



Geological Survey Ireland Marine Survey Operations 2021-2022

Appropriate Assessment Screening and Natura Impact Statement



**An Roinn Comhshaoil,
Aeráide agus Cumarsáide**
Department of the Environment,
Climate and Communications



Geological Survey
Suirbhéireacht Gheolaíochta
Ireland | Éireann

GLOSSARY

DECC	Department of the Environment, Climate and Communications
GSI	Geological Survey Ireland
MI	Marine Institute
NPWS	National Parks and Wildlife Service
DEHLG	Department of Environment, Heritage and Local Government
AA	Appropriate Assessment
NIS	Natura Impact Statement
MMO	Marine Mammal Observer
SAC	Special Area of Conservation
SOLAS	The International Convention for the Safety of Life at Sea
DTM	Digital Terrain Model

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1. Introduction

1.1 INFOMAR – Programme Background

Ireland has undertaken one of the largest marine mapping programmes in the world. The value of this work to ocean management is derived not just from ambitious mapping, but by having matched this with an investment in data management, an open access policy, and effective partnerships with research, public and private organisations.

Following from the very successful Irish National Seabed Survey, in 2006, a successor programme was approved, Integrated Mapping For the sustainable development of Ireland's Marine Resource (INFOMAR). It is managed jointly by Geological Survey Ireland (GSI) and the Marine Institute (MI), with the current priority being to map inshore and shelf areas, integrate and provide the data, and support the value added use of the data & products. This strategic capital project is funded through the Department of the Environment, Climate and Communications.

In 2008 the Department of Communications, Energy and Natural Resources commissioned PricewaterhouseCoopers (PWC) to conduct an appraisal of the INFOMAR programme and to make recommendations on the future implementation of the programme. The Benefit to Cost Ratio established for completion of the project was between 4 and 6, the higher return being related to reducing the 20 year total duration of the project.

The operational focus up to 2016 was on mapping 26 priority bays, 3 priority coastal areas, and undertaking mapping in the Biologically Sensitive Area. Between 2016 and 2026 the focus is now on mapping the remaining waters unmapped to date, including completion of some bays and inshore areas already visited. Data which are provided openly and freely are having a significant impact on marine research and development, safety, environment, energy and infrastructure, fisheries, flood risk management and heritage. The division of the remaining work between the project partners is such that Geological Survey Ireland is tasked with completing all seabed mapping from the shoreline out to 30 nautical miles, with the Marine Institute surveying the remaining shelf areas beyond 30 nautical miles.

These SACs will be discussed in more detail in the appropriate assessment section along with associated conservation objectives and potential sensitivities, recommended actions and mitigation procedures which will be put into place prior to undertaking survey operations.



Expected Benefits:

The acquisition of high resolution hydrographic data within the designated SAC areas facilitates the development of Digital Terrain Models (DTMs) and qualitative derivatives such as slope, aspect and rugosity which act as useful habitat descriptors and environmental proxies as well as key baseline data for conservation and habitat monitoring and protection. The expected conservation benefits of undertaking the proposed plan of operations are outlined below.

Hydrographic data acquisition will enable improved modelling of oceanographic dynamics and benthic habitats. This will provide a better understanding of the local ecosystem and the monitoring requirements needed to ensure that the long term integrity of SAC sites within the intended area of operations are maintained.

Significant vessel activity takes place along the coast, with cargo, passenger, marine leisure and inshore fisheries vessels routinely transiting through the proposed survey area including SAC areas. In many cases charted depths used for navigation have not been updated for over a century.

Hydrographic information is the essential baseline data required to ensure that the State can meet its obligations under the SOLAS Convention in providing safe passage for vessels, their crew and cargo. Failure to provide up to date information in an SAC could result in vessel grounding, fuel spillage and long term detrimental impacts on the surrounding environment. Shallow, previously unmapped features are of risk to fisheries, tourism and commercial shipping and are regularly identified during routine INFOMAR surveys using modern mapping techniques. Salvage operations for accidents at sea require detailed hydrographic information to ensure units involved in recovery operations may do so safely.

The acquisition of INFOMAR's strategic baseline dataset for the South and South-West Coasts including NPWS designated SAC areas are profiled as part of the 2020/2021 INFOMAR acquisition programme. This Appropriate Assessment aims to ensure adequate mitigation measures can be defined for the proposed acoustic survey activities to be undertaken. It aims to address the requirements under the Habitats Directive, to ensure the proposed acoustic survey activity minimises impacts in relation to the site conservation objectives.



1.2 Appropriate Assessment - Background

The EU Habitats Directive ensures the conservation of a wide range of rare, threatened or endemic animal and plant species. Some 200 rare and characteristic habitat types are also targeted for conservation in their own right.

Adopted in 1992, the Council Directive 92/43/EEC of 21 May 1992 on the conservation of natural habitats and of wild fauna and flora aims to promote the maintenance of biodiversity, taking account of economic, social, cultural and regional requirements. It forms the cornerstone of Europe's nature conservation policy with the Birds Directive and establishes the EU wide Natura 2000 ecological network of protected areas, safeguarded against potentially damaging developments.

National guidance for planning authorities on Appropriate Assessment of plans and projects in Ireland was published by the Department of Environment, Heritage and Local Government (DEHLG) in 2009 – entitled “Appropriate Assessment of Plans and Project in Ireland – Guidance for Planning Authorities”. It states:

“The obligation to undertake appropriate assessment derives from Article 6(3) and 6(4) of the Habitats Directive, and both involve a number of steps and tests that need to be applied in sequential order. Article 6(3) is concerned with the strict protection of sites, while Article 6(4) is the procedure for allowing derogation from this strict protection in certain restricted circumstances. Each step in the assessment process precedes and provides a basis for other steps. The results at each step must be documented and recorded carefully so there is full traceability and transparency of the decisions made. They also determine the decisions that ultimately may be made in relation to approval or refusal of a plan or project. AA [Appropriate Assessment] is not a prohibition on new development or activities but involves a case-by-case examination of the implications for the Natura 2000 site and its conservation objectives. In general terms, implicit in Article 6(3) is an obligation to put concern for potential effects on Natura 2000 sites at the forefront of every decision made in relation to plans and projects at all stages, including decisions to provide funding or other support.”

Article 6(3) of the Habitats Directive establishes the requirement for Appropriate Assessment:

“Any plan or project not directly connected with or necessary to the management of the site but likely to have a significant effect thereon, either individually or in combination with other plans or projects, shall be subject to appropriate assessment of its implications for the site in view of the site's conservation objectives. In the light of the conclusions of



the assessment of the implications for the site and subject to the provisions of paragraph 4, the competent national authorities shall agree to the plan or project only after having ascertained that it will not adversely affect the integrity of the site concerned and, if appropriate, after having obtained the opinion of the general public.”

Article 6(4) allows for a derogation from this strict protection under certain circumstances.

“If, in spite of a negative assessment of the implications for the site and in the absence of alternative solutions, a plan or project must nevertheless be carried out for imperative reasons of overriding public interest, including those of a social or economic nature, the Member State shall take all compensatory measures necessary to ensure that the overall coherence of Natura 2000 is protected. It shall inform the Commission of the compensatory measures adopted.

Where the site concerned hosts a priority natural habitat type and/or a priority species, the only considerations which may be raised are those relating to human health or public safety, to beneficial consequences of primary importance for the environment or, further to an opinion from the Commission, to other imperative reasons of overriding public interest.”

It is the responsibility of the competent national authority, in this instance Geological Survey Ireland, to decide whether or not the proposed marine surveys should be permitted, taking into account any potential impact on the Natura 2000 sites whose extents the surveys overlap.

1.3 Stages of the Appropriate Assessment

The Commission’s methodological guidance (EC, 2002) promotes a four-stage process to complete the AA, and outlines the issues and tests at each stage. An important aspect of the process is that the outcome at each successive stage determines whether a further stage in the process is required (DEHLG, 2009).

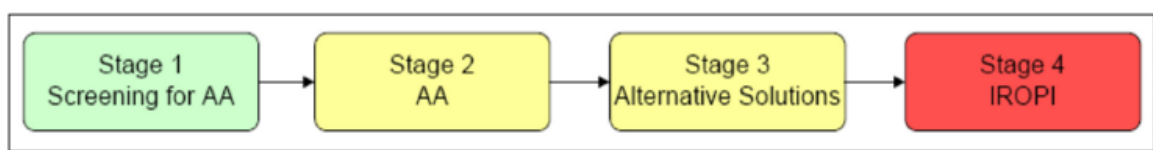


Figure 1. Stages in the AA process (Source: DEHLG, 2009)

(1) Appropriate Assessment Screening

The screening stage examines and documents whether or not the proposed work is directly connected to or necessary for the management of a Natura 2000 site, or likely to have potential impacts on a Natura 2000 site with regard to its conservation objectives.

According to “Appropriate Assessment of Plans and Project in Ireland – Guidance for Planning Authorities” (DEHLG, 2009):

“If the effects are deemed to be significant, potentially significant, or uncertain, or if the screening process becomes overly complicated, then the process must proceed to Stage 2 (AA). Screening should be undertaken without the inclusion of mitigation, unless potential impacts clearly can be avoided through the modification or redesign of the plan or project, in which case the screening process is repeated on the altered plan. The greatest level of evidence and justification will be needed in circumstances when the process ends at screening stage on grounds of no impact.”

In the case of GSI’s proposed INFOMAR survey work, the nature of the survey equipment used and its potential effect on relevant NATURA 2000 qualifying interests is documented.

(2) Appropriate Assessment (Natura Impact Statement)

At this stage the proponent of the work (Geological Survey Ireland in this instance) prepares and a Natura Impact Statement, a scientific report that examines the following:

- Scope of proposed work and the potentially affected Natura sites with regard to their conservation objectives.
- Consultation with NPWS.
- Nature of potential impacts without mitigation.
- Proposed mitigation measures to offset any adverse effects.
- NIS Conclusions.

(3) Alternative Solutions

As described in “Appropriate Assessment of Plans and Project in Ireland – Guidance for Planning Authorities” (DEHLG, 2009):

“This stage examines any alternative solutions or options that could enable the plan or



project to proceed without adverse effects on the integrity of a Natura 2000 site. The process must return to Stage 2 as alternatives will require appropriate assessment in order to proceed. Demonstrating that all reasonable alternatives have been considered and assessed, and that the least damaging option has been selected, is necessary to progress to Stage 4.”

(4) Imperative Reasons for Overriding Public Interest (IROPI)

As described in “Appropriate Assessment of Plans and Project in Ireland – Guidance for Planning Authorities” (DEHLG, 2009):

“Stage 4 is the main derogation process of Article 6(4) which examines whether there are imperative reasons of overriding public interest (IROPI) for allowing a plan or project that will have adverse effects on the integrity of a Natura 2000 site to proceed in cases where it has been established that no less damaging alternative solution exists. Appropriate Assessment of Plans and Projects in Ireland - Guidance for Planning Authorities Section 3 - The AA Process 29 The extra protection measures for Annex I priority habitats come into effect when making the IROPI case¹⁸. Compensatory measures must be proposed and assessed. The Commission must be informed of the compensatory measures. Compensatory measures must be practical, implementable, likely to succeed, proportionate and enforceable, and they must be approved by the Minister.”



2. Scope of Work

2.1 INFOMAR Operations

From 1st December 2020 through to November 2021 it is proposed to primarily survey at key areas on the South Coast ranging between Kinsale, Co. Cork and the Dingle Peninsula, Co. Kerry, along with some ancillary survey work in the Dublin Bay area, with the focus on mapping as near to shore as safely possible (typically between 2m and 0m LAT), although a large offshore area is designated for R.V. Mallet / R.V. Keary operations (up to 30 nautical miles offshore). While larger scale survey work is not planned off the east coast for 2021, parts of the shelf there remain to be mapped by 2026 and may be targetted by GSI vessels should the opportunity arise while they are located at their base in Dublin – therefore those potential survey extents are included in this Appropriate Assessment.

The area of expected operations is outlined in Figure 2 and all SAC sites listed on the NPWS website (<https://www.npws.ie/protected-sites/sac>) identified as potential concerns are also displayed.

The survey will be conducted to IHO “Order 1a” standard and the data will be used to update the navigational charts and, once ratified, it will be available for free via the INFOMAR website (www.infomar.ie).



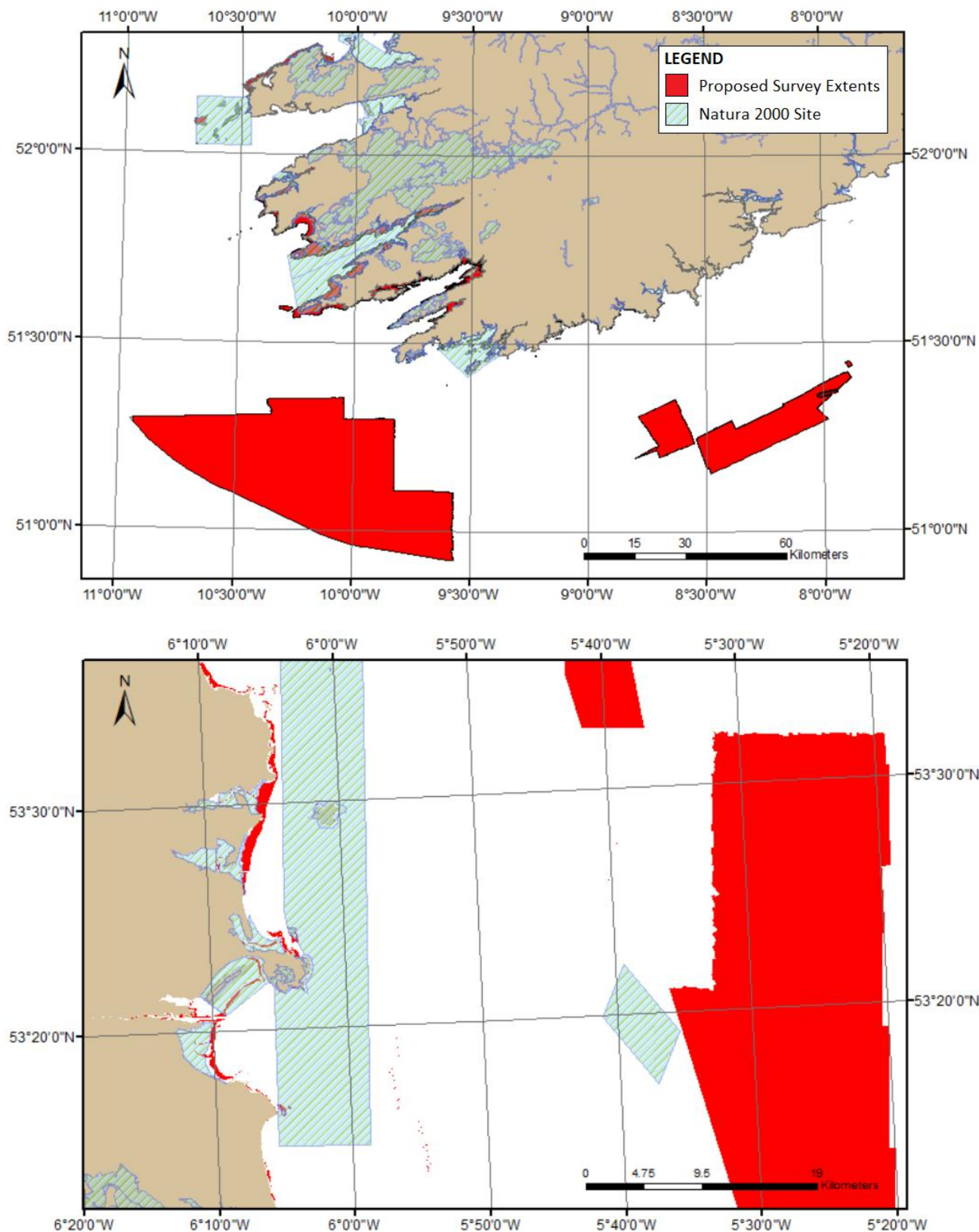


Figure 2: Expected Areas of INFOMAR Survey Operations 2020/2021

2.1 Hydrographic Survey Equipment

Acoustic Survey Equipment installed on INFOMAR survey platforms are documented in the tables below, which also provide specific information on sonar frequency for each installed system on a vessel by vessel basis. Specifications for INFOMAR inshore survey vessels are provided in the next section.

Acoustic Survey Equipment – R.V. Keary			
Equipment	Model	Deployment	Company
Multibeam Echo Sounder	EM2040 (200, 300 & 400 kHz)	Retractable hull mount	Kongsberg Maritime: http://www.km.kongsberg.com/ks/web/nokbg0397.nsf/AllWeb/B7D372808AE6002DC1257583002F1122?OpenDocument&Count=-1&Cat=Support
Singlebeam Echo Sounder	EA400 (38 & 200 kHz)	Retractable hull mount	Kongsberg Maritime: http://www.km.kongsberg.com/ks/web/nokbg0397.nsf/AllWeb/E4515C34D66E4673C1257583002F2524?OpenDocument&Count=-1&Cat=Support
Sub-Bottom Profiler	Edgetech 3200XS CHIRP (1-12 kHz)	Retractable hull mount	Edgetech: https://www.edgetech.com/wp-content/uploads/2019/07/0004840_REV_E.pdf

Table 1: Acoustic Equipment Operated on board the R.V. Keary



Acoustic Survey Equipment – R.V. Mallet			
Equipment	Model	Deployment	Company
Multibeam Echo Sounder	EM2040P (200, 300 & 400 kHz)	Retractable hull mount	Kongsberg Maritime: http://www.km.kongsberg.com/ks/web/nokbg0397.nsf/AllWeb/B7D372808AE6002DC1257583002F1122?OpenDocument&Count=-1&Cat=Support

Table 2: Acoustic Equipment Operated on board the R.V. Mallet

Acoustic Survey Equipment – R.V. Lir			
Equipment	Model	Deployment	Company
Multibeam Echo Sounder	Reson T20P dual-head (200-400 kHz)	Retractable bow mount	Reson T20P: http://www.teledyne-reson.com/products/echo-sounder-seabat/seabat-t20-p/

Table 3: Acoustic Equipment Operated on board the R.V. Lir

Acoustic Survey Equipment – R.V. Galtee			
Equipment	Model	Deployment	Company
Multibeam Echo Sounder	Reson T20P dual-head (200-400 kHz)	Retractable bow mount	Reson T20P: http://www.teledyne-reson.com/products/echo-sounder-seabat/seabat-t20-p/

Table 4: Acoustic Equipment Operated on board the R.V. Galtee



Acoustic Survey Equipment – R.V. Geo			
Equipment	Model	Deployment	Company
Multibeam Echo Sounder	Reson T20P (200-400 kHz)	Retractable bow mount	Reson T20P: http://www.teledyne-reson.com/products/echo-sounder-seabat/seabat-t20-p/

Table 5: Acoustic Equipment Operated on board the R.V. Geo

2.1 Sediment Sampling Equipment

Day Grab

The Day Grab comprises two stainless steel bucket sections mounted within a stainless steel frame that ensures the grab is square and level to the seabed when it is deployed. Once lowered and the frame has made contact with the seabed, the latch plates on the buckets unlock and they are released. As the grab is retrieved the bridles connected to the buckets come under tension and the buckets close collecting the sediment sample before the grab is brought back to the surface. It samples a 0.1m² area of seabed and can potentially retrieve a volume of approximately 15 litres of sediment.



Figure 3: Day Grab

Van Veen Grab

The Van Veen Grab is a clamshell bucket made of stainless steel. Up to 20 cm deep samples of roughly 0.1 m² can be extracted with this instrument. While letting the instrument down into the water, the two levers with buckets at their ends are spread like an open scissor. The levers are locked in this position, and unlocked on hitting the ground. When the rope is pulled upward again, the two buckets close and grab a sample from the sea floor.

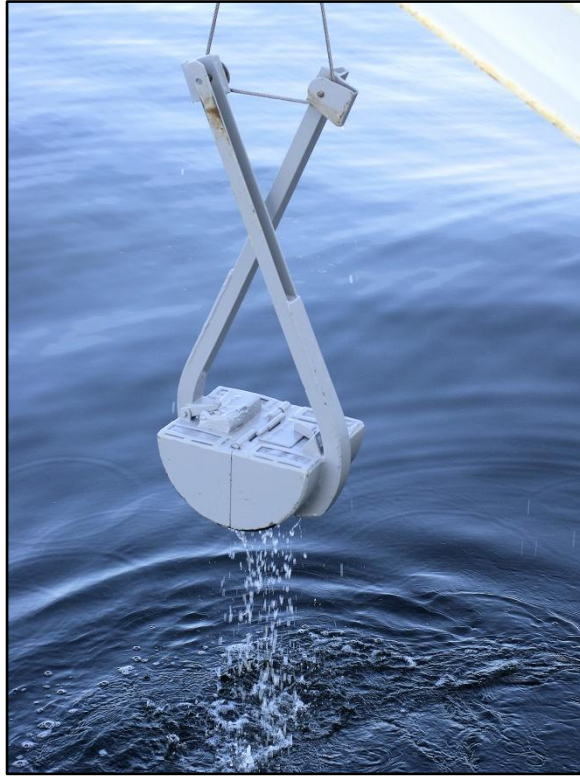


Figure 4: Van Veen Grab

2.2 Survey Vessels

The INFOMAR programme envisions the utilisation of five vessel platforms equipped for hydrographic survey operations during 2020/2021.

	Vessel Name: Flag State: Call Sign: Length: Breadth: Draught: Tonnage (GRT):	R.V. Keary Ireland EI-G0-9 15.5 m 5 m 2.1 m (max) 25 Tonnes
	Vessel Name: Flag State: Call Sign: Length: Breadth: Draught: Tonnage (GRT):	R.V. Mallet Ireland EI-SN-9 18 m 5 m 2.6 m 30 Tonnes
	Vessel Name: Flag State: Call Sign: Length: Breadth: Draught: Tonnage (GRT):	R.V. Geo Ireland EI-DK-6 7.4 m 2.8 m 1.3 m (max) 2.5 Tonnes

	Vessel Name: Flag State: Call Sign: Length: Breadth: Draught: Tonnage (GRT):	R.V. Galtee Ireland TBA 11 m 3.31 m 1.8 m (max) 3.5 Tonnes
	Vessel Name: Flag State: Call Sign: Length: Breadth: Draught: Tonnage (GRT):	R.V. Lir Ireland EI-HI-2 11 m 3.31 m 1.8 m (max) 3.5 Tonnes

Figure 5: INFOMAR Inshore Survey Platforms

3. Potential Impacts

3.1 Acoustic Impact on Marine Mammals

The waters of Ireland's Exclusive Economic Zone (EEZ) represent one of the most important cetacean (whales, dolphins and porpoise) habitats in Europe. All cetacean and 2 pinniped species (Common/Harbour and Grey seals) in Irish waters are protected by the 1976 to 2018 wildlife acts (and wildlife amendment act 2000) and Irish waters, including the EEZ, were declared a whale and dolphin sanctuary in 1991. All cetacean species are protected under the EU habitats directive and the harbour porpoise and bottlenose dolphin are listed under Annex II of the habitats directive, requiring the designation of special areas of conservation (SACs) for their protection.

In January 2014 National Parks and Wildlife Service issued the "Guidance to Manage the Risk to Marine Mammals from Man-made Sound Sources in Irish Waters". They apply to all seismic surveys, as well as multibeam, electromagnetic and side scan sonar surveys which take place in bays, inlets, or estuaries and within 1.5km of the entrance of enclosed bays/inlets/estuaries.

INFOMAR acknowledges the sensitivities associated with some priority bays and coastal areas being SACs for the protection of both resident and transient populations of Cetaceans and Pinnipeds, and commit to compliance with the relevant requirements under the Habitats Directive in relation to the site conservation objectives set by DAHG.

Potential impacts relate to the possibility of disturbance associated with acoustic transmissions from survey echo sounder equipment.



3.2 Sampling Impact on Seabed Habitats

GSI survey vessels, particularly the R.V. Keary, occasionally carry out sediment sampling for the purposes of ground truthing seabed classification maps, a key source of data for the production of habitat maps. Typically, the equipment used in Section 2.1 is used.

Due to the relatively small footprint of this sampling equipment and the well spaced-out nature of the sampling sites, the impact on any seabed habitat is considered to be negligible. Biological sampling will not be carried out in Natura 2000 sites.

3.3 Consultation

The INFOMAR programme has engaged in discussions with IWDG, CMRC, and RPS relating to implications and risks associated with routine INFOMAR survey activities, and also engaged expert acoustic advice in relation to impacts associated with the acoustic equipment.

Equipment manufacturers (Kongsberg Maritime, Reson) and independent acoustic experts have been consulted with reference to the acoustic attenuation patterns and potential impacts of same.

Communications with Kongsberg Maritime (EM3002 & EM2040 Multi-beam manufacturers) referenced the standard paper on sound attenuation (1982 JASA 72 Sep and Dec Francois & Garrison part 1 and 2). For the EM3002 a decrease of 65 dB/Km is to be expected in open water. The design specifications for all shallow water MBES systems including the EM2040 and EM2040P are within the same range as the EM3002. Horizontally the sound level is at least 30 dB below the main lobe. In practice this means that outside the main lobe (directly beneath the vessel), sound intensity is significantly less than 180dB.

Kongsberg Maritime stated that no reports on cetacean damage affiliated to the use of EM3002 multibeam echo sounders have been received by them worldwide, and they would deem it unlikely that there is damage to cetaceans from such high frequency systems.



3.4 Literature Review

A review was carried out in order to collate and assess existing best practice procedures for operating a hydrographic data acquisition programme in an SAC designated for dolphins/cetaceans. Rather than engaging in an exhaustive review on cetacean distribution, which has already been well documented, the objective of the study was to identify likely ecological impacts that might be associated with the proposed operations.

It is essential to clarify at this stage, that the proposed marine acoustic survey operation will engage technologies, which are directional in type, emitting focused directional sound waves. They should not be confused with seismic systems typically used in the oil and gas exploration industry, which emit sound energy in every direction from a point source. The significance of this is that for the proposed acoustic survey, for any given instrument, single beam, multibeam, or pinger, at any given instant in time, only a very small water volume is ensonified (1.5 – 3 degrees window of exposure to acoustic energy). As a percentage of the area proposed to be surveyed within any given SAC, the area of ensonification at any point in time is negligible.

$$\text{Area of ensonification} = \pi [\text{depth} \times \tan(\text{beam angle})]^2$$

Typically in water depths of 30m, for a shallow water multibeam system with a swath of approximately 135 degrees, an area of 1.9 m² of the seabed is ensonified, with the area decreasing linearly through the water column towards the vessel.

In relation to the frequencies and amplitudes involved in the use of these acoustic systems, some of the more relevant references are included below:



Reference A:**EM Technical Note, September 20, 2005**

Author: Erik Hammerstad

Subject: Sound Levels from Kongsberg Multibeam

The power output level of an echo sounder is normally specified by giving its source level in dB relative to 1 μ Pa at a distance of 1m from the transmit transducer. However this is really a measure of the pressure level of the output sound wave. The pressure level of a sound wave will fall off with the square of the distance from the source due to the spherical spreading of the wave, and the wave will be further attenuated due to absorption loss. In the nearfield the pressure level will be nominally constant as there is no spreading.

For the EM3002, pressure levels at a set of fixed distances are given and also the range at which the pressure level is 180 dB re 1 μ Pa. It is imperative to note that energy attenuation due to absorption has not been taken into account, so these figures represent maximum empirical values (worst case amplitudes).

SYSTEM	Power Level @1m	Power Level @10m	Power Level @100m	Power Level @1000m	180 dB Dist. From Source
EM3002	207	194	162	NA	35m

Table 6: Empirical EM3002 Pressure Levels

Reference B:

US National Marine Fisheries Service (NMFS), National Oceanic and Atmospheric Administration (NOAA)

Source: Federal Register / Vol. 72, No. 68 / Tuesday, April 10, 2007 / Notices
Subject: Small Takes of Marine Mammals
Incidental to Specified Activities

This notice referenced the Kongsberg Maritime EM120 system which has an operating frequency of 11.25–12.6 kHz. Because of the shape of the sonar beam, NMFS believes it unlikely that marine mammals will be exposed to the bathymetric sonar at levels at or above those likely to cause harassment. Further, NMFS believes that the brief exposure of cetaceans or pinnipeds to one pulse, or small numbers of signals, from the multi-beam bathymetric sonar system are not likely to result in the harassment of marine mammals.

The EM3002 and EM2040 proposed for this survey have operating frequencies of 293 and 307 kHz and 300 kHz respectively. These are significantly beyond the audible range of the Bottlenose Dolphin, and due to the higher frequencies, they have a higher acoustic attenuation rate, with reduced sonar levels and reduced impact.

Reference C:

RESON informal documentation. Extract from Reson pdf presentation

Author: Reson

Subject: Marine Mammal Impact SeaBat 7112

A study was carried out between the AN/WQX-2 MBES (multibeam echosounder) and the Reson Seabat 7112 MBES. The AN/WQX-2 is the US Navy's diver detection sonar. It is used in conjunction with trained dolphins for defence purposes. As a result, the USN did extensive experiments evaluating the impact of this sonar on dolphins.

- AN/WQX-2 - 224 dB Source Level, 10 msec pulse @ 66 kHz
Resulting USN Guideline – Keep Dolphins >50 yards away
- Reson SeaBat 7112 - 216 dB Source Level, 1 msec pulse @ 100 kHz
Lower Source Level and Higher Frequency. Far Less Impact

At 25 yards (23m), Reson 7112 sound pressure is equal to 188 dB which is empirically



established dolphin/porpoise safety threshold. At all ranges greater than 25 yards, the signal level is less. Reson concluded that their system should not pose a safety risk to dolphins/porpoises.

Again, the EM3002 and EM2040 proposed for this survey have operating frequencies of 293 and 307 kHz and 300 kHz respectively, beyond the audible range of the Bottlenose Dolphin and Grey Seal, and have lower source levels and consequently are of less impact.

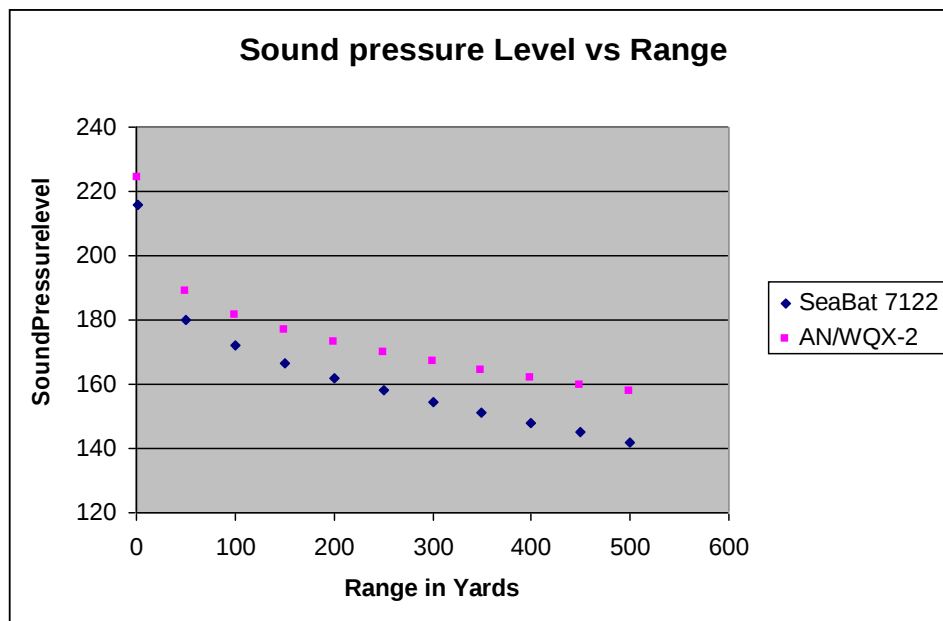


Figure 6: Sound attenuation of mid frequency multibeam

SCAR (2002)¹ recommended a method of assessing the potential risk of acoustic surveys to marine mammals by asking questions and constructing a risk matrix.

Questions that should be addressed include:

- Can the equipment physically kill or injure an animal and if so at what range?
- Can the equipment damage an animal's hearing and if so over what range?
- Does the use of the equipment affect animal behaviour and over what area?

- Does the behavioural disturbance constitute a threat to populations by changing behaviour at critical times and in critical areas?
- Will a survey affect large numbers of animals, a small important group of animals or
Will the area be free of most species during the survey?
- Will a survey affect prey species in a way that will increase or decrease their availability to predators?
- What proportion of an area used by animals is affected by the survey?

In practice it can be very difficult to assess the risk of injury as there has been little research carried out to answer these questions directly and most literature available is based on effects on humans ('The impact of Multibeam on cetaceans: A review of best practice'. O'Brien, Berrow and Wall. March, 2005).

Below is a table of marine mammal functional hearing groups and estimated functional hearing ranges proposed by Southall *et al.* (2007)

Functional Hearing Group	Estimated Auditory Bandwidth	Genera Represented (Number Species/Subspecies)	Frequency-Weighting Network
Low-frequency cetaceans	7 Hz to 22 kHz	<i>Balaena, Caperea, Eschrichtius, Megaptera, Balaenoptera</i> (13 species/subspecies)	M _{lf} (lf: low-frequency cetaceans)
Mid-frequency cetaceans	150 Hz to 160 kHz	<i>Steno, Sousa, Sotalia, Tursiops, Stenella, Delphinus, Lagenodelphis, Lagenorhynchus, Lissodelphis, Grampus, Peponocephala, Feresa, Pseudorca, Orcinus, Globicephala, Orcacella, Physeter, Delphinapterus, Monodon, Ziphius, Berardius, Tasmacetus, Hyperoodon, Mesoplodon</i> (57 species/subspecies)	M _{mf} (mf: mid-frequency cetaceans)
High-frequency cetaceans	200 Hz to 180 kHz	<i>Phocoena, Neophocaena, Phocoenoides, Platanista, Inia, Kogia, Lipotes, Pontoporia, Cephalorhynchus</i> (19 species/subspecies)	M _{hf} (hf: high-frequency cetaceans)
Pinnipeds in water	75 Hz to 75 kHz	<i>Arctocephalus, Callorhinus, Zalophus, Eumetopias, Neophoca, Phocarctos, Otaria, Erignathus, Phoca, Pusa, Halichoerus, Histriophoca, Pagophilus, Cystophora, Monachus, Mirounga, Leptonychotes, Ommatophoca, Lobodon, Hydrurga, Odobenus</i> (41 species/subspecies)	M _{pw} (pw: pinnipeds in water)
Pinnipeds in air	75 Hz to 30 kHz	Same species as pinnipeds in water (41 species/subspecies)	M _{pa} (pa: pinnipeds in air)

Table 7: Marine Mammal Functional Hearing Groups & Estimated Hearing Ranges

There have been various frequency ranges cited which the Bottlenose Dolphin can detect. They respond to tones within the frequency range of 1 to 150 kHz (Ridgeway, 1990), are sensitive to frequencies from 5 kHz to 110 kHz (O'Brien, Berrow and Wall, 2005), have a hearing band of 15 kHz to 110 kHz with greatest sensitivity at 50 kHz, and taking a conservative approach are noted as having a mid-frequency range of 0.15 kHz to 160 kHz (Southall et al., 2007).

Common seals are sensitive to tones within the frequency range 4 kHz to 45 kHz (peak sensitivity at 32 kHz) and grey seals 8 - 40 kHz (O'Brien, Berrow and Wall, 2005; Southall et al., 2007).

While INFOMAR multibeam echo sounders are significantly beyond these frequency ranges, the single beam echo sounder and sub bottom profiler systems transmit lower frequencies that may be detected by porpoises and seals. Similar frequency transmissions are emitted continuously by all vessels navigating within the Lower Shannon Estuary SAC (home to a resident population of bottlenose dolphin) for example, with no negative impact identified or reported to date. This is supported by extensive ongoing research of the resident bottlenose dolphin populations in the Shannon, where significant dolphin tourism related vessel activity is ongoing. Each vessel hosts similar single beam mounted echo sounders with no exclusion zone practice in place, and no negative impact has been reported, despite the proximity of the dolphins to the echo sounders.

While the impact of the instruments discussed above on marine mammals is considered to be low risk, a series of measures to mitigate against any potential impact are nonetheless proposed in the next chapter.



4. Mitigation

4.1 Basis

The mitigation requirements put in place by DAHG in granting permission to survey lower Shannon Estuary SAC in 2011 and West Connacht SAC in 2014 are the basis for those outlined in this appropriate assessment.

4.2 Marine Mammal Observations

- During all proposed INFOMAR survey operations the Code of Practice for the Protection of Marine Mammals during Acoustic Seafloor Surveys in Irish Waters will be fully adhered to.
- Fully qualified MMO's will be engaged to ensure full time watch-keeping is provided during all daylight operational hours, including breaks, for the entire duration of operations within the SAC and associated 1.5km buffer area.

4.3 Additional Mitigation

- Operations will be restricted to daylight hours only.
- A 15m exclusion zone will be put in place which if breached by marine mammals, will result in the immediate shutdown of the multibeam, singlebeam and sub bottom profiler systems.
- INFOMAR will fully comply with the NPWS Guidance for underwater sound sources (2014).
- Strict adherence will be maintained to the Wildlife Act Section 23 pertaining to the protection of certain species and their habitats as listed in Annex IV & II of the Habitats Directive.



- All personnel onboard (ship and scientific) will be fully briefed in advance of commencement of operations on the sensitivities associated with the proposed survey and survey area, and asked to communicate any sightings of cetaceans and seals to the MMO's accordingly.
- The pre-start scan and soft start will be controlled by the MMO on watch, who will liaise with the Chief Scientist, bridge crew, and online survey personnel to ensure compliance.
- MMO's employed will attend a pre-survey briefing to review and discuss the mitigation requirements.
- The survey Chief Scientist will be advised in advance of commencement of operations that the MMO's will determine survey visibility limitations. Operations within the SAC and associated 1.5km buffer zone will commence and terminate on the decision of the MMO.
- Sidescan sonar and sparker will not be used inside the SAC or 1.5 km buffer zone.
- Daily MMO report forms (Operations and Effort) will be maintained as standard for all INFOMAR inshore vessels and records compiled at the end of the field season and forwarded to NPWS, along with cetacean sighting forms, as part of an annual MMO report that covers all GSI survey legs for that season.

4.4 Impact / Mitigation Matrix

The following impact mitigation matrix (Table 5) attempts to summarise the marine survey equipment which could theoretically have an impact on marine mammals and the mitigation proposed to minimize the level of such an impact during the proposed survey.

For the purpose of the impact / mitigation matrix, the potential impacts have been classified into the following categories in order of increasing severity:

None / Disturbance / Avoidance / Physical** / Stranding

****Note:** While a potential impact could become “physical” through sustained exposure at short distances to the ensonified area of a system’s transducer, in practice this would be very difficult and unlikely for a cetacean to sustain due to the narrow directional acoustic transmissions, which a cetacean is more likely to be intermittently exposed to if / when it passes through this area of ensonification.



System	Model	Frequencies KHz	Potential Impact	Mitigation
Multibeam Echo Sounder	EM3002	293	• Disturbance*	• Adhere to NPWS Code of Practice
		307		• Soft start with intermittent power up before beginning survey
	EM2040	300		• 15 exclusion zone around vessel during survey operations
		420		• Care taken with line plans to avoid restricting cetaceans' ability to avoid the source.
Sub Bottom Profiler	Probe 5000	3.5	• Disturbance	Adhere to NPWS Code of Practice
		10		• Soft start with intermittent power up before beginning survey
		12		• 15 exclusion zone around vessel during survey operations
				• Care taken with line plans to avoid restricting cetaceans' ability to avoid the source.
Singlebeam Echo Sounder	EA400	38	• Disturbance • Avoidance • Physical*	• Vessel based observers to monitor marine mammals in the vicinity
		200	• Disturbance	• Vessel based observers to monitor marine mammals in the vicinity

Table 8: Equipment Impact / Mitigation Matrix

Mitigation procedures have been proposed based on a review of best survey practice at international level, which are considered to remove and/or minimize any potential likely impacts on local marine mammal populations, should they be encountered within one of the referenced SAC sites during the survey season.

5. Screening for Appropriate Assessment

5.1 Identification of Relevant Natura 2000 Sites

Figures 5 and 6 below display the proposed seabed survey extents as described in Section 2.1. Natura 2000 sites whose extents overlap the survey areas, including an outer buffer zone of 15km, are also displayed. Because of the underwater nature of the survey work, only Natura 2000 sites with some marine element are included in this screening. All of these sites are listed in Table 9.

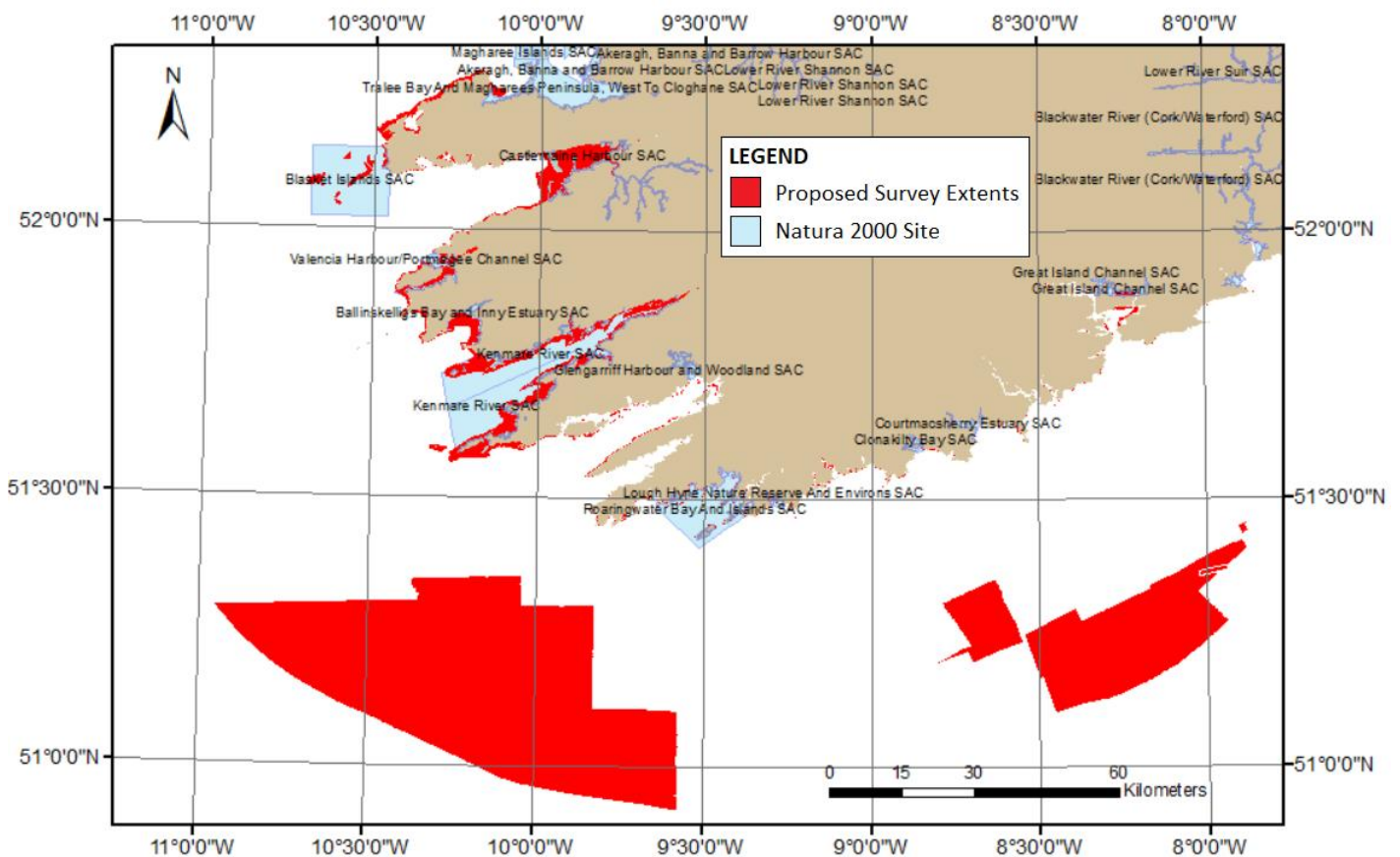


Figure 7: South-West Coast Proposed Survey Extents & Relevant Natura 2000 Sites

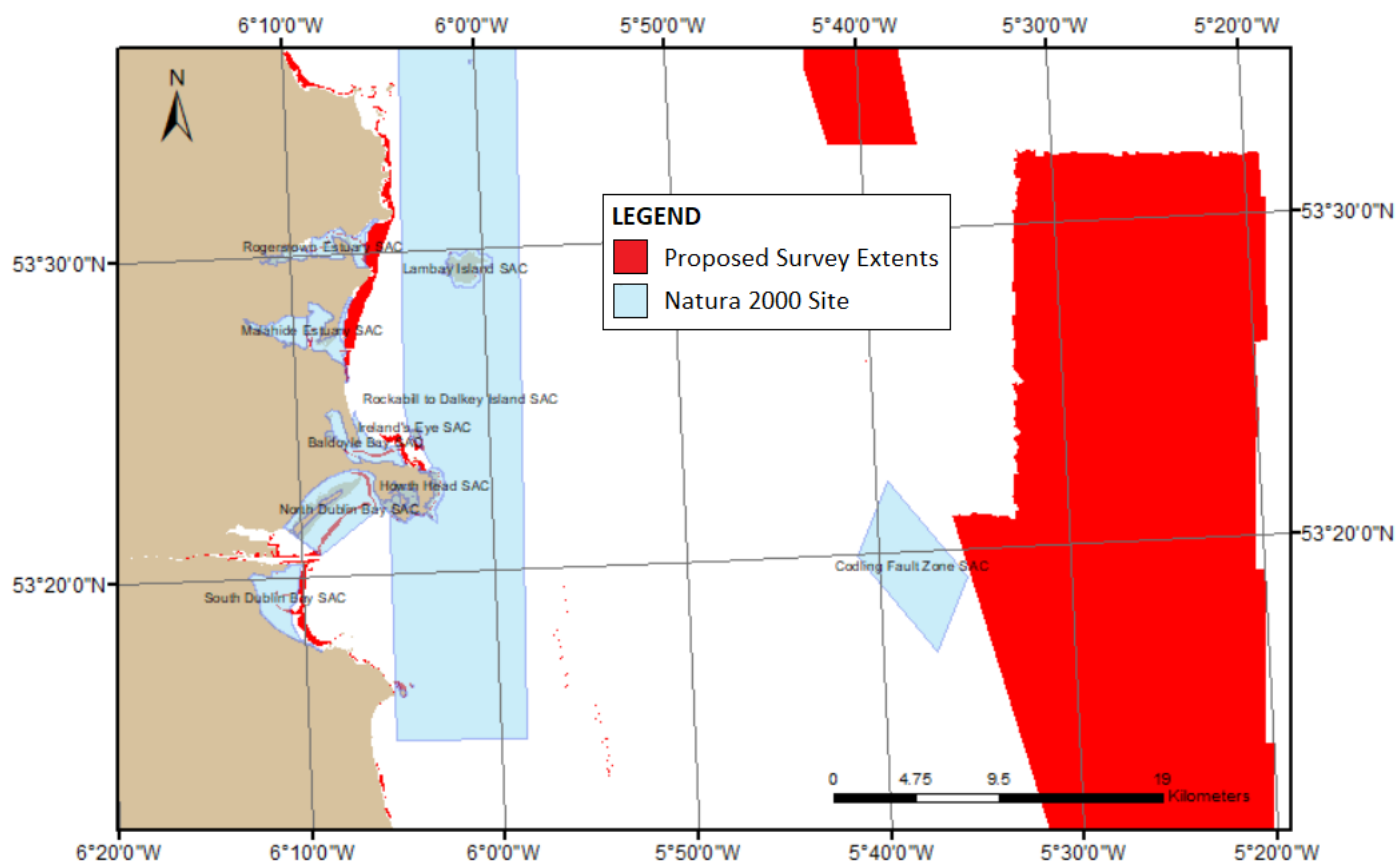


Figure 8: East Coast Proposed Survey Extents & Relevant Natura 2000 Sites

From this list, the Natura 2000 sites considered relevant and screened in for Appropriate Assessment are those which have Conservation Objectives or Qualifying Interests (QIs)/Special Conservation Interests (SCIs) which may be impacted by the proposed works. The potential impacts are discussed in detail in Section 3 of this report. The following table lists each potentially impacted Natura 2000 site, along with the screening in or out of its qualifying interests.

5.2 Screening of Relevant Natura 2000 Sites

Natura 2000 Site	Qualifying Interest	Interaction with Survey Area	Potential Impacts	Screened In/Out
Blasket Islands SAC (IE002172)	Reefs [1170]	Overlap	Disturbance from seabed sampling?	Screened in
	Vegetated sea cliffs of the Atlantic and Baltic coasts [1230]	No overlap	None	Screened out
	European dry heaths [4030]	No overlap	None	Screened out
	Submerged or partially submerged sea caves [8330]	Overlap	None	Screened out
	Phocoena phocoena (Harbour Porpoise) [1351]	Overlap	Potential disturbance from sonar	Screened in
	Halichoerus grypus (Grey Seal) [1364]	Overlap	Potential disturbance from sonar	Screened in
Tralee Bay and Magharees Peninsula, West to Cloghane SAC (IE002070)	Estuaries [1130]	Overlap	Disturbance from seabed sampling?	Screened in
	Mudflats and sandflats not covered by seawater at low tide [1140]	Overlap	Disturbance from seabed sampling?	Screened in
	Coastal lagoons [1150]	No overlap	None	Screened out
	Large shallow inlets and bays [1160]	Overlap	Disturbance from seabed sampling?	Screened in
	Reefs [1170]	Overlap	Disturbance from seabed sampling?	Screened in
	Annual vegetation of drift lines [1210]	No overlap	None	Screened out
	Perennial vegetation of stony banks [1220]	No overlap	None	Screened out
	Salicornia and other annuals colonising mud and sand [1310]	No overlap	None	Screened out
	Atlantic salt meadows (Glaucopuccinellietalia maritima) [1330]	No overlap	None	Screened out
	Mediterranean salt meadows (Juncetalia maritimi) [1410]	No overlap	None	Screened out
	Shifting dunes along the shoreline with Ammophila arenaria (white dunes) [2120]	No overlap	None	Screened out
	Fixed coastal dunes with herbaceous vegetation (grey dunes) [2130]	No overlap	None	Screened out
	Dunes with Salix repens ssp. argentea (Salicion arenariae) [2170]	No overlap	None	Screened out
	Humid dune slacks [2190]	No overlap	None	Screened out
	Molinia meadows on calcareous, peaty or clayey-silt-laden soils (Molinion caeruleae) [6410]	No overlap	None	Screened out
	Alluvial forests with Alnus glutinosa	No overlap	None	Screened out



	and <i>Fraxinus excelsior</i> (Alno-Padion, <i>Alnion incanae</i> , <i>Salicion albae</i>) [91E0]			
	<i>Lutra lutra</i> (Otter) [1355]	Overlap	Potential disturbance from sonar	Screened in
	<i>Petalophyllum ralfsii</i> (Petalwort) [1395]	No overlap	None	Screened out
Akeragh, Banna and Barrow Harbour SAC (IE000332)	Annual vegetation of drift lines [1210]	No overlap	None	Screened out
	<i>Salicornia</i> and other annuals colonising mud and sand [1310]	No overlap	None	Screened out
	Atlantic salt meadows (<i>Glaucopuccinellietalia maritima</i>) [1330]	No overlap	None	Screened out
	Mediterranean salt meadows (<i>Juncetalia maritimi</i>) [1410]	No overlap	None	Screened out
	Embryonic shifting dunes [2110]	No overlap	None	Screened out
	Shifting dunes along the shoreline with <i>Ammophila arenaria</i> (white dunes) [2120]	No overlap	None	Screened out
	Fixed coastal dunes with herbaceous vegetation (grey dunes) [2130]	No overlap	None	Screened out
	Humid dune slacks [2190]	No overlap	None	Screened out
	European dry heaths [4030]	No overlap	None	Screened out
Castlemaine Harbour SAC (000343)	Estuaries [1130]	Overlap	Disturbance from seabed sampling?	Screened in
	Mudflats and sandflats not covered by seawater at low tide [1140]	Overlap	Disturbance from seabed sampling?	Screened in
	Annual vegetation of drift lines [1210]	No overlap	None	Screened out
	Perennial vegetation of stony banks [1220]	No overlap	None	Screened out
	Vegetated sea cliffs of the Atlantic and Baltic coasts [1230]	No overlap	None	Screened out
	<i>Salicornia</i> and other annuals colonising mud and sand [1310]	No overlap	None	Screened out
	Atlantic salt meadows (<i>Glaucopuccinellietalia maritima</i>) [1330]	No overlap	None	Screened out
	Mediterranean salt meadows (<i>Juncetalia maritimi</i>) [1410]	No overlap	None	Screened out
	Embryonic shifting dunes [2110]	No overlap	None	Screened out
	Shifting dunes along the shoreline with <i>Ammophila arenaria</i> (white dunes) [2120]	No overlap	None	Screened out
	Fixed coastal dunes with herbaceous vegetation (grey dunes) [2130]	No overlap	None	Screened out
	Dunes with <i>Salix repens</i> ssp. <i>argentea</i> (<i>Salicion arenariae</i>)	No overlap	None	Screened out



	[2170]			
	Humid dune slacks [2190]	No overlap	None	Screened out
	Alluvial forests with <i>Alnus glutinosa</i> and <i>Fraxinus excelsior</i> (<i>Alno-Padion</i> , <i>Alnion incanae</i> , <i>Salicion albae</i>) [91E0]	No overlap	None	Screened out
	<i>Petromyzon marinus</i> (Sea Lamprey) [1095]	Overlap	Potential disturbance from sonar	Screened in
	<i>Lampetra fluviatilis</i> (River Lamprey) [1099]	Overlap	Potential disturbance from sonar	Screened in
	<i>Salmo salar</i> (Salmon) [1106]	Overlap	Potential disturbance from sonar	Screened in
	<i>Lutra lutra</i> (Otter) [1355]	Overlap	Potential disturbance from sonar	Screened in
	<i>Petalophyllum ralfsii</i> (Petalwort) [1395]	No overlap	None	Screened out
Valentia Harbour/Portmagee Channel SAC (IE002262)	Mudflats and sandflats not covered by seawater at low tide [1140]	Overlap	Disturbance from seabed sampling?	Screened in
	Large shallow inlets and bays [1160]	Overlap	Disturbance from seabed sampling?	Screened in
	Reefs [1170]	Overlap	Disturbance from seabed sampling?	Screened in
Ballinskelligs Bay and Inny Estuary SAC (IE000335)	Atlantic salt meadows (<i>Glaucopuccinellietalia maritima</i>) [1330]	No overlap	None	Screened out
	Mediterranean salt meadows (<i>Juncetalia maritimi</i>) [1410]	No overlap	None	Screened out
	<i>Petalophyllum ralfsii</i> (Petalwort) [1395]	No overlap	None	Screened out
Kenmare River SAC (IE002158)	Large shallow inlets and bays [1160]	Overlap	Disturbance from seabed sampling?	Screened in
	Reefs [1170]	Overlap	Disturbance from seabed sampling?	Screened in
	Perennial vegetation of stony banks [1220]	No overlap	None	Screened out
	Vegetated sea cliffs of the Atlantic and Baltic coasts [1230]	No overlap	None	Screened out
	Atlantic salt meadows (<i>Glaucopuccinellietalia maritima</i>) [1330]	No overlap	None	Screened out
	Mediterranean salt meadows (<i>Juncetalia maritimi</i>) [1410]	No overlap	None	Screened out
	Shifting dunes along the shoreline with <i>Ammophila arenaria</i> (white dunes) [2120]	No overlap	None	Screened out
	Fixed coastal dunes with herbaceous vegetation (grey dunes) [2130]	No overlap	None	Screened out
	European dry heaths [4030]	No overlap	None	Screened out
	<i>Juniperus communis</i> formations on heaths or calcareous grasslands [5130]	No overlap	None	Screened out
	Calaminarian grasslands of the	No overlap	None	Screened out



	<i>Violetalia calaminariae</i> [6130]			
	Submerged or partially submerged sea caves [8330]	Overlap	None	Screened out
	<i>Vertigo angustior</i> (Narrow-mouthed Whorl Snail) [1014]	No overlap	None	Screened out
	<i>Rhinolophus hipposideros</i> (Lesser Horseshoe Bat) [1303]	No overlap	None	Screened out
	<i>Lutra lutra</i> (Otter) [1355]	Overlap	Potential disturbance from sonar	Screened in
	<i>Phoca vitulina</i> (Harbour Seal) [1365]	Overlap	Potential disturbance from sonar	Screened in
Glengarriff Harbour and Woodland SAC (IE000090)	Old sessile oak woods with <i>Ilex</i> and <i>Blechnum</i> in the British Isles [91A0]	No overlap	None	Screened out
	Alluvial forests with <i>Alnus glutinosa</i> and <i>Fraxinus excelsior</i> (<i>Alno-Padion</i> , <i>Alnion incanae</i> , <i>Salicion albae</i>) [91E0]	No overlap	None	Screened out
	<i>Geomalacus maculosus</i> (Kerry Slug) [1024]	No overlap	None	Screened out
	<i>Rhinolophus hipposideros</i> (Lesser Horseshoe Bat) [1303]	No overlap	None	Screened out
	<i>Lutra lutra</i> (Otter) [1355]	Overlap	Potential disturbance from sonar	Screened in
	<i>Phoca vitulina</i> (Harbour Seal) [1365]	Overlap	Potential disturbance from sonar	Screened in
Roaringwater Bay And Islands SAC (IE000101)	Large shallow inlets and bays [1160]	Overlap	Disturbance from seabed sampling?	Screened in
	Reefs [1170]	Overlap	Disturbance from seabed sampling?	Screened in
	Vegetated sea cliffs of the Atlantic and Baltic coasts [1230]	No overlap	None	Screened out
	European dry heaths [4030]	No overlap	None	Screened out
	Submerged or partially submerged sea caves [8330]	Overlap	None	Screened out
	<i>Phocoena phocoena</i> (Harbour Porpoise) [1351]	Overlap	Potential disturbance from sonar	Screened in
	<i>Lutra lutra</i> (Otter) [1355]	Overlap	Potential disturbance from sonar	Screened in
	<i>Halichoerus grypus</i> (Grey Seal) [1364]	Overlap	Potential disturbance from sonar	Screened in
Lough Hyne Nature Reserve And Environs SAC (000097)	Large shallow inlets and bays [1160]	Overlap	Disturbance from seabed sampling?	Screened in
	Reefs [1170]	Overlap	Disturbance from seabed sampling?	Screened in
	Submerged or partially submerged sea caves [8330]	Overlap	None	Screened out
Clonakilty Bay SAC (IE000091)	Mudflats and sandflats not covered by seawater at low tide [1140]	Overlap	Disturbance from seabed sampling?	Screened in
	Annual vegetation of drift lines [1210]	No overlap	None	Screened out
	Embryonic shifting dunes [2110]	No overlap	None	Screened out
	Shifting dunes along the shoreline	No overlap	None	Screened out



	with <i>Ammophila arenaria</i> (white dunes) [2120]			
	Fixed coastal dunes with herbaceous vegetation (grey dunes) [2130]	No overlap	None	Screened out
	Atlantic decalcified fixed dunes (<i>Calluno-Ulicetea</i>) [2150]	No overlap	None	Screened out
Courtmacsherry Estuary SAC (IE001230)	Estuaries [1130]	Overlap	Disturbance from seabed sampling?	Screened in
	Mudflats and sandflats not covered by seawater at low tide [1140]	Overlap	Disturbance from seabed sampling?	Screened in
	Annual vegetation of drift lines [1210]	No overlap	None	Screened out
	Perennial vegetation of stony banks [1220]	No overlap	None	Screened out
	<i>Salicornia</i> and other annuals colonising mud and sand [1310]	No overlap	None	Screened out
	Atlantic salt meadows (<i>Glaucopuccinellietalia maritima</i>) [1330]	No overlap	None	Screened out
	Mediterranean salt meadows (<i>Juncetalia maritimi</i>) [1410]	No overlap	None	Screened out
	Embryonic shifting dunes [2110]	No overlap	None	Screened out
	Shifting dunes along the shoreline with <i>Ammophila arenaria</i> (white dunes) [2120]	No overlap	None	Screened out
	Fixed coastal dunes with herbaceous vegetation (grey dunes) [2130]	No overlap	None	Screened out
Great Island Channel SAC (IE001058)	Mudflats and sandflats not covered by seawater at low tide [1140]	Overlap	Disturbance from seabed sampling?	Screened in
	Atlantic salt meadows (<i>Glaucopuccinellietalia maritima</i>) [1330]	No overlap	None	Screened out
Rockabill to Dalkey Island SAC (IE003000)	Reefs [1170]	Overlap	Disturbance from seabed sampling?	Screened in
	<i>Phocoena phocoena</i> (Harbour Porpoise) [1351]	Overlap	Potential disturbance from sonar	Screened in
Lambay Island SAC (IE000204)	Reefs [1170]	Overlap	Disturbance from seabed sampling?	Screened in
	Vegetated sea cliffs of the Atlantic and Baltic coasts [1230]	No overlap	None	Screened out
	<i>Halichoerus grypus</i> (Grey Seal) [1364]	Overlap	Potential disturbance from sonar	Screened in
	<i>Phoca vitulina</i> (Harbour Seal) [1365]	Overlap	Potential disturbance from sonar	Screened in
Rogerstown Estuary SAC (IE000208)	Estuaries [1130]	Overlap	Disturbance from seabed sampling?	Screened in
	Mudflats and sandflats not covered by seawater at low tide [1140]	Overlap	Disturbance from seabed sampling?	Screened in
	<i>Salicornia</i> and other annuals colonising mud and sand [1310]	No overlap	None	Screened out
	Atlantic salt meadows (<i>Glaucopuccinellietalia maritima</i>) [1330]	No overlap	None	Screened out



	Puccinellietalia maritimae) [1330]			
	Mediterranean salt meadows (Juncetalia maritimi) [1410]	No overlap	None	Screened out
	Shifting dunes along the shoreline with Ammophila arenaria (white dunes) [2120]	No overlap	None	Screened out
	Fixed coastal dunes with herbaceous vegetation (grey dunes) [2130]	No overlap	None	Screened out
Malahide Estuary SAC (IE000205)	Mudflats and sandflats not covered by seawater at low tide [1140]	Overlap	Disturbance from seabed sampling?	Screened in
	Salicornia and other annuals colonising mud and sand [1310]	No overlap	None	Screened out
	Atlantic salt meadows (Glauco-Puccinellietalia maritimae) [1330]	No overlap	None	Screened out
	Mediterranean salt meadows (Juncetalia maritimi) [1410]	No overlap	None	Screened out
	Shifting dunes along the shoreline with Ammophila arenaria (white dunes) [2120]	No overlap	None	Screened out
	Fixed coastal dunes with herbaceous vegetation (grey dunes) [2130]	No overlap	None	Screened out
Baldoye Bay SAC (IE000199)	Mudflats and sandflats not covered by seawater at low tide [1140]	Overlap	Disturbance from seabed sampling?	Screened in
	Salicornia and other annuals colonising mud and sand [1310]	No overlap	None	Screened out
	Atlantic salt meadows (Glauco-Puccinellietalia maritimae) [1330]	No overlap	None	Screened out
	Mediterranean salt meadows (Juncetalia maritimi) [1410]	No overlap	None	Screened out
Ireland's Eye SAC (IE002193)	Perennial vegetation of stony banks [1220]	No overlap	None	Screened out
	Vegetated sea cliffs of the Atlantic and Baltic coasts [1230]	No overlap	None	Screened out
Howth Head SAC (IE000202)	Vegetated sea cliffs of the Atlantic and Baltic coasts [1230]	No overlap	None	Screened out
	European dry heaths [4030]	No overlap	None	Screened out
North Dublin Bay SAC (IE000206)	Mudflats and sandflats not covered by seawater at low tide [1140]	Overlap	Disturbance from seabed sampling?	Screened in
	Annual vegetation of drift lines [1210]	No overlap	None	Screened out
	Salicornia and other annuals colonising mud and sand [1310]	No overlap	None	Screened out
	Atlantic salt meadows (Glauco-Puccinellietalia maritimae) [1330]	No overlap	None	Screened out
	Mediterranean salt meadows	No overlap	None	Screened out



	(Juncetalia maritimi) [1410]			
	Embryonic shifting dunes [2110]	No overlap	None	Screened out
	Shifting dunes along the shoreline with Ammophila arenaria (white dunes) [2120]	No overlap	None	Screened out
	Fixed coastal dunes with herbaceous vegetation (grey dunes) [2130]	No overlap	None	Screened out
	Humid dune slacks [2190]	No overlap	None	Screened out
	Petalophyllum ralfsii (Petalwort) [1395]	No overlap	None	Screened out
South Dublin Bay SAC (IE000210)	Mudflats and sandflats not covered by seawater at low tide [1140]	Overlap	Disturbance from seabed sampling?	Screened in
	Annual vegetation of drift lines [1210]	No overlap	None	Screened out
	Salicornia and other annuals colonising mud and sand [1310]	No overlap	None	Screened out
	Embryonic shifting dunes [2110]	No overlap	None	Screened out
Codling Fault Zone SAC (IE003015)	Submarine structures made by leaking gases [1180]	Overlap	Disturbance from seabed sampling?	Screened in
Wicklow Reef SAC (IE002274)	Reefs [1170]	Overlap	Disturbance from seabed sampling?	Screened in

Table 9: Screening of Individual Natura 2000 Sites

5.3 Screening Conclusions

Following the initial screening of all potentially impacted Natura 2000 sites by the proposed survey operations, the following sites have been screened out as there is considered to be no interaction between the survey activity (acoustic mapping and seabed sampling) and their qualifying interests:

- Ireland's Eye SAC (IE002193)
- Howth Head SAC (IE000202)
- Akeragh, Banna and Barrow Harbour SAC (IE000332)
- Ballinskellig Bay and Inny Estuary SAC (IE000335)

The following sites have been screened in for further assessment due to potential impacts by survey operations on one or more of their qualifying interests (see Table 9). At this point these sites' qualifying interests (species and habitats) must be further discussed in the second stage of the Appropriate Assessment – Natura Impact Statement.



Natura 2000 sites screened in for Appropriate Assessment:

- Blasket Islands SAC (IE002172)
- Tralee Bay and Magharees Peninsula, West to Cloghane SAC (IE002070)
- Castlemaine Harbour SAC (000343)
- Valentia Harbour/Portmagee Channel SAC (IE002262)
- Kenmare River SAC (IE002158)
- Glengarriff Harbour and Woodland SAC (IE000090)
- Roaringwater Bay And Islands SAC (IE000101)
- Lough Hyne Nature Reserve And Environs SAC (000097)
- Clonakilty Bay SAC (IE000091)
- Courtmacsherry Estuary SAC (IE001230)
- Great Island Channel SAC (IE001058)
- Rockabill to Dalkey Island SAC (IE003000)
- Lambay Island SAC (IE000204)
- Rogerstown Estuary SAC (IE000208)
- Malahide Estuary SAC (IE000205)
- Baldoyle Bay SAC (IE000199)
- Ireland's Eye SAC (IE002193)
- Howth Head SAC (IE000202)
- North Dublin Bay SAC (IE000206)
- South Dublin Bay SAC (IE000210)
- Wicklow Reef SAC (IE002274)
- Codling Fault Zone SAC (IE003015)

Qualifying interests to be assessed in Natura Impact Statement:

- Reefs [1170]
- *Phocoena phocoena* (Harbour Porpoise) [1351]
- *Halichoerus grypus* (Grey Seal) [1364]
- Estuaries [1130]
- Mudflats and sandflats not covered by seawater at low tide [1140]
- Large shallow inlets and bays [1160]
- *Lutra lutra* (Otter) [1355]
- *Petromyzon marinus* (Sea Lamprey) [1095]
- *Lampetra fluviatilis* (River Lamprey) [1099]
- *Salmo salar* (Salmon) [1106]
- *Phoca vitulina* (Harbour Seal) [1365]
- Submarine structures made by leaking gases [1180]



6. Natura Impact Statement

6.1 Acoustic Mapping - Species Impact Assessments

***Phocoena phocoena* (Harbour Porpoise) [1351]**

There is potential for disturbance of harbour porpoises, a high frequency cetacean species, if they pass through an ensonified area during survey operations (see section 3.1 for further discussion). In order to mitigate fully against any potential impact, the measures described in Section 4 will be undertaken.

The useage of a pre-start scan, “soft start” procedure and access to onsite MMO expertise and guidance will ensure that the conservation objectives are unaffected.

***Halichoerus grypus* (Grey Seal) [1364]**

Grey seals are sensitive to tones within the 8 - 40 kHz frequency range (Southall et al., 2007). There is potential for disturbance of grey seals if they pass through an ensonified area during survey operations (see section 3.1 for further discussion). In order to mitigate fully against any potential impact, the measures described in Section 4 will be undertaken.

The useage of a pre-start scan, “soft start” procedure and access to onsite MMO expertise and guidance will ensure that the conservation objectives are unaffected.

***Phoca vitulina* (Harbour Seal) [1365]**

Common or Harbour seals are sensitive to tones within the frequency range 4 kHz to 45 kHz (peak sensitivity at 32 kHz) (O’Brien, Berrow and Wall, 2005). There is potential for disturbance of grey seals if they pass through an ensonified area during survey operations (see section 3.1 for further discussion). In order to mitigate fully against any potential impact, the measures described in Section 4 will be undertaken.

The useage of a pre-start scan, “soft start” procedure and access to onsite MMO expertise and guidance will ensure that the conservation objectives are unaffected.



***Lutra lutra* (Otter) [1355]**

At the time of writing this document, no research has been conducted on the hearing thresholds of *Lutra Lutra* (Eurasian Otter). However, an examination has been carried out on the auditory capabilities of the Sea Otter (*Enhydra lutris*) by Ghoul & Reichmuth (2014). According to this study:

“Under water, hearing sensitivity was significantly reduced when compared to sea lions and other pinniped species, demonstrating that sea otter hearing is primarily adapted to receive airborne sounds.”

Given this observation, along with the fact that otters spend less time in the water than cetaceans and pinnipeds, suggests that the impact on them could be very low. This is further mitigated by the fact that the same MMO-led procedures being followed for cetaceans and pinnipeds will also allow otters to leave the survey vessel’s area before any disturbance can take place.

***Petromyzon marinus* (Sea Lamprey) [1095]**

Mickle et al (2018) conducted a study on the auditory responses of sea lampreys and concluded that they cannot detect sounds above 300Hz. This rules them out of being impacted by any of the acoustic instruments in used by the survey vessels, all of which use sound in the kHz range.

***Lampetra fluviatilis* (River Lamprey) [1099]**

According to Popper, A.N. (2005):

“... their ear is relatively simple and there is nothing within the structure of the ear or associated structures to suggest any specializations that would make them into anything but a hearing generalist, with maximum hearing to no more than several hundred Hz.”

Though the study by Mickle et al (2018) was focused on sea lampreys, that information, in addition to the work by Popper, A.N. (2005) indicates that the proposed survey works will have no impact on any river lampreys that enter the area.



***Salmo salar* (Salmon) [1106]**

Hawkins et al (2006) demonstrated that salmon only respond to frequencies below 380 Hz and conclude that their hearing is quite poor. This rules them out of being impacted by any of the acoustic instruments in used by the survey vessels, all of which use sound in the kHz range.

6.2 Seabed Sampling - Habitats Impact Assessments

Reefs [1170]

Seabed sampling will not be carried out over reefs (which by definition are rocky ground), as the Day Grab and Van Veen Grabs described in Section 2.1 are exclusively soft sediment samplers. Sampling locations are targeted using backscatter maps and so rocky ground is avoided. There will therefore be no impact by any seabed sampling campaigns on reef habitats.

All other habitats (Mudflats and sandflats not covered by seawater at low tide [1140], Large shallow inlets and bays [1160], Submarine structures made by leaking gases [1180])

Due to the relatively small footprint of this sampling equipment and the well spaced-out nature of the sampling sites, the impact on any seabed habitat is considered to be negligible. Biological sampling will not be carried out in Natura 2000 sites.

6.3 Conclusions

Marine mammals are considered to be the only qualifying interests in the relevant Natura 2000 sites that are potentially susceptible to disturbance by GSI's marine mapping activities. By following the mitigation measures outlined in Section 4, this potential impact will be avoided. At this point, Stage 3 (Alternative Solutions) and Stage 4 (Imperative Reasons for Overriding Public Interests) of the Appropriate Assessment are considered unnecessary.



7. Conclusion

This Appropriate Assessment is considered to incorporate all of the relevant requirements of the EC DG Environment guidance document, “Assessment of plans and projects significantly affecting Natura 2000 sites – Methodological guidance on the provisions of Article 6(3) and (4) of the Habitats Directive 92/43/EEC”.

In a partnership programme between the Marine Institute and Geological Survey Ireland, INFOMAR seeks DAHG / NPWS approval to proceed with the proposed plan to carry out acoustic surveys in the intended area of operations.

Mitigation procedures have been proposed based on a review of best survey practice at international level, which are considered to remove and/or minimize any potential likely impacts on local marine mammal populations, should they be encountered within one of the referenced SAC sites during the survey season.

INFOMAR has been undertaking routine seabed mapping activities in SACs annually in support of and cooperation with NPWS, and in line with NPWS / DAHG guidelines, licensing and mitigation requirements, and with no adverse incidents reported or incurred.

With increased confidence in INFOMAR survey approaches, blanket seasonal restrictions on survey operations are no longer implemented by DAHG, and in recent years mitigation has included implementation of a 15m exclusion zone and daylight hours restrictions in the Shannon Estuary, and compliance with the NPWS Code of Practice.

The protection and management of Natura 2000 sites within the intended area of operations will benefit significantly from the addition of INFOMAR baseline survey data. INFOMAR will endeavour to proceed with the acquisition and distribution of marine mapping information, while ensuring appropriate protection of the marine environment is provided in the process. An annual report on protection efforts applied by survey crews will be rendered to NPWS on completion of annual operations.



7 Referenced Documents

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