

## CLARUS OFFSHORE WIND FARM LIMITED

---

### Investigative Foreshore Licence Application: Reference FS006886

Environmental Supporting Information

---



P2399\_R5062\_Rev3 | April 2022

## DOCUMENT RELEASE FORM

### Clarus Offshore Wind Farm Limited

**P2399\_R5062\_Rev3**

Investigative Foreshore Licence Application: Reference FS006886

Environmental Supporting Information

Author/s

[REDACTED]

Project Manager

[REDACTED]

[REDACTED]

Authoriser

[REDACTED]

[REDACTED]

Rev No	Date	Reason	Author	Checker	Authoriser
Rev 0	13/11/2020	Draft for Client Review	[REDACTED]	[REDACTED]	[REDACTED]
Rev 0.1	15/12/2020	Addressing client comments	[REDACTED]	[REDACTED]	[REDACTED]
Rev 1	18/12/2020	Final	[REDACTED]	[REDACTED]	[REDACTED]
Rev 2	19/11/2021	Update to Foreshore Licence Application Area	[REDACTED]	[REDACTED]	[REDACTED]
Rev 3	07/04/2022	Addressing Foreshore Unit comments	[REDACTED]	[REDACTED]	[REDACTED]

Intertek Energy & Water Consultancy Services is the trading name of Metoc Ltd, a member of the Intertek group of companies.

# CONTENTS

	<b>DOCUMENT RELEASE FORM</b>	<b>I</b>
	<b>GLOSSARY</b>	<b>VI</b>
<b>1.</b>	<b>INTRODUCTION</b>	<b>1</b>
1.1	Introduction	1
1.2	Marine Planning	2
1.3	Aim of this Report	4
<b>2.</b>	<b>DESCRIPTION OF THE PROPOSED SITE INVESTIGATIONS</b>	<b>7</b>
2.1	Introduction	7
2.2	Overview	7
2.3	Survey Schedule	7
2.4	Summary of Proposed Site Investigations	8
2.5	General Requirements	10
<b>3.</b>	<b>ENVIRONMENTAL BASELINE</b>	<b>11</b>
3.1	Protected Sites	11
3.2	Intertidal and Benthic Communities	13
3.3	Birds	19
3.4	Fish	19
3.5	Marine Mammals	25
3.6	Commercial Fisheries	27
3.7	Shipping and Navigation	42
3.8	Subsea Infrastructure and Wrecks	43
3.9	Recreation	47
3.10	Other Proposed Activities in the Area	47
<b>4.</b>	<b>POTENTIAL ENVIRONMENTAL EFFECTS</b>	<b>51</b>
4.1	Identification of Pressures	51
4.2	Intertidal and Benthic Communities	52
4.3	Protected Sites	53
4.4	Marine Mammals	54
4.5	Fish	58

4.6	Birds	61
4.7	Sea and Air Navigation Systems	61
4.8	Archaeology	62
4.9	Marine Activity	62
4.10	Recreational Resource	64
4.11	Waste Management	65
<b>5.</b>	<b>SUMMARY AND CONCLUSIONS</b>	<b>66</b>
	<b>REFERENCES</b>	<b>67</b>



## LIST OF TABLES AND FIGURES

### Tables

Table 1-1	NMFP compliance statement	2
Table 3-1	Natura 2000 sites within 15km	11
Table 3-2	Intertidal and benthic communities	13
Table 3-3	Summary of spawning and nursery periods for commercially important fish species within the Foreshore Licence Application Area	20
Table 3-4	Sightings and strandings for commonly occurring cetaceans within the FLAA and surrounding waters	25
Table 3-5	Foreshore Licence Applications (currently listed on DHLGH's website) that overlap with the Foreshore Licence Application Area	47

### Figures

Figure 1-1	Map 1: Foreshore Licence Application Area	6
Figure 2-1	Map 2: Indicative Sampling Locations	9
Figure 3-1	Map 3: European Protected Sites within a 15km FLA Buffer	12
Figure 3-2	Map 4: EMODnet Benthic Habitats	16
Figure 3-3	Map 5: Reef habitat in the vicinity of the FLA.	18
Figure 3-4	Map 6: Designated Shellfish Waters	22
Figure 3-5	Map 7: Fish Spawning and Nursery	23
Figure 3-6	Map 8: Aquaculture sites	24
Figure 3-7	Main fishing grounds around southern Ireland.	28
Figure 3-8	Map 9: Inshore Commercial Fisheries – Irish Vessels <15m	29
Figure 3-9	Map 10: Atlas Commercial Fisheries for Shellfish around Ireland	30
Figure 3-10	Map 11: Fishing Effort by Irish Vessels >12m during 2014-2018	32
Figure 3-11	Map 12: Dredge Fishing Effort by Vessels >12m during 2015-2019	33
Figure 3-12	Map 13: Pot Fishing Effort by Vessels >12m during 2015-2019	34
Figure 3-13	Map 14: Landing by Vessels >12m during 2015-2019	35
Figure 3-14	Map 15: Bottom Otter Trawl Fishing by Vessels > 12m during 2015-2019	36
Figure 3-15	Map 16: Seine Fishing Effort by Vessels > 12m during 2015-2019	37
Figure 3-16	Map 17: Pelagic Trawl Fishing Effort by Vessels > 12m during 2015-2019	38
Figure 3-17	Map 18: Long Line Fishing Effort by Vessels > 12m during 2015-2019	39
Figure 3-18	Map 19: Gill Net Fishing Effort by Vessels > 12m during 2015-2019	40
Figure 3-19	Map 20: Other/Not Specified Fishing Effort by Vessels > 12m during 2015-2019	41

Figure 3-20	Map 21: Shipping routes in in the vicinity of the Foreshore Licence Application Area	44
Figure 3-21	Map 22: Infrastructure (Ports and Substations)	45
Figure 3-22	Map 23: Shipwrecks in the vicinity of the Foreshore Licence Application Area	46
Figure 3-23	Map 24 - Other projects in the area	50

## GLOSSARY

### AA

Appropriate Assessment

### ADCP

Acoustic Doppler Current Profiler

### AIS

Automatic Identification System

### BSA

Biologically Sensitive Area

### COLREGS

International Regulations for the Prevention of Collisions at Sea

### COSHH

Control of Substances Hazardous to Health

### COWF

Clarus Offshore Wind Farm

### CPT

Cone Penetration Test

### DAHG

Department of Arts, Heritage and the Gaeltacht

### DCENR

Department of Communications, Energy & Natural Resources

### DHLGH

Department of Housing, Local Government and Heritage

### DECC

Department of Energy and Climate Change

### DPE

DP Energy

### EIA

Environmental Impact Assessment

### EIAR

Environmental Impact Assessment Report

### EMODnet

European Marine Observation Data Network

### EPS

European Protected Species

### EU

European Union

### EUNIS

European Nature Information System

### Foreshore Licence Application Area

Foreshore Licence Application Area

### FLO

Fisheries Liaison Officer

### ha

Hectare

### HF

High Frequency Cetaceans

### HZ

Hertz

### ICES

International Council for the Exploration of the Seas

### ICG-C

Intercessional Correspondence Group on Cumulative Effects

### IMO

International Maritime Organization

### ICPC

International Cable Protection Committee

### IWDG

Irish Whale and Dolphin Group

### JUB

Jack Up Barge

### kHZ

Kilohertz

### LF

Low Frequency Cetaceans

**MBES**

Multibeam echosounder

---

**NIS**

Natura Impact Statement

---

**NM**

Nautical Mile

---

**NMPF**

National Marine Planning Framework

---

**MU**

Management Units

---

**NPWS**

National Parks & Wildlife Service

---

**OMPP**

Overarching Marine Planning Policies

---

**ORE**

Offshore Renewable Energy

---

**OREI**

Offshore Renewable Energy Installations

---

**PCW**

Phocid carnivores in water

---

**PTS**

Permanent Threshold Shift

---

**RNLI**

Royal National Lifeboat Association

---

**SAC**

Special Area of Conservation

---

**SBP**

Sub-bottom profiler

---

**SMRU**

Sea Mammals Research Unit

---

**SMPP**

Strategic Marine Planning Policies

---

**SOLAS**

Safety of Life at Sea

---

**SPA**

Special Protection Area

---

**SSS**

Side Scan Sonar

---

**TTS**

Temporary Threshold Shift

---

**VC**

Vibrocores

---

**VMS**

Vessel Monitoring Services

---

**ZOI**

Zone of Influence

---

# 1. INTRODUCTION

## 1.1 Introduction

Clarus Offshore Wind Farm Limited, a subsidiary project company of DP Energy Ireland, is investigating the feasibility of developing an offshore wind farm off the west coast of Ireland, the Clarus Offshore Wind Farm (COWF). Clarus Offshore Wind Farm is a key part of a wider portfolio of offshore wind projects that DPEI is developing with joint venture partner Iberdrola.

The Foreshore Licence Application Area covers the area within territorial waters (from the 12 nautical mile (NM) limit to the high-water mark along both County Kerry and County Clare), which contains the Cable Investigation Area associated with the COWF. The Foreshore Licence Application Area covers 93,622 hectares (ha) and is illustrated in Map 1 (Figure 1-1, Map 1).

Clarus Offshore Wind Farm Limited intend to carry out the proposed site investigations within this Foreshore Licence Application Area, under Foreshore Licence application FS006886, to investigate potential export cable corridors and landfall areas, and to assess the associated seabed. The results of the proposed site investigations will be used to select optimal cable route(s), landfall option(s) and provide baseline data for future environmental appraisal, Environmental Impact Assessment Report and subsequent Environmental Impact Assessment by the Competent Authority.

The area under investigation for the wind turbine array (the Array Investigation Area) lies beyond the 12 NM limit (i.e. outwith the State foreshore). Under existing legislation, a Foreshore Licence is required for site investigations within the State foreshore, i.e. inside the 12 NM limit. The Array Investigation Area is shown as 'Contiguous Project Area' in Map 1 (Figure 1-1).

The following Natura 2000 sites lay wholly or partially within the Foreshore Licence Application Area: Lower River Shannon Special Area of Conservation (SAC) (site code: IE002165), Kilkee Reefs SAC (site code: IE002264), Carrowmore Dunes SAC (site code: IE002250), Mid-Clare Coast SPA (site code: IE004182), River Shannon and River Fergus Estuaries SPA (site code: IE004077) and Loop Head SPA (site code: IE004119).

As the proposed site investigation works are not directly connected with or necessary to the management of the Natura 2000 sites, it is regarded as necessary that the project should be subject to the Appropriate Assessment (AA) process. A document entitled 'Supporting Information for Screening for Appropriate Assessment and Natura Impact Statement' (Document reference: P2399\_R5061) has been prepared in support of this process and is submitted in support of this Investigative Foreshore Licence Application.

A Foreshore Licence is sought solely for the proposed site investigation works which will be temporary and short-term. Undertaking the site investigation works does not guarantee that an offshore wind farm and associated infrastructure will be developed. The construction of a wind farm will be subject to a full Environmental Impact Assessment (EIA) as per EU Directive 2014/52/EU. As part of the EIA process, the construction phase of the project will be subject to Screening, Scoping and Consultation.

## 1.2 Marine Planning

### 1.2.1 National Marine Planning Framework

The National Marine Planning Framework (NMPF) was published on the 01 July 2021. It brings together all marine based human activities, detailing how marine activities will interact with each other to ensure sustainable use of marine resources by 2040. All applications for activities or developments in Ireland's marine area will be considered by the appropriate Regulator in terms of their consistency with the objectives of the plan.

The NMPF establishes 32 Overarching Marine Planning Policies (OMPPs), which apply to all proposals capable of having impacts in the maritime area, and 16 Sectoral Marine Planning Policies (SMPPs). For any proposed project or activity, a range of OMPPs and SMPPs may need to be considered to ensure full compliance with the NMPF. Table 1-1 presents the OMPPs and the Energy – Offshore Renewable SMPP, summarising how the proposed site investigations align with those policies. For a full description of the policies, please refer to the National Marine Planning Framework (<https://www.gov.ie/en/publication/a4a9a-national-marine-planning-framework/#national-marine-planning-framework>).

**Table 1-1 NMFP compliance statement**

Planning Policy	Clarus Offshore Wind Farm Compliance Statement
Environmental – Ocean Health Policy 1	Requires compliance with Biodiversity, Non-Indigenous species, water quality, sea-floor and water column integrity, marine litter and underwater noise policies.
Biodiversity 1	The proposed site investigations will not have significant adverse impacts on species adaptation or migration or on natural native habitat connectivity. Mitigation has been proposed to avoid or minimise potential for in-combination impacts on Primary Feature Common Bottlenose Dolphin of Lower River Shannon Special Area of Conservation. See document entitled 'Investigative Foreshore Licence Application: Supporting Information for Screening for Appropriate Assessment and Natura Impact Statement' submitted with this application (document reference P2399_R5061).
Biodiversity 2	The proposed site investigations will not lead to habitat reduction. Mitigation has been proposed to avoid or minimise potential for habitat disturbance of sensitive reef habitat. See document entitled 'Supporting Information for Screening for Appropriate Assessment and Natura Impact Statement' submitted with this application (document reference P2399_R5061).
Biodiversity 3	The proposed site investigations will not have significant adverse impacts on marine or coastal natural capital assets.
Biodiversity 4	Mitigation has been proposed to avoid or minimise potential for significant disturbance to highly mobile Annex IV species. See Section 4.4 of this Environmental Supporting Information document and see the document entitled 'Supporting Information for Screening for Appropriate Assessment and Natura Impact Statement' and 'Investigative Foreshore Licence Application for Site Investigations: Risk Assessment of Annex IV Species' submitted with this application (document references P2399_R5061, P2399_R5461).
Protected Marine Sites 1	The proposed site investigations can be implemented without adverse effects on Natura 2000 sites. See document entitled 'Supporting Information for Screening for Appropriate Assessment and Natura Impact Statement' submitted with this application (document reference P2399_R5061).
Protected Marine Sites 2 and 3	The proposed site investigations will not conflict with these policies.
Protected Marine Sites 4	Section 4 of this Environmental Supporting Information document assesses the potential impacts of the proposed site investigations on sensitive marine features which are not protected. No significant adverse impacts have been identified. The proposed site investigations are therefore in line with this policy.

Planning Policy	Clarus Offshore Wind Farm Compliance Statement
Non-indigenous Species 1	All vessels used for the proposed site investigations will comply with the latest International Maritime Organization (IMO), Safety of Life at Sea (SOLAS) and environmental requirements for their classification and with any national requirement of the territorial or offshore waters to be operated in. Compliance with national statute will reduce the risk of the introduction or spread of non-indigenous species.
Water Quality 1 and 2	The proposed site investigations will not have a significant adverse impact upon water quality and will not conflict with these policies.
Sea-floor Integrity 1, 2 and 3	The proposed site investigations will not have a significant adverse impact upon marine habitats and will not conflict with these policies.
Marine Litter 1	Liquid or non-liquid pollutants or waste material will not be dumped, thrown, or otherwise disposed of into the sea. All refuse and materials shall be kept onboard the vessel and safely disposed of onshore according to the MARPOL Convention.
Underwater Noise 1	This Environmental Supporting Information document and the document entitled 'Supporting Information for Screening for Appropriate Assessment and Natura Impact Statement' as well as the document entitled 'Risk Assessment for Annex IV Species' submitted with this application have considered all underwater noise sources and the potential impacts on marine fauna. Appropriate mitigation has been proposed to avoid or minimise potential impacts.
Air Quality 1 and 2	All vessels used for the proposed site investigations will comply with the latest International Maritime Organization (IMO), Safety of Life at Sea (SOLAS) and environmental requirements for their classification and with any national requirement of the territorial or offshore waters to be operated in. This includes regulations around atmospheric emissions.
Climate Change 2	
Climate Change 1	The proposed site investigations will not change the physical features of the coast or effect flood defence or habitats that provide carbon sequestration ecosystem services.
Co-existence 1	Measures to be followed to allow co-existence with the fishing industry are described in Section 4.9. No significant adverse impacts have been identified.
Infrastructure 1	The proposed site investigations will not conflict with these policies.
Access 1 and 2	
Employment 1	DP Energy Ireland is an Irish based company with offices and permanent employees based in Cork City and Buttevant, County Cork. The Fisheries Liaison Officer for the project is a local Irish sub-contractor. Where appropriate DP Energy select Irish contractors or contractors who can demonstrate they are maximising local Irish content.
Heritage Assets 1	Section 4.8 of this Environmental Supporting Information document details measures to be implemented to avoid impacts to heritage assets.
Rural Coastal and Island Communities 1	The proposed site investigations will not conflict with this policy.
Seascape and Landscape 1	The proposed site investigations will not have a visual impact on the seascape or landscape.
Social Benefits 1 and 2	The proposed site investigations will not conflict with these policies.
Transboundary 1	The proposed site investigations will not have transboundary impacts.
Aquaculture SMPP	The proposed site investigations will not have a significant impact on aquaculture production areas (see Section 4.9 of this document) and will not conflict with the sustainable development of aquaculture.
Defence and Security SMPP	The proposed site investigations will not interfere with the performance of the Defence Forces.
Energy – Natural Gas Storage SMPP	The proposed site investigations will not conflict with this SMPP.
Offshore Renewable Energy (ORE) Policy 1	Clarus Offshore Wind Farm Limited, a subsidiary project company of DP Energy Ireland, is investigating the feasibility of developing an offshore wind farm off the west

Planning Policy	Clarus Offshore Wind Farm Compliance Statement
	coast of Ireland, the Clarus Offshore Wind Farm (COWF). Development of a new wind farm has potential to assist the State in meeting the Government's offshore renewable energy targets. The proposed site investigations will support the development of the COWF. This proposal is therefore in line with this policy.
ORE Policy 2	The development of a new wind farm as a consequence of the feasibility works being undertaken by DP Energy Ireland, will need to demonstrate it is consistent with national policy and the Offshore Renewable Energy Development Plan and its successor. The proposed site investigations do not conflict with this policy and are in line with the plan to develop sustainably Ireland's offshore renewable energy.
ORE Policy 3	Other potential ORE proposals have been identified which potentially overlap spatially with the proposed site investigations. All sites are under feasibility stages and none are held under permission or subject to an ongoing permitting or consenting process for renewable energy generation.
ORE Policies 4 - 11	The proposed site investigations will not conflict with these policies.
Energy - Petroleum SMPP	There are no petroleum activities within the Foreshore Licence Application Area. The proposed site investigations will not conflict with these policies.
Energy – Transmission SMPP	The proposed site investigations will not conflict with this SMPP.
Fisheries SMPP	Measures to be followed to allow co-existence with the fishing industry are described in Section 4.9 of this document. No significant adverse impacts have been identified to the industry or essential fish habitat.
Mineral Exploration and Mining SMPP	The proposed site investigations will not conflict with this SMPP.
Ports, Harbours and Shipping SMPP	All vessels used for the proposed site investigations will comply with the latest International Maritime Organization (IMO), Safety of Life at Sea (SOLAS) and environmental requirements for their classification and with any national requirement of the territorial or offshore waters to be operated in. Commissioners for Irish Lights (CIL) standard navigational safety requirements will be adhered to with regards to positioning, mooring, marking and lighting of all equipment deployed under the Foreshore Licence.  Potential impacts on shipping and navigation have been assessed in Section 4.9. The proposed site investigations will not conflict with this SMPP.
Safety at Sea SMPP	All vessels used for the proposed site investigations will comply with the latest International Maritime Organization (IMO), Safety of Life at Sea (SOLAS) and environmental requirements for their classification and with any national requirement of the territorial or offshore waters to be operated in. Commissioners for Irish Lights (CIL) standard navigational safety requirements will be adhered to with regards to positioning, mooring, marking and lighting of all equipment deployed under the Foreshore Licence.
Seaweed Harvesting SMPP	No significant impacts have been identified on these receptors (see Section 4 of this Environmental Supporting Information). The proposed site investigations will not conflict with these SMPPs.
Sport and Recreation SMPP	
Telecommunications SMPP	
Tourism SMPP	
Wastewater Treatment and Disposal SMPP	

### 1.3 Aim of this Report

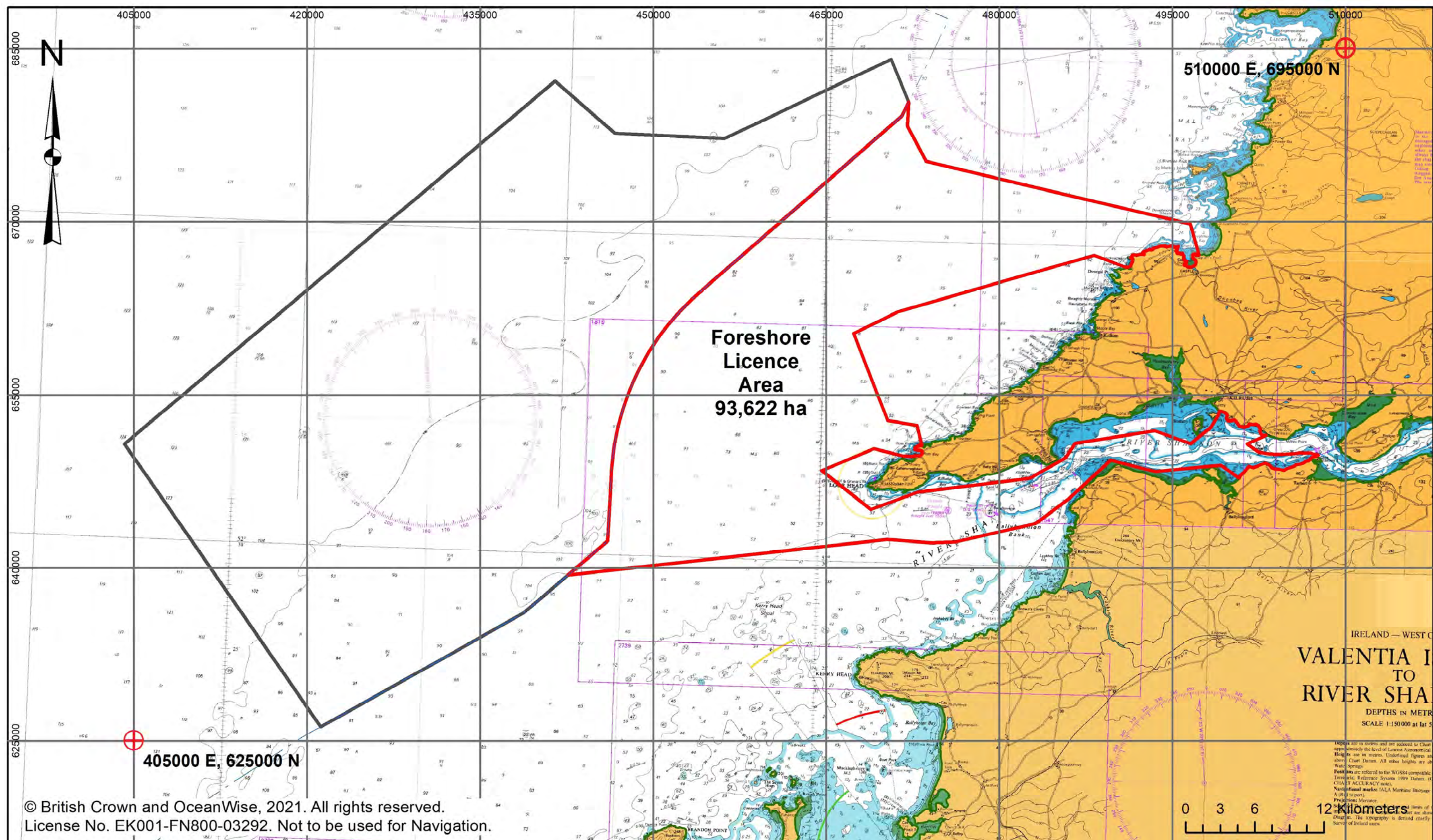
This report has been prepared to provide information to support the determination of a Foreshore Licence. This document provides a high-level characterisation of the environmental baseline within



the Foreshore Licence Application Area and surrounding area and identifies any potential environmental sensitivities in the region. In order to determine any potential environmental effects, a significance assessment in accordance with the Environment Protection Agency (EPA) Ireland (2017) definitions of significance has been carried out. This report provides the following:

- Description of the proposed site investigations (Section 2);
- Environmental baseline and appraisal of environmental sensitivities in the region (Section 3); and
- Assessment of potential effects of the proposed site investigations including any proposed mitigation to reduce the significance of effects (Section 4).





# **Foreshore Licence Map 1** **Clarus Offshore Wind Farm**

File Number: FS006886

## **Legend**

- ▬ Foreshore Licence Application Area
- ▬ Contiguous Project Area
- ▬ High Water of Medium Tides
- ▬ Irish Territorial Sea 12 nm Limit

Ver	Date	Drawn by	Checked	Approved
V2	30/09/2021			
Map prepared by <span></span> MEngSc in Environmental Engineering, PGD in Sustainable Energy, HDGGIS				
Filename: C003IE_FIG_ClarusOffshoreWindFarm_V2.0_20210930				Size A3
Scale: 1:420,000		Printed @ A3		
Coordinate System: IREN95 Irish Transverse Mercator Projection: Transverse Mercator				



Mill House, Buttevant, P51 TN35  
Co. Cork, Ireland

[www.dpenergy.com](http://www.dpenergy.com)

All Rights Reserved, 2021



## 2. DESCRIPTION OF THE PROPOSED SITE INVESTIGATIONS

### 2.1 Introduction

This section provides a high-level overview of the proposed site investigations. Full detail on the proposed site investigations are provided with the document submitted in support of the Investigative Foreshore Licence Application as Schedule of Survey Works.

### 2.2 Overview

The proposed site investigations (geophysical, geotechnical, wind resource and metocean, archaeological and ecological surveys) will enable:

- Detailed mapping of shallow geological and seabed character;
- Reconnaissance level mapping of seabed relief and features (i.e. areas of reef, sandwaves and exposed archaeology etc);
- Greater understanding of bird, marine mammal and reptile species abundance and distribution in the area;
- Greater understanding of metocean conditions; and
- Baseline environmental mapping (i.e. habitats and species).

The information gained from the proposed site investigations would be used to minimise uncertainty in ground conditions at an early design stage and optimise cable routeing within the Cable Investigation Area.

Depending on the results of the proposed site investigations, other consents and permissions required to develop, install, operate and ultimately decommission an offshore wind energy project and associated export cables may be sought via the appropriate channels at a future date. Data acquired during the proposed site investigations would be used to inform environmental assessments in support of any required applications by providing information on the baseline environment and allowing potential effects to be assessed, and subsequently, appropriate mitigation measures to be developed. This data may also be used at a later date to provide a baseline against which to monitor post construction effects of construction, operation and decommissioning.

### 2.3 Survey Schedule

The intention is to commence the proposed site investigation activities as soon as feasible following award of Foreshore Licence, with a staged programme of site investigations to capitalise on suitable weather windows over this time period, likely during Spring and Summer. This phased approach will progress the overall development towards detailed design stage. The exact mobilisation dates for the site investigation activities will not be known until a Foreshore Licence has been secured and the process of procuring the contractor is complete.

While a multi-year licence is sought, most survey activities will only occur over a period of weeks, with the exception of the metocean devices (LiDAR, ADCPs and Wave Buoys) which may be deployed for longer. The time spent at each individual location will be a maximum of hours for other site investigation activities such as Boreholes, CPTs, Vibrocores, Gravity Coring, Grab Sampling etc.

## 2.4 Summary of Proposed Site Investigations

In summary the following Licensable Activities are proposed:

- **Geophysical:** Geophysical studies to determine seabed conditions (and ultimately installation methods and cable protection measures) along the potential export cable route(s) and landfalls. Investigations to include, for example multibeam echosounder (MBES), side scan sonar (SSS) and sub-bottom profiler (SBP).
- **Geotechnical:** To evaluate the nature and mechanical properties of the superficial seabed sediments and intertidal sediments in the Foreshore Licence Application Area. Following review of the geophysical data, a limited number of export cable and landfall options will be selected for geotechnical sampling. Investigations to include:
  - Up to approximately 130 vibrocores (VCs).
  - Up to approximately 130 cone penetration tests (CPTs).
  - Up to approximately 6 boreholes.
- **Archaeological:** A desktop study will be undertaken to inform the approach to assessment of onshore and offshore cultural heritage features. Offshore magnetometer/gradiometer surveys are proposed as part of this Investigative Foreshore Licence Application to identify any additional cultural heritage features.
- **Wind Resource and Metocean Survey:** To evaluate wind and wave conditions, proposed survey methodologies include deployment of up to two SEAWATCH Wind LiDAR Buoys or similar and two Waverider Buoys. Up to five acoustic doppler current profilers (ADCP) will be used to assess tidal currents in the area.
- **Ecological:** These include benthic (up to 65 grab stations) and intertidal surveys as well as potential Marine Mammal Acoustic Monitoring and boat-based bird and marine mammal surveys to complement aerial bird and marine mammal surveys underway.

Figure 2-1, Map 2 presents a high-level indication of potential geotechnical and ecological grab sample locations. These are indicative only and there are more sample positions indicated on Figure 2-1, Map 2 than 130 VCs, 130 CPTs, and 65 grab sample stations.





0 3 6 12 Kilometers

- Benthic Habitats**  
**EUNIS Classification**
- A3
  - A3.1
  - A3.2
  - A3.3
  - A4
  - A4.1
  - A4.12
  - A4.2
  - A4.27
  - A4.3
  - A4.33
  - A5.13
  - A5.14
  - A5.15
  - A5.23 or A5.24
  - A5.25 or A5.26
  - A5.27
  - A5.33
  - A5.34
  - A5.35
  - A5.36
  - A5.37
  - A5.43
  - A5.44
  - A5.45
  - Na

Sources: Esri, GEBCO, NOAA, National Geographic, Garmin, HERE, Geonames.org, and other contributors, Esri, Garmin, GEBCO, NOAA NGDC, and other contributors

# Clarus Offshore Wind Farm

## Map 26

Indicative Sampling Locations

- Legend**
- Foreshore Licence Application Area
  - Contiguous Project Area
  - Indicative Grab Sample Locations
  - Indicative CPT/Borehole/Vibrocore Locations
  - Irish Territorial Sea 12 nm Limit
- Data source: EMODnet

Ver	Date	Drawn by	Checked	Approved
V1	13/10/2021			
Map prepared by [REDACTED] MEngSc in Environmental Engineering, PGD in Sustainable Energy, HDGGIS				
Filename: C003IE_FIG_IndicativeSamplingLocations_V1.0_202110				Size A3
Scale: 1:400,000		Printed @ A3		
Coordinate System: IRENET95 Irish Transverse Mercator Projection: Transverse Mercator				



**DP ENERGY**

Mill House, Buttevant, P51 TN35  
Co. Cork, Ireland  
www.dpenergy.com  
All Rights Reserved, 2021



## 2.5 General Requirements

The survey contractor and vessels will comply with international and national statute as appropriate. In addition, the following standard environmental procedures/protocols will be followed during the survey campaign:

- All vessels will comply with the latest International Maritime Organization (IMO), Safety of Life at Sea (SOLAS) and environmental requirements for their classification and with any national requirement of the territorial or offshore waters to be operated in.
- The contractor will take particular care when handling or storing hazardous materials, radiation sources and chemicals.
- Liquid or non-liquid pollutants or waste material will not be dumped, thrown, or otherwise disposed of into the sea.
- All refuse and materials shall be kept onboard the vessel and safely disposed of onshore according to the MARPOL Convention.
- All substances handled and/or used whilst undertaking the works will be handled, used, stored, and documented in accordance with assessments and recommendations of the Control of Substances Hazardous to Health (COSHH) Regulations 1994.
- Where Fuels, Oils and Lubes are required to be stored on boats, suitable containers will be used and stowed to allow ventilation and safe dissipation of any accidental leaked gas and retention of any leaked liquid.
- No liquid will be discharged into the water at any stage of the work on site. No smoking will be permitted in the vicinity of fuel in storage or when in use.
- In line with ICPC Recommendations, geotechnical and environmental sampling locations will be positioned a minimum of 250m from third-party assets e.g. pipelines. All asset owners will be contacted prior to proposed site investigations to determine if proximity agreements are required.
- Commissioners for Irish Lights (CIL) standard navigational safety requirements will be adhered to with regards to positioning, mooring, marking and lighting of all equipment deployed under the Foreshore Licence.
- Removal of all equipment deployed under the Foreshore Licence and return of the seabed to its original condition.

## 3. ENVIRONMENTAL BASELINE

An understanding of the potential effects from an operation on the environment requires a clear understanding of the present state of the environmental baseline. For the purposes of this report, this section focuses on the environmental receptors which have the potential to be affected by the planned site investigation works.

The description of the environment is based on publicly available data sources, as referenced in the text.

### 3.1 Protected Sites

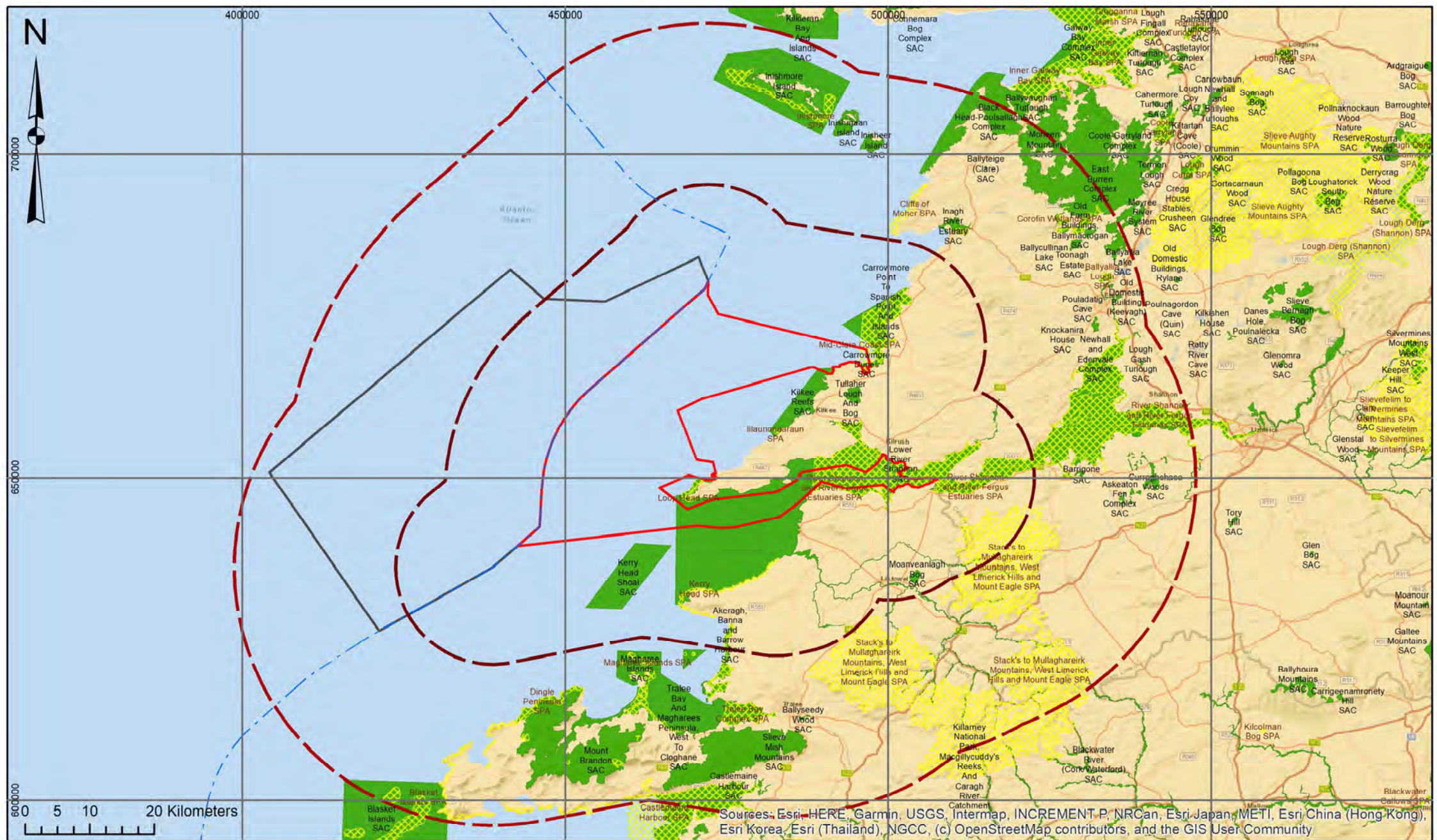
In accordance with the provisions of Article 6(3) of the EC Habitats Directive (92/43/EEC) transposed into Irish statute by the European Communities (Birds and Natural Habitats) Regulations 2011, SI 477/2011, Screening for Appropriate Assessment (Stage 1) and information to inform Stage 2 Appropriate Assessment has been undertaken for European Sites and is presented in a NIS, submitted with this application, document reference P2399\_R5061.

To identify the relevant Natura 2000 sites, a 15km buffer was applied to the Foreshore Licence Application Area. The distance of 15km zone of influence was used based on guidance provided by the NPWS on AA procedures (DEHLG, 2010). All Natura 2000 sites (SACs and SPAs) within 15km of the Foreshore Licence Application Area are shown on Figure 3-1, Map 3 and are listed in Table 3-1. Additionally, all SACs within 40km of the Foreshore Licence Application Area have been screened for the presence of Annex II migratory fish species as Qualifying Interests, in recognition that as mobile species, fish could potentially enter the Foreshore Licence Application Area. Only SACs with marine components have been screened for AA.

**Table 3-1 Natura 2000 sites within 15km**

Designation	Site Code & Name
SAC	IE002165 Lower River Shannon
SAC	IE002264 Kilkee Reefs
SAC	IE001021 Carrowmore Point to Spanish Point And Islands
SAC	IE002250 Carrowmore Dunes SAC
SAC	IE002263 Kerry Head Shoal
SPA	IE004189 Kerry Head
SPA	IE004114 Illaunonearaun
SPA	IE004182 Mid-Clare Coast
SPA	IE004077 River Shannon and River Fergus Estuaries
SPA	IE004119 Loop Head
SPA	IE004161 Stack's to Mullaghareirk Mountains, West Limerick Hills and Mount Eagle
SPA	IE004188 Tralee Bay Complex





## Clarus Offshore Wind Farm

### Map 6

Natura 2000

#### Legend

- Irish Territorial Sea 12 nm Limit
  - Foreshore Licence Application Area
  - FLAA 15km Buffer
  - FLAA 40km Buffer
  - SPA
  - SAC
  - Contiguous Project Area
- Data source: NPWS, DCCAE

Ver	Date	Drawn by	Checked	Approved
V1	30/09/2021			
Map prepared: [REDACTED] [REDACTED] # Environmental Engineering, PGD in Sustainable Energy, HDGG/IS				
Filename: C003E_FIG_Nature2000_V1.0_20210930				Size A3
Scale: 1:750,000		Printed @ A3		
Coordinate System: IRENET95 Irish Transverse Mercator Projection: Transverse Mercator				



Mill House, Buttevant, P51 TN35  
Co. Cork, Ireland

www.dpenergy.com

All Rights Reserved, 2021



## 3.2 Intertidal and Benthic Communities

Intertidal and benthic ecology comprises the habitats and species (flora and fauna) present in, on or closely associated with the seabed. A high-level assessment of the key sensitive intertidal and benthic habitats and species within the Foreshore Licence Application Area has been made by reviewing the European Marine Observation Data Network (EMODnet) Seabed Habitats project ([www.emodnet-seabedhabitats.eu](http://www.emodnet-seabedhabitats.eu)). This provides broad-scale predictive mapping based on physical hydrographic information within different habitats areas and water depths (EMODnet 2021).

This data is predictive rather than definitive; however, it does provide some indication to the types of benthic habitats that may be found within the Foreshore Licence Application Area. The habitats identified within the Foreshore Licence Application Area, along with their European Nature Information System (EUNIS) code, are listed in Table 3-2 and shown in Figure 3-2, Map 4.

**Table 3-2 Intertidal and benthic communities**

EUNIS code	EUNIS name	Typical fauna
A3	Infralittoral rock and other hard substrata	Broadscale habitat
A3.1	Atlantic and Mediterranean high energy infralittoral rock	Rocky habitats in the infralittoral zone subject to exposed to extremely exposed wave action or strong tidal streams. Typically, the rock supports a community of kelp <i>Laminaria hyperborea</i> with foliose seaweeds and animals, the latter tending to become more prominent in areas of strongest water movement. The depth to which the kelp extends varies according to water clarity. The sublittoral fringe is characterised by dabberlocks <i>Alaria esculenta</i> .
A4	Circalittoral rock and other hard substrata	Broadscale habitat
A4.1	Atlantic and Mediterranean high energy circalittoral rock	Occurs on extremely wave-exposed to exposed circalittoral bedrock and boulders subject to tidal streams ranging from strong to very strong. Typically found in tidal straits and narrows. The high energy levels found within this habitat complex are reflected in the fauna recorded. Sponges such as <i>Pachymatisma johnstonia</i> , <i>Halichondria panicea</i> , <i>Esperiopsis fucorum</i> and <i>Myxilla incrustans</i> may all be recorded. Characteristic of this habitat complex is the dense 'carpet' of the hydroid <i>Tubularia indivisa</i> . The barnacle <i>Balanus crenatus</i> is recorded in high abundance on the rocky substrata. On rocky outcrops, <i>Alcyonium digitatum</i> is often present.  In EUSeaMap broad-scale predictive mapping this habitat is classified as 'circalittoral rock and biogenic reef'. It is therefore possible that EC Habitats Directive Annex listed habitat biogenic reef maybe observed in these areas.
A4.12	Sponge communities on deep circalittoral rock	Occurs on deep (commonly below 30m depth), wave-exposed circalittoral rock subject to negligible tidal streams. The sponge component of this biotope is the most striking feature. <i>Phakellia ventralabrum</i> , <i>Axinella infundibuliformis</i> , <i>Axinella dissimili</i> and <i>Stelligera stuposa</i> dominate. Other sponge species frequently found on exposed rocky coasts are also present in low to moderate abundance. These include <i>Cliona celata</i> , <i>Polymastia boletiformis</i> , <i>Haliclona viscosa</i> , <i>Pachymatisma johnstonia</i> , <i>Dysidea fragilis</i> , <i>Suberites carnosus</i> , <i>Stelligera rigida</i> , <i>Hemimycale columella</i> and <i>Tethya aurantium</i> .
A4.2	Atlantic and Mediterranean moderate energy circalittoral rock	Mainly occurs on exposed to moderately wave-exposed circalittoral bedrock and boulders, subject to moderately strong and weak tidal streams. This habitat type contains a broad range of biological subtypes, from echinoderms and crustose communities (A4.21) to Sabellaria reefs (A4.22) and circalittoral mussel beds (A4.24).
A4.27	Faunal communities on deep moderate energy circalittoral rock	These communities populate hard substrata with low hydrodynamics and strong sedimentation.
A4.3	Atlantic and Mediterranean low energy circalittoral rock	Occurs on wave-sheltered circalittoral bedrock and boulders subject to mainly weak/very weak tidal streams. The biotopes identified within this habitat type are

EUNIS code	EUNIS name	Typical fauna
		often dominated by encrusting red algae, brachiopods ( <i>Neocrania anomala</i> ) and ascidians ( <i>Ciona intestinalis</i> and <i>Ascidia mentula</i> ).
A4.33	Faunal communities on deep low energy circalittoral rock	No description available.
A5.13	Infralittoral coarse sediment	Moderately exposed habitats with coarse sand, gravelly sand, shingle and gravel in the infralittoral, are subject to disturbance by tidal steams and wave action. Such habitats found on the open coast or in tide-swept marine inlets are characterised by a robust fauna of infaunal polychaetes such as <i>Chaetozone setosa</i> and <i>Lanice conchilega</i> , cumacean crustacea such as <i>Iphinoe trispinosa</i> and <i>Diastylis bradyi</i> , and venerid bivalves. Habitats with the lancelet <i>Branchiostoma lanceolatum</i> may also occur.
A5.14	Circalittoral coarse sediment	Tide-swept circalittoral coarse sands, gravel and shingle generally in depths of over 15-20m. This habitat may be found in tidal channels of marine inlets, along exposed coasts and offshore. This habitat, as with shallower coarse sediments, may be characterised by robust infaunal polychaetes, mobile crustacea and bivalves. Certain species of sea cucumber (e.g. <i>Neopentadactyla</i> ) may also be prevalent in these areas along with the lancelet <i>Branchiostoma lanceolatum</i> .
A5.15	Deep circalittoral coarse sediment	Offshore (deep) circalittoral habitats with coarse sands and gravel or shell. This habitat may cover large areas of the offshore continental shelf although there is relatively little quantitative data available. Such habitats are quite diverse compared to shallower versions of this habitat and generally characterised by robust infaunal polychaete and bivalve species. Animal communities in this habitat are closely related to offshore mixed sediments and in some areas settlement of horse mussel ( <i>Modiolus modiolus</i> ) larvae may occur and consequently these habitats may occasionally have large numbers of juvenile <i>M. modiolus</i> . In areas where the mussels reach maturity their byssus threads bind the sediment together, increasing stability and allowing an increased deposition of silt leading to the development of the biotope A5.622.
A5.25 or A5.26	Circalittoral fine sand or Circalittoral muddy sand	<p>A5.25 - Clean fine sands with less than 5% silt/clay in deeper water, either on the open coast or in tide-swept channels of marine inlets in depths of over 15-20 m. The habitat may also extend offshore and is characterised by a wide range of echinoderms (in some areas including the sea urchin (<i>Echinocyamus pusillus</i>), polychaetes and bivalves. This habitat is generally more stable than shallower, infralittoral sands and consequently supports a more diverse community.</p> <p>A5.26 - Circalittoral non-cohesive muddy sands with the silt content of the substratum typically ranging from 5% to 20%. This habitat is generally found in water depths of over 15-20m and supports animal-dominated communities characterised by a wide variety of polychaetes, bivalves such as <i>Abra alba</i> and <i>Nucula nitidosa</i>, and echinoderms such as <i>Amphiura</i> spp and <i>Ophiura</i> spp., and <i>Astropecten irregularis</i>. These circalittoral habitats tend to be more stable than their infralittoral counterparts and as such support a richer infaunal community.</p>
A5.27	Deep circalittoral sand	Offshore (deep) circalittoral habitats with fine sands or non-cohesive muddy sands. Very little data is available on these habitats however they are likely to be more stable than their shallower counterparts and characterised by a diverse range of polychaetes, amphipods, bivalves and echinoderms.
A5.37	Deep circalittoral mud	In mud and cohesive sandy mud in the offshore circalittoral zone, typically below 50-70 m, a variety of faunal communities may develop, depending upon the level of silt/clay and organic matter in the sediment. Communities are typically dominated by polychaetes but often with high numbers of bivalves such as <i>Thyasira</i> spp., echinoderms and foraminifera.
A5.44	Circalittoral mixed sediments	Mixed (heterogeneous) sediment habitats in the circalittoral zone (generally below 15-20 m) including well mixed muddy gravelly sands or very poorly sorted mosaics of shell, cobbles and pebbles embedded in or lying upon mud, sand or gravel. Due to the variable nature of the seabed a variety of communities can develop which are often very diverse. A wide range of infaunal polychaetes, bivalves, echinoderms and burrowing anemones such as <i>Cerianthus lloydii</i> are often present in such habitat and the presence of hard substrata (shells and stones) on the surface enables epifaunal species to become established, particularly hydroids such as <i>Nemertesia</i> spp and

EUNIS code	EUNIS name	Typical fauna
		<i>Hydrallmania falcata</i> . The combination of epifauna and infauna can lead to species rich communities. Coarser mixed sediment communities may show a strong resemblance, in terms of infauna, to biotopes within the A5.1. However, infaunal data for this habitat type is limited to that described under the biotope A5.443, and so are not representative of the infaunal component of this habitat type.
A5.45	Deep circalittoral mixed sediments	Offshore (deep) circalittoral habitats with slightly muddy mixed gravelly sand and stones or shell. This habitat may cover large areas of the offshore continental shelf although there is relatively little data available. Such habitats are often highly diverse with a high number of infaunal polychaete and bivalve species. Animal communities in this habitat are closely related to offshore gravels and coarse sands and in some areas populations of the horse mussel ( <i>Modiolus modiolus</i> ) may develop in these habitats.

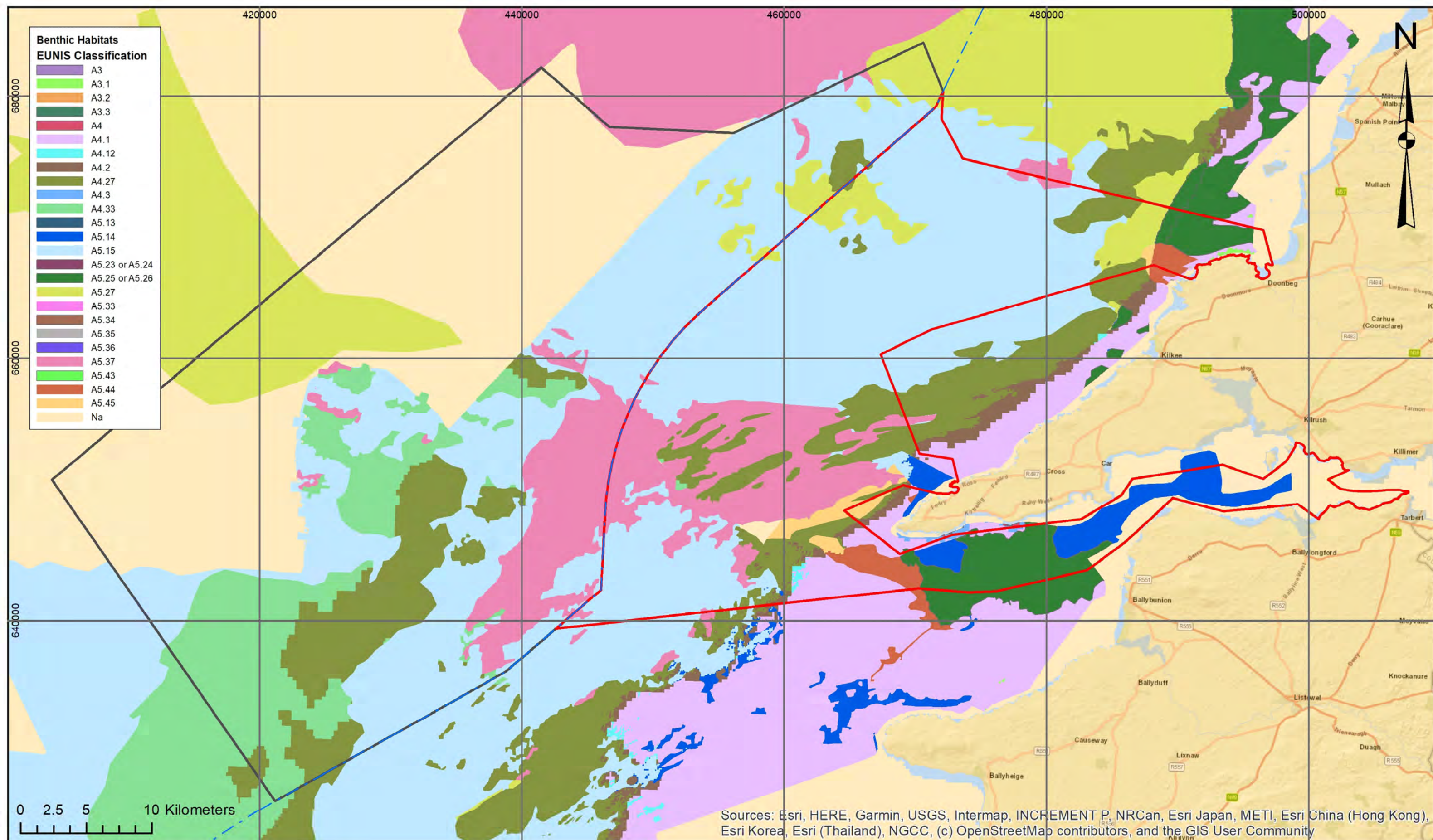
Source: EMODnet (2021)

The seabed sediments and habitats within the Foreshore Licence Application Area are variable and reflective of the different sedimentation processes within the area. The sediments within the most upstream part of the Shannon Estuary of the Foreshore Licence Application Area are not classified within the EUNIS system and a habitat description for these sediments is not available. The seabed sediments within the mouth of the Shannon Estuary are largely comprised of high energy circalittoral coarse sediment (A5.14) and circalittoral fine sand (A5.25) or circalittoral muddy sand (A5.26). These habitats are characteristic for tidal channels of marine inlets and may be characterised by robust infaunal polychaetes, echinoderms, mobile crustacea and bivalves.

Within the outer reaches of the Shannon Estuary and along the coast is an area classified as circalittoral rock (A4.1). Along the coastline there is also a band of A4.2 – Atlantic and Mediterranean moderate energy circalittoral rock which runs almost parallel to A4.1. These habitats are likely to be dominated by sponges, hydroids, barnacles and potentially Sabellaria reef and mussel beds.

Further out from the shore the seabed there is a large area roughly parallel to the coastline of faunal communities on deep moderate energy circalittoral rock (A4.27). These communities populate hard substrata with low hydrodynamics and strong sedimentation. The rest of the Foreshore Licence Application Area is primarily dominated by, deep circalittoral coarse sediment (A5.15) and deep circalittoral mud (A5.37). These sediments are likely to be characterised by polychaetes, bivalves and echinoderms. There is also an isolated area of A5.27 near the northwest corner of the application, which is continued outside of the Foreshore Licence Application Area.





Sources: Esri, HERE, Garmin, USGS, Intermap, INCREMENT P, NRCan, Esri Japan, METI, Esri China (Hong Kong), Esri Korea, Esri (Thailand), NGCC, (c) OpenStreetMap contributors, and the GIS User Community

# Clarus Offshore Wind Farm

## Map 10

### Benthic Habitats

- Legend**
- Foreshore Licence Application Area
  - Contiguous Project Area
  - - Irish Territorial Sea 12 nm Limit

Data source: EMODnet

Ver	Date	Drawn by	Checked	Approved
V1	30/09/2021			
Map prepared by: <span style="background-color: black; color: black;">XXXXXXXXXX</span> mengoc in Environmental Engineering, PGD in Sustainable Energy, HDGGIS				
Filename: C0031E_FIG_BenthicHabitats_V1.0_20210930				Size A3
Scale: 1:370,000		Printed @ A3		
Coordinate System: IRENET95 Irish Transverse Mercator Projection: Transverse Mercator				



**DP ENERGY**

Mill House, Buttevant, P51 TN35  
Co. Cork, Ireland  
[www.dpenergy.com](http://www.dpenergy.com)  
All Rights Reserved, 2021



### 3.2.2 Reefs

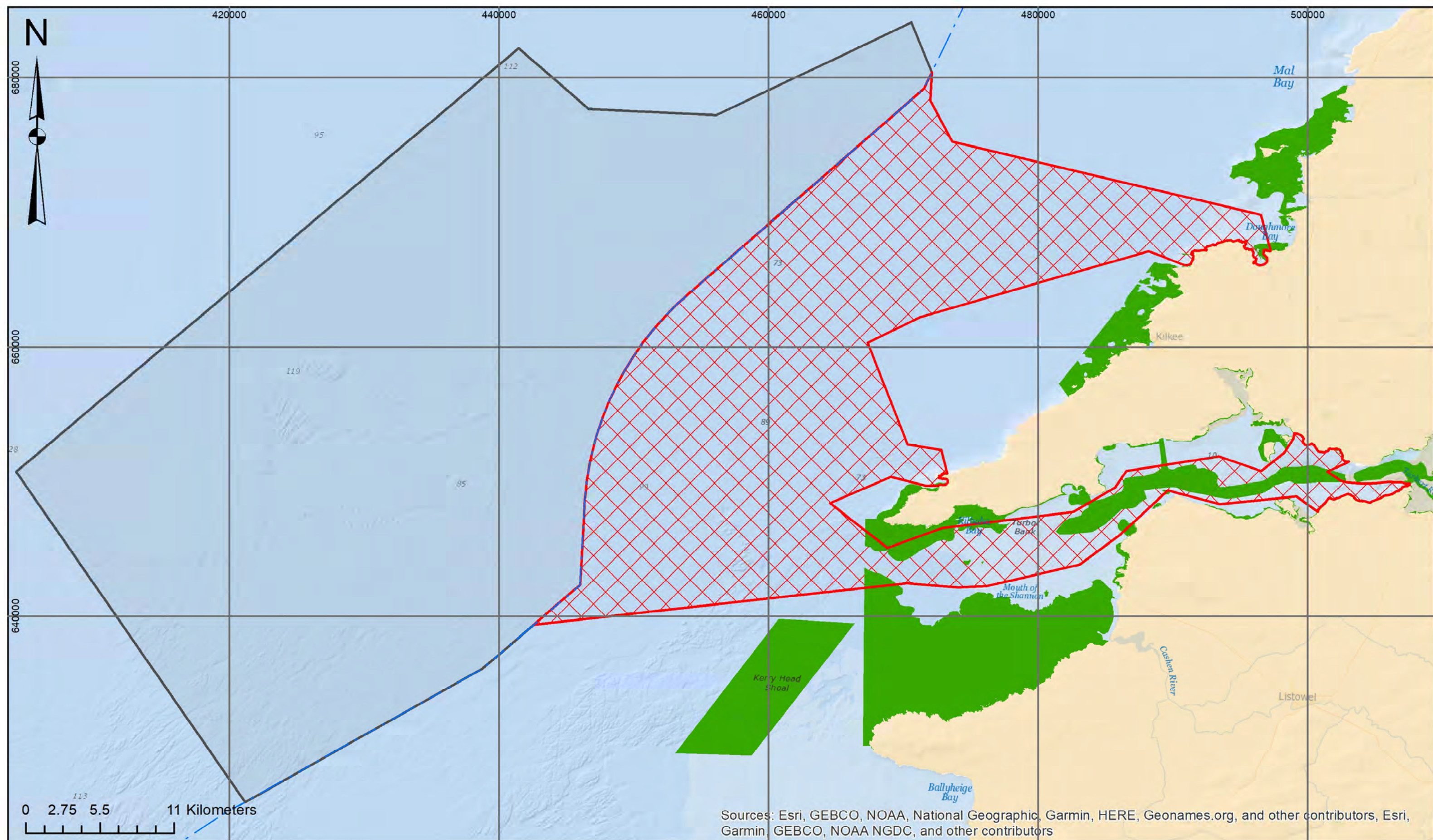
The Foreshore Licence Application Area overlaps with three protected sites that are designated for the Qualifying Interest, Annex I reefs namely; Lower River Shannon SAC, Kilkee Reefs SAC, and Carrowmore Dunes SAC (Figure 3-3, Map 5).

The Lower River Shannon SAC supports a wide range of reef habitat, including the following reef community types: Furoid-dominated intertidal reef community complex; Mixed subtidal reef community complex; Faunal turf-dominated subtidal reef community; Anemone- dominated subtidal reef community; and Laminaria- dominated community complex (NPWS, 2012).

Almost the entirety of the Kilkee Reefs SAC is covered by subtidal reef habitat. The exposed nature of the site provides ideal conditions for extensive, dense blue mussel (*Mytilus edulis*) beds in the lower mid-shore (NPWS, 2014b). Moving seaward, the shallow sublittoral reefs are steeply sloping and extremely or moderately exposed to wave action. These reef communities may be very species rich, with many algal, kelp and sponge species present, along with sea fans and sea slugs as the depth increases. At depths below 25 m the reefs have animal-dominated communities with sparse algae.

Within Carrowmore Dunes SAC there are two reef communities, intertidal reef complex and Laminaria-dominated community complex which are largely located to the north and southwest of the site (NPWS 2013).





Sources: Esri, GEBCO, NOAA, National Geographic, Garmin, HERE, Geonames.org, and other contributors, Esri, Garmin, GEBCO, NOAA NGDC, and other contributors

## Clarus Offshore Wind Farm

### Map 7

Reefs

#### Legend

- Foreshore Licence Application Area
- Contiguous Project Area
- Cable Investigation Area
- Reefs (1170)
- Irish Territorial Sea 12 nm Limit

Data source: NPWS, DCCAE, EMODnet

Ver	Date	Drawn by	Checked	Approved
V1	30/09/2021			
Map prepared by [redacted], mcmgoc in Environmental Engineering, PGD in Sustainable Energy, HDGGIS				
Filename: C003IE_FIG_Reefs_V1.0_20210930				Size A3
Scale: 1:360,000		Printed @ A3		
Coordinate System: IRENET95 Irish Transverse Mercator Projection: Transverse Mercator				



Mill House, Buttevant, P51 TN35  
Co. Cork, Ireland

[www.dpenergy.com](http://www.dpenergy.com)

All Rights Reserved, 2021



### 3.3 Birds

The coastal sea cliffs, estuaries and offshore islands of Ireland are host to nationally and internationally important bird species, with many areas designated as SPAs.

At least 45 species of seabird (including divers and grebes) have been recorded during at-sea surveys in Irish waters, of which 24 seabird species regularly breed around Ireland (Cummins, Lauder and Tierney, 2019, Pollock et al 2008, Mackey et al 2004). This includes globally important populations of Manx shearwater, Storm petrel and Roseate Tern (Cummins, Lauder and Tierney, 2019). In addition, a further 59 species of waterfowl and wader regularly occur at coastal sites around Ireland such as estuaries; including 5 grebe species, 2 heron species, 26 species of wildfowl and 26 wader species (Crowe 2005). Some of these species are migratory and are present only during migration periods in spring and autumn; others come to Ireland to breed or to spend the winter, while some are resident all year round.

The Foreshore Licence Application Area lies within or near the following SPAs, designated for breeding and over-wintering bird species:

- Kerry Head SPA
- Illaunonearaun SPA
- Mid-Clare Coast SPA
- River Shannon and River Fergus Estuaries SPA
- Loop Head SPA
- Stack's to Mullaghareirk Mountains, West Limerick Hills and Mount Eagle SPA
- Tralee Bay Complex SPA

Further details on these sites are provided in the document entitled 'Supporting Information for Screening for Appropriate Assessment and Natura Impact Statement' submitted with this application (document reference P2399\_R5061).

### 3.4 Fish

#### 3.4.1 Spawning and Nursery Grounds

Offshore gravelly sediments on the Irish continental shelf are dominated by elasmobranchs (rays, skates and sharks), gurnards, haddock, hake, pollock, large whiting and a few flatfish species. Soft, muddy sediments have higher numbers of gadoids and lower densities of plaice and dab than found in shallower sandy areas. Pelagic species such as mackerel, horse mackerel and herring are present within Irish waters largely on a seasonal basis, migrating between spawning and feeding grounds (DCENR 2015). Additionally, in more recent years basking shark observations have been increasing around the coast of Ireland and in 2020, a large aggregation was observed off the coast of Co. Clare (IBSG, 2020).

Fish communities present within coastal areas include juvenile flatfish and sandeel over sandy sediments, with seasonal influxes of sprat, herring, juvenile gadoids and mullet. Rocky shore fish assemblages are diverse and dominated by small species such as wrasses, gobies and blennies, as well as juvenile pollock and saithe (DCENR 2015).

The waters off the southwest coast of Ireland from Waterford Harbour around to Slyne Head, including the entire Foreshore Licence Application Area, have been designated a Biologically Sensitive Area (BSA) by the European Union (Marine Institute 2020c)). This is in recognition of the important juvenile fish nursery areas off the coast of Ireland as determined by UK Scottish, Irish and French groundfish

surveys. The Foreshore Licence Application Area is within the spawning and nursery grounds for ten commercially important fish species (Map 9). A summary of the spawning and nursery periods for nine of these commercially important fish species is outlined in Table 3-3. The Foreshore Licence Application Area is a spawning ground for Atlantic herring (*Clupea harengus*) and haddock (*Melanogrammus aeglefinus*) (see Table 3-3 below). As indicated by Figure 3-5, Map 7, the Foreshore Licence Application Area is also within the nursery grounds of white-bellied angler monk (*Lophius piscatorius*) and black-bellied angler monk (*Lophius budegassa*), however no data on spawning and nursery period is available for this species.

Brown, or edible, crabs and lobster are distributed throughout the continental shelf area to the north and west of Ireland and the rocky areas of the Irish Sea. Populations of scallop and queen scallop may also occur in areas of gravelly sediments (DCENR 2015).

**Table 3-3 Summary of spawning and nursery periods for commercially important fish species within the Foreshore Licence Application Area**

Species	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
White-bellied Anglerfish ( <i>Lophius piscatorius</i> ) (N) †	N	N	N	N	N	N	N	N				
Atlantic Cod ( <i>Gadus morhua</i> ) (N)	N	N	N	N	N	N						
European Hake ( <i>Merluccius merluccius</i> ) (N)	N	N	N	N	N	N	N	N				
Haddock ( <i>Melanogrammus aeglefinus</i> ) (S) (N)		SN*	SN*	SN*	SN	N	N					
Atlantic herring ( <i>Clupea harengus</i> ) (S)								S	S	S	S	
Horse Mackerel ( <i>Trachurus trachurus</i> ) (N)			N	N	N	N	N	N	N	N		
Atlantic mackerel ( <i>Scomber scombrus</i> ) (N)†			N	N	N	N	N	N	N			
Megrim ( <i>Lepidorhombus whiffiagonis</i> ) (N)	N	N	N	N	N	N						
Whiting ( <i>Merlangius merlangus</i> ) (N)		N	N	N	N	N	N	N				

Key = S = Spawning, N = Nursery, SN = Spawning and Nursery, Blank = No Data, † High intensity nursery and \*peak spawning period.

Grey shading indicates likely survey period.

Source: Coull et al. (1998); ICES (2009). Ellis et al. (2012). Marine Institute (2020a), O'Sullivan et al (2013).

Note: Black bellied angler fish has not been included as there is currently no reference for this species spawning or nursery period.

### 3.4.1 Basking Shark

Basking shark are a filter-feeding fish species which can grow up to 12m in length, making them the second largest fish species in the world. They are listed on Appendix II of the Convention on the International Trade in Endangered Species (CITES). Basking shark are not currently protected under any Irish regulation and are not a designated feature in any protected site. However, in March 2022 basking sharks have been granted protection status under the Wildlife Act in Ireland following a public campaign. The status has not yet been finalised but will be in an upcoming review of the Wildlife Act (O'Sullivan, 2022). This species is distributed globally in warm temperate waters and is known for seasonal surface feeding behaviours in coastal waters (Sims, 2008). Higher densities occur in areas of high primary productivity, such as in thermal and shelf sea fronts (Speedie, Johnson and Witt, 2009; Sims and Quayle, 1998). Basking shark are usually present in Irish waters in the summer months and studies of migratory patterns indicate an extensive migration from deep water to coastal water in April



with migrations northwards due to increasing sea surface temperature until August (IBSG, 2021, Gore et al., 2008; Skomal et al., 2009; Doherty et al., 2017). A study conducted by Doherty et al. (2019), identified basking shark occupying shallow waters off West Coast Scotland and north Northern Ireland during July-August with a migration to the west of Ireland and Irish and Celtic Seas in autumn (September-October). Public sightings in 2012 recorded 376 individuals in waters around the Republic of Ireland (Witt et al., 2012). Studies of their behaviour during their seasonal hotspot residences indicates this species spends 36% of its time on the surface (Sims et al, 2003), although areas of high basking shark activity is not always characterised by visible feeding behaviour (Southall et al, 2005).

### 3.4.2 EC Habitats Directive Annex II Species

The EC Habitats Directive Annex II listed species, sea lamprey (*Petromyzon marinus*), river lamprey (*Petromyzon marinus*), brook lamprey (*Lampetra planeri*) and Atlantic salmon (*Salmo salar*) are listed as Qualifying Interests of the Lower River Shannon SAC. Additionally, sea lamprey, river lamprey and Atlantic salmon are listed as Qualifying Interests of the Castlemaine Harbour SAC. All of these (except for brook lamprey) are migratory species that may be found in the Foreshore Licence Application Area at certain times of the year:

- Sea lamprey – late April to early June
- River lamprey – September to June
- Atlantic salmon – May to June and autumn months

Source: (National Biodiversity Data Centre 2020)

Brook lamprey only inhabit fresh water and therefore will not be observed in the Foreshore Licence Application Area.

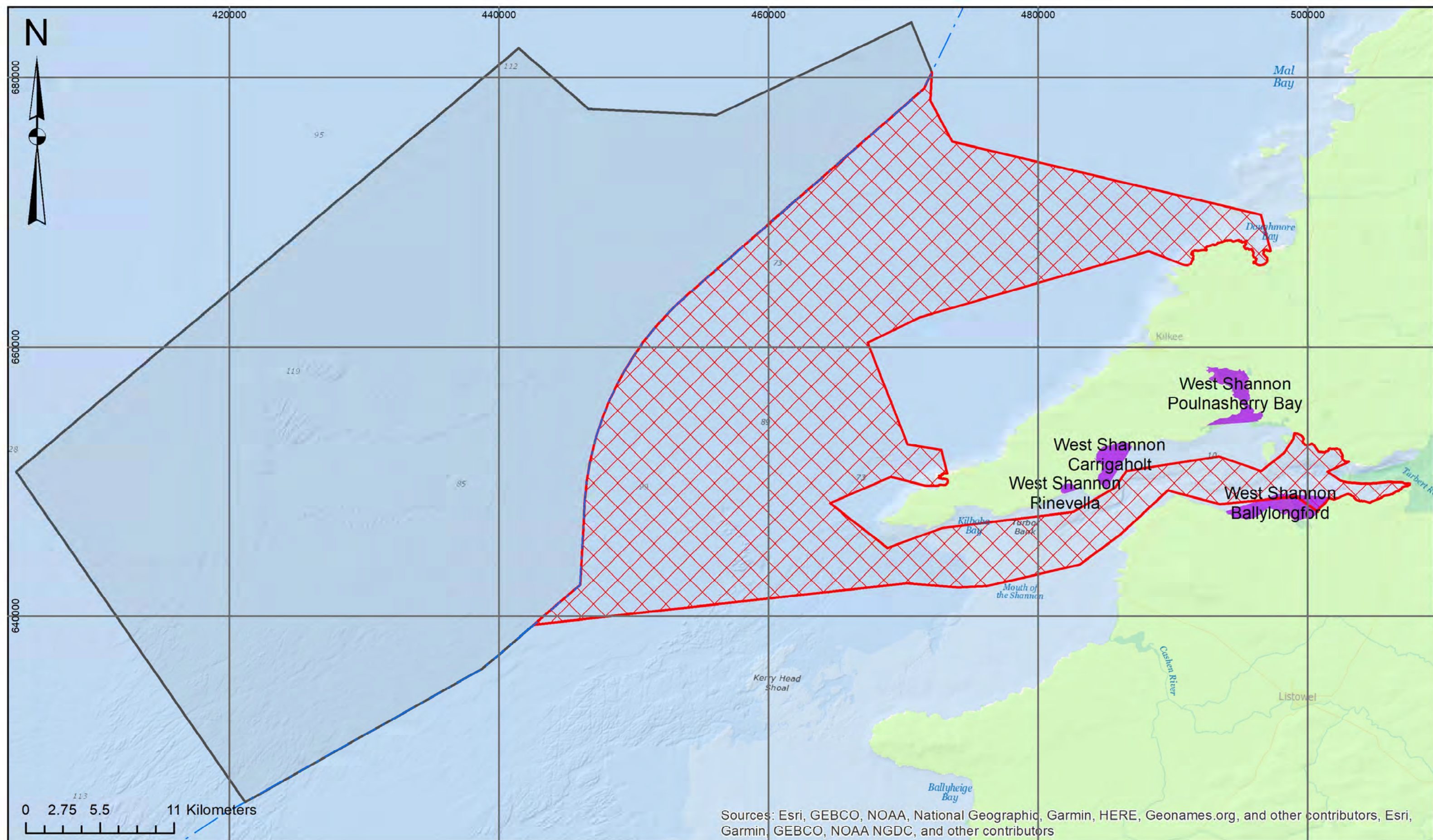
Species, such as Atlantic salmon and sea and river lamprey have a lower sensitivity to sound (in comparison to Twaite shad another Annex II fish species) as their swim bladder is located far from the ear (Popper et al 2014). The hearing of these species only involves particle motion and not sound pressure, and they are therefore less susceptible to impacts from the proposed site investigations. These species are susceptible to internal injury (barotrauma) from a rapid pressure change, i.e. unexploded ordnance detonation, which does not form part of the proposed site investigations (Popper et al 2014). Of the SACs within a 40km radius designated for migratory fish species, none of these protected sites list Twaite shad as a Qualifying Interest.

### 3.4.3 Aquaculture and Shellfish Waters

There are two aquaculture sites which (partially) overlap the Foreshore Licence Application Area: Shannon Estuary Oysters and Ballylongford Bay Mussels, see Figure 3-6, Map 8.

The Foreshore Licence Application Area is located within the West Shannon Ballylongford designated shellfish waters and adjacent to the West Shannon Carrigaholt designated shellfish waters. The Foreshore Licence Application Area is also located 1.88km from the West Shannon Rinevella designated shellfish waters, see Figure 3-4, Map 6.










## Clarus Offshore Wind Farm

### Map 8

Designated Shellfish Waters

#### Legend

-  Foreshore Licence Application Area
-  Contiguous Project Area
-  Cable Investigation Area
-  Designated Shellfish Waters
-  Irish Territorial Sea 12 nm Limit

Data source: DHLGH

Ver	Date	Drawn by	Checked	Approved
V1	30/09/2021			
Map prepared by: <div></div> manganon in Environmental Engineering, PGD in Sustainable Energy, HDGGIS				
Filename: C003IE_FIG_DSW_V1 0_20210930				Size A3
Scale: 1:360,000		Printed @ A3		
Coordinate System: IRENET95 Irish Transverse Mercator Projection: Transverse Mercator				

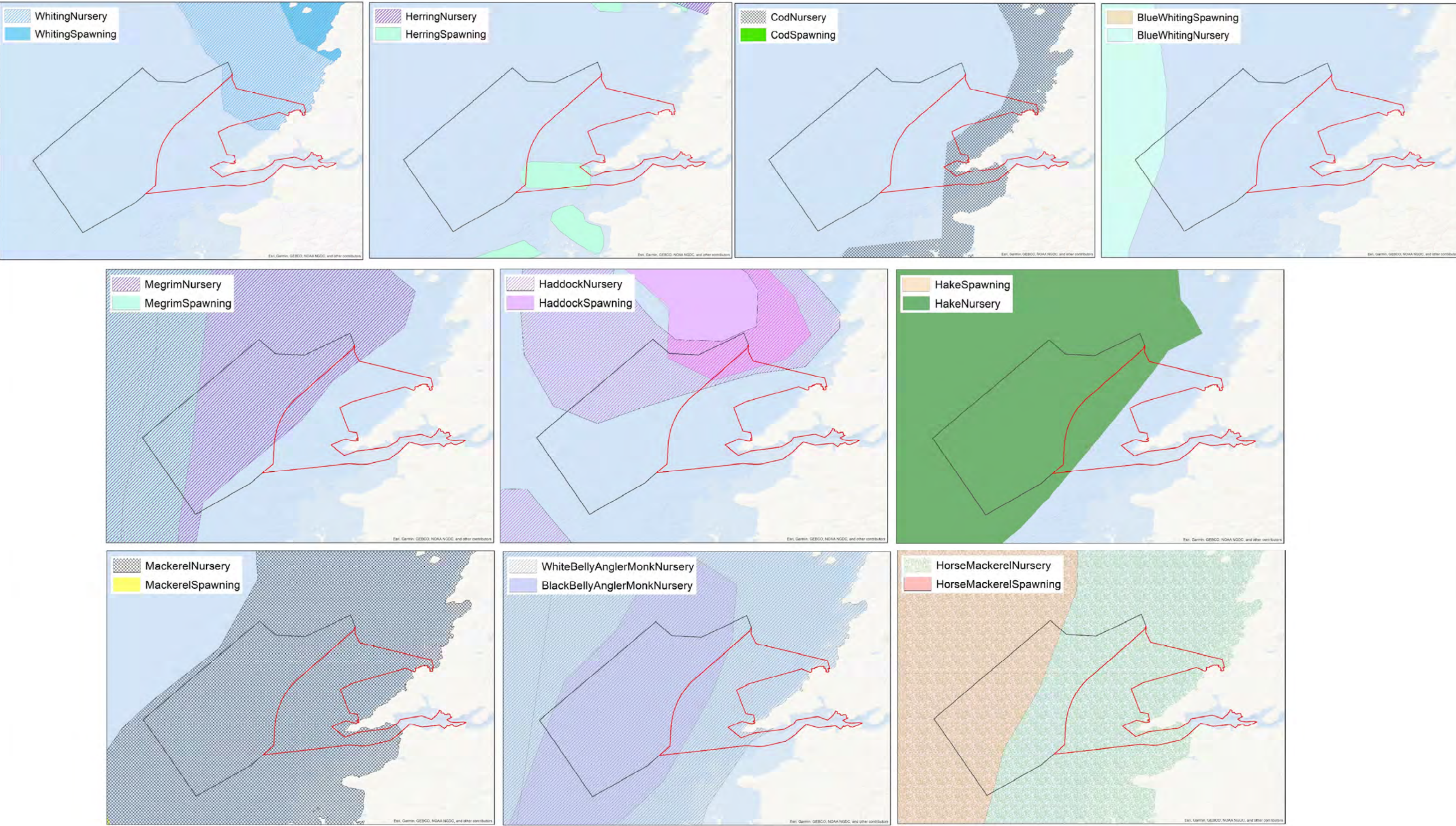


Mill House, Buttevant, P51 TN35  
Co. Cork, Ireland

[www.dpenergy.com](http://www.dpenergy.com)

All Rights Reserved, 2021





Clarus Offshore Wind Farm

Map 9

Fish Spawning and Nursery

Legend

- Foreshore Licence Application Area
- Contiguous Project Area

Data from the Species distribution Sea Fisheries theme accessed through Ireland's Marine Atlas at [atlas.marine.ie](https://atlas.marine.ie).  
Sources: Esri, HERE, Garmin, USGS, Intermap, INCREMENT P, NRCan, Esri Japan, METI, Esri China (Hong Kong), Esri Korea, Esri (Thailand), NGCC, (c) OpenStreetMap Contributors, and the GIS User Community

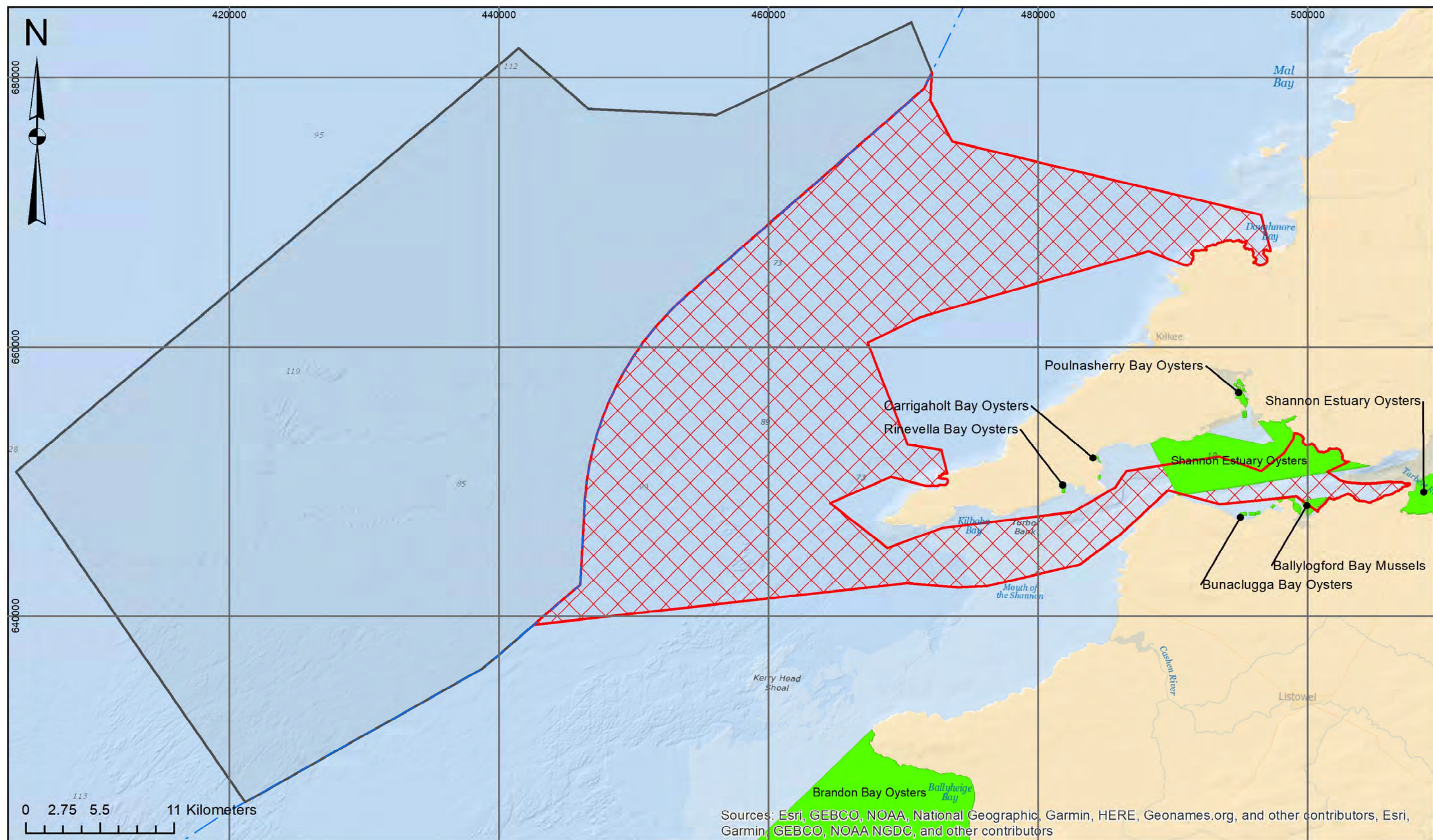
Ver	Date	Drawn by	Checked	Approved
V1	30/09/2021			
Map prepared by: <div></div> MEngSc in Environmental Engineering, PGD in Sustainable Energy, HDGGIS				
Filename: C003IE_FIG_FishSpawningNursery_V1.0_20210930				Size A3
Scale: 1:420,000		Printed @ A3		
Coordinate System: IRENET95 Irish Transverse Mercator Projection: Transverse Mercator				



**DP ENERGY**

Mill House, Buttevant, P51 TN35  
Co. Cork, Ireland  
[www.dpenergy.com](https://www.dpenergy.com)  
All Rights Reserved, 2021





Sources: Esri, GEBCO, NOAA, National Geographic, Garmin, HERE, Geonames.org, and other contributors, Esri, Garmin, GEBCO, NOAA NGDC, and other contributors

## Clarus Offshore Wind Farm

### Map 11

Aquaculture

#### Legend

- Foreshore Licence Application Area
- Contiguous Project Area
- Cable Investigation Area
- Aquaculture Site
- Irish Territorial Sea 12 nm Limit

Aquaculture Licence GIS Dataset from the Department of Agriculture, Food and the Marine; accessed through opendata@agriculture.gov; 02/02/2021

Ver	Date	Drawn by	Checked	Approved
V1	30/09/2021			
Map prepared by: <div></div> MEngSc in Environmental Engineering, PGD in Sustainable Energy, HDGGIS				
Filename: C003IE_FIG_Aquaculture_V1_0_20210930				Size A3
Scale: 1:360,000		Printed @ A3		
Coordinate System: IRENET95 Irish Transverse Mercator Projection: Transverse Mercator				



Mill House, Buttevant, P51 TN35  
Co. Cork, Ireland

www.dpenergy.com

All Rights Reserved, 2021



### 3.5 Marine Mammals

Marine mammals present in the Foreshore Licence Application Area are cetaceans (whales, dolphins and porpoises) and pinnipeds (seals), with European otter also recorded on the surrounding coastline by the National Biodiversity Data Centre (National Biodiversity Data Centre, 2021).

Of the 24 species of cetacean recorded in Irish waters, approximately 10 of these have been recorded off the west coast and may be present in the Foreshore Licence Application Area at least on a seasonal basis. These species are listed in Table 3-4. Common dolphin, common bottlenose dolphin and harbour porpoise are the most frequently sighted, while the other species are rare or occasional visitors. It is unlikely that deep water species such as the blue whale and long-finned pilot whale will be present (Reid et al. 2003).

Common bottlenose dolphin are the most abundant and commonly sighted species in the area. In addition, the Foreshore Licence Application Area overlaps the Lower River Shannon SAC, a Qualifying Interest of which is bottlenose dolphin.

The Irish Whale and Dolphin Group (IWDG) website (<http://www.iwdg.ie/>) has 370 records of cetacean sightings either within the Foreshore Licence Application Area or within an approximately 20km radius of the Foreshore Licence Application Area for the period November 2019 to October 2021. Species identified include harbour porpoise; minke whale; Risso's dolphin; common bottlenose dolphin; common dolphin; fin whale and humpback whale. Observations of species within the Foreshore Licence Application Area have been included in Table 3-4.

Most cetaceans are wide-ranging, and individuals encountered within Irish waters form part of a much larger biological population whose range extends into adjacent jurisdictions. As a result, management units (MUs) have been outlined for seven of the common regularly occurring species following advice from the Sea Mammals Research Unit (SMRU) and the International Council for the Exploration of the Sea (ICES). These provide an indication of the spatial scales at which effects of anthropogenic activities should be taken into consideration. The relevant MUs are listed in Table 3-4.

**Table 3-4 Sightings and strandings for commonly occurring cetaceans within the FLAA and surrounding waters**

Species	Frequency of sightings*	IWDG sightings (November 2019 – October 2021)**	Applicable MU***	Abundance of animals in MU***
<b>Toothed whales (odontocetes)</b>				
Short-beaked common dolphin (Delphinus delphis)	Peak period is summer and Autumn and November peak on the south coast associated with prey items.	73 sightings some of which are within the Foreshore Licence Application Area. Recorded during all months of the year.	Celtic & Greater North Seas	56,556
Common bottlenose dolphin (Tursiops truncatus)	Common year round but most frequent in summer.	76 sightings some of which are within the Foreshore Licence Application Area. Recorded during all months of the year.	West Coast of Ireland. Shannon Estuary	No data available
Harbour porpoise (Phocoena phocoena)	Common from June through the autumn. Peak period in July and August. Low numbers recorded for the remainder of the year.	29 sightings some of which are within the Foreshore Licence Application Area. Recorded during all months of the year.	Celtic and Irish Seas	47,229

Species	Frequency of sightings*	IWDG sightings (November 2019 – October 2021)**	Applicable MU***	Abundance of animals in MU***
Risso's dolphin ( <i>Grampus griseus</i> )	Occasional sightings, peak sightings in May and July	10 sightings to the south of the Foreshore Licence Application Area; May–November	Celtic & Greater North Seas	No data available
Long-finned pilot whale ( <i>Globicephala melas</i> )	Primarily occur in deep waters, highest number of sightings in summer and autumn.	No sightings	N/A	No data available
White-beaked dolphin ( <i>Lagenorhynchus albirostris</i> )	Irregular in Irish Sea. More regular in late summer – autumn.	No sightings	Celtic & Greater North Seas	15,895
Killer whale ( <i>Orcinus orca</i> )	Occasional sightings in Irish Sea waters.	No sightings	N/A	No data available
<b>Baleen whales (mysticetes)</b>				
Minke whale ( <i>Balaenoptera acutorostrata</i> )	Peak period July and August, less common throughout the year.	77 sightings; March – November	Celtic & Greater North Seas	23,528
Humpback whale ( <i>Megaptera novaeangliae</i> )	Occasional sightings from February to March	65 sightings; May – December. The majority of which are to the south of the Foreshore Licence Application Area.	N/A	No data available
Fin whale ( <i>Balaenoptera physalus</i> )	Occasional sightings with the highest number of sightings recorded from October to December.	9 sightings to the south of the Foreshore Licence Application Area; July – August	N/A	No data available

Sources: \* Marine Institute (2020b) and Reid et al. (2003); \*\* IWDG (2020) \*\*\*ICES Management Units D (Irish seas) and DECC (2016).

All cetaceans are European Protected Species (EPS) protected under Annex IV of the EC Habitats Directive (92/43/EEC), which lists species of Community Interest in need of strict protection. It is an offence to deliberately capture, kill, injure, or disturb animals classed as EPS. In addition, harbour porpoise, bottlenose dolphin, grey seal and common/harbour seal are listed under Annex II of the Habitats Directive, which lists species whose conservation requires designation of SAC.

In 1997, the Habitats Directive was transposed into Irish national law through Statutory Instrument (S.I) Number 94/1997 - European Communities (Natural Habitats) Regulations 1997. These were subsequently revised and consolidated in S.I. No. 477/2011 - European Communities (Birds and Natural Habitats) Regulations 2011, which covers the terrestrial environment and marine waters up to the 12 NM limit.

The Foreshore Licence Application Area is within the Celtic and Irish Sea MU for harbour porpoise (*Phocoena phocoena*). Within the MU there are five SACs designated for the conservation of harbour porpoise; Rockabill to Dalkey Island SAC and the Roaringwater Bay and Islands SAC in Irish waters; and the Bristol Channel Approaches / Dynesfeydd Môr Hafren SAC, West Wales Marine / Gorllewin Cymru Forol SAC; North Anglesey Marine/ Gogledd Môn Forol SAC in UK waters (Joint Nature Conservation Committee, JNCC 2020a). As harbour porpoise are highly mobile species, animals from these European Sites may be visitors to the Foreshore Licence Application Area.

The Foreshore Licence Application Area also overlaps the Lower River Shannon SAC which is designated for populations of common bottlenose dolphin (*Tursiops truncatus*). The Shannon Estuary

is a typical and important habitat for the species. Research has shown that the dolphins are resident, occur throughout the year and that the estuary is an important calving area (Berrow et al. 1996; Ingram 2000). The latest summer abundance estimate for the Lower River Shannon SAC is 139 ( $\pm 15$  standard error (SE)) (Rogan et al. 2018), with smaller numbers using the estuary in the wintertime (Rogan et al. 2018; Englund et al., 2008). Within the framework of the species' range, current population definition and its ecology, the Shannon Estuary is therefore a critical habitat for bottlenose dolphins (Rogan et al 2002) in both a national and a European context.

Two species of seal are resident within Irish waters and are present in the FLAA; grey seal (*Halichoerus grypus*) and harbour (or common) seal (*Phoca vitulina*). Ireland's Marine Atlas identifies the coastline of the FLAA as within the distribution of Ireland's populations of both grey and harbour seal. Russel et al (2017) provide grey seal densities in the FLAA as <1 animals per 25km<sup>2</sup>, whilst harbour seal densities are lower at <1 animal per 25km<sup>2</sup>. National Biodiversity Data Centre (2020) records over 100 harbour seal and grey seal sightings within the FLAA. In addition, grey seal pups have been recorded at Loop Head at the mouth of the Shannon Estuary (Cadha et al 2005), indicating a potential haul out site.

The closest SACs to the FLAA that listing grey seal as a Qualifying Interest are the Blasket Islands SAC (41km southwest of the FLAA) and Slyne Head Islands SAC (63km northwest of the FLAA). The closest SAC for harbour seal is the Kilkieran Bay and Islands SAC, 40 km north of the FLAA.

European Otter (*Lutra lutra*) are protected within Ireland under the Wildlife Amendment Act (2000) where it is now illegal to hunt, disturb, or intentionally kill otters. The otter is also listed on Annex II and Annex IV of the EU Habitats Directive (92/43/EEC). A review of the National Biodiversity Data Centre (<https://maps.biodiversityireland.ie/>) data for 2005 to 2021 showed occurrences of otter and otter signs along the coastline adjacent to the Foreshore Licence Application Area (National Biodiversity Data, 2021). Otter are also listed as a Qualifying Interest of the Lower River Shannon SAC.

## 3.6 Commercial Fisheries

### 3.6.1 Overview

The seas around Ireland are among the most productive and biologically sensitive areas in EU waters. In 2010 an estimated 1.3 million tonnes of fish were taken by the fishing fleets of EU member states from the waters around Ireland (ICES Sub-areas VI & VII) (Marine Institute 2020a). The main fish species caught were mackerel, horse mackerel, boarfish, blue whiting, herring, cod, whiting, haddock, saithe, hake, megrim, anglerfish, plaice, sole and *Nephrops* (Marine Institute, 2020a).

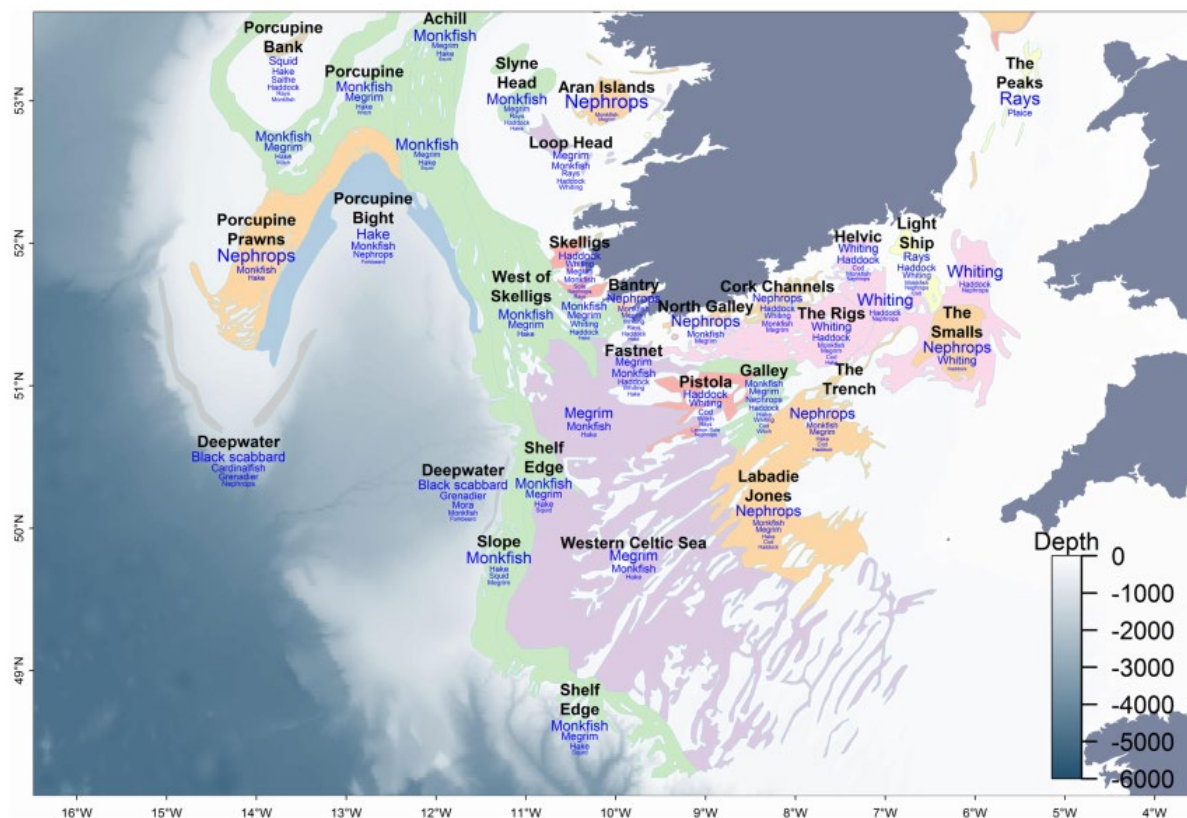
There are currently 1,985 registered fishing vessels operating around the Irish coasts, the majority of which are under 12m (DAFMI 2021). The Irish fishing fleet is engaged in a variety of fisheries and targets a wide range of commercial species. Vessels under 12m tend to operate close to shore using both mobile and static gear types (Tully, 2017; Fahy, *et al.*, 2008). These smaller vessels are engaged in fisheries such as potting for crab and lobster, gillnetting for whitefish, inshore trawling for whitefish or prawns and jigging/trolling for mackerel or whitefish (Fahy, *et al.*, 2008).

Larger vessels (>15m) tend to operate further from shore and engage in fisheries such as gillnetting for whitefish, trawling for whitefish or prawns, seining for whitefish, long-lining for whitefish, or pelagic pair trawling.

The continental shelf west of Ireland includes the fishing grounds Slyne Head, Aran Islands and Loop Head and supports fisheries for *Nephrops*, monkfish, megrim, rays, haddock, whiting and hake. Further west are the West of Achill and West of Blaskets fishing grounds, dominated by anglerfish fisheries (Gerritsen and Kelly 2019; see Figure 3-7). Pelagic fisheries for species such as scad, mackerel and blue whiting also occur along Ireland's Atlantic margin. Key fishing grounds overlapping the Foreshore Licence Application Area are Doughmore Bay and the Loop Head grounds, which are of

substantial value to the fishing community as they offer good catches of high value species which are less commonly encountered on alternate grounds.

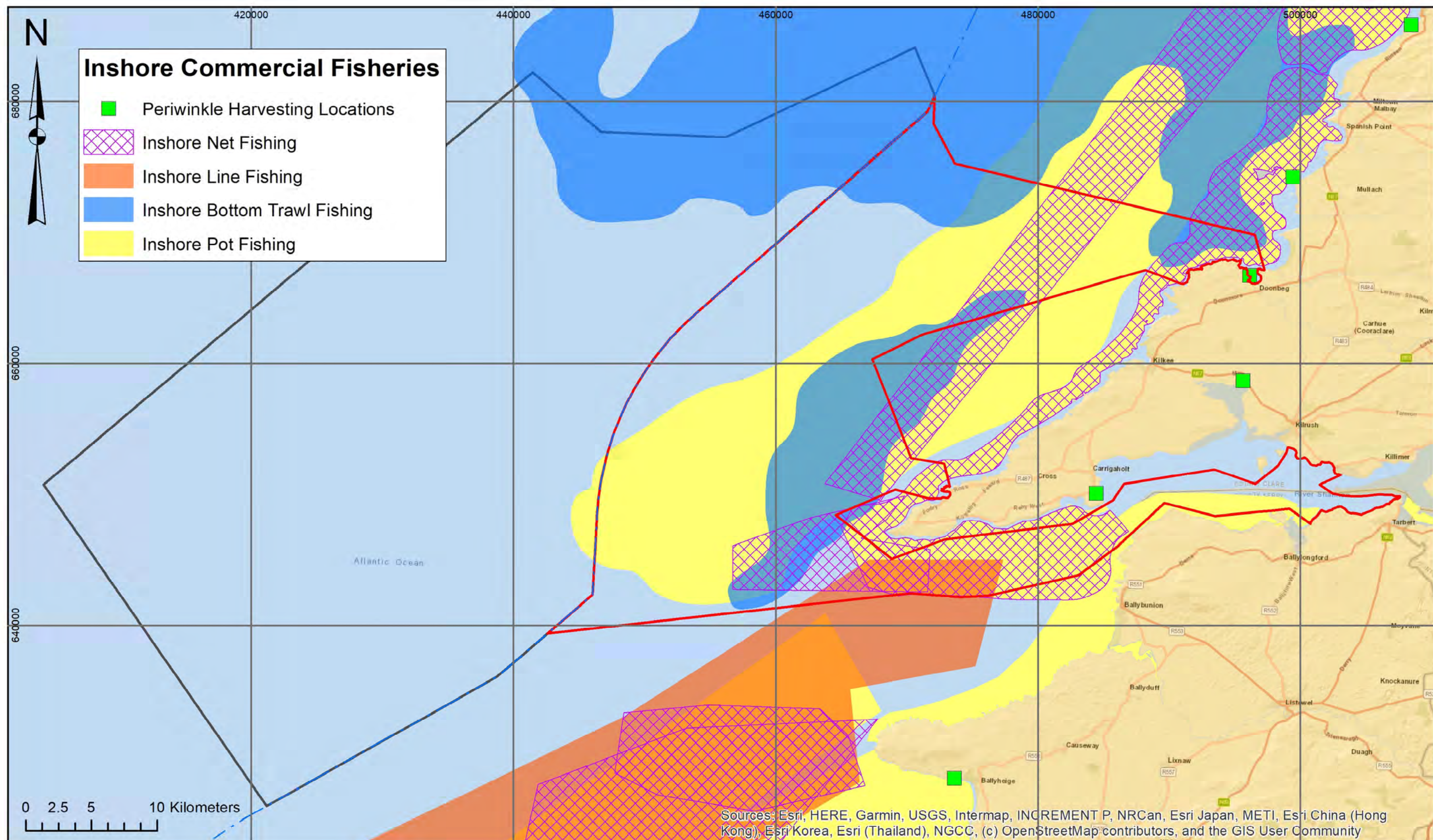
**Figure 3-7 Main fishing grounds around southern Ireland.**



Source: Gerritsen and Kelly 2019, Marine Institute, VMS Dataset 2015-2019

Ireland's Marine Atlas indicates that inshore fishing (within 12 NM) taking place near and within the Foreshore Licence Application Area (Marine Institute, 2020b) includes net fishing, line fishing, bottom trawl fishing, pot fishing and periwinkle harvesting (Figure 3-8; Map 9). Within the inshore of the Foreshore Licence Application Area, the target species of pot fishing include brown crab, lobster, shrimp and spider crab (Figure 3-9; Map 10). The targets species for inshore net fishing are crayfish and for bottom trawling, mixed demersal species (Figure 3-9; Map 10).





## Clarus Offshore Wind Farm

### Map 12

Inshore Commercial Fisheries  
- Irish Vessels < 15m

#### Legend

- Foreshore Licence Application Area
- Contiguous Project Area
- Irish Territorial Sea 12 nm Limit

Data source: MI, DCCAE

Ver	Date	Drawn by	Checked	Approved
V1	30/09/2021			
Map prepared by <span></span> mngc in Environmental Engineering, PGD in Sustainable Energy, HDGGIS				
Filename: C0031E_FIG_InshoreCommercialFisheries_V1_0_20210930				Size A3
Scale: 1:370,000		Printed @ A3		
Coordinate System: IRENET95 Irish Transverse Mercator Projection: Transverse Mercator				

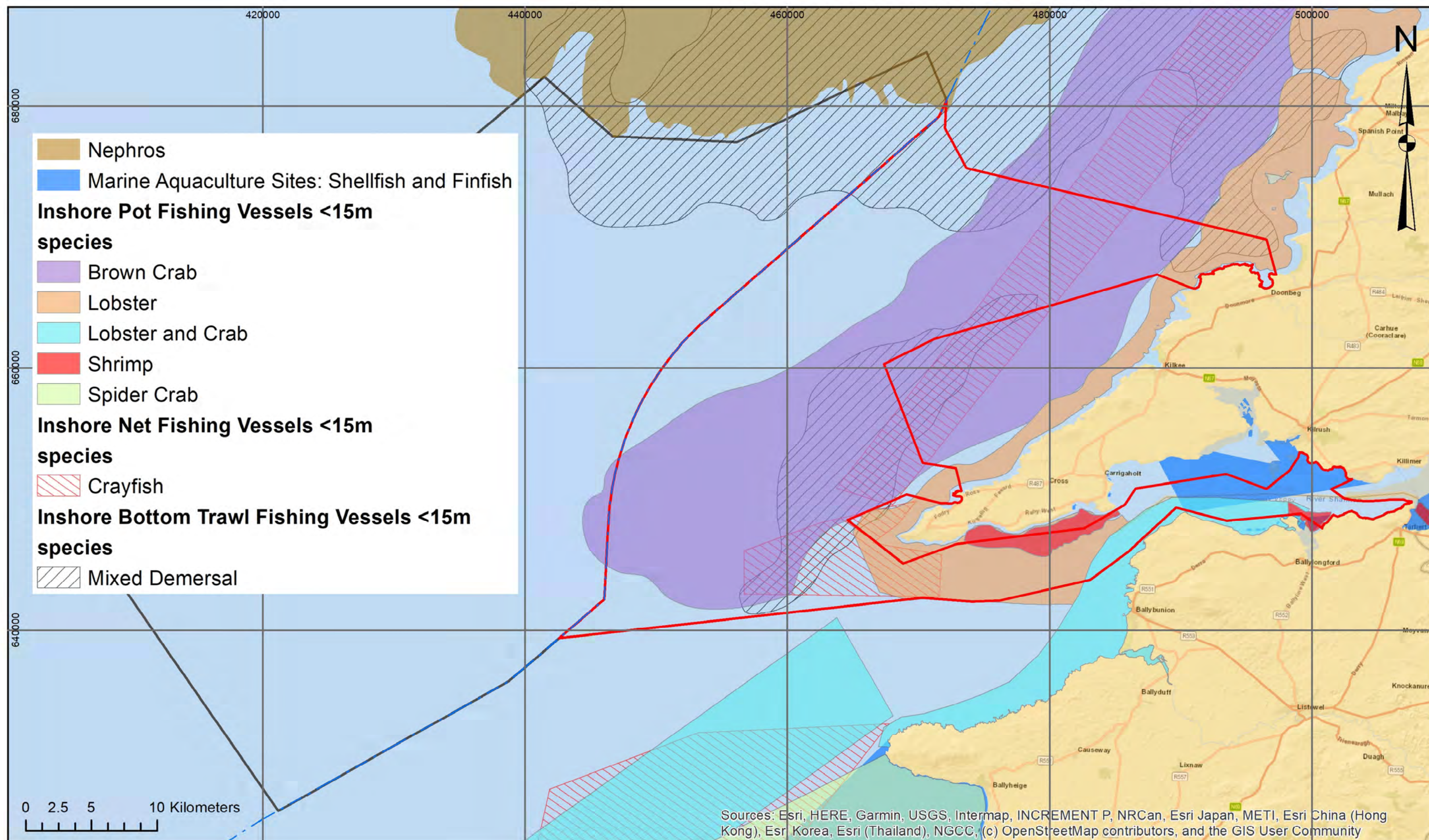


Mill House, Buttevant, P51 TN35  
Co. Cork, Ireland

www.dpenergy.com

All Rights Reserved, 2021





## Clarus Offshore Wind Farm

### Map 13

Atlas: Commercial Fisheries  
for Shellfish around Ireland

#### Legend

- Foreshore Licence Application Area
- Contiguous Project Area
- Irish Territorial Sea 12 nm Limit

Data source: MI, DCCAE

Ver	Date	Drawn by	Checked	Approved
V1	30/09/2021			
Map prepared by: <div></div> MEngSc in Environmental Engineering, PGD in Sustainable Energy, HDGGIS				
Filename: C0031E_FIG_InshoreCommercialFisheriesShellfish_V1.0_20210930				Size A3
Scale: 1:370,000		Printed @ A3		
Coordinate System: IREN95 Irish Transverse Mercator Projection: Transverse Mercator				



Mill House, Buttevant, P51 TN35  
Co. Cork, Ireland

[www.dpenergy.com](http://www.dpenergy.com)

All Rights Reserved, 2021



### 3.6.2 Commercial Fishing Effort

There are several fisheries occurring along the west coast which overlap with the Foreshore Licence Application Area. These include trawling for whitefish or flatfish, set net fishing targeting whitefish with gillnets, bait with trammel nets or crayfish with tangle nets, potting for brown crab, spider crab, lobster and shrimp, line fishing/trolling for tuna, mackerel or whitefish, and pelagic trawling for scad, herring, mackerel or sprat ((Marine Institute, 2020b; Gerritsen and Kelly 2019; Tully, 2017; Fahy, *et al.*, 2008). A number of these fisheries occur over an extensive area, while other fisheries are more spatially restricted (Gerritsen and Kelly 2019; Tully, 2017).

The Vessel Monitoring System (VMS) data for commercial fishing effort for vessels >12m is low for all fishing activities within the Foreshore Licence Application Area (0.1-2 h/km<sup>2</sup>/year). Bottom otter trawl fishing has a higher distribution of effort within the Investigative Foreshore Licence Application Area compared to the other fishing methods with Ireland's Marine Atlas identifying effort of 6-8 h/km<sup>2</sup>/year. However, this is not distributed across the Investigative Foreshore Licence Application Area but rather in some localised areas (Figure 3-10 and 3-14; Map 11 and 15).

There is a high concentration of bottom otter trawl fishing to the north of the Investigative Foreshore Licence Application Area outside the site boundary. This is associated with the Aran Islands nephrops fishery which is the main fishing ground of the Ros a Mhíl fleet.

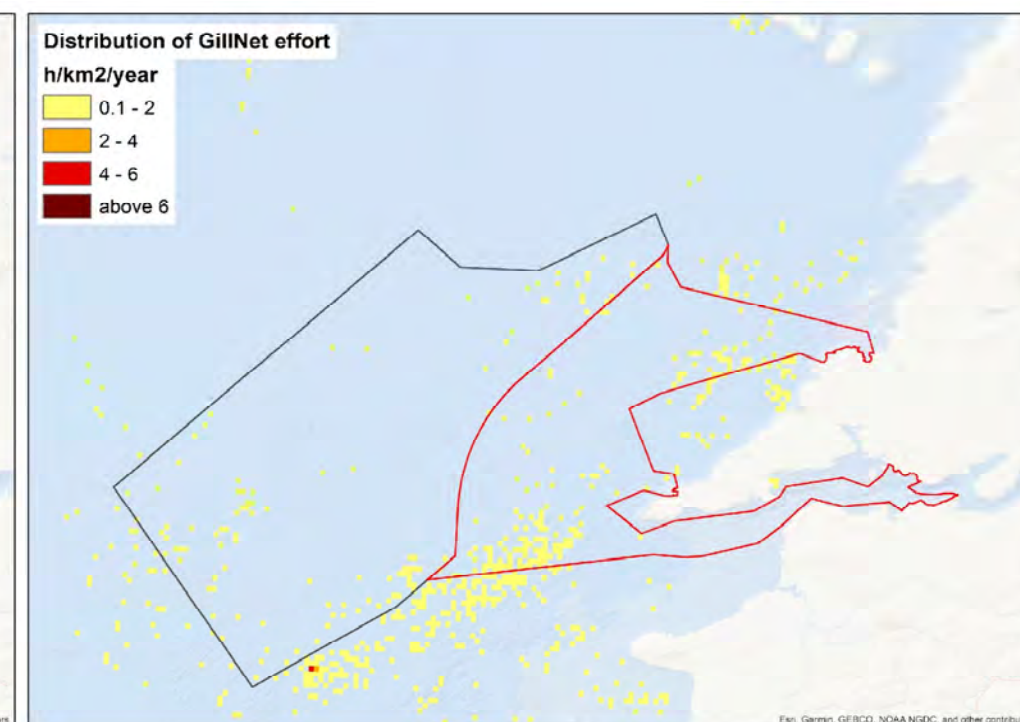
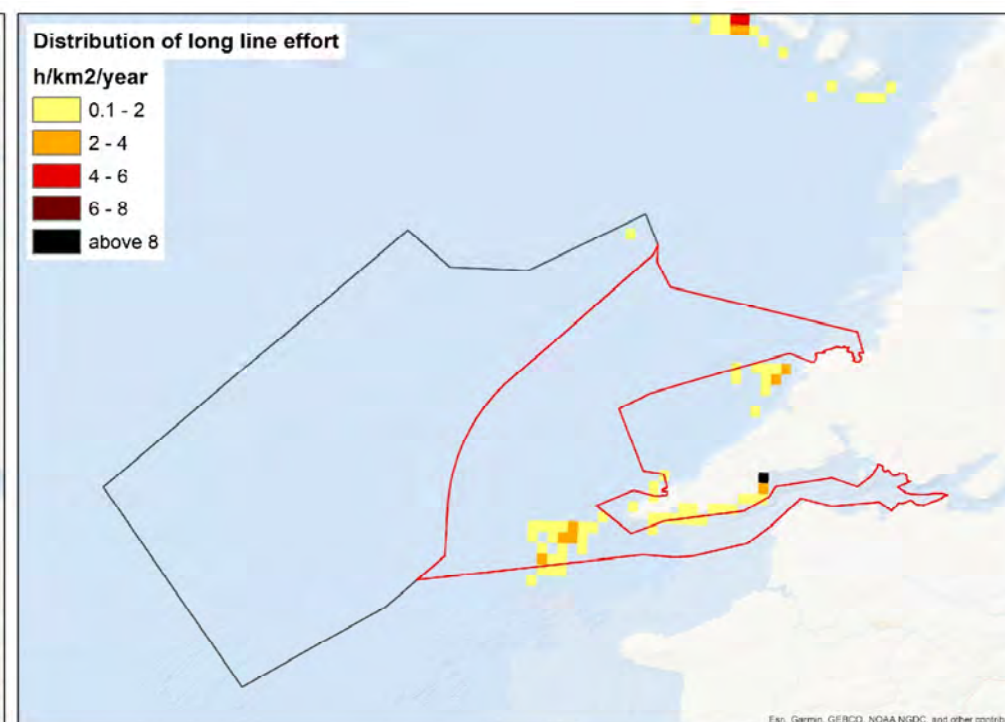
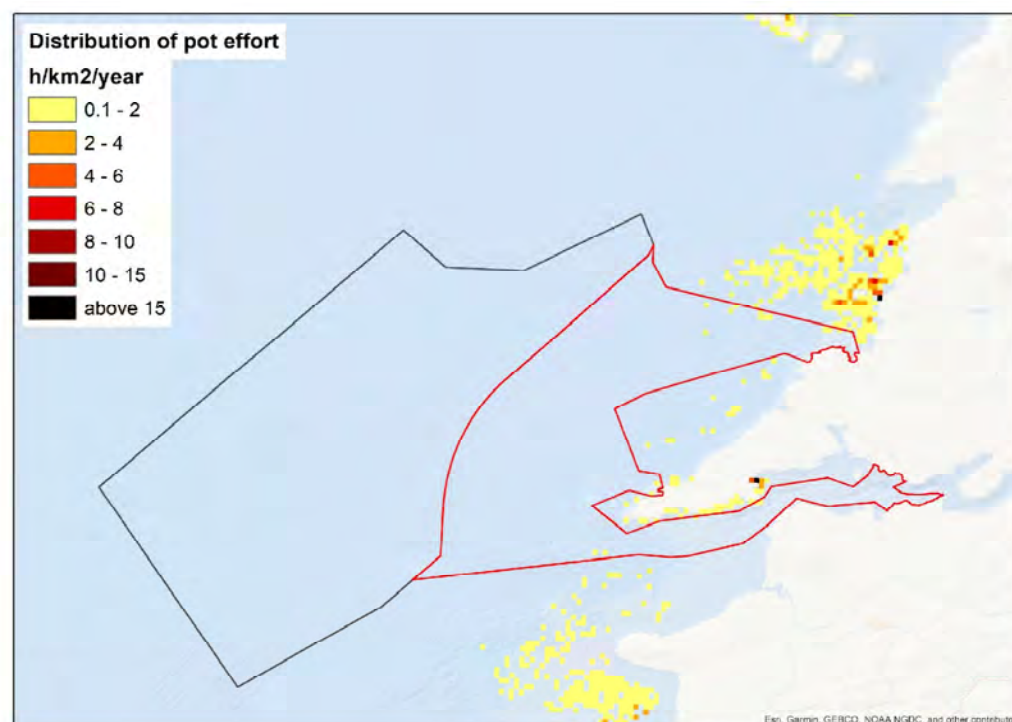
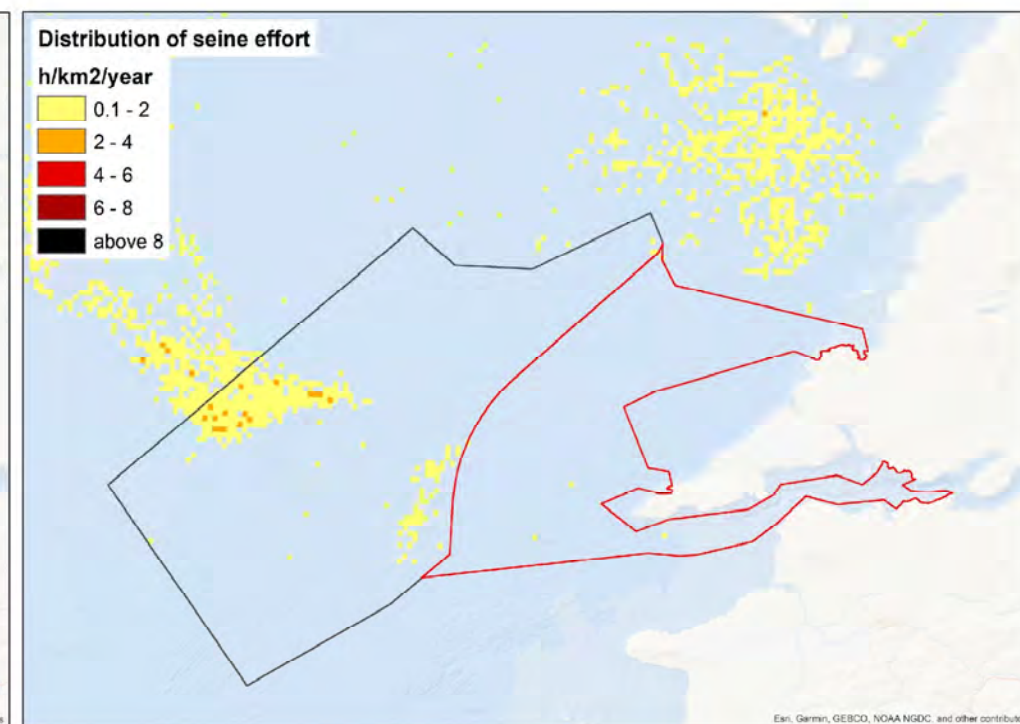
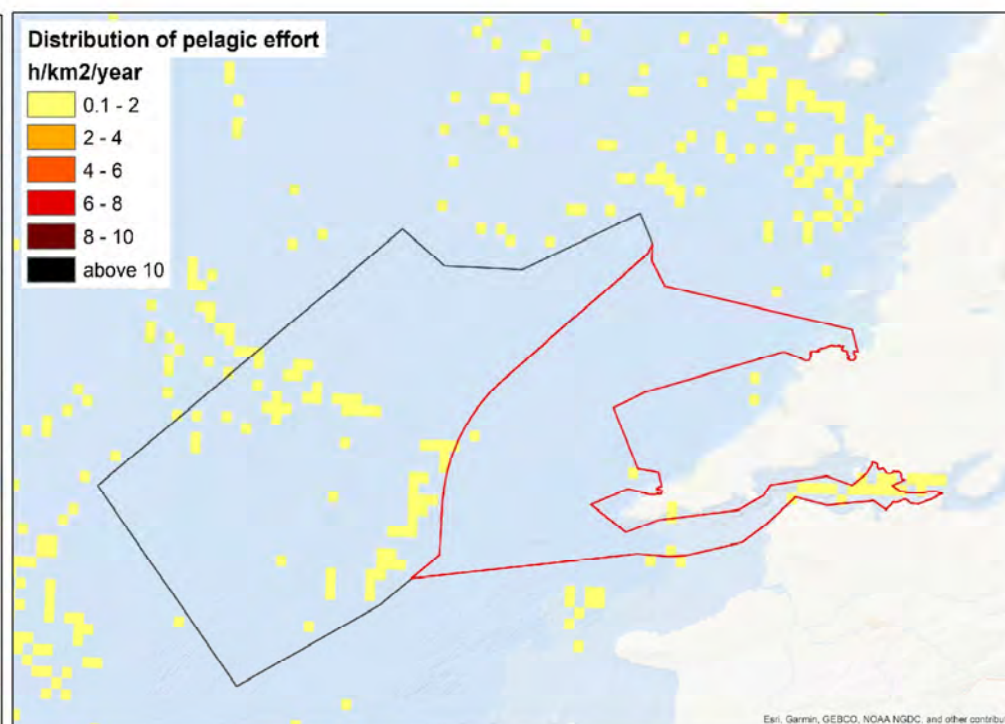
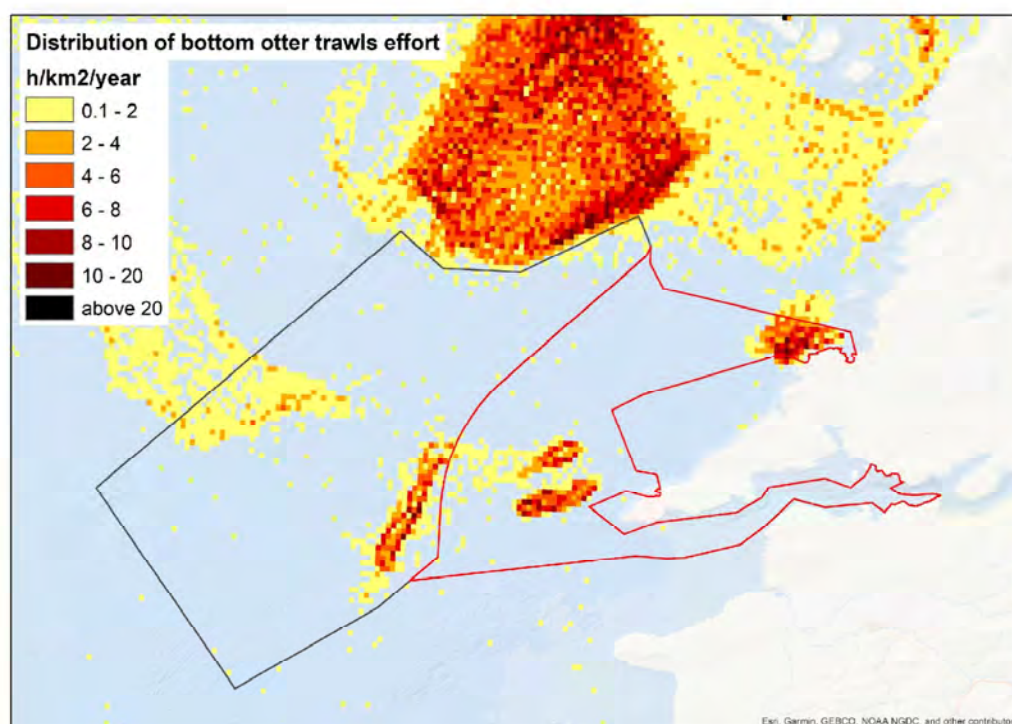
There is a localised area of higher seine fishing effort overlapping the western boundary (Loop fishing ground) of the Investigative Foreshore Licence Application Area (Figure 3-15; Map 16). In addition, there is a small patch on the eastern boundary called Inner Loop Grounds.

Gill netting is distributed across the Investigative Foreshore Licence Application Area in low numbers (0-10 h/km<sup>2</sup>/year). Within the 12 NM limit there is a slightly higher concentration of gill net fishing effort between 21-50 h/km<sup>2</sup>/year, however again this is in a localised area (Figure 3-19; Map 20).

Dredge, pot, pelagic, long-line and other fishing efforts are either not distributed within the Investigative Foreshore Licence Application Area or have very low fishing effort (0-10 h/km<sup>2</sup>/year) (Figures 3-11, 3-12, 3-13, 3-16, 3-17 and 3-19; Maps 12, 13, 14, 17, 18, and 20).

A full baseline assessment on commercial fisheries will be undertaken as part of the preparation of an Environmental Impact Assessment Report for any potential future planning application for the Clarus Offshore Wind Farm. The Commercial Fisheries chapter of the Environmental Impact Assessment Report (EIAR) will be informed through desktop studies (i.e. ICES block landings data) and consultation.





## Clarus Offshore Wind Farm

### Map 14

Fishing Effort by Irish Vessels >12m  
during 2014-2018

#### Legend

- Foreshore Licence Application Area
- Contiguous Project Area

Data source: MI, DCCAE

Ver	Date	Drawn by	Checked	Approved
V1	30/09/2021			
Map prepared by: <span style="background-color: black; color: black;">XXXXXXXXXX</span> MEngSc in Environmental Engineering, PGD in Sustainable Energy, HDGGIS				
Filename: C003IE_FIG_CommercialFisheries20142018_V1.0_20210930				Size A3
Scale: 1:420,000		Printed @ A3		
Coordinate System: IREN95 Irish Transverse Mercator Projection: Transverse Mercator				



Mill House, Buttevant, P51 TN35  
Co. Cork, Ireland

[www.dpenergy.com](http://www.dpenergy.com)

All Rights Reserved, 2021



N



h/km2/year

Irish Vessels:

0 - 10

11 - 14

GBR Vessels

0 3.5 7 14 Kilometers

Esri, Garmin, GEBCO, NOAA NGDC, and other contributors

# Clarus Offshore Wind Farm

## Map 15

Dredge Fishing Effort by  
Vessels > 12m during 2015-2019

### Legend

- Foreshore Licence Application Area
- Contiguous Project Area
- . . Irish Territorial Sea 12 nm Limit

Data source: MI, VMS Dataset 2015-2019

Ver	Date	Drawn by	Checked	Approved
V1	30/09/2021			
Map prepared by: [Redacted], Environmental Engineering, PGD in Sustainable Energy, HDGGIS				
Filename: C003IE_FIG_CommercialFisheriesDredge20152019_V1_0_20210930				Size A3
Scale: 1:450,000		Printed @ A3		
Coordinate System: IRENET95 Irish Transverse Mercator Projection: Transverse Mercator				

**DP ENERGY**

Mill House, Buttevant, P51 TN35  
Co. Cork, Ireland  
[www.dpenergy.com](http://www.dpenergy.com)

All Rights Reserved, 2021

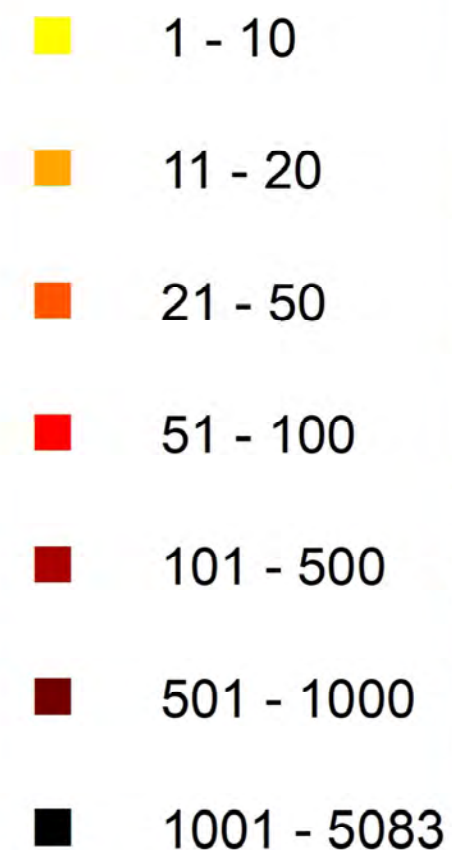


N



h/km2/year

Irish Vessels:



0 3.5 7 14 Kilometers

Esri, Garmin, GEBCO, NOAA NGDC, and other contributors

## Clarus Offshore Wind Farm

### Map 17

Pot Fishing Effort by  
Vessels > 12m during 2015-2019

#### Legend

- Foreshore Licence Application Area
- Contiguous Project Area
- Irish Territorial Sea 12 nm Limit

Data source: MI, VMS Dataset 2015-2019

Ver	Date	Drawn by	Checked	Approved
V1	30/09/2021			
Map prepared by <div></div> MEngSc in Environmental Engineering, PGD in Sustainable Energy, HDGGIS				
Filename: C003IE_FIG_CommericalFisheriesPot20152019_V1.0_20210930				Size A3
Scale: 1:450,000		Printed @ A3		
Coordinate System: IRENET95 Irish Transverse Mercator Projection: Transverse Mercator				



Mill House, Buttevant, P51 TN35  
Co. Cork, Ireland

[www.dpenergy.com](http://www.dpenergy.com)

All Rights Reserved, 2021





Species

●

 Pollock

●

 Scallop

●

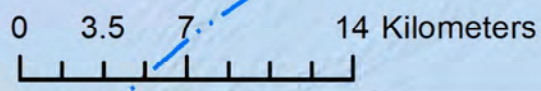
 Mackerel

●

 Brown Crab

●

 Species not Specified



Esri, Garmin, GEBCO, NOAA NGDC, and other contributors

Clarus Offshore Wind Farm

Map 18

Landing by  
Vessels > 12m during 2015-2019

Legend

▭

 Foreshore Licence Application Area

▭


 Contiguous Project Area

---

 Irish Territorial Sea 12 nm Limit

Data source: MI, VMS Dataset 2015-2019

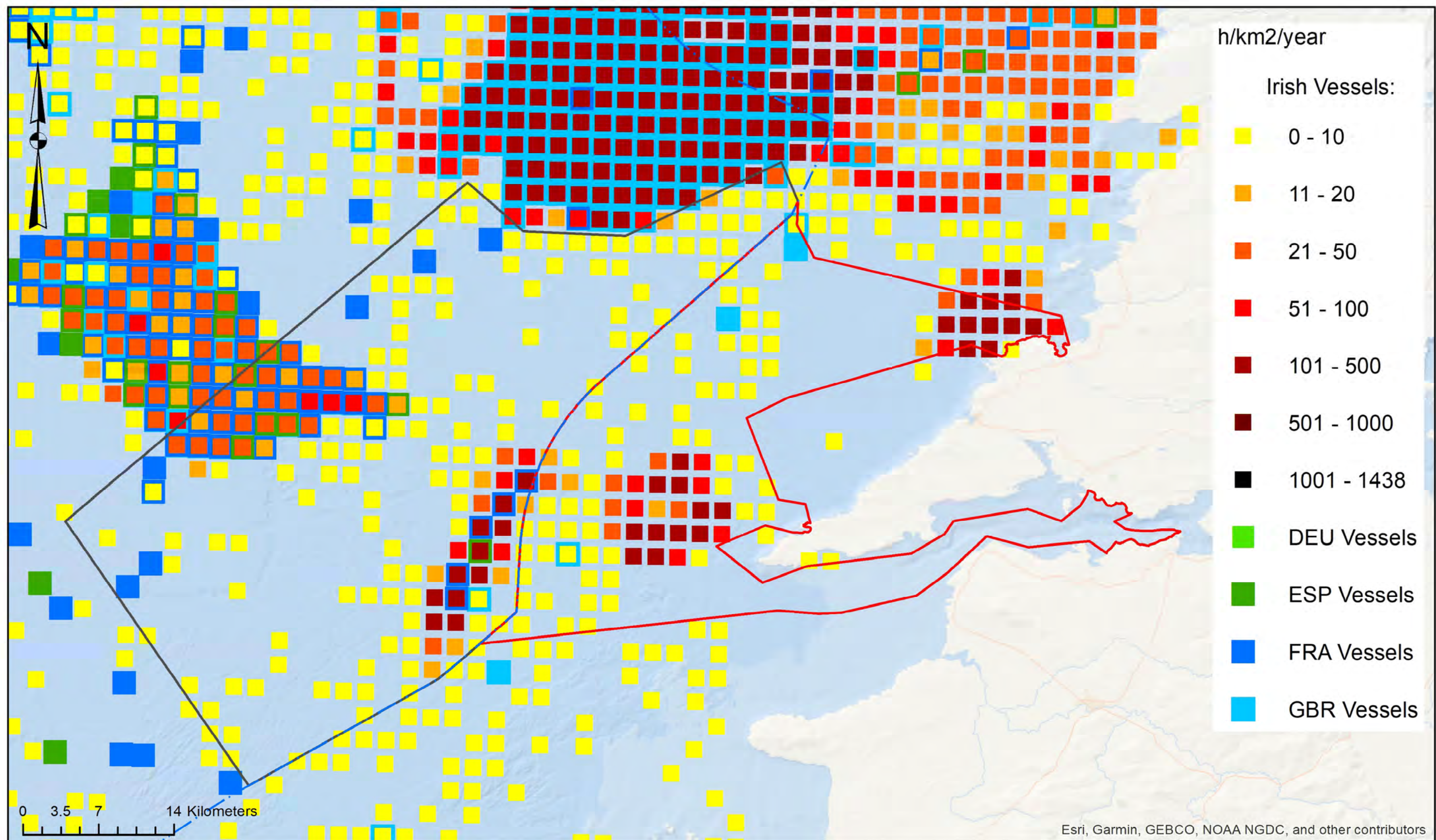
Ver	Date	Drawn by	Checked	Approved
V1	30/09/2021			
Map prepared by <div></div> MEngSc in Environmental Engineering, PGD in Sustainable Energy, HDGGIS				
Filename: C003IE_FIG_CommericalFisheriesLandingSpecies20152019_V1 0_20210930				Size A3
Scale: 1:450,000		Printed @ A3		
Coordinate System: IRENET95 Irish Transverse Mercator Projection: Transverse Mercator				

 **DP ENERGY**

Mill House, Buttevant, P51 TN35  
Co. Cork, Ireland  
www.dpenergy.com

All Rights Reserved, 2021





## Clarus Offshore Wind Farm

### Map 19

Bottom Otter Trawl Fishing Effort by  
Vessels > 12m during 2015-2019

#### Legend

- Foreshore Licence Application Area
- Contiguous Project Area
- Irish Territorial Sea 12 nm Limit

Data source: MI, VMS Dataset 2015-2019

Ver	Date	Drawn by	Checked	Approved
V1	30/09/2021			
Map prepared by <span style="background-color: black; color: black;">XXXXXXXXXX</span> mngoc in Environmental Engineering, PGD in Sustainable Energy, HDGGIS				
Filename: C003IE_FIG_CommercialFisheriesBottomOtterTrawls20152019_V1.0_20210930			Size A3	
Scale: 1:450,000		Printed @ A3		
Coordinate System: IRENET95 Irish Transverse Mercator Projection: Transverse Mercator				

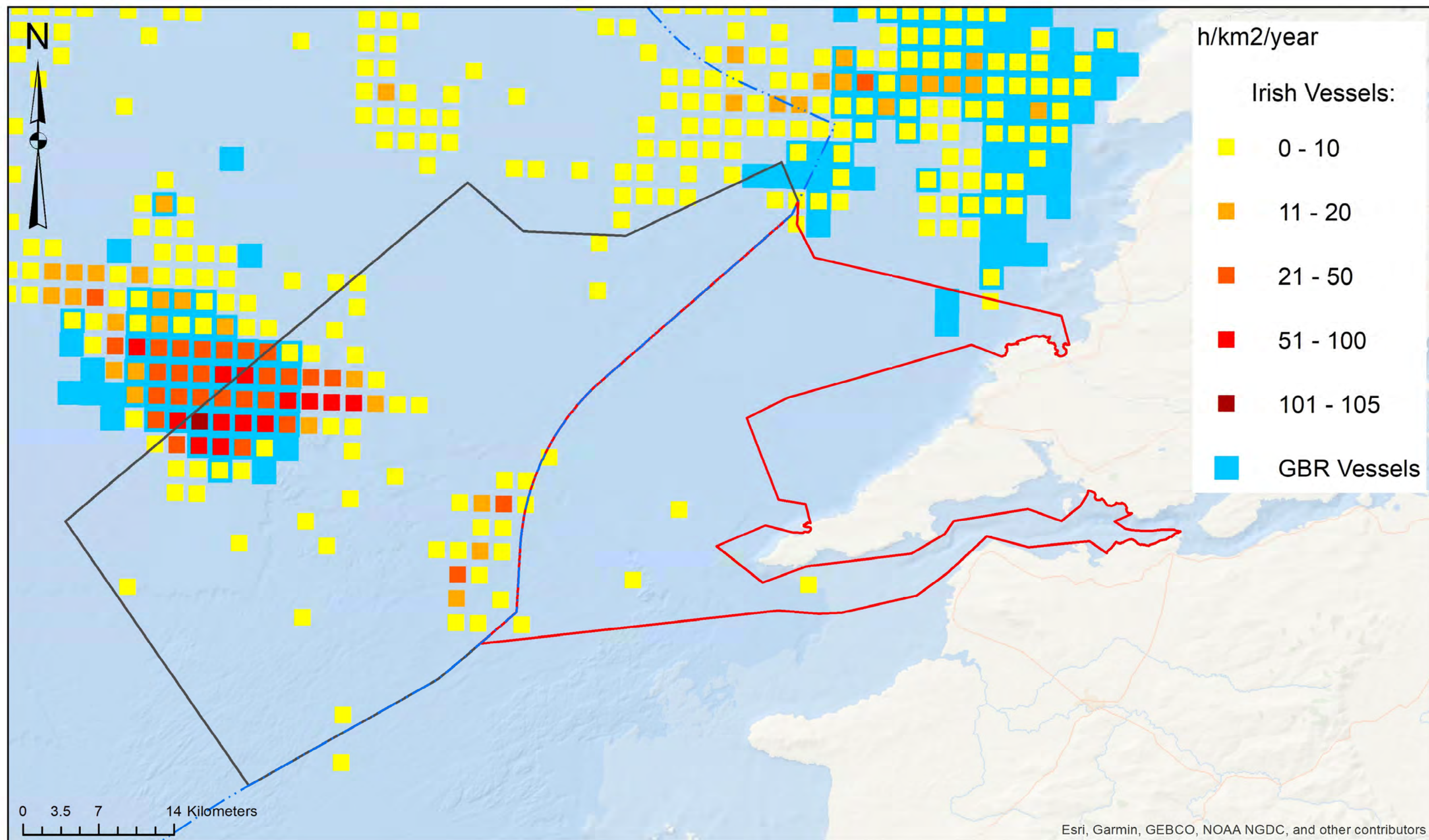


Mill House, Buttevant, P51 TN35  
Co. Cork, Ireland

[www.dpenergy.com](http://www.dpenergy.com)

All Rights Reserved, 2021





## Clarus Offshore Wind Farm

### Map 20

Seine Fishing Effort by  
Vessels > 12m during 2015-2019

#### Legend

- Foreshore Licence Application Area
- Contiguous Project Area
- Irish Territorial Sea 12 nm Limit

Data source: MI, VMS Dataset 2015-2019

Ver	Date	Drawn by	Checked	Approved
V1	30/09/2021			
Map prepared by <span style="background-color: black; color: black;">XXXXXXXXXX</span> mngoc in Environmental Engineering, PGD in Sustainable Energy, HDGGIS				
Filename: C003IE_FIG_CommercialFisheriesSeine20152019_V1 0_20210930			Size A3	
Scale: 1:450,000		Printed @ A3		
Coordinate System: IRENET95 Irish Transverse Mercator Projection: Transverse Mercator				

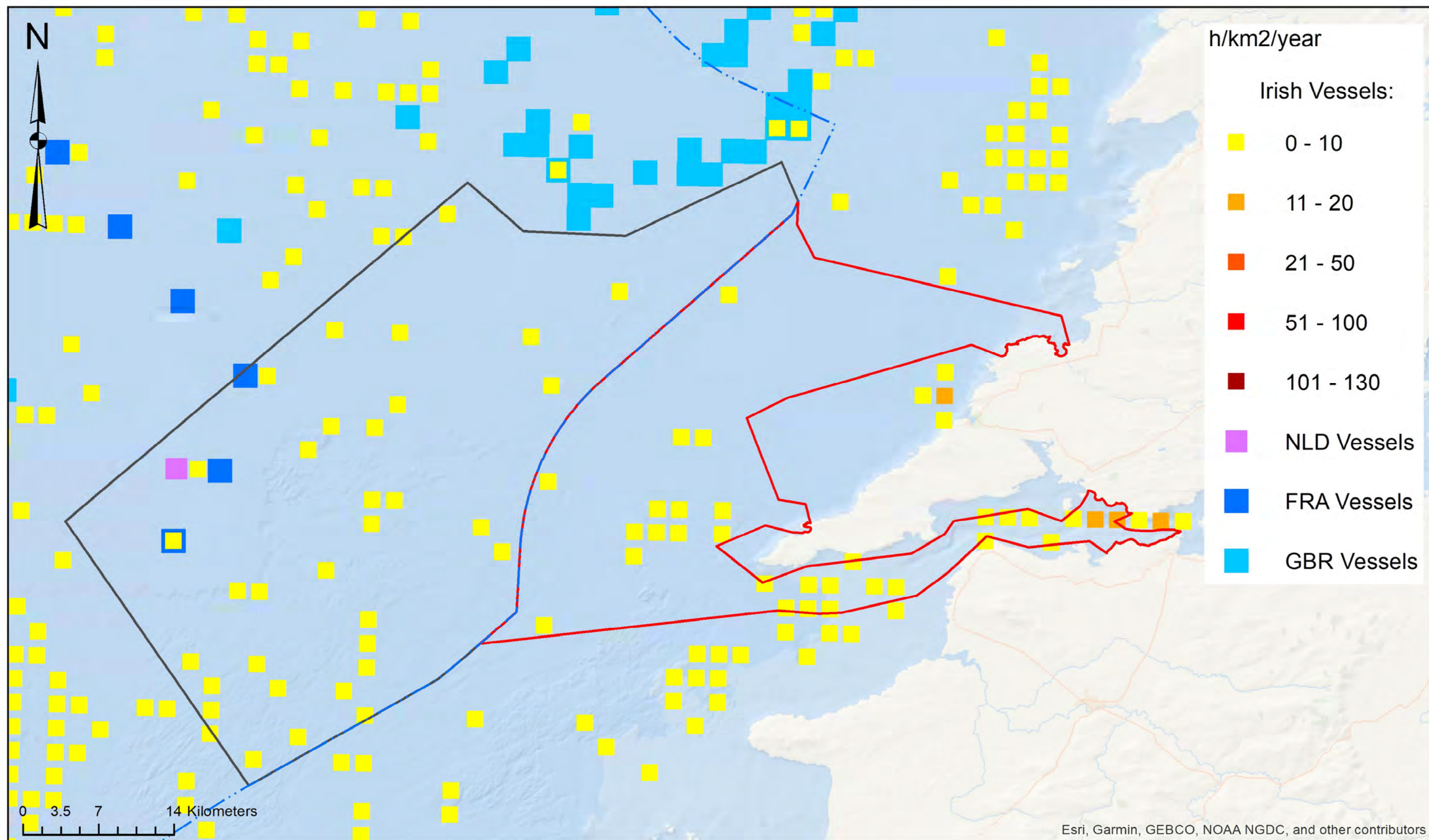


Mill House, Buttevant, P51 TN35  
Co. Cork, Ireland

[www.dpenergy.com](http://www.dpenergy.com)

All Rights Reserved, 2021





## Clarus Offshore Wind Farm

### Map 21

Pelagic Trawl Fishing Effort by  
Vessels > 12m during 2015-2019

#### Legend

- Foreshore Licence Application Area
- Contiguous Project Area
- Irish Territorial Sea 12 nm Limit

Data source: MI, VMS Dataset 2015-2019

Ver	Date	Drawn by	Checked	Approved
V1	30/09/2021			
Map prepared by <span style="background-color: black; color: black;">[REDACTED]</span> in Environmental Engineering, PGD in Sustainable Energy, HDGGIS				
Filename: C003IE_FIG_CommercialFisheriesPelagicTrawls20152019_V1 0_20210930			Size A3	
Scale: 1:450,000		Printed @ A3		
Coordinate System: IRENET95 Irish Transverse Mercator Projection: Transverse Mercator				

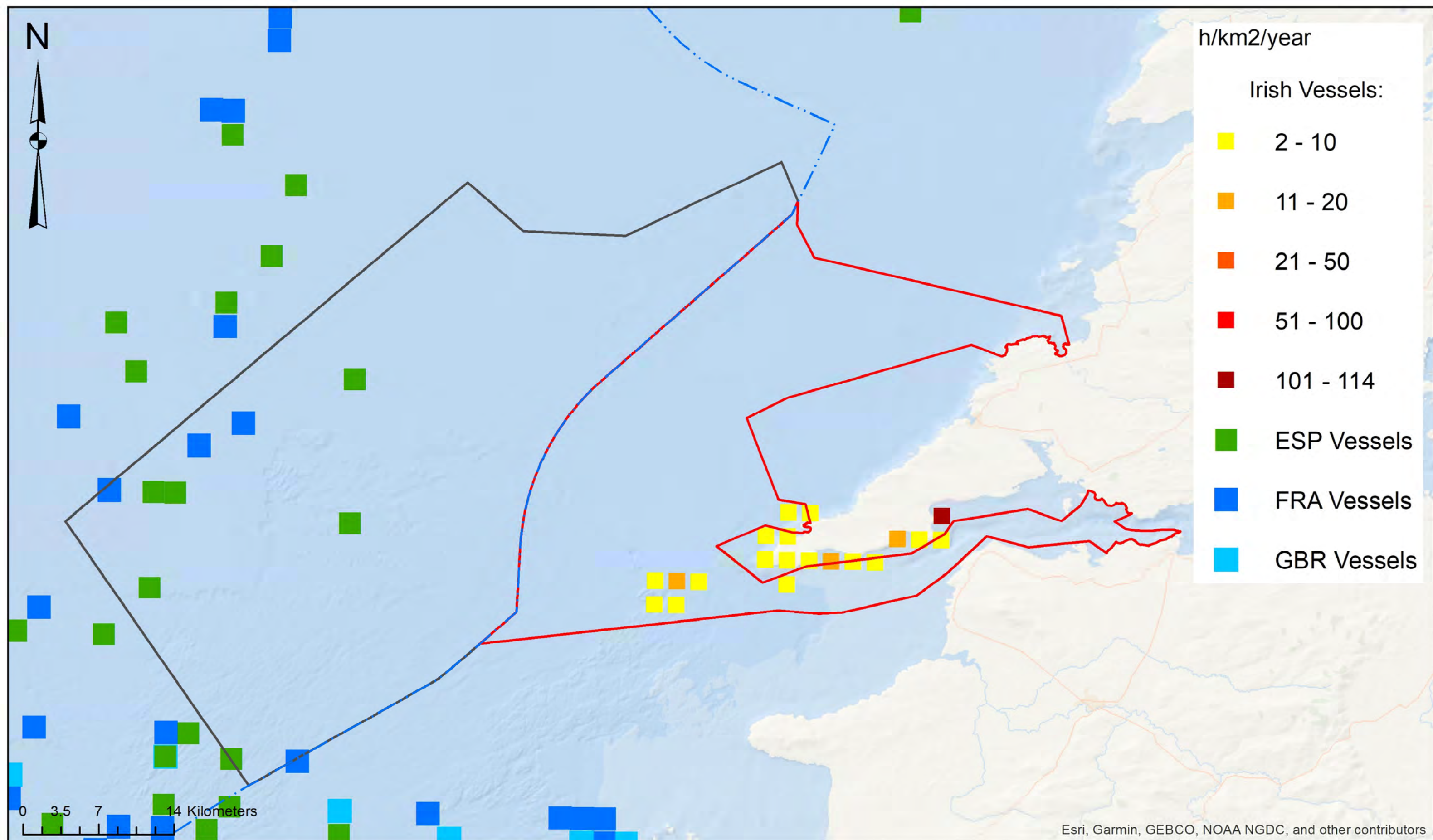


Mill House, Buttevant, P51 TN35  
Co. Cork, Ireland

[www.dpenergy.com](http://www.dpenergy.com)

All Rights Reserved, 2021





## Clarus Offshore Wind Farm

### Map 22

Long Line Fishing Effort by  
Vessels > 12m during 2015-2019

#### Legend

- Foreshore Licence Application Area
- Contiguous Project Area
- Irish Territorial Sea 12 nm Limit

Data source: MI, VMS Dataset 2015-2019

Ver	Date	Drawn by	Checked	Approved
V1	30/09/2021			
Map prepared by <span style="background-color: black; color: black;">XXXXXXXXXX</span> meniscus in Environmental Engineering, PGD in Sustainable Energy, HDGGIS				
Filename: C0031E_FIG_CommercialFisheriesLongLines20152019_V1.0_20210930			Size A3	
Scale: 1:450,000		Printed @ A3		
Coordinate System: IRENET95 Irish Transverse Mercator Projection: Transverse Mercator				

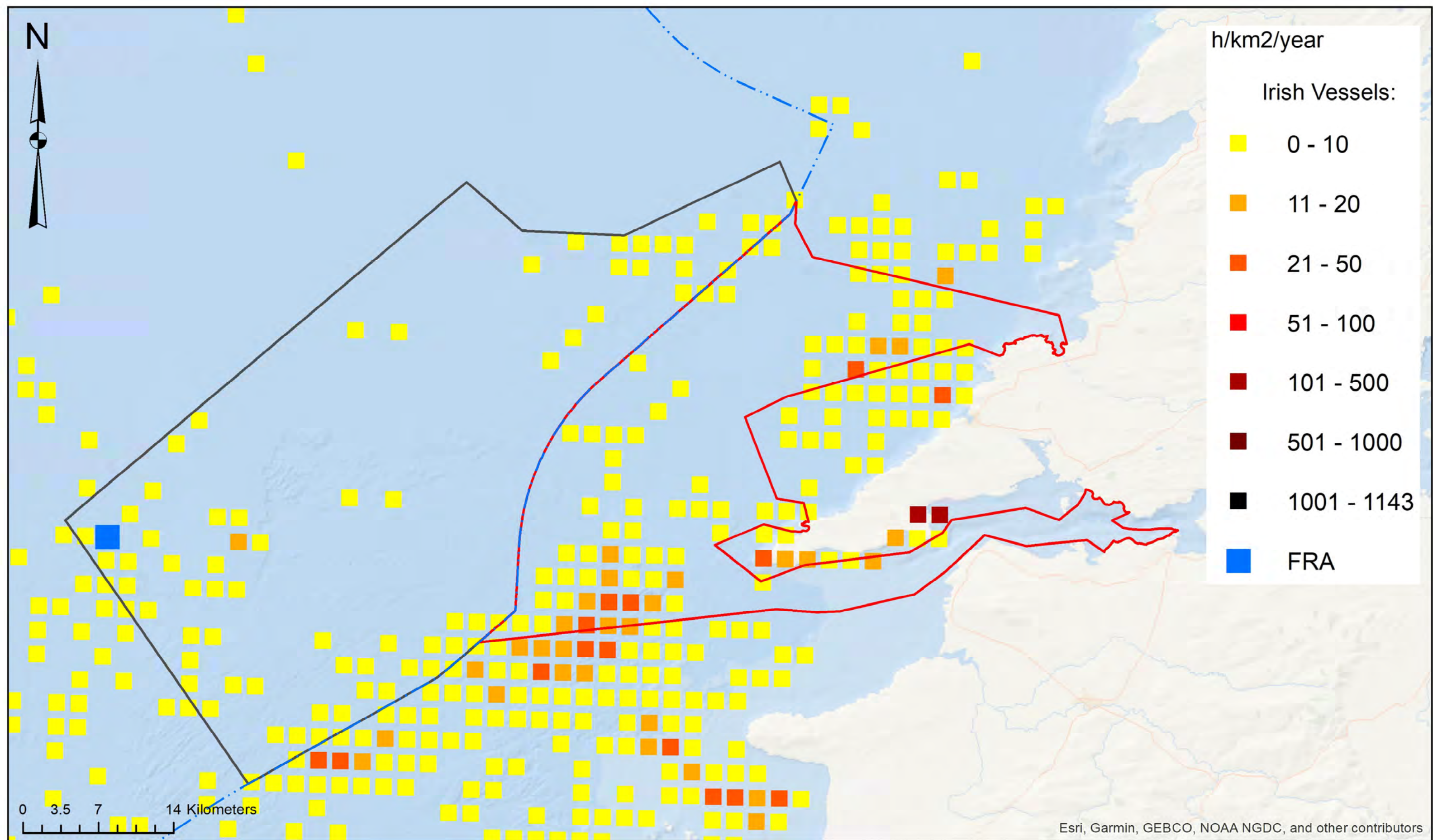


Mill House, Buttevant, P51 TN35  
Co. Cork, Ireland

[www.dpenergy.com](http://www.dpenergy.com)

All Rights Reserved, 2021





## Clarus Offshore Wind Farm

### Map 23

GillNet Fishing Effort by  
Vessels > 12m during 2015-2019

#### Legend

- Foreshore Licence Application Area
- Contiguous Project Area
- Irish Territorial Sea 12 nm Limit

Data source: MI, VMS Dataset 2015-2019

Ver	Date	Drawn by	Checked	Approved
V1	30/09/2021			
Map prepared by: <span style="background-color: black; color: black;">XXXXXXXXXX</span> MEngSc in Environmental Engineering, PGD in Sustainable Energy, HDGGIS				
Filename: C003IE_FIG_CommercialFisheriesGillNet20152019_V1_0_20210930			Size A3	
Scale: 1:450,000		Printed @ A3		
Coordinate System: IRENET95 Irish Transverse Mercator Projection: Transverse Mercator				

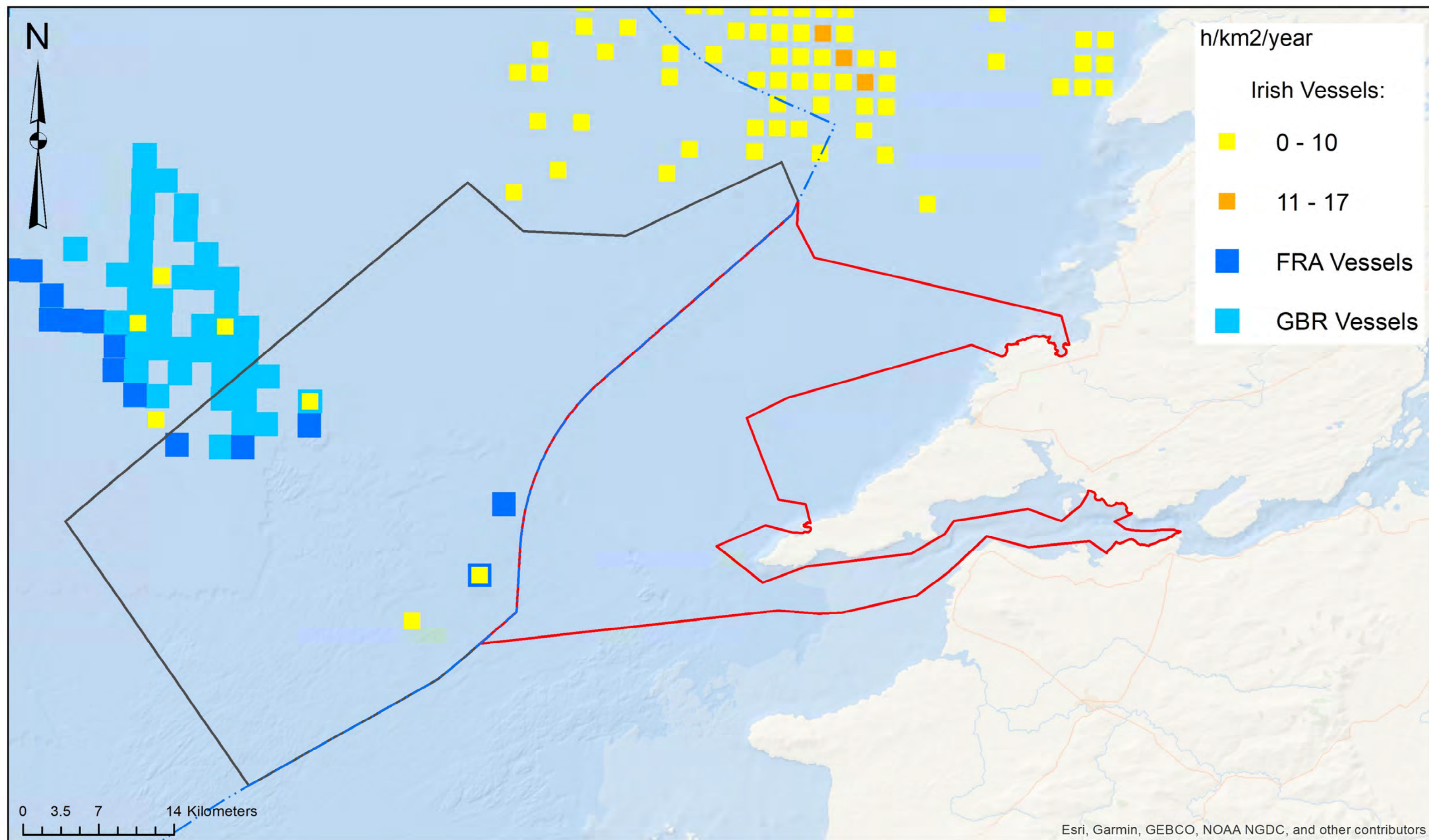


Mill House, Buttevant, P51 TN35  
Co. Cork, Ireland

[www.dpenergy.com](http://www.dpenergy.com)

All Rights Reserved, 2021





## Clarus Offshore Wind Farm

### Map 24

Other/Not Specified Fishing Effort by  
Vessels > 12m during 2015-2019

#### Legend

- Foreshore Licence Application Area
- Contiguous Project Area
- Irish Territorial Sea 12 nm Limit

Data source: MI, VMS Dataset 2015-2019

Ver	Date	Drawn by	Checked	Approved
V1	30/09/2021			
Map prepared by <span></span> manager in Environmental Engineering, PGD in Sustainable Energy, HDGGIS				
Filename: C003IE_FIG_CommercialFisheriesOtherNotSpec20152019_V1 0_20210930			Size A3	
Scale: 1:450,000		Printed @ A3		
Coordinate System: IRENET95 Irish Transverse Mercator Projection: Transverse Mercator				



Mill House, Buttevant, P51 TN35  
Co. Cork, Ireland

[www.dpenergy.com](http://www.dpenergy.com)

All Rights Reserved, 2021

## 3.7 Shipping and Navigation

The following sections provide an overview of the shipping activities and navigational features within or near the Foreshore Licence Application Area.

### 3.7.1 Navigational features

The following points summarise the main navigational features identified in proximity to the area of interest:

- The nearest major commercial port is the Shannon Foynes Port (Map 29). Shannon Foynes Port Company (SFPC), Ireland's second largest port operation, has statutory jurisdiction over all marine activities on a 500km<sup>2</sup> area on the Shannon Estuary, stretching from Kerry/Loop Heads to Limerick City. Part of the Foreshore Licence Application Area lies within the jurisdiction of the Shannon Foynes Port;
- Other ports and harbours near the Foreshore Licence Application Area include Port Kilrush (Map 29), Port of Tarbert and the fishing port Carrigaholt;
- A passenger ferry service between Killimer and Tarbert operates across the Shannon Estuary. There is also a seasonal (May – September) ferry from Kilrush to Scattery Island; and
- The closest RNLI stations are at Kilrush and Fenit.

### 3.7.2 Marine traffic analysis

The coastguard Automatic Identification System (AIS) shows a high volume of marine traffic across the Shannon Estuary (Marine Institute, 2020b). The marine traffic density recorded within the Foreshore Licence Application Area is presented in Figure 3-20, Map 21 (Note: 2020 data has not been included on this figure. This data set was reviewed however was considered not representative due to impacts of Covid on vessel traffic). This figure indicates a high concentration of vessel movements within the Shannon Estuary and within the Foreshore Licence Application Area, running parallel to the coast.

#### 3.7.2.1 Commercial vessels (excluding fishing and recreation)

Most of the commercial traffic is bulk cargo vessels with smaller numbers of tankers, passenger vessels, and other / miscellaneous vessel types. The cargo vessel density is high on the Shannon Estuary and follows a route from Limerick towards the open sea and around the southwest coast of Ireland (Marine Institute, 2020b).

Within the Foreshore Licence Application Area, the passenger vessel density for 2017 ranged from low (0 hours per km<sup>2</sup> per month) to high (1955.37 hours per km<sup>2</sup> per month). The highest passenger vessel densities are recorded at the mouth of the Shannon Estuary and at the ferry route across the estuary between Killimer and Tarbert. Passenger vessel traffic along the coast is low (Marine Institute, 2020b).

#### 3.7.2.2 Fishing vessels

An assessment of fishing activity has been conducted following analysis of historical data and VMS data. As VMS carriage is not mandatory for fishing vessels below 12m in length, such vessels may be under-represented (Tully, 2017).

The most common gear types near and within the Foreshore Licence Application Area are bottom trawls, otter board trawls, pelagic trawls, pots, nets and lines (Marine Institute, 2020b). The following types of fisheries are most likely to be limited in their ability to seek other opportunities on alternate grounds: trawling, seining and potting.

The fishing pier closest to the Foreshore Licence Application Area is Carrigaholt, other fishing harbours near the Foreshore Licence Application Area include: Fenit and Fahamore to the south and harbour



associated with the Aran Islands (Inisheer, Inishmaan and Inishmore) to the north. Dingle and Rossaveal are the closest major fishing ports. (Figure 3-21, Map 22).

#### 3.7.2.3 Recreational vessels

The recorded sailing activity within the Foreshore Licence Application Area is low (Marine Institute, 2020b). Additionally, COWF are aware, through Fisheries Liaison activities, that there are a number of recreational angling operators within the Foreshore Licence Application Area.

However, it should be noted that only a minority of recreational vessels broadcast on AIS and so actual activity may be under-represented.

The majority of vessels recorded visiting facilities in the area were routeing to / from Kilrush Marina and Fenit Harbour Marina. Other vessels were transiting on passage through the area along the south west coast.

Recreational activity is likely to be highest during the summer months.

### 3.8 Subsea Infrastructure and Wrecks

No subsea cables and pipelines are located within the Foreshore Licence Application Area (Marine Institute, 2020b).

There are 10 shipwrecks within and 10 in close vicinity of the Foreshore Licence Application Area as identified on the National Monuments Service Wreck Viewer mapping tool (WIID 2020). See Figure 3-22, Map 23.

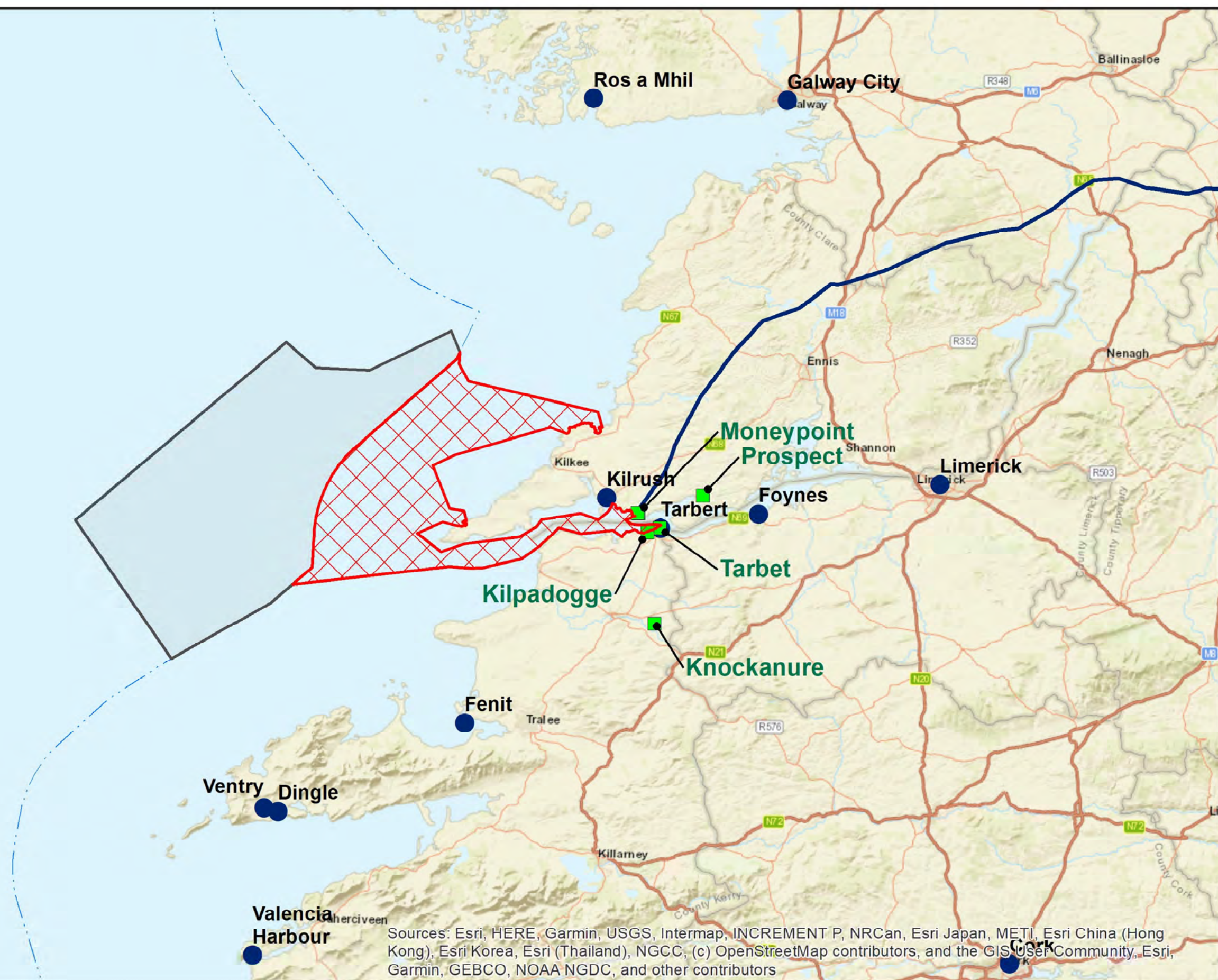








0 5 10 20 Kilometers



Sources: Esri, HERE, Garmin, USGS, Intermap, INCREMENT P, NRCan, Esri Japan, METI, Esri China (Hong Kong), Esri Korea, Esri (Thailand), NGCC, (c) OpenStreetMap contributors, and the GIS User Community, Esri, Garmin, GEBCO, NOAA NGDC, and other contributors

## Clarus Offshore Wind Farm


### Map 29

Infrastructure (Ports and Substations)

#### Legend

- Foreshore Licence Application Area
- Contiguous Project Area
- Cable Investigation Area
- Substation > 220 kV
- Grid Line 400 kV
- Commercial Port
- Irish Territorial Sea 12 nm Limit

Data source: MI, EIRGRID, MARINE TRAFFIC

Ver	Date	Drawn by	Checked	Approved
V1	30/09/2021			
Map prepared by:  MEngSc in Environmental Engineering, PGD in Sustainable Energy, HDGGIS				
Filename: C:\031E_FIG_PortsSubstations_V1.0_20210930				Size A3
Scale: 1:1,000,000		Printed @ A3		
Coordinate System: IREN95 Irish Transverse Mercator Projection: Transverse Mercator				



Mill House, Buttevant, P51 TN35  
Co. Cork, Ireland

[www.dpenergy.com](http://www.dpenergy.com)

All Rights Reserved, 2021





0 3 6 12 Kilometers

Sources: Esri, GEBCO, NOAA, National Geographic, Garmin, HERE, Geonames.org, and other contributors, Esri, Garmin, GEBCO, NOAA NGDC, and other contributors

# Clarus Offshore Wind Farm





## Map 4

Shipwrecks

### Legend

-  Foreshore Licence Application Area
-  Contiguous Project Area
-  Cable Investigation Area
-  Shipwrecks
-  Irish Territorial Sea 12 nm Limit

Data source: NMS, INFOMAR

Ver	Date	Drawn by	Checked	Approved
V1	30/09/2021			
Map prepared by  MEngSc in Environmental Engineering, PGD in Sustainable Energy, HDGGIS				
Filename: C003IE_FIG_Shipwrecks_V1.0_20210930				Size A3
Scale: 1:400,000		Printed @ A3		
Coordinate System: IRENET95 Irish Transverse Mercator Projection: Transverse Mercator				



Mill House, Buttevant, P51 TN35  
Co. Cork, Ireland

[www.dpenergy.com](http://www.dpenergy.com)

All Rights Reserved, 2021



### 3.9 Recreation

The Foreshore Licence Application Area lies on the South West of Ireland adjacent to Co. Clare, between Doonbeg Bay in the North and Shannon Estuary, in the south.

The Foreshore Licence Application Area includes the Blue Flag awarded beach White Strand Doonbeg, but avoids Ballybunion South Beach, Kilrush Marina, Kilrush Cappa River and Kilkee (Blue Flag, 2020).

Whitestrands Doonbeg is famous for its white sand that frames magnificent coastal scenery (Tourism Ireland, 2020). This sandy beach is located 2.5 km west of the village of Doonbeg, off the N67 national road. The beach is popular for walking, swimming, surfing and other activities, especially in the summer holiday period (June – August).

### 3.10 Other Proposed Activities in the Area

A search of Foreshore Licence Applications for surveys or other projects which could interact with the proposed site investigations was conducted using the Department of Housing, Local Government and Heritage (DHLGH) 'Applications and Determinations' website<sup>1</sup> on 04 November 2021. Commercial fisheries, shipping interests and recreational use have been scoped out of the list of projects as they are considered to represent baseline conditions, and are not considered as projects, plans or licenced activities. Existing pipelines and cables within the Foreshore Licence Application Area were also not considered as they will not interact with the proposed site investigations.

As outlined in Table 3-5, two projects were identified on the DHLGH website which could potentially interact with the proposed site investigations. However, through membership of Wind Energy Ireland, and an internet search, Clarus Offshore Wind Farm Ltd. are aware of six additional proposed projects that could potentially overlap the Foreshore Licence Application Area. These are described below and where spatial information is available, this is shown in Map 3.

Other installations/projects within/in the vicinity of the Foreshore Licence Application Area include the Ballybunion metocean buoy found within the Foreshore Licence Application Area and the Sceirde (Skerd) Rocks wind farm project (FS006361) found >46km north of the Foreshore Licence Application Area in Bertraghboy Bay (see Figure 3-23, Map 24). These installations/projects have been scoped out of further assessment as there is no pathway for effect between them and the proposed site investigations.

**Table 3-5 Foreshore Licence Applications (currently listed on DHLGH's website) that overlap with the Foreshore Licence Application Area**

Name of development	Licence ref	Type of activity	Commencement date	Licence Status	Distance from Foreshore Licence Application Area (km)
ESB Moneypoint Ecological Survey Ballymacrinan Bay	FS007141	Ecological survey in the form of nine grab samples for infauna and granulometric analysis to help characterise subtidal habitat and benthic communities	Between 01/07/2020 to 31/10/2020	Approved 6th October 2020	Within Foreshore Licence Application Area
Eirgrid Cross Shannon 400 kV Electricity Cable	FS007083	The installation of submarine electricity cables across the Lower Shannon Estuary	Construction 2022 for operation by end of 2023	In progress (public consultation complete)	Within Foreshore Licence Application Area

<sup>1</sup> <https://www.gov.ie/en/collection/f2196-foreshore-applications-and-determinations/#2008>



### **ESB Moneypoint Ecological Survey - Ballymacrinan Bay**

A Foreshore Licence (reference FS007141) was approved on the 6<sup>th</sup> October 2020 for an ecological survey. The ecological survey proposed consists of the collection of nine grab samples for infauna and granulometric analysis to help characterise subtidal habitat and benthic communities. The sampling is required solely for compliance with an Environmental Protection Agency (EPA) Industrial Emissions Licence, with a survey of the habitats and communities of Ballymacrinan Bay required to be conducted every two years. Survey activities will occur over a two-day period. The application for a Foreshore Licence stated that works would commence between the 1<sup>st</sup> of July and 31<sup>st</sup> October 2020. As the Licence was approved on the 6<sup>th</sup> of October 2020, it is likely that the survey works have now concluded. As the surveys are required bi-annually, the next surveys will likely be carried out in a similar period in 2022.

### **Eirgrid Cross Shannon 400kV Electricity Cable**

Eirgrid is developing a submarine cable that will link the electricity substation at Kilpaddoge in North Kerry to the Moneypoint generating station in Clare. This project overlaps the Foreshore Licence Application Area in the upper Shannon Estuary. Planning approval was received from An Bord Pleanála in June 2021 and the cable is planned to be constructed in 2022 to be fully operational in later 2023.

### **Moneypoint One and Moneypoint Two projects – ESB**

ESB is proposing to develop an offshore wind farm approximately 16km off the coast of Co. Kerry and Co. Clare. The development is set to be installed in two phases with the first phase, Moneypoint One (located within the Foreshore Licence Application Area) covering an area of 70km<sup>2</sup> with an estimated capacity of 400MW. Moneypoint Two (located approximately 15km from Foreshore Licence Application Area) is expected to have a capacity of 1GW-1.5GW and cover an area of 200km<sup>2</sup>. The Moneypoint Offshore Wind website (Moneypoint Offshore Wind, 2021) indicated that in January 2021 ESB submitted an Investigative Foreshore Licence application; although as of November 2021 this is not publicly available.

Note: Equinor announced in November 2021 that they have withdrawn from the project. ESB has put the project on hold, however, do intend to continue with the development once another investor has agreed to continue the development (Buljan, 2021).

### **WestWave Energy Test Site – ESB**

The proposed WestWave energy test site is located off Killard, Co. Clare. It is a 5MW pre-commercial project to build the first full-scale, operational wave farm off the west coast of Ireland. The proposed development will include near-shore and offshore wave energy converter devices. As of November 2021, there were no Foreshore Licence Applications relating to this project published on the DHLGH website.

### **Ilen Floating Wind Farm – Simply Blue Energy**

COWF are aware that the Ilen Floating Wind Farm project is a proposed co-developed floating offshore wind and wave energy installation to be located approximately 35km off the west coast of Co. Clare. This project is in conjunction with Project Saoirse and both projects will be installed in two separate phases, with installation of the Ilen Floating Wind Farm Project intended for 2028 (CORPOWER, 2021). The floating wind farm element has a proposed capacity of 1.1 GW while the wave energy element has a proposed capacity of 30 MW, with the first pre-FEED and geophysical reconnaissance surveys planned to be undertaken sometime in 2021. An Investigative Foreshore Licence application was intended to be submitted in December 2020, although as of November 2021 this is not publicly available. Currently the status of the project is at concept/early planning stage (4C Offshore, 2020). As such, there is potential for these surveys to overlap spatially and temporally with the proposed site investigations.

### **Project Saoirse Wave Energy, Simply Blue Energy**

Simply Blue Energy is developing Project Saoirse approximately 4-6 km off the west coast of County Clare, which will consist of a 5MW wave energy conversion array of approximately 15-16 WEC units. The installation for this project is planned to be in 2026 (CORPOWER, 2021). The proposed development will overlap within the Foreshore Licence Application Area. Publicly available information (Skopljak, 2021; Offshore, 2021) suggests that an Investigative Foreshore Licence application for the project was submitted in December 2020; although as of November 2021 this is not publicly available.

### **Mainstream Renewable Power**

COWF are aware that Mainstream Renewable Power is preparing to apply for an Investigative Foreshore Licence to conduct site investigation works to assess a potential wind farm off counties Clare and Kerry. At present, the application is not available on the DHLGH foreshore applications website. However, the Mainstream Renewable Power website indicates that public consultations are ongoing for multiple sites (Mainstream Renewable Power, 2021). While no publicly available information is available on this development, it is thought it could potentially overlap the Foreshore Licence Application Area for the Clarus Offshore Wind Farm.

### **Loop Head Wave Power Station**

There is limited publicly available information on this project. A presentation by Marine Renewable Energy Ireland and University College Cork (October 2018) suggests that the proposed project could have an initial capacity of 300MW. The wave energy converters could be installed over the period 2022 to 2032 with an export power cable to the Moneypoint Power Station. At present (November 2021) there are no associated Investigative Foreshore Licence Applications available on the DHLGH foreshore applications website.

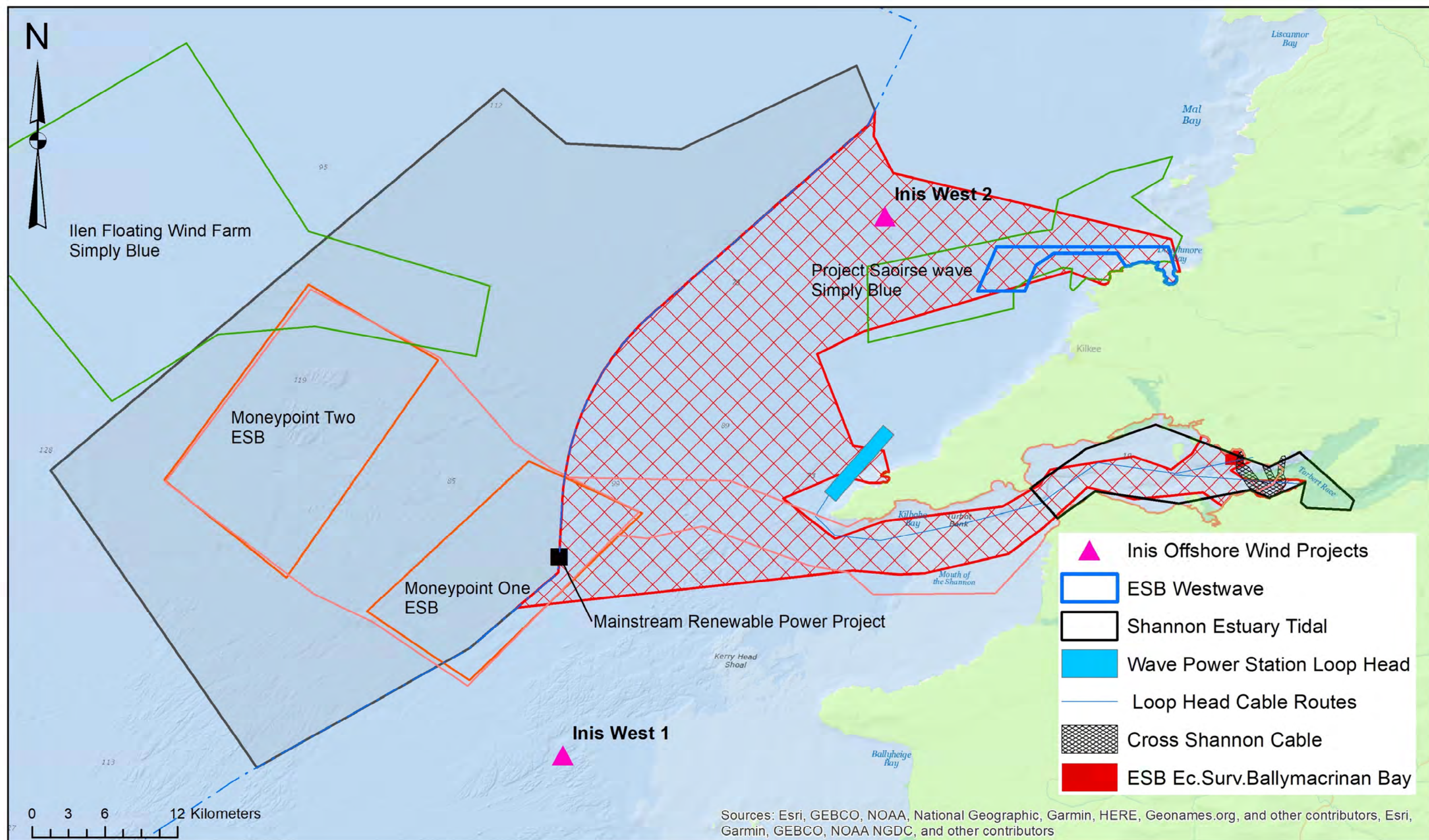
### **Shannon Estuary Tidal**

There is limited publicly available information on this project. However, in 2020 DesignPro Limited, submitted an Investigative Foreshore Licence Application (FS007081) to deploy and test a 60KW hydrokinetic turbine in the Shannon Estuary as part of a European Funded Horizon 2020 project. The deployment location is off the pier at Inishmurry (Cahiracon, Co. Clare). This site is outside of the Foreshore Licence Application Area, further east in the River Shannon estuary, approximately 17km away. At present (November 2021), there are no Investigative Foreshore Licence applications available on the DHLGH foreshore applications website.

### **Inis West One and Two, Inis West Offshore Wind**

COWF are aware of two further proposed developments by Inis West Offshore Wind in collaboration with Warwick Energy off the Coast of Co. Clare; Inis 1 and Inis 2. Both projects have an estimated capacity of 1000MW (2000 MW in total). Information available from Wind Energy Ireland suggest that Inis 2 overlaps the Foreshore Licence Application Area. 4C Offshore (2021) reports that as of 10 October 2021 an Investigative Foreshore Licence Application has been submitted; but as November 2021 this was not publicly available.





## Clarus Offshore Wind Farm

### Map 3

Other Projects in the Area

#### Legend

- Foreshore Licence Application Area
- Contiguous Project Area
- Cable Investigation Area
- Irish Territorial Sea 12 nm Limit

Notes: Project locations and boundaries indicative only based on current information available.  
Data source: DCCAE, DHLGH, EIRGRID, MRJA, WEI, Inis Website

Ver	Date	Drawn by	Checked	Approved
V1	03/11/2021			
Map prepared by: <span style="background-color: black; color: black;">XXXXXXXXXX</span> MEngSc in Environmental Engineering, PGD in Sustainable Energy, HDGGIS				
Filename: C:\0031E_FIG_OtherProjects_V3_0_20211103				Size A3
Scale: 1:400,000		Printed @ A3		
Coordinate System: IREN95 Irish Transverse Mercator Projection: Transverse Mercator				



Mill House, Buttevant, P51 TN35  
Co. Cork, Ireland

[www.dpenergy.com](http://www.dpenergy.com)

All Rights Reserved, 2021



## 4. POTENTIAL ENVIRONMENTAL EFFECTS

To assess the significance of effects on the environment from the proposed site investigations, it is first necessary to identify the pressures and potential effects the proposed site investigations may have.

Pressures are the mechanism through which an activity has an effect on any part of the ecosystem. The nature of the pressure is determined by the activity type, intensity and distribution. A list of marine physical / chemical and biological pressures and their definitions has been formally agreed by the OSPAR Intercessional Correspondence Group on Cumulative Effects (ICG-C) (OSPAR 2011) and the list of pressures is published within OSPAR Agreement 2014-02 and has been used in the assessment. The ICG pressure list does not include human pressures, and therefore, categories have been developed based on industry experience.

An impact is the consequence of the pressure i.e. a predicted change in the baseline environment. The effect is the consequence of the impact and is usually measurable. Effects only occur when an impact is present within an environment that is sensitive to it. In assessing the significance of the effect, the magnitude (the spatial extent of the impact, the duration and frequency) and sensitivity, recoverability and importance of the receptor are considered. The Environment Protection Agency (EPA) Ireland (2017) definitions of significance have been used in the assessment as follows:

- Imperceptible – An effect capable of measurement but without significant consequences.
- Not Significant – An effect which causes noticeable changes in the character of the environment but without significant consequences.
- Slight – An effect which causes noticeable changes in the character of the environment without affecting its sensitivities.
- Moderate – An effect that alters the character of the environment in a manner that is consistent with existing and emerging baseline trends.
- Significant – An effect which, by its character, magnitude, duration or intensity alters a sensitive aspect of the environment.
- Very Significant – An effect which, by its character, magnitude, duration or intensity alters most of a sensitive aspect of the environment.
- Profound – An effect which obliterates sensitive characteristics.

This section describes the potential pressures that the proposed site investigation works could have on the environment and the significance of the resulting effects. The section is ordered by receptor. If necessary and appropriate, project specific mitigation has been proposed to reduce the significance of effects.

### 4.1 Identification of Pressures

Potential pressures associated with the proposed site investigation works were identified as:

- Penetration and/or disturbance of the substrate;
- Visual disturbance;
- Introduction or spread of non-indigenous species;
- Siltation rate changes, including smothering;
- Underwater sound changes;
- Death or injury by collision;



- Displacement of vessels fishing activity;
- Loss or damage to fisheries habitats/fish stocks;
- Direct or indirect damage to an archaeological asset;
- Damage to or interference of an external cable asset;
- Restricted access to recreational users; and
- Cumulative and in-combination effects.

## 4.2 Intertidal and Benthic Communities

### 4.2.1 Potential effects

#### 4.2.1.1 Penetration and/or disturbance of the substrate

Small areas of seabed will be removed by the geotechnical and environmental sampling. Based on figures presented in Section 2.4 and Section 2.5, combined, the geotechnical (VC) and environmental grab sampling will remove approximately 33.8m<sup>3</sup> of sediment from the Foreshore Licence Application Area.

At the selected landfall, the JUB legs and six boreholes will affect an area of approximately 71.88m<sup>2</sup>. Following completion of drilling, the borehole will be left to naturally backfill with sediments and cuttings material.

As discussed in Section 3.2, areas of seabed within the Foreshore Licence Application Area consists of hard bedrock. It is unlikely that geotechnical sampling will be undertaken on bedrock as the equipment cannot penetrate the substrate.

The sedimentary areas of the seabed within the Foreshore Licence Application Area primarily consisted of coarse sediment and sand. The geotechnical sampling programme will create small depressions (from the JUB legs) and mounds (from risings) within these sediments. However, metocean conditions within the study area are highly dynamic. Within the Shannon Estuary peak currents vary between about 1 (neap) and 2 (spring) ms<sup>-1</sup> (O'Rourke et al 2014). Outside the estuary, north of Loop Head, tidal currents are lower (of the order of 0.2ms<sup>-1</sup> during spring tides, MIDA undated). In this region the dominant energy source is wave action, resulting from exposure to Atlantic storms and swells (Marine Institute 2020). Therefore, any mounds or depressions created during sampling will be quickly dispersed and infilled following equipment removal.

All benthic communities in the footprint of sampling equipment and borehole drill site will be effected through minor disturbance around the sample station and a very small volume of substratum loss, direct displacement or smothering during sampling. Any smothering will be a thin layer due to the small volumes of sediment displaced during the sampling and this deposited sediment will be quickly dispersed given the strong currents in the area. The area of disturbance will back fill leaving no permanent significant loss or damage. Areas of sandy and coarser sediments are highly recoverable given that the sample depressions will be quickly infilled following cessation of disturbance and therefore typical species are able to quickly recolonise the area (Dernie et al 2003).

The sedimentary benthic habitats identified within the survey area are widespread and common for the region. Therefore, any disturbance is not expected to have an effect on the wider population of benthic fauna and the significance of any effect will be **Imperceptible** for sedimentary habitats.

The document submitted in support of this application as 'Supporting Information for Screening for Appropriate Assessment and Natura Impact Statement' concluded that there is a potential for LSE from the drilling of boreholes on reefs within the Lower River Shannon SAC (IE002165), Kilkee Reefs SAC (IE002264) and Carrowmore Dunes SAC (IE002250). Therefore, Stage 2 Appropriate Assessment

(AA) is required. The document submitted in support of this application as 'Supporting Information for Screening for Appropriate Assessment and Natura Impact Statement' presents information to inform the Appropriate Assessment and proposes project specific mitigation (reiterated in Section 4.2.2 below) which commits to measures to avoid intrusive sampling or boreholes being drilled on areas of sensitive habitat. With the implementation of this mitigation, the document submitted in support of this application as 'Supporting Information for Screening for Appropriate Assessment and Natura Impact Statement' concluded that there will be no adverse effect on the integrity of these European sites, either alone or in combination with other plans or projects.

#### 4.2.2 Project specific mitigation

The following project specific mitigation is proposed in the document submitted in support of this application as 'Supporting Information for Screening for Appropriate Assessment and Natura Impact Statement'.

- Geophysical data and the existing biotope maps for the area will be used to identify potential reef and priority habitats, and position geotechnical and environmental stations to avoid intrusive sampling in these areas. If geophysical interpretation is inconclusive, drop down camera will be used to visualise the seabed prior to sampling.

### 4.3 Protected Sites

#### 4.3.1 Potential effects

Screening for Appropriate Assessment (AA) (Stage 1) has been undertaken for European Sites and is presented in the document submitted in support of this application as 'Supporting Information for Screening for Appropriate Assessment and Natura Impact Statement'. The Screening for AA assessed 32 European Sites that are either within the direct Zone of Influence of the proposed site investigations or contain mobile Annex II species which could potentially travel into the Foreshore Licence Application Area.

It was identified that the proposed site investigations could have potential to induce the following pressures on Qualifying Interests / Special Conservation Interests:

- Visual disturbance;
- Underwater sound changes; and
- Penetration and/or disturbance of the substrate below the surface of the seabed, including abrasion.

Other projects and plans in the area were identified and assessed to determine if they could interact with the proposed site investigations to have an in-combination effect. It was determined that there exists a potential spatial and temporal pathway between the proposed site investigation and other projects in the region.

Of the 31 Natura 2000 sites assessed within the Supporting Information for Screening for AA, it is considered possible that there is a likelihood of interaction between the proposed site investigations for the Clarus Offshore Wind Farm and Qualifying Interests of 13 Natura 2000 sites. Of these 13 Natura 2000 sites, assessment for Likely Significant Effects (LSE) has identified three sites; Lower River Shannon SAC (IE002165), Kilkee Reefs SAC (IE002264), and Carrowmore Dunes SAC (IE002250) for which it cannot be ruled out that the proposed site investigations, either alone or in-combination with other plans and projects, will not have a likely significant effect and so Stage 2 AA is required.

The AA will be conducted by the Department of Housing, Local Government and Heritage. However, as part of the process, a document has been prepared in support of this application as 'Supporting Information for Screening for Appropriate Assessment and Natura Impact Statement' and this



document concludes that, provided that the proposed mitigation measures are implemented, there will be no adverse effect on the integrity of the Lower River Shannon SAC (IE002165), Kilkee Reefs SAC (IE002264) and Carrowmore Dunes SAC (IE002250) due to the proposed site investigations, either alone or in combination with other plans or projects.

#### 4.3.2 Project specific mitigation

The following project specific mitigation is proposed in the document submitted in support of this application as 'Supporting Information for Screening for Appropriate Assessment and Natura Impact Statement' as follows:

- Geophysical data and the existing biotope maps for the area will be used to identify potential reef and priority habitats, and position geotechnical and environmental stations to avoid intrusive sampling in these areas. If geophysical interpretation is inconclusive, drop down camera will be used to visualise the seabed prior to sampling.

##### **Lower River Shannon SAC (IE002165)**

- The contractor for the proposed site investigations will follow the Department of Arts, Heritage and the Gaeltacht (DAHG) 'Guidance to Manage the Risk to Marine Mammals from Man-made sound sources in Irish Waters' (DAHG 2014); specifically, Section 4.3.4 Geophysical Acoustic Surveys, and Section 4.3.2 Drilling.
- Clarus Offshore Wind Farm Limited will co-ordinate with any developers that are granted a Foreshore Licence within the region on the timing of site investigations to minimise cumulative impacts.

### 4.4 Marine Mammals

#### 4.4.1 Potential effects

##### 4.4.1.1 Introduction

All cetaceans are EPS protected under the European Communities (Birds and Natural Habitats) Regulations 2011 (S.I No. 477 of 2011). It is an offence to deliberately disturb EPS, particularly during the period of breeding, rearing, hibernation or migration. A Risk Assessment for Annex IV species (Ref: P2399\_R5461\_Rev0) was undertaken for the proposed site investigations and is submitted in support of this Investigative Foreshore Licence Application. The Risk Assessment for Annex IV Species assessed the risk of increased underwater noise from the proposed site investigations and increased collision risk from presence of vessels affecting cetaceans in the Foreshore Licence Application Area. The information provided below summarises the conclusions of the assessment.

##### 4.4.1.2 Underwater sound changes

One of the most important environmental considerations related to the proposed site investigations is the potential effects of underwater sound on marine mammals. For the purposes of this assessment, a qualitative approach has been taken using existing literature as this was considered proportionate to the proposed site investigations and their potential to generate underwater sound changes which could affect environmental receptors (i.e. marine mammals).

##### **Cetaceans**

The Risk Assessment for Annex IV species concluded that:

- The potential for auditory injury from geophysical survey is nil or negligible.
- The potential for disturbance from geophysical survey in open waters is negligible.

- The potential for disturbance of common bottlenose dolphin in the River Shannon SAC from geophysical survey is temporary and slight.
- The potential for auditory injury and disturbance from geotechnical survey is nil or negligible.
- The potential for physical injury and disturbance from all survey vessels and equipment associated with other surveys is nil or negligible.
- There is the potential for cumulative effects on Annex IV species and project specific mitigation has been proposed.

Temporary behavioural impacts (disturbance) to cetaceans will not be extensive, severe or biologically significant, given the transient and short-term nature of the activities. It is highly unlikely that disturbance would negatively impact upon the Favourable Conservation Status (FCS) of any species which may be present in the Foreshore Licence Application Area. The activities are temporary and transitory and set within a region where shipping noise is common suggesting animals will exhibit a degree of habituation.

Implementation of best practice industry standard mitigation in the form of implementation of the DAHG 'Guidance to Manage the Risk to Marine Mammals from Man-made sound sources in Irish Waters' (DAHG 2014); specifically, Section 4.3.4 Geophysical Acoustic Surveys, and Section 4.3.2 Drilling, will reduce the risk of deliberate injury to cetaceans to negligible levels.

It is considered that a Derogation Licence to disturb marine Annex IV species will not be required.

The document submitted in support of this application as 'Supporting Information for Screening for Appropriate Assessment and Natura Impact Statement' concluded that there is a potential likely significant effect on common bottlenose dolphin from the Lower River Shannon SAC (IE002165) and that AA is required for this European Site.

The AA will be conducted by the Department of Housing, Local Government and Heritage. However, as part of the process, the applicant has submitted a document in support of this application as 'Supporting Information for Screening for Appropriate Assessment and Natura Impact Statement' and this concludes that provided that the proposed mitigation measures are implemented, there will be no adverse effects on the integrity of the European site, either alone or in combination with other plans or projects.

### **Pinnipeds**

Grey seal and harbour seal are not Annex IV species and therefore were not assessed in the Risk Assessment for Annex IV Species. Underwater noise changes generated by the proposed site investigations may pose a risk to seal populations either through auditory injury or temporary or continuous disturbance. Whilst disturbance does not result in physical injury, disruptions to behavioural patterns such as migration, nursing, breeding, foraging, socialising and/or sheltering may occur.

Acute to significant long-term consequences to seal populations can occur, for example by avoidance of important habitats, interference with vocalisations and auditory damage (Southall et al., 2019; Tyack, 2008). Male seals have been shown to utilise a repertoire of underwater vocalisations during mating season to attract a mate (Van Parijs and Kovacs 2011), and to defend territories (Matthews et al. 2017).

Harbour seals use low frequency rumblings from 250Hz to 1.4kHz (Van Parijs, Janik and Thompson, 2000), and are more sensitive to continuous noise than impulsive noise (Baltic Marine Environment Protection Commission 2016). Therefore, there is potential for significant noise disturbance during mating to affect seal breeding success, as seals rely on these vocalisations (Baltic Marine Environment Protection Commission 2016). Similar vocalisations have been recorded in harbour seal outside of breeding seasons, but the behavioural significance of these vocalisations is unknown (Andersson et al.



2015). To determine the potential impact of noise generated by the geophysical survey, the sound levels that will be produced have been compared to the available Southall et al (2019) estimated thresholds for injury and disturbance in seals.

The auditory range of harbour and grey seal is expected to fall within the range of the SBP and MBES equipment. When modelled, the sound levels generated by the SBP and MBES typically exceed the thresholds for auditory injury and a temporary threshold shift in animal hearing within 100m of the survey equipment. However, it should be noted that sonar based surveys have very strong directivity which effectively means that there is only potential for auditory injury when a marine mammal is directly within the main beam of the sound source. Once the animal moves outside of the main beam then there is little potential for injury. The same is true in many cases for a TTS in hearing where an animal is only exposed to enough energy to cause TTS when inside the direct beam of the sonar. The threshold for disturbance is exceeded at a greater distance from the vessel (circa 3km) but is based on the assumption that the animal and the noise source will stay static, with the animal remaining in the zone of influence continuously for a period of 24-hours. The survey vessels will be continuously moving, and it is highly unlikely that the presence of the survey vessel would result in significant changes in behaviour.

Animals will be able to return to the area once the vessel has passed through. Parts of the Foreshore Licence Application Area experience high levels of marine traffic associated with the River Shannon navigation and approach channels and therefore the marine environment will already experience elevated levels of anthropogenic sound in addition to natural ambient sound levels. However, as best practice, certain mitigation can be adopted into the design of the proposed site investigations to reduce the potential for a significant effect on the marine mammals. This project specific mitigation is provided in Section 4.4.2 below.

Implementation of the project specific mitigation, combined with the localised zone of influence and temporary nature of the proposed site investigations, will mean that effects to pinnipeds will be **Temporary and Not Significant**.

#### **Otter**

Otter are an Annex IV species and are listed as a Qualifying Interest of the Lower River Shannon SAC. The Screening for AA concluded that there will be no likely significant effect on otter and AA is not required.

Otter typically forage within 80m of the shoreline, and so are unlikely to be found out in the open waters of the Shannon Estuary where the proposed site investigations will primarily take place, reducing the potential for noise generated by the activities to injure or disturb individuals. Due to their similarity in auditory characteristics, otter have a similar impact criteria to high frequency cetaceans (Southall et al. 2019). The Risk Assessment for Annex IV Species submitted in support of this Investigative Foreshore Licence Application concluded that injury to otters will not occur due to the proposed site investigations. The distribution within the SAC will not be affected and there will be no significant increase in the barriers to connectivity between their habitats. In relation to the conservation objectives for the species, the proposed site investigations will not lead to a decline in the extent of habitat available, distribution of the species within the site or availability of prey.

#### **Cumulative effects**

Section 3.10 has identified that other site investigations could be undertaken in the same region as the Foreshore Licence Application Area simultaneously or consecutively. The assessment above concluded that the significance of the effect of the proposed site investigations on marine mammals, with the implementation of mitigation measures is Not Significant. However, there remains the possibility that if considered alongside other activities occurring within the same region the site investigation works could give rise to significant cumulative effects. This potential is discussed below.

Cumulative effects are likely to result where localised disturbance from more than one activity either occurs simultaneously resulting in a wider zone of disturbance restricting foraging, migratory or breeding behaviour; or consecutively within a restricted area resulting in an extended period of disturbance or the production of a barrier restricting movements.

It is planned that the proposed site investigations will be conducted over the next number of years to capitalise on suitable weather windows over this time period. At this time, it is not known when a Foreshore Licence might be awarded or when other offshore site investigations will be conducted, therefore two scenarios were considered by the assessment. Firstly, that the proposed and other site investigations are conducted at the same time, and secondly that they occur consecutively. The first scenario is highly unlikely as data acquisition can be impaired if two or more geophysical surveys occur at the same time in proximity due to equipment interference. It is therefore more likely that site investigations would occur consecutively. This would result in an extension of the time period that marine mammals would be disturbed.

Given that Lower River Shannon SAC Lies (partially) within the Foreshore Licence Application Area, the largest potential for a significant cumulative effect would be on common bottlenose dolphin within this SAC. The confined nature of the SAC within the estuary and the fact that animals form a discrete genetic population means that barrier effects or extended periods of disturbance could have a greater effect than would be normally experienced in open coastal waters.

Taking this into consideration, to reduce the significance of potential effects mitigation has been proposed in Section 4.4.2. Implementation of the project specific mitigation, combined with the temporary nature of the proposed site investigations, will mean that **within the River Shannon Estuary** cumulative effects to marine mammals will be **Temporary** and **Slight**.

**In open coastal waters**, the potential cumulative effect has been assessed as **Temporary** and **Not Significant**. This is based on the results of a study in the UK Southern North Sea SAC on the potential cumulative effects from a number of nearby windfarms on harbour porpoise (BEIS 2020). The study found that harbour porpoise displacement was temporary and harbour porpoise relocated elsewhere. It was concluded that seismic surveys would not have an adverse effect upon the integrity of the Southern North Sea SAC. The same behavioural response is likely in open coastal waters where marine mammals have the ability to avoid the temporary site investigation works.

#### 4.4.1.3 Risk of injury from collision

There is the risk that animals could collide with survey vessels. Shipping collision is a recognised cause of marine mammal mortality worldwide, the key factor influencing the injury or mortality caused by collisions is the ship size and its travelling speed. Ships travelling at 14 knots or faster are most likely to cause lethal or serious injuries.

Vessels involved in the survey are likely to be either stationary or travelling considerably slower than 14 knots therefore the collision risk is lower than that posed by commercial shipping activity. Therefore, risk of injury from collision to marine mammals is very low, and the significance of any effects will be **Imperceptible**.

#### 4.4.1.4 Visual disturbance

Seals hauled out on land could react to the presence of vessels. In general, ships more than 1,500m away from hauled out grey or common seals are unlikely to evoke any reactions, between 900m and 1,500m seals could be expected to detect the presence of vessels and at closer than 900m a flight reaction could be expected (Brasseur & Reijnders, 1994). This pressure would be most significant for breeding and moulting seals, hauled out on the coast and on intertidal banks. There is a potential grey seal haul out site located at Loop Head at the mouth of the River Shannon. Any grey seals hauled up at this site could be disturbed by the presence of vessels. However, vessel traffic in and out of the Shannon Estuary is high. Therefore, any seals hauled up within this site will be habituated to visual



disturbance caused by vessels. Therefore, it is considered that the significance of any effects to seals will be **Imperceptible**.

There are no protected sites designated for seals within the vicinity of the Foreshore Licence Application Area therefore there is no potential for visual disturbance to seals hauled up within these sites. The closest SAC designated for seals is the Blasket Islands SAC located 40km from the Foreshore Licence Application Area. Therefore, it is considered that the significance of any effects to seals within protected sites will be **Imperceptible**.

#### 4.4.2 Project specific mitigation

The following project specific mitigation is proposed in the document submitted in support of this application as 'Supporting Information for Screening for Appropriate Assessment and Natura Impact Statement' as follows.

- The contractor for the proposed site investigations will follow the Department of Arts, Heritage and the Gaeltacht (DAHG) 'Guidance to Manage the Risk to Marine Mammals from Man-made sound sources in Irish Waters' (DAHG 2014); specifically, Section 4.3.4 Geophysical Acoustic Surveys, and Section 4.3.2 Drilling.
- Clarus Offshore Wind Farm Limited will co-ordinate with any developers that are granted a Foreshore Licence within the region on the timing of site investigations to minimise cumulative impacts.

### 4.5 Fish

#### 4.5.1 Potential effects

##### 4.5.1.1 Underwater sound changes

The ability of fish to hear noise is dependent on their hearing structures, which indicate their sensitivity to sound. All fish can detect particle motion (the movement of fluid particles in a sound field) but sound pressure is only detected by those species possessing a swim bladder; the otolith organ (the auditory portion of the ear) acts as a particle motion detector and where linked to the swim bladder, converts sound pressure into particle motion, which is detected by the inner ear. Generally, species with specialisations for sound pressure detection (e.g. a swim bladder) can hear higher frequencies (between 200Hz – 3kHz) than fishes lacking morphological adaptations, which can detect sound at lower frequencies between 100Hz to 1kHz (Carroll et al. 2017). The common prawn (*Palaemon serratus*) has been shown to be sensitive to particle motion due to low frequency sound waves from 100Hz up to 3kHz, with a hearing acuity similar to generalist fish (Nedwell et al. 2007). Popper et al (2014) categorises fish into three groups for analysing the effects of sound upon them:

- Low sensitivity hearing species are fish with no swim bladder or other gas chamber (e.g. dab and other flatfish). These species only detect particle motion and not sound pressure and therefore are less susceptible to barotrauma.
- Medium sensitivity hearing species are fish with swim bladders but where hearing does not involve the swim bladder or other gas volume. Examples of species within this category include Atlantic salmon. In these species hearing only involves particle motion and not sound pressure. They are however, susceptible to barotrauma due to the presence of a swim bladder.
- High sensitivity hearing species such as clupeids (e.g. herring, sprat, twaite shad and allis shad) have specialisations of the auditory apparatus where the swim bladder and inner ear are intimately connected. These species can detect sound pressure as well as particle motion and are able to detect frequencies up to 3kHz; with optimum sensitivity between 300Hz-1kHz (Nedwell et al. 2007).

Based on the above, most of the proposed site investigations operate at frequencies above the audible range for hearing specialist fish however disturbance and injurious effects can occur from the sudden change in pressure generated by activities. The greater the sound pulse the greater the likely effects to high sensitivity hearing specialist fish. There is also potential for some fish and shellfish species to be vulnerable to impulsive activities during sensitive life stages, for example during the egg and larvae development stages.

Basking shark were screened out of the assessment as they have a low sensitivity to noise (Popper et al., 2014). Additionally, it is also unlikely for vessel noise to cause an impact due to 'masking' of auditory cues as basking shark are not known to vocalise, or rely on hearing to forage.

All SACs within 40km of the Foreshore Licence Application Area have been screened for the presence of Annex II migratory fish species as Qualifying Interests, in recognition that as mobile species, fish could potentially enter the Foreshore Licence Application Area (see the document submitted in support of this application as 'Supporting Information for Screening for Appropriate Assessment and Natura Impact Statement'). It is possible that the following Annex II listed species are likely to be within or moving through the Foreshore Licence Application Area at certain times of the year:

- Sea lamprey – late April to early June
- River lamprey – September to June
- Atlantic salmon – May to June and autumn months

Species, such as Atlantic salmon and sea and river lamprey have a lower sensitivity to sound (in comparison to Twaite shad another Annex II fish species) as their swim bladder is located far from the ear (Popper et al 2014). The hearing of these species only involves particle motion and not sound pressure, and they are therefore less susceptible to impacts from geophysical survey. These species are susceptible to internal injury (barotrauma) from a rapid pressure change, i.e. unexploded ordnance detonation, which does not form part of the proposed site investigations (Popper et al 2014). None of the SACs within 40km of the Foreshore Licence Application Area list Twaite shad as a Qualifying Interest.

However, commercially important species present in the Foreshore Licence Application Area known to be sensitive to underwater noise include species in the clupeid family such as herring and sprat.

### Continuous sound

Existing environmental conditions of background sound are considered when assessing anthropogenic activities that produce additional sound. Sources of background sound come from shipping, interaction of waves and currents with the seabed, seabed development and operation, fishing industry and recreational activities. Fish are likely to become habituated to levels of background sound (Carroll *et al.* 2017). A decreased responsiveness over time could arise through a change in tolerance, through habituation (Radford et al. 2016). Therefore, effects are only expected if sound produced during the proposed site investigations is significantly above the background sound levels.

Popper et al. (2014) identified that there is no direct evidence of permanent injury to fish species from shipping and other continuous noise. The typical behavioural response to sound might range from no change in behaviour, to a mild awareness (startle response) to larger movements of temporary displacement for the duration of the sound (Popper and Hastings 2009).

Nedwell *et al.* (2012) reviewed herring sensitivity to sources of noise from non-pulse cable laying operations (i.e. cable lay and trenching) and proposed effect ranges. Clupeids are expected to show strong avoidance behaviour (i.e. reaction by virtually all individuals) within 8m of the works, whilst significant avoidance (85% of individuals will react to noise) is expected within 66m. Upon reviewing marine traffic data, vessel density, particularly towards the coast of Ireland and River Shannon, is relatively high compared to the surrounding area. Therefore, it is likely that existing background noise



levels from shipping along the coast will mask the disturbance effect to herring and sprat from the survey vessel.

The presence of the survey vessels means it is likely that hearing specialist fish will demonstrate brief to temporary avoidance behaviour. The proposed site investigations will not lead to any long-term displacement as works are transient and temporary. Individuals would be expected to be able to return once the proposed site investigations are complete. However, it should be noted that the ability of small fish to take avoiding action may be limited, and temporary displacement may not therefore occur. Disturbance effects to fish resulting from vessel noise has been assessed as **Temporary and Not Significant**.

#### **Impulsive Sound**

A combination of multi-beam echosounder, side scan sonar and sub-bottom-profiler will be utilised during the geophysical survey. Most noise from the geophysical surveys will be operating at a frequency below 100 kHz with the highest frequencies operating between 300 – 900 kHz above the auditory capacity of fish (generally between 0.2Hz to 1kHz). In addition, sound from survey equipment is targeted towards the seabed, meaning that effects to fish are only expected if they are within the immediate zone of ensonification below the geophysical equipment. It is expected that fish will avoid the area once the geophysical surveys have started and are extremely unlikely to move towards the sound source. Studies of penned Pacific herring identified that they showed no visible response to sonar and echosounders indicating that they are not as sensitive to the high frequency sound emitted from geophysical equipment as the low frequency sound emitted from vessel movements (Peng et al 2015). Investigations into the influence of seismic surveys on the distribution and abundance of pelagic fish (including herring) revealed insignificant short-term horizontal distribution effects (Carroll et al 2017). It is therefore concluded that hearing specialist fish may experience temporary displacement from the immediate area surrounding the survey, however individuals will return to the area quickly based on the transient and brief nature of the survey activities. In conclusion, disturbance effects to fish resulting from impulsive sound sources has been assessed as **Temporary and Not Significant**.

The geotechnical equipment typically operates at low frequencies (30 – 120 Hz) (Codling Wind Park, 2020) generally below the lower sound levels detect by fish. Given that sound levels are unlikely to be audible to fish species and the activity will be temporary in any one location the disturbance effects to fish resulting from the geotechnical surveys has been assessed as **Temporary and Not Significant**.

#### **4.5.1.2 Collision below water with static or moving objects not naturally found in the marine environment**

Basking shark display both feeding and courtship behaviours at the water surface, which can make them vulnerable to vessel movements. However, due to the slow vessel speeds the pressure has been assessed as **Temporary and Not Significant**.

#### **4.5.2 Project specific mitigation**

The effects from underwater noise on fish have been assessed as Not Significant and therefore no project specific mitigation has been proposed. However, COWF will consult with the Irish Basking Shark Group as part of their ongoing stakeholder engagement on the project.

## 4.6 Birds

### 4.6.1 Potential effects

#### 4.6.1.1 Visual disturbance

The additional activity in the region during the proposed site investigations (both at the beach and in the foreshore area), may disturb birds which use the area for feeding, loafing and breeding.

Disturbance can lead to a number of physiological and behavioural responses which can affect demographic characteristics of the population. Responses to disturbance can result in loss of energy; impaired breeding; unrest through increased vigilance; and disruption to incubation leading to increased nest failures due to predation and nest abandonment (Valente et al. 2011).

The extent to which a seabird responds to disturbance is dependent upon a number of factors including: period of breeding cycle during which disturbance occurs; duration, type and intensity of the disturbance; presence of opportunistic predators; and the degree of habituation with the disturbance (Showler et al. 2010). Some seabirds are more resilient to disturbance than others.

Whilst birds present on the surface waters in the vicinity of the survey vessel could be temporarily displaced from their chosen feeding/resting location, they are likely to readily move to another nearby location. Given the short duration of the operations with the vessel moving steadily forward along the survey route, any disturbance at a given location is likely to be minimal and given the level of shipping activity in the region, disturbance is unlikely to be felt against background levels. Therefore, the significance of effects on birds in the **offshore environment** from the proposed site investigations will be **Temporary and Imperceptible**.

The birds most vulnerable to disturbance would be any **nesting birds** in the immediate vicinity of the site investigation works during the breeding season. Disturbance to nesting birds due to vessel presence, could have an effect on the success rate of the breeding population. The zone of influence of disturbance on nesting birds (notably Northern fulmar, guillemot and kittiwake) is considered to be up to approximately 2km surrounding the Foreshore Licence Application Area (NE and JNCC 2012). Therefore, all SPAs within 2km of the Foreshore Licence Application Area were screened for nesting birds (see the document submitted in support of this application as 'Supporting Information for Screening for Appropriate Assessment and Natura Impact Statement').

The document submitted in support of this application as 'Supporting Information for Screening for Appropriate Assessment and Natura Impact Statement' concluded that for four European Sites, the Kerry Head SPA (IE004189), Mid-Clare Coast SPA (IE004182), River Shannon and River Fergus Estuaries SPA (IE004077) and Loop Head SPA (IE004119), there is potential that the proposed site investigations could interact with breeding bird species and an assessment for LSE was undertaken. The assessment concluded for all four sites no LSE and that AA is not required.

### 4.6.2 Project specific mitigation

The effects from visual disturbance on birds have been assessed as Not Significant and therefore, no project specific mitigation has been proposed.

## 4.7 Sea and Air Navigation Systems

The survey equipment being utilised for the proposed site investigations, on the vessels, is not of the type which will interfere with any sea or air navigation systems.



## 4.8 Archaeology

### 4.8.1 Potential effects

#### 4.8.1.1 Direct or indirect damage to an archaeological asset

The geophysical survey is non-intrusive and therefore it is not anticipated that it will have any impact on archaeological features.

In addition to obtaining the conditions of the seabed, the geophysical survey is intended to determine the location of any unknown archaeology. The magnetometer data acquired during the geophysical survey is a key component of this. A Detection Device Consent will be applied for ahead of the survey, and consultation undertaken with the Department of Culture, Heritage and the Gaeltacht – Underwater Archaeology Unit to ensure that all requirements are met during the application process.

The results of the geophysical survey will be interpreted by a licensed marine archaeologist to inform: the positioning of the intrusive features of the geotechnical surveys e.g., vibrocores, CPTs, geotechnical boreholes and to inform any future Environmental Impact Assessment. In addition to this, an archaeologist will carry out a walkover inspection of the intertidal area prior to commencement of any intrusive survey works. All sample locations will be positioned to avoid archaeological sensitive areas. A Licence for Archaeological Excavation from the Department of Culture, Heritage and the Gaeltacht – Underwater Archaeology Unit will be applied for once the geophysical data has been reviewed.

This mitigation within the survey design and compliance with the conditions of the archaeological excavation licence will ensure that the effects of the proposed site investigations on archaeology will be **Imperceptible**.

### 4.8.2 Project specific mitigation

- An archaeology desk-based assessment will be undertaken by a qualified and experienced marine archaeologist prior to intrusive survey works occurring.
- An archaeologist will carry out a walkover inspection of the land/intertidal area prior to commencement of any boreholes or sampling within the land/intertidal area.
- Geophysical data will be reviewed by an archaeologist and geotechnical sampling locations moved as appropriate to avoid features of interest.
- A written scheme of investigation and protocol for archaeological discoveries will be prepared and implemented during the proposed site investigations. An archaeologist will be on-hand during the survey (although not present on site) should any archaeological finds be made.

## 4.9 Marine Activity

### 4.9.1 Potential effects

#### 4.9.1.1 Displacement of vessels and fishing activity

The types of marine activity that occur in the Foreshore Licence Application Area relate to shipping, fisheries and leisure/sports traffic categories.

This section summarises the potential effects of the proposed site investigations based on the navigational features and traffic identified in the review.

The proposed site investigation works are relatively minor, temporary activities involving survey vessels on location for a period of weeks, plus the deployment of wind resource, metocean survey buoys and potentially marine mammal monitoring equipment. Many of inshore fishing vessels may be

limited in their ability to seek other fishing opportunities on alternate grounds or safely fish in waters further offshore due to their size or availability of suitable alternate grounds. However, any potential effect is expected to be **Temporary** and **Imperceptible**. For example, risk of collision between vessels, or allision with wave rider buoy.

Notices to Mariners will be issued by the contractor for the proposed site investigations requesting that vessels keep a safe distance from the works. Clarus Offshore Wind Farm's Fisheries Liaison Officer will ensure that all local fishing organisations are in receipt of the Notice to Mariners and are aware of the proposed site investigations ahead of mobilisation. No safety zones are sought, however Notice to Mariners will request that vessels remain at least 500m radial distance from the survey vessels for safety purposes. Although it might be extended further to the rear of the survey vessel if towed gear is in use. The FLO will request fishermen with static gear in the Foreshore Licence Application Area move the pots until the proposed site investigations have been completed. The contractor for the proposed site investigations will define specific 'blocks' in which survey activities will be completed before the next block starts. This will minimise the time a particular area has to be cleared by static gear.

As the exclusion zone moves with the survey spread, potential effects will be temporary and restricted to this relatively small zone. The geotechnical vessels will also have a temporary exclusion zone due to their restricted manoeuvrability.

The execution of the proposed site investigations will increase the volume of shipping traffic by an imperceptible amount; within the boundary of seasonal fluctuations. Therefore, there will be no additional navigational safety implications. However, established marine navigation practices will be adhered to and maintained by the survey vessels involved.

As the works are temporary, there will be no effect on marine navigation and fishing activity once the proposed site investigations have been completed.

Whilst it is acknowledged there may be temporary disruption to individual vessels using the Foreshore Licence Application Area during the proposed site investigations, the effects will be localised. In the context of the whole commercial fishery, the significance of effects on commercial fisheries will be **Temporary** and **Imperceptible**.

The proposed Ilan Floating Wind Farm site investigation activities, any other site investigation works (e.g. Project Saoirse, Mainstream Renewable Power project, Loop Head Power, Moneypoint 1 and 2, Inis West 2) and any future ecological surveys conducted in Ballymacrinan Bay for ESB Moneypoint which intersect with the Foreshore Licence Application Area have the potential for cumulative effects on commercial fisheries. The worst-case is that fishers using static gear (pot fishing) are requested to move fishing gear for more than one survey, extending the period in which they cannot access their traditional grounds. However, the cumulative effect will be temporary as fishers will be able to return to the area once the proposed site investigations have passed and therefore it is concluded that the significance of **cumulative effects** will be **Slight**.

#### 4.9.1.2 Loss or damage to commercial fisheries habitats/fish stocks

The Foreshore Licence Application Area lies within West Shannon Ballylongford shellfish waters, is within close proximity (<3km) from the West Shannon Carrigholt, West Shannon Rinevella and West Shannon Poulmasherry Bay shellfish waters. However, the proposed site investigations will not affect water quality.

As discussed in Section 3.6 of this document, commercially exploited shellfish species in the area include lobster; crayfish; spider and brown crabs; shrimp and periwinkles (Marine Institute 2020b). The likelihood of the proposed site investigations affecting these species will be minimal as these species commonly occur in naturally turbid environments and have the ability to recover from environmental disturbance (Marlin 2020). Furthermore, the re-suspension of sediments will be



extremely small and localised to the borehole locations. Therefore, there will be **No Effect** on these commercially exploited species.

In 2020, the project appointed a Fisheries Liaison Officer who will continue to work on the project. The scope of this appointee covers the commercial fishing industry but also includes a wider selection of stakeholders including recreational fishing industry and other recreational users of the marine area.

#### 4.9.1.3 Damage to or interference of an external cable or pipeline asset

There are no subsea cables and pipelines located within the Foreshore Licence Application Area (see Section 3.8). Therefore, there will be no damage to or interference of external cables or pipelines.

### 4.9.2 Project specific mitigation

The assessment has identified the potential for cumulative effects with other site investigations in the region. Clarus Offshore Wind Farm Limited will liaise with other developers in the region to determine whether survey schedules will overlap. Efforts will be made to coordinate survey activities in a manner that reduces cumulative effects.

To mitigate against risks to shipping and navigation, standard industry measures will be implemented including:

- A Fisheries Liaison Officer has been appointed;
- Liaison with local fishers;
- Liaison with local ports and harbours;
- Notices to Mariners will be issued;
- Consultation with Irish Lights regarding marking and lighting;
- Consultation with Irish Coast Guard; and
- Vessel assurance and management including procedures such as compliance with COLREGS, use of appropriate marking and lighting, AIS broadcasts with up-to-date navigational status, adverse weather policy, emergency response plans, etc.

## 4.10 Recreational Resource

### 4.10.1 Potential effects

#### 4.10.1.1 Restricted access

The key recreational activity relating to the offshore area is likely to be restricted to sailing and possibly diving. Notices to Mariners will be issued by the contractor for the proposed site investigations requesting that vessels keep a safe distance from the works.

The main concern in the intertidal / nearshore area of the Foreshore Licence Application Area will be maintaining access to the beach areas for recreational use during the works. The locations of the geotechnical boreholes are currently not known, but it is possible that a location within the intertidal area will be required. Any restrictions on the beach will be limited in duration (i.e. one to two weeks) and the beach will be left in a pre-impact condition. Disturbance to recreational users will be temporary. Therefore, effects on recreational users in the area will be **Temporary** and **Imperceptible**.

### 4.10.2 Project specific mitigation

Clarus Offshore Wind Farm Limited will consult with all the relevant stakeholders e.g., local authorities and sailing clubs, as appropriate ahead of planned site investigations, once schedules and locations are confirmed.

## 4.11 Waste Management

The survey vessels will operate under international standards (MARPOL) with respect to black and grey wastewater and food waste discharges, which are designed to eliminate impacts to coastal waters, and reduce the levels of discharge in offshore waters. Therefore, no effects are expected.



## 5. SUMMARY AND CONCLUSIONS

To determine whether the proposed site investigations are likely to have a significant effect on the surrounding environment and protected Natura 2000 sites, either individually or in-combination with other plans or projects, a number of assessments were carried out, including a significance assessment (Section 4), a Risk Assessment for Annex IV species (submitted in support of this application as document entitled 'Risk Assessment for Annex IV Species') and NIS (submitted in support of this application as document entitled 'Supporting Information for Screening for Appropriate Assessment and Natura Impact Statement').

There are areas of reef habitat within the Foreshore Licence Application Area. Three protected sites are designated for the Qualifying Interest, Annex I reefs; namely Lower River Shannon SAC, Kilkee Reefs SAC, and Carrowmore Dunes SAC. Although the Lower River Shannon SAC also contains Atlantic salt meadows and Mediterranean salt meadows, these lie outside of the Foreshore Licence Application Area. The Supporting Information for Screening for Appropriate Assessment concluded that there is the potential for a likely significant effect on reef habitat from intrusive seabed sampling and that Appropriate Assessment is required. The document submitted in support of this application as 'Supporting Information for Screening for Appropriate Assessment and Natura Impact Statement' concluded that with the implementation of project specific mitigation, there will be no adverse effect on the integrity of the Natura 2000 sites, either alone or in combination with other plans or projects.

The Foreshore Licence Application Area lies within or near to seven SPAs designated for breeding and over-wintering bird species. The birds most vulnerable to disturbance would be any nesting birds in the immediate vicinity of the proposed site investigations during the breeding season. The Supporting Information for Screening for Appropriate Assessment concluded that given the distance to nesting colonies, there is no potential for a likely significant effect and that Appropriate Assessment is not required.

The proposed site investigations will generate underwater noise which has the potential to cause disturbance effects to fish and marine mammals. Particularly, there is potential for a likely significant effect on the Qualifying Interest, common bottlenose dolphin of the Lower River Shannon SAC. However, disturbance will be temporary, and individuals will return to survey area once the sound has ceased. Through the implementation of the project specific mitigation, combined with the localised zone of influence and temporary nature of the proposed site investigations, effects to marine mammals will be Temporary and Not Significant. The document submitted in support of this application as 'Supporting Information for Screening for Appropriate Assessment and Natura Impact Statement' concluded that there will be no adverse effect on the integrity of the Lower River Shannon SAC, either alone or in combination with other plans or projects.

The proposed site investigations will cause temporary and localised disturbance to other users of the application area e.g. fisheries, shipping and recreational users. To mitigate against risks to shipping and navigation, standard industry measures have already been undertaken, for example the appointment of a Fisheries Liaison Officer, or will be implemented, such as the distribution of Notices to Mariners.

## REFERENCES

- 1 Andersen, S. M., Teilmann, J., Dietz, R., Schmidt, N.M. and Miller, L. A. (2012). Behavioural responses of harbour seals to human-induced disturbances. *Aquatic Conservation: Marine and Freshwater Ecosystems*, 22(1), pp.113–121. [Online]. Available at: doi:10.1002/aqc.1244 [Accessed October 2021].
- 2 Baltic Marine Environment Protection Commission. (2016). Noise Sensitivity of Animals in the Baltic Sea. p.76. [Online]. Available at: <https://www.helcom.fi/wpcontent/uploads/2019/08/BSEP167.pdf> [Accessed October 2021].
- 3 BEIS. (2020). Review of Consented Offshore Wind Farms in the Southern North Sea Harbour Porpoise SAC. [Online]. Available at: [https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment\\_data/file/921754/RoC\\_SNS\\_SAC\\_HRA\\_FINAL.pdf](https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/921754/RoC_SNS_SAC_HRA_FINAL.pdf) (Accessed November 2020)
- 4 Berrow, S.D., Holmes, B. and Kiely, O. (1996) Distribution and Abundance of Bottle-nosed Dolphins *Tursiops truncatus* (Montagu) in the Shannon Estuary, Ireland. *Proceedings of the Royal Irish Academy Biology and Environment* 96B (1), 1-9.
- 5 Blue Flag (2020) Blue Flag 2020 Awarded Beaches & Marinas Republic of Ireland. [online] Available at: <https://beachawards.ie/blue-flag/sites-2-2/> [Accessed October 2020]
- 6 BOEM (2017). BOEM: Best Management Practices Workshop for Atlantic Offshore Wind Facilities. Overview of NMFS 2016 Technical Guidance for Assessing the Effects of Anthropogenic Sound on Marine Mammal Hearing. [online] Available at: <https://www.boem.gov/Day-1-Scholik-Overview-Guidance/> [Accessed November 2020]
- 7 Brandt T,M.J., Dragon A.C., Diederichs A., Schubert A., Kosarev V., Nehl, G., Wahl, V., Michalik, A., Braasch, A., Hinz C., Ketzer, C., Todeskino, D., Gauger, M., Laczny, M. & Piper, W. (2016). Effects of offshore pile driving on harbour porpoise abundance in the German Bight 2009-2013. Assessment of Noise Effects. Work package 2-5, Revision 3. Final report. Prepared for Offshore Forum Windenergie. P. 247. IBL Umweltplanung GmbH, Institut für angewandte Ökosystemforschung GmbH, BioConsult SH GmbH & Co. KG, Oldenburg, Neu Broderstorf, Husum.
- 8 Brasseur, S. and Reijnders, P. (1994). Invloed van diverse verstoringsbronnen op het gedrag en habitatgebruik van gewone zeehonden: consequenties voor de inrichting van het gebied. - IBN-Rapp. 113, 62 pp.
- 9 Buljan, A. (2021). Equinor Abandons Offshore Wind Projects in Ireland. [Online]. Available at: <https://www.offshorewind.biz/2021/11/04/equinor-abandons-offshore-wind-projects-in-ireland/> [Accessed 10 November 2021].
- 10 O' Cadhla, O., Strong, D., O'Keeffe, D, Coleman, M., Cronin, M., Duck, C., Murray, T., Dower, P., Nairn, R., Murphy, P., Smiddy, P., Saich, C., Lyons, D and Hiby, L. (2005). Grey seal breeding population assessment in the Republic of Ireland, 2005 [online] Available at: [https://www.npws.ie/sites/default/files/publications/pdf/OCadhla\\_et\\_al\\_2005\\_Grey\\_Seal\\_Population\\_Survey.pdf](https://www.npws.ie/sites/default/files/publications/pdf/OCadhla_et_al_2005_Grey_Seal_Population_Survey.pdf) [Accessed November 2020]
- 11 Carroll, A.G., Przeslawski, A.D., Gunning, M and Bruce, B. (2017). A critical review of the potential impacts of marine seismic surveys on fish & invertebrates. *Marine Pollution Bulletin* 112 (1) pp 9-24. [online] Available at: <https://www.sciencedirect.com/science/article/pii/S0025326X16309584> [Accessed November 2020]
- 12 Codling Wind Park (2020). Codling Wind Park Geophysical and Geotechnical Surveys. European Protected Species Risk Assessment.
- 13 Coull, K.A., Johnstone, R., and Rogers, S.I. (1998). Fisheries Sensitivity Maps for British Waters. Published and distributed by UK Oil and Gas.
- 14 CORPOWER. (2021). Western Star – Project Saoirse. [Online]. Available at: <https://www.corpowerocean.com/projects/western-star-project-saoirse/> [Accessed 10 November 2021].
- 15 Crowe, O. (2005). Ireland's Wetlands and their Waterbirds: Status and Distribution. BirdWatch Ireland. Newcastle.



- 16 Cummins, S., Lauder, C. and Tierney, D. (2019). THE STATUS OF IRELAND'S BREEDING SEABIRDS: BIRDS DIRECTIVE ARTICLE 12 REPORTING 2013 – 2018. p.89.
- 17 DAHG (2014). Guidance to manage the risk to marine mammals from man-made sound sources in Irish Waters. [online] Available at: [https://www.npws.ie/sites/default/files/general/Underwater%20sound%20guidance\\_Jan%202014.pdf](https://www.npws.ie/sites/default/files/general/Underwater%20sound%20guidance_Jan%202014.pdf) [Accessed November 2020]
- 18 DCENR (2015). Irish Offshore Strategic Environmental Assessment (IOSEA) 5 Environmental Report. [online] Available at: <https://assets.gov.ie/77784/a1788b2e-be3e-4d57-8fed-d9de6d924c59.pdf> [Accessed October 2020]
- 19 DEHLG. (2010). Appropriate Assessment of Plans and Projects in Ireland. p.84. [Online]. Available at: [https://www.npws.ie/sites/default/files/publications/pdf/NPWS\\_2009\\_AA\\_Guidance.pdf](https://www.npws.ie/sites/default/files/publications/pdf/NPWS_2009_AA_Guidance.pdf) [Accessed 8 November 2021].
- 20 Department of the Environment, Climate and Communications (2014). Offshore Renewable Energy Development Plan. [online] Available at: <https://assets.gov.ie/27215/2bc3cb73b6474beebbe810e88f49d1d4.pdf> [Accessed October 2021]
- 21 Department for Business, Energy & Industrial Strategy (BEIS) (2018). Offshore Oil & Gas Licensing 30th Seaward Round. Habitat Regulations Assessment. Draft Appropriate Assessment: Southern North Sea. February 2018. [online] Available at: [https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment\\_data/file/681627/30th\\_Round\\_Draft\\_AA\\_-\\_Southern\\_North\\_Sea\\_Blocks.pdf](https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/681627/30th_Round_Draft_AA_-_Southern_North_Sea_Blocks.pdf) [Accessed November 2020]
- 22 Department of Agriculture, Food and Marine Ireland (DAFMI) (2019) Annual report on the Irish fishing fleet. [online] Available at: [https://ec.europa.eu/fisheries/sites/fisheries/files/docs/2018-fleet-capacity-report-ireland\\_en.pdf](https://ec.europa.eu/fisheries/sites/fisheries/files/docs/2018-fleet-capacity-report-ireland_en.pdf) [Accessed October 2020]
- 23 Department of Energy and Climate Change (DECC) (2016). Offshore Energy Strategic Environmental Assessment. Department of Energy and Climate Change. March 2016.
- 24 Dernie, K.M., Kaiser, M.J and Warwick, R.M. (2003). Recovery rates of benthic communities following physical disturbance. *Journal of Animal Ecology*, 6, pp1043-1056.
- 25 DP Energy (2020) Pre-project fisheries Report - Assessment of fisheries activities for DP Energy. Clarus floating offshore windfarm project.
- 26 Doherty, P. et al. (2017). Testing the boundaries: Seasonal residency and inter-annual site fidelity of basking sharks in a proposed Marine Protected Area. 209, pp.68–75. [Online]. Available at: doi:10.1016/j.biocon.2017.01.018.
- 27 Ellis, J., Milligan, S. Readdy, L., Taylor, N and Brown, M. (2012). Spawning and Nursery Grounds of Selected Fish Species in UK Waters. Science Series Technical Report No. 147. CEFAS, Lowestoft.
- 28 Englund, A., Ingram, S. and Rogan, E. (2008). An updated population status report for bottlenose dolphins using the lower river Shannon SAC in 2008. Final Report to the National Parks and Wildlife Service, 34pp
- 29 European Marine Observation Data Network (EMODnet) (2021) "Seabeds Habitat Project" [online] Available at: <https://www.emodnet-seabedhabitats.eu/> [Accessed October 2021]
- 30 Fahy, E. *et al.*, 2008. An atlas of fishing and some related activities in Ireland's territorial sea and internal marine waters with observations concerning their spatial planning. Irish Fisheries Investigations: No. 19 / 2008.
- 31 Gerritsen, H.D. and Kelly, E. (2019). Atlas of Commercial Fisheries around Ireland, third edition. Marine Institute, Ireland.
- 32 Gore, M. et al. (2008). Transatlantic migration and deep mid-ocean diving by basking shark. *Biology letters*, 4, pp.395–398. [Online]. Available at: doi:10.1098/rsbl.2008.0147.
- 33 Government of Ireland (2021). Project Ireland 2040 National Marine Planning Framework. [online] Available at: <https://www.gov.ie/en/publication/60e57-national-marine-planning-framework/> [Accessed October 2021]
- 34 Hammond, P.S., Lacey, C., Gilles, A., Viquerat, S., Borjesson, P., Herr, H., Macleod, K., Ridoux, V., Santos, M.B., Scheidat, M., Teilmann, J., Vingada, J. and Øien, N. (2017) Estimates of cetacean abundance in

European Atlantic waters in summer 2016 from the SCANS-III aerial and shipboard surveys. [online] Available at: <https://synergy.st-andrews.ac.uk/scans3/files/2017/04/SCANS-III-design-based-estimates-2017-04-28-final.pdf> [Accessed October 2020]

**35** IBSG. (2021). Distribution | The Irish Basking Shark Group. [Online]. Available at: <https://www.baskingshark.ie/distribution> [Accessed 11 November 2021].

**36** IBSG. (2020). The Irish Basking Shark Group. [Online]. Available at: <https://www.baskingshark.ie/copy-of-2020> [Accessed November 2021].

**37** ICES (2009). Review of the Biologically Sensitive Area/Irish Box. [online] Available at <http://www.ices.dk/sites/pub/Publication%20Reports/Advice/2009/Special%20Requests/EC%20Irish%20box.pdf#search=%22Irish%20Box%22%20in%20the%20context%20of%20the%20Western%20Waters%20Regime>. [Accessed November 2020]

**38** Ingram, S. D. (2000) The ecology and conservation of bottlenose dolphins in the Shannon Estuary, Ireland, University College Cork. PhD thesis, 1-213.

**39** IWDG (2020). Sightings. [online] Available at: <http://www.iwdg.ie/> [Accessed October 2020]

**40** Mackey, M., Ó Cadhla, O., Kelly, T.C., Aguilar, A., de Soto, N. and Connolly, N. (2004). Cetaceans and Seabirds of Ireland's Atlantic Margin. Volume I - Seabird distribution, density & abundance.

**41** Mainstream Renewable Power. (2021). Mainstream Renewable Power - Ireland. [Online]. Available at: <https://www.mainstreamrp.com/ireland/> [Accessed November 2021].

**42** Marine Institute (2020a). Fisheries Overview. [online] Available at: <https://www.marine.ie/Home/site-area/areas-activity/fisheries-ecosystems/fisheries-overview> [Accessed October 2020]

**43** Marine Institute (2020b). Ireland's Marine Atlas. [online] Available at: <http://atlas.marine.ie/> [Accessed October 2020]

**44** Marine Institute (2020c). Biologically Sensitive Areas [online] Available at: [https://www.marine.ie/Home/site-area/areas-](https://www.marine.ie/Home/site-area/areas-activity/fisheries-ecosystems/biologically-sensitive-area)

[activity/fisheries-ecosystems/biologically-sensitive-area](https://www.marine.ie/Home/site-area/areas-activity/fisheries-ecosystems/biologically-sensitive-area) [Accessed November 2020]

**45** Marine Institute (2020d). Marine Renewable Energy Resource [online] Available at: <https://www.marine.ie/Home/site-area/infrastructure-facilities/ocean-energy/marine-renewable-energy-resource> -[Accessed November 2020]

**46** MarLIN (2020). The Marine Life Information Network. [online] Available at: <https://www.marlin.ac.uk> (Accessed November 2020)

**47** Matthews, L. P., Parks, S. E., Fournet, M. E. H., Gabriele, C. M., Womble, J. N. and Klinck, H. (2017). Source levels and call parameters of harbour seal breeding vocalizations near a terrestrial haulout site in Glacier Bay National Park and Preserve. The Journal of the Acoustical Society of America, 141 (3), pp.EL274–EL280. [Online]. Available at: doi:10.1121/1.4978299 [Accessed October 2021].

**48** MIDA (Undated). Tides, Waves and Currents. [online] Available at: <http://mida.ucc.ie/pages/information/phys/oceanography/tidesWavesCurrents/full.htm> (Accessed November 2020)

**49** Moneypoint Offshore Wind. (2021). MoneyPoint Offshore Wind. [Online]. Available at: <https://www.moneypointoffshorewind.ie/> [Accessed 11 November 2021].

**50** National Biodiversity data Centre (2020) Biodiversity Maps [online] Available at: <https://maps.biodiversityireland.ie/> [Accessed November 2020]

**51** National Biodiversity Data Centre, Ireland, European Otter (*Lutra lutra*), Available at: <https://maps.biodiversityireland.ie/Species/119290> Accessed October 2021.

**52** Natural England and JNCC (2012) Joint Natural England and JNCC Interim Advice Note: Presenting information to inform assessment of the potential magnitude and consequences of displacement of seabirds in relation of Offshore Windfarm Developments.

**53** Nedwell, J., Mason, T., Barham, R. and Chessman, S (2012). Assessing the environmental impact of underwater noise during offshore windfarm



construction and operation. Proceedings of Acoustics 2012, Fremantle, Australia [online] Available at: [http://www.acoustics.asn.au/conference\\_proceedings/AAS2012/papers/p116.pdf](http://www.acoustics.asn.au/conference_proceedings/AAS2012/papers/p116.pdf) [Accessed November 2020]

**54** Nedwell, J.R., Edwards, B., Turnpenny, A.W.H., and Gordon, J (2004) Fish and Marine Mammal Audiograms: A summary of available information. [online] Available online: [https://www.jstor.org/stable/41811925?seq=3#meta\\_data\\_info\\_tab\\_contents](https://www.jstor.org/stable/41811925?seq=3#meta_data_info_tab_contents) [Accessed November 2020]

**55** NMFS (2016), NMFS Technical Guidance on Marine Mammal Hearing: Underwater Acoustic Thresholds for onset of permanent and temporary threshold shift.

**56** NMFS (2018). Revisions to: Technical Guidance for Assessing the Effects of Anthropogenic Sound on Marine Mammal Hearing (Version 2.0): Underwater Thresholds for Onset of Permanent and Temporary Threshold Shifts. U.S. Dept. of Commer., NOAA. NOAA Technical Memorandum NMFS-OPR-59, 167 p. [online] Available at: <https://www.fisheries.noaa.gov/national/marine-mammal-protection/marine-mammal-acoustic-technical-guidance> [Accessed November 2020]

**57** NPWS. (2012). Lower River Shannon SAC Conservation objectives supporting document - marine habitats and species. [online]. Available at: [https://www.npws.ie/sites/default/files/publications/pdf/002165\\_Lower%20River%20Shannon%20SAC%20Marine%20Supporting%20Doc\\_V1.pdf](https://www.npws.ie/sites/default/files/publications/pdf/002165_Lower%20River%20Shannon%20SAC%20Marine%20Supporting%20Doc_V1.pdf) [Accessed November 2020]

**58** NPWS. (2013). Carrowmore Point to Spanish Point and Islands SAC - Site Synopsis. [online]. Available at: <https://www.npws.ie/sites/default/files/protected-sites/synopsis/SY001021.pdf> [Accessed November 2020]

**59** NPWS. (2014a). Kilkee Reefs SAC - Site Synopsis. [online]. Available at: <https://www.npws.ie/sites/default/files/protected-sites/synopsis/SY002264.pdf> [Accessed November 2020]

**60** NPWS. (2014b). Kilkee Reefs SAC Conservation objectives supporting document - Marine habitats. [online]. Available at: [https://www.npws.ie/sites/default/files/publications/pdf/Kilkee%20Reefs%20SAC%20\(002264\)%20Conservation%20objectives%20supporting%20document%20-%20Marine%20habitats%20\[Version%201\].pdf](https://www.npws.ie/sites/default/files/publications/pdf/Kilkee%20Reefs%20SAC%20(002264)%20Conservation%20objectives%20supporting%20document%20-%20Marine%20habitats%20[Version%201].pdf) [Accessed November 2020]

%20Marine%20habitats%20[Version%201].pdf [Accessed November 2020]

**61** Offshore. (2021). *Consortium developing floating wind/wave scheme offshore Ireland*. [Online]. Available at: <https://www.offshore-mag.com/renewable-energy/article/14198728/consortium-developing-floating-windwave-energy-scheme-offshore-ireland> [Accessed November 2021].

**62** O'Rourke, F., Boyle, F. and Reynolds, A. (2014) Ireland's tidal energy resource; An assessment of a site in the Bulls Mouth and the Shannon Estuary using measured data, Energy Conversion and Management, Vol. 87, pp. 726-734, ISSN 0196-8904,. [online] Available at: doi:10.1016/j.enconman.2014.06.089 <https://arrow.tudublin.ie/cgi/viewcontent.cgi?article=1045&context=engschmecart> (Accessed November 2020).

**63** O'Sullivan, K. (2022). Ireland's basking sharks to get protected status under Wildlife Act. [Online]. Available at: <https://www.irishtimes.com/news/environment/ireland-s-basking-sharks-to-get-protected-status-under-wildlife-act-1.4817822> [Accessed April 2022].

**64** O'Sullivan, D., O'Keefe, E., Berry, A., Tully, O and Clarke, M. (2013). An Inventory of Irish Herring Spawning Grounds. [online] Available at: <https://oar.marine.ie/bitstream/handle/10793/874/N.o.%202042.%20%20An%20Inventory%20%20Of%20Irish%20Herring%20Spawning%20Grounds.pdf?sequence=4&isAllowed=y> (Accessed November 2020).

**65** OSPAR Commission (2011). Intersessional Correspondence Group on Cumulative Effects - Amended 25th March 2011. Pressure lists and descriptions. [online] Available at: [http://jncc.defra.gov.uk/PDF/20110328\\_ICG-C\\_Pressures\\_list\\_v4.pdf](http://jncc.defra.gov.uk/PDF/20110328_ICG-C_Pressures_list_v4.pdf) (Accessed February 2019).

**66** Peng, C., Zhao, Z and Liu, G. (2015). Noise in the Sea and Its Impacts on Marine Organisms. Int J Environ Res Public Health. 12 (10) pp 12304 – 12323. [online] Available at: <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4626970/> (Accessed November 2020).

**67** Pollock, C. and Barton, C. (2008). A Gap Analysis of Irish Waters using the European Seabirds at Sea (ESAS) database. Irish Wildlife Manuals. National Parks and

Wildlife Service, Department of Environment, Heritage and Local Government, Dublin, Ireland.

**68** Popper, A., Hawkins, A., Fay, R., Mann, D., Bartol, S., Carlson, T., Coombs, S., Ellison, W., Gentry, R., Halvorsen, M., et al. (2014). Sound Exposure Guidelines for Fishes and Sea Turtles: A Technical Report. In: pp.33-51. [Online]. Available at: doi:10.1007/978-3-319-06659-2\_7.

**69** 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, UK.

**70** Reid, N., Hayden, B., Lundy, M.G., Pietravallo, S., McDonald, R.A. & Montgomery, W.I. (2013) National Otter Survey of Ireland 2010/12. Irish Wildlife Manuals No. 76. National Parks and Wildlife Service, Department of Arts, Heritage and the Gaeltacht, Dublin, Ireland.

**71** Richardson, W.J., Greene, C.R. Jr., Malme, C.I., and Thomson, D.H. (1995). Marine Mammals and Noise. Academic Press, San Diego, CA, USA.576p.

**72** Rogan, E., Garagouni, M., Nykänen, M., Whitaker, A., and Ingram, S. (2018). Bottlenose dolphin survey in the Lower River Shannon SAC, 2018. Report to the National Parks and Wildlife Service, Department of Culture, Heritage and the Gaeltacht. University College Cork. 19pp.

**73** Rolland, R.M., Parks, S.E., Hunt, K.E., Castellote, M., Corkeron, P.J., Nowacek, D.P., Wasser, S.K. and Kraus, S.D. (2012). Evidence that ship noise increases stress in right whales. Proceeding of the Royal Society of Biological Sciences, 10. 1098/rspb. 2011. 2429.

**74** Russell, D.J.F., Jones, E.L and Morris, C.D. (2017). Updated Seal Usage Maps: The Estimated at-sea Distribution of Grey and Harbour Seals. Scottish Marine and Freshwater Science Vol 8 No 25

**75** Showler, D.A., Stewart, G.B., Sutherland, W.J., and Pullin, A.S. (2010). What is the impact of public access on the breeding success of ground-nesting and cliff-nesting birds? CEE review 05-010 (SR16).

**76** Sims, D. W. and Quayle, V. A. (1998). Selective foraging behaviour of basking sharks on zooplankton in a small-scale front | Nature. Nature, 393, pp.460–464. (Online). Available at:

doi:https://doi.org/10.1038/30959 (Accessed July 2021).

**77** Sims, D. et al. (2003). Seasonal movements and behaviour of basking sharks from archival tagging: No evidence of winter hibernation. 248, pp.187–196. [Online]. Available at: doi:10.3354/meps248187.

**78** Sims, D. (2008). Sieving a Living: A Review of the Biology, Ecology and Conservation Status of the Plankton-Feeding Basking Shark *Cetorhinus Maximus*. Advances in marine biology, 54, pp.171–220.

**79** Skomal, G. et al. (2009). Transequatorial Migrations by Basking Sharks in the Western Atlantic Ocean. Current biology: CB, 19, pp.1019–1022. [Online]. Available at: doi:10.1016/j.cub.2009.04.019.

**80** Skopljak, N. (2021). Floating Wind-Wave Energy Project Planned Offshore Ireland. [Online]. Available at: <https://www.offshorewind.biz/2021/03/05/floating-wind-wave-energy-project-planned-offshore-ireland/> [Accessed November 2021].

**81** Southall, E, Sims, D, Metcalfe, J, Doyle, J, Fanshawe, S, Lacey, C, Shrimpton, J, Solandt, J-L & Speedie, C 2005, 'Spatial distribution patterns of basking sharks on the European shelf: Preliminary comparison of satellite-tag geolocation, survey and public sightings data.', Journal of the Marine Biological Association of the United Kingdom, vol. 85, no. 5, pp. 1083-1088.

**82** Southall, B.L., Bowles, A.E., Ellison, W.T., Finneran, J.J., Gentry, R.L., Greene Jr, C.R., Kastak, Ketten, D.R., Miller, J.H., Nachtigall, P.E., Richardson, W.J., Thomas, J.A. and Tyack, P.L. (2007). Marine Mammal Noise Exposure Criteria: Initial Scientific Recommendations. Aquatic Mammals, 33: Number 4.

**83** Speedie, C. D., Johnson, L. A. and Witt, M. J. (2009). Basking Shark Hotspots on the West Coast of Scotland: Key sites, threats and implications for conservation of the species. p.59.

**84** Thomsen, F., Ludemann, K., Kafemann, R. and Piper, W. (2006) Effects of Offshore Windfarm Noise on Marine Mammals and Fish. Report prepared by Biola for COWRIE Ltd. Hamberg, Germany. 62pp.

**85** Tourism Ireland (2020) Beaches [online] Available at: <https://www.ireland.com/what-is-available/attractions-built->



heritage/beaches/destinations/republic-of-ireland/  
[Accessed November 2020]

**86** Tully, O. 2017. Atlas of Commercial Fisheries for Shellfish around Ireland, Marine Institute, March 2017. ISBN 9781902895611 58pp.

**87** Valente, J.J. and Fischer, R.A (2011). Reducing human disturbance to waterbird communities near corps of engineers projects. Report reference ERDC TN-DOER-E29.

**88** Van Parijs, S. M., Janik, V. M. and Thompson, P. M. (2011). Display-area size, tenure length, and site fidelity in the aquatically mating male harbour seal, *Phoca vitulina*. Canadian Journal of Zoology, 78 (12), pp.2209–2217. [Online]. Available at: doi:10.1139/z00-165 [Accessed October 2021].

**89** 4C Offshore. (2020). *Ilen Floating Wind Farm - Concept/Early Planning - Ireland | 4C Offshore*. [Online]. Available at: <https://www.4coffshore.com/windfarms/ireland/ilen-ireland-ie32.html> [Accessed 10 November 2021].

**90** Doherty, P. et al. (2017). Testing the boundaries: Seasonal residency and inter-annual site fidelity of basking sharks in a proposed Marine Protected Area. 209, pp.68–75. [Online]. Available at: doi:10.1016/j.biocon.2017.01.018.

**91** Mainstream Renewable Power. (2021). *Mainstream Renewable Power - Ireland*. [Online]. Available at: <https://www.mainstreamrp.com/ireland/> [Accessed 10 November 2021].

**92** Witt, M. et al. (2012). Basking sharks in the northeast Atlantic: Spatio-temporal trends from sightings in UK waters. *Mar Ecol Prog Ser*, 459, pp.121–134. [Online]. Available at: doi:10.3354/meps09737.

**93** Wreck Inventory of Ireland Database (WIID) (2020) National Monuments Service: Wreck Viewer. [online] Available at: <https://www.arcgis.com/apps/webappviewer/index.html?id=89e50518e5f4437abfa6284ff39fd640> [Accessed October 2020]

**94** Wyatt, R (2008). Joint Industry Programme on Sound and Marine Life Review of Existing Data on Underwater Sounds Produced by the Oil and Gas industry Issue 1. August 2008. Seiche Measurements Limited Ref - S186. [online] Available at: <https://gisserver.intertek.com/JIP/DMS/ProjectReport>

[s/Cat1/JIP-Proj1.4\\_Soundsinventory\\_Seiche\\_2008.pdf](#)  
[Accessed November 2020]

**95** 4C Offshore. (2020). *Ilen Floating Wind Farm - Concept/Early Planning - Ireland | 4C Offshore*. [Online]. Available at: <https://www.4coffshore.com/windfarms/ireland/ilen-ireland-ie32.html> [Accessed November 2021].

**96** 4C Offshore. (2021). *Inis West 2 Offshore Wind Farm - Concept/Early Planning - Ireland | 4C Offshore*. [Online]. Available at: <https://www.4coffshore.com/windfarms/ireland/inis-west-2-ireland-ie41.html> [Accessed 10 November 2021]