Marine Ecological Consultancy Services for the Great Blasket Island

Annex IV Risk Assessment

Client: Office of Public Works

Address: [redacted]

Project reference: P000012541

Date of issue: April 2024

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Author: [redacted]

APEM Ltd

[redacted]

Registered in England No. 2530851

APEM (2024). Annex IV Risk Assessment: Great Blasket Island. APEM Scientific Report P000012541. OPW, 26/01/2024, 30 pp.

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1 Introduction

1.1 Background

Office of Public Works (OPW) proposes to redevelop the landing zone on Great Blasket Island in tandem with a revitalised Island management plan. Survey works are to be carried out as part of the marine aspect of this project including deployment of static Passive Acoustic Monitoring (PAM) devices, boat-based line transects, intertidal and subtidal surveys. As a result, a marine area usage licence is required from the Maritime Area Regulatory Authority (MARA) for the survey works.

OPW has engaged APEM Ltd to conduct an Annex IV Species Risk Assessment for the proposed scope of survey works (herein referred to as the Works) at the Great Blasket Island (herein referred to as the Site). Article 12 of the Habitats Directive (92/42/EEC) lists all cetaceans (whales, dolphins, and porpoises), marine turtles, otters and all bat species as Annex IV species. As Annex IV species are protected by law, any risk of impacts to such species because of the Works must be assessed. In addition, harbour porpoise (*Phocoena phocoena*) and bottlenose dolphin (*Tursiops truncatus*), which are commonly occurring species in Irish waters, along with otter (*Lutra lutra*) and Lesser horseshoe bats (*Rhinolophus hipposideros*) are also listed as Annex II species of the EC Habitats Directive whose conservation requires the designation of Special Areas of Conservation (SACs). Of note, a separate report has been produced by AQUAFACT, a member of the APEM Group; Supporting information for Screening for Appropriate Assessment (SISAA), which provides relevant information to enable the competent authorities to carry out a Stage 1: Screening for Appropriate Assessment.

This Annex IV Species Risk Assessment has assessed the risk of impact from the activities associated with the Works on all Annex IV species and provides recommendations on mitigation measures if needed, and if a derogation licence is likely to be required.

This Annex IV Species Risk Assessment also draws on the most recent relevant scientific publications and other guidance documents to inform the assessment and recommendations herein, as the guidance produced by the Department of Arts, Heritage and Gaeltacht (2014) is in the process of being reviewed and updated.

1.2 Annex IV species

Annex IV of the EC Habitats Directive (European Council Directive 92/43/EEC on the conservation of natural habitats and of wild flora and fauna) lists species of European interest in need of strict protection; these are termed European Protected Species (EPS). All species of cetacean and marine turtles, plus otter and all bat species are EPS. The Habitats Directive has been transposed into Irish law by the European Communities (Birds and Natural Habitats) Regulations 2011 (S.I. No. 477 of 2011). Consequently, it is an offence to kill, injure or disturb cetaceans, marine turtles, otter and bats and if any such offence is likely to occur, a derogation licence is required.

Derogation licences for Annex IV species may be granted by the Minister for Housing, Local Government and Heritage (DHLGH), which would allow otherwise illegal activities to go ahead, provided that:

- There is no satisfactory alternative.
- The action authorised will not be detrimental to the maintenance of the population of the species concerned at a Favourable Conservation Status (FCS) in their natural range.

FCS is defined in the Habitats Directive as when:

- Population dynamics data on the species concerned indicate that it is maintaining itself on a long-term basis as a viable element of its natural habitats.
- The natural range of the species is neither being reduced nor is likely to be reduced for the foreseeable future; and
- There is, and will probably continue to be, a sufficiently large habitat to maintain its populations on a long-term basis.

1.3 Statement of Authority

This report has been prepared by [redacted] The technical review was provided by [redacted]

[redacted] **BSc** (Joint Hons) is a Principal Ecologist with Apem Ireland and has over 12 years' experience in ecological assessment and holds a BSc in Marine Biology/Oceanography from the University of Wales, Bangor and a HND in Coastal Conservation with Marine Biology from Blackpool and Fylde College. [redacted] has a wide range of experience in the preparation of Environmental Impact Assessment Reports, Appropriate Assessment Screening reports and Natura Impact Statements. [redacted] was the lead ecologist on a range of projects in the UK, including large scale infrastructural schemes. Since moving to Ireland he has been lead ecologist / author (EIAR, EcIA, AA Screening reports and NIS's) for a number of projects including historic landfill remediation works, urban planning applications, commercial regeneration sites and renewable energy projects.

[redacted] is a Consultant Ecologist has a First Class Hons. BSc in Zoology from NUIG and a First Class Hons. MA in Ecological Design Strategy. She is experienced in a range of research and technical survey skills in terrestrial, marine, ornithology, mammals, habitats and phylogenetics. She has a good knowledge of environmental legislation with reference to Ireland as well as the EU and the Habitats Directive. She has also previously spent time at sea conducting UWTV and Deep-Sea Trawling fisheries surveys with the Marine Institute. As a consultant ecologist for APEM ltd., she contributors towards Ecological Impact Assessments (EcIA), Appropriate Assessments Screenings (AA Screenings) and Preliminary Ecological Appraisals (PEAs).

[redacted] (B.Sc. (Hons), M.Sc., Ph.D.) is an Associate Director and the head of our marine mammal consultancy; he has a wealth of expertise in the field of marine mammal ecology, conservation and management, and a practical understanding of the legislation and policy relating to marine mammals and the consenting of major marine infrastructure projects. [redacted] has gained this experience working across several sectors, including academia, government and consultancy. [redacted] is an expert in his field, working on marine mammals for almost 20 years. Across his career [redacted] has led research and desk-based studies on topics such as identifying and implementing suitable monitoring and mitigation plans for better understanding anthropogenic impacts, and designing scientific studies aimed at reducing knowledge gaps that are barriers to the consenting of major marine infrastructure projects. He has authored (in his consultancy role) and/or critically reviewed (in his former Government role) scoping reports, EIARs, HRAs, AAs, EPS licence applications and marine mammal mitigation plans.

2 Methodology

2.1 Approach to risk assessment

The general approach and terminology used in this document is consistent with the Environmental Impact Assessment Report (EIAR) guidelines produced by the Environment Protection Agency (EPA) (EPA, 2022) (Section 3 Table 3.4 and Figure 3.4 therein), in terms of describing the effects and determining significance. Questions to be considered as part of this risk assessment include the following:

- Do individuals or populations of Annex IV species occur within the proposed area?
- Is the plan or project likely to result in death, injury or disturbance of individuals?
- Is it possible to estimate the number of individuals of each species that are likely to be affected?
- Will individuals be disturbed at a sensitive location or sensitive time during their life cycle?
- Are the impacts likely to focus on a particular section of the species' population, e.g., adults vs. juveniles, males vs. females?
- Will the plan or project cause displacement from key functional areas, e.g., for breeding, foraging, resting or migration?
- How quickly is the affected population likely to recover once the plan or project has ceased?

Where appropriate, consideration will be given to the sensitivity of the Annex IV species to the potential impact(s). The magnitude and likelihood of potential impact(s) will also be considered, the latter relating to the probability that an impact will occur as a result of a receptor being exposed to a discernible impact. The risk will be determined by considering the sensitivity of a receptor along with the magnitude and likelihood of the potential impact to which the receptor is exposed.

Where an effect is considered likely and significant, appropriate mitigation will be proposed to manage the risk.

2.2 Zone of Influence

In order to establish the Zone of Influence (ZoI) of the proposed Works, the assessment of connectivity between impact mechanisms (or source) and a conservation feature considers the location of the Project relative to habitats and non-mobile species, species foraging distances and migration routes, the proximity of the Project to foraging and breeding areas, potential changes in species behaviour, potential hydrological connectivity between the Project and conservation features, effects on prey species resulting in alteration of interactions, and associated impacts. Given the nature of the survey works and the potential impacts, the ZoI for the project is set as the boundary line for the project laid out in Figure 2.

2.3 Data Analysis

In considering broad-scale information on cetacean occurrence, distribution, and abundance, the ZoI lies within Stratum 7 of the ObSERVE aerial surveys (refer to Figure 2), which were conducted in summer and winter 2015 and 2016 (Rogan *et al*., 2018). Given the proximity to Stratum 8 (Figure 2), this will also be considered in this risk assessment. When there was sufficient data collected (60 sightings required for a species/species group) two approaches to estimate abundance and density were used: a design-based method and a model-based method. The former is based on distance sampling approaches to estimate species

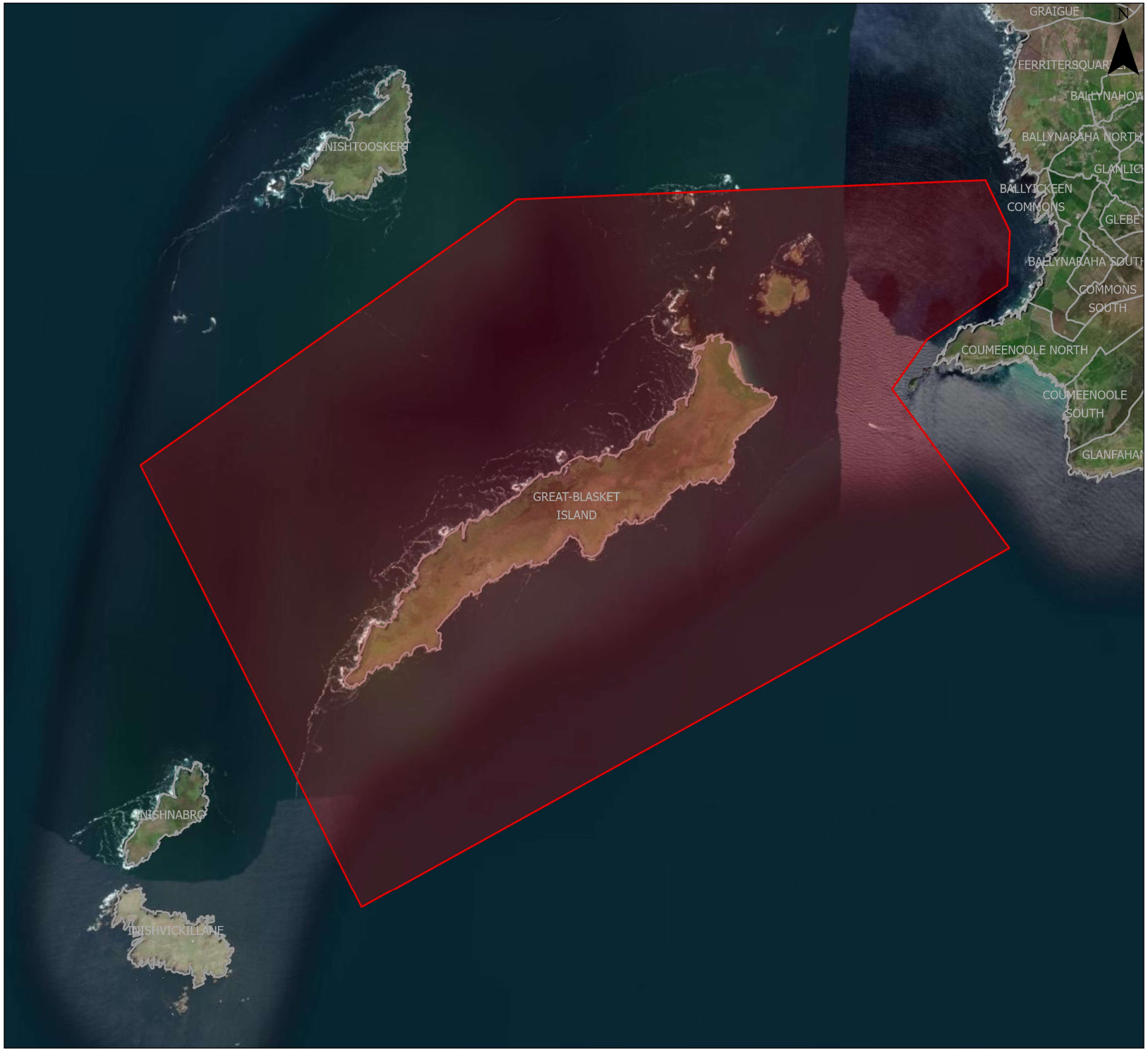
abundance and the latter uses modelling approaches to estimate species abundance and to quantify the influence of environmental parameters on the abundance estimate. The analysis methodology was designed to achieve the most robust absolute abundance and density estimates possible, by correcting for biases where sufficient data were collected. In the case where both the design-based and model-based estimates are available for S7 and S8 for a species, the highest density estimate across the seasons is used in the assessment, as this is the most precautionary approach.

For marine turtles, sightings from the ObSERVE aerial surveys (Rogan *et al*., 2018) and those submitted via the Irish Whale and Dolphin Group (IWDG) sightings app (IWDG, 2019a) during the last 12 months have been used to inform species occurrence, distribution and abundance, as well as sightings data collated in relevant literature (e.g. King and Berrow, 2009; Botterell *et al.,* 2020).

A desk-based study of data from the National Biodiversity Data Centre (NBDC)[1] website was accessed for information on the presence of bat and otter within the Site. Only records for the past 10 years are included within common practice desk studies, older records are unlikely to still be relevant given their age and changes in land management that may have occurred in the intervening period. The absence of rare or protected species from the NBDC databases does not necessarily imply that it does not occur within the area. Similarly, the presence of a recent record within the study area does not imply it is present within the Site rather it is known to be present within the study area chosen for desk study.

The baseline for each of the Annex IV species' group is detailed in Section 4.

[1] https://maps.biodiversityireland.ie/Map (last accessed 16 February 2024)



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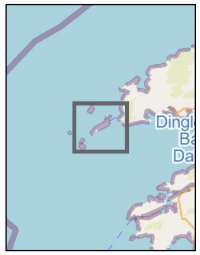
Boundary for Marine Ecology Surveys.

Annex IV Risk Assessment

Initial Marine Ecology Survey Boundary

Townlands___Ungen_2019_Clip



Notes

World Imagery: Maxar, Microsoft
OpenStreetMap: Map data © OpenStreetMap contributors, Microsoft, Facebook, Inc. and its affiliates, Esri Community Maps contributors, Map layer by Esri

Coordinate Reference System
IRENET95 / Irish Transverse Mercator

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Figure 1

Figure Reference: 12541_OPW_GreatBlasketIsland_SISAA

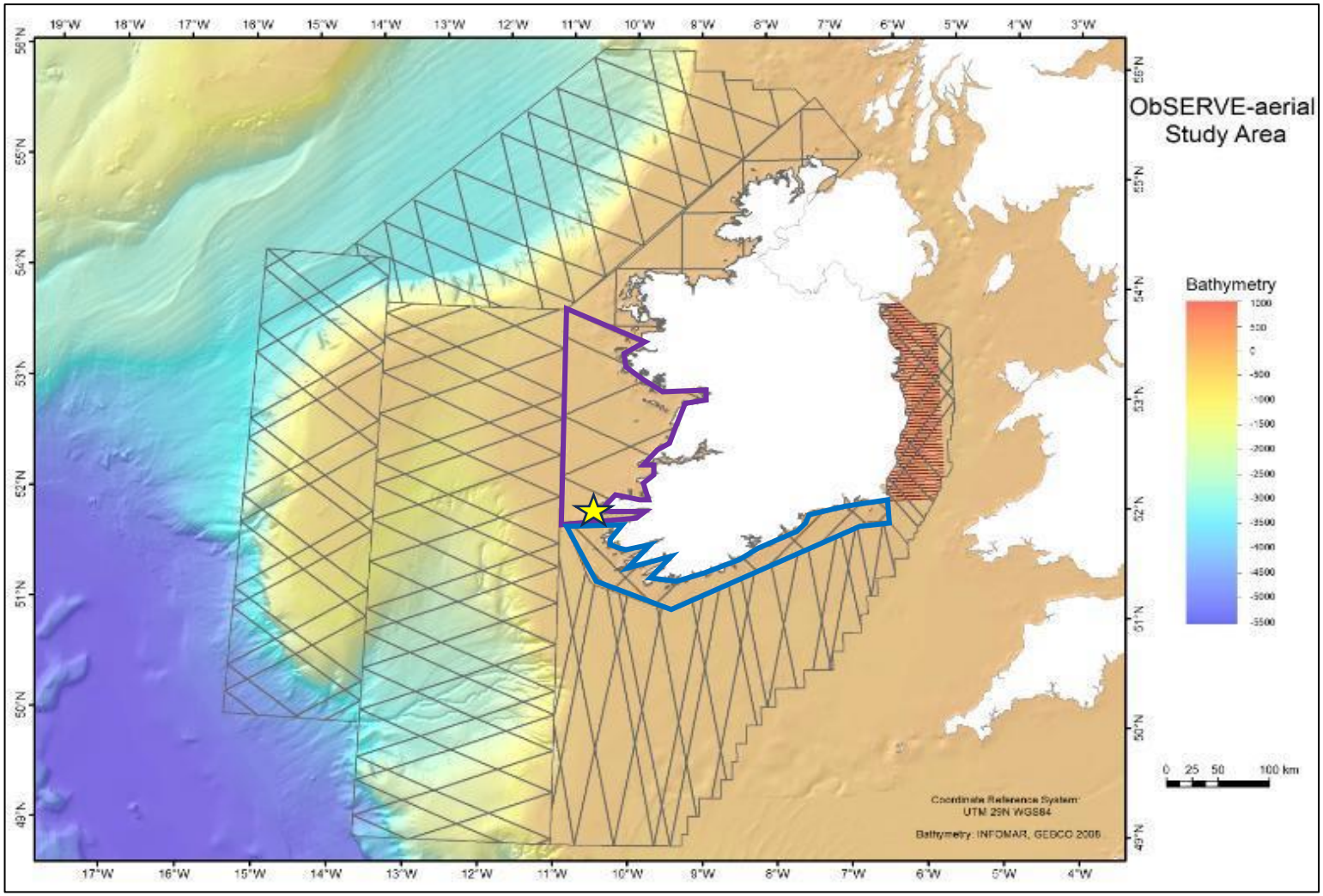

Figure 2: ObSERVE aerial study area map indicating stratum 7 (purple) and stratum 8 (blue) in relation to the study area (star) (Rogan et al., 2018).

3 Description of the Project

3.1 Intertidal Survey

The intertidal survey will cover a <1km stretch of coastline. A Marine Nature Conservation Review (MNCR) Phase 1 intertidal survey will be completed within the intertidal areas during mean low water spring (MLWS) tidal conditions. Surveys will be carried out throughout the entire proposed ZoI. The Common Standards Monitoring Guidance (JNCC, 2004) and 'Littoral Sediments Habitats' Procedural Guidance (Version 4, August 2004) will be followed as guidance throughout surveys. Additional guidance including the 'CCW Handbook for marine intertidal Phase 1 survey and mapping (Wyn et al., 2000), the 'Guidelines for the Conduct of Benthic Studies at Marine Aggregate Extraction Sites (2nd edition)' (Ware and Kenny, 2011) will be applied.

The intertidal survey extent will include areas of soft sediment habitat (beach) and rocky shore (Figure 3). A Phase II Quantitative Intertidal transect survey will be conducted within the survey area. The methodology will follow that set out within the Marine Monitoring Handbook Procedural Guidance No's 3-1 (Intertidal Biotope Recording) (Wyn & Brazier, 2001) and 3-6 (Intertidal Core Sampling) (Dalkin and Barnett, 2001). Where rocky shore habitat is encountered, surveying may need to be adapted appropriately to use quadrats rather than core sampling. Three replicate samples will be taken using a hand operated coring device measuring 30 cm in depth and 15 cm in width. One additional fist-sized bag of sediment will be taken at suitable stations. Photographic records during surveying should be taken as appropriate for recording and reporting purposes.

3.2 Drop down video (DDV) or camera surveying (digital video / stills)

Subtidal still and video seabed photographic data will be acquired to determine the presence of subtidal reefs and calculate a 'reefiness' score (Irving, 2009) where applicable at specified locations using a high-resolution underwater camera. AQUAFACT follows the NMBAQC and JNCC guidelines for the best practice acquisition of video stills imaging of benthic substrata and epibenthic species, ensuring that the data collected is fit for purpose in relation to the needs and requirements of the proposed survey.

3.3 Dive surveys

In areas that are not suitable for the use of DDV equipment, such as subtidal reefs or sea caves, a team of HSE Part 4 qualified commercial divers will be deployed to obtain video and still imagery. The team will use high-resolution underwater camera and lighting equipment to obtain imagery suitable for species / habitat type identification. The team will use non-intrusive method of works, ensuring to remain 0.5 – 1 m from the seabed or sea cave walls. The team of marine biologists will take note on seabed type and features, cave wall conditions and features, flora and fauna with emphasis on notable sensitive and protected species.

3.4 Acoustic surveys

Four F-POD acoustic monitoring devices (used to detect clicks of cetaceans, including porpoise and dolphin species) will be deployed on fixed moorings to provide continuous monitoring of the area throughout the season. The devices will be deployed on either side of the Blasket Sound, one south west of Slea Head and one to the north of Beiginis pier, see Figure 4 for indicative mooring locations. The locations will be finalised subject to final *in situ* determination. Servicing of the F-POD will be carried out every 2-3 months after deployment, to replace batteries and download data, for up to one year. The moorings will be a standard concrete construction (50 to 70 kg).

3.5 Boat based surveys

Boat based transect surveys will be carried out to further determine the species of marine mammals (and other marine megafauna, e.g. turtle species) and their occurrence and distribution within the ZoI. The aim will be to undertake 6 surveys, each survey will coincide with deployment, recovery, and maintenance of the F-PODs to minimise vessel presence within the ZoI. The transect surveys will cover the area surrounding the entirety of the Great Blasket Island and extending into the area of Dunquin Pier (Figure 4). The survey vessel will travel at a standard survey speed of approx. 12 km/hr (7 knots) while on transect (traveling between F-POD sites). All marine mammal sightings during this transect will be recorded along with number of animals, location of sighting and any other relevant data (e.g. behaviour). Each survey will include a search area of approximately 200 m either side of the transect line.

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Intertidal Transects and Sediment Sampling on Great Blasket Island Beach

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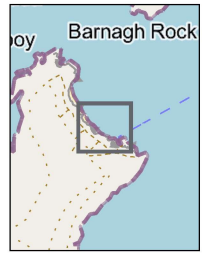
- Indicative Transect for Intertidal Surveys
- Indicative Sediment Sampling Points
- High_Water_Mark__2023



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World Imagery: Maxar, Microsoft OpenStreetMap: Map data © OpenStreetMap contributors, Microsoft, Facebook, Inc. and its affiliates, Esri Community Maps contributors, Map layer by Esri

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APEM Ireland

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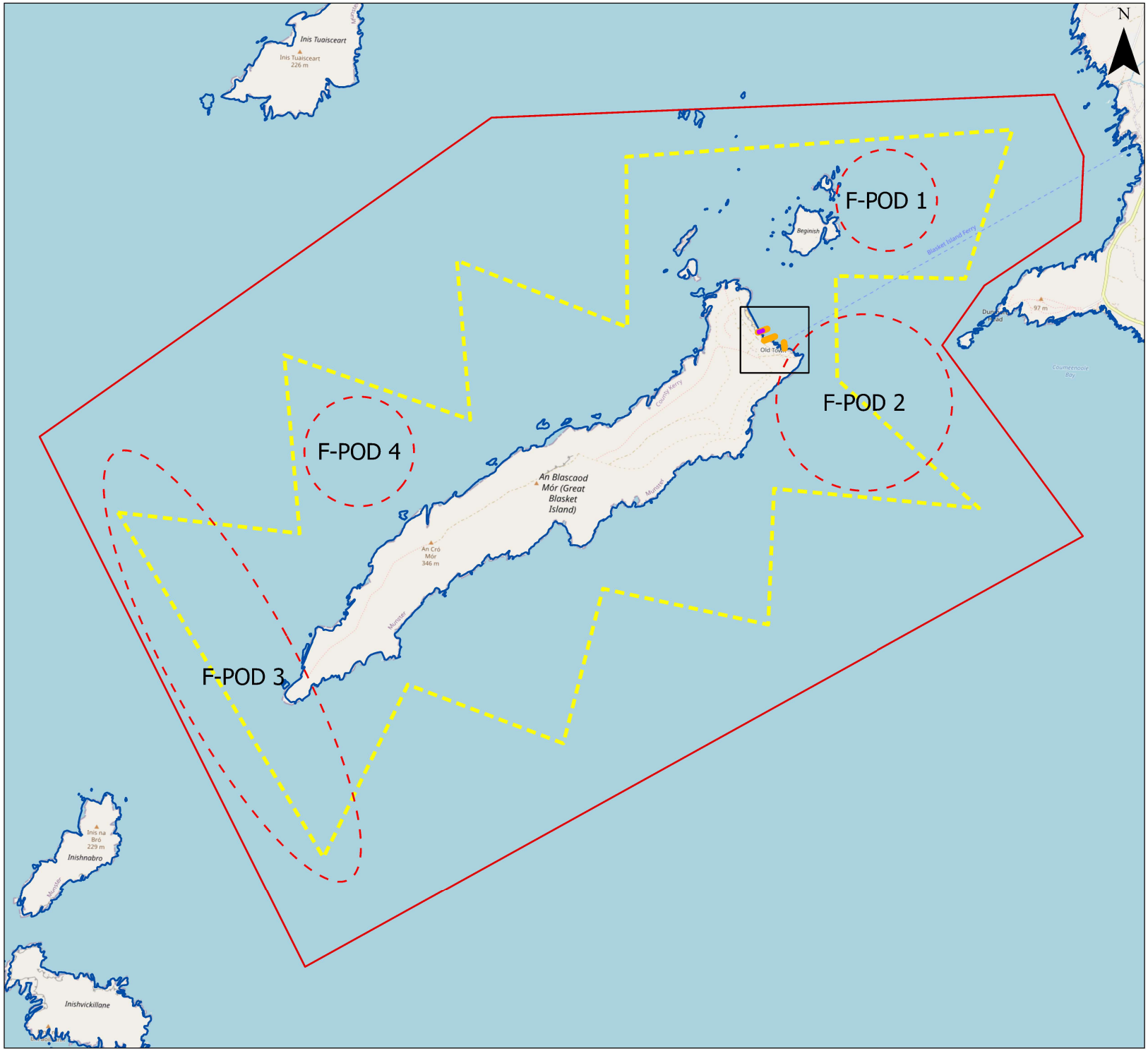
Figure 3

Figure Reference: 12541_OPW_GreatBlasketIsland_SISAA



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Indicative Survey Locations

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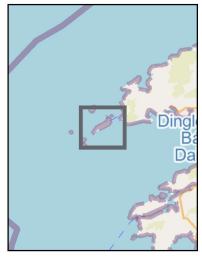
- Initial Marine Ecology Survey Boundary
- Acoustic Deployment Sites
- Marine Mammal Survey Transect
- High_Water_Mark__2023
- Indicative Transect for Intertidal Surveys
- Indicative Sediment Sampling Points



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World Imagery: Maxar, Microsoft OpenStreetMap: Map data © OpenStreetMap contributors, Microsoft, Facebook, Inc. and its affiliates, Esri Community Maps contributors, Map layer by Esri

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Figure 4

Figure Reference: 12541_OPW_GreatBlasketIsland_SISAA

4 Baseline

4.1 Cetaceans

More than 25 species of cetaceans have been recorded in Irish waters (NBDC, 2023), with about 10 of these regularly occurring within the region surrounding the Blasket Islands (Berrow *et al.*, 2018; Rogan *et al.*, 2018; IWDG, 2022; NBDC, 2023). A desk-based review for OPW identified cetacean species considered resident or are annually recorded as seasonal visitors, including harbour porpoise, common dolphin (*Delphinus delphis*), white-sided dolphin (*Leucopleurus acutus)*, bottlenose dolphin, Risso's dolphin (*Grampus griseus*), minke whale (*Balaenoptera acutorostrata)*, humpback whale (*Megaptera novaeangliae)*, fin whale (*Balaenoptera physalus)*.

Larger cetaceans, such as fin whales, are occasionally sighted in the open sea region of Celtic Sea. Sightings of humpback whales are becoming more frequent in the region, particularly between December and March. Fin and humpback whales are migratory species that travel from mating and calving grounds to nutrient-rich feeding grounds at high latitudes (Corkeron and Connor, 1999; Edwards *et al.*, 2015; Kennedy *et al.,* 2014). Their distribution is likely related to prey hot spots, where they feed on small pelagic fish such as sprat and herring (Volkenandt *et al.*, 2016). However, as these species are not considered resident and have not been recorded as seasonal visitors within the ZoI (refer to Section 2.2) they are not considered further in this assessment.

Other cetacean species, which are infrequently recorded within the region include Atlantic white-sided dolphin, striped dolphin (*Stenella coeruleoalba*), sei whale (*Balaenoptera borealis*), Cuvier's beaked whale (*Ziphius cavirostris*), killer whale (*Orcinus orca*), long-finned pilot whale (*Globicephala melas*), northern bottlenose whale (*Hyperoodon ampullatus*), pygmy sperm whale (*Kogia breviceps*), blue whale (*Balaenoptera musculus*), Sowerby's beaked whale (*Mesoplodon bidens*) and sperm whale (*Physeter macrocephalus*) (Reid *et al*., 2003; Rogan *et al.,* 2018; NBDC, 2023). However, as these species are not considered resident or recorded as seasonal visitors within the ZoI (refer to Section 2.2) they are also not considered further in this assessment.

4.1.1 Harbour porpoise

The harbour porpoise is the most widespread and frequently recorded species in Irish waters, sighted largely in inshore waters in the Celtic Sea throughout the entire year (Ó Cadhla *et al*., 2004; Berrow *et al*., 2010; Wall *et al*., 2013; Rogan *et al*., 2018). Porpoise sightings tend to differ by season, with densities peaking in summer (Berrow *et al.*, 2010). They are listed as a species of Least Concern on the International Union for Conservation of Nature (IUCN) Red List (Braulik *et al.,* 2020). Corrected design-based and model-based harbour porpoise abundance and density estimates are presented in **Table 4.1** and **Table 4.2** using data collected during the ObSERVE aerial surveys (Rogan *et al.*, 2018). Lower abundance in spring suggests a seasonal movement offshore, potentially for calving (IWDG, 2019b). Harbour porpoises are opportunistic foragers with a varied diet and are known to forage at high energy, near-shore sites, where their distribution is linked to year-round proximity to small shoaling fish species, such as sandeel (*Ammodytidae*) (Santos and Pierce, 2003). NPWS harbour porpoise surveys in the Blasket Islands SAC from 2007 – 2018 notes there is a steady yet steep decline in numbers of harbour porpoise in the area, from an estimated number of 372 (± 105) in 2008 to 60 (± 13) in 2018 (O'Brien & Berrow, 2018). Harbour Porpoise will be taken forward in this assessment.

4.1.2 Common dolphin

Common dolphins are widely distributed within Irish waters, with higher abundances off the south and southwest coasts as well as in deeper waters and over the continental shelf (Reid *et al.*, 2003; Berrow *et al.*, 2010; Wall *et al.*, 2013; IWDG, 2019c). They are listed as a species of Least Concern on the IUCN Red List (Braulik *et al.*, 2021). Corrected model-based abundance and density estimates are presented in **Table 4.1** and **Table 4.2** using data collected during the ObSERVE aerial surveys (Rogan *et al.*, 2018). It is reported that common dolphins have a seasonal presence occurring in low densities over summer and autumn, with sightings peaking between September and January off Kerry (Berrow *et al.*, 2010). They are then almost absent over the winter period due to an eastward movement along the south coast (Wall *et al.,* 2013, Berrow *et al.*, 2010). They prey on a variety of fish and cephalopod species, particularly schooling fish such as herring and sprat (Brophy *et al.,* 2009). Common dolphins are thought to calve in Irish waters, with calves primarily sighted from late summer to late autumn (Wall *et al.,* 2013). Due to their infrequent occurrence and (where data exists) their relatively low density and abundance within the ZoI and the wider region, common dolphin will not be taken forward in this assessment.

4.1.3 Bottlenose dolphin

Bottlenose dolphins are one of the most frequently recorded cetaceans in Ireland (NPWS, 2019) and have been observed throughout Irish waters year-round. They are listed as a species of Least Concern on the IUCN Red List (Wells *et al*., 2019). Corrected design-based and model-based bottlenose dolphin abundance and density estimates are presented in **Table 4.1** and **Table 4.2** using data collected during the ObSERVE aerial surveys. The abundance estimates and mean group sizes of bottlenose dolphins were respectively higher and larger in both Stratum 7 and 8 during summer months, suggesting potential offshore movement from inshore during winter periods (Rogan *et al.,* 2018). In Ireland, there are thought to be at least three distinct populations of bottlenose dolphin, as determined by genetic studies (Mirimin *et al*., 2011). One of these populations is highly mobile and the same individuals have been recorded off all Irish coasts, with individuals recorded in Dublin Bay recaptured (i.e., sighted and identified through photographic identification (hereafter 'photo-ID')[2] using distinctive features) in Galway Bay, approximately 650 km away (O'Brien *et al*., 2010). Comparison of images within bottlenose dolphin photo-ID catalogues confirm movement of individuals through prospective corridors linking designated Special Areas of Conservation (SACs) in the Moray Firth (Scotland), Cardigan Bay (Wales) and Shannon Estuary (Ireland) (Robinson *et al.,* 2012). There is in the meantime a small 'semi-resident' group described in Cork Harbour (Berrow *et al.,* 2010, Ryan *et al.,* 2010). Recent photo-ID of bottlenose dolphins by IWDG have recorded the same individuals off counties Dublin, Cork, Kerry, Galway, Mayo, Donegal and Antrim (Berrow *et al.,* 2010), suggesting that inshore dolphins recorded within and / or near the Works area potentially using the entire Irish coast. Most coastal sightings around Ireland fall within 10 km from shore (O'Brien *et al*., 2010; Robinson *et al*., 2012). Irish coastal bottlenose dolphins have a widely variable diet including benthic and pelagic species; prey includes, but is not limited to, hake (*Merluccius merluccius*), whiting (*Merlangius merlangus*), haddock (*Melanogrammus aeglefinus*), conger eel (*Conger conger*), gadoids, flatfish, and cephalopods (Hernandez-Milian *et al.,* 2012; 2015). In Irish waters bottlenose dolphins with calves are recorded primarily in the summer months (Berrow *et al.,* 2010). Although bottlenose dolphin occur infrequently, at relatively low density and abundance within the ZoI and the wider region (where data exists), they are one of the most frequently recorded cetacean species in Irish waters, year round. Considering their

[2] A method of monitoring using photographs of features, such as dorsal fin shape or scarring, that allows for identification of individual animals.

general frequent occurrence and highly mobile nature a precautionary approach has been adopted in which bottlenose dolphin are taken forward in this assessment.

4.1.4 Risso's dolphin

Risso's dolphins are primarily recorded in oceanic waters off the continental shelf in the Celtic Sea (Berrow *et al.*, 2010; Rogan *et al.,* 2018). They are known to seasonally migrate to coastal waters in late spring to summer around the entire Irish coast, with higher relative abundances recorded off the southwest and southeast coasts (Berrow *et al.*, 2010). Risso's dolphins primarily feed on cephalopods, including squid, octopus, and cuttlefish (Clarke, 1996). Young calves have been sighted within Irish waters, with numbers peaking between March and June (Wall *et al.*, 2013; IWDG, 2018). Risso's dolphins are listed as a species of Least Concern on the IUCN Red List (Kiszka and Braulik, 2018). Design-based abundance and density estimates of Risso's dolphins from the ObSERVE survey programme during summer in 2016 (Rogan *et al.*, 2018) are presented in **Table 4.1** and **Table 4.2** Due to few sightings, these estimates could not be corrected for availability bias and are therefore underestimates by an unknown amount. Due to their infrequent occurrence and (where data exists) their relatively low density and abundance within the ZoI and the wider region, Risso's dolphin will not be taken forward in this assessment.

4.1.5 Minke whale

Minke whales are the most abundant baleen whale species within Irish waters and occur throughout the coast of Ireland (Berrow *et al*., 2010; Wall *et al*., 2013; NPWS, 2019). They use both coastal and offshore waters around southern Ireland (Healy *et al.,* 2013), and can be seen off the southern Irish coast through autumn and early winter (Berrow *et al.,* 2010). Seasonal inshore movement of whales along the southwest coast was observed in summer (Rogan *et al*., 2018) and autumn (Wall *et al.*, 2013), where foraging activity on concentrations of pelagic schooling fish is often reported (Wall *et al.,* 2013). The minke whale is currently listed as a species of Least Concern on the IUCN Red List (Cooke *et al.*, 2018). Corrected design-based minke whale abundance and density estimates are presented in **Table 4.1** and **Table 4.2** .There were no sightings within Stratum 7 or 8 during winter surveys; consequently, no model-based abundance estimates were available because of low sample size. There is currently no evidence of minke whales calving in Irish waters (Wall *et al.*, 2013). Due to their infrequent occurrence and (where data exist) their relatively low density and abundance within the ZoI and the wider region, minke whale will not be taken forward in this assessment.

Table 4.1 The abundance and density estimates for each cetacean species considered in this assessment for all the seasons in which there were sightings in Stratum 7 (Rogan *et al*, 2018). Where relevant, the highest density estimate for the species has been carried forward in the assessment following a highly precautionary approach: *uncorrected estimates available only.

Species	Season	Abundance (Stratum 7)		Density (animals/km^2) (Stratum 7)	
		Design-based	Model-based	Design-based	Model-based
Harbour porpoise	Summer 2016	623.8 animals (CV = 78.9; 95% CI = 258.4 – 1,506.1)	1552.0 animals (CV = 47.4; 95% CI = 867.3 – 2,777.3)	0.037	0.092
	Winter 2016-2017	4,422.1 animals (CV= 80.9; 95% CI = 1,796.9 – 10,882.8)	-	0.026	-
Common dolphin	Summer 2016	-	9,725.1 animals (CV = 99.50; 95% CI = 3,330.8 – 28,395.3)	-	0.576
Bottlenose dolphin	Summer 2016	18,704 animals (CV= 62.45; 95% CI = 5,425 - 64,484)	17,281 animals (CV = 30.16; 95% CI = 5,963 - 27,159)	1.084	1.0238
	Winter 2016-2017	2,762 animals (CV = 95.32; 95% CI = 498 - 15,317)	5,010 animals (CV = 36.73; 95% CI = 1,218 - 5,636)	0.160	0.2968
Minke whale	Summer 2016	1714.3 animals (CV = 69.15; 95% CI = 764.6 - 3,843.7)	-	0.102	-

Table 4.2 The abundance and density estimates for each cetacean species considered in this assessment for all the seasons in which there were sightings in Stratum 8 (Rogan *et al*, 2018). Where relevant, the highest density estimate for the species has been carried forward in the assessment following a highly precautionary approach; *uncorrected estimates available only.

Species	Season	Abundance (Stratum 8)		Density (animals/km^2) (Stratum 8)	
		Design-based	Model-based	Design-based	Model-based
Harbour porpoise	Summer 2016	1,977.4 animals (CV= 62.6; 95% CI = 963.4 – 4,058.9)	2,738.4 animals (CV=29.9; 95% CI= 1,876.6 – 3,995.8)	0.208	0.288
	Winter 2016-2017	567.7 animals (CV= 73.2; 95% CI = 248.3 – 1297.9)	-	0.06	-
Common dolphin	Summer 2016	-	818.7 animals (CV= 44.7; 95% CI = 471.8 – 1,420.8)	-	0.086
Bottlenose dolphin	Summer 2016	11,266 animals (CV= 59.9; 95% CI = 3,579 – 35,464)	10,966 animals (CV=23.2; 95% CI= 5,242 – 18,113)	1.161	1.1544
	Winter 2016-2017	3,322 animals (CV= 47.59; 95% CI = 1,303 – 8,471)	3,361 animals (CV= 27.02; 95% CI = 1,396 – 4,202)	0.342	0.3538
Risso's dolphin	Summer 2016	548.6 animals (CV= 50.91; 95% CI = 204 – 1,477) *	-	0.0565*	-
Minke whale	Summer 2016	2,242.4 animals (CV= 66.14; 95% CI = 1,029.9 – 4,882.1)	-	0.236	-

4.2 Marine turtles

There have been six species of marine turtle recorded in UK and Irish waters, with most records being on the west and south coasts of Ireland (Botterell *et al.,* 2020). Of these, the leatherback turtle (*Dermochelys coriacea*) is the only species that is considered resident.

Leatherback turtles have been recorded around the Irish coast, with most sightings off the south and west coasts of Ireland (King and Berrow, 2009; Botterell *et al.,* 2020). They are listed as a vulnerable species on the IUCN Red List (Wallace *et al.*, 2013). No marine turtles were sighted off the south coast of Ireland during the ObSERVE surveys (Rogan *et al.,* 2018). There was no leatherback turtle record made in the last twelve months (between 1st Jan 2023 and 1st Jan 2024) according to the IWDG sightings app (IWDG, 2019a). Two sightings were made near Rocky Bay, Co. Cork in 2000 and off Ballybrannigan Strand in 2015 (NBDC, 2023). Leatherback turtles are mostly recorded between June and October when they forage on jellyfish (*Medusozoa* spp.) within this region (Doyle, 2007; Botterell *et al.*, 2020). Due to their infrequent occurrence and (where data exists) their relatively low density and abundance within the ZoI and the wider region, leatherback turtle will not be taken forward in this assessment.

4.3 Otters

The otter is one of Ireland's most elusive mammals, yet it is surprisingly common and widespread. The otter is a semi-aquatic carnivore and is typically seen in or near water and distributed throughout Ireland, from the coastal uplands and lowland midlands to offshore islands (Lysaght and Marnell, 2016). Otter, or evidence of presence have been recorded on Inishabro Island and to the north of Dún Chaoin (NBDC, 2024). Although Great Blasket Island is situated between the geographically between the locations of these records, otter have not been recorded within here. The records from outside the Site are also over 10 years old. However, based on the precautionary principal, otter is considered in this assessment.

4.4 Bats

There are nine species of bats established in Ireland (Roche *et al.,* 2014; Aughney, 2022). All nine bat species resident in Ireland are protected under Annex IV of the Habitats Directive. There are no records of bats within 10km of the Site and Dún Chaoin (NBDC, 2024) other than a single record for brown long-eared bat (*Plecotus auritus*) from 1985 in the Dingle peninsula. Furthermore, the bat landscape suitability index identifies the eastern section of the Site as having a score of 15 for all bats[3], with the west being unassessed. Due to there being no current evidence of bat species within 10 km of the Site and the proposed Works constituting vessel-based surveys, deployment of monitoring equipment, and minimal footprint on the island, all conducted in daytime hours, there are no impact pathways to bats. Therefore, bats are not considered further in this assessment.

[3] The bat landscape suitability index is a scoring system (Lundy, M.G., et al, 2011) and was assessed through on-line mapping on the National Biodiversity Data Centre webpage (https://maps.biodiversityireland.ie/). The degree of favourability ranges from 0 – 100, with 0 being least favourable and 100 most favourable for bats. The values of the grid squares represent the range of habitat suitability values the bat species can tolerate within each individual square.

5 Risk Assessment

This risk assessment will assess the risk to Annex IV species and other protected species outlined in **Section 3** by reviewing any impact sources and pathways as routes of exposure during the Works, with the intention of addressing two key questions:

- Is the activity likely to result in death, injury or disturbance of individuals?
- Is mitigation required?

5.1 Introduction

During the Works conducted for the proposed Works there is potential for impact pathways to Annex IV/protected species through the following:

- Vessel collision.
- Changes in water quality.

Potential impact sources which have been screened out include the following:

- Underwater noise – Noise emissions created due to survey work are limited to the operational noise of the boat. Moorings for the static PAM stations will be gravity secured/anchored with no drilling or piling required. The PAM devices do not produce noise either actively or passively (see Appendix 1). No other elements of the survey work are predicted to result in noise emissions to water.

  Noise emissions can have the potential to affect species, especially marine mammals. However, due to existing boating activity in the area, species are most likely already habituated to noise disturbance from marine traffic, such as shipping vessels and boats for tourism purposes. Consequently, the introduction of an additional slow-moving vessel during infrequent surveys (every two to three months for PAM and boat based surveys) is not likely to cause significant disturbance.

- Accidental discharge - All vessels will be compliant with the International Convention for the Prevention of Pollution from Ships (MARPOL) and the Marine Pollution Contingency Plan (MPCP), which contain the necessary steps to initiate an external response for any oil-related discharges, or in the case of a maritime accident/collision that results in an oil spill. Published guidelines and best working practices will be adhered to, to ensure that the likelihood of accidental spills is extremely low.

5.1.1 Vessel collision

Shipping activity within and near the ZoI was frequent between 2017 and 2022, with less than 1 hour of total shipping operations per km^2 per month throughout the inshore and coastal waters (EMODnet, 2021). Fishing vessels were the most common vessel type in the region of the Blasket Sound during this period. Therefore, it is likely that Annex IV species using this area would be familiar with slower moving vessels.

In many regions of the world collisions between marine mammals and vessels are widely reported, and one of the key parameters influencing this is vessel speed (NOAA, 2008 and Schoeman *et al.*, 2020). Slow speeds and predictable movement are known to be key factors in minimising collision risk between vessels and marine mammals (Nowacek *et al.,* 2001; Lusseau, 2003; Lusseau et al., 2006). Once on site for surveys (e.g. DDV,

SCUBA/snorkelling, intertidal) and PAM deployment, the vessel is anticipated to be stationary. For boat-based transects, the vessel will travel slowly (7 knots), and in a consistent and predictable pattern. With slow speeds and predictable movement, animals have the time and opportunity to react to the vessel; this has been demonstrated with similarly slow vessels used in dredging (Todd *et al.,* 2015). Furthermore, the marine mammals and otters in the area are already accustomed to vessels travelling through on a regular basis due to other activities, including tourism to the islands.

The potential effect of vessel collision is assessed to be **Not Significant** and the risk of collision between vessels and Annex IV species is assessed to be unlikely; therefore, no mitigation is required.

5.1.2 Changes in water quality

Changes in water quality, sedimentation and increased turbidity are unlikely to have a direct effect on Annex IV species, nor have an indirect effect through impacts on prey (Todd *et al.,* 2015). Furthermore, the duration of the proposed Works is short-term and the PAM moorings have a small footprint, the negligible sediment material in suspension that may be created will quickly fall out of suspension or disperse into the water column. Both the drop-down video and diving surveys should not result in an effect on the benthos as they will be occurring exclusively in the water column. As such, the potential effect of subtidal disturbance is assessed to be **Not Significant**.

The potential effect of changes in water quality is assessed to be **Not Significant** and the risk to Annex IV species is unlikely; therefore, no mitigation is required.

6 Conclusion

Based on the information set out in this report, in the light of the best scientific knowledge, as well as the accompanying documents, we submit that the competent authority has sufficient information to allow them to determine, with reasonable scientific certainty, that the proposed survey work, individually or in combination with other plans or projects, will have no adverse effect on Annex IV species.

7 References

Aughney, T., Roche, N., & Langton, S. (2022). Irish bat monitoring programme 2018–2021. Irish wildlife manuals, (137).

Berrow, S.D., Whooley, P., O'Connell, M. and Wall, D. (2010). Irish Cetacean Review (2000–2009). Irish Whale and Dolphin Group, 60pp.

Berrow, S.D., O'Brien, J., Meade, R., Delarue, J., Kowarski, K., Martin, B., Moloney, J.,Wall, D., Gillespie, D., Leaper, R., Gordon, J., Lee, A. and Porter, L. (2018). Acoustic Surveys of Cetaceans in the Irish Atlantic Margin in 2015–2016: Occurrence, distribution and abundance. Department of Communications, Climate Action & Environment and the National Parks and Wildlife Service (NPWS), Department of Culture, Heritage and the Gaeltacht, Dublin, Ireland,348pp.

Botterell, Z.L., Penrose, R., Witt, M.J. and Godley, B.J. (2020). Long-term insights into marine turtle sightings, strandings and captures around the UK and Ireland (1910–2018). Journal of the Marine Biological Association of the United Kingdom, 100(6), pp.869-877.

Braulik, G., Minton, G., Amano, M. and Bjørge, A. (2020). *Phocoena phocoena*. The IUCN Red List of Threatened Species 2020: e.T17027A50369903. https://dx.doi.org/10.2305/IUCN.UK.2020-2.RLTS.T17027A50369903.en. Accessed on 10 October 2023.

Braulik, G., Jefferson, T.A. and Bearzi, G. (2021). *Delphinus delphis* (amended version of 2021 assessment). The IUCN Red List of Threatened Species 2021: e.T134817215A199893039. https://dx.doi.org/10.2305/IUCN.UK.2021-2.RLTS.T134817215A199893039.en. Accessed on 10 October 2023.

Brophy, J. T., Murphy, S., & Rogan, E. (2009). The diet and feeding ecology of the short-beaked common dolphin (*Delphinus delphis*) in the northeast Atlantic. IWC Scientific Committee Document SC/61/SM, 14.

Clarke, M.R. (1996). Cephalopods as prey. III. Cetaceans. Philosophical Transactions of the Royal Society of London. Series B: Biological Sciences, 351(1343), pp.1053-1065.

Cooke, J.G. (2018). *Balaenoptera acutorostrata*. The IUCN Red List of Threatened Species 2018: e.T2474A50348265. https://dx.doi.org/10.2305/IUCN.UK.2018-2.RLTS.T2474A50348265.en. Accessed on 10 October 2023.

Corkeron, P.J. and Connor, R.C. (1999), 'Why do baleen whales migrate?', Marine Mammal Science, 15/4: 1228-1245.

Dalkin, M. and Barnett, B., 2001. Procedural guideline No. 3-6: Quantitative sampling of intertidal sediment species using cores. by J. Davies, J. Baxter, M. Bradley, D. Connor, J. Khan, E. Murray, W. Sanderson, C. Turnbull and M. Vincent, pp.253-258.

Department of Arts, Heritage and Gaeltacht, (2014). Guidance to Manage the Risk to Marine Mammals from Man-made Sound Sources in Irish Waters.

Doyle, T. K. (2007). Leatherback Sea Turtles (*Dermochelys coriacea*) in Irish waters. Irish Wildlife Manuals, No. 32. National Parks and Wildlife Service, Department of the Environment, Heritage and Local Government, Dublin, Ireland.

Edwards, E. F., Hall, C., Moore, T. J., Sheredy, C., & Redfern, J. V. (2015). Global distribution of fin whales *Balaenoptera physalus* in the post-whaling era (1980–2012). Mammal Review, 45(4), 197-214.

EMODnet. (2021). EMODnet Human Activities, Vessel Density Map, funded by the European Commission. Available from: https://ows.emodnet-humanactivities.eu/geonetwork/srv/api/records/0f2f3ff1-30ef-49e1-96e7-8ca78d58a07c. Accessed: 10 October 2023.

EPA (Environmental Protection Agency). (2022). Guidelines on the information to be contained in Environmental Impact Assessment Reports. EIAR_Guidelines_2022_Web.pdf (epa.ie).

Healy, H., Minto, C., Wall, D., O'Donnell, D. and O'Connor, I. (2013). Marine Mammals and Megafauna in Irish Waters-Behaviour, Distribution and Habitat Use: WP4 Research into Ecosystem Links and Habitat Use between Cetaceans and Fisheries in the Celtic Sea. Marine Institute.

Hernandez-Milian, G., Gosch, M., Kavanagh, A., Doyle, A., Jessopp, M., Cronin, M., Reid, D. and Rogan, E. (2012). Coastal Marine Mammals: what are they eating in Irish coasts? All-Ireland Mammal Symposium 2012. Dublin, Ireland.

Hernandez-Milian, G., Berrow, S., Santos, M.B., Reid, D. and Rogan, E. (2015). Insights into the Trophic Ecology of Bottlenose Dolphins (*Tursiops truncatus*) in Irish Waters. Aquatic Mammals. 41. 226-239. 10.1578/AM.41.2.2015.226.

Irving, R. (2009). The identification of the main characteristics of stony reef habitats under the Habitats Directive: Summary report of an inter-agency workshop 26–27 March 2008, JNCC Report No. 432, JNCC, Peterborough, ISSN 0963-8091.

IWDG (Irish Whale and Dolphin Group). (2018). Risso's Dolphin. Available from: https://iwdg.ie/rissos-dolphin/. Accessed 22 March 2023.

IWDG (Irish Whale and Dolphin Group). 2019a. Sightings. Available from: https://iwdg.ie/browsers/sightings.php. Accessed 23 March 2023.

IWDG (Irish Whale and Dolphin Group). 2019b. Harbour Porpoise. Available from: https://iwdg.ie/harbour-porpoise/. Accessed 22 March 2023.

IWDG (Irish Whale and Dolphin Group). 2019c. Common Dolphin. Available from: https://iwdg.ie/common-dolphin/. Accessed 22 March 2023.

IWDG (Irish Whale and Dolphin Group). (2022). Irish Whale and Dolphin Group offshore marine mammal atlas. Available from: https://iwdg.ie/browsers/sightings-map.php?foundrecords=2210. Accessed 29 March 2023.

JNCC (2004). Common Standards Monitoring Guidance for Littoral Sediment Habitats. August 2004 version.

Kennedy, A.S., Zerbini, A.N., Vásquez, O.V., Gandilhon, N., Clapham, P.J. and Adam, O. (2014). Local and migratory movements of humpback whales (*Megaptera novaeangliae*) satellite-tracked in the North Atlantic Ocean. Canadian Journal of Zoology, 92(1): 9-18.

King, G.L. and Berrow, S.D. (2009). Marine turtles in Irish waters. The Irish Naturalists' Journal, 30, pp.1-30.

Kiszka, J. and Braulik, G. (2018). Grampus griseus. The IUCN Red List of Threatened Species 2018: e.T9461A50356660. https://dx.doi.org/10.2305/IUCN.UK.2018-2.RLTS.T9461A50356660.en. Accessed 10 October 2023.

Lusseau, D. (2003). Male and female bottlenose dolphins *Tursiops* spp. have different strategies to avoid interactions with tour boats in Doubtful Sound, New Zealand. Marine Ecology Progress Series, 257, 267-274.

Lusseau, D. (2006). The short-term behavioral reactions of bottlenose dolphins to interactions with boats in Doubtful Sound, New Zealand. Marine Mammal Science, 22(4), 802-818.

Lysaght, L., & Marnell, F. (2016). Atlas of Mammals in Ireland, 2010-2015. National Biodiversity Data Centre.

Mirimin, L., Miller, R., Dillane, E., Berrow, S.D., Ingram, S., Cross, T.F. and Rogan, E. (2011). Fine-scale population genetic structuring of bottlenose dolphins in Irish coastal waters. Animal Conservation, 14(4), pp.342-353.

NBDC (National Biodiversity Data Centre). (2023). Biodiversity Maps: online mapping tool, National Biodiversity Data Centre, Ireland. Available from: https://maps.biodiversityireland.ie/Map. Accessed 11 October 2023.

NOAA (National Oceanographic and Atmospheric Administration). (2008). Endangered fish and wildlife; final rule to implement speed restrictions to reduce the threat of ship collisions with North Atlantic right whales. Fed. Regist., 73, 60173-60191.

Nowacek, S.M., Wells, R.S. and Solow, A.R. (2001). Short-term effects of boat traffic on bottlenose dolphins, *Tursiops truncatus*, in Sarasota Bay, Florida. Marine Mammal Science, 17(4), 673-688.

NPWS (National Parks and Wildlife Services). (2019). The Status of EU Protected Habitats and Species in Ireland. Volume 1: Summary Overview. Unpublished NPWS report.

O'Brien, J. and Berrow, S.D. (2018). Harbour porpoise surveys in Blasket Islands SAC, 2018. Report to the National Parks and Wildlife Service, Department of Culture, Heritage and the Gaeltacht. Irish Whale and Dolphin Group. pp. 24

O'Brien, J.M., Berrow, S.D., Ryan, C., McGrath, D., O'Connor, I., Pesante, G., Burrows, G., Massett, N., Klotzer, V. and Whooley, P. (2010). A note on long-distance matches of bottlenose dolphins (*Tursiops truncatus*) around the Irish coast using photo-identification. Journal of Cetacean Research and Management, 11(1), pp.69-74.

Ó Cadhla, O., Mackey, M., Aguilar de Soto, N., Rogan, E. and Connolly, N. (2004). Cetaceans and Seabirds of Ireland's Atlantic Margin. Volume II - Cetacean distribution and abundance. Report on research carried out

under the Irish Petroleum Infrastructure Programme (PIP): Rockall Studies Group (RSG) projects 98/6 and 00/13, Porcupine Studies Group project P00/15 and Offshore Support Group (OSG) project 99/38. 82pp.

Reid, J.B., Evans, P.G.H. and Northridge, S.P. (2003). Atlas of Cetacean distribution in north-west European waters. Joint Nature Conservation Committee, Peterborough.

Roche, N., Aughney, T., Marnell, F., Lundy, M., (2014). Irish Bats in the 21st Century. 978-0-9930672-0-4.

Robinson, K.P., O'Brien, J.M., Berrow, S.D., Cheney, B., Costa, M., Eisfeld, S.M., Haberlin, D., Mandleberg, L., O'Donovan, M., Oudejans, M.G. and Ryan, C. (2012). Discrete or not so discrete: Long distance movements by coastal bottlenose dolphins in UK and Irish waters. J. Cetacean Res. Manage., 12(3), pp.365-371.

Rogan, E., Breen, P., Mackey, M., Cañadas, A., Scheidat, M., Geelhoed, S. and Jessopp, M. (2018). Aerial surveys of cetaceans and seabirds in Irish waters: Occurrence, distribution and abundance in 2015-2017. Department of Communications, Climate Action and Environment and National Parks and Wildlife Service (NPWS), 297pp.

Santos, M.B. and Pierce, G.J. (2003). The diet of harbour porpoise (*Phocoena phocoena*) in the northeast Atlantic. 41. 355-390.

Schoeman, R. P., Patterson-Abrolat, C., & Plön, S. (2020). A global review of vessel collisions with marine animals. Frontiers in Marine Science, 7, 292.

Todd, V. L., Todd, I. B., Gardiner, J. C., Morrin, E. C., MacPherson, N. A., DiMarzio, N. A., & Thomsen, F. (2015). A review of impacts of marine dredging activities on marine mammals. ICES Journal of Marine Science, 72(2), 328-340.

Wall, D., Murray, C., O'Brien, J., Kavanagh, L., Wilson, C., Ryan, C., Glanville, B., Williams, D., Enlander, I., O'Connor, I., McGrath, D., Whooley, P. and Berrow, S. (2013). Atlas of the distribution and relative abundance of marine mammals in Irish offshore waters 2005 - 2011. Irish Whale and Dolphin Group, Kilrush, Co. Clare. 63pp.

Wallace, B.P., Tiwari, M. and Girondot, M. (2013). *Dermochelys coriacea*. The IUCN Red List of Threatened Species 2013: e.T6494A43526147. https://dx.doi.org/10.2305/IUCN.UK.2013-2.RLTS.T6494A43526147.en. Accessed 10 October 2023.

Ware, S.J. and Kenny, A.J., 2011. Guidelines for the conduct of benthic studies at marine aggregate extraction sites. Cefas, Lowestoft (UK). Project Code: MEPF, 8, p.P75.

Wells, R.S., Natoli, A. and Braulik, G. (2019). *Tursiops truncatus* (errata version published in 2019). The IUCN Red List of Threatened Species. 2019: e.T22563A156932432. https://dx.doi.org/10.2305/IUCN.UK.2019-1.RLTS.T22563A156932432.en. Accessed 10 October 2023.

Wyn, G., Brazier, P., Birch, K., Bunker, A., Cooke, A., Jones, M., Lough, N., McMath, A. & Roberts, S. (2000). Handbook for Marine Intertidal Phase 1 Biotope Mapping Survey. Countryside Council for Wales.

Wyn, G. and Brazier, P., 2001. Procedural Guideline No. 3-1. In situ biotope recording. Marine Monitoring Handbook.

Volkenandt, M., O'Connor, I., Guarini, J. M., Berrow, S., & O'Donnell, C. (2016). Fine-scale spatial association between baleen whales and forage fish in the Celtic Sea. *Canadian Journal of Fisheries and Aquatic Sciences*, 73(2), 197-204.

8 Appendix 1

Chelonia Ltd. F-POD Technical Specification

Housing:	F-POD: Polypropylene. DeepF-POD: Aluminium.
Dimensions:	F-POD: Length: 710 mm. Diameter: 90 mm. DeepF-POD: Length: 710 mm. Diameter: 100 mm
Weight:	F-POD: 2.35 kg without batteries. DeepF-POD: 7.15 kg without batteries.
Buoyancy:	F-POD: Approximately +0.7 kg with alkaline batteries and +1.2 kg with lithium batteries. This makes F-PODs self-orientating and increases the chance of recovery if the mooring fails. A web link engraved on the outside has enabled over 150 PODs to be returned to their owners by people who have found them on sea shores, sometimes more than 2,500 km from home. DeepF-POD: -3.1 kg, not buoyant.
Mooring:	F-POD: 3 x 10 mm holes in the lid. DeepF-POD: 1 x 12 mm hole in the lid.
Hydrophone:	Improved hydrophone with less Z-plane variation. 20 kHz to 160 kHz omni-directional in a large-diameter housing to reduce surface noise. The transducer mounting and housing design gives high resistance to impact damage.
Memory:	Removable 32 GB micro SD card. Two SD cards are supplied with each F-POD. Any blank micro SD card up to 32 GB can be used.
Batteries:	Battery packs hold 10 D-cells. The battery housing is sprung to reduce battery damage from end impacts.
Detection range:	Maximum detection range for porpoises is approximately 400 metres. Dolphins may be detected at >1 km.
Standardisation:	See standardisation and calibration.
Click selection:	Digital time domain waveform analysis, using duration (5µs resolution), frequency, amplitude, number of cycles, bandwidth, amplitude profile, frequency profile and Narrow Band High Frequency Index, to select possible cetacean clicks in the range 20-160 kHz. On-board train detection selects clicks in trains so that some representative full waveforms can be saved.
Cetacean detection:	Coherent click trains are extracted and classified by the KERNOF classifier. This classifier is a fixed component of the process to give long term uniformity of performance.
Species classification:	Porpoises and other narrow-band high frequency (NBHF) species can be distinguished from broadband species. Some discrimination of groups of species within the broadband species may become possible when enough data is available. Every species tested has given good detection performance – see Species detection.
Sonars:	Runs two independent sonar detectors that detect and filter out boat sonars. A record is kept of sonar detections.
Settings:	The default settings cover all species and most environments. In locations with high levels of ambient noise, which are usually due to substrate transport by currents, standard low sensitivity settings may be required.
Angle sensing:	The angle-from-vertical is recorded each minute, enabling the user to check after deployment that the F-POD was deployed in a vertical position, and giving information on currents. A range of angles at which the POD will log can be set. This allows the F-PODs to be set up well in advance and transported in a horizontal attitude saving power and memory.
Temperature sensing:	Temperature is recorded each minute.
Maintenance:	The external surfaces of the F-POD are simple and tough allowing robust methods of removing biofouling. The lids use a dual O-ring design with grease-free lubricants and these have proved highly reliable.