel or from an inflatable workboat when required for safe operations near fishing gear.

Recordings will be conducted using a structured spatial design, with the recorder deployed at defined relative distances from the active ADD source. For trawling scenarios, distances will be computed dynamically using GPS-based source–receiver separation during towing. For simulated static scenarios, distances will be measured relative to the fixed gear position.

The survey with static gear will follow a standardised radial transect design to enable robust sound modelling. At each site, the research vessel will occupy four distinct recording stations relative to the fixed ADD mooring (Table 3). To ensure high-quality data and minimise the project's acoustic footprint, all recordings will be conducted with the vessel's engines switched off. The acoustic sampling design follows a strictly defined temporal framework to minimise unnecessary sound emission during controlled experimental trials. For these trials, each recording station will consist of three depth-specific deployments, with pinger activation limited to 10 minutes per depth (totalling 120 minutes per device in total) to characterise vertical variability in received levels and propagation conditions. The experimental design includes three to four radial sampling stations positioned relative to the sound source, typically comprising near-field, mid-field, far-field, and control locations, depending on operational conditions.

For data collection during commercial fishing operations, acoustic recordings will be conducted while the fishing gear is actively deployed and the ADD remains attached to the gear. Because the pinger cannot be deactivated once the tow begins, its operation will coincide with the duration of the fishing haul. Commercial trawl operations typically involve tow durations of approximately 2 to 5 hours per haul, and the acoustic emissions generated during the experiment will therefore remain within the temporal bounds of normal fishing activity. This approach ensures that acoustic emissions generated during the study remain comparable to those produced during normal fishing operations.

Table 3 – Recording stations details

Recording Station	Recording Depth (m)	Recording Duration per depth	ADD Depth (m)	Recording Duration per device	Recording Duration (all devices)
Near-Field (150 m from ADD)	10, 20, 40	10 min per depth	20 m	30 min	210 min (3.5 h)
Mid-Field (400 m from ADD)	10, 20, 40	10 min per depth	20 m	30 min	210 min (3.5 h)
Edge-Field (800 m from ADD)	10, 20, 40	10 min per depth	20 m	30 min	210 min (3.5 h)
Far-Field/Control (1500 m from ADD)	10, 20, 40	10 min per depth	20 m	30 min	210 min (3.5 h)
TOTAL (all stations)	-	-	-	-	840 min (14 h)

Environmental metadata (GPS position, sea state, water depth, temperature, and, where feasible, sound speed profile information) will be recorded concurrently to support later modelling using standard propagation frameworks on dBSea software.

Behavioural observations of marine mammals will not be a primary experimental component but may be recorded opportunistically when animals are present near active ADDs.

The MMO is responsible for implementing a precautionary mitigation protocol consistent with national and international guidance for the management of anthropogenic underwater sound (NPWS, 2014; JNCC, 2017). Prior to the commencement of ADD activation, the MMO will conduct a systematic visual watch of at least 30 minutes within a 500 m mitigation zone to ensure that no cetaceans are present. Trials will not commence if mother–calf/pup pairs are detected within the mitigation zone. Visual monitoring will continue throughout the trial period, and the MMO will retain full authority to delay or halt operations if animals are sighted within or remain inside the mitigation zone. Any behavioural observations are purely opportunistic and secondary to the primary goal of quantifying sound propagation; there is no deliberate approach or attraction of animals.

All personnel involved in field data collection hold professional certifications in international maritime safety standards. This includes the ENG 11 (Seafarer Medical Fitness Certificate), PST (Personal Survival Techniques), and Security Awareness training, and the extent of the work will remain limited to short-duration acoustic trials at selected sites within the proposed survey area.

5) Ecological Survey and site assessment (Not required for applications to carry out surveys)

- a. Pre-existing information on species at location and environs.**
- b. Status of the species in the local/regional area (relevant to the consideration of the impact on the population at the relevant geographic scale (Test 3))**
- c. Objective(s) of survey**
- d. Description of Surveys Area**
- e. Survey methodology (including evidence as to how the methodology represents best practice and is appropriate to the Objective). Methodology should include survey maps, details of timing, climate, equipment used and identify any uncertainties or difficulties encountered.**
- f. Survey results including raw data, any processed or aggregated data, and negative results as appropriate. Photographs and maps must be provided where site-specific features are referred.**

g. Population size class assessment.

6) Evidence to support the Derogation Tests

Test 1 - Reason for Derogation

i. There should be a clear explanation as to why a specific reason(s) has been selected in the application form

The application qualifies under (d): For the purpose of research and education, of re-populating and re-introducing these species and for the breeding operations necessary for these purposes, including artificial propagation of plants.

The objective of the proposed activities is to generate essential scientific data for the purpose of research, to characterise the acoustic propagation and performance of Acoustic Deterrent Devices (ADDs) as mitigation measures to reduce bycatch of common dolphins (*Delphinus delphis*) and other marine mammals. These activities fall within the scope of Article 16(1)(d) of the Habitats Directive (92/43/EEC), which permits derogations for research purposes, provided that there is no satisfactory alternative and that the action is not detrimental to the maintenance of the population at a favourable conservation status in its natural range.

Incidental capture in fisheries is recognised as the most significant ongoing threat to common dolphins in the North-East Atlantic, with bycatch levels in some regions exceeding sustainable thresholds (ICES Advice, 2023; ASCOBANS, 2024). The proposed research directly addresses this conservation issue by providing the scientific basis required to evaluate and optimise mitigation technologies, including both conventional ADDs (e.g. STM DDD series, Fishtek pingers, Future Oceans devices) and alternative approaches such as Targeted Acoustic Startle Technology (TAST). These technologies may fall outside current regulatory specifications under Commission Implementing Regulation (EU) 2020/967, and their assessment is necessary to determine whether they can be authorised under Article 2(3) of that Regulation based on demonstrated effectiveness. Though, as noted earlier, under Commission Implementing Regulation (EU) 2020/967, Member States are permitted to authorise devices that do not meet the standard technical specifications, provided their effectiveness in reducing incidental cetacean bycatch is clearly demonstrated and properly documented (European Commission, 2020).

The proposed activities do not involve the deliberate capture, handling, or disturbance of animals. The study is limited to the physical characterisation of underwater sound fields, with acoustic emissions that are short-term, intermittent, and spatially restricted. Exposure, if it occurs, will be temporary and localised, and is expected to remain below thresholds associated with auditory injury (Please see item 3 in this document). As such, the activities are not anticipated to adversely affect the conservation status of the species concerned.

Reducing or eliminating acoustic emissions would prevent the collection of empirical data required to model sound propagation and assess the effectiveness and environmental implications of ADD deployment. Similarly, reliance on existing data is insufficient, as there is a recognised lack of independent, field-based evidence on the performance of these devices, particularly for higher-output or non-conventional technologies.

The proposed work is therefore necessary to address a critical knowledge gap directly linked to a major conservation threat. The limited and temporary nature of potential disturbance is outweighed by the expected long-term conservation benefits, including the development of more effective bycatch mitigation measures and the reduction in cetacean mortality.

b. Test 2 - Absence of Alternative Solutions

i. Applicants must list the alternatives to the proposed activity that have been considered, including the do-nothing alternatives in a clear and objective manner. A basic requirement is that these alternatives should be compared in terms of their impact on the species subject to strict protection. It should be clear to NPWS officials as to why the chosen approach has been selected.

- The "do-nothing" alternative is unacceptable because it allows the current gap in scientific knowledge regarding the optimal use and effectiveness of acoustic deterrent devices (ADDs) to persist. It fails to address the transformation of the marine soundscape caused by the mass deployment of these devices across fishing fleets. While existing literature focuses on the impact of individual devices, real-world operations involve the simultaneous use of multiple units, shifting the underwater environment from its natural state to one characterised by chronic anthropogenic noise. This represents a significant scientific and regulatory blind spot. The primary objective of this research is not to assess direct biological responses of individual animals, but to characterise the cumulative acoustic signature and total noise input into the marine environment. By modelling how individual acoustic ranges overlap and propagate under realistic conditions, this study will quantify the cumulative sound field,

determine the total ensonified area, and identify the distances over which marine species are likely to be affected, including the loss of acoustic refuges. Without these empirical data and propagation modelling outputs, it is not possible to develop evidence-based deployment guidelines or to manage the large-scale acoustic disturbance associated with widespread ADD use. Failure to proceed would result in continued reliance on single-device assessments that do not reflect actual environmental conditions.

- **Testing within current specifications:** The study was designed to assess not only medium-frequency ADDs but also high-frequency ADDs with different SPL levels. Testing solely within the currently regulated SPL specifications is unsuitable, as it does not address the specific data gap this research seeks to resolve, particularly regarding the cumulative acoustic effects of high-output devices deployed at scale. The primary objective of this study is not to evaluate the direct biological effects of these devices on individual animals, but to characterise the "sound signature" and total noise input into the marine soundscape. Previous studies conducted in Scottish waters have highlighted the importance of understanding the spatial footprint and cumulative soundscape contribution of ADD deployments, particularly under chronic operational scenarios associated with aquaculture (Findlay et al., 2018; 2022). To build accurate acoustic models of propagation and transmission range, it is necessary to record non-conventional, high-output models that exceed current standards. These data are essential to quantify the scale of the cumulative sound field and to understand the various environmental properties that affect sound transmission in realistic operational areas. Without capturing these higher-output signatures, it is not possible to accurately model the full noise footprint generated by the simultaneous operation of a vessel fleet. This research aims to examine how cumulative excessive noise inputs modify the marine environment, necessitating measurements beyond standard recording limits. Such an approach is essential to provide a comprehensive assessment of the effects of large-scale deployment on underwater soundscapes and to determine the spatial extent over which these impacts will occur.
- **Relying on literature/modelling:** A comprehensive systematic review conducted under the Marine Beacon project has identified substantial gaps and inconsistencies in the existing body of ADD research, including variability in device performance, acoustic properties, effective ranges, and reported impacts on marine mammals. The available literature remains insufficient to support robust policy development. While modelling is a valuable tool, it is inherently dependent on theoretical assumptions and requires

empirical validation. Site-specific field trials are therefore essential to ground-truth, calibrate, and verify model outputs against real-world environmental conditions. Reliance solely on modelling without empirical data is inadequate for informing responsible and evidence-based conservation decision-making.

- **Phased Approach / Gradual Sound Ramp-up:** A gradual increase in source level is not technically feasible for the ADDs used in this study. These devices are autonomous, factory-calibrated systems with fixed source levels and pre-programmed emission characteristics, which activate automatically upon deployment and cannot be adjusted in real time. The devices operate at source levels of approximately 175–175.4 dB SPL, which is approximately 49 dB below the 224 dB SPL Temporary Threshold Shift onset threshold defined by NPWS. Due to the logarithmic nature of the decibel scale, this difference corresponds to an approximate 80,000-fold increase in acoustic intensity, indicating that the energy required to reach the TTS threshold is of a substantially higher order of magnitude than that emitted by the devices. This safety margin applies across all cetacean functional hearing groups.
- **Lower Sound Level Configurations:** Lower sound level configurations are not technically or operationally viable, as the ADD models used are factory-calibrated, autonomous systems with fixed output that cannot be adjusted before or during deployment. Safety during deployment is ensured through a mandatory 500-metre mitigation zone, within which a minimum 30-minute pre-activation visual monitoring period is conducted by a trained Marine Mammal Observer to confirm the absence of sensitive species. The source levels of the devices remain below established auditory injury thresholds for all relevant marine mammal hearing groups, even in the unlikely event that animals enter the area after activation. Reducing output would increase the likelihood of signal masking in noisy operational environments, particularly in trawl fisheries, thereby compromising detectability and reducing device effectiveness. This would undermine the intended conservation objective and could result in increased bycatch.
- **Alternative Location (Conducting trials elsewhere in Irish waters):** Conducting trials in a different location within Irish waters would not eliminate the risk of disturbance, as species such as the Common Dolphin are widely distributed year-round. Site selection has been specifically designed to minimise exposure risk by avoiding known marine mammal hotspots. Galway Bay was selected due to its representative bathymetry and its suitability for controlled deployments in relatively confined waters. Trial locations within the bay will avoid sensitive areas such as the Galway Bay Complex SAC, and

acoustic emissions will be spatially constrained. Real-time mitigation measures are incorporated, allowing immediate cessation of sound if marine mammals enter the mitigation zone. Alternative sites, including more exposed offshore areas or locations such as Tralee Bay, were deemed not suitable due to higher species density of bottlenose dolphins, for example, or reduced monitoring capability. Tank-based testing was also rejected due to acoustic artefacts that prevent realistic propagation measurements. Instead, one of the trials is planned for Kilrush Harbour, a semi-controlled environment where the absence of marine mammals can be visually confirmed before deployment.

- **Reduction in Scale, Intensity or Duration:** Reducing the scale, intensity, or duration of the study is not feasible without compromising its scientific validity. Alternatives involving fewer recording stations or shorter sampling periods were considered but deemed insufficient to achieve robust spatial and temporal characterisation of sound propagation. The trials are intentionally limited in duration, typically lasting only a few hours and generally completed within a single day, with a maximum of three days only where required due to logistical or environmental constraints. The number of recording stations (three to four per area) has been minimised to the lowest level compatible with adequate spatial coverage. During controlled trials, ADD activation is restricted to short, discrete recording intervals of approximately 10 minutes per depth. In fishing trials, device activity is inherently limited by standard gear deployment durations and does not exceed typical operational conditions.
- **Alternative Timing (Conducting trials at a different time of year):** Conducting the trials at a different time of year would not remove the risk of interaction with marine mammals, as Common Dolphins are present year-round in Irish waters. Therefore, altering the timing would not eliminate the need for a derogation licence. Trials will not proceed if mother-calf pairs are observed, and schedules have been designed to minimise overlap with peak calving periods: The period of June and July represents a critical biological window in Galway Bay coinciding with the peak births of the common seal (*Phoca vitulina*) (NPWS, 2004; NPWS, 2013) and although site-specific calving data for Galway Bay are limited for harbour porpoise (*Phocoena phocoena*) and common dolphin (*Delphinus delphis*), calving in Irish waters is considered to occur predominantly during May and June (NPWS, 2011) for the former and during July and August for the latter (Murphy et al., 2009). Therefore, the months June and July have been excluded from the trial schedule in Galway Bay to reduce potential disturbance.

c. Test 3 - Impact of a derogation on Conservation Status

- i. Applicants should include details of the population at the appropriate geographic scale and an evaluation of how the proposed activity will affect the conservation status both before and after mitigation measures have been applied.**
 - ii. Full and detailed descriptions of proposed mitigation measures that are relevant to the potential impact on the target species. Evidence that such mitigation has been successful elsewhere should be provided, where available.**
- i. The proposed research activities may overlap with the occurrence of Annex II and Annex IV marine mammal species known from Irish coastal waters and the wider Northeast Atlantic, including Common Dolphin (*Delphinus delphis*), Bottlenose Dolphin (*Tursiops truncatus*), Harbour Porpoise (*Phocoena phocoena*), Harbour Seal (*Phoca vitulina*), and Grey Seal (*Halichoerus grypus*). These species are regularly recorded within Galway Bay and adjacent offshore waters, although their use of the area varies seasonally and behaviourally. Common dolphins, bottlenose dolphins, and harbour porpoises are highly mobile species with broad regional distributions throughout Irish and Northeast Atlantic waters (Murphy et al., 2021). As such, they do not depend exclusively on the proposed trial locations for critical life-history functions such as breeding, feeding, or resting. Similarly, harbour and grey seals occur widely throughout Irish coastal habitats, including Galway Bay, where seals utilise haul-out sites and nearshore foraging habitat. Particular consideration has been given to seasonal ecological sensitivities, as discussed previously, the critical window of the neonate season will be avoided, with no trials within that period.
- ii. Prior to mitigation, the principal potential impact associated with the proposed activity is temporary behavioural disturbance arising from short-duration exposure to acoustic deterrent devices (ADDs). Potential responses may include brief localised avoidance, short-term interruption of behaviour, or temporary displacement from the immediate vicinity of the sound source. The acoustic exposure associated with the proposed trials is intermittent, spatially restricted, and non-coercive. ADD source levels (~175–175.4 dB SPL) remain substantially below currently recognised thresholds associated with temporary threshold shift (TTS) onset for cetaceans and pinnipeds, ensuring a considerable safety margin for all relevant hearing groups. Consequently, physical injury, permanent auditory damage, mortality, habitat exclusion, or barrier effects are not anticipated. No long-term impacts on reproduction, calf or pup survival, migration,

habitat availability, population connectivity, or ecological function are anticipated. The proposed activity is therefore not expected to adversely affect the favourable conservation status of any marine mammal species occurring within the study area. Following implementation of mitigation measures, any residual impact is expected to remain negligible, temporary, and fully reversible, ensuring that the proposed activity will not result in deterioration of conservation status within the natural range of any affected species.

All research activities will be conducted under tightly controlled temporal and spatial conditions designed to minimise acoustic exposure and reduce the likelihood of disturbance to marine mammals. All research activities will be conducted under tightly controlled, short-term temporal and spatial conditions. These measures will limit overall acoustic exposure and ensure that all activities remain confined to the defined trial area, thereby minimising any potential temporary disturbance. To minimise risk to marine mammals, all trials will follow a precautionary mitigation protocol consistent with national and international guidance for the management of anthropogenic underwater sound (NPWS, 2014; JNCC, 2017). Prior to the commencement of ADD activation in any trial, the MMO will conduct a systematic visual watch of at least 30 minutes within a 500 m mitigation zone to ensure that no marine mammals are present. Trials will not commence until the zone is clear. During recordings under a static gear scenario, visual monitoring will continue throughout the trial. In these controlled scenarios, the MMO will retain full authority to delay or halt operations if any marine mammal species is sighted entering the mitigation zone. The semi-enclosed nature of Kilrush Harbour further facilitates visual confirmation of marine mammal absence prior to device activation in static gear scenarios.

For sound-propagation work conducted during operational gear deployments (active fishing/trawling), it is recognised that animals may enter the area once the commercial gear has been deployed and the ADD is active. Because it is practically unfeasible to halt commercial towing operations immediately without compromising safety or the gear, mitigation for operational trials relies strictly on ensuring no animals are present prior to ADD activation, with continuous opportunistic monitoring maintained throughout.

7) Monitoring the impacts of the derogations

- a. Applicants must include details of how they propose to verify whether the derogations have been implemented correctly and whether they achieved their objective, using scientifically based evidence, and, if**

necessary, how the applicant will take corrective measures where required.

- b. Applicants should provide details of proposed reports to be submitted to the NPWS including the results of monitoring.**

Monitoring will be conducted to ensure that the derogation is implemented under strictly controlled conditions. This will include continuous monitoring to detect the presence of other cetacean species in the area and to identify sensitive groups, such as mother–calf pairs, both prior to and throughout all trials. Trials will only proceed when it is confirmed that no such sensitive groups are present, thereby ensuring minimal disturbance.

In addition to real-time monitoring, the study will rely on peer-reviewed scientific literature to guide and validate all procedures. This includes studies that have conducted similar ADD trials, as well as controlled behavioural response experiments involving Common Dolphins and other relevant cetacean species. These sources will inform the selection of thresholds, shape monitoring procedures, and guide interpretation of behavioural responses, ensuring robust oversight of animal welfare and preventing harm. Trials will only proceed when it is confirmed that no such sensitive groups are present, thereby ensuring minimal disturbance. As a corrective measure, if sensitive groups or any other marine mammals are detected entering the mitigation zone during operations, the MMO has the full authority to ensure trials are immediately delayed or halted.

- **Reporting:** A report will be submitted to the NPWS detailing the outcomes of the trials, the behavioural responses observed, and confirmation that mitigation measures (such as avoiding maternal groups) were implemented correctly.

8) References from both Derogation Application Form (Main document) and this present document (Supporting Information Document)

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