Liverpool Bay CCS Ltd
HYNET CARBON DIOXIDE TRANSPORTATION AND STORAGE PROJECT - OFFSHORE

Environmental Statement
Volume 3, Appendix A: Scoping Report

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EIA Scoping Report
Scoping Report
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Prepared for:

Liverpool Bay CCS Limited

Contents

ACRONYMS

Acronym	Description
ADD	Acoustic Deterrent Device
BEIS	The Department for Business, Energy and Industrial Strategy
CA	Competent Authority
CCC	Committee on Climate Change
CCS	Carbon Capture and Storage
CO_2	Carbon Dioxide
CtL	Consent to Locate
DCO	Development Consent Order
DDV	Drop Down Video
DR	Drilling
EAJ	Environmental Assessment Justification
EIA	Environmental Impact Assessment
ENI	Eni UK Limited
EPS	European Protected Species
ES	Environmental Statement
FO	Fibre Optic
HRA	Habitats Regulations Assessment
IDC	Industrial Decarbonisation Challenge
LSE	Likely Significant Effects
MAT	Master Application Template
MCAA	Marine and Coastal Access Act
MHWS	Mean High Water Spring
MLWS	Mean Low Water Spring
MMO	Marine Management Organisation
MMV	Monitoring, Measuring and Verification
NRW	Natural Resources Wales
NRW-MLT	Natural Resources Wales – Marine Licencing Team
NSTA	North Sea Transition Authority
OGA	Oil and Gas Authority
OPRED	Offshore Petroleum Regulator for Environment and Decommissioning
P&A	Plugging and Abandonment
PWA	Pipeline Works Authorisation
SAT	Subsidiary Application Template
SLA	Service Level Agreement
SPM	Suspended Particulate Matter
SSC	Suspended Sediment Concentration
WFD	Water Framework Directive
UKCS	United Kingdom Continental Shelf

1 INTRODUCTION

1.1 Background

The UK Government and Welsh Government have set legally binding net-zero carbon dioxide (CO_2) emissions targets in response to the global climate emergency. This means that by 2050, any CO_2 emissions to the atmosphere must be offset by equivalent emissions removal.

The HyNet North West Project"[1], is a hydrogen supply and Carbon Capture and Storage (CCS) project. The goal of the HyNet North West Project is to reduce carbon dioxide emissions from industry, homes and transport and support economic growth in the North West of England and North Wales. The HyNet North West Project will include infrastructure to produce and distribute low carbon hydrogen. The hydrogen is produced using natural gas, with the resultant CO_2 emissions captured and stored in depleted hydrocarbon reservoirs offshore, in addition to the CO_2 emissions which will be captured from existing industrial sources.

Eni UK Limited intend to develop, through their Eni group affiliate Liverpool Bay CCS Limited (hereafter "the Applicant"), the HyNet Carbon Dioxide Transportation and Storage System, which includes the CO_2 onshore pipeline network, the repurposing of the existing Point of Ayr (PoA) natural gas Terminal for CO_2 service, the CO_2 storage offshore and associated transportation and injection facilities, including pipelines and wells. A schematic of the HyNet CO_2 Transportation and Storage System (orange line), within the HyNet North West Project, is illustrated in Figure 1-1.

In October 2020, the UK Oil and Gas Authority (OGA) awarded Eni UK Limited a Carbon Dioxide Appraisal and Storage Licence (CS004). This Licence would cover an area located within the Liverpool Bay area of the East Irish Sea. Under the Licence, the Applicant plans to reuse and repurpose depleted hydrocarbon reservoirs (Hamilton, Hamilton North and Lennox fields) in addition to associated infrastructure, to store CO_2 captured by the HyNet North West Project.

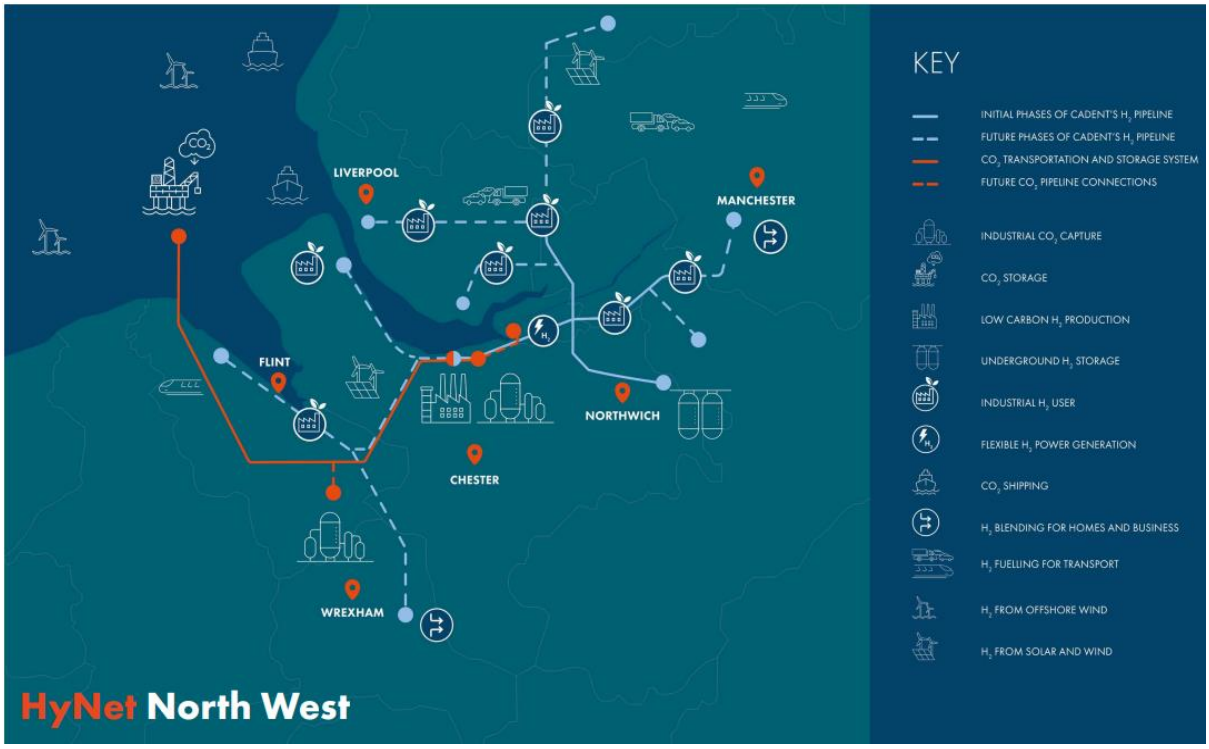

Figure 1-1 Illustrates the Eni Carbon Dioxide Transportation and Storage System within the HyNet North West Project

[1] https://hynet.co.uk

The HyNet Carbon Dioxide Transportation and Storage System has both Onshore and Offshore elements.

The Onshore elements are being supported by two separate Environmental Statements (ES):

- an ES to support the Development Consent Order (DCO) application for the HyNet Carbon Dioxide Pipeline DCO. An EIA Scoping Report for the HyNet Carbon Dioxide Pipeline DCO application has been submitted in June 2021 and the EIA Scoping Opinion received in July 2021. At the time of writing, the ES is undergoing finalisation.
- an ES to support the Town and Country Planning Act (TCPA) applications for the HyNet Carbon Dioxide Pipeline TCPA, these covering the elements located in Wales only. An EIA Scoping Report for the HyNet Carbon Dioxide Pipeline TCPA applications has been submitted in July 2021 and the EIA Scoping Opinion received in August 2021. At the time of writing, the Draft ES is undergoing finalisation.

The Onshore elements of the HyNet Carbon Dioxide Transportation and Storage System are outside the scope of this current Offshore EIA Scoping Report, which relates to those impacts from the infrastructures seawards of Mean High Water Spring (MHWS). The onshore EIA Scoping Report for the TCPA application would relate to those impacts from infrastructure landwards of Mean Low Water Spring (MLWS) and therefore there is an overlap in assessment within the intertidal area (between MHWS and MLWS).

Where there is an overlap in jurisdiction in the intertidal area between MHWS and MLWS of the Offshore and Onshore consenting and regulatory regimes, both the Offshore Scoping Report and the Onshore Scoping Report present the relevant technical assessments. Within this current Offshore Scoping Report, 'Offshore' generally refers to the receptors on the seaward side of MHWS and 'Onshore' refers to the receptors on the landward side of MHWS.

Upon receiving the Offshore EIA Scoping Opinion, the Applicant intends to develop a single overarching ES that serves the requirements of all consenting authorities for the Offshore elements, to support the following applications:

- Storage Permit application, following requirements defined in License CS004, for the use of the depleted hydrocarbon reservoirs within the Liverpool Bay area for the storage of CO2, including the carbon dioxide pipeline/transportation and injection facilities offshore; and
- Marine Licence applications, for the new electricity transmission infrastructure and communication interconnection from the MHWS level to the offshore platforms, located both in Welsh and English territorial waters.

1.2 Proposed Development Description

As part of the HyNet Carbon Dioxide Transportation and Storage Project - Offshore (hereafter the “Proposed Development”), the existing offshore natural gas import pipeline from PoA gas Terminal will be re-purposed to become a CO_2 export pipeline and will transport the CO_2 to the repurposed Douglas platform. From the Douglas platform, CO_2 will be transported along re-purposed natural gas pipelines to the Hamilton Main platform for injection into the Hamilton Main reservoir, to the Hamilton North platform for injection into the Hamilton North reservoir, and to the Lennox platform for injection into the Lennox reservoir.

The Proposed Development will also require new electrical and fibre optic transmission infrastructure seawards of Mean High Water Spring (MHWS), connecting the PoA Terminal to the offshore infrastructures.

The concept of the Proposed Development is illustrated in Figure 1-2.

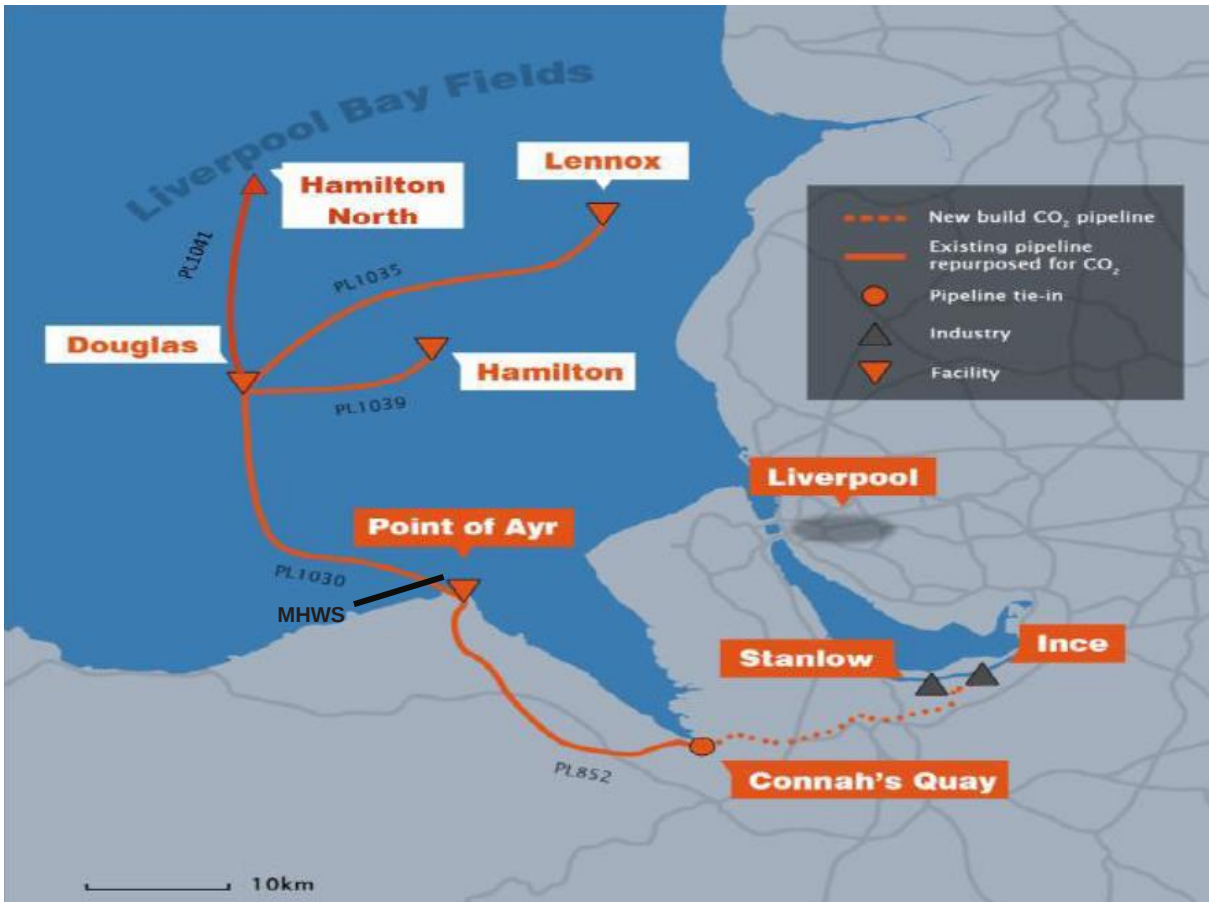

Figure 1-2 Illustrates the concept of the Proposed Development (infrastructure seawards MHWS)

The Proposed Development is located within both Welsh and English territorial waters and will include:

- Reconfiguration of the existing Douglas Process platform to receive CO2 from the onshore PoA Terminal and distribute CO2 to the Hamilton Main, Hamilton North, and Lennox wellhead platforms and when necessary, provide heating.
- Installation of new topsides on the Hamilton Main, Hamilton North and Lennox wellhead platforms to receive and inject CO2 into the depleted hydrocarbon reservoirs.
- Repurposing of the existing subsea natural gas pipelines for their change of use from hydrocarbon to CO2 service.
- Development of the Hamilton Main, Hamilton North and Lennox reservoirs for CO2 storage through the drilling and re-completion of new injection wells by side-tracking existing production wells.
- Implementation of a programme of Monitoring, Measurement and Verification (MMV) activities. This includes the drilling of Monitoring Wells in each field and a number of Sentinel Wells.
- Installation, including trenching, of two submarine 33kV armoured cables, with integrated fibre-optic cable connections (35 km from PoA Terminal onshore to the modified Douglas platform, including within the intertidal/foreshore area up to MHWS, within Welsh waters only).
- Installation, including trenching, of new power cables with integrated fibre-optic connecting the modified Douglas platform with the Hamilton Main (12 km; 33 kV), Hamilton North (15 km; 33 kV) and Lennox (35 km; 33 kV) platforms.
- Installation of concrete mattresses and external cable protection, at crossings of existing cables, and in areas where trenching is not deemed feasible, or as a remedial secondary protection measure if the target cable depth of lowering cannot be achieved.

The Proposed Development does not currently require the following activities in both Welsh and English territorial waters:

- No dredging or disposal is planned as part of the Proposed Development activities.
- No additional rock dumping is expected along the existing pipeline at the current design stage. However, as the design progresses, any additional rock dumping need will be confirmed and assessed where necessary.

To support the Proposed Development, a number of site surveys may be required, including:

- Environmental Baseline Survey (EBS) to inform the Offshore EIA.
- Geophysical and Geotechnical (G&G) survey to inform the Offshore cable routes design.
- Surveys to inform the Monitoring, Measurement and Verification (MMV) plan, including seismic, bathy-morphological surveys and environmental monitoring.
- Pipeline and facilities integrity surveys.

Site surveys are anticipated to be consented with separate permits (Marine Licenses), accompanied by an Environmental Assessment Justification (EAJ) proportionate to the works within the scope of the surveys, where required.

To support the Proposed Development, a number of existing offshore infrastructures which would no longer be required for CO_2 service, will be decommissioned. This will include removal of equipment from the Topside module on the Douglas Process platform and removal of the entire Topside modules from Hamilton Main, Hamilton North, and Lennox wellhead platforms, in order to accommodate the installation of new topsides for CO_2 service. The partial decommissioning activities are anticipated to be consented with separate permits, upon submission of a Partial Decommissioning Programme (Partial DP), including an Environmental Appraisal (EA) proportionate to the works within the scope of the Partial DP.

1.3 Offshore Scoping Report

1.3.1 Purpose

This Offshore Scoping Report has been prepared in order to support a request for a formal Scoping Opinion in relation to the Proposed Development. It is anticipated that the Scoping Opinion will be based on responses to this Offshore Scoping Report from key statutory and non-statutory consultees, which will help guide the Applicant in progressing the Offshore EIA Report.

The purpose of this Offshore Scoping Report is to provide stakeholders with information on the Proposed Development and allow for engagement with stakeholders on the key topics to be addressed in the Offshore EIA Report, as well as the baseline data sources and assessment methodologies to be used to inform the Offshore EIA Report.

Table 1-1 summarises the information requirements set out in the EIA Regulations and where these can be found in this Offshore Scoping Report.

Table 1-1: Scoping requirements of the EIA regulations and where the information is included within the Offshore Scoping Report.

EIA Regulation Topic Requirement	Summary content
A description of the location of the Proposed Development, including a plan sufficient to identify the land	Chapter 3 includes a description of the Proposed Development including a plan.
A brief description of the nature and purpose of the Proposed Development and of its likely significant effects (LSE) on the environment	Chapter 3 includes a description of the nature and purpose of the Proposed Development, and chapters 6 to 8 and Annex A includes a description of the LSE on the environment from the Proposed Development.
Information on the Proposed Development and the associated environmental impacts in order to sufficiently define the potential effects and therefore extent of the EIA	Chapters 6 to 8 includes a description of the potential effects on the environment and therefore the extent of the EIA.

Within this Offshore Scoping Report, a number of potential environmental impacts are considered. These include impacts which are proposed to be scoped out of the EIA due to no likely significant effect in EIA terms or no effect-receptor pathways identified. Agreement with key stakeholders will be sought to determine final impacts to be scoped in and scoped out of the Offshore EIA Report (see section 5.3.4).

The Applicant welcomes the opportunity for engagement with stakeholders and feedback on the Proposed Development and the scope (proposed content) of the Offshore EIA Report.

1.3.2 Approach

This section sets out the approach to scoping that has been taken in the preparation of this Offshore Scoping Report with the aim of achieving the following objectives:

- providing a high-level overview of the baseline environment and the data collection and survey methodologies that will be implemented to inform the EIA baseline characterisation for each technical assessment (see section 1.3.3);

proposing impacts to be scoped out of the Proposed Development EIA where there is clear justification for doing so; and

proposing impacts to scope in to the Proposed Development EIA, drawn upon the existing evidence base where appropriate.

This approach will allow the Offshore EIA Report to focus on those potential impacts which either have the potential to lead to a significant effect, or where significant uncertainty exists on potential effects, thereby supporting the development of a proportionate Offshore EIA Report.

Each of the topic specific sections of this Offshore Scoping Report provides:

- an overview of existing data that will support the development of the Proposed Development EIA baseline characterisation;
- identifies where additional data may be required to inform the Proposed Development EIA baseline characterisation and Impact Assessment; and
- identifies potential impacts to be scoped in and scoped out the Proposed Development EIA.

Further information on the approach to the Offshore Scoping Report is set out in chapter 5.

1.3.3 Structure

This Offshore Scoping Report and the subsequent Offshore EIA Report relate to those impacts and receptors associated with the offshore environment, including potential impacts of offshore infrastructure on onshore and offshore receptors.

The structure of the Offshore Scoping Report is set out in Table 1-2. It should be noted that consideration to human health in the Offshore Scoping Report is given in the Air Quality and Climate Change section (Section 6.3).

Table 1-2: Topics within the Offshore Scoping Report.

Topic	Summary content	Section	Author
Introductory Chapters			
Introduction	Provides background to the Proposed Development and outlines the purpose and approach of the Offshore Scoping Report.	Chapter 1	The Applicant and RPS
Policy and Legislation	Overview of internal obligations, and national legislation and policy applicable to the Proposed Development.	Chapter 2	RPS
Proposed Development Description	Description of the proposed design for the Proposed Development, based on preliminary conceptual design information and current understanding of the environment from initial site investigation studies.	Chapter 3	The Applicant and RPS
Site Selection Methodology and Consideration of Alternatives	Description of the site selection process and the approach undertaken by the Applicant to identify the siting of the Proposed Development and reasonable alternatives considered to date.	Chapter 4	The Applicant and RPS
Environmental Impact Assessment Methodology	Description of the proposed principles of the EIA process and the approach that will be applied in the Offshore EIA Report to identify and evaluate the likely impacts and, subsequently, evaluate the significance of effects, associated with the Proposed Development.	Chapter 5	RPS
Offshore Physical Environment			
Physical Processes	Overview of the offshore physical environment (tidal elevations, current, waves, bathymetry, geology and seabed sediments, suspended sediments and sediment transport) within the Proposed Development. Required for understanding of potential impacts to the offshore physical environment from construction, operation and maintenance and decommissioning.	Section 6.1	RPS
Subsea Noise	Overview of ambient subsea noise within the Proposed Development. Required for understanding of potential impact to subsea noise sensitive receptors such as marine mammals and fish from construction, operation and maintenance and decommissioning.	Section 6.2	RPS
Air Quality	Overview of the offshore air quality within the vicinity of the Proposed Development. Required for understanding of potential impact to offshore air quality from construction, operation and maintenance and decommissioning.	Section 6.3	RPS

Topic	Summary content	Section	Author
Climate Change	Overview of the climate change within the vicinity of the Proposed Development. Required for understanding of potential impact to climate change from construction, operation and maintenance and decommissioning.	Section 6.4	RPS
Offshore Biological Environment			
Benthic Subtidal and Intertidal Ecology	Overview of the ecology of the seabed within the Proposed Development. Required for understanding of potential impacts to seabed ecology from construction, operation and maintenance and decommissioning.	Section 7.1	RPS
Fish and Shellfish Ecology	Overview of the fish and shellfish ecological communities within the Proposed Development. Required for understanding of potential impact to fish and shellfish ecology from construction, operation and maintenance and decommissioning.	Section 7.2	RPS
Marine Mammals	Overview of the marine mammals within the vicinity of the Proposed Development. Required for understanding of potential impacts to marine mammals from construction, operation and maintenance and decommissioning.	Section 7.3	RPS
Offshore Ornithology	Overview of the ornithological features within the vicinity of the Proposed Development. Required for understanding of potential impacts to ornithology from construction, operation and maintenance and decommissioning.	Section 7.4	RPS
Offshore Human and Socio-economic Environment			
Commercial Fisheries and Aquaculture	Overview of commercial fisheries within the vicinity of the Proposed Development. Required for understanding of potential impacts to commercial fisheries from construction, operation and maintenance and decommissioning.	Section 8.1	RPS
Shipping and Navigation	Overview of the baseline shipping and navigation within the vicinity of the Proposed Development. Required for understanding of potential impacts to shipping and navigation from construction, operation and maintenance and decommissioning.	Section 8.2	RPS
Marine Archaeology and Ordnance	Overview of marine archaeology within the vicinity of the Proposed Development. Required for understanding of potential impacts to marine archaeology from construction, operation and maintenance and decommissioning.	Section 8.3	RPS
Infrastructure and Other Users of the Sea	Overview of aviation, military, and communications within the vicinity of the Proposed Development. Required for understanding of potential impacts to aviation, military and communications from construction, operation and maintenance and decommissioning.	Section 8.4	RPS
Socio-economics and Tourism	Overview of the baseline offshore socio-economics and tourism within the vicinity of the Proposed Development. Required for understanding of potential impacts to baseline offshore socio-economics and tourism from construction, operation and maintenance and decommissioning.	Section 8.5	RPS

Topic	Summary content	Section	Author
Concluding Chapters and Annexes			
Summary	Presents a summary of those impacts that are proposed to be scoped in and out of the Offshore EIA Report.	Chapter 9	RPS
References	Includes a list of all references included in the Offshore Scoping Report.	Section 10	RPS

1.4 The Developer and the project EIA Team

1.4.1 The Developer

Eni UK Limited, whose ultimate parent company is Eni SpA, is a leading partner of the Consortium delivering the HyNet North West Project, through their Eni group affiliate Liverpool Bay CCS Ltd ("the Applicant").

Eni is an integrated energy company committed to developing a fully decarbonised portfolio of products and services by 2050, creating value for their stakeholders and contributing to a socially just energy transition[2]. As a global energy company, Eni is active at every stage of the value chain, from natural gas and oil to co-generated electricity and renewables

1.4.2 The project EIA Team

RPS has been instructed by the Applicant to lead the offshore EIA for the Proposed Development. RPS are competent and experienced experts in the field of offshore EIA. RPS will conduct an initial review of the key environmental issues associated with the construction, operation and maintenance, and decommissioning of the Proposed Development as part of the Offshore Scoping Report.

[2] https://www.eni.com/assets/documents/eng/just-transition/2021/eni-for-2021-carbon-neutrality-2050-eng.pdf

2 POLICY AND LEGISLATIVE CONTEXT

This chapter of the Offshore Scoping Report represents the key policies and legislation of relevance to the Proposed Development in English and Welsh waters.

Table 2-1 sets out the permits and licences pertinent to the Proposed Development and to which the following legislation applies. The applications will be supported by an EIA, as well as a Water Framework Directive (WFD) assessment, and a Habitats Regulations Assessment (HRA).

Table 2-1 Proposed Development Planning and Consenting requirements

Activity	Permit / Licence / Requirement	Key Legislation
Benthic Ecology Baseline Surveys - Intertidal Benthic Survey - Subtidal Benthic Survey	Marine Licence (Band 1) from NRW-MLT (MMO exemption) OPRED Survey Notification Crown Estate seabed survey licence	Marine and Coastal Access Act (MCAA) 2009
Pipeline Repurposing	Pipeline Works Authorisation (PWA) updates / renewals for the repurposed pipeline	The Pipeline Safety Regulations 1996
Drilling	Master Application Templates (MATs) and Subsidiary Application Templates (SATs) for side-track drilling and well intervention	Offshore Oil and Gas Exploration, Production, Unloading and Storage (Environmental Impact Assessment) Regulations 2020 The Offshore Chemicals Regulations 2002 (as amended) Part 4A of The Energy Act 2008 (as amended) The Offshore Petroleum Activities (Oil Pollution Prevention and Control) Regulations 2005 (as amended) Consent for a Marine Geological Survey or Investigation under The Offshore Petroleum Activities (Conservation of Habitats) Regulations 2001 (as amended)
Environmental Impact Assessment	Scoping ES Production HRA screening and appropriate assessment Water Framework Directive (WFD) assessment	The Offshore Oil and Gas Exploration, Production, Unloading and Storage (Environmental Impact Assessment) Regulations 2020; The Offshore Environmental Impact Assessment (The Marine Works (Environmental Impact

Activity	Permit / Licence / Requirement	Key Legislation
	Submission and Public Notice	Assessment) (Amendment) Regulations 2017); Habitat Regulations Assessment (Conservation of Habitats and Species Regulations 2017 (as amended); Conservation of Offshore Marine Habitats and Species Regulations 2017 (as amended)); Water Framework Directive; and The Habitats and Birds Directive
Carbon Storage	Carbon Dioxide Appraisal and Storage Licence already awarded by OGA (now NSTA) Crown Estate Lease Carbon Storage Permit	Energy Act 2008
Cable Laying	Marine Licence Band 3	Marine and Coastal Access Act (MCAA) Marine Licence

2.1 Need for the HyNet North West Project and Climate Change

The Committee on Climate Change (CCC) have stated that CCS is a necessity, not an option (see Chapter 10 References). CCS is fundamental to the decarbonisation of energy intensive industries, such as chemical and cement plants and refineries, and will enable domestic production of low carbon hydrogen from natural gas.

Through proposed updates to NPS EN-1 (see chapter 10 References), the UK Government recognises that new CCS infrastructure will be essential to ensuring the transition to a net zero economy and that any realistic alternatives to new CCS infrastructure for delivering net zero by 2050 are limited.

To meet the UK's sixth carbon budget, the Government has outlined an ambition to capture 20-30 $MtCO_2$ per year by 2030 and the CCC have recommended that the first cluster should be operational by 2025, with at least one cluster involving low-carbon hydrogen. A cluster is a collection of businesses and applications working in unison to create a new hydrogen network.

The HyNet North West Project is an innovative low carbon and hydrogen energy project that will provide infrastructure to unlock a low carbon economy for the North West of England and North Wales and put the region at the forefront of the UK's drive to Net-Zero. The importance of the Project has been recognised in the Government's choice in taking forward the Project in Track 1 of its Cluster Sequencing process, which provides support to begin decarbonising industry from 2025.

The Proposed Development, being part of the HyNet North West Project, will contribute to the reduction of CO_2 in the atmosphere and make a significant contribution to the international, national, and local effort against the climate emergency. The HyNet North West Project overall will capture 10Mt CO_2 per year by 2030, the equivalent of taking 4 million cars off the road or the equivalent of heating 5 million households with natural gas boilers for a year. The transportation and offshore storage of CO_2 via the Proposed Development, in combination with the onshore elements of the CCS infrastructure, means

that industry in the region will be able to reduce their emissions and new low-carbon hydrogen plant can be built with the CO_2 captured.

2.1.1 United Nations Framework Convention on Climate Change

The UK is a signatory to the Kyoto Protocol which commits state parties to reduce greenhouse gas emissions. The protocol came into effect in 2005 and its commitments were transposed into UK law by the Climate Change Act 2008, which requires the net UK carbon account for the year 2050 to be 80% lower than the 1990 baseline. This has led to and will continue to lead to, a substantial array of government legislation and policy that requires the development of energy sources with reduced carbon emissions.

The UK has so far outperformed on its carbon budget targets, but progress is slowing, and the UK is not on track to meet its future budgets or the overall reduction target, according to the most recent Progress Report to Parliament by the Committee on Climate Change (CCC, 2021). Low carbon and hydrogen energy proposed developments, such as the HyNet North West Project, are an important part in aiding the whole of the UK to meet its future environmental budgets.

2.2 UK Energy Policy and Legislation

2.2.1 The Climate Change Act 2008

Under the Climate Change Act 2008, the UK committed to a net reduction in GHG emissions by 2050 of 80% against the 1990 baseline. In June 2019, secondary legislation was passed that extended that target to at least 100% against the 1990 baseline by 2050. The Climate Change Act 2008 also established the Committee on Climate Change (CCC) which advises the UK government on emissions targets, and reports to Parliament on progress made in reducing GHG emissions. There are currently no amendments to the Climate Change Act 2008 as a result of the UK's exit from the EU.

2.2.2 The Energy Act 2008

The Energy Act 2008 provides for a licensing regime that governs the offshore storage of carbon dioxide. It forms part of the transposition into UK law of EU Directive 2009/31/EC on the geological storage of carbon dioxide. The Storage of Carbon Dioxide (Licensing etc.) Regulations 2010 (SI 2010/2221), which transpose many other requirements of the Directive, came into force in 1 October 2010.

The regime applies to storage in the offshore area comprising both UK territorial sea and beyond designated as a gas importation and storage zone (GISZ) under section 1(5) of the Act. The North Sea Transition Authority (NSTA) is the licensing authority for offshore storage except within the territorial sea adjacent to Scotland, which Scottish ministers authorise. In addition to applying for a license, developers must obtain a grant of the appropriate rights from the Crown Estate or the Crown Estate Scotland.

2.2.3 UK Marine Policy Statement

Published in 2011, the UK Marine Policy Statement (MPS), under Section 44 of the Marine and Coastal Access Act (MCAA) 2009, provides the framework for marine spatial planning, specifically for the preparation of Marine Plans and to ensure marine resources are utilised in a sustainable way. The MPS was jointly adopted by the Secretary of State, Welsh Minister, Scottish Ministers and the Department of the Environment in Northern Ireland to promote successful collaboration opportunities.

The MPS states that Marine Plans should consider and identify the specific areas of potential related to the deployment of various renewable energy technologies, to help improve the UK's energy security. Additionally, the MCAA 2009 requires that all public authorities taking authorisation and/or enforcement decisions that affect or have the potential to affect the UK marine area, to do so in accordance with the MPS and relevant Marine Plans.

2.2.4 Clean Growth Strategy

In October 2017, the government announced its new approach to carbon capture, usage and storage in the Clean Growth Strategy. The approach is designed to enable the UK to become a global technology leader for CCUS and ensure that government has the option of deploying CCUS at scale during the 2030s, subject to costs coming down sufficiently. To progress this ambition, the government has set out action under 3 themes:

- re-affirming our commitment to deploying CCUS in the UK subject to cost reduction;
- international collaboration on CCUS; and
- CCUS innovation.

Additionally, in 2018, the UK Government published "The UK Carbon Capture Usage and Storage Deployment Pathway: An Action Plan". This document further illustrated and details the commitment to CCS as part of the UK's Energy Strategy. Furthermore, the Action Plan identifies the East Irish Sea Basin as a key location to develop CCS projects.

2.3 Welsh Planning Policy and Legislation

2.3.1 The Well-being of Future Generations (Wales) Act 2015

The Well-being of Future Generations (Wales) Act 2015 places the duty on public bodies to place the principles of sustainability and sustainable development at the heart of its decision-making processes. The Act is centred in improving the social, economic, environmental, and cultural well-being of Wales. The relevant objectives of the Well-being of Future Generations (Wales) Act 2015 include:

- A Resilient Wales – contributing to the protection and improvement of the environment, to improve the quality of life and protect local and global ecosystems;
- A Healthier Wales – contribute to the protection and, where possible, the improvement of people's health and well-being as a core component of achieving the well-being goals and responding to climate change; and
- A Globally Responsive Wales – support the need to tackle the causes of climate change by moving towards a low carbon economy.

2.3.2 The Environment (Wales) Act 2016

The Environment (Wales) Act 2016 puts in place the legislation needed to plan and manage Wales' natural resources in a more proactive, sustainable and collective way. A key part of the Environment (Wales) Act 2016 focuses on climate change with the aim to reduce emissions by at least 80% by 2050 and sets a clear path for decarbonisation in the future.

The Environment (Wales) Act 2016 is supported by the Natural Resources Policy (NRP) which focuses on the sustainable management of Wales' natural resources to maximise their contribution to achieving goals within the Well-being of Future Generations (Wales) Act. The NRP sets out three National Priorities including 'increasing renewable energy and resource efficiency'.

The act will provide an iterative framework that ensures sustainable management of natural resources, provide NRW with tools to manage natural resources more sustainably, and include a biodiversity duty to help in reversing decline and securing the long-term resilience of biodiversity in Wales.

2.3.3 Welsh National Marine Plan

The Welsh National Marine Plan (WNMP) was published in November 2019, introducing a framework to support sustainable decision making within the marine environment. Policies within the WNMP are specific to the renewable energy sector.

The WNMP represents the planning process to shape Wales' seas in order to support economic, social, environmental, and cultural objectives. The purpose of the WNMP is to guide the sustainable development of Wales' marine area by setting out how proposals will be considered to decision makers. Pertaining to the Welsh inshore region (out to 12 nautical miles (nm)) and the offshore region (12 to 200 nm), the WNMP sets out four key objectives in achieving an increasingly sustainable marine economy, including:

- Contribute to a thriving Welsh economy by encouraging economically productive activities and profitable and sustainable businesses that create long-term employment at all skill levels;
- Support the opportunity to sustainably develop marine renewable energy resources with the right development in the right place, helping to achieve the UK's energy security and carbon reduction objectives, whilst fully considering other's interests, and ecosystem resilience;
- Provide space to support existing and future sustainable economic activity through managing multiple uses, encouraging the coexistence of compatible activities, the mitigation of conflicts between users and, where possible, by reducing the displacement of existing activities; and
- Recognise the significant value of coastal tourism and recreation to the Welsh economy and well-being and ensure such activity and potential for future growth are appropriately safeguarded.

2.3.4 Future Wales: The National Plan 2040

Future Wales is the national development framework, setting the direction for development in Wales to 2040. It addresses key national priorities, including sustaining and developing a vibrant economy, achieving decarbonisation and climate-resilience, developing strong ecosystems and improving the health and well-being of communities.

In terms of climate change, Future Wales recognises that changes to climate and weather patterns will have a significant impact on well-being for both current and future generations. Therefore, climate change is identified as an equality issue as it will disproportionately affect the most vulnerable communities in Wales and throughout world.

Furthermore, the plan realises that it is vital that emissions are reduced to protect well-being and to demonstrate global responsibility. Future Wales together with Planning Policy Wales will ensure the planning system focuses on delivering a decarbonised and resilient Wales. Future Wales identifies that Wales can become a world leader in renewable energy technologies. Wales' support for both large and community scaled projects and commitment to ensuring the planning system provides a strong lead for renewable energy development means it is well placed to support the renewable sector, attract new investment and reduce carbon emissions.

2.4 Planning Consents and Environmental Legislation

This section summarises the planning consents that will be required to construct and operate the Proposed Development, as well as describing the UK and EU legal requirements for the development.

2.4.1 The Carbon Appraisal and Storage Licensing

In October 2020, the UK Oil and Gas Authority (OGA, currently NSTA) awarded Eni UK Limited a Carbon Dioxide Appraisal and Storage Licence (CS004) under the Energy Act 2008, Section 18.

The CS004 License includes terms and conditions for the application of a Storage Permit, in accordance with the Storage of Carbon Dioxide (Licensing etc.) Regulations 2010 (SI 2010/2221), in respect of a storage site situated in the licensed area. In addition, the CS004 License includes the general conditions applicable to a storage site authorised under a Storage Permit, addressing the closure of storage site, the post-closure plan and post-closure obligations.

Prior to the submission of the Storage Permit application, the Licensee shall submit a Site Characterisation Review and undertake an End 'Assess' Phase Review, which shall demonstrate to

NSTA, among other things, (i) that the Storage Site and Storage Complex are fully assessed and characterised, and (ii) the carbon dioxide transportation and facilities 'concept' selected by the Licensee.

Monitoring, Measurement and Verification (MMV) Plan, Corrective Measures (CM) Plan and Provisional closure and post-closure Plan are also required to inform the End 'Assess' Phase Review. To inform the above Plans, the environmental assessment will be undertaken with reference to the following guidelines:

- OSPAR. Guidelines for Risk Assessment and Management of Storage of CO2 Streams in Geological Formations (Reference Number: 2007-12)
- London Protocol. Risk Assessment and Management Framework for CO2 Sequestration in Sub-Seabed Geological Structures (CS-SSGS), LC/SG-CO2 1/7, annex 3. 2006
- London Protocol. Specific Guidelines for the Assessment of Carbon Dioxide for Disposal into Sub-seabed Geological Formations.LP.7. LC 34/15, Annex 8. 2012

2.4.2 Marine and Coastal Access Act (MCAA) Marine Licence

Within the UK offshore waters (between 12 nm and up to 200 nm offshore), the Marine and Coastal Access Act (MCAA) 2009 applies. Under the MCAA 2009 (as amended) there is the requirement for a marine licence to be obtained prior to the construction, alteration or improvement of any works or deposit any object in or over the sea, or on or under the seabed. Similarly, under the Marine MCAA 2009 which applies to both Welsh and English Territorial Waters (between 0 and 12 nm from MHWS), there is also the requirement for a marine licence prior to the construction, alteration or improvement of any works or deposit any object in or over the sea, or on or under the seabed. Marine Licensable areas in Welsh waters are defined in the MCAA 2009 (Section 42), while those in English waters are assessed by the Marine Management Organisation (MMO) in Part 4 of the MCAA 2009.

The MCAA 2009 (administered by NRW-MLT and MMO), make it a licensable activity to:

- Deposit any substance or object in the sea or on or under the seabed from:
    - Any vehicle, vessel, aircraft or marine structure;
    - Any container floating in the sea; and
    - Any structure on land constructed for depositing solids in the sea.
- Construct, alter or improve any works either in or over the sea or under the seabed;
- Use a vehicle, vessel, aircraft or marine structure to remove any substance or object from the seabed; and
- Carry out any form of dredging, whether or not involving the removal of any material from the sea or seabed.

As proposed, the Applicant activities include the potential to remove substrate from the seabed and to deposit infrastructure in the sea or on or under the seabed, Marine Licences may be required for certain activities.

Section 77 of the Act specifically excludes offshore energy activities relating to oil and gas exploration and production, gas unloading and storage, and carbon dioxide storage from the marine licensing provisions, where the activities fall into the following categories:

- Anything done in the course of carrying on an activity for which a licence under section 3 of the Petroleum Act 1998 (c. 17) or section 2 of the Petroleum (Production) Act 1934 (c. 36) (licences to search for and get petroleum) is required;
- Anything done for the purpose of constructing or maintaining a pipeline as respects any part of which an authorisation (within the meaning of Part 3 of the Petroleum Act 1998) is in force;
- Anything done for the purpose of establishing or maintaining an offshore installation (within the meaning of Part 4 of the Petroleum Act 1998 (c. 17)); and

- Anything done in the course of carrying on an activity for which a licence under section 4 or 18 of the Energy Act 2008 (c. 32) is required (gas unloading, storage and recovery, and carbon dioxide storage), with the exception of activities where there is devolved competence.

Additional exemptions from the marine licensing provisions are contained in the Marine Licensing (Exempted Activities) Order 2011 (as amended).

As a consequence of the exclusions and exemptions, most offshore energy activities that are the responsibility of the Offshore Petroleum Regulator for Environment and Decommissioning (OPRED) are not subject to the MCAA marine licensing regime. However, the exclusions do not apply to activities that do not fall into the categories detailed above, and the most significant activities that aren't excluded are any licensable activities relating to decommissioning operations and the use of explosives for ordnance clearance or during decommissioning.

Where there is a licensing requirement, OPRED is the licensing authority for reserved offshore energy activities, acting on behalf of the Secretary of State.

2.4.3 Marine Licensing in England

In England, depositing any object in the sea, on, or under the seabed, may require a marine licence. The Marine Management Organisation (MMO) licences most activities in English inshore and offshore waters. A marine wildlife licence or an EPS licence may also be required if deployment of an acoustic deterrent device (ADD) may cause an offence in relation to seals (UK protected species) or cetaceans (EPS species).

The English and Welsh guidance "The protection of marine European Protected Species from injury and disturbance: Guidance for the marine area in England and Wales and the UK offshore marine area", can be referred to for further information.

The location of planned infrastructure is described in Section 3 and shown in Figure 3-1.

2.4.4 Marine Licensing in Wales

Natural Resources Wales (NRW) licences activities in Welsh inshore and offshore waters. In Wales, depositing any object in the sea or on or under the seabed may require a marine licence.

A marine wildlife licence or an EPS licence may also be required if deployment of an ADD may cause an offence in relation to seals (UK protected species) or cetaceans (EPS species). From 31st March 2017 species licensing becomes the responsibility of Welsh Ministers and licences will be issued by Natural Resources Wales.

The English and Welsh guidance "The protection of marine European Protected Species from injury and disturbance: Guidance for the marine area in England and Wales and the UK offshore marine area", can be referred to for further information.

The location of planned infrastructure is described in Section 3 and shown in Figure 3-1.

2.4.5 Environmental Impact Assessment Regulations

In compliance with the EU Directive on the assessment of the effects of certain public and private projects on the environment (EIA Directive) (2011/92/EU, as amended by Directive 2014/52/EU), when applying for a marine licence or planning permission, an EIA Report is required to be prepared and submitted to support these applications if they are likely to have a significant effect on the environment due to factors such as their size nature or location. The Proposed Development is classified as a band 3 project under NRW's Marine Licensing bands, defined as having a complex application process that has estimated costs pertaining to marine works exceeding £1 million and/or requiring an EIA and/or undertaking activities involving construction works.

Under Regulation 15 (2) of the EIA Regulations (The Marine Works (Environmental Impact Assessment Regulations) the information provided must include that which is necessary to "*identify the location,*

nature and purpose of the works, and must indicate the main environmental consequences to which the applicant proposed to refer in the Offshore EIA Report". This is supplemented by Schedule 4 of the 2017 EIA Regulations which specify the requirements of the information for inclusion in environmental impact assessment reports.

The Proposed Development meets these criteria and therefore requires an EIA to be undertaken. The Offshore EIA Report will be undertaken in accordance with the following regulations and therefore, fulfils their requirements in relation to the marine licence applications: The Marine Works (Environmental Impact Assessment) (England and Wales) Regulations 2017 and The Marine Works (Environmental Impact Assessment) Regulations 2007.

Regulation 5 of the EIA Regulations (The Marine Works (Environmental Impact Assessment (England and Wales) Regulations) sets out what the environmental assessment process comprises, while Regulation 6 sets out the content of an EIA Report. This is supplemented by Schedule 4 of the Marine Works (Environmental Impact Assessment) (England and Wales) Regulations 2017 which specify the requirements of the information for inclusion in environmental impact assessment reports.

In addition to this, the Offshore EIA Report must consider the following factors during the assessment:

- population and human health;
- biodiversity, in particular species and habitats protected under the Habitats Directive;
- land, soil, water, air and climate; and
- material assets, cultural heritage and the landscape.

The main stages of the EIA process include the following:

- decision to undertake an EIA (screening);
- scoping to determine the subject matter of the EIA and to identify potentially significant effects;
- data review involving compiling and reviewing available baseline data and/or undertaking of baseline surveys to generate site-specific data;
- assessment and design iterations, whereby the potential impacts of the development during the construction, operation and maintenance, and decommissioning stages of its life are assessed. Feedback is provided to the design and engineering team(s) to modify the design of the development where possible in order to avoid, prevent, reduce and/or offset any significant adverse effects on the environment;
- identifying any further mitigation or compensation requirements;
- identifying residual effects;
- preparing the Offshore EIA Report (i.e., reporting on the EIA process and continuing with design iteration and consultation);
- consultation with the consultation bodies, stakeholders and the community, in accordance with all relevant requirements (the MCAA 2009, EIA Regulations and the associated regulations and guidance);
- consideration of the Offshore EIA Report by NRW and the MMO; and
- controlling and where necessary monitoring the effects of the project during construction, operation and maintenance, and decommissioning in accordance with the mitigation measures identified in the Offshore EIA Report and/or the requirements identified in the relevant licences which have been drawn from the findings of the EIA.

The Offshore Oil and Gas Exploration, Production, Unloading and Storage (Environmental Impact Assessment) Regulations 2020 ("the 2020 EIA Regulations") transpose EU Directive 2011/92/EU on the assessment of the effects of certain public and private projects on the environment ("the EIA Directive"), as amended by EU Directive 2014/52/EU. The 2020 EIA Regulations applies to activities related to proposed offshore oil and gas exploration and production, gas unloading and storage, and storage of carbon dioxide ("offshore projects"). The 2020 EIA Regulations makes provision for the

Secretary of State's consideration of the environmental impacts of proposed offshore projects when deciding whether to agree to the grant of consent for such projects.

The 2020 EIA Regulations replaces the Offshore Petroleum Production and Pipelines (Assessment of Environmental Effects) Regulations 1999 (as amended) ("the 1999 EIA Regulations"), except that the 1999 Regulations will continue to apply for some limited transitional provisions. The 1999 EIA Regulations have not been revoked as they were amended by the Pipelines, Petroleum, Electricity Works and Oil Stocking (Miscellaneous Amendments) (EU Exit) Regulations 2018 (S.I. 2018/1325) ("the 2018 EU Exit Regulations") which came into effect at the end of the Transition Period. The 2018 EU Exit Regulations correct deficiencies arising from the withdrawal of the UK from the EU and will amend the 1999 EIA Regulations in so far as they continue to apply for transitional purposes.

2.5 Additional Consents and Legislation

2.5.1 Drilling Operations

Master Application Template (MAT) and Subsidiary Application Template (SAT) permits will be required to undertake drilling operations.

- Drilling Operations (DR) MAT: this will cover the proposed Measurement, Monitoring and Verification (MMV) wells, sentinel wells, and side-track drilling operations. SATs falling under the DR MAT will include:
    - EIA Screening Direction SAT (Offshore Oil and Gas Exploration, Production, Unloading and Storage (Environmental Impact Assessment) Regulations 2020);
    - Chemical Permit (CP) SAT (The Offshore Chemicals Regulations 2002 (as amended);
    - Consent to Locate (CtL) (Part 4A of The Energy Act 2008 (as amended) SAT; and
    - Marine Licensing, OPEP/TOOPEP.

2.5.2 The Water Framework Directive (WFD) Regulations

In the UK, coastal waters are protected under the Water Framework Directive (WFD) which requires that "*the project or activity does not cause or contribute to deterioration in water body status or jeopardise the water body achieving good status*" (UK Government, 2014).

The Welsh Ministers, in exercise of the powers conferred by article 11 of the Natural Resources Body for Wales (Establishment) Order 2012(a) and having consulted the Secretary of State to the extent that there is any effect in those parts of England that are within the catchment areas of the rivers Dee, Wye and Severn, and having also consulted the Natural Resources Body for Wales, give the following Directions to the Natural Resources Body for Wales.

The Directions are given for the implementation of:

- Directive 2000/60/EC of the European Parliament and of the Council establishing a framework for Community action in the field of water policy;
- Directive 2008/105/EC of the European Parliament and of the Council on environmental quality standards in the field of water policy; and
- Directive 2013/39/EU of the European Parliament and of the Council amending Directives 2000/60/EC and 2008/105/EC as regards priority substances in the field of water policy.

The WFD guidance is for activities in the marine environment up to one nautical mile out to sea. A WFD assessment must be provided as part of the application to the public body tasked with regulating and granting permission for the Proposed Development activity. Additionally, a WFD assessment helps you and your regulator understand:

- The impact your activity may have on the immediate water body and any linked water bodies; and
- Whether your activity complies with the River Basin Management Plan (RBMP).

For the Proposed Development, it is proposed that one WFD assessment be carried out to cover all activities (described in Section 3).

2.5.3 The Habitats and Birds Directive

The Council Directive 92/43/EEC (the Habitats Directive) was adopted in 1992, providing a means for the EU to meet its obligations under the Bern Convention. The aim of the Directive is to maintain or restore natural habitats and wild species listed on the Annexes at a favourable conservation status. This protection is granted through the designation of European Sites and European Protected Species (EPS). The European Directive (2009/147/EC) on the conservation of wild birds (The Birds Directive) provides a framework for the conservation and management of wild birds within Europe. The Directive affords rare and vulnerable species listed under Annex I of the Directive, and regularly occurring migratory species, protection through the identification and designation of Special Protection Areas (SPAs).

The Habitat Regulations require that where a plan or project that is not directly connected with, or necessary to the management of a Natura 2000 site, but likely to have a significant effect thereon, either individually or in combination with other plans or projects, shall be subject to appropriate assessment of its implications for the site in view of the site's conservation objectives. NRW-MLT, and the Marine Management Organisation (MMO) must therefore consider whether the Proposed Development is likely to have significant effects on the conservation objectives of the sites considered in the Habitats Regulations Appraisal (HRA), and, where LSE cannot be excluded at the screening stage, and in the absence of mitigation measures, an 'Appropriate Assessment' of the implication of the plan or project must be undertaken by the competent authority before consent may be given for the proposed project.

The HRA process is a multi-stage process aligned with European Commission (EC) guidance documents 'Assessment of plans and projects significantly affecting Natura 2000 sites' (EC, 2001) and 'Managing Natura 2000 sites: The Provisions of Article 6 of the 'Habitats' Directive 92/43/EEC' (EC, 2019). In accordance with this guidance from the Commission, the obligations arising under Article 6 establish a step-wise procedure, as set out below:

1. The first part of this procedure consists of a preliminary 'screening' stage to determine whether, firstly, the plan or project is directly connected with or necessary to the management of the site, and secondly, whether it is likely to have a significant effect on the site; it is governed by the first sentence of Article 6(3);
2. The second part of the procedure, governed by the second sentence of Article 6(3), relates to the appropriate assessment and the decision of the competent national authorities; and
3. A third part of the procedure (governed by Article 6(4)) comes into play if, despite a negative assessment, it is proposed not to reject a plan or project but to give it further consideration. In this case Article 6(4) allows for derogations from Article 6(3) under certain conditions.

The step-wise procedure has the aim of determining LSEs and, where necessary, assesses the implications of the Proposed Development for their potential to adversely affect the integrity of a European site or sites in accordance with Article 6(3) of the Habitats Directive. If a determination of adverse effect on site integrity is made despite the application of mitigation measures intended to avoid or reduce the harmful effects of the project(s) on the sites concerned, the step-wise procedure then provides for a derogation procedure under Article 6(4). Such a derogation is available to the competent authorities concerned following three tests to be met in sequential order:

1. There are no feasible alternative solutions to the project which are less damaging;
2. There are "imperative reasons of overriding public interest" (IROPI) for the project to proceed; and
3. Compensatory measures are secured to ensure that the overall coherence of the network of European sites is maintained.

Some of the existing and proposed project infrastructure lies within the Liverpool Bay / Bae Lerpwl SPA (UK designated site and Natura 2000 site), namely, the existing pipeline and proposed cables route between PoA and Douglas platforms, the existing Douglas, Hamilton North, Hamilton Main, and Lennox

platforms, and the existing pipelines and proposed cables between Douglas and Hamilton North, Hamilton Main and Lennox platforms (Figure 3-1).

The aim of the Directive 2009/147/EC of 30 November 2009 on the conservation of wild birds "Birds Directive" (Ref 2.5) is to protect, manage and control all species of naturally occurring wild birds in the Member States. Member States are required to take the requisite measures to maintain the population of the species at a level which corresponds to ecological, scientific and cultural requirements, while taking account of economic and recreational requirements, or to adapt the population of these species to that level. The Birds Directive is implemented in England and Wales through the Wildlife & Countryside Act 1981 (as amended) and the Habitats Regulations.

For the Proposed Development, it is proposed that one HRA assessment be carried out to cover all activities (described in Section 3).

2.5.4 European Protected Species (EPS) Licensing

The Conservation of Habitats and Species Regulations 2017, known as the 'Habitats Regulations' transposes requirements of the European Habitats Directive (92/43/EEC) on the conservation of natural habitats and of wild flora and fauna into UK law. This includes animals whose natural range includes any area of the UK, and animals which are included in Annex IV of the Directive, and which are considered to be species of European Community interest and in need of strict protection (European Protected Species (EPS)). Within Welsh and English waters, the following EPS are known to occur:

Cetaceans (whales, dolphins and porpoises);

- marine turtles;
- otter; and
- common sturgeon.
- Of the cetacean species occurring within UK waters, the following species are known to occur in Welsh waters:
- Harbour porpoise (Phocoena phocoena);
- Bottlenose dolphin (Tursiops truncates);
- Short-beaked common dolphin (Delphinus delphis);
- Risso's dolphin (Grampus griseus); and
- Minke whale (Balaenoptera acutorostrata).

Under the Conservation of Habitats and Species Regulations 2017, it is an offence to deliberately or recklessly capture, injure or kill an EPS, or deliberately disturb wild animals of EPS. As of 1st April 2018, the responsibility for the administration of EPS licence applications has transferred to NRW-MLT, who will be acting on behalf of the Welsh Ministers. NRW-MLT issues licences under Regulation 55 of the Conservation of Habitats and Species Regulations 2017 and the Conservation of Offshore Marine Habitats and Species Regulations 2017, to allow activities that would otherwise constitute an offence under the Conservation of Habitats and Species Regulations 2017, to be carried out.

Underwater noise associated with the Proposed Development activities (e.g., seismic activity) has the potential to cause an offence under the Regulations, therefore there may be a requirement to obtain a licence to disturb marine EPS for BEIS. EPS licences are obtained from Natural England and Natural Resources Wales, depending on the reason for the licence application. Although the grant of EPS licences is separate to the Section 36 and marine licence application process, it can be considered in parallel by Natural England (NE) and NRW in order to constrict timelines.

Should an EPS licence be required, the Department for Business, Energy, and Industrial Strategy (BEIS) aims to process applications within 6 to 8 weeks from receipt of a completed application, with all associated supporting information provided.

Should additional pre-construction licences be required, these will be discussed and agreed with the relevant consenting authority during the pre-construction phase of the Proposed Development.

2.5.5 Basking Shark Licence

Basking sharks are protected under Schedule 5 of the Wildlife and Countryside Act (WCA) 1981 (as amended). Under this Act it is an offence to intentionally kill, injure or take; damage or destroy a place of shelter or protection, or disturb them whilst occupying such a place; or obstruct access to such a place. In addition, it is an offence to disturb a basking shark intentionally or recklessly.

NRW can issue a licence under Section 16 (3) of the WCA (if required) to allow an activity to be carried out that would otherwise constitute an offence. NRW aim to process applications with 30 working days from receipt of a completed application, with all associated supporting information provided.

2.5.6 UK Emissions Trading Scheme

The UK Emissions Trading Scheme (UK ETS) was established on 1st January 2021 by the UK ETS Authority (UK Government, Scottish Government, Welsh Government and the Department of Agriculture, Environment and Rural Affairs of Northern Ireland (DEFRA)), replacing the UK's participation in the EU ETS.

The UK ETS is established through The Greenhouse Gas Emissions Trading Scheme Order 2020. This guidance includes CO_2 capture, transport by pipelines and geological storage of CO_2 in its scope of activities (Schedule 2). This means that the installations that are covered by the UK ETS wouldn't need to surrender credits for the CO_2 they have captured for subsequent transportation by pipelines and geological storage.

At the time of writing, proceedings for the development of the UK ETS are ongoing, including proposals on aligning the scheme's cap with UK Net Zero Target. It is expected the new legislation will come to force in due course, ahead of the 2024 scheme year.

3 PROPOSED DEVELOPMENT DESCRIPTION

3.1 Introduction

This chapter of the Offshore Scoping Report provides an outline description of the Proposed Development and describes activities associated with the construction, operation and maintenance, and end of life decommissioning. It summarises the design and components for the Proposed Development infrastructure, based on preliminary conceptual design information and current understanding of the environment.

Offshore activities will support the repurposing of existing infrastructure to transport and store CO_2 offshore. This will include the installation of new planned infrastructure, and modifications to existing installations (Figure 3-1).

3.2 Proposed Development Location

The Proposed Development encompasses the development area, which will include the following infrastructure:

- Offshore Platforms (OPs), specifically Douglas Process Platform, and Hamilton North, Hamilton Main, and Lennox Wellhead Platforms;
- Offshore CO2 injection wells, connected to the Wellhead platforms, and CO2 monitoring and sentinel wells, located within the Hamilton, Hamilton North and Lennox fields;
- Offshore pipelines connecting PoA Terminal to Douglas OP and connecting Douglas OP to Hamilton North, Hamilton Main and Lennox OPs;
- Offshore inter-platform power and fibre optic cables; and
- Offshore power and fibre optic cables connecting the Point of Ayr (PoA) Terminal to Douglas OP (seawards of MHWS).

The CO_2 Appraisal and Storage Licence (CS004) area, which includes the depleted hydrocarbon reservoirs (Hamilton, Hamilton North and Lennox fields) planned to be used for CO_2 storage and the associated Offshore infrastructure, is approximately 576.82 km^2 and is located in the Irish Sea, specifically within Liverpool Bay (Figure 3-1). This development area is situated approximately 12 km to the north of the Welsh coastline and 2 km west of the English coastline. The development area includes both the Licence (CS004) area and the pipeline and cables corridor connecting PoA Terminal to Douglas OP (up to MHWS). The corridor shore approach is located to the north of Talacre in Flintshire, Wales based at the mouth of the Dee Estuary (Figure 3-1).

The development area is located in water depths that range from 0.72 m LAT to 35 m LAT, with average water depths across the development area being approximately 20 m LAT. The Lennox OP is located in 7.2 m of water while the Douglas OP is situated in 29.2 m of water. Shallower water is generally present towards the southern and eastern boundaries of the development area, including the PoA pipeline and cables, situated in inshore waters.

The development area comprises the existing OPs which are connected by submarine pipelines (Figure 3-1). Additional details on each of the existing OPs are detailed below:

- Douglas OP Complex: three-bridge linked offshore platforms comprising a wellhead platform (oil), a central process platform, and an accommodation platform. Only the central platform would be repurposed for CO2 service, while the others would be decommissioned
- Lennox OP: an unmanned oil and gas Wellhead platform to be repurposed for CO2 service
- Hamilton Main OP: an unmanned oil and gas Wellhead platform to be repurposed for CO2 service, and
- Hamilton North OP: an unmanned Wellhead gas platform to be repurposed for CO2 service.

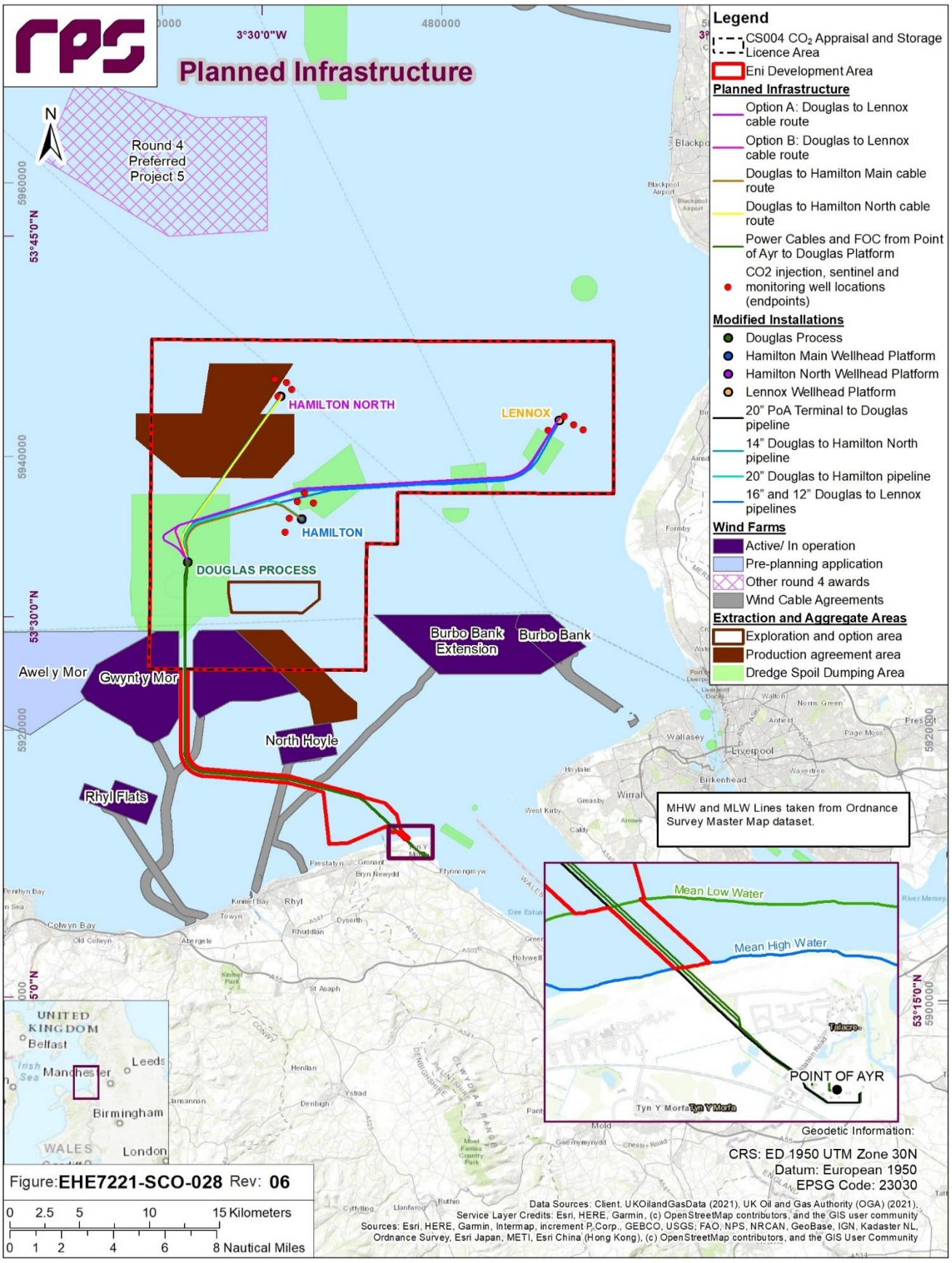

Figure 3-1 Illustrates the Proposed Development and Development Area Overview.

3.3 Design Envelope Approach

At this stage in the EIA process, the proposed development description is indicative, and the 'envelope' has been designed to include sufficient levels of flexibility in order to accommodate additional and ongoing refinement. Therefore, this section illustrates a series of options and parameters for which the maximum values are detailed. The maximum parameters outlined constitute the realistic worst-case scenario regarding the Proposed Development. The final design will be refined later in the project's ongoing development from the parameters detailed here. This process will be dependent on various factors including; design constraints, environmental constraints, and both statutory and non-statutory consultation responses. Throughout the EIA process, proposed values will be refined and updated to provide a more realistic and current scenario. A further refined and detailed proposed development description will be provided within the Offshore EIA Report that will accompany the application.

The design envelope (also known as the Rochdale Envelope) approach will be adopted for the assessment of the Proposed Development, in accordance with current good practice and the 'Rochdale Envelope Principle'. The design envelope concept allows for some flexibility in project design options, where the full details of a project are not known at application submission.

The use of the Rochdale Envelope has been recognised in the Overarching NPS for Energy (NPS EN-1) (DECC, 2011a) and the NPS for Renewable Energy Infrastructure (NPS EN-3) (DECC, 2011b). This approach has been used in the majority of offshore marine renewable energy applications.

The NPS EN-3 states that:

"The 'Rochdale [Design] Envelope' is a series of maximum extents of a project for which the significant effects are established. The detailed design of the project can then vary within this 'envelope' without rendering the ES [Environmental Statement] inadequate".

The design envelope approach is widely recognised and is consistent with PINS Advice Note Nine: Rochdale Envelope (PINS, 2012) which states that:

"The 'Rochdale Envelope' is an acknowledged way of dealing with an application comprising EIA development where details of a project have not been resolved at the time when the application is submitted".

Throughout the Scoping Report and subsequent EIA, the Rochdale Envelope approach has been taken to allow meaningful assessments of the Proposed Development to proceed, whilst still allowing reasonable flexibility for future project design decisions.

3.4 Offshore Infrastructure

The key offshore infrastructure of the Proposed Development will include:

- Douglas OP;
- Lennox Wellhead OP;
- Hamilton Main Wellhead OP;
- Hamilton North Wellhead OP;
- Inter-platforms offshore pipelines;
- Offshore CO2 Import Pipeline (PoA to Douglas OP) up to MHWS;
- Inter-platforms offshore Cables;
- Offshore Import Power Cables (PoA to Douglas OP) up to MHWS;
- CO2 Injection Wells;
- Monitoring Wells; and
- Sentinel Wells.

3.4.1 Offshore Platform and Pipeline Facilities

The Douglas OP is proposed to be reconfigured in order to receive and distribute CO_2 to the Hamilton Main, Hamilton North, and Lennox OPs. When necessary, the Douglas platform will additionally provide pressure control and heating prior to distribution of the CO_2 to the three fields. The existing Douglas, Hamilton Main, Hamilton North, and Lennox OPs will be redeveloped in an incremental manner for CO_2 service, as dictated by the availability of CO_2 from the emitters.

The HyNet CO_2 Transport and Storage system has been designed to commence transportation in gaseous phase and ramp up to the nominal capacity of 4.5 million tonnes of CO_2 per annum (MTPA of CO_2), driven by increasing CO_2 flow rates from upstream emitters. At a certain stage, when the reservoir pressures reach a pre-defined level, the Offshore system downstream of PoA will be upgraded to Dense Phase Operating Mode. The dense phase operation is not considered as part of the Proposed Development and will be subject to a separate planning application when required.

The following operational schedule is based upon a phased approach for Stage configurations in Gas Phase Operating Mode. These stages are as follows, with respect to the impact to the existing offshore platform infrastructure:

- Stage 1 – Free Flow: in this early operating mode in which the initial pressures of the storage reservoirs are building up, CO2 can flow in gas phase from the emitters directly into the storage reservoirs without the need for intermediate pressure boosting. The Offshore configuration does not require any flow control system or continuous heating requirements at this stage.
- Stage 2 – Compression at PoA: due to the constant reservoir pressures build-up and the flowrate ramp-up, the installation of a pressure boosting unit at PoA is required. During this stage, the Offshore configuration again does not require any flow control system. Heaters are required on each satellite platform for transient/shutdown conditions.
- Stage 3 – Pressure Control at Douglas OP: when CO2 volumes approach 4.5 MTPA, some hydraulic limitations could be observed in the existing 20” PoA to Douglas pipeline. The Joule-Thompson (JT) effect in the 20” pipeline can lead to a very cold arrival temperatures at Douglas OP, especially during winter conditions. These cold temperatures may give rise to ice formation in the topside piping and liquid CO2 drop-out in the rest of the distribution network. To avoid this issue, a pressure control system will be brought into operation at the Douglas OP to maintain a minimum pipeline operating pressure, which will in turn, reduce the pressure to drop along the pipeline. With this pressure regulation, the minimum CO2 receiving temperature at Douglas OP (topside) can be maintained at acceptable levels to avoid the risk of ice formation. In conjunction with the pressure control, a heating unit is also required at Douglas and on each of the satellite platforms. The two existing pipelines (12” and 16”) between Douglas and Lennox OPs will be used to support a more homogeneous distribution of the CO2 injection.

Existing pipelines to and from Offshore infrastructure that will be reutilised and requalified (from Pig Trap to Pig Trap) for the purpose of transporting CO_2 are further detailed below:

- PL1030 - Existing 20” sales gas pipeline between PoA and the Douglas OP;
- PL 1039 - Existing 20” gas pipeline between Douglas OP and Hamilton Main OP;
- PL 1035 - Existing 16” oil pipeline between Douglas OP and Lennox OP;
- PL 1036A - Existing 12” gas pipeline between Douglas OP and Lennox OP; and
- PL 1041 - Existing 14” gas pipeline between Douglas Process OP and Hamilton North OP.

The existing pipelines to be re-utilized for gas phase have been assessed to suit the CO_2 injection. The assessment conducted so far included:

- Corrosion Integrity assessment;
- In-Service buckling analysis;
- External Coating and cathodic protection verification;

- Allowable free span assessment;
- Ductile fracture propagation assessment;
- Evaluation of release frequencies and risk analysis;
- Risk analysis and risk-based inspection plan; and
- Requalification Report and Mitigation Plan.

At this time, there are no anticipated additional modifications needed for the purpose of transporting CO_2. As the design progresses, further assessment will be performed, including:

- Existing Pipeline System Integrity Status (Internal and External) including components;
- Establishing need for any specific additional inspections;
- Establishing any modifications (if needed); and
- Requalification of existing risers and spools.

The outcome of the design studies progressed so far has demonstrated that a modular approach (consisting of the installation of a new module including the facilities necessary for CO_2 treatment and injection) for the modification of the Wellhead OPs (Hamilton Main, Hamilton North and Lennox) is not viable. These substructures do not possess the reserve strength required to support the additional topsides weight without removal of the topside structures themselves. It has been determined that the only feasible approach is the removal of the existing topsides and the installation of new purpose-built topsides, with the installation of new risers and J-Tubes within the perimeter of the existing jacket in order to avoid additional protection frames and their additional loads on the substructures. For the existing Douglas Process OP, it is anticipated that there is sufficient reserve strength in the substructure load bearing capacity to accommodate the topsides equipment weight by removing the existing facilities.

Due to the age and condition of the existing facilities at the OPs, following the assessment conducted so far, it has been concluded that no existing process or utility systems have been deemed suitable for reuse with the exception of the flare/vent boom at Douglas Process OP, currently under assessment.

The following equipment is expected to be required on some or all the OPs to be repurposed for CO_2 service:

- Pig Launcher / Receiver
- Manifold and piping
- Filtration
- Heathers
- Inert Gas
- Control system, telecoms and instrumentation equipment;
- Electrical substation and all electrical infrastructure;
- Helideck plus associated utilities;
- Temporary refuge and/or shelter;
- All safety equipment;
- Handling and lifting equipment; and
- Flare boom.

3.4.1.1 Pipeline Contents Temperature Increase

Natural gas currently flows into the PoA terminal from offshore production, then onwards to Connah's Quay Power Station. As the natural gas reaches the foreshore pipeline, having travelled from the Douglas Process OP through the marine environment, it is at or near equilibrium with the sea temperature. With the Proposed Development, CO_2 will flow from the PoA terminal out through the foreshore pipeline to the Douglas Process OP. Compression at the PoA terminal will increase the temperature of the gas. There is the potential for this to increase the temperature of the surrounding environment of the foreshore and offshore pipeline. Further studies will be undertaken to understand

the effect of heat from the Proposed Development, and this will be presented in the ES and assessed as necessary.

3.5 Offshore Construction Phase

This section summarises the key Offshore construction activities of the Proposed Development. In addition, it provides details on the temporary infrastructure required for the installation of the offshore cables, and associated permanent infrastructure, as developed for offshore scoping.

Construction of the Proposed Development is anticipated to start in 2024, to enable operation to commence by mid-2020s.

Pre-Construction Activities

The Proposed Development will re-utilise the existing Douglas Process OP and the substructures of Hamilton Main, Hamilton North, and Lennox Oil and Gas Platforms. Structural assessments have previously been performed which identified that the mentioned structures can be utilised to support the modifications required for CO_2 service.

As the design progresses, the Applicant will complete close visual inspection on all critical joints to revise the associated management and monitoring requirements.

The existing pipeline from the PoA Terminal to the Douglas OP and a selection of the existing pipelines connecting Douglas OP to Hamilton North, Hamilton Main and Lennox OPs will be repurposed to transport CO_2, though no physical changes to the current pipelines are expected.

Offshore Platforms

The current approach to the construction strategy is to provide a new module to be installed on the Douglas OP in place of the existing facilities that will be decommissioned and dismantled, while on each of the satellite wellhead OPs (Hamilton Main, Hamilton North, and Lennox) a new deck will be installed after removal of the existing. These components will be delivered to the OPs completely fabricated and ready for integration onto their respective jackets.

A new caisson, a watertight retaining structure, will be installed on the Douglas OP to house and protect new power cables within J-tubes. The main pedestal crane that is located on the Douglas OP will be retained during construction and utilised to help install new equipment packages. The Proposed Development will result in the main fabricated components detailed in Table 3-1.

Table 3-1: Illustrates the proposed fabricated module and topside decks.

Component	Dimensions / Weight (Gross, rounded)	Equipment Accommodated
Douglas OP Helideck/shelter Module	Estimated Dimensions: **L: 23 m X W: 23 m X H: 4.5 m** Estimated Dry Weight: **400 tonnes**	Helideck Overnight shelter for personnel (12) Deluge skid Helicopter re-fuelling Helideck drains Potable water
Hamilton Main OP Integrated Deck	Estimated Dimensions: **L: 23 m X W: 26 m X H: 12 m** Estimated Dry Weight: **1100 tonnes**	Helideck Electrical heaters and controls Battery room UPS system Instrument room (telecoms)
Hamilton North OP Integrated Deck	Estimated Dimensions: **L: 23 m X W: 26 m X H: 12 m** Estimated Dry Weight: **900 tonnes**	Helideck Electrical heaters and controls Battery room UPS system

Component	Dimensions / Weight (Gross, rounded)	Equipment Accommodated
		Instrument room (telecoms)
Lennox OP Integrated Deck	Estimated Dimensions: **L: 24 m X W: 30.5 m X H: 12 m** Estimated Dry Weight: **1300 tonnes**	Helideck Electrical heaters and controls Battery room UPS system Instrument room (telecoms)

Additionally, installation aids, such as bumpers and guides will be required to be installed on new modules and the weather deck of respective OPs to facilitate installation operation procedures.

A summary of the installation methodology for both the fabricated modules and the equipment packages is detailed in Table 3-2 below.

Table 3-2: Illustrates the offshore installation methodology.

Platform	Water Depth (LAT)	Module/Equipment		Installation Equipment
		Item	Est. Lift Weight (Gross, rounded)	
Douglas OP	29.2 m	Helideck/shelter module	400 tonnes	HLV / FSL 1000t class
		Various electrical equipment, including transformer and heater skids, fire water pump packages, etc.	< 100 tonnes	Douglas OP Crane
Hamilton Main OP	25.8 m	Deck replacement	1100 tonnes	HLV 2500t class
Hamilton North OP	22.1 m	Deck replacement	900 tonnes	HLV 2500t class
Lennox OP	7.2 m	Deck replacement	1300 tonnes	HLV 2500t class

Offshore Wells

The development of the Hamilton Main, Hamilton North and Lennox hydrocarbon depleted reservoirs for CO_2 storage requires the drilling and re-completion of new CO_2 injection wells, by side-tracking existing production wells.

In addition to the CO_2 injector wells, monitoring and sentinel wells are planned for CO_2 conformance and containment monitoring, to inform the Monitoring, Measurement and Verification (MMV) plan, at the pre-injection, operation and post closure phases.

Their locations have been selected to accommodate the aforementioned needs, hence targeting sensitive areas which would require tailored monitoring.

The current base case for the Proposed Development includes a total of 13 wells, of which:

- 8 CO2 injectors wells (4 at Hamilton Main, 2 at Hamilton North and 2 at Lennox field). These will be drilled as side-tracks from existing producer wells to install CO2 resistant tubulars and cement;

- 2 new monitoring wells (1 at Hamilton Main and 1 at Hamilton North field). These will target areas of the reservoirs on the flanks not previously drilled hence why new wells will be used;
- 1 additional monitoring well, side-track from existing producer, will be drilled at Lennox field; and
- 2 sentinel wells (1 at Hamilton North and 1 at Lennox field). These wells will be existing wells that are to be recompleted for additional reservoir monitoring. They will not have CO2 resistant cement or tubulars. As such, they will be Plugged and Abandoned (P&A) once the CO2 front reached them.

All CO_2 injection and monitoring wells will be drilled from the platform well slots (either as side-track or as new ones), while the sentinel wells will be only recompleted (no drilling activity).

Offshore Power and Fibre Optic (FO) Cables

Douglas Process OP currently supplies 13.8 kV, 60 Hz power, through the existing gas-fuelled turbine installed on the platform, to Hamilton Main and Hamilton North OPs via a subsea cable, while Lennox OP is provided with power, in series, from Hamilton Main OP.

None of the existing inter-platforms subsea power cables have been deemed suitable for re-use for CO_2 service, consequently new inter-platform power cables would be installed as part of the Proposed Development. In addition, the Proposed Development will require the electrification of Douglas OP from the Onshore PoA Terminal, the existing gas-fuelled turbine on Douglas OP being dismissed at the end of its current use.

It is expected that the main power to Douglas OP would be extended from PoA Terminal with two new 33 kV, 50 Hz subsea cables integrated with FO connection, while the power from Douglas OP to Hamilton Main, Hamilton North and Lennox OPs would be provided with a new single 33 kV, 50 Hz subsea cable integrated with FO, connecting Douglas OP to each of the three wellhead platforms (Figure 3-1).

There is planned to be 35,000 m (35 km) of Offshore power and FO cables (35 km each, for the two parallel cables) which would lead from PoA Terminal to Douglas OP. There is an additional requirement of 72,000 m (72 km) of inter-platform cabling. Approximately 15,000 m (15 km) of this subsea cabling would be present from Douglas OP to Hamilton North OP, while 12,000 m (12 km) would be present from Douglas OP to Hamilton Main OP and 35,000 m (35 km) of inter-platform cabling would be present from Douglas OP to Lennox OP (Figure 3-1 and Table 3-3).

The zone of disturbance for the cable installation is expected to be around 15 metres total width for each trench. The two cables from PoA Terminal to Douglas OP are expected to be laid at a minimum separation distance of 30 metres, within two separate trenches. The minimum cables burial depth (top of cables) is expected to be between two and three metres. Burial depth and separation distance will be confirmed as the design progresses.

The zone of disturbance will be within the Development Area identified in Figure 3-1. The design envelope for offshore cables is provided in Table 3-3.

Table 3-3: Design Envelope: Cables

Parameter	Maximum Design Envelope
	Cable Length
Cables from PoA Terminal to Douglas OP	35,000 m (each of the two cables)
Inter-platform cable from Douglas OP to Hamilton North OP	15,000 m
Inter-platform cable from Douglas OP to Hamilton Main OP	12,000 m

Parameter	Maximum Design Envelope
	Cable Length
Inter-platform cable from Douglas OP to Lennox OP	35,000 m

Installation Method

As the design progresses, further assessments will be undertaken in order to assess the subsea cables protection against shipping and fishing activities (anchoring and trawling). If these activities are present, the best course of action would be to bury the cable with an adequate top of cable burial depth, which could be verified for anchor hooking and other subsea activities. The depth of burial will be studied during the design by applying a risk-based approach. Rock protection could potentially be utilised to cover the cable pending assessment from marine traffic and a Navigational Risk Assessment (NRA).

With regards to the installation method for the offshore cables, the following three post trenching techniques may be utilised:

- Jetting (post-lay trenching);
- Ploughing (pre-lay trenching); and
- Mechanical cutting (simultaneously laying and burying).

In terms of cable post trenching, ploughing could be utilised for cables in the presence of softer sediments (sand and clay) and would cause the least amount of impact and disturbances to the surrounding environment.

The key activities to be undertaken to prepare for subsea cables installation would include:

- Excavation of trench for cable shore pull;
- Cable shore pull-in from vessel to onshore location;
- Cable positioning on intermediate rollers
- Pull-in through conduits;
- Offshore cable laying along pre-defined route;
- Cable burial (trenching and/or post-trenching)
- Cable termination and pull-in at OP side;
- ROV operations;
- Vessel operations (material transfer, crew change, logistics);
- Survey (pre-construction, post lay, and as-built); and
- Pre-commissioning of the system.

The Onshore cable construction works from PoA Terminal to MLWS are part of the HyNet Carbon Dioxide Pipeline TCPA and associated EIA, as explained in Chapter 1. The cable construction works, for the intertidal area between MHWS and MLWS, are also described in this scoping report, for alignment with the Offshore works included in the Proposed Development.

The cables route from PoA Terminal to Douglas OP, in its initial Onshore segment, heads out of PoA Terminal and crosses the Talacre dune system, until it reaches the MLWS point. To cross the dunes, two parallel conduits would be installed using Horizontal Directional Drilling (HDD) trenchless method. The exit pits of the HDD works would likely consist of temporary steel prefabricated containment sumps to capture any drilling fluid emitted from the drilling process. There is the potential for the exit pit to be located at the intertidal area between MHWS and MLWS.

At the end of the HDD works required to prepare the conduits, it is expected that the cables would be brought into the area via a marine vessel and then pulled ashore through the conduits using a winch.

The cables route corridor of the Proposed Development, at the intertidal area between MHWS and MLWS, is consistent with the HyNet Carbon Dioxide Pipeline TCPA Red Boundary Line (Figure 3-1).

Seawards of MLWS, at the shore approach, the cables route corridor of the Proposed Development is taking allowance for possible alternative options currently under assessment, considering the presence of the Hoyle Spit sandbank and other constraints (Figure 3-1).

Seawards of the shore approach, the cables routes of the Proposed Development would broadly follow the alignment of the existing pipelines connecting PoA Terminal to Douglas OP and Douglas OP to Hamilton Main, Hamilton North and Lennox OPs (Figure 3-1).

Casing is not required for all the Offshore cables and as such, the cables would be armoured and directly buried for their entire length.

Vessel Utilisation

A range of installation vessels would be used for the construction of the Proposed Development. This includes main installation vessels (e.g., jack-up or Dynamic Positioning (DP) vessels with heavy lifting equipment), support vessels, tugs and anchor handlers, cable installation vessels, guard vessels, survey vessels, crew transfer vessels and scour/cable protection installation vessels. In addition, helicopters are expected to be used for crew transfers to the OPs, when required.

Alternatively, for well drill rig location and positioning, geotechnical and geophysical 'ground truthing', which includes borehole and seabed surveys with accompanying environmental analysis, may be carried out by two different types of survey vessel.

The main construction vessel for the cable laying work will be a Dynamic Positioning (DP2) class vessel or anchor mooring vessel with shallow draft and flatbed. Multi-Purpose Supporting Vessels (MSV) or Supply Vessel and crew boats will be utilised for Touch Down Point (TDP) monitoring, survey activities and post-trenching work. TDP monitoring provides live visualisation and monitoring of cable survey and installation activities. Additionally, anchor handling tugs will be utilised for anchor mooring vessels.

All the integrated decks for Hamilton Main, Hamilton North and Lennox OPs could be transported using a sea transportation barge, along with the helideck/shelter module of the Douglas OP. The offshore installation of these components would require Heavy Lift Vessels (HLV) or Floating Shear Legs (FSL) vessels.

Fabric maintenance activity in Liverpool Bay is currently undertaken by the ISP (Irish Sea Pioneer) 4-legged jack-up barge. It is intended to continue to use the ISP during construction phase, to accommodate any major fabric maintenance requirement for the repurposing of the Offshore OPs to CO_2 service.

3.6 Offshore Operation and Maintenance Phase

This section summarises the key offshore operation and maintenance activities of the Proposed Development. The offshore maintenance activities will be both preventative and corrective. Preventative maintenance is according to scheduled services, whereas corrective maintenance covers component replacements, unexpected repairs, and potential breakdowns.

The Proposed Development has been designed to require minimal operational and maintenance intervention. The safety of employees, customers, the general public, and the environment will remain priorities during this phase. The operation of the Proposed Development is expected to be 25 years from 2025 to 2050.

The Offshore components of the Proposed Development will be operated from the PoA Terminal central control room, located onshore in accordance with the Applicant's Operations and Maintenance Procedure. The overall integrity and operation will be continuously monitored from the central control room. Offshore maintenance teams will be based at PoA Terminal and will travel out to the offshore installations as required. Once repurposed for CO_2 service, the offshore OPs will be all Normally Unattended Installations (NUI).

Operation and Maintenance Activities

During the operation phase of the Proposed Development, fugitive and venting emissions may take place but every effort will be made to minimise.

Fugitive emissions are unintentional leakage of gases or vapours from pressure-containing equipment or facilities and typically would occur at flanges, valves and other equipment interfaces. During the operation phase, fugitive emissions will be monitored through a Leak Detection and Repair (LDAR) programme as part of the preventive maintenance activities, to avoid or minimise their presence as low as reasonably practicable.

There is no requirement currently set out for routine venting of CO_2 equipment during the operation phase. However, there would be a requirement for periodical venting of CO_2 equipment during planned maintenance activities and the potential for venting in case of pipeline depressurisation required for maintenance or decommissioning.

As part of the Storage Permit application requirements, a Monitoring, Measurement and Verification (MMV) programme is being developed, The MMV programme will cover the pre-injection, operation and maintenance and post-closure phases of the Proposed Development. The objective of the MMV programme is to establish an environmental baseline and to assess whether injected CO_2 is behaving as expected, and to detect if any unexpected migration or leakage occurs.

The preparation of the MMV Programme is expected to adopt the following stepwise approach:

1. Assess site-specific storage risks: establish definitions for loss of conformance and loss of containment as reported in the Containment Risk Assessment;

2. Characterise geological safeguards: identify and appraise the integrity of each geological seal within and above the storage complex[3];

3. Define engineered safeguards: identify and assess the engineering concept selections that provide safeguards against unexpected loss of well integrity;

4. Establish monitoring requirements: define monitoring tasks to verify the performance of these initial safeguards and, if necessary, trigger timely control measures;

5. Select monitoring plans: select monitoring technologies according to a cost-benefit ranking. This includes baseline monitoring as well as monitoring during the injection and closure phases (including seismic, micro-seismic, ground deformation, wellbore, and environmental monitoring);

6. Identify control measures: design interventions to reduce the likelihood or the consequence of any unexpected loss of conformance or containment. These include operational controls and updates to model-based predictions.

The MMV is applied for the entire life cycle of the Proposed Development (25 years), including post-closure phase, currently anticipated for 20 years.

Vessel Utilisation

It is expected that there will be less supply vessel, standby vessel coverage, and helicopter traffic movements than current operations at the Liverpool Bay fields area, due to the unmanned OPs.

Cable repair, pipeline maintenance, and associated surveys are expected to utilise one supply vessel and one standby vessel.

[3] 'storage complex' means the storage site and surrounding geological domain which can have an effect on overall storage integrity and security; that is, secondary containment formations

Well interventions and service activity in Liverpool Bay is currently undertaken by the ISP (4-legged jack-up barge) as the OPs are relatively small and without cranes. It is intended to continue to use the ISP or similar for future well interventions and to support general maintenance activity. There will also be a requirement for drilling rig and support vessels from time to time. The ISP is a self-propelled jack-up vessel that has four lattice legs (73 m) and four 360-degree thrusters. Additionally, the ISP is equipped with two Manitex cranes designed for supply boat operations.

4 ASSESSMENT OF ALTERNATIVES

4.1 Introduction

A summary of the considerations for alternatives of the major offshore Proposed Development components, is outlined below. The Offshore Environmental Impact Assessment (EIA) Report will outline the process by which alternatives were considered in order to develop the proposed works. Furthermore, the Offshore EIA Report will set out any refinements to the Proposed Development that have taken place as a result of the Offshore EIA Report process and in response to consultation and stakeholder feedback and describe the main alternatives that have been considered as part of the process.

4.2 Site Selection and Consideration of Alternatives

The alternatives assessment undertaken for the Proposed Development was a phased process, starting with undertaking considerations of the best method for the transportation of CO_2 in gas phase, followed by comprehensive assessments of the best corridor for the refurbished pipelines and associated infrastructure. The identified site is considered to be most suitable for the Proposed Development, given its reutilisation of existing infrastructure, proximity to existing infrastructure (onshore and offshore), and strong transport connections.

The Proposed Development strategy is to make use of existing assets wherever possible, including pipelines and OPs. Specifically, the existing offshore natural gas export pipeline to PoA gas terminal will be repurposed to become a CO_2 import pipeline and will transport the CO_2 to the Douglas OP complex. From the Douglas OP complex, CO_2 will be transported along repurposed natural gas pipelines to the Hamilton OP for injection into the Hamilton reservoir, to the Hamilton North OP for injection into the Hamilton North reservoir, and to the Lennox OP for injection into the Lennox reservoir.

Additionally, the Proposed Development is based on the utilisation of new facilities and partial re-utilisation of the existing facilities which provide flexibility in decommissioning activities.

Assessments previously undertaken by the Applicant have determined the suitability of the existing platforms in the offshore development area for re-utilisation. Specifically, the Proposed Development aims to reutilise the existing Douglas, Hamilton Main, Hamilton North, and Lennox OPs. Structural assessments have previously been undertaken to verify the feasibility of re-using the existing platforms for the Proposed Development. The Douglas, Hamilton Main, Hamilton North, and Lennox OPs were found to be appropriate to support the offshore modifications for CO_2 purposes, based on their current strength and ability to support additional loads.

Well sites and reservoirs at Hamilton Main, Hamilton North, and Lennox are notable for their significant pressure depletion and shallow depth. Therefore, these well sites have been denoted as being some of the most suitable CO_2 storage sites within UK Waters.

Regulation 14(2)(d) of the EIA Regulations 2017 states that an EIA should include:

'A description of the reasonable alternatives studied by the applicant, which are relevant to the proposed development and its specific characteristics, and an indication of the main reasons for the option chosen, taking into account the effects of the development on the environment'.

As part of the iterative design process, the Proposed Development will continue to evolve to take account of issues including environmental, health, and safety and engineering constraints and opportunities. This will be recorded within the Offshore EIA Report as primary mitigation.

Seawards of MLWS, at the shore approach, the cables route corridor of the Proposed Development is taking allowance for possible alternative routing options, considering the presence of the Hoyle Spit sandbank, further assessment is ongoing as part of the current Offshore design (Figure 3-1).

The assessment of alternatives in the Offshore EIA Report will report the route options and infrastructure locations / designs. It will also consider the construction strategy and best available techniques and practices. The Offshore EIA Report will consider the 'do nothing' scenario, i.e., the missed opportunities or avoidance of likely significant environmental effects associated with the Proposed Development. The main reasons for selecting the chosen options will be provided, including a comparison of environmental effects.

As part of the aforementioned process of assessing alternatives to the Proposed Development, the option of 'do nothing' or 'no development' was considered. However, the potential beneficial socio-economic outcomes of the Proposed Development (including alignment with Net Zero objectives and local employment opportunities) and associated environmental risks of not progressing with the Proposed Development were considered greater than the potential negative environmental and social impacts that will result from the construction, operation and decommissioning of the Proposed Development and its associated infrastructure.

5 ENVIRONMENTAL IMPACT ASSESSMENT METHODOLOGY

5.1 Introduction

This section describes the Environmental Impact Assessment (EIA) methodology that will be applied to the Proposed Development. It outlines the methodology for the identification and evaluation of potential likely significant environmental effects (as defined in the EIA Regulations (see section 2.4.5)) and presents the proposed methodology for the identification and evaluation of potential cumulative, inter-related impacts and consideration of potential transboundary effects. A systematic and auditable evidence-based approach will be followed to evaluate and interpret the potential effects on physical, biological, and human receptors.

5.2 Basis of Assessment

5.2.1 EIA Legislative Basis and Guidance Documents

The impact assessment methodology will draw on a number of EIA principles, regulations, and guidance documents, including:

Legislation

- The Infrastructure Planning (Environmental Impact Assessment) Regulations 2017 (the 2017 EIA Regulations);
- The Marine and Coastal Access Act 2009 (as amended) (relevant to the Marine Licence application to Natural Resources Wales);
- The Conservation (Natural Habitats &c.) Regulations 1994;
- The Conservation of Habitats and Species Regulations 2017;
- Environmental Impact Assessment for Offshore Renewable Energy Projects (British Standards Institute (BSI), 2015);
- The Conservation of Habitats and Species (Amendment) (EU Exit) Regulations 2019;
- The Marine Environment (EU Exit) (Amendment) Regulations 2019;
- The Marine Works (Environmental Impact Assessment Regulations) 2007 (as amended) (the 2007 EIA Regulations) (relevant to the Marine Licence application to Natural Resources Wales); and
- The Environmental Permitting (England and Wales) Regulations 2016.

Policy

- Overarching NPS for Energy (NPS EN-1) (including updated consultation draft) (DECC, 2011a; BEIS, 2021a);
- NPS for Renewable Energy Infrastructure (NPS EN-3) (including updated consultation draft) (DECC, 2011b; BEIS, 2021b); and
- NPS for Electricity Networks Infrastructure (NPS EN-5) (including updated consultation draft) (DECC, 2011c; BEIS, 2021c).
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- Guidance
- The Planning Inspectorate Advice Note Seven: Environmental Impact Assessment: Preliminary Environmental Information, Screening and Scoping (PINS, 2020a);
- The Planning Inspectorate Advice Note Twelve: Transboundary Impacts and Process (PINS, 2020b);
- The Planning Inspectorate Advice Note Seventeen: Cumulative effects assessment (PINS, 2019);

- Guidelines for Ecological Impact Assessment (EcIA) in the UK and Ireland (CIEEM, 2019);
- Environmental Impact Assessment Guide to: Delivering Quality Development (IEMA, 2016);
- Environmental impact assessment for offshore renewable energy projects (British Standards Institute (BSI), 2015);
- Delivering Proportionate EIA, A Collaborative Strategy for Enhancing UK Environmental Impact Assessment Practice (IEMA, 2017); and
- Guidelines for data acquisition to support marine environmental assessments of offshore renewable energy projects (CEFAS, 2012).

Topic-specific specialist methodologies and good practice guidelines will be further drawn on as necessary and the full account of the applicable legislation and guidance to be considered within the EIA methodology will be further documented in the Offshore EIA Report.

5.2.2 The Environmental Impact Assessment Process

The EIA process can be broadly summarised as consisting of:

- **Scoping:** The Applicant produces an Offshore Scoping Report (this document) and requests a formal Scoping Opinion from OPRED.
- **Consultation**: the Applicant is required to conduct pre-application consultation.
- Offshore EIA Report Preparation: The Offshore EIA Report will be prepared, considering the responses to the consultation process and outcomes of the assessment of the Likely Significant Effects (LSE) of the development area during the construction, operation and maintenance, and decommissioning stages of the project lifecycle.
- **Offshore EIA Report Consultation**: The Offshore EIA Report must be publicised, and the consultation bodies and the public must be given an opportunity to give their views about the Proposed Development and the Offshore EIA Report.
- **Determination:** The relevant authority must examine all the environmental information, including the Offshore EIA Report and any comments and representations received, and must reach their reasoned conclusion on the significant effects of the development on the environment. The environmental information, and the conclusions reached, must be considered by the competent authority in deciding whether or not to give consent for the development. The relevant authority must also consider whether any monitoring measures are appropriate; and
- **Decision notice:** The relevant authority must inform the public and the consultation bodies of the decision and must publish a 'decision notice' which incorporates the authority's reasoned conclusion on the significant effects of the development on the environment.

5.3 Key Principles of the EIA

5.3.1 Overview

Within the Offshore EIA Report, the assessment of each topic (e.g., physical processes, marine mammals, infrastructure and other users, etc.) will be included in a separate chapter. A list of the topic chapters that will be included in the Offshore EIA Report is outlined in Table 1-2. Within each of the topic chapters, the following matters will be considered:

- Identification of the study area for the topic-specific assessments;
- Description of the planning policy and guidance context;
- Summary of consultation activity, including comments received in the Scoping Opinion;
- Description of the environmental baseline conditions; and
- Presentation of impact assessment, which includes:
    - identification of the maximum design scenario for each impact assessment;

- a description of the measures adopted as part of the Proposed Development, including mitigation and design measures which seek to prevent, reduce or offset environmental effects;
- identification of likely impacts and assessment of the significance of identified effects, taking into account any mitigation measures adopted as part of the Proposed Development;
- identification of any further mitigation measures required in respect of LSE (in addition to those measures adopted as part of the Proposed Development), together with consideration of any residual effects.
- identification of any future monitoring required;
- assessment of any cumulative effects with other major developments, including those that are proposed, consented and under construction (including, where applicable, those projects, plans or activities that are currently operational that were not operational when baseline data was collected); and
- assessment of any transboundary effects (i.e., effects on other European Economic Area (EEA) states).

Inter-related effects (i.e., inter-relationships between environmental topic areas) will be assessed in a separate standalone EIA chapter which will consider the impacts of the Proposed Development on each of the identified receptor groups.

Within each topic chapter a number of key principles will be applied, and these are detailed in sections 5.3.2 to 5.3.9.

5.3.2 Maximum Design Scenario

The Project Design Envelope (PDE) approach (also known as the Rochdale Envelope approach) has been adopted for the assessment of the Proposed Development, in accordance with current best practice and the “Rochdale Envelope Principle”. This requires the assessment of likely significant effects (LSE) of the realistic ‘worst case’ parameters of the Proposed Development.

For each of the topic chapters and effects assessed within the Offshore EIA Report, the PDE considered will be the scenario which would give rise to the greatest potential effect (hereafter referred to as the Maximum Design Scenario (MDS)).

An example of the PDE approach would be where several types of subsea cable installation methods are considered. The assessment in this case would be based on the installation method known to have the greatest potential impact on a given receptor. In this instance, the PDE for the installation method with the greatest seabed disturbance potential would be that which leaves the largest footprint. It can be assumed that any project parameters equal to or less than those assessed will have environmental effects of the same level or less upon the receptors for the topic under consideration.

By identifying the MDS for any given impact, it can be concluded that the impact (and therefore the effect) will be no greater for any other design scenario than that assessed for the MDS. Employing the PDE approach will allow the Applicant to retain necessary flexibility in the design of the Proposed Development offshore components, with certain maximum scenarios, all of which will be fully assessed within the Offshore EIA Report.

5.3.3 Proportionate EIA

The importance of delivering EIAs which are proportionate and accessible to a wide range of stakeholders has been acknowledged by EIA practitioners, with a recent drive for improved quality of EIA reports from a number of organisations (e.g., IEMA, 2017).

The aim of producing a proportionate EIA has been a key consideration in the development of this Offshore Scoping Report. A number of tools and processes have been used to aid the proportionality of the Proposed Development EIA, both within this Offshore Scoping Report, and that will be subsequently considered in the Offshore EIA Report. This includes:

- application of the existing evidence basis; and
- commitment to embedded mitigation measures.

5.3.3.1 Existing Evidence Basis

The development area is located in Liverpool Bay, for which there exists significant data and knowledge regarding the baseline environment. This data/knowledge has been acquired through the former Liverpool Bay zonal studies, from the surveys and assessments undertaken for Burbo Bank, Rhys Flat, and Gwynt y Mor offshore wind farms, and the multiple oil and gas platforms and developments in the area. Where possible in this Offshore Scoping Report, the Applicant has made use of these data to:

- provide an initial high-level overview of the baseline environment and the availability of existing data to support the Offshore EIA Report;
- support scoping out of impacts where there is clear evidence of lack of a receptor-impact pathway; and
- where impacts are proposed to be scoped into further assessment in the Offshore EIA Report, to draw upon the pre-existing evidence base where appropriate.

Where this Offshore Scoping Report identifies that additional data is required to inform the Proposed Development EIA, the Offshore EIA Report will provide a description of the additional data.

5.3.3.2 Mitigation Measures

The EIA can influence the design of a project in many ways, including:

- amending the layout and extent of a development site to avoid key sensitive receptors;
- amending the design of a specific aspect of the development to manage impacts;
- specifying construction techniques to avoid effects on receptors; and
- changing materials to reduce volume and/or transport impacts (IEMA, 2016).

There are three distinct forms of mitigation which include:

- **primary inherent mitigation**: These include modifications to the location or design of the development made during the pre-application phase that are an inherent part of the Proposed Development and do not require additional action to be taken. This includes measures such as identifying an archaeological feature which should remain unaffected by the Proposed Development;
- **secondary foreseeable mitigation**: These include actions that will require further activity in order to achieve the anticipated outcome. These may be imposed as part of the consents and licences, or through inclusion in the Offshore EIA Report. This includes measures such as those required to restore a sensitive habitat; and
- **tertiary inexorable mitigation**: Actions that would occur with or without input from the EIA feeding into the design process. These include actions that will be undertaken to meet other existing legislative requirements, or actions that are considered to be standard practices used to manage commonly occurring environmental effects. This includes measures such as the Code of Construction Practice (CoCP) and Environmental Management Plans (EMPs).

Both primary and tertiary measures can be embedded into the project design. The basis of the Offshore EIA Report can therefore be undertaken on the basis that these measures will definitely be delivered and therefore any effects which might arise without these mitigation measures do not need to be identified as potential effects as there is no potential for them to arise (IEMA, 2016).

Throughout this Offshore Scoping Report, a range of ‘embedded design measures’ have been applied and are detailed in the technical assessments (see chapters 6 to 7.1). Mitigation measures will evolve whilst the Offshore EIA Report progresses and in response to stakeholder engagement.

5.3.4 Design Envelope Approach and Maximum Design Scenario

The Proposed Development will utilise the Design Envelope Approach and Maximum Design Scenario. This approach allows for the Proposed Development to be assessed on the basis of project design parameters that are not specific at the time of writing but are indicated with a range of potential values. It is not possible to provide precise final details of the Proposed Development, or the way it will be built, a number of years ahead of the time it will be constructed. As a relatively novel industry, improvements in technology and construction methodologies occur frequently and information provided as part of the consent application could become rapidly outdated, resulting in an uneconomical and potentially unbuildable project.

For each impact assessment, the maximum adverse scenario from within the range of potential options for each development parameter will be identified, and the assessment will be undertaken on this basis. The Design Envelope Approach employed for the Proposed Development is consistent with the Planning Inspectorate's (PINS) Advice Note Nine: Rochdale Envelope (PINS, 2012).

Chapter 3: Proposed Development Description sets out the Proposed Development parameters and identifies the range of potential project design values for all relevant components of the development. For each of the topic chapters (Chapters 6 to 8 below) within the Proposed Development EIA Scoping Report and for each of the impacts assessed, the Design Envelope considered will be the scenario which would give rise to the greatest potential impact. If, after undertaking the impact assessment it is shown that no significant effect is anticipated, it can be assumed that any project parameters equal to or less than those assessed in this 'Design Envelope' will have environmental effects of the same level or less and will therefore also have no significant effect upon the receptors for the topic under consideration.

By employing the Design Envelope approach, the developer retains flexibility in design of the Proposed Development and associated offshore infrastructure within certain maximum extents and ranges, all of which are fully assessed in the Offshore EIA Report

It is the Applicant’s intention to refine the Design Envelope throughout the EIA process as further technical, environmental and design information becomes available.

5.3.5 Consultation and Stakeholder Engagement

To support the development of this Offshore EIA Report, pre-scoping stakeholder engagement has been undertaken. Consultation has included general project introductions to key stakeholders and regulators; discussions on proposed survey methodologies; pre-scoping engagement on the initial Proposed Development proposal; presentation of landfall options and proposed intertidal assessment approach; interim updates with key Statutory Nature Conservation Bodies (SNCBs) and stakeholders and updates on interim data results for topics such as marine mammals, ornithology and shipping and navigation.

The Applicant, along with their EIA consultants, intends to consult with key statutory and non-statutory stakeholders throughout the pre-application process. The Applicant will refine the Proposed Development Application, based upon the consultation undertaken during the pre-application phase. A summary of key consultation undertaken will be presented in the Offshore EIA Report.

5.3.6 Impacts and Effects

The development area has the potential to create a range of impacts and effects with regard to the physical, biological, and human environment related to marine receptors. For the purposes of the Offshore EIA Report, the term ‘impact’ is defined as a change that is caused by an action. For example, the laying of an inter-array cable (action) is likely to result in seabed disturbance (impact). Impacts can be defined as direct, indirect, temporary, irreversible, secondary, cumulative and inter-related. They can also be either positive or negative, although the relationship between them is not always straightforward.

The term ‘effect’ is defined as the consequence of an impact. Using the increased sedimentation example again, the laying of an inter-platform cable (action) results in seabed disturbance (impact), with

the potential to disturb benthic habitats and species (effect). The significance of effects is determined by consideration of the magnitude of impact alongside the sensitivity of each receptor/receptor group.

The magnitude of an impact is the consideration of the extent, duration, frequency and reversibility of an impact. Receptors can be defined as the physical or biological resource or user group that could be affected by the potential impacts. In defining the sensitivity for each receptor/receptor group, the vulnerability, recoverability and value/importance of that receptor will be taken into consideration.

In order to ensure consistency in defining the significance of an effect, a matrix approach will be adopted in the Offshore EIA Report as presented in Table 5-1. In cases where a range is suggested for the significance of effect, there remains the possibility that this may span the significance threshold (i.e., the range is given as minor to moderate). In such cases the final significance is based upon the expert's professional judgement as to which outcome delineates the most likely effect, with an explanation as to why this is the case.

Table 5-2: Matrix Used for the Assessment of the Significance of Effect.

		Magnitude of Impact			
		Negligible	**Low**	**Medium**	**High**
Sensitivity of Receptor	**Negligible**	Negligible	Negligible or Minor	Negligible or Minor	Minor
	Low	Negligible or Minor	Negligible or Minor	Minor	Minor or Moderate
	Medium	Negligible or Minor	Minor	Moderate	Moderate or Major
	High	Minor	Minor or Moderate	Moderate or Major	Major or Substantial
	Very High	Minor	Moderate or Major	Major or Substantial	Substantial

A level of effect of moderate or more will be considered a ‘significant’ effect for the purposes of the EIA. A level of effect of minor or less will be considered ‘not significant’. Effects of moderate significance or above are therefore considered important in the decision-making process, whilst effects of minor significance or less warrant little, if any, weight in the decision-making process.

The matrix approach is consistent with the general approach described in the Design Manual for Roads and Bridges (DMRB) (Highways England *et al.,* 2019) and Environmental Impact Assessment for Offshore Renewable Energy Projects – Guide (BSI, 2015). A number of modifications have however been made in the interest of proportionality, including:

- a magnitude of impact of ‘no change’ will not be assessed since it will always lead to a non-significant effect;
- a negligible magnitude impact will not be considered further because it will always lead to a non-significant effect; and
- receptors of negligible importance, value, or sensitivity will not be considered further because it will always lead to a non-significant effect.

Where significant effects are initially identified, the EIA will follow a “feedback loop” methodology, as illustrated within Figure 5-1. Through this process, an impact is initially assessed to determine the significance of the potential environmental effect. If the effect of an impact presents a major or substantial significant adverse outcome, changes are typically made to the Proposed Development design (primary mitigation) in order to reduce or offset the magnitude of impact. If the effect of an impact presents a moderately significant adverse outcome, mitigation such as engineering controls or construction methods (secondary and tertiary mitigation) are employed in order to reduce or offset the magnitude of the impact.

This process is repeated, as illustrated within Figure 5-1 until the EIA practitioner is satisfied that:

- the effect is reduced to a level that is not significant in EIA terms; or
- no further changes can be made to the Proposed Development design to reduce the magnitude of impact and therefore the significance of the effect. In these cases, an overall effect that is still significant in EIA terms may be presented.

Following this iterative approach ensures that the significance of effect presented for each identified impact may be presumed to be representative of the maximum residual adverse effect the development area may have on the receiving environment.

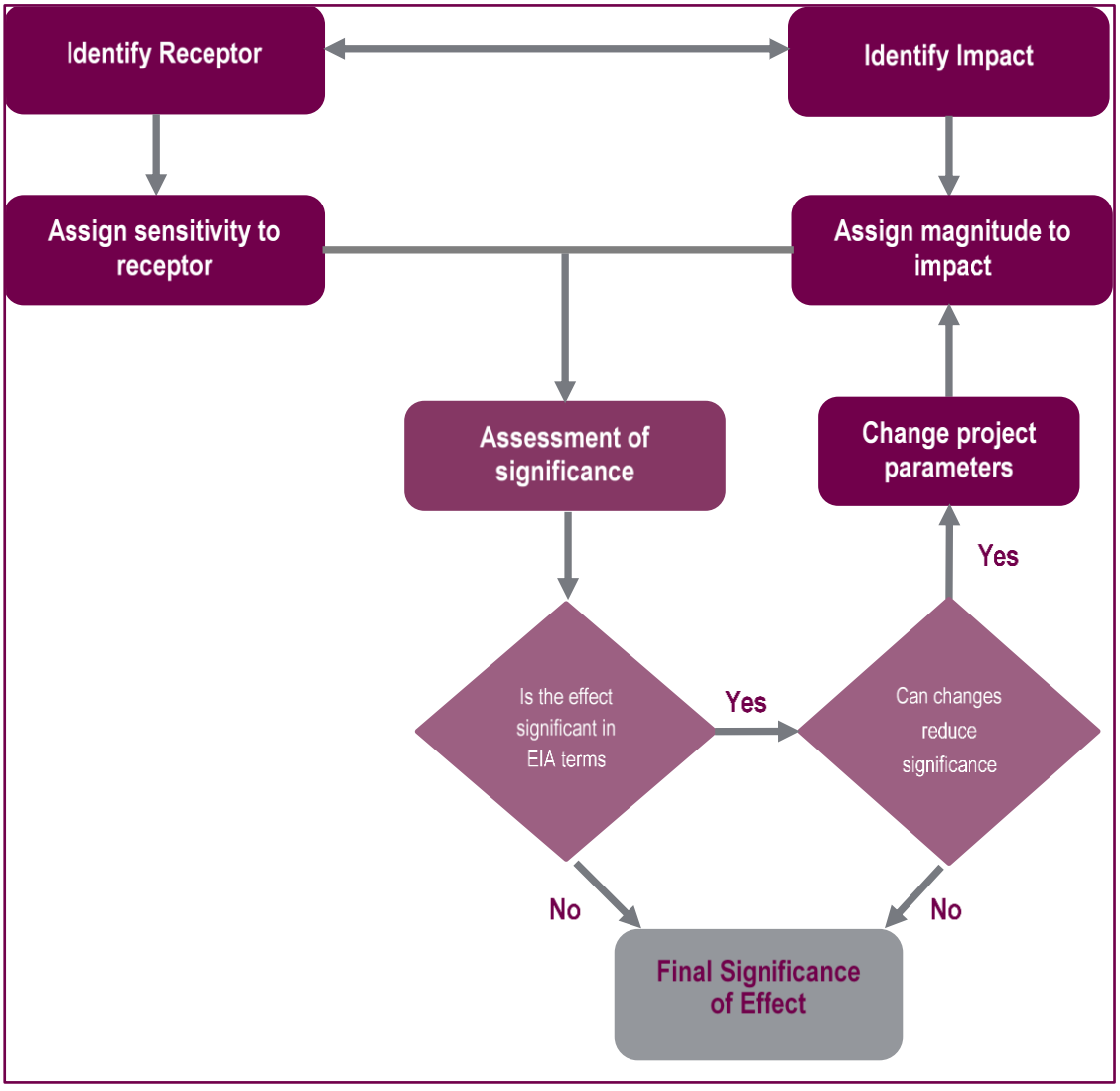

Figure 5-1: Proposed Iterative Approach to Mitigation Within the Proposed Development EIA.

5.3.7 Inter-related Effects

The EIA Regulations require consideration of inter-related effects. Inter-related effects refer to the inter-relationships between EIA topics that may lead to environmental effects. There are two categories of inter-related effects:

- project lifetime effects: effects that occur throughout more than one phase of the project (construction, operation and maintenance, and decommissioning) interacting to potentially create a more significant effect upon a receptor than if just assessed in isolation in a single phase; and

- receptor-led effects: effects that interact spatially and/or temporally resulting in inter-related effects upon a single receptor. For example, the impacts of increased sedimentation the surrounding benthic ecology may be greater when multiple sources of impact interact or combine to produce a different or greater effect upon this receptor than when single sources of impact are considered in isolation. Receptor-led effects might be short term, temporary or transient effects, or incorporate longer term effects.

Within the Offshore EIA, assessment of inter-related effects will be undertaken with specific reference to the potential for such effects to arise in relation to receptor groups. The term 'receptor group' is used to highlight the fact that the proposed approach to inter-relationships assessment will, in the main, not assess every individual receptor assessed at the EIA stage, but rather, potentially sensitive groups of receptors.

Where the significance of an effect within the topic-specific assessment has been identified as 'no effect across all stages of the project', the assumption has been made that these effects can not contribute to any inter-related effects. These effects will therefore not be included in the inter-related effects assessment as there will be no effect from the Proposed Development over the lifetime of the project.

It is acknowledged that an ecosystem assessment for marine ecology receptors may be required. It is proposed that the Offshore EIA Report will present an ecosystem assessment as a section within each ecology topic and that the format and layout of this section will be determined following further discussion and guidance from Natural England and Natural Resources Wales.

The inter-related assessment will consider only effects from the Proposed Development and not those from other projects, which will be considered in the Cumulative Effect Assessment (CEA) (see section 5.3.8).

5.3.8 Cumulative Effect Assessment

5.3.8.1 Overview

A CEA is a legal requirement under the EIA Regulations. A CEA provides consideration of the impacts arising from the Proposed Development alone and cumulatively with other relevant plans, projects and activities. Cumulative effects are therefore the combined effect of the Proposed Development in combination with the effects from a number of different projects, on the same receptor or resource.

A fundamental requirement of undertaking the CEA is to identify those foreseeable developments or activities with which the Proposed Development may interact to have the potential to result in a cumulative impact. All phases (construction, operation and maintenance, and decommissioning) of the Proposed Development may have the potential to lead to cumulative impact.

For the Proposed Development CEA, other proposed major developments in the area will be takin into account within the CEA. PINS Advice Note Seventeen: Cumulative Effects Assessment Relevant to Nationally Significant Infrastructure Projects (PINS, 2015) recommend that, through consultation with Local Authorities and other relevant consenting bodies, other major developments (both onshore and offshore) in the area should be taken into account when conducting a CEA, including those which are:

- already constructed;
- under construction;
- permitted application(s), but not yet implemented;
- submitted application(s) not yet determined; and
- plans and projects which are "reasonably foreseeable" (i.e., developments that are being planned, including, for example, offshore renewable energy projects which have a Crown Estate Agreement for Lease (AfL), offshore renewable energy projects that have been scoped).

The CEA will consider all other relevant plans, projects and activities that are publicly available three months prior to the Proposed Development application, these including the DCO and TCPA applications being progressed by the Applicant for the Onshore elements of the HyNet Carbon Dioxide Transportation and Storage System.

5.3.8.2 Screening Stage

To ensure a thorough and comprehensive approach to identification of potential projects to be considered in the CEA, an initial 'long list' of projects within a defined Zone of Influence (ZOI) will be developed based on the above listed criteria. The ZOI will be large enough to encompass all technical assessment regional study areas.

The initial long list will then be reduced following a consideration of potential for cumulative effects for each potential impact-receptor pathway staged process as set-out below:

- conceptual overlap – An impact has the potential to directly or indirectly affect the receptor(s) in question. In EIA terms this is described as an impact-receptor pathway and is defined here as a conceptual overlap;
- physical overlap – Ability for impacts arising from the Proposed Development to overlap with those from other projects/plans on a receptor basis. This means that an overlap of the physical extents of the impacts arising from the two (or more) projects/plans must be established for a cumulative effect to arise. Exceptions to this exist for certain mobile receptors that may move between, and subject to, two or more separate physical extents of impact from two or more projects; and
- temporal overlap – In order for a cumulative effect to arise from two or more projects, a temporal overlap of impacts arising from each must be established. It should be noted that some impacts are active only during certain phases of development, such as piling noise during construction. The absence of a strict overlap however may not necessarily preclude a cumulative effect, as receptors may become further affected by additional, non-temporally overlapping projects.

This screening stage will be based on the experience and knowledge of technical specialists, and the current guidance and regulations. The projects or plans that remain after review of the long list are taken forwards to the assessment stage.

5.3.8.3 Assessment Stage

Following the screening stage outlined in section 5.3.8.2, information is gathered on the projects, plans or activities to be taken forwards into the CEA. Where the potential significant effect for the Proposed Development alone is assessed as negligible, or where an impact is predicted to be highly localised, these will not be considered within the Proposed Development CEA, as there is not considered to be a potential for cumulative effects with other plans, projects or activities.

When undertaking the CEA of the Proposed Development, a tiered approach will be adopted. This provides a framework for placing relative weight upon the potential for each project/plan to be included in the CEA to ultimately be realised, based upon the project/plan's current stage of maturity and certainty in the projects' parameters. The tiered approach which will be utilised within the Proposed Development CEA employs the following tiers:

- tier 1 assessment – Proposed Development;
- tier 2 assessment – All plans/projects assessed under Tier 1, plus projects which are operational, under construction, those with consent and submitted but not yet determined;
- tier 3 assessment – All plans/projects assessed under Tier 2, plus those projects with a Scoping Report; and
- tier 4 assessment – All plans/projects assessed under Tier 3, plus those projects likely to come forward where an AfL has been granted.

All projects/plans that have been screened into the CEA via the screening process will be allocated into one of the above Tiers and assessed in the CEA.

The CEA will consider all other relevant plans, projects and activities that are publicly available three months prior to the Proposed Development application.

Where practicable, the CEA methodology then follows the outline of the stand-alone assessment methodology as described in section 5.3.5. This approach allows consistency throughout the EIA.

5.3.9 Transboundary Effects

Transboundary effects arise when impacts from the Proposed Development within one EEA state affects the environment of another EEA state(s). The need to consider such transboundary effects has been embodied by the United Nations Economic Commission for Europe Convention on EIA in a Transboundary Context (commonly referred to as the 'Espoo Convention'). The Convention requires that assessments are extended across borders between Parties of the Convention when a planned activity may cause significant adverse transboundary impacts.

Article 7 of the amended EIA Directive provides the basis for consultation between Member States in relation to the LSE of Proposed Development in one state on the environment in another Member State. The principal obligation is in respect of information and consultation and is imposed by Article 7(4) of the amended Directive:

"The Member States concerned shall enter into consultations regarding, inter alia, the potential transboundary effects of the project and the measures envisaged to reduce or eliminate such effects and shall agree on a reasonable timeframe for the duration of the consultation period. Such consultations may be conducted through an appropriate joint body."

Under Regulations 41 and 42 of the EIA Regulations, for any project that is likely to cause significant transboundary effects, appropriate Ministers must send information about the development to the government of the affected country and invite them to participate in the consultation procedures. The following receptors may experience transboundary impacts from the Proposed Development:

Fish and shellfish ecology;

- Marine mammals;
- Offshore ornithology;
- Commercial fisheries; and
- Shipping and navigation.

6 OFFSHORE PHYSICAL ENVIRONMENT

6.1 Introduction

This chapter of the Offshore EIA Scoping Report identifies the offshore physical environmental receptors of relevance to the development area, which includes the pipelines and cables leading to MHWS. This chapter considers the potential impacts from the construction, operation and maintenance, and decommissioning of the offshore and intertidal components (seaward of the MHWS mark) of the development area. Specifically, this chapter will provide baseline data, proposed additional data collection, potential impacts, assessment methodologies, and mitigation measures related to impacts of the development area on physical processes, subsea noise, air quality, and climate change.

6.2 Physical Processes

6.2.1 Study Area

The Proposed Development physical processes study area is defined as the area encompassing the development area, plus a buffer of one tidal excursion (Figure 6-1). The 8 km buffer around the development area accounts for this tidal excursion and illustrates the areas potentially affected by changes in water quality (increases in Suspended Sediment Concentrations (SSCs)). The study area accounts for the maximum distance that SSCs could potentially travel from the development area (ABPmer, 2017).

The physical processes study area forms the focus for the assessment, however the extent of the numerical models to be employed in undertaking the study is not limited to this region and would therefore also identify potential impacts beyond the physical processes study area both further offshore and along the shoreline.

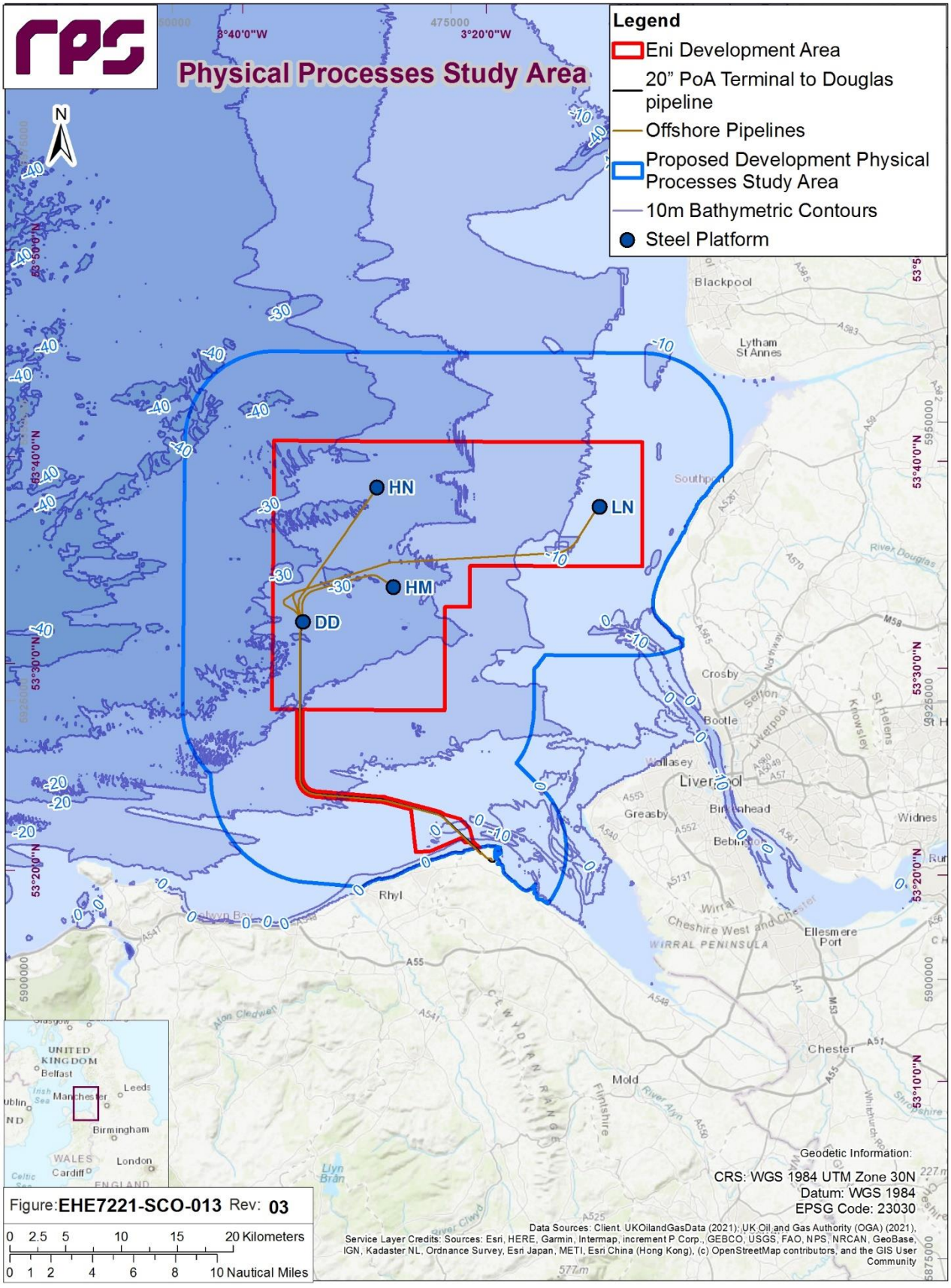

Figure 6-1: Illustrates the Proposed Development Physical Processes Study Area.

6.2.2 Baseline Environment

Information regarding the physical processes within Liverpool Bay has been collated through a detailed and comprehensive review of currently accessible studies and datasets. To provide a wider context, the desktop review has also considered the broader area of the Irish Sea in proximity to the development area. The baseline has been established through the use of data on bathymetry, geology, seabed sediments, sediment quality and contamination, suspended sediments, tidal regime, sediment transport, and waves. Key data sources are listed in Table 6-1, noting that this list is not exhaustive.

Table 6-1: Summary of Key Desktop Data Sources to Inform the Physical Processes Scoping Assessment.

Title	Source	Year	Author
LBA CCS Transport and Storage Project Feasibility Study Pre-ESHIA	ENI Progetti	2021	ENI
Geology of the seabed and shallow subsurface: The Irish Sea.	British Geological Survey	2015	Mellett *et al*.
Suspended Sediment Climatologies around the UK.	Department for Business, Energy & Industrial Strategy (BEIS)	2016	CEFAS
Physical and Dynamical Oceanography of Liverpool Bay	Ocean Dynamics	2011	Polton *et al*.
UK Renewables Atlas (Tide)	ABPmer	2017	ABPmer
European Marine Observation and Data Network (EMODnet) Bathymetry	EMODnet	2022	EMODnet
MEDIN Seabed Mapping Programme	ADMIRALTY Marine Data Portal	2022	MEDIN
Admiralty Tide Tables	UK Hydrographics Office	2022	UKHO
INFOMAR Seabed Mapping Programme	Geological Survey Ireland (GSI) and Marine Institute	2022	INFOMAR
Long term wind & wave datasets	Eurpean Centre for Medium-range Weather Forecasting (ECMWF)	2022	ECMWF
Channel Coastal Observatory Gwynt y Mor	National Network of Regional Coastal Monitoring	2022	Channel Coastal Observatory
ABPmer Data Explorer SeaStates Tides	ABPmer	2022	ABPmer

6.2.2.1 Desktop Study

Bathymetry

Water depths across Liverpool Bay are relatively shallow, generally less than 50 m with no discernible subsea features or bedforms being present (ENI, 2021). Seabed formations within Liverpool Bay have been evidenced to be characterised by sand ribbons and sand wave fields of minimal height (Eni, 2021). The development area, which includes the Douglas, Hamilton Main, Hamilton North, and Lennox OPs is located approximately 2 km off the west coast of England and 12 km off the north coast of Wales. The development area is located in water depths that typically range between 10 m and 30 m, increasing in depth from the east to the west (Figure 6-1). The development area including the PoA Terminal to Douglas OP pipeline, leading to Talacre Beach, is situated in water depths that range from 0.72 m (nearshore) to 35 m (offshore), with average water depths across the offshore development area being approximately 20 m (Figure 6-1). The Lenox OP is located in 7.2 m of water while the Douglas OP is situated in 29.2 m of water. Shallower water is generally present towards the southern and eastern

boundaries of the development area, including the PoA Terminal to Douglas OP pipeline, situated in inshore waters. Water depth increases towards the northwest boundary of the development area, approaching the Irish Sea with increasing distance from the shoreline with water depths ranging from 50 m to 150 m (EMODnet, 2021).

Geology

The predominant bedrock types within Liverpool Bay and more specifically, the development area, are comprised of Permo-Triassic and Carboniferous sandstone, mudstone and limestone (Mellet *et al*., 2015). This bedrock is covered by Quaternary sediments that have a thickness exceeding 50 m in the eastern and western Irish Sea (Mellet *et al*., 2015).

Properties of the Quaternary sediments are known to be highly variable both laterally and with depth due to repeated fluctuations of ice sheets during the last glacial period (Mellet *et al.,* 2015). It has also been evidenced that the uppermost surface of bedrock that is found beneath the Quaternary sediment has potentially been weathered due to the last glacial period, therefore it could be weaker than the underlying rock (Mellet *et al*., 2015).

Seabed Sediments

Bedform formations in the Irish Sea are highly variable as evidenced within Liverpool Bay, where the area is predominantly characterised by sand ribbons less than 30 cm in height and sand wave fields less than 2 m in height extending between 10 m and 20 m in length (ENI, 2021). However, within the Irish Sea, sand waves can occur up to heights of 12 m illustrating the high variability in the area (Mellet *et al*., 2015; ENI, 2021).

There are several bedform banks located in the Irish Sea which can be subdivided into two ‘Mudbelts’ which comprise soft muds along the eastern and western areas and a ‘Gravel Belt’ comprised of coarse sediment and hard substrate through the centre (Mellet *et al*., 2015).

The seabed within Liverpool Bay is dominated by circalittoral coarse sediment, circalittoral mixed sediment, circalittoral sand and circalittoral mud (EMODnet, 2019; ENI, 2021). More specifically, the seabed sediments found within the offshore development area are found to be predominantly comprised of circalittoral fine sand, deep circalittoral coarse sediment, and deep circalittoral sand (EMODnet, 2019). As the offshore pipeline (PoA) moves from the offshore development area and the Douglas OP towards the coast of northern Wales, sandy sediments grade into circalittoral muddy sand, circalittoral coarse sediment, and circalittoral coarse rock (EMODnet, 2019). Additional detail on seabed sediments in the vicinity of the development area are presented in Section 7.2. Benthic Subtidal and Intertidal Ecology.

Sediment Quality and Contamination

Historically, Liverpool Bay, within which the development area, and physical processes study area is located, has been utilised for the disposal of industrial wastes and domestic sewage. Prior to the 1993 International Maritime Conventions regulations on dumping waste at sea, more than 50,000 tonnes of treated and untreated material were disposed of in the area annually (ENI, 2021).

Previous sediment contamination studies undertaken in the development area, and physical processes study area have evidenced metal contamination in the surrounding sediments located in the vicinity of various offshore oil and gas platforms (CEFAS, 2005).

Metal contaminants are relatively significant within sediments in Liverpool Bay. Although historic oil and gas industry activity in Liverpool Bay has contributed to these contaminants, more than 80% of these inputs originate from rivers discharging into the surrounding bay (ENI, 2021). Pre-construction monitoring programmes occurring in 2005 for the Burbo Bank OWF project, located approximately 9.8 km east of the development area, found that most contaminants were below the Centre for Environment, Fisheries and Aquaculture Science (CEFAS) chemical Action Level 1 (cAL1), resulting in no concern and ultimately unlikely to influence licencing decisions (CMACS, 2005).

Liverpool Bay is home to an historical disposal site known as Site Z, located within the physical processes study area (Figure 6-2) which was first licensed for the disposal of dredged materials in 1982 (Whomersley *et al*., 2008; Bolam *et al*., 2016). This disposal site is located in water depths of approximately 10 m and is partially exposed to wave action from winds moving in the westerly and northerly directions (Whomersley *et al*., 2008). The material that has historically been dumped at the Site Z disposal site is comprised of maintenance dredging material from docks and navigational channels associated with the Mersey estuary (Whomersley *et al*., 2008).

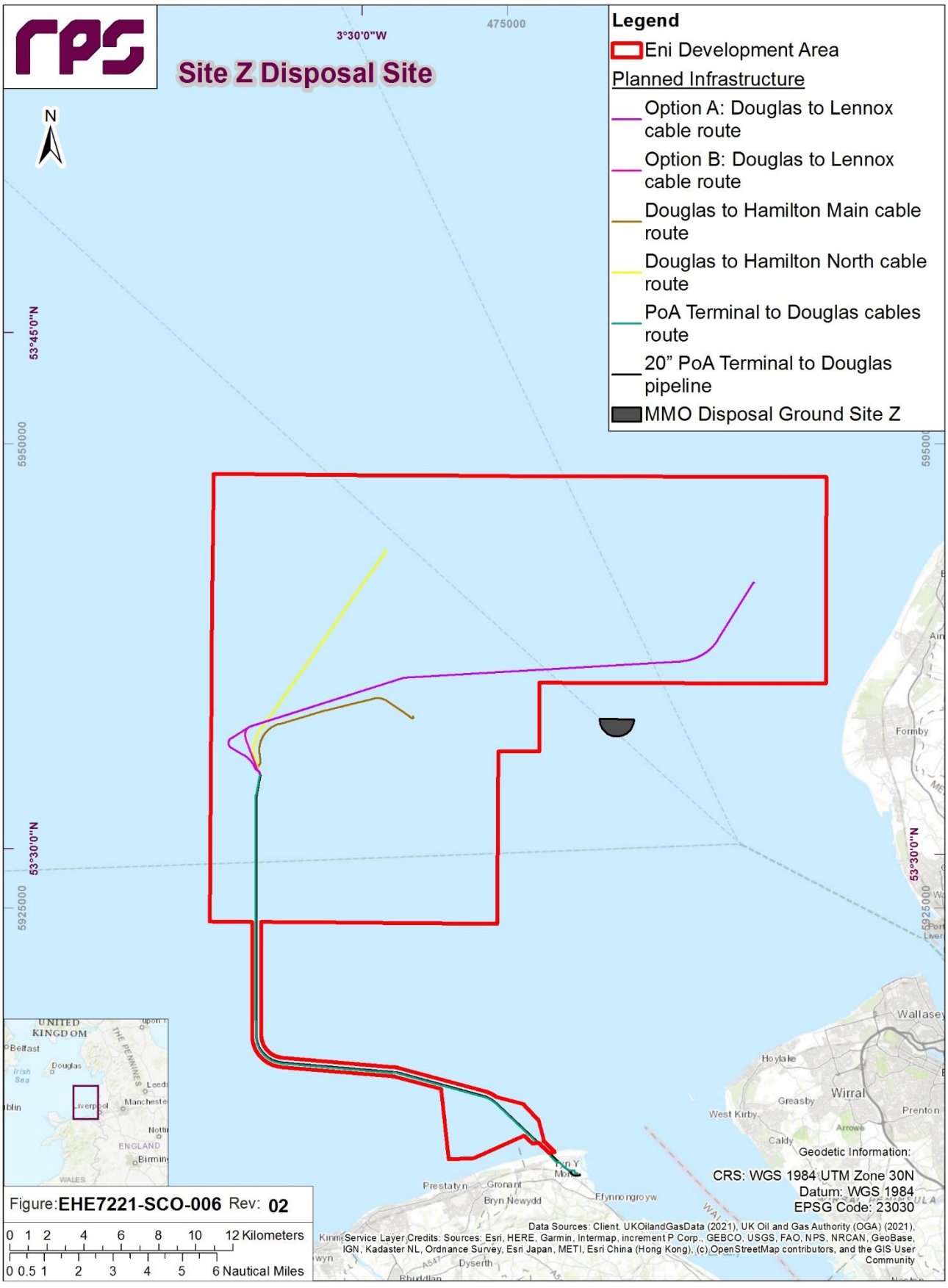

Figure 6-2: Illustrates Site Z Disposal Grounds in Liverpool Bay.

In 2014, samples were taken from areas surrounding the Site Z marine disposal site and were found to be predominantly composed of gravelly sand and slightly gravelly and muddy sand (Bolam *et al*., 2016). 15 individual samples were collected from stations surrounding the disposal site and were tested for sediment contamination and the presence of arsenic, cadmium, chromium, copper, nickel, lead, zinc and mercury (Bolam *et al.,* 2016). Results illustrated that there were no significant differences between the dredged material and sediments in the vicinity of the disposal grounds (Bolam *et al*., 2016).

From the analysis of the 15 stations, only one was found to exceed the effects range for low molecular weight polycyclic aromatic hydrocarbons (PAHs) (Bolam *et al*., 2016). These values are typical of those exhibited along the west coasts of England and Wales (Bolam *et al*., 2016).

Suspended Sediments

Data collected and analysed by CEFAS from 1998 to 2015 illustrated the spatial distributions of average non-algal Suspended Particulate Matter (SPM, also known as Suspended Sediment Concentration (SSC)), along the UK continental shelf (CEFAS, 2016). Along the UK coastline, the most significant SSC plumes were found to be associated with large rivers such as the Thames estuary, Humber, Wash, Severn and Liverpool Bay which were evidenced to have mean SSC values above 10 mg/l (CEFAS, 2016).

SSC values within the development area were found to be estimated between 2 mg/l and 10 mg/l over the 18-year study period (CEFAS, 2016). It was also noted that higher levels of SSC were experienced more frequently during winter months given increased sea conditions (CEFAS, 2016). However, due to the local tidal regime, summer months also illustrated elevated SPM levels when sea conditions are typically calmer (CEFAS, 2016).

SSCs are primarily impacted by tidal currents which fluctuate between spring and neap tidal cycles as well as different tidal stages. SSCs have also been evidenced to fluctuate from storm events which impact the overall wave climate and wave driven currents. SSC levels will gradually return to their baseline levels following storm events in the area.

Direct anthropogenic factors such as trawling, dredging, and shipping are likely to cause changes in SSCs during the summer months when background levels are normally lower (CEFAS, 2016). Additionally, increased SSC from river discharges is typically more noticeable during winter months when precipitation levels are higher along the English coastline (CEFAS, 2016).

Tidal Regime and Sediment Transport

Semi-diurnal tides are known to be the predominant physical process within the Irish Sea, moving into the Irish Sea from the Atlantic Ocean through both the North Channel and St. George's Channel. The tidal range in the Irish Sea is extremely variable, with spring tidal ranges in excess of 10 m, one of the largest on Earth and only second in the UK (Polton *et al*., 2011). Subsequently, Liverpool Bay experiences strong tidal currents which ultimately affect sediment transport rates and patterns.

The tidal range in Liverpool Bay has an average spring tidal range of 8.4 m and more specifically, a tidal range between 6.0 m and 7.0 m during spring and 3.0 m to 4.0 m during neap tides at the Douglas OP (ENI, 2021).

The strongest tidal current in the vicinity of the development area occur northwest of Anglesey and north of the Isle of Man. These currents have been found to exceed 2 m/sec and occur for almost 40% of the time (Polton *et al.,* 2011; ENI, 2021).

The tidal currents within Liverpool Bay are known to be asymmetric, with the greatest speeds present on flood tides (Polton *et al*., 2011). In conjunction with an extended tidal range of 6 m to 8 m, this environment is known to facilitate deposition and encourages mud and sand belts to accumulate as evidenced through baseline findings referencing the regions geology and subtidal sediments.

Tidal currents are predominantly east to west within the development area and near shore, but with increasing distance offshore, the current in deeper coastal waters tends to run in a north-south direction (ABPmer, 2017).

Tidal dynamics and plume buoyancy, defined in the marine environment as a vertical body of fluid moving through another resulting from differences in density, have been found to oversee the fate of fresh water as it enters Liverpool Bay, in addition to associated sediments, contaminants and nutrient loads (Polton *et al*., 2011). Freshwater forcing statistics found that on average, Liverpool Bay receives 233 m^3 s^{-1} of freshwater (Polton *et al*., 2011). Although the region of Liverpool Bay and therefore the development area are salinity controlled, the river input temperature has been evidenced to significantly control the plume buoyancy with a seasonal cycle, illustrating that stratification strongly influences the regions dynamics (Polton *et al*., 2011).

Data collected from long-term oceanographic instruments illustrated that for 65% of tidal cycles, the region of Liverpool Bay alternates between being vertically mixed and stratified (Polton *et al.,* 2011). The region of Liverpool Bay is unique in that the interactions between fresh water inputs and strong tidal forcing are responsible for complex dynamics in the surrounding areas.

Waves

Waves in the Irish Sea are highest to the south west of the Isle of Man with the highest mean significant wave height of 1.39m recorded between the Isle of Man and Anglesey. Approaching the coast, the significant wave height has been evidenced to decrease (ABPmer, 2022). The mean wave height across the development area was calculated to be 0.8 m (ABPmer, 2022). Wind speed and direction across the same region of the development area was found to be 5.6 m/sec on average, originating predominantly from the west and southwest direction (ABPmer, 2022).

The Gwynt y Mor wave buoy is maintained by the Channel Coastal Observatory and is located in the southwestern corner of the development area (53° 28.62' N 03° 30.20' W) in approximately 10 m of water. The buoy was deployed in 2007 and has been collecting a series of metocean data every half hour. Averages over the last 16 years have shown that the month of December was found to have the largest significant wave height (1.17 m), while July had the smallest (0.56 m) (CCO, 2022). Additionally, the average significant wave height was found to be 0.83 m, consistent with findings from the ABPmer metocean data explorer (CCO, 2022; ABPmer, 2022). Over the 16-year data collection process, the dominant wind direction was consistently found to originate from the west, southwest direction (CCO, 2022).

6.2.3 Potential Project Impacts

A range of potential project impacts on physical processes have been identified which could potentially occur during the construction, operation and maintenance, and decommissioning phases of the Proposed Development.

Impacts that have been scoped into the assessment are outlined Table 6-2, while impacts that will potentially be scoped out of the assessment are presented in Table 6-3.

Table 6-2: Impacts Proposed to be Scoped into the Assessment for Physical Processes.

Potential Impact	Project Phase			Justification
	C	O	D	
Increased suspended sediment concentrations and sediment deposition	✓	✓	✓	**Construction and decommissioning phase** • There is potential for increased SSCs and deposition associated with various forms of seabed preparation activities (jetting, ploughing, mechanical cutting, drilling) and cable installation activities. Therefore, smaller

Potential Impact	Project Phase			Justification
	C	O	D	
				particles located within the sediment could potentially be raised into suspension during the construction phase of the Proposed Development. **Operation and maintenance phase** • There is potential for increases in SSCs and deposition from activities related to cable repair and/or removal. These effects are likely to be similar to those exhibited during the construction and decommissioning phases of the Proposed Development.
Activities affecting surrounding water quality	✓	×	✓	**Construction and decommissioning phase** • Construction activities conducted near the shoreline (e.g., trenching for the cable route) could impact water quality in proximity to the coastline through increased SSC which could then impact the local tidal regime and wave climate. • Construction activities could cause toxicity effects through mobilisation of contaminated sediments through sediment disturbance during cable installation which would potentially affect the surrounding water quality through the local tidal regime and wave climate. • Construction vehicles and vessels have the potential to cause accidental spills and pollution within the development area and the surrounding project footprint. **Operation and maintenance phase** • Operation and maintenance activities could cause toxicity effects through mobilisation of contaminated sediments through sediment disturbance during cable repair activities during operation which could potentially affect the surrounding water quality.

Table 6-3: Impacts Proposed to be Scoped out of the Assessment for Physical Processes.

Potential Impact	Project Phase			Justification
	C	O	D	
Changes to seabed morphology and water quality due to the utilisation of jack-up vessels	✓	×	✓	**Construction and decommissioning phase** • The utilisation of jack-up vessels during the construction and decommissioning phases of the project within the development area will only be temporary and any potential disturbances on the subsea surface, potentially increasing SSCs and/or causing toxicity effects through the mobilisation of contaminated sediments would likely infill over time and be

Potential Impact	Project Phase			Justification
	C	O	D	
				brief. Therefore, it is not expected that jack-up vessels would have any implications on the surrounding seabed morphology or water quality and this impact is to be scoped out of the physical processes assessment.
Presence of infrastructure may lead to changes in the local tidal regime, wave climate, and sediment transport	×	✓	×	**Operation and maintenance phase** • At the early project stages, it is anticipated that the offshore cables and inter-platform cabling will be trenched and then backfilled. Offshore platforms will remain unchanged in terms of the project footprint, therefore, there is no additional infrastructure on the seabed and/or within the water column. • The presence of infrastructure potentially leading to changes in the local tidal regime, wave climate, and sediment transport can therefore be scoped out of the assessment based on these preliminary design parameters and associated infrastructure not being present.

6.2.4 Proposed Assessment Methodology

The physical processes EIA report will consider the potential impacts of the construction, operation and maintenance, and decommissioning phases of the development area within the development area physical processes study area and will follow the methodology outlined in Section 5. The following guidance documents will also be considered:

- Guidance on Best Practice for Marine and Coastal Physical Processes Baseline Survey and Monitoring Requirements to inform EIA of Major Development Projects, NRW Report No: 243, 119 pp, Natural Resources Wales, Cardiff, Brooks, AJ., Whitehead, PA., Lambkin, DO., (2018).
- Guidelines in the use of metocean data through the lifecycle of a marine renewables development (ABPmer *et al.,* 2018).

To support the development of the physical processes EIA chapter, a numerical modelling study is planned. This study will be undertaken using the MIKE software developed by DHI (www.dhigroup.com), which contains a suite of coastal and environmental modelling modules of global standard. The key to the MIKE suite of computational models is that each module may be applied to a single model mesh and then the modelling of combined (coupled) parameters may be undertaken.

The MIKE 21 Flexible Mesh coupled modules would be used to model sediment released into the water column to replicate the construction phase works during the drilling, seabed preparation and installation of the cabling and the sediment dispersion and fate will be gauged. Modelling will be validated using all available data sources.

The computational modelling will quantify the potential impacts of the installation (including seabed preparation activities). It will also provide the transport and fate of any material released into the water column as part of the installation works.

The results of this numerical modelling will be used to support the impact assessments within the below topics:

- Benthic subtidal and intertidal ecology (section 7.2);

- Fish and shellfish ecology (section 7.3);
- Marine mammals (section 7.4);
- Marine archaeology (section 8.4); and
- Other sea users (section 8.5).

6.2.4.1 Cumulative Effects

The potential effects related to the construction, operation and maintenance and decommissioning of the Proposed Development on physical processes will assess the potential cumulative effects that could occur on physical processes from alternate projects and/or activities that take place within the broader area of Liverpool Bay and the eastern Irish Sea.

6.2.5 Potential Mitigation

The following embedded mitigation measures are proposed in relation to physical processes:

Development and adherence to a Cable Specification and Installation Plan.

Any further mitigation requirements for physical processes will be dependent on the significance of the effects.

6.3 Subsea Noise

6.3.1 Introduction

This section provides a summary of underwater noise considerations of relevance to the construction, operation and maintenance, and decommissioning of the Proposed Development. It is important to note that the intention of this section is not to provide assessment or consideration of noise effects to either scope in or scope out potential impacts, as this will be undertaken within the aspects chapters that consider impacts on receptors potentially sensitive to noise emissions. In particular this will relate to the following:

- **Chapter 7.3: Fish and Shellfish Ecology** (describes pathways of effect from noise sources on sensitive fish and shellfish receptor species);
- **Chapter 7.4: Marine Mammals** (describes pathways of effect from noise sources on sensitive marine mammal receptor species);
- **Chapter 8.2: Commercial Fisheries and Aquaculture** (describes pathways of effect from noise sources on sensitive commercial fisheries receptor species); and
- **Chapter 8.5: Infrastructure and Other Users of the Sea** (describes pathways of effect from noise sources on sensitive other marine users).

6.3.2 Study Area

A study area that specifically concerns subsea noise is defined by individual sensitive receptors on which potential impacts are expected to occur within each of the aspects chapters identified above.

6.3.3 Baseline Environment

Information regarding subsea noise within Liverpool Bay has been collated through a detailed and comprehensive review of currently accessible studies and datasets. Subsea noise resulting from the construction, operation and maintenance, and decommissioning of the Proposed Development may include drilling, and will include the utilisation of barges, vessels, industrial machinery, and generators. The subsea noise assessment will include for noise transmitted through the air and into the surrounding marine environment. Baseline data will additionally be utilised to inform the impact assessment for the Fish and Shellfish Ecology, Marine Mammals, and Commercial Fisheries and Aquaculture receptors. Key data sources are listed in Table 6-4, noting that this list is not exhaustive.

Table 6-4: Summary of Key Desktop Data Sources to Inform the Subsea Noise Scoping Assessment.

Title	Source	Year	Author
SEA 6 Technical Report: Underwater Ambient Noise	QinetiQ	2005	Harland *et al*.,
Underwater Ambient Noise	Acoustics Today	2007	Dahl *et al*.,
Gwynt y Mor Offshore Wind Farm Marine Ecology Technical Report	CMACS	2005	CMACS

6.3.3.1 Desktop Survey

Ambient underwater noise is comprised of contributions from various natural and anthropogenic sources (Harland *et al.,* 2005; Dahl *et al*., 2007). These sources can include rain, waves breaking, surface wind, seismic and biological noise. Natural, biological noises can include marine mammals and certain fish and shellfish species, while anthropogenic noise results predominantly from ships in transit, fishing boats, industrial activities, and leisure activities.

Other sources of subsea noise include impact noises, bubble noise, turbulence, seismic activities, cavitation, machinery and/or industrial noise, and tonals (sonar systems) (Harland *et al*., 2005).

Sources of ambient noise such as aggregate extraction, commercial shipping and fishing, leisure crafts, offshore and onshore industrial noise, military noise, sonar activities, aircraft noise, biological and thermal noise have all been exhibited within SEA 6 (St Georges Channel, the Irish Sea, and the North Channel) and more specifically, Liverpool Bay (Harland *et al*., 2005).

The ambient noise level in the Irish Sea is expected to be relatively high due to the combination of natural and anthropogenic sounds within the region (ENI, 2021). Anthropogenic noise within and surrounding the development area has been evidenced to predominantly arise from shipping noise with industrial, shore and natural noise also being present to a lesser extent (Harland *et al*., 2005).

In addition, operational wind farms at North Hoyle and the construction and subsequent operation of the Rhyl Flats and Burbo Bank OWF will additionally contribute to anthropogenic noise levels in proximity to the development area (CMACS, 2005).

Considering the location and impact of offshore developments, a thorough knowledge of the baseline ambient noise levels is required to judge the likely impacts of subsea noise resulting from construction, operation and maintenance, and decommissioning. The issue lies in defining which measurements are required in order to effectively characterise ambient noise levels over a wide geographic range (SEA 6) encompassing various types of acoustic environments (Harland *et al*., 2005).

It is also increasingly important to understand how baseline noise levels will vary depending on the sea state and seasonal fluctuations. To make accurate predictions within the context of the baseline, it is imperative to understand the range of noise levels and types likely to be encountered, specifically within Liverpool Bay.

For example, the effect of shipping noise, the predominant source of noise in Liverpool Bay and therefore the development area, is highly dependent on the time of year and depth which cause variations in the temperature structure of water (Harland *et al*., 2005).

While subsea ambient noise is dependent on a wide range of physical, anthropogenic, and natural sound sources, these can come together in a highly complex manner that directly results in significant spatial and temporal variations (Harland *et al*., 2005).

6.3.3.2 Site-Specific Surveys

Site-specific surveys were conducted at the Gwynt y Mor OWF, located in the southwest corner of the development area to determine the pre-existing background noise levels present at the site (CMACS, 2005).

Subsea ambient noise levels for the area were found to be highly variable between surveyed sites, varying from below 120 dB re 1 uPA per band level to 147 dB re 1 uPA per band level (CMACS, 2005). A variation of nearly 30 dB was found to be typical up to a frequency ~ 20 kHz (CMACS, 2005). Considerable variations were illustrated between multiple survey locations which were attributed to several factors including wind noise, wave crash, flow noise, and industrial noise from nearby renewable energy developments and shipping (CMACS, 2005). Variations can also be attributed to bathymetric variation affecting the water depth and tidal regime.

6.3.4 Proposed Additional Data Collection

Based on the baseline data and information identified above, additional data will need to be collected to inform the EIA Report, specifically within the development area.

It is recommended that the following method be used to further characterise noise within the SEA 6 region, and more importantly Liverpool Bay and the subsequent development area:

- Collect and analyse data on sound sources within the SEA 6 region to fill data gaps. Data should provide spectra, source levels and variability information for each sound source;
- Collect information on the distribution and number of sources to be included in potential models of ambient noise;
- Assemble the input data required to run an ambient noise model (if being undertaken);
- Run the model to provide the required noise field data and collect additional data from a selected number of sites within the SEA 6 region to validate the model; and
- Iterate the model to improve geographic resolution and include additional sources (Harland *et al.,* 2005).

6.3.5 Potential Project Impacts

Subsea noise is not a receptor itself, but rather a medium that is a part of the impact pathway that affects other receptor groups. A range of potential project impacts from subsea noise on varying receptors have been identified, which could potentially occur during the construction, operation and maintenance, and decommissioning phases of the Proposed Development.

Impacts resulting from subsea noise that have been scoped in to and out of the assessment are further detailed in Section 7.2: Fish and Shellfish Ecology, Table 1.9 and Table 1.10 and Section 7.3: Marine Mammals, Table 1.17 and Table 1.18.

6.3.6 Proposed Assessment Methodology

The subsea noise EIA Report will consider the potential impact pathways affecting other receptor groups during the construction, operation and maintenance, and decommissioning phases of the development area regarding subsea noise and will follow the methodology outlined in Section 5. Appropriate guidance documents to be considered are further detailed in Section7.2: Fish and Shellfish Ecology and Section 7.3: Marine Mammals.

6.3.6.1 Cumulative Effects

The potential effects related to the construction, operation and maintenance, and decommissioning of the Proposed Development subsea noise on receptor groups will assess the potential cumulative effects that could occur from cumulative subsea noise related to alternate projects and/or activities that take place within the development area and the wider region. Cumulative effects relevant to fish and shellfish

ecology and marine mammals are further detailed in Section 7.2: Fish and Shellfish Ecology and Section 7.3: Marine Mammals.

6.3.7 Potential Mitigation

Embedded mitigation measures utilised in regard to the development area as a part of the Proposed Development will be further discussed within the relevant sections of the EIA Report, where subsea noise is considered relevant. Specifically, the proposed mitigation measures related to minimising the potential impacts of subsea noise on fish and shellfish ecology, marine mammals, and commercial fisheries and aquaculture will be further assessed.

Additional measures will depend on the significance of effects of subsea noise on receptors identified within each topic and will be consulted upon throughout the EIA Report process.

6.4 Air Quality

6.4.1 Study Area

The air quality study area comprises the local environment (Liverpool Bay) and the national environment (England and Wales). The effects arising from the potential impacts on air quality are considered to impact on a local level. This section will specifically look at the potential impacts of the development area during construction, operation and maintenance, and decommissioning phases on the offshore air quality within Liverpool Bay.

6.4.2 Baseline Environment

Information regarding offshore air quality has been collated through a detailed and comprehensive review of currently accessible studies and datasets. To provide a wider context, the desktop review has considered the air quality present within the broader offshore area in proximity to the development area and the greater Irish Sea. Key data sources are listed in Table 6-5, noting that this list is not exhaustive.

Table 6-5: Summary of Key Desktop Data Sources to Inform the Offshore Air Quality Scoping Assessment.

Title	Source	Year	Author
UK Air – Air Information Resource	DEFRA	2022	DEFRA
Air Quality Guidance	UK GOV	2019	UK GOV
Offshore Energy SEA – Air Quality	UK GOV	2009	UK GOV
LBA CCS Transport and Storage Project Feasibility Study Phase PRE-ESHIA	Eni Progetti	2021	Eni
The Offshore Combustion Installations (Pollution Prevention and Control) Regulations	BEIS	2016	BEIS

6.4.2.1 Desktop Study

The air quality study area for the assessment of the development area on the surrounding air quality is broadly northwest England and northeast Wales. The development area is located approximately 12 km off the north coast of Wales and 2 km off the west coast of England in Liverpool Bay.

Due to the offshore location of the development area, typical sources of pollution that would be present with an onshore development, such as road traffic, rail, agriculture, and general dusts are not present.

The existing sources of pollution in the air quality study area include natural atmospheric systems including sea salt aerosol, which is a common natural source of dust in coastal areas. The only other source of note includes marine vessels (commercial, fishing, and recreational), operating periodically in the area, and the oil and gas infrastructure within the area.

Pollutants that affect offshore air quality are dependent on the rate of release, location, and weather conditions in the area, as well as the level and/or amount of pollutant, determining the local concentration and subsequent impacts.

Typically, onshore air quality study areas follow guidelines set out by the Institute of Air Quality Management (IAQM). These guidelines often designate ecological receptors within 50 m of potential landfall construction activities and human receptors within 350 m of potential landfall construction activities.

According to the Marine Management Organisation (MMO), the development area is located within the North West Inshore Marine Plan (MMO, 2020). This area is considered to be a highly populated, industrial area adjacent to the coast and surrounding major ports. The major ports located within the North West Inshore marine plan and their associated activities are:

- Liverpool (Seaforth, Birkenhead) – commercial, container, bulk cargo, and general cargo shipping, as well as ship fabrication and repair;
- Manchester (via the Manchester Ship Canal) – commercial, container, and bulk cargo shipping;
- Fleetwood (Associated British Ports) – fishing, offshore gas, and general cargo shipping;
- Heysham (Peel ports) – ferry, bulk cargo, and offshore gas shipping; and
- Barrow in Furness (Associated British Ports) – general cargo, bulk cargo, shipbuilding, and offshore wind shipping.

None of the aforementioned port areas within the North West Inshore are designated AQMAs. There are however localised air quality issues associated with the Stanlow Oil Refinery, located approximately 45 km southeast of the offshore development area and known to affect the Mersey Estuary SSSI (MMO, 2020; UK GOV, 2019).

The main emissions discharged into the atmosphere that are considered by current English and Welsh regulations are:

- Oxides of nitrogen (NOx);
- Sulphur dioxide (SO2);
- PM2.5 and PM10;
- Carbon monoxide (CO); and
- Volatile Organic Compounds (VOCs) (BEIS, 2016).

These emissions are known to cause air pollution and are often associated with offshore installations and developments (BEIS, 2016). The majority of air pollution that is found within the North West Marine Plan area is a result of major shipping routes and large coastal cities including Liverpool, Blackpool, and Lancaster (UK GOV, 2019).

In the UK, the responsibility for meeting air quality limit values is devolved to national administrations in Northern Ireland, Scotland, Wales and England. At a national level, the UK Government and the devolved administrations are required under the Environment Act 1995 to produce a national air quality strategy, with the overall purpose of covering the entirety of the UK. The air quality strategy prioritises the three main pollutants which are nitrogen dioxide (NO_2), ozone (O_3) and particulate matter ($PM_{2.5}$ and PM_{10}) (ENI, 2021).

6.4.2.2 Site-Specific Surveys

No site-specific baseline surveys have been undertaken. The data from desk-based, publicly available source presented here is taken as representative of the baseline air quality in the study area.

6.4.3 Potential Project Impacts

A range of potential project impacts on offshore air quality have been identified which could potentially occur during the construction, operation and maintenance, and decommissioning phases of the Proposed Development.

Impacts that have been scoped into the assessment are outlined in Table 6-6, while impacts that will potentially be scoped out of the assessment are presented in Table 6-7.

Table 6-6: Impacts Proposed to be Scoped into the Assessment for Offshore Air Quality.

Potential Impact	Project Phase			Justification
	C	O	D	
Emissions to the atmosphere	✓	✓	✓	**All phases** • There is potential for emissions into the atmosphere to occur during the construction, operation and maintenance, and decommissioning phases of the Proposed Development. These emissions would potentially range from those incorporated in materials utilised in construction, the number and type of offshore vessels utilised, and venting processes (fugitive emissions, venting, and leaks) undertaken in the development area.
Exhaust emissions from offshore vessels	✓	✗	✗	**Construction phase** • Offshore vessels utilised during the construction phase of the development have the potential to increase local ambient concentrations of sulphur dioxide (SO_2),nitrogen dioxide NO_2, and particulate matter PM_{10} and $PM_{2.5}$ and impact human health. • The specific port locations where vessels will travel to and from to support offshore construction, operation and maintenance and decommissioning activities has not yet been identified, however it is likely to be an established commercial/industrial port in close proximity to Liverpool Bay. Engine exhausts from offshore vessels associated with the construction, operation and maintenance, and decommissioning phases would contribute, at a small scale, to atmospheric emissions from existing shipping traffic in the area. It is considered that associated atmospheric emissions of infrequent vessel movements associated with the Proposed Development would be negligible in comparison to the total shipping activity in the area.

Table 6-7: Impacts Proposed to be Scoped out of the Assessment for Offshore Air Quality.

Potential Impact	Project Phase			Justification
	C	O	D	
Potential effects on air quality from dust and emissions	✓	×	×	**Construction phase** • The assessment of potential impacts on air quality typically addresses the potential for impacts from dust and traffic/plant emissions on nearby sensitive receptors. As the development area relates to the construction of offshore infrastructure only there is no potential for dust impacts. Furthermore, due to the distance of the development away from the shoreline, any potential impacts that might arise from emissions associated with plant or marine vessels are unlikely to give rise to likely significant effects due to the dispersal of emissions. There is unlikely to be potential for significant air quality impacts during either the operation and maintenance, or decommissioning phases of the development area.
Odour during construction activities	✓	×	×	**Construction phase** • Potential odour risk given the nature of the Proposed Development and its offshore location away from both the English and Welsh coastlines would be transient.

6.4.4 Proposed Assessment Methodology

An air quality assessment will be assessed by comparison to the relevant air quality standards and guidelines for the protection of human health, and critical loads and critical level for the protection of sensitive habitats. These will be derived from appropriate sources, including:

- UK Environment Agency (EA) Carbon Calculator for Construction Sites;
- European Environment Agency (EEA) EMEP/EEA Air Pollutant Emission Inventory Guidebook 2019: Technical Guidance to Prepare National Emission Inventories - (Section 1.A.3.d Navigation (shipping)) (2019);
- Directive on Ambient Air Quality and Cleaner Air for Europe (2008/50/EC) (CAFE Directive);
- Air Quality Standards Regulations (S.I. 180 of 2011);
- the Environment Agency H1 guidance document; and
- Air Pollution Information Systems (APIS) guidelines.

Impacts to air quality will be assessed at all off-site locations, to represent sensitive human receptors. Impacts will also be assessed at sensitive habitats. Following the Environment Agency H1 guidance document, within 15 km of the development area the following habitats will be assessed: Special Areas of Conservation (SACs); Special Protection Areas (SPAs), and Ramsar sites. In addition, within 2 km Sites of Special Scientific Interest (SSSIs) declared for reasons of ecological interest will also be considered. Impacts will also be identified at nearby non-statutory sites (for example, Local Nature Reserves, National Nature Reserves, Biodiversity Action sites etc.); however, the impacts on these sites will be considered only in a small amount of detail.

6.4.4.1 Cumulative Effects

The potential effects related to the construction, operation and maintenance, and decommissioning of the Proposed Development offshore air quality will assess the potential cumulative effects that could occur on offshore air quality related to alternate projects and/or activities that take place within the development area air quality study area and the wider region.

6.4.5 Potential Mitigation

The following designed in measures, and how these can reduce potential for impact, have been considered in identification of impacts that are proposed to be scoped into and out of the Proposed Development Offshore EIA Report.

A bespoke Code of Construction Practice (CoCP) will be prepared for the construction phase of the Proposed Development and will include:

- a detailed project description with figures illustrating location of proposed construction and operation activities, and main ports used for vessels to and from the offshore construction site;
- adherence to all legislative requirements;
- a proposed programme of work;
- a summary of Environmental Management Procedures including roles and responsibilities, sub-contractors and evidence of training, awareness and competence of on-site personnel;
- procedures for communication; and
- details of environmental management plans, including an air quality management plan to minimise the generation and potential impacts of dust emissions on receptors relevant for human health, amenity and ecology.
- A Dust and Air Quality Management Plan within the CoCP will include good practice measures in accordance with the Institute of Air Quality Management (IAQM) guidance (DEFRA, 2017; IAQM, 2018), proportionate to the potential impacts which notes that, even close to well-managed mineral extraction sites in the UK, impacts from release of dust on habitats, are rare. If effects are rare close to large-scale, long-term mineral extraction sites, then impacts from smaller-scale, well-managed temporary construction, operation and decommissioning activity can be concluded to be negligible and therefore scoped out of further assessment.
- An Environmental Management Plan (EMP) will be prepared and implemented during the construction, operation and maintenance, and decommissioning phases of the development area. The EMP will include mitigation/monitoring measures and commitments relating to energy use:
  - Regular maintenance of plant and equipment used during the construction phase. Technical inspection of vessels and plant to ensure they will perform the most efficiently.
  - All vessel engines should be properly maintained in line with manufacturers requirements ensure emissions are minimised.
  - Implement an Energy Management System for the duration of the works;
  - The contractor will be required to measure and record all activity data (fuel use, material use, transport, etc.) to allow for the development of a carbon footprint for the construction phase of the Proposed Development.
  - Materials with a reduced environmental impact may also be incorporated into the construction design through re-use of materials or incorporation of recycled materials in place of conventional materials.

6.5 Climate Change

6.5.1 Introduction

This section of the scoping report considers potential impacts on and due to climate change. In line with Schedule 6 of the EIA Regulations and IEMA's guidance (IEMA 2017; IEMA 2020), the relevant aspects of climate change impact to consider are:

- The emission of greenhouse gases (GHGs) contributing to climate change, including cumulative impacts;
- The potential risks to the development from a changing climate and its vulnerability;
- The potential in-combination effects of climate change with other environmental impacts assessed; and
- The potential effects of accidents or disasters.

The potential for each to lead to significant environmental effects, and hence whether they should be included in the scope of the EIA, is discussed in this section; and for those impacts where there is considered to be potential for likely significant effects, the proposed approach to the assessment is set out.

6.5.2 Baseline Environment

6.5.2.1 Desktop Study

Information regarding GHG emissions leading to climate change has been collated from published datasets. Key data sources are listed in Table 6-8, noting that this list is not exhaustive.

Table 6-8: Summary of Key Desktop Data Sources to Inform the Climate Change Scoping Assessment.

Title	Source	Year	Author
Report to Parliament	Climate Change Committee (CCC)	2021	CCC
HyNet North West EIA Report (onshore project EIA scoping report)	Infrastructure Planning Inspectorate	2021	WSP UK, Ltd
2019 UK Greenhouse Gas Emissions	Department for Business, Energy and Industrial Strategy (BEIS)	2019	BEIS
Met Office Climate Profile of North West England	Met Office	2020	Met Office
Met Office Climate Profile of Wales	Met Office	2020	Met Office
The Wave Climate of Liverpool Bay – Observations and Modelling	Ocean Dynamics	2011	Wolf, Brown and Howarth
Past to Future Extreme Events in Liverpool Bay: Model Projections from 1960-2100	Climatic Change	2012	Brown, Wolf and Souza

A 2019 study conducted by the Department for Business, Energy and Industrial Strategy (BEIS) found that CO_2 accounted for 80% of all greenhouse emissions in the UK (BEIS, 2020) expressed in equivalent global warming potential. UK GHG emissions from 2019 exceeded 450 $MtCO_2e$ with the transport sector responsible for 27% of this value, energy sector 21%, business sector 17%, residential sector 15%, and agricultural sector 10% (BEIS, 2020).

According to Met Office data, the development area is situated in both Wales' and North West England's official regional climate profiles (Met Office, 2020). These climate profiles exhibit high degrees of

environmental variability, being some of the most exposed locations to strong Atlantic winds and maritime airmasses leading to significant amounts of precipitation (Met Office, 2020). Predicted effects from climate change include, amongst other things, an increase in global temperature and potentially, an increased frequency of extreme weather events (National Academies of Science, 2016).

Research findings show that future extreme wind and wave events will be closely related to future North Atlantic storm tracks, with the forthcoming wave climate of Liverpool Bay not being expected to change significantly from those events currently exhibited in present day (Wolf *et al.,* 2011). Additionally, the analysis of a 140-year times series (1960-2100) illustrated that although there was a slight increase in the severity of most extreme events, there was little change in the extreme wave and surge conditions within Liverpool Bay (Brown *et al*., 2012). Results from recent findings additionally illustrate that there were no compelling trends in storminess and wind variability over the last four decades and global projections into 2100 show similar results (Met Office, 2019).

6.2.1 Proposed Additional Data Collection

Data utilised for the scoping report and therefore the EIA Report will be comprised of a mixture of project design data and published reference data. In specific cases where project data will be difficult and timely to collect, reliance will be on published studies that can be used as proxy data.

6.2.2 Potential Project Impacts

6.5.2.2 GHG emissions

IEMA's assessment guidance (IEMA, 2017) indicates that in principle, any GHG emissions may be considered to be significant, and advocates as good practice that GHG emissions should always be reported at an appropriate, proportionate level of detail in an ES.

The purpose of the Proposed Development is to provide for the transport and long-term geological sequestration of CO_2 that has been captured through the onshore carbon capture infrastructure, which is expected to remove more than one million tonnes of CO_2 emissions from the atmosphere annually (Patterson, 2021). In this context, GHG emissions occurring from the Proposed Development's construction, operation and maintenance, and decommissioning, in combination with the GHG emissions occurring from the HyNet North West Project overall, are likely to be very minor compared to the CO_2 sequestration benefit.

Nevertheless, in line with IEMA's guidance and the strong policy drivers to minimise GHG emissions at all life cycle stages of development, a proportionate assessment of GHG emissions will be undertaken and mitigation measures identified where appropriate. This assessment will be undertaken against the context that the principal driver of the Proposed Development is to capture, transport, and sequester CO_2 from large industrial CO_2 emitters, as part of the UK policy drive to achieve Net Zero.

6.5.2.3 Climate Risks

Climate change has the potential to increase the frequency and/or severity of extreme weather events, which could therefore pose an increased risk to the development, although as set out in Section 6.5.2.1 above, there is no clear indication of significant changes that are likely in the wind and wave environment in the location of the Proposed Development over its operating lifetime.

The Proposed Development will be re-using and refurbishing existing offshore infrastructure that has been designed for resilience to storms in Liverpool Bay and has been proven operationally. The design of refurbishment works to the sea-surface infrastructure will be to appropriate engineering and safety standards taking into account metocean data for this location. The pipeline and gas injection well are all undersea (and indeed under the seabed in the case of the sequestration volume) with minimal vulnerability to storm events.

Given the use of existing infrastructure that is either inherently at low risk or has been designed for resilience to extreme weather events, a further climate change risk and development vulnerability/adaptation assessment for the development is proposed to be scoped out of the EIA.

The risk of major accidents and disasters will be assessed in the EIA. This will include assessment of the effects of an accidental release of CO_2 from the pipeline, injection well or sequestered storage, which based on the engineering design and geological suitability of the chosen formation for CO_2 sequestration is considered to be a very low likelihood but, if it were to occur, potentially high impact magnitude event.

6.5.2.4 In-Combination Effects of Climate Change

A degree of climate change is already 'locked in' over the course of the Proposed Development's lifetime, notwithstanding the expected beneficial effect of the development itself in sequestering CO_2. The changing climate has the potential to modify other environmental impacts of the development, for example by causing additional stress to marine ecology receptors and therefore increasing their sensitivity to development impacts.

These in-combination effects will be assessed in the applicable topic chapters within the ES, through consideration of how climate change is likely to affect the future baseline environment and sensitivity of receptors.

6.5.2.5 Proposed Scope

The impacts that are proposed to be scoped into the assessment are detailed in Table 6-9. The impacts that are proposed to be scoped out of further assessment are provided in Table 6-10.

Table 6-9: Impacts Proposed to be Scoped into the Assessment of Climate Change Impacts.

Impact	Project Phase			Justification (Including Consideration of Designed in Measures)
	C	O	D	
GHG emissions associated with construction/refurbishment activities, including materials, transport and use of plant / offshore marine vehicles	✓	×	×	These GHG emissions would contribute to the lifecycle total and net GHG balance of the development; These GHG emissions would potentially contribute to the lifecycle total and net GHG balance of the development through construction stage effects. Further assessment will enable carbon reduction measures to be explored.
GHG emissions associated with materials and use of offshore marine vehicles required for operation and maintenance	×	✓	×	These GHG emissions would contribute to the lifecycle total and net GHG balance of the development; assessment will enable carbon reduction measures to be explored where applicable.
GHG emissions associated with energy and fuel use during the operation phase	×	✓	×	The development includes construction of a new energy supply to the offshore infrastructure; GHG emissions from its use would contribute to the lifecycle total and net GHG balance of the development; assessment will enable carbon reduction measures to be explored.
GHG emissions from decommissioning works (plant, fuel	×	×	✓	Although the Proposed Development is designed to provide infrastructure in the long term, with decommissioning stage works occurring at a point in the future when energy

Impact	Project Phase			Justification (Including Consideration of Designed in Measures)
	C	O	D	
and vessel use) and recovery or disposal of materials				and transport have been substantially decarbonised; and recycling processes are further established, the Proposed Development has a potential lifetime ranging from 25-40 years. New pipelines will be designed for a lifetime of 40 years and other system assets, including capture plants, heaters, and compressors will be designed for a 25-year operational lifetime. Decommissioning phase impacts have the potential to be no greater than those exhibited during construction.
CO_2 transportation, sequestration and long-term storage	×	✓	✓	The purpose of the Proposed Development is to enable CO_2 transport, sequestration and storage, with this being the main likely significant effect. Any planned venting of CO_2 during system maintenance will also be assessed, regardless of the expected quantity.

Table 6-10: Impacts Proposed to be Scoped out of the Assessment for Climate Change.

Impact	Project Phase			Justification (Including Consideration of Designed in Measures)
	C	O	D	
GHG emissions from leaks and/or damage to the Proposed Development components within the development area into the environment during operation or during long-term sequestration use following decommissioning of the infrastructure	×	✓	✓	Emissions from potential leaks and damage to the structural integrity of the development area offshore components could lead to increases in surrounding CO2 pollution and concentration, causing impacts to environmental and human health in the immediate vicinity and/or partial or full reversal of the sequestration benefits of the development. However, these are not considered to be likely or expected effects of the Proposed Development. Engineering and geological studies undertaken in the planning of the sequestration facility to date have shown its suitability for stable, long-term storage and the purpose of the engineering design of the facility will be to ensure this is achieved.

Impact	Project Phase			Justification (Including Consideration of Designed in Measures)
	C	O	D	
				Any material amount of CO2 leakage is therefore considered to be possible in an accident or disaster scenario; the possibility of such effects will be assessed in the Accidents and Disasters chapter of the EIA.
In-combination effects of climate change with other environmental impact pathways	✓	✓	✓	In-combination effects will be assessed in the applicable topic chapters within the EIA, through consideration of how climate change is likely to affect the future baseline environment and sensitivity of receptors, and it will not be duplicated within the scope of the climate change EIA chapter.
Climate change risk to the Proposed Development and resilience/adaptation measures	✓	✓	✓	Studies conducted from Liverpool Bay have shown that extreme wind and wave climates are not expected to change significantly from those that are currently exhibited in present day. Additionally, long-term analyses have illustrated that although there was a slight increase in the severity of most extreme events, there was little change in the extreme wave climate predicted for Liverpool Bay. The Proposed Development will be re-using and refurbishing existing offshore infrastructure that has been designed for resilience to storms in Liverpool Bay and has been proven operationally. The design of refurbishment works to the sea-surface infrastructure will be to appropriate engineering and safety standards taking into account metocean data for this location. The pipeline and gas injection well are all undersea (and indeed under the sea bed in the case of the sequestration volume) with minimal vulnerability to storm events.

6.2.3 Proposed Assessment Methodology

6.2.3.1 GHG Emissions Impact

The climate change assessment will take into account the IEMA Environmental Impact Assessment Guide 'Assessing Greenhouse Gas Emissions and Evaluating Their Significance, 2nd Edition' (IEMA, 2022. It will be undertaken on a lifecycle basis, calculating the GHG emissions associated with the construction and operation of the Proposed Development, with reference to the framework set out in Publicly Available Specifications (PAS) 2080:2016 Carbon Management in Infrastructure (BSI, 2016).

The main sources of GHG emissions associated with the Proposed Development would be:

- the 'embodied carbon' of materials used in the refurbishment works and for the new electrical cables (caused by manufacturing and delivery)
- fuel/energy use in vessels and plant during the construction phase;
- operational energy or fuel use for the development, for example to operate equipment such as pumps or compressors; and
- fuel/energy use in vessels and plant for maintenance during the operation phase.

6.2.3.2 Assessment of Effects

The magnitude of impact will be expressed as tonnes of carbon dioxide equivalent (tCO_2e), using 100-year global warming potential values for non-CO_2 GHGs from the Intergovernmental Panel on Climate Change's Fifth Assessment Report or as otherwise defined in literature sources used.

The sensitive receptor will be defined as the global atmospheric concentration of GHGs, and it will be characterised as having a 'high' sensitivity, given the severe consequences of climate change.

There are no clear, generally agreed thresholds or methods for evaluating the significance of GHG impacts in EIA. The IEMA guidance referenced above recommends contextualising a development's GHG impacts, for example on a sectoral basis or compared to the UK's national carbon budget. It is considered that broadly speaking, the significance of the Proposed Development's GHG emissions can be contextualised in one or more of the following ways:

- with reference to the absolute magnitude of net GHG emissions as a percentage of the UK's national carbon budget and local authority or regional carbon budget (if available);
- through considering any increase/reduction in absolute GHG emissions and GHG intensity compared with the baseline scenario; and
- with reference to whether the Proposed Development contributes to and is in line with the UK's national carbon budget sectoral goals for GHG emissions reduction, which are consistent with science-based commitments to limit global climate change to an internationally-agreed level, taking into account the reduction of GHG emissions as a result of the Proposed Development.

Taking these factors into account, where applicable, the evaluation of significance will ultimately be a matter of professional judgement, as it is not considered that a fixed numerical threshold can be defined.

In due course, offshore emissions monitoring should be undertaken utilising the Offshore Combustion Installations (Pollution Prevention and Control) Regulations and Offshore Emissions Monitoring Guidance (BEIS, 2016).

The EIA Report will consider the potential impacts from the construction, operation and maintenance and decommissioning phases of the Proposed Development on climate change receptors. The proposed approach will follow best practice guidelines for undertaking impact assessments and will utilise key legislation and local policy that is relevant to the climate change assessment:

- The Climate Change Act 2008 (UK Government, 2008) and subsequent Carbon Budget Orders;
- The Climate Change (Carbon Budgets) (Wales) (Amendment) Regulations 2021 No. 332 (W.87) (UK Legislation, 2021);
- The Climate Change and Sustainable Energy Act 2006 (Sources of Energy and Technologies) Order 2008 (UK Legislation, 2008);
- The United Nations Framework Convention on Climate Change (UNFCCC, 2021);
- Greenhouse Gases Emissions Trading Scheme (ETS);
- The Offshore Oil and Gas Exploration, Production, Unloading and Storage (Environmental Impact Assessment) Regulations 2020 No. 1497 (UK Government, 2021a);
- Article 6 of the Energy Act 2008 (Consequential Modifications) (Offshore Environmental Protection) Order 2010 (UK Government, 2021b);

- Fluorinated Greenhouse Gases Regulations 2015 (UK Government, 2021c);
- Liverpool City Region Year One Climate Action Plan 2021/2022 (Liverpool City Region, 2021);
- Cheshire West and Chester Climate Emergency Response Plan 2021 (CWCC, 2021); and
- Flintshire County Council – Environment and Sustainability Policy (FCC, 2021).

6.2.3.3 Cumulative Effects

All developments that emit GHGs have the potential to impact the atmospheric mass of GHGs as a receptor, and so may have a cumulative impact on climate change. Consequently, cumulative effects due to other specific local development projects will not be individually predicted, as these are taken into account when considering the impact of the Proposed Development by defining the atmospheric mass of GHGs as a high sensitivity receptor in view of the contributions from all sources to climate change.

6.5.3 Potential Mitigation

The overall magnitude of GHG emissions that are associated with the design and construction of the development area can be reduced by considering the following measures:

- Design scenario to reflect the carbon reduction hierarchy (PAS 2080 Carbon management for infrastructure (BSI, 2016);
  - Reduce the overall elements that are required for the development area;
  - Reduce the requirements for construction materials;
  - Substitute and use alternative materials and resources with lower embodied carbon; and;
  - Use efficient construction processes.
- Maximise the opportunity to use sustainable and recycled materials where safe and sufficient for the required engineering integrity;
- Designing and constructing the development area to maximise its operational lifetime while minimising the need for associated maintenance;
- Implement an offshore Construction Environmental Management Plan (CEMP), incorporating a Site Waste Management Plan (SWMP) and Materials Management Plan (MMP) with appropriate personnel;
- Utilise effective equipment and materials that are known to be long-lasting, durable, energy efficient and reliable where appropriate;
- Minimise the overall quantity of materials utilised to construct the development area;
- Where appropriate, use locally sourced materials to minimise the distance materials and goods are required to travel;
- Where appropriate, use low emission vessels during construction, operation and decommissioning; and
- Where appropriate, use innovative offshore construction methods to reduce carbon outputs.

6.5.4 Summary

Climate Change Resilience (CCR) to future climate change will be considered during the design process. The design of the development area will take into account potential future climate change scenarios, for example, future resilience to extreme weather events based on metocean data.

Consideration of predicted changes in baseline environmental conditions, including changes in receptor sensitivity resulting from climate change, will be set out within each EIA Report topic chapter. The

assessment of effects for each topic will take into account identified trends or changes predicted to arise as a result of climate change.

GHG emissions can occur throughout the lifecycle of a development, from activities and materials required during construction and operation. This can be affected by factors such as material use and energy demand. The design of the Proposed Development would consider measures to minimise and mitigate greenhouse gas emissions, where possible, such as measures to control energy demand and improve energy efficiency. Such measures would be summarised in the EIA.

Overall, there is anticipated to be a positive effect on climate change as the development will play an essential role in transporting and sequestering carbon from the onshore capture hub, helping to decrease the UK's reliance on imported fossil fuels and simultaneously remove carbon emissions from the atmosphere.

7 OFFSHORE BIOLOGICAL ENVIRONMENT

7.1 Introduction

This chapter of the Offshore EIA Scoping Report identifies the offshore biological environmental receptors of relevance to the development area, which includes the pipelines and cables from MHWS to the offshore infrastructure. This chapter considers the potential impacts from the construction, operation and maintenance, and decommissioning of the offshore and intertidal components (seaward of the MHWS mark) of the Proposed Development. Specifically, this chapter will provide baseline data, proposed additional data collection, potential impacts, assessment methodologies, and mitigation measures related to impacts of the development area on benthic subtidal and intertidal ecology, fish and shellfish ecology, marine mammals and offshore ornithology.

7.2 Benthic Subtidal and Intertidal Ecology

7.2.1 Study Area

To support the development of the benthic subtidal and intertidal ecology section, two study areas are defined:

- The Proposed Development benthic subtidal and intertidal ecology study area: this is defined as the area encompassing the development area, offshore pipeline (including intertidal habitats up to the MHWS), and associated cables in Liverpool Bay (Figure 7-1). This is the area within which site-specific benthic surveys will be undertaken, the results of which will further inform the baseline characterisation. Also, the identification of benthic receptors against which potential impacts associated with the development area will be assessed for the EIA Report; and
- The Proposed Development regional benthic subtidal and intertidal ecology study area: this is defined as the area encompassing the wider Irish Sea habitats and includes the neighbouring consented offshore wind farms and designated sites (Figure 7-1). This area will be characterised by desktop data and will provide a wider context to the site-specific data collected within the benthic subtidal and intertidal ecology study area.

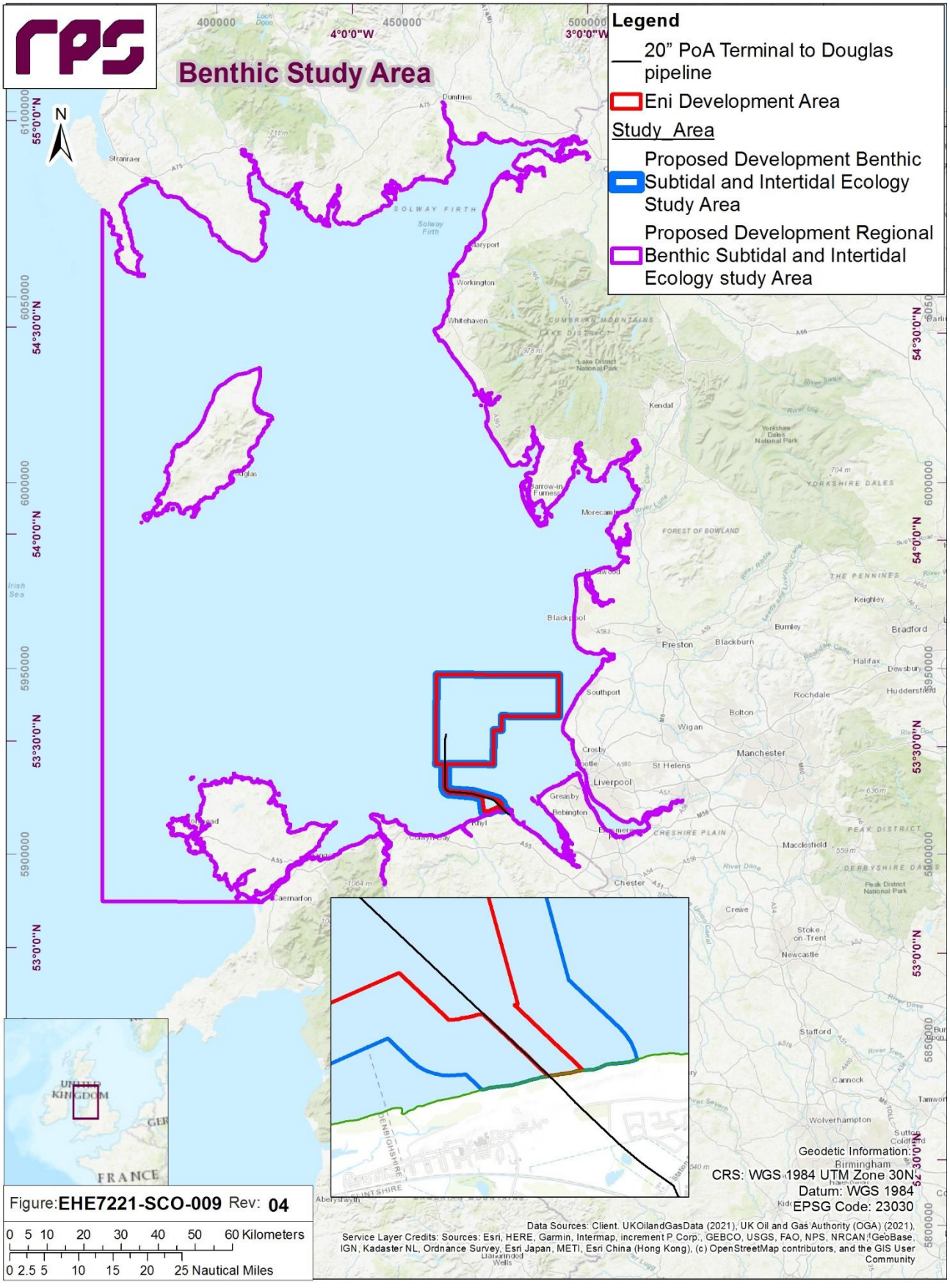

Figure 7-1: Illustrates the Proposed Development Benthic Subtidal and Intertidal Ecology Study Areas.

7.2.2 Baseline Environment

Information regarding the Proposed Development benthic subtidal and intertidal ecology study area in Liverpool Bay has been collated through a detailed and comprehensive review of currently accessible studies and datasets. To provide a wider context, the desktop review has considered the benthic subtidal and intertidal habitats, communities and species present within the regional benthic subtidal and intertidal ecology study area as well. Key data sources are listed in Table 7-1, noting that this list is not exhaustive.

Table 7-1: Summary of Key Desktop Data Sources to Inform the Benthic Subtidal and Intertidal Ecology Scoping Assessment.

Title	Source	Year	Author
Liverpool Bay Interactive Map	JNCC	2021	JNCC
Case Study – North Hoyle Offshore Wind Farm	OSPAR Commission	2010	OSPAR Commission
EU SeaMap	EMOD Net	2019	EMOD Net
LBA CCS Transport and Storage Project Feasibility Study Pre-ESHIA	ENI Progetti	2021	ENI Progetti
Burbo Bank Extension Offshore Wind Farm EIA Scoping Report	Dong Energy	2010	Sorenson *et al.,* (2010)
Gwynt y Mor Offshore Wind Farm Marine Ecology Technical Report	Centre for Marine and Coastal Studies	2005	CMACS

7.2.2.1 Desktop Study

Subtidal Sediments

The seabed within the regional benthic subtidal and intertidal ecology study area, situated in both English and Welsh territorial waters is dominated by circalittoral coarse sediment, circalittoral mixed sediment, circalittoral sand and circalittoral mud (EMODnet, 2019; ENI, 2021). Sandbanks present off the English coastline of Liverpool Bay include East Hoyle Bank, and portions of Great Burbo Bank. Sandbanks present off the Welsh coastline of Liverpool Bay include West Hoyle Bank, Dutchman Bank, and the Chester and Rhyl Flats (Natural England, 2010).

Based on 2019 EUSeaMap data, the Proposed Development benthic subtidal and intertidal ecology study area is predominantly comprised of circalittoral fine sand, deep circalittoral coarse sediment and deep circalittoral sand (Figure 7-2) (EU SeaMap, 2019). As the offshore pipeline moves from the development area towards the coastline of northern Wales and the MHWS, sandy sediments grade into circalittoral muddy sand, circalittoral coarse sediment, and circalittoral coarse rock (Figure 7-2) (EU SeaMap, 2019).

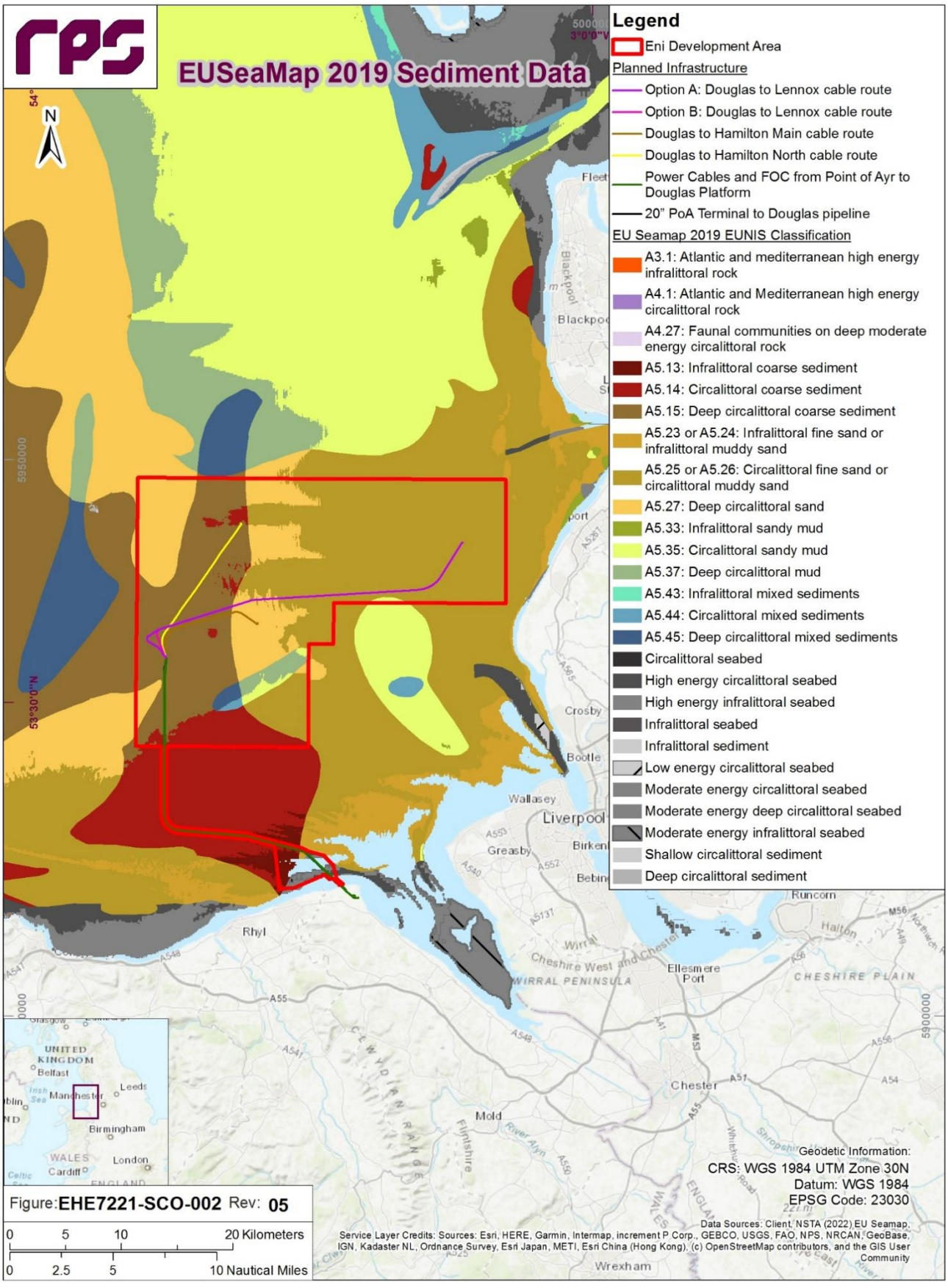

Figure 7-2: Illustrates the Sediment Type within the Eni Development Area and Regionally Across Liverpool Bay (EMODnet, 2019).

Gwynt y Mor offshore wind farm is located within the southwestern most corner of the development area. In 2002, the University of Liverpool Centre for Marine and Coastal Studies (CMACS) was commissioned to undertake a benthic study to characterise and better understand the surrounding environment.

Results illustrated that the area was found to be predominantly composed of medium and coarse sands, poorly sorted with varying degrees of coarser materials, such as stones and gravel (CMACS, 2005). These findings agree with those evidenced by the British Geological Survey (BGS) and information obtained from the EUSea Map 2019 datasets, describing the area as being composed predominantly of sand with varying degrees of mud, gravel and stone content (BGS, 1995; EUSea Map, 2019). Fine and sandy sediments are dominant in inshore waters and particle sizes range from 260 to 420 µm in areas with stronger currents and from 190 to 250 µm in areas with contrasting, weaker currents (ENI, 2021).

Seabed Communities

Pre- and post-construction benthic surveys conducted at Burbo Bank offshore wind farm in 2010, located approximately 9.8 km from the development area, and within the regional benthic and subtidal ecology study area, illustrated that the area was predominantly classified as a sublittoral sandbank with sandy sediments and associated fauna (Sorenson *et al*., 2010).

The Burbo Bank Offshore Wind Farm OWF scoping report found that there were two main biotopes present within the footprint of the offshore array. These biotopes were identified as:

- IGX.FabMag (*Fabulina fibula* and *Magelona mirabilis* with venerid bivalves present in infralittoral compacted sand); and
- IGS.NcirBat (*Nephtys cirrowsa* and *Bathyporeia* spp. in infralittoral sand).

The aforementioned biotopes are known to support various polychaete and bivalve species (Sorenson *et al*., 2010). It has been evidenced that benthic habitats classified with sandy sediments tend to support significant numbers of infaunal communities and fewer epifaunal species (Sorenson *et al.,* 2010; Henseler *et al.,* 2019; Somerfield *et al*., 2019). Organisms within these communities tend to have shorter lifespans and exhibit higher degrees of natural variability and recoverability, traits common in benthic communities located within energetic environments (Sorenson *et al*., 2010). These organisms are also well adapted to the surrounding high energy conditions and are therefore more tolerant to the overall changes in sediment movement and disturbance.

Benthic sampling was additionally undertaken at Site Y disposal grounds, just north of the Site Z disposal grounds during the 2015 survey period (Bolam *et al*., 2016). While Site Z analyses focused primarily on sediment contamination and the presence of heavy metals, the Site Y analyses prioritised understanding the macrofaunal assemblages that were present within Liverpool Bay (Figure 7-3).

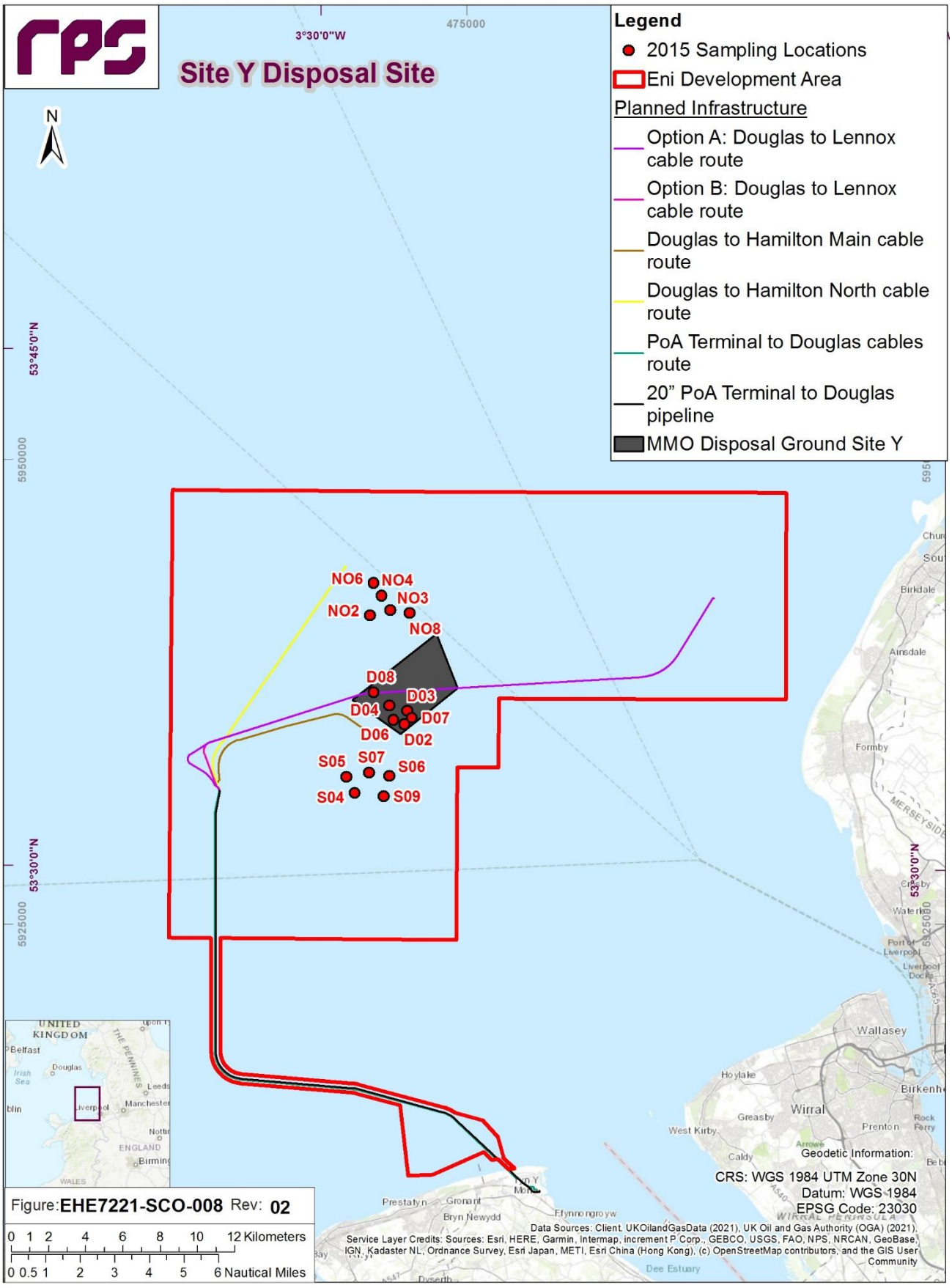

Figure 7-3: Illustrates the Site Y Disposal Grounds and 2015 sampling locations (Bolam *et al.*, 2016).

Benthic grab samples were collected at 16 distinct sites within Site Y and were found to comprise a total of 138 taxa (Bolam *et al*., 2016). Results illustrated that the bivalve molluscs *Phaxus pellucidus* and *Mysella bidentata* were the most abundant taxa, present in 16 and 15 of the sample locations respectively, and the polychaete *Scalibregma inflatum* and *Nemertea* spp. (ribbon worms) were both present in 15 sample locations (Bolam *et al*., 2016). Further analysis evidenced that annelids were typically the most prevalent macroinvertebrate encountered in stations outside of the main disposal area and molluscan taxa were most abundant within the disposal area and less common in the peripheral reference sites (Bolam *et al*., 2016).

Grab samples were collected from the Gwynt y Mor OWF located in the southwest corner of the development area, overlapping the PoA Terminal to Douglas OP pipeline. Of the 256 collected samples, 44,445 individuals from 487 taxa were recorded (CMACS, 2005). All of the taxa recorded from the 2005 study had been previously recorded within Liverpool Bay and the Irish Sea. The surveys evidenced that the most abundant group by taxa were annelid worms (mostly polychaetes) (51%), followed by crustacea (18%), and echinoderms (5%) (CMACS, 2005).

Overall, similar to other findings presented within this study, the diversity and richness of fauna were not significantly high within this area of Liverpool Bay (CMACS, 2005). Higher diversity is typically found in areas characterised by gravel and/or coarse substratum, as opposed to the sandier environments exhibited from the study (CMACS, 2005).

The 2019 EUSeaMap broad-scale predictive model classifies and maps seabed sediment types according to the European Nature Information Systems (EUNIS) classification criteria. The system is able to identify keystone species that have been evidenced to inhabit areas with certain environmental conditions and can therefore act as an indicator, allowing inferences of overall community composition (ENI, 2021).

According to EUSeaMap 2019 data, the following EUNIS seabed classifications dominate the seabed within and surrounding the development area (Figure 7-2) (EUNIS, 2021):

- A5.14: Circalittoral Coarse Sediment – This habitat may be characterised by robust infaunal polychaetes, mobile crustacea and bivalves. Certain species of sea cucumber (e.g., Neopentadactyla) may also be prevalent in these areas along with the lancelet (*Branchiostoma lanceolatum*);
- A5.15: Deep Circalittoral Coarse Sediment – Animal communities in this habitat are closely related to offshore mixed sediments and in some area's settlement of Modiolus larvae may occur and consequently these habitats may occasionally have large numbers of juvenile *M. modiolus*. In areas where the mussels reach maturity their byssus threats bind the sediment together, increasing stability and allowing an increased deposition of silt;
- A5.25: Circalittoral Fine Sand – Characterised by a range of echinoderms including the sea urchin (*Echinocyamus pusillus*), polychaetes and bivalves. This habitat is generally more stable than infralittoral fine sand and subsequently supports a more diverse faunal assemblage;
- A5.26: Circalittoral Muddy Sand – Characterised by a variety of polychaetes, bivalves (*Abra alba* and *Nucula nitidosa*) and echinoderms (*Amphiura spp., Ophiura spp. and Astropecten irregularis*). These circalittoral habitats tend to be more stable than their infralittoral counterparts and as such support a richer infaunal community; and
- A5.27: Deep Circalittoral Sand - Offshore deep habitat with fine sand or non-cohesive muddy sands. Communities are typically dominated by polychaetes, amphipods, bivalves and echinoderms.

Multiple surveys undertaken in Liverpool Bay in connection with offshore wind farm developments have confirmed the benthic habitats and communities previously detailed. It has therefore been evidenced that Liverpool Bay, and more specifically the offshore extents where the development area will reside, are largely comprised of sandy, gravelly and muddy sediments, with polychaete, bivalve, and amphipod species being predominantly present (ENI, 2021; EU SeaMap, 2019).

Utilising data supplied by the Joint Nature Conservation Committee (JNCC) and the European Marine Observation and Data Network (EMODnet), there were no known Annex I Sandbanks, or OSPAR threatened and declining habitats found to be located within the development area. However, there is a small area of Annex I Reefs located within the development area along the northern border situated directly to the west of Southport, England, and a small area of intertidal biogenic reef (mussel beds) located to the east of the PoA Terminal to Douglas OP pipeline landfall location (Figure 7-4).

7.2.3 Designated Sites

There are a number of designated sites that occur within the regional benthic subtidal and intertidal ecology study area. These sites are further detailed in Figure 7-5 and Table 7-2.

Of particular interest to the development area benthic subtidal and intertidal ecology study area, is the Flyde MCZ, which is located within the development area along the north-eastern corner and has qualifying features related to subtidal sand and subtidal sands and gravel (MMO, 2016). Within the regional benthic subtidal and intertidal study area, the Ribble Estuary MCZ, Dee Estuary SPA and SAC, Shell Flat and Lune Deep SAC, Menai Strait and Conwy Bay SAC, Wyre-Lune MCZ, Morecambe Bay SAC, West of Walney MCZ, and Lavan Sands Conwy Bay SAC are also present (Table 7-2).

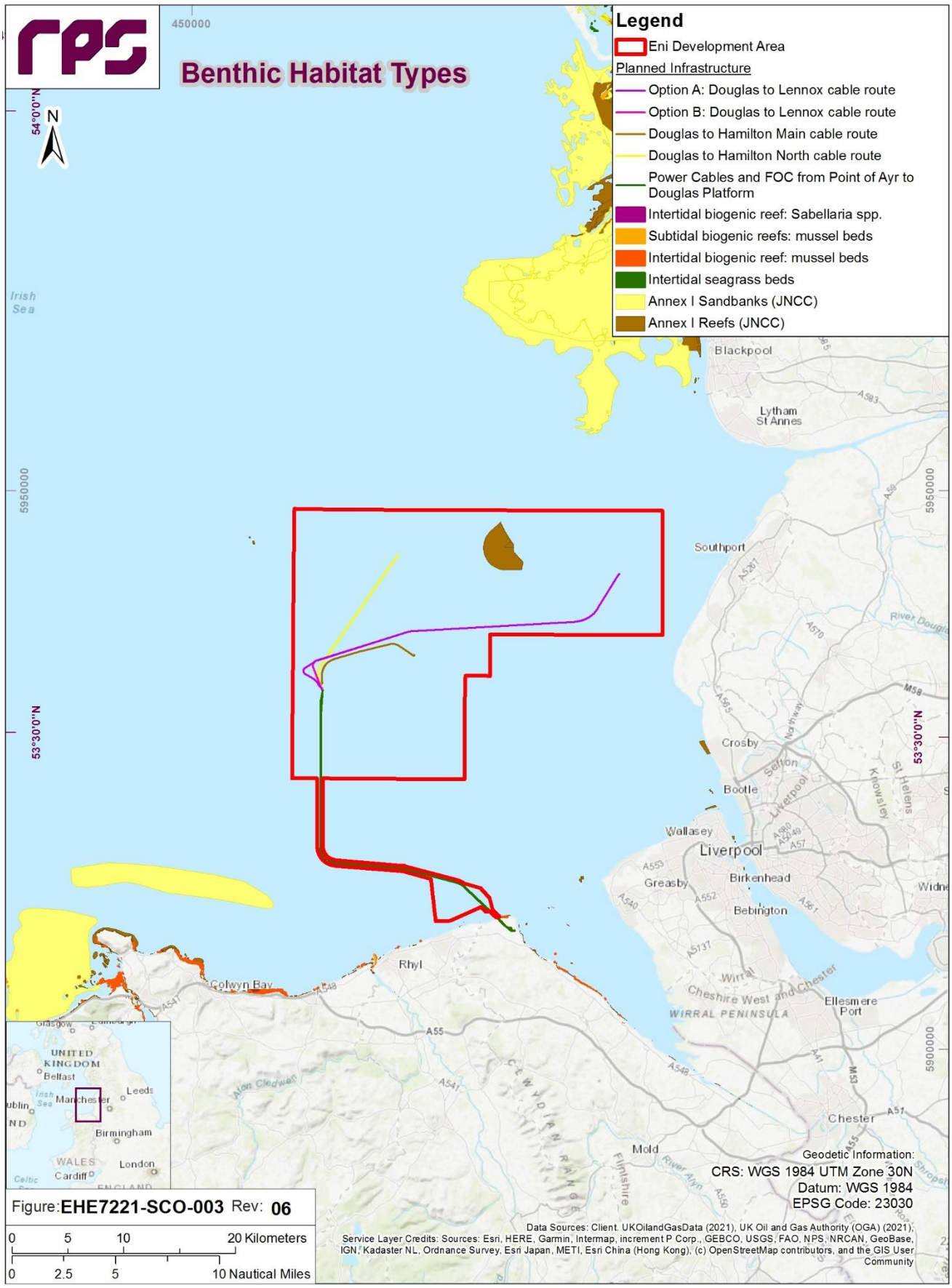

Figure 7-4 Illustrates the Annex I Sandbanks, Annex I Reefs, and OSPAR Threatened and Declining Habitats in Proximity to the Development Area.

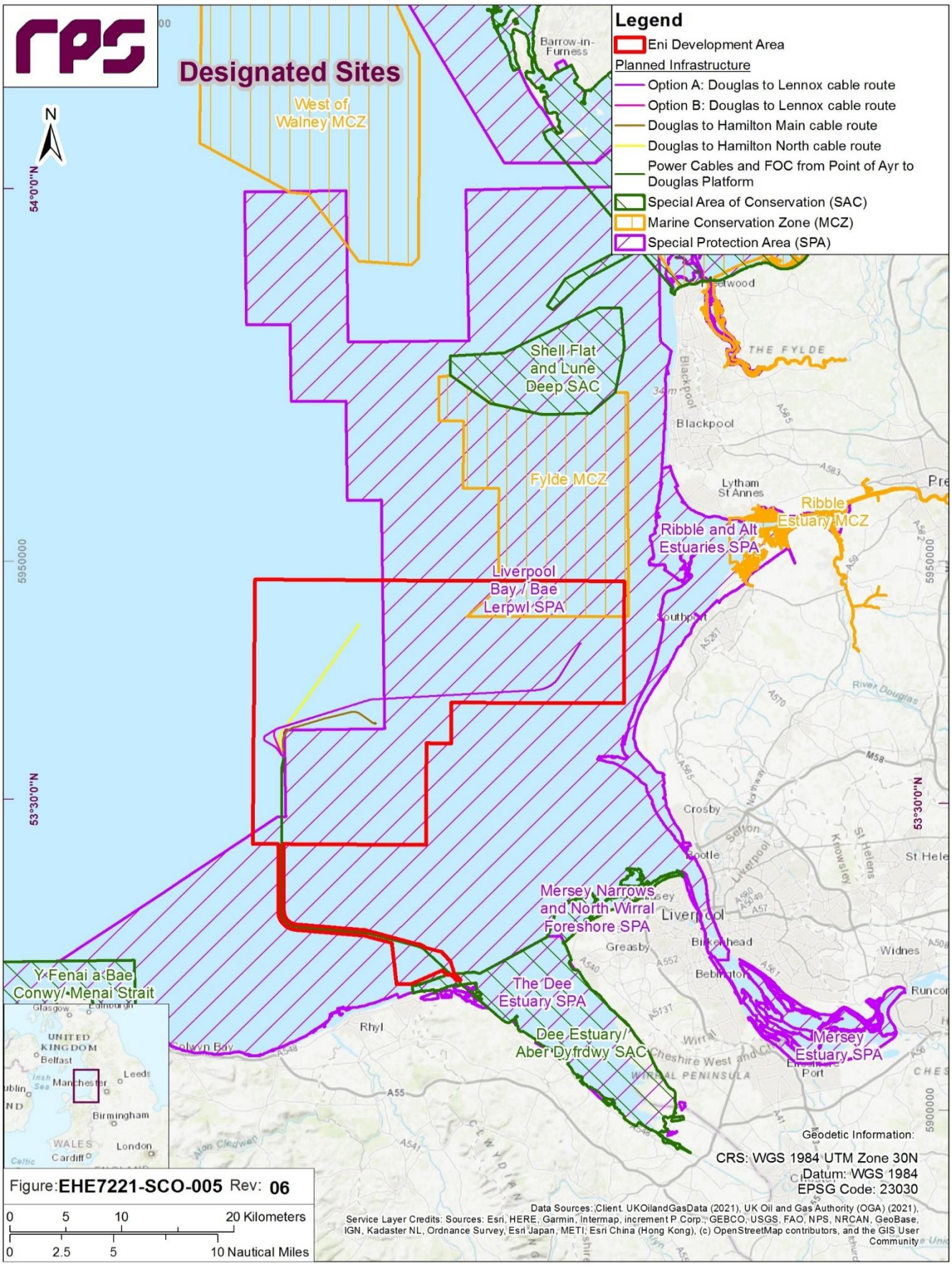

Figure 7-5: Designated Sites in Proximity to the Eni Development Area.

Table 7-2: Illustrates the UK Designated Sites within the Regional Benthic Subtidal and Intertidal Ecology Study Area relevant to Benthic Subtidal and Intertidal Ecology Receptors.

Designated Site	Distance to Eni Development Area	Qualifying Features and Site Description
Flyde MCZ	0.0 km	Flyde MCZ was designated in 2013 in order to maintain the broad scale habitat ”subtidal sand” and the habitat of conservation importance ”subtidal sands and gravels” which are situated in the area. The Flyde MCZ overlaps the Liverpool Bay SPA. **Qualifying Features:** Subtidal sand and subtidal mud which are highly productive and have been evidenced to support diverse bivalve mollusc populations. The Flyde MCZ is known to support an abundance of animals such as crabs, starfish, crustaceans, and bivalve species, including: nut-shell (*Nucula nitidosa*), razor shell (*Pharus legumen*) and the white furrow shell (Abra alba). Flatfish, including sole (*Solea solea*) and plaice (*Pleuronectes platessa*), in addition to whiting (*Merlangius merlangus*) are also supported by the habitat within the site (MMO, 2016).
Ribble Estuary MCZ	9.5 km	The Ribble Estuary MCZ is an inshore area covering approximately 15 km^2, located on the northwest coast of England (DEFRA, 2019a). **Qualifying Features:** Smelt (*Osmerus eperlandus*) is a protected feature within the MCZ and is known to congregate in large shoals, migrating to freshwater areas to spawn. This MCZ provides crucial habitat that is necessary for smelt to complete their lifecycle (DEFRA, 2019a).
Dee Estuary SPA and SAC	12.0 km	The Dee Estuary marine area is comprised of the Dee Estuary SPA and the Dee Estuary / Aber Dyfrdwy SAC. The Dee Estuary is one of the largest estuaries within the UK, comprising an area of over 140 km^2, with an intertidal area made up of predominantly mudflats, sandflats and saltmarsh (ENI, 2021). The estuary lies on the boundary between England and Wales and is known to be a site of major importance to waterbird species (MMO, 2021b). **Qualifying Features**: The Dee Estuary has been designated as a SAC because it hosts the following habitats: mudflats and sandflats not covered by seawater at low tide; *Salicornia* and other animals colonizing mud and sand; Atlantic salt meadows (*Glauco-Puccinellietalia maritimae*); and estuaries (MMO, 2021b).
Shell Flat and Lune Deep SAC	15.0 km	The Shell Flat and Lune Deep SAC is located between approximately 3 and 20 km to the east off the Lancashire Coast, at the mouth of Morecambe Bay. The site gets its name from the deep water channel (Lune Deep) and the large sandbank features (Shell Flat) situated to the north and the south (MMO, 2021d). **Qualifying Features:** Sandbanks which are slightly covered by sea water all the time and reefs. These features are considered representative of boulder and cobble reefs, and sandbanks that are present in the eastern part of the Irish Sea (MMO, 2021d).

Designated Site	Distance to Eni Development Area	Qualifying Features and Site Description
Menai Strait and Conwy Bay SAC	15.0 km	Menai Strait and Conwy Bay SAC is located in northwest Wales and is characterised as having unique physiographic conditions that are critical for marine wildlife (NRW, 2018). The variations in sediment composition, water clarity, and tidal regime result in a diverse collection of marine communities (NRW, 2018). **Qualifying Features:** Mudflats and sandflats not covered by seawater at low tide, reefs, and sandbanks which are slightly covered by seawater at all times (NRW, 2018; ENI, 2021).
Wyre-Lune MCZ	27.0 km	The Wyre-Lune MCZ is an inshore site covering an area of approximately 92 km^2 located in the southern portion of Morecambe Bay in the Irish Sea. **Qualifying Features**: Smelt is a protected feature within the MCZ and is known to congregate in large shoals, migrating to freshwater to spawn. This MCZ provides crucial habitat that is necessary for smelt to complete their lifecycle (DEFRA, 2019b).
Morecambe Bay SAC	27.0 km	The Morecambe Bay SAC is a predominantly sandy bay at the confluence of the Leven, Kent, Lune and Wyre estuaries. It is one of the largest areas of intertidal flats in Britain and includes various habitat and sediment types (MMO, 2021g). **Qualifying Features**: Morecambe Bay SAC has various qualifying features which include Atlantic decalcified fixed dunes; Atlantic salt meadows; coastal lagoons; dunes with *Salix repens* ssp. *argentea*; embryonic shifting dunes; estuaries; fixed dunes with herbaceous vegetation; humid dune slacks; large shallow inlets and bays; mudflats and sandflats not covered by seawater at low tide; reefs; *Salicornia* and other annuals colonising mud and sand; sandbanks which are slightly covered by sea water all the time; (ENI, 2021; MMO, 2021g).
West of Walney MCZ	29.0 km	West of Walney MCZ is located offshore of Walney Island, Cumbria with an overall area of 388 km^2 (ENI, 2021). **Qualifying Features:** Subtidal sand, subtidal mud, sea-pen and burrowing megafauna communities are protected features within the West of Walney MCZ. The seabed habitat within the West of Walney MCZ is predominantly comprised of subtidal mud. This broad-scale habitat feature is considered part of an area known as the eastern Irish Sea mud belt. Sea-pen and burrowing megafauna communities' (which is considered Threatened and/or Declining habitat in the north east Atlantic, and specifically in the Irish Sea, by the OSPAR commission) makes up a component part of the subtidal mud habitat occurring within the site's boundary. This habitat is characterised by the presence of sea-pens (feather-like soft corals) and burrowing animals such as mud shrimp (*Corophium voluator*) and the Norway lobster (*Nephrops norvegicus*), which is a commercially important species (JNCC, 2010).

Designated Site	Distance to Eni Development Area	Qualifying Features and Site Description
Lavan Sands Conwy Bay SPA	33.0 km	The Lavan Sands Conwy Bay SPA is partially encompassed within the Menai Strait and Conwy Bay SAC, resulting in SAC designated features at the site, including Annex I Habitats (CCW, 2008). **Qualifying Features**: Lavan Sands designated SAC features are due to the presence of mudflats and sandflats not covered by seawater at low tide (CCW, 2008).

Additional information to support a full and comprehensive screening of European sites with relevant qualifying features related to benthic subtidal and/or intertidal features will be provided within the Habitats Regulations Assessment (HRA) Screening Report. The relevant features that are screened into the HRA will be considered in full and assessed in the appropriate sections, with additional information utilised to further support the assessment on European sites and features provided in the Report to Inform Appropriate Assessment (RIAA). Similarly, additional information will be provided to support a MCZ assessment.

7.2.4 Proposed Additional Data Collection

While the studies identified above have undertaken characterisation of the benthic species within the vicinity of the development area, these studies alone are considered insufficient to obtain a complete dataset of the benthic habitats and communities associated with the development area up to MHWS. In addition, some of the surveys have been undertaken over five years ago which may mean that the communities have potentially changed since these studies were last conducted.

Therefore, the following surveys are proposed to be undertaken to collect additional, current data on habitats and communities in the benthic subtidal and intertidal ecology study area. The proposed approach is to characterise the subtidal and intertidal marine ecology receptors that could be impacted by the development area by determining the abundance and distribution of key marine ecological habitats, communities and species within the study area.

As part of the benthic survey, sediment samples will be collected from specific areas around and within the development area offshore components. These samples will be collected for the purpose of benthic infauna, contaminant, particle size, seabed imagery, and epibenthic beam trawl analysis.

The full Sampling and Analysis Plan (SAP) for the development area, detailing the proposed drop-down video (DDV), grab sample locations, and epibenthic trawl surveys can be found in Appendix B.

Field surveys will be undertaken in order to gather additional data which will be utilised to inform the EIA Report. Surveys will be completed in line with relevant current best practice standards and guidelines. Where deviations from best practice occur, or where best practice guidelines are unavailable, approaches to survey effort will be further justified with survey methods and/or survey limitations detailed comprehensively within the EIA Report.

7.2.5 Potential Project Impacts

A range of potential project impacts on the benthic subtidal and intertidal ecology have been identified, which could potentially occur during the construction, operation and maintenance, and decommissioning phases of the Proposed Development.

Impacts that have been scoped-into the assessment are outlined in Table 6-2, while impacts that have the potential to be scoped out of the assessment are presented in Table 6-3.

Table 7-3: Impacts Proposed to be Scoped into the Assessment for Benthic Subtidal and Intertidal Ecology.

Potential Impact	Project Phase			Justification
	C	O	D	
Temporary subtidal habitat loss and/or disturbance	✓	✓	✓	**Construction and decommissioning phase** • There is potential for direct habitat and species loss in the subtidal and intertidal development area due to site preparation activities and the installation, maintenance, refurbishment, and removal of development infrastructure (subsea cable and pipeline installation, temporary OP refurbishment, drill cutting deposits, jack-up vessel and drill rig spud deployments). **Operation and maintenance phase** • Habitat and species loss may be temporary during operation and maintenance (device repair, cable repair, vessel anchoring).
Increased suspended sediment concentrations and associated deposition	✓	✗	✓	**Construction and decommissioning phase** • Increased suspended sediment concentrations and sediment deposition from construction and decommissioning activities related to subsea pipeline refurbishment and cable installation/protection may potentially result in indirect impacts on the benthic habitats and communities. • These indirect impacts include increased turbidity and smothering effects, which could affect the water quality in the surrounding area and habitat degradation affecting spawning and nursery grounds. • Drill cuttings being released into the surrounding marine environment. • The potential disturbance of contaminated sediments could release additional contaminants into the surrounding marine benthic environment.
Long-term subtidal habitat loss	✗	✓	✓	**Construction and decommissioning phase** • Potentially, long-term subtidal habitat loss could occur directly under the newly installed cable route with rock armouring/protection in place.
Introduction of artificial habitat and colonisation of hard structures	✓	✓	✓	**Operation and maintenance phase** • The introduction of new habitat, such as artificial structures used for pipeline protection, in the offshore marine environment may potentially affect the established community environment by providing new habitat and ecosystem function. It is expected that the artificial structures will be colonised by a range of organisms which could lead to increases in biodiversity locally.

Potential Impact	Project Phase			Justification
	C	O	D	
Increased temperature impacting benthic and marine communities	×	✓	×	**Operation and maintenance phase** • There is potential for increased temperatures from the subsea pipeline to impact the immediate environment surrounding the pipeline in-turn affecting the flora and fauna species associated with the sediment.
Accidental pollution to the surrounding area	✓	✓	✓	**All phases** • There is a risk of pollution to water and sediment through accidental release of chemicals and pollutants from vessels/vehicles and equipment/machinery during all stages of installation of the development area.
Increased risk of introduction and spread of Invasive Non-native Species (INNS)	✓	✓	✓	**All phases** • Vessels utilised during all stages of the development area could inadvertently transport INNS resulting in significant impacts on the local fauna which have the potential to spread throughout the area.
Impacts resulting from the release of sediment bound benthic contaminants	✓	×	✓	**Construction and decommissioning phase** • Seabed disturbances related to project construction and decommissioning could potentially lead to the remobilisation of previously sediment bound contaminants which could impact the surrounding benthic communities. • Site specific sediment chemistry sampling and analysis will be undertaken across the development area during subtidal sampling surveys. These impacts are to be scoped out subject to the results of the site-specific surveys and appropriate consultation with relevant stakeholders.

Table 7-4: Impacts Proposed to be Scoped out of the Assessment for Benthic Subtidal and Intertidal Ecology.

Potential Impact	Project Phase			Justification
	C	O	D	
Impacts to benthic ecology due to electromagnetic fields (EMF)	×	✓	×	**Operation and maintenance phase** • Low-frequency EMFs are present along subsea cables used to transmit electricity from the development area to the appropriate substation and terminal locations. There are limited findings on the electro sensitivity of benthic organisms and on the associated impact of EMFs

Potential Impact	Project Phase			Justification
	C	O	D	
				on the surrounding benthic invertebrates. Cables within the development area will be buried and/or protected therefore, there is limited scope for impacts from EMF on benthic invertebrates.

7.2.6 Proposed Assessment Methodology

The benthic subtidal and intertidal ecology EIA Report will consider the potential impacts of the construction, operation and maintenance, and decommissioning phases of the development area within the benthic subtidal and intertidal ecology study area and will follow the methodology outlined in Section 5. The following guidance documents will also be considered:

- Guidelines for Ecological Impact Assessment (EcIA) in the UK and Ireland. Terrestrial, Freshwater and Coastal (CIEEM, 2019).
- Guidelines for data acquisition to support marine environmental assessments of offshore renewable energy projects (Judd, 2012).

For the purposes of preparing the EIA Report, marine habitats, communities and species identified, as having the potential to occur in the benthic subtidal and intertidal ecology study area, will be grouped into broad habitat and community types. These broad habitat and community types will serve as the Valued Ecosystem Components (VECs), against which, impacts associated with the construction, operation and maintenance and decommissioning phases of the development area will be assessed. Habitats with similar physical and biological characteristics (including species complement and richness/diversity), as well as conservation status and interest, will be grouped together for the purposes of the EIA Report. Consideration will also be given to the inherent sensitivities of different habitats in assigning the groupings, such that habitats and species with similar vulnerability and recoverability (e.g., due to similar broad sediment types and species complements) will be grouped together. Impacts on VECs will be described in terms of the magnitude of that impact and correlated against the sensitivity of each VEC to that each impact, to produce a statement of significance.

7.2.6.1 Cumulative Effects

The potential effects related to the construction, operation and maintenance, and decommissioning of the Proposed Development on benthic subtidal and intertidal will assess the potential cumulative effects that could occur on benthic subtidal and intertidal ecology related to alternate projects and/or activities that take place within the regional benthic subtidal and intertidal ecology study area.

7.2.7 Potential Mitigation

The following embedded mitigation measures are proposed in relation to benthic subtidal and intertidal ecology:

- An Environmental Management Plan (EMP) will be developed and implemented in order to cover the construction and operation and maintenance phases of the development area. The EMP will plan for accidental spills, address any potential contaminants that could be released and will include key emergency contact details associated with the development area;
- Construction practices will comply with a Code of Construction Practice (CoCP) which, when utilised, will ensure appropriate Pollution Prevention Guidelines (PPG) and that best practices are followed;
- Avoidance of key sensitive habitats, where already known, through pre-construction surveys and micro-siting of development area infrastructure;
- Facilitating discussions with regulatory authorities and stakeholders on methods to reduce overall impact and minimising the total development area footprint; and
- Compliance with available guidelines on mitigating the introduction and spread of INNS.

7.3 Fish and Shellfish Ecology

7.3.1 Study Area

Fish and shellfish are known to be highly variable, both spatially and temporally. Therefore, to effectively analyse findings related to the fish and shellfish ecology baseline data, a broad and inclusive study area

has been defined. The proposed study area includes areas within territorial waters of England, Ireland, Wales and Scotland. Such an inclusive fish and shellfish ecology study area will allow for the characterisation of all fish and shellfish receptors within the eastern Irish Sea, accounting for migration and additional variability.

The development area fish and shellfish ecology study area is therefore defined as the area encompassing the ICES Statistical Area VIIa, development area, offshore pipeline (including intertidal habitats up to the MHWS), and associated cables in Liverpool Bay Figure 7-6.

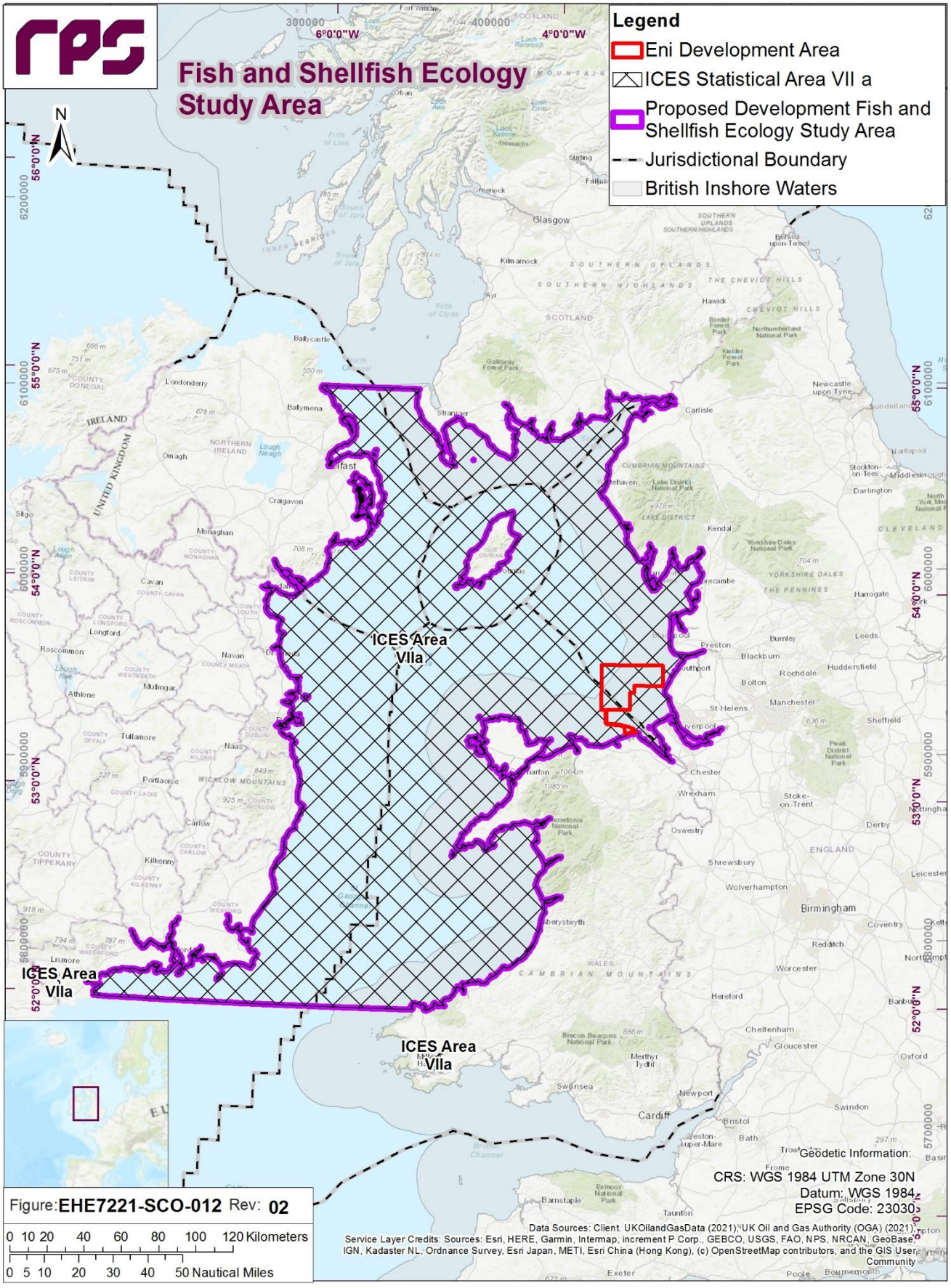

Figure 7-6: Illustrates the Development Area Fish and Shellfish Ecology Study Area.

7.3.2 Baseline Environment

Information regarding the fish and shellfish ecology section has been collated through a detailed and comprehensive review of currently accessible studies and datasets. To provide a wider context, the desktop review has considered the fish and shellfish habitats, communities and species present within the broader offshore area in proximity to the development area (the development area fish and shellfish ecology study area). Key data sources have been provided in Table 7-5.

Table 7-5: Summary of Key Desktop Data Sources to Inform Fish and Shellfish Ecology Scoping Assessment.

Title	Source	Year	Author
Application for Offshore Carbon Storage Licence Environmental Appendix Liverpool Bay Area Environmental Sensitivity Assessment	Eni	2019	Eni
Celtic Seas ecoregion – Fisheries overview, including mixed-fisheries considerations	ICES	2020	ICES
Spawning and nursery grounds of selected fish species in UK waters	CEFAS	2012	CEFAS
ICES Division VIIa technical reports series	CEFAS	N/A	CEFAS
Gwynt y Mor Offshore Wind Farm Marine Ecology Technical Report	Centre for Marine and Coastal Studies	2005	CMACS

7.3.2.1 Desktop Study

Geology

The seabed in the Eastern Irish Sea is characterised largely by coarse sediment/rock, grading to fine muddy sand inshore. In the northern part of the Irish Sea, large patches of rocks and boulders occur in offshore waters of the central Irish Sea (EUSeaMap, 2019).

The development area is predominantly composed of medium and coarse sands, poorly sorted with varying degrees of coarser materials, such as stones and gravel (CMACS, 2005). The development area, offshore pipeline and cables are located in water depths ranging from 0.72 m to 35 m. Tidal currents in Liverpool Bay are complicated by the influence of river flows and do not exceed 2 m/sec. The general direction of current flow is towards SSW and bifurcate at the Isle of Man (ENI, 2021). The substrate and currents are an important environmental variable in determining the composition and abundance of fish and shellfish communities in the region. The substrates at the development area and surrounding areas are an important factor in shaping the associated fish and shellfish assemblages in the locality.

Fish Assemblages

Fish present within Liverpool Bay include pelagic, demersal, cartilaginous, and migratory species. Pelagic fish are defined as shoals swimming in mid-levels of the water, typically making extensive seasonal movements or migrations between sea area. Demersal species can be further divided into benthic fish and benthopelagic fish; with benthic fish tending to live on or beneath the seabed and benthopelagic fish living on or floating just above the seabed. Cartilaginous fish are defined as having a skeletal structure made out of cartilage. Shellfish are found locally throughout the intertidal and subtidal regions of Liverpool Bay.

Pelagic fish species found in Liverpool Bay include allis shad (*Alosa alosa)*, twaite shad (*Alosa fallax)*, herring (*Clupea harengus)*, ling (*Molva molva)*, mackerel (*Scomber scombrus)*, cod (*Gadus morhua)*, haddock (*Melanogrammus aeglefinus),* and whiting (*Merlangius merlangus)*.

Demersal fish species include common goby (*Pomatoschistus microps)*, plaice (*Pleuronectes platessa),* brill (*Scophthalmus rhombus)*, turbot (*Scophthalmus maximus)* sand goby (*Pomatoschistus minutus)*,

monkfish (*Lophius piscatorius)*, sole (*Solea solea)*, solenette (*Buglossidium leteum*) and lemon sole (*Microstomus kitt)* (CMACS, 2010; Celtic Array Ltd, 2013).

Cartilaginous species include basking shark (*Cetorhinus maximus)*, thornback ray (*Raja clavate*), tope shark (*Galeorhinus galeus)*, spotted ray (*Raja montagui)*, Lesser spotted dogfish (*Scyliorhinus canicular)*, spurdog (*Squalus acanthias*), nurse hound (*Scyliorhinus stellaris)*, common smooth-hound (*Mustelus mustelus)*, cuckoo ray (*Raja naevus)* (CMACS, 2010; Celtic Array Ltd, 2013).

Migratory species present in the area are salmon (*Salmo salar)*, sea trout (*Salmo trutta)*, river lamprey (*Lamperta fluviatilis)*, sea lamprey (*Petromyzon marinus)* and smelt (*Osmerus eperlanus)* (Lockwood, 2005).

Fish communities within the eastern Irish Sea and more specifically, Liverpool Bay, were dominated by pelagic, demersal and cartilaginous species including plaice, brill, cod, turbot, whiting, haddock and monkfish, thornback ray, cuckoo ray, and spurdog (ICES, 2020; Eni UK, 2019).

European seabass (*Dicentrarchus labrax)* and grey mullet (*Muglidae* spp.) are seasonally abundant in inshore waters, with abundance decreasing further north, away from the development area (DECC, 2016). Fisheries targeted European seabass have been found to predominantly be comprised of female individuals, illustrating a potential localised spawning area in proximity to the development area (Moore *et al.,* 2020).

Fishery trawl surveys conducted in the Irish Sea and more specifically, Liverpool Bay were undertaken by CEFAS from 1992-2004. Findings from these surveys illustrated that more than 100 fish species were recorded throughout the Irish Sea, while less than 70 species were enumerated in Liverpool Bay (Parker-Humphreys, 2004; CMACS, 2005).

Benthic grab surveys were utilised during pre-construction of the Gwynt y Mor OWF, located in the southwestern corner of the development area. Results from DDV surveys simultaneously conducted during the aforementioned benthic grab surveys, illustrated that plaice, dab (*Limanda limanda*), solenette, sand goby, and the lesser spotted dogfish were the most abundant species at this time (CMACS, 2011). Additionally, multiple elasmobranch species were also found within the Gwynt y Mor benthic and DDV surveys. These species were predominantly comprised of small-spotted catsharks (*Scyliorhinus canicular*), thornback rays, and blonde rays (*Raja brachyura*) (CMACS, 2011).

Basking sharks have been evidenced migrating through the Irish Sea, predominantly near the Isle of Man, located approximately 91.6 km northwest of the development area (Dolton *et al*., 2020). Satellite tracked individuals have illustrated that basking sharks typically have a north-south migration through the Irish Sea and therefore have the potential to be found within the fish and shellfish ecology study area (Dolton *et al*., 2020). Northerly movements have been exhibited by the species in early summer months, while southerly movements have been found to take place during late summer and autumn (Sims *et al.,* 2008; Wilson *et al.,* 2020).

Shellfish Assemblages

Important shellfish in the Irish Sea include blue mussel (*Mytilus edulis)*, European lobster (*Hommarus Gammarus)*, Norway lobster (*Nephrops norvegicus)*, common whelk (*Buccinum undatum)*, great scallop (*Pecten maximus)*, queen scallop (*Chlamys opercularis)*, edible crab (*Cancer pagurus)*, common shrimp (*Crangon crangon)*, and squid (*Loligo vulgaris)*. Cockles (*Cerastoderma edule)* and native oysters (*Ostrea edulis)* are also abundant throughout the region, particularly in the Solway Firth, approximately 135.1 km north of the development area (CMACS, 2011; Brown and May Marine Ltd, 2013; Celtic Array Ltd, 2013).

The Irish Sea is also an important region for great scallops and queen scallops, with substantial populations found in Cardigan Bay, around the Isle of Man, the Solway Firth, Morecambe Bay and around islands in the Firth of Clyde. European lobsters and brown crabs are abundant, particularly on the rocky shores of north Wales. Whelks are also abundant in specific areas, including around the Isle of Man and off the north Wales coast (DECC, 2016; Eni UK, 2019).

Beam trawl surveys were undertaken at the Gwynt y Mor OWF in 2011 identified common whelk, edible crab, common mussel, brown shrimp (*Crangon crangon*), and pink shrimp (*Pandalus montagui*) (CMACS, 2011). It is worth noting that with the exception of the common whelk, none of the aforementioned species are commercially harvested within the Liverpool Bay area and therefore in vicinity to the development area (CMACS, 2011).

Spawning and Nursery Grounds

The Irish Sea provides spawning and nursery grounds for a number of ecologically and commercially important fish and shellfish species.

Data from CEFAS (Ellis *et al.*, 2012), the Irish Marine Atlas, and fisheries sensitivity maps (Coull *et al.*, 1998) provided spatially explicit diagrams of the nursery and/or spawning areas for key species. The Irish Sea supports spawning populations of several commercially important fish species such as monkfish, cod, herring, ling, mackerel, plaice, sandeel, sole, spurdog, thornback ray, tope shark, and whiting (Table 7-6). Additionally, cod, herring, ling, mackerel, plaice, sandeel, sole, spurdog, thornback ray, tope shark, and whiting have nursey and spawning grounds within the development area fish and shellfish ecology study area (Table 7-6).

The species that are found within the development area fish and shellfish study area with high intensity nursery grounds are cod, herring, sole, spurdog and whiting. Those with low intensity nursery grounds are mackerel, plaice, sandeel, thornback ray, and tope shark (Coull *et al*., 1998; Ellis *et al*., 2010). Comparing the same species as above, cod, plaice, sandeel, and sole were found to have high intensity spawning grounds located within the development area fish and shellfish ecology study area. Ling, mackerel and whiting were evidenced to have low intensity spawning grounds within the same area (Table 7-6) (Coull *et al.,* 1998; Ellis *et al*., 2010).

Findings illustrate that the fish species most likely to have nursery and spawning grounds of both low and high intensity within the development area are cod, herring, mackerel, plaice, sandeel, sole and whiting (Coull *et al*., 1998: Ellis *et al*., 2010). Findings also show that these nursery and spawning grounds are typically concentrated to inshore waters predominantly within English boundaries (Coull *et al*., 1998; Ellis *et al*., 2010).

Table 7-6: Illustrates the Key Species, Seasonal Spawning Periods/Peaks and Nursery and Spawning Grounds (with Intensity). Also, located Within and in Proximity to the Development Area (Coull *et al.,* 1998; Ellis *et al.,* 2010).

Common Name	Species	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Nursery Ground	Spawning Ground
Monkfish	*Lophius piscatorius*														
Cod	*Gadus morhua*														
Herring	*Clupea harengus*														
Ling	*Molva molva*														
Mackerel	*Scomber scombrus*														
Plaice	*Pleuronectes platessa*														
Sandeel	*Ammodytidaespp.*														
Sole	*Solea solea*														
Spurdog	*Squalus spp.*														

Common Name	Species	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Nursery Ground	Spawning Ground
Thornback ray	*Raja clavata*														
Tope shark	*Galeorhinus galeus*														
Whiting	*Merlangius merlangus*														

Spawning Period | Peak Spawning | High Intensity | Low Intensity

7.3.3 Designated Sites

There are a number of designated sites that occur within the development area and fish and shellfish ecology study area. These sites are further detailed in Table 7-7.

Of particular interest to the development area fish and shellfish ecology study area are the Flyde MCZ, Ribble Estuary MCZ, Wyre-Lune MCZ, West of Walney MCZ, Cardigan Bay SAC and Solway Firth SAC (Table 7-7).

Table 7-7: Designated Sites with Fish and Shellfish Qualifying Features. Also, located Within the Development Area and Fish and Shellfish Ecology Study Area.

Designated Site	Distance to Eni Development Area	Qualifying Features and Site Description Relevant to Fish and Shellfish
Flyde MCZ	0.0 km	**Qualifying Features:** Subtidal sand and subtidal mud which are highly productive and have been evidenced to support diverse bivalve mollusc populations. The Flyde MCZ is known to support an abundance of animals such as crabs, starfish, crustaceans, and bivalve species, including: nut-shell, razor shell and the white furrow shell. Flatfish, including sole and plaice, in addition to whiting are also supported by the habitat within the site (MMO, 2016).
Ribble Estuary MCZ	9.5 km	**Qualifying Features:** Smelt is a protected feature within the MCZ and is known to congregate in large shoals, migrating to freshwater areas to spawn. This MCZ provides crucial habitat that is necessary for smelt to complete their lifecycle (DEFRA, 2019a).
Wyre-Lune MCZ	27.0 km	**Qualifying Features**: Smelt is a protected feature within the MCZ and is known to congregate in large shoals, migrating to freshwater to spawn. This MCZ provides crucial habitat that is necessary for smelt to complete their lifecycle (DEFRA, 2019b).
West of Walney MCZ	29.0 km	**Qualifying Features:** Subtidal sand, subtidal mud, sea-pen and burrowing megafauna communities are protected features within the West of Walney MCZ. The seabed habitat within the West of Walney MCZ is predominantly comprised of subtidal mud. Sea-pen and burrowing megafauna communities' (which is considered Threatened and/or Declining habitat in the north east Atlantic, and specifically in the Irish Sea, by the OSPAR commission) makes up a component part of the subtidal mud habitat occurring within the site's boundary. Shellfish which characterise this habitat include burrowing animals such as mud shrimp and the Norway lobster, which is a commercially important species (JNCC, 2010).

Designated Site	Distance to Eni Development Area	Qualifying Features and Site Description Relevant to Fish and Shellfish
Cardigan Bay SAC	128.5 km	Cardigan Bay SAC is located between Pembrokeshire and Ceredigion, extending 20 km from the coast and protecting an area of the sea greater than 1,000 km^2. **Qualifying Features:** Those specific to fish and shellfish are sea lamprey and river lamprey (JNCC, 2015a).
Solway Firth SAC	145.2 km	Solway Firth SAC is a large, shallow, and complex estuary with a diverse mix of intertidal habitats (tidal rivers, estuaries, mud flats, sand flats, lagoons, salt marshes and salt steppes) (JNCC, 2022). **Qualifying Features:** Those specific to fish and shellfish are sea lamprey and river lamprey (JNCC, 2018).

Additional information to support a full and comprehensive screening of European sites with relevant qualifying features related to fish and shellfish features will be provided within the Habitats Regulation Assessment (HRA) Screening Report. The relevant features that are screened into the HRA will be considered in full and assessed in the appropriate sections, with additional information utilised to further support the assessment on European sites and features provided in the Report to Inform Appropriate Assessment (RIAA).

7.3.4 Proposed Additional Data Collection

There are a significant number of publicly available datasets related to fish and shellfish ecology within the ICES VIIa Statistical Area, Liverpool Bay, and more specifically in close proximity to and overlapping the development area.

While studies summarised above provide a broad overview of the fish and shellfish species and communities likely to occur in the vicinity of the development area, further data collection is warranted to support a more targeted assessment in the EIA Report.

Specifically, the benthic subtidal and intertidal ecology surveys will incorporate benthic grab samples which will be analysed for PSA, which will detail habitat suitability for sandeel and herring spawning grounds. Sandeel and herring are known to be particularly sensitive to seabed disturbance because they spawn in very specific substrates. These species are of particular importance because they play a key ecological role as principal prey items for several larger fish species, marine birds and marine mammals.

Sandeel hibernate in generally coarse sand or fine gravel in autumn and winter, whilst in spring and summer they exhibit diurnal movements, burying themselves in the seafloor at night and feeding on plankton in the water column above their burrows during the day (Engelhard *et al.,* 2008). A study by Holland *et al.,* (2005) showed that areas which combined a high proportion of medium and coarse sand (particle size 0.25 to 2.0mm) with a low silt content (<4%) were preferred seabed habitats for sandeel (Holland *et al.,* 2005). Sandeel emerge from hibernation briefly between December and January to spawn. The sticky eggs are partly buried in the upper centimetres of the sediment and hatch in February to March (DECC 2016).

Herring have a specific habitat preference which limits the spatial extent of their spawning grounds. Eggs adhere to the seabed and can form extensive egg beds, meaning they are particularly sensitive to seabed disturbance. Suitable herring spawning habitat comprises a seabed with a high gravel content with minimal fines and high oxygenation of sediments (Reach *et al.,* 2013). Spawning typically occurs on coarse gravel 0.5-5cm) to stone (8-15cm) substrates and often on crest of ridges and ripples rather than hollows (ICES 2012).

DDV surveys will aid in identifying benthic species present within the development area, as well as identifying fish assemblages from data collected during epibenthic beam trawls. Lastly, incidental observations of fish and shellfish species from benthic grabs and seabed imagery analysis will help to provide further validation of the desktop baseline data.

7.3.5 Potential Project Impacts

A range of potential project impacts on fish and shellfish ecology have been identified, which could potentially occur during the construction, operation and maintenance, and decommissioning phases of the Proposed Development.

Impacts that have been scoped into the assessment are outlined in Table 7-8, while impacts that have the potential to be scoped out of the assessment are presented in Table 7-9.

Table 7-8: Impacts Proposed to be Scoped into the Assessment for Fish and Shellfish Ecology.

Potential Impact	Project Phase			Justification
	C	O	D	
Temporary habitat loss and/or disturbance	✓	✓	✓	**Construction and decommissioning phase** • There is potential for direct habitat and species loss in the development area due to site preparation activities and the installation, maintenance, refurbishment, and removal of development infrastructure (subsea cable pipeline installation, temporary OP refurbishment, drill cutting deposits, jack-up vessel and drill rig spud deployments). **Operation and maintenance phase** • Habitat and species loss may be temporary during operation and maintenance (device repair, cable repair, vessel anchoring).
Subsea noise impacting fish and shellfish receptors	✓	×	✓	**Construction and decommissioning phase** • There is potential for disturbance and/or displacement to sensitive fish and shellfish species as a direct result of subsea noise resulting from construction activities (as listed above).
Increased suspended sediment concentrations and associated deposition	✓	×	✓	**Construction and decommissioning phase** • Increased suspended sediment concentrations and sediment deposition from construction and decommissioning activities related to subsea pipeline refurbishment and cable installation/protection may potentially result in indirect impacts on the fish and shellfish ecology. • These indirect impacts include increased turbidity and smothering effects, which could affect the water quality in the surrounding area and habitat degradation affecting spawning and nursery grounds. • Drill cuttings being released into the surrounding marine environment. • The potential disturbance of contaminated sediments could release additional contaminants into the surrounding marine benthic environment.

Potential Impact	Project Phase			Justification
	C	O	D	
Long-term subtidal habitat loss	×	✓	✓	**Construction and decommissioning phase** • Potentially, long-term subtidal habitat loss could occur directly under the newly installed cable route with rock armouring/protection in place.

Table 7-9: Impacts Proposed to be Scoped out of the Assessment for Fish and Shellfish Ecology.

Potential Impact	Project Phase			Justification
	C	O	D	
Effects of subsea noise on marine biodiversity from UXO detonation	✓	×	×	**Construction phase** • The potential for displacement and disturbance to fish and shellfish species from UXO detonation during the construction phase of the Proposed Development has been scoped out due to the historical oil and gas developments in the area. It is unlikely that UXOs that need to be removed and/or detonated have not already been encountered as the area has been fully utilised for decades.
Subsea noise from marine vessels during construction, operation and maintenance and decommissioning phases	✓	✓	✓	**All phases** • The potential for subsea noise generated from marine vessels will only occur within the development area and the immediate vicinity. Fish and shellfish receptors are unlikely to remain in the area for long periods of time during offshore construction, maintenance, and decommissioning activities.
Impacts to fish and shellfish ecology due to electromagnetic fields (EMF)	×	✓	×	**Operation and maintenance phase** • Low-frequency EMFs are present along subsea cables used to transmit electricity from the development area to the appropriate substation and terminal locations. There are limited findings on the electro sensitivity of fish and shellfish and on the associated impact of EMFs on the surrounding fish and shellfish species. Cables within the development area will be buried and/or protected therefore, there is limited scope for impacts from EMF on fish and shellfish ecology.
Accidental pollution during construction, operation and maintenance, and decommissioning phases	✓	✓	✓	**All phases** • The potential for accidental pollution to be released during the construction, operation and maintenance, and decommissioning phases of the Proposed Development is present. This pollution could potentially result from sources including vessels/vehicles and equipment/machinery. However, the risk of these events is managed through EMP, PPGs, and Marine Pollution Contingency Plans.

7.3.6 Proposed Assessment Methodology

The fish and shellfish ecology EIA Report will consider the potential impacts of the construction, operation and maintenance, and decommissioning phases of the development area within the fish and shellfish ecology study area and will follow the methodology outlined in Section 5. The following guidance documents will also be considered:

- Guidelines for Ecological Impact Assessment (EcIA) in the UK and Ireland. Terrestrial, Freshwater and Coastal (CIEEM, 2019);
- EPA (2017) Guidelines on the Information to be Contained in Environmental Impact Assessment Reports;
- Guidelines for data acquisition to support marine environmental assessments of offshore renewable energy projects (Judd, 2012);
- Marine Strategy Framework Directive (MSFD) 2008;
- Good practice guide to underwater noise measurement (NPL, 2014);
- Review of underwater acoustic propagation models (NPL) (Wang *et al.,* 2014);
- Sound exposure guidelines for Fishes and Sea Turtles (Popper *et al.,* 2014);
- The European Union (EU) Marine Strategy Framework Directive (Directive 2008/56/EC). This seeks to achieve good environmental status (GES) in Europe's seas by 2020. The qualitative descriptors for determining GES include "Introduction of energy, including underwater noise, is at levels that do not adversely affect the marine environment." This Directive was transposed into United Kingdom (UK) law by the Marine Strategy Regulations 2010;
- National Policy Statement (NPS) EN-1 Section 5.11, noise and vibration (DECC, 2011); and
- Draft NPS-1 Section 5.12, noise and vibration (BEIS, 2021a).

For the purposes of preparing the EIA Report, marine habitats, communities, nursery and spawning grounds, and species identified as having the potential to occur in the study area will be grouped into broad habitat/community types. These broad habitat/community types will serve as the VECs against which impacts associated with the construction, operation and maintenance, and decommissioning phases of the development area will be assessed. Habitats with similar physical and biological characteristics (including species complement and richness/diversity) as well as conservation status/interest will be grouped together for the purposes of the EIA Report. Consideration will also be given to the inherent sensitivities of different habitats in assigning the groupings, such that habitats and species with similar vulnerability and recoverability (e.g., due to similar broad sediment types and species complements) will be grouped together. Impacts on VECs will be described in terms of the magnitude of that impact and correlated against the sensitivity of each VEC to that each impact, to produce a statement of significance.

7.3.6.1 Cumulative Effects

The potential effects related to the construction, operation and maintenance, and decommissioning of the Proposed Development on fish and shellfish communities will assess the potential cumulative effects could occur on fish and shellfish ecology related to alternate projects and/or activities that take place within the development area fish and shellfish ecology study area.

7.3.7 Potential Mitigation

The following embedded mitigation measures are proposed in relation to Fish and Shellfish ecology:

- An Environmental Management Plan (EMP) will be developed and implemented in order to cover the construction and operation and maintenance phases of the development area. The EMP will plan for accidental spills, address any potential contaminants that could be released and will include key emergency contact details associated with the development area;

- Construction practices will comply with a Code of Construction Practice (CoCP) which, when utilised, will ensure appropriate Pollution Prevention Guidelines (PPG) and that best practices are followed;
- Avoidance of key sensitive habitats, where already known, through pre-construction surveys and micro-siting of development area infrastructure;
- Facilitating discussions with regulatory authorities and stakeholders on method to reduce overall impact and minimising the total development area footprint; and
- Compliance with available guidelines on mitigating the introduction and spread of INNS.

7.4 Marine Mammals

7.4.1 Study Area

To support the development of the marine mammal section, two study areas are defined:

- The Proposed Development Marine Mammal Study Area: this is defined as the area encompassing the Proposed Development area, (including the offshore pipeline, and associated cables in Liverpool Bay) plus a buffer of 10 km, which includes the survey area (Figure 7-7).
- Regional Marine Mammal Study Area: this is defined as the area encompassing wider Irish Sea habitats and includes the neighbouring consented offshore wind farms and designated sites (Figure 7-7). This area will be characterised by desktop data and will provide a wider context to site specific data collected within the development area marine mammal study area.

Marine mammals are known for being highly mobile and covering vast distances within their range of distribution. The desktop review will detail the ecology, distribution, and abundance of marine mammals within the wider area of the Irish Sea. The regional marine mammal study area will also aid in informing the assessment where the Zone of Influence (ZOI) for given impacts, such as underwater noise, may potentially extend beyond the Proposed Development marine mammal study area.

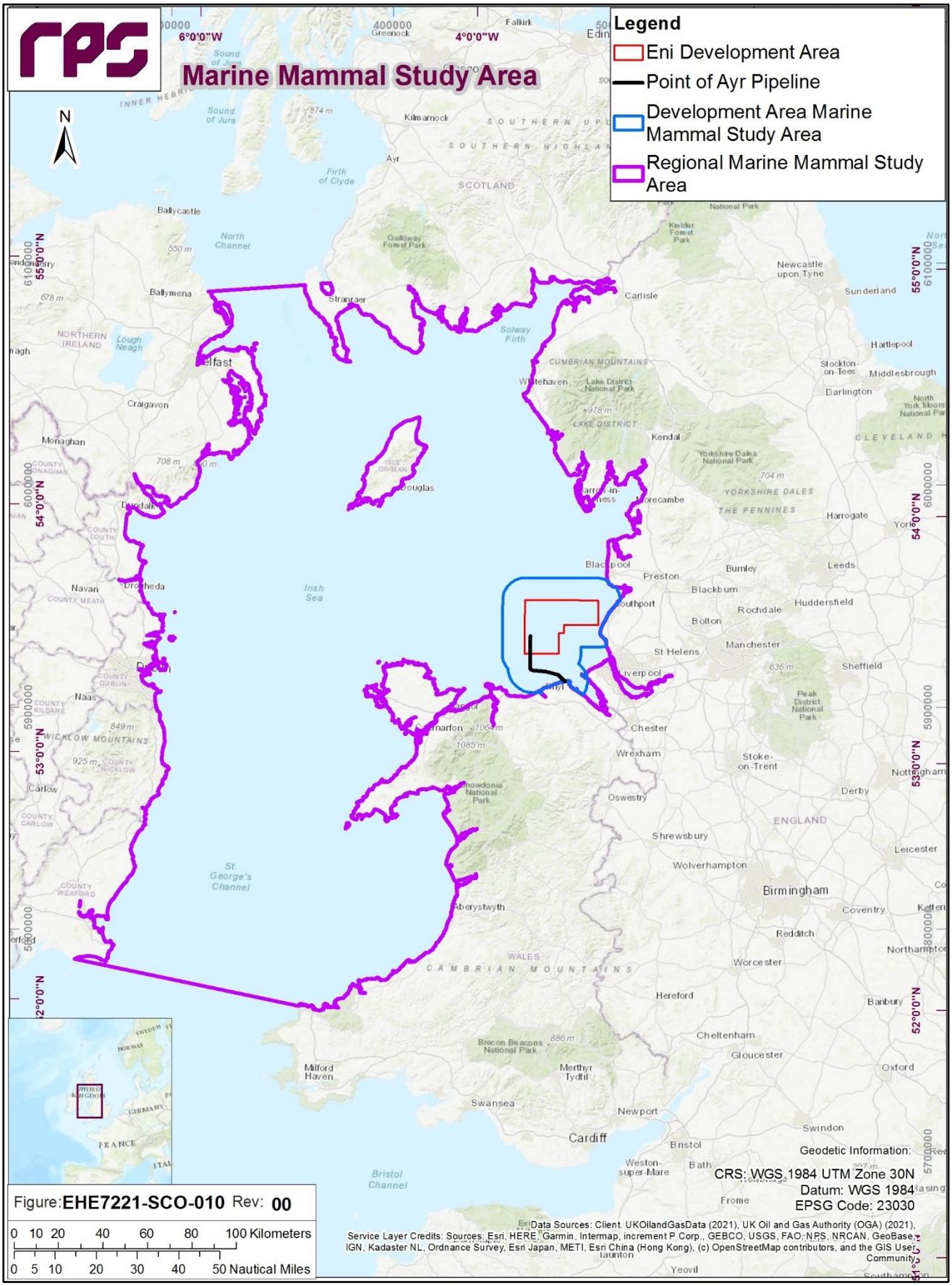

Figure 7-7: Illustrates the Development Area Marine Mammal Study Areas.

7.4.2 Baseline Environment

Information regarding the marine mammal ecology in Liverpool Bay has been collated through a detailed and comprehensive review of currently accessible studies and datasets. To provide a wider context, the desktop review has considered the marine mammals present within the broader offshore area in proximity to the development area (regional marine mammal study area). Key data sources are listed in Table 7-10, noting that this list is not exhaustive.

Table 7-10: Summary of Key Desktop Data Sources to Inform Marine Mammal Ecology Scoping Assessment.

Source	Year	Author
Sea Mammal Research Unit, University of St. Andrews	2021	Hammond *et al*. (2021)
Centre for Marine and Coastal Studies	2005	CMACS
Countryside Council for Wales	2009	Baines and Evans (2009)
Irish Whale and Dolphin Group	2005-2011	Wall *et al*. (2011)
Aerial Surveys of Cetaceans and Seabirds in Irish waters: Occurrence, distribution and abundance	2018	Rogan *et al.* (2018)
JNCC	2010-2011	Heinänen and Skov (2011)
JNCC	2011	Paxton *et al*. (2011)
Dong Energy	2010	Sorenson *et al.* (2010)
JNCC	2019	JNCC
Sea Mammal Research Unit, University of St. Andrews	2015-2020	Carter *et al*. (2020)
Sea Mammal Research Unit, University of St. Andrews	2021	SCOS
JNCC	2021	Inter-Agency Marine Mammal Working Group (IAMMG)

7.4.2.1 Desktop Study

Marine Mammals in UK waters comprise cetaceans (dolphins and whales), pinnipeds (true seals) and the otter. Of these, only certain species of cetaceans and pinnipeds are observed in proximity to the development area. These species are considered below.

Cetaceans

The waters in this region of the UK, and more specifically the waters of Liverpool Bay are not considered to be an important area in terms of species richness and abundance of cetacean as compared to other parts of the UK (CMACS, 2005). During the 1994 survey season, cetacean numbers in this area of the Irish Sea were so low that the SCANS project, an international assessment of cetacean abundance in UK waters, chose not to conduct surveys within the area (Hammond *et al.,* 2002).

There are 15 cetacean species that have been recorded within 60 km of the coastline in the eastern Irish Sea since 1975 (Evans, 1998) and therefore, could potentially be present within the regional marine mammal study area. However, only five are considered to be present year-round, or consistently observed within the area (Evans 1998; CMACS, 2005). The five species that are either abundant, or found to be more commonly occurring within Liverpool Bay and therefore eastern Irish Sea are: harbour porpoise (*Phocena phocena*), bottlenose dolphin (*Tursiops truncatus*), common dolphin (*Delphinus delphis*), Risso's dolphin (*Grampus griseus*), and minke whale (*Balaenoptera acutorostrata)* (Table 7-11) (CMACS, 2005; Sorenson *et al*., 2010).

Table 7-11: Illustrates the abundant, common, occasional, and rare cetacean species within the Irish Sea.

Species	Occurrence in the Irish Sea	Description
Toothed whales, dolphins and porpoises		
Harbour porpoise	Abundant	Abundant and widespread throughout Irish Sea; most frequently reported cetacean in Irish waters
Short-beaked common dolphin	Common	Occurs throughout the Irish Sea and second most frequently reported cetacean after harbour porpoise in Irish waters
Bottlenose dolphin	Common	Occurs in both eastern and western Irish Sea near the coast and there is a semi-resident population at Cardigan Bay
Atlantic white-sided dolphin *Lagenorhynchus acutus*	Occasional	Largely restricted to cool waters of the North Atlantic; rarely recorded in the Irish Sea; 5 stranding records (1984-2006)
Striped dolphin *Stenella coeruleoalba*	Occasional	Small number of records from the Irish Sea and rarely sighted in inshore waters; largely distributed along south and west Ireland
Risso's dolphin	Common	Frequently recorded species in Irish Sea, particularly off coast of Co. Wexford and Wicklow
White-beaked dolphin *Lagenorhychus albirostris*	Rare	Sightings rare in all Irish waters; no sightings records for Irish Sea and only one stranding record
Killer whale *Orcinus orca*	Occasional	Occasionally sighted in Irish Sea (most recently 2011) but most sightings to southwest, west and north of Ireland
Sperm whale *Physeter macrocephalus*	Rare	Largely distributed off the western and along the northern coast of Ireland; single stranding record (1766) on east coast
Beaked whales (Ziphidae)		
Northern bottlenose whale *Hyperoodon ampullatus*	Rare	Records of strandings on east coast of Ireland although none since 1954; sightings in inshore waters very rare.
Sowerby's beaked whale *Mesoplodon bidens*	Rare	Rarely recorded in Irish Sea; records of strandings on the southeast coast of Ireland; one in 2004.
Baleen whales		
Humpback whale *Megaptera novaeangliae*	Occasional	More commonly seen in the south and southwest of Ireland but occasional sightings on the east coast of Ireland.
Minke whale	Common	Most frequently sighted baleen whale in Irish waters; occurs seasonally (spring/summer) in the Irish Sea

Species	Occurrence in the Irish Sea	Description
Fin whale *Balaenoptera physalus*	Rare	Occurs primarily in the south of Ireland but also along the west coast; rarely recorded in the Irish Sea
Blue whale *Balaenoptera musculus*	Rare	Migrates along the western seaboard of Ireland; single stranding record (early 1900) on the southeast coast of Ireland
Sei whale *Balaenoptera borealis*	Rare	Sei whales prefer deep, offshore waters and are known to be far ranging animals that infrequently visit UK shores

The remaining nine species of cetaceans that have been observed infrequently in the eastern Irish Sea are: striped dolphin, white-beaked dolphin, northern bottlenose whale, killer whale, Sowerby's beaked whale, Atlantic white-sided dolphin, sperm whale, fin whale, and sei whale (*Balaenoptera borealis*) (Sorenson *et al*., 2010).

The five cetacean species that have the increased potential to be occasionally observed within the development area marine mammal study area vary in distribution, habitat preference, and IUCN conservation status (Table 7-12).

Table 7-12: Key Cetacean Species Likely to be Found Within the Development Area Marine Mammal Study Area.

Species	Taxonomic Name	Distribution	Habitat Preference	Favourable Conservation Status (FCS): UK assessment[1]	IUCN Status	Additional Information
Harbour Porpoise	*Phocena phocena*	The harbour porpoise is the most commonly observed cetacean species in UK waters, including Liverpool Bay (Baines, 2003; CMACS, 2005). Sightings occur year-round throughout the Irish Sea and along the east coast of the UK (Baines and Evans, 2009). Higher densities of harbour porpoise can be found off North and West Anglesey, the south coast of Lleyn Peninsula, Cardigan Bay, Pembrokeshire, Bristol Channel, and the south coast of Wales (Baines and Evans, 2012).	Harbour porpoise have been found to prefer habitats where depths range from 35 - 150 m in highly sloped regions (Booth *et al.,* 2013; Buttifant, 2021).	Range and Future Prospects: Favourable; Population and Habitat: Unknown; Overall FCS: Unknown.	Least Concern	The harbour porpoise is thought to be resident to Liverpool Bay year-round with peak numbers occurring in coastal areas between July and September (CMACS, 2005). Harbour porpoise has been identified as a citation species for SAC designation in the Irish Sea due to areas of consistently high densities Heinanen and Skov, 2015). Water depth and hydrodynamic variables have been found to have the greatest influence on distribution of the species within the Irish Sea (Heinanen and Skov, 2015).
Bottlenose Dolphin	*Tursiops truncatus*	The bottlenose dolphin is relatively common in the eastern Irish Sea. Most observations that occur within the regional marine mammal study area are along the north coast of Anglesey, in Morecambe Bay with the main concentration of sightings in Cardigan Bay to the south of the development area (CMACS, 2005; Baines and Evans, 2009). Seasonally, higher sightings occur in	Bottlenose dolphin are predominantly found in coastal regions, although low densities are known to have been recorded offshore (Baines and Evans, 2012). Studies conducted within the UK have found that bottlenose dolphin prefer estuarine areas with the greatest benthic slope and	Range and Future Prospects: Favourable; Population and Habitat: Unknown; Overall FCS: Unknown.	Least Concern	Most sightings that occur in Welsh waters take place in April and between July and September (Reid *et al*., 2003). The species often occur in small groups in coastal areas, moving offshore during winter months to feed on benthic and pelagic fish species (CMACS, 2005). In coastal waters, bottlenose dolphins have been found to

Species	Taxonomic Name	Distribution	Habitat Preference	Favourable Conservation Status (FCS): UK assessment[1]	IUCN Status	Additional Information
		coastal regions during summer and autumn (Baines and Evans, 2009). Cardigan Bay is one of only two areas around the UK that hosts a semi-resident population of bottlenose dolphins.	depth (Ingram and Rogan, 2002).			prefer headlands, river estuaries, or sandbanks, where there is typically uneven bottom relief and/or strong tidal currents (Reid *et al*., 2003).
Common Dolphin	*Delphinus delphis*	Common dolphin have a large offshore distribution, predominantly occurring at the southern-end of the Irish Sea (Baines and Evans, 2012). High density areas extend towards Pembrokeshire, while lower densities are found throughout the Irish Sea in offshore waters (Baines and Evans, 2012). The common dolphin is mainly a summer visitor to the east Irish Sea, but large-scale seasonal movements have been suggested relating to prey availability (Sabio, 2018).	Common dolphin typically prefer coastal, shelf, slope, and deep-water habitats (Mackey and Gimenez, 2006). Short-beaked common dolphins have additionally been found more frequently along shelf edges and in areas comprised of sharp bottom relief, such as seamounts and escarpments (NOAA, 2022).	Range and Future Prospects: Favourable; Population and Habitat: Unknown; Overall FCS: Unknown.	Least Concern	Sightings predominantly occur along the west coast of Scotland, Ireland and to the southwest of England (Reid *et al*., 2003). Infrequent sightings in the Irish Sea typically occur between June and September (CMACS, 2005). Prey species tend to be pelagic fish such as mackerel, sardine and sprat. Research undertaken to analyse common dolphin foraging habits illustrated that the species is abundant in both neritic and oceanic habitats, suggesting a highly variable habitat preference and associated foraging strategies (Pusineri *et al*., 2007).
Risso's Dolphin	*Grampus griseus*	Risso's dolphin are commonly observed in offshore and inshore waters, and are occasionally seen within Liverpool Bay (CMACS, 2005). This species is known to have a	Risso's dolphin tend to prefer shelf-edge offshore waters and are typically found at depths ranging from 400 – 1,000 m (NOAA, 2022). The majority of	Range and Future Prospects: Favourable; Population and Habitat:	Least Concern	In Welsh waters, Risso's dolphin is commonly observed along the northwest coastline (CMACS, 2005). This species has been found to predominantly be a

Species	Taxonomic Name	Distribution	Habitat Preference	Favourable Conservation Status (FCS): UK assessment[1]	IUCN Status	Additional Information
		relatively localised distribution that encompasses Pembrokeshire, the Lleyn Peninsula, and Anglesey (Baines and Evans, 2012). This species is also known to predominantly visit the area during summer and autumn months, with the greatest rates of observance from July to September (Baines and Evans, 2012).	sightings within the UK occur along the west coast of Scotland and the Outer Hebrides, close to the continental shelf (NatureScot, 2020).	Unknown; Overall FCS: Unknown.		nocturnal forager, targeting deep dwelling benthic organisms (Visser *et al.,* 2021). However, Risso's dolphin is known to perform 'prey switching' between deeper diving for squid and shallow water foraging. As stated, the species will often feed at night to benefit from vertical migrations of squid as they can then stay nearer surface to breathe and conserve energy (Benoit-Bird *et al*., 2019).
Minke Whale	*Balaenoptera acutorostrata*	Minke whale has a largely offshore distribution, with the highest density of sighting occurring in the area of the Celtic Deep (Baines and Evans, 2012). The species predominantly visits the Irish Sea during summer months, with few sightings occurring in the winter. This seasonal variation in observance within the Irish Sea has been linked to changes in oceanographic conditions and prey availability (NatureScot, 2019).	The minke whale is known to have a largely offshore distribution, typically found in deep water areas over 50 m in depth (Baines and Evans, 2012). Their low energetic cost of swimming allows the species to switch between prey species according to seasonal availability, ultimately affecting their habitat preferences throughout the year (Anderwald *et al.,* 2012).	• Range and Future Prospects: Favourable; Population and Habitat: Unknown; Overall FCS: Unknown.	Least Concern	Minke whales can be observed occasionally within Liverpool Bay during summer months and most often alone or in small groups (Reeves *et al*., 2002). The lesser sandeel (Ammodytes marinus) is known to have both spawning and nursery grounds which overlap the development area and are a key food source for minke whale (RSPB, 2014).

[1] UK Conservation status assessment under Article 17 of the Directive on the Conservation of Natural Habitats and of Wild Fauna and Flora (92/43/EEC) from January 2013 to December 2018.

Small Cetaceans in European Atlantic and North Seas (SCANS) III data collected from 2016 aerial surveys within Liverpool Bay and the wider Irish Sea helped to estimate the localised abundances and densities of key cetacean species (Hammond *et al*., 2021).

The development area and marine mammal study area is located within SCANS III block F and the regional marine mammal study area is located within both SCANS III blocks E and F (Figure 7-8) (Hammond *et al*., 2021).

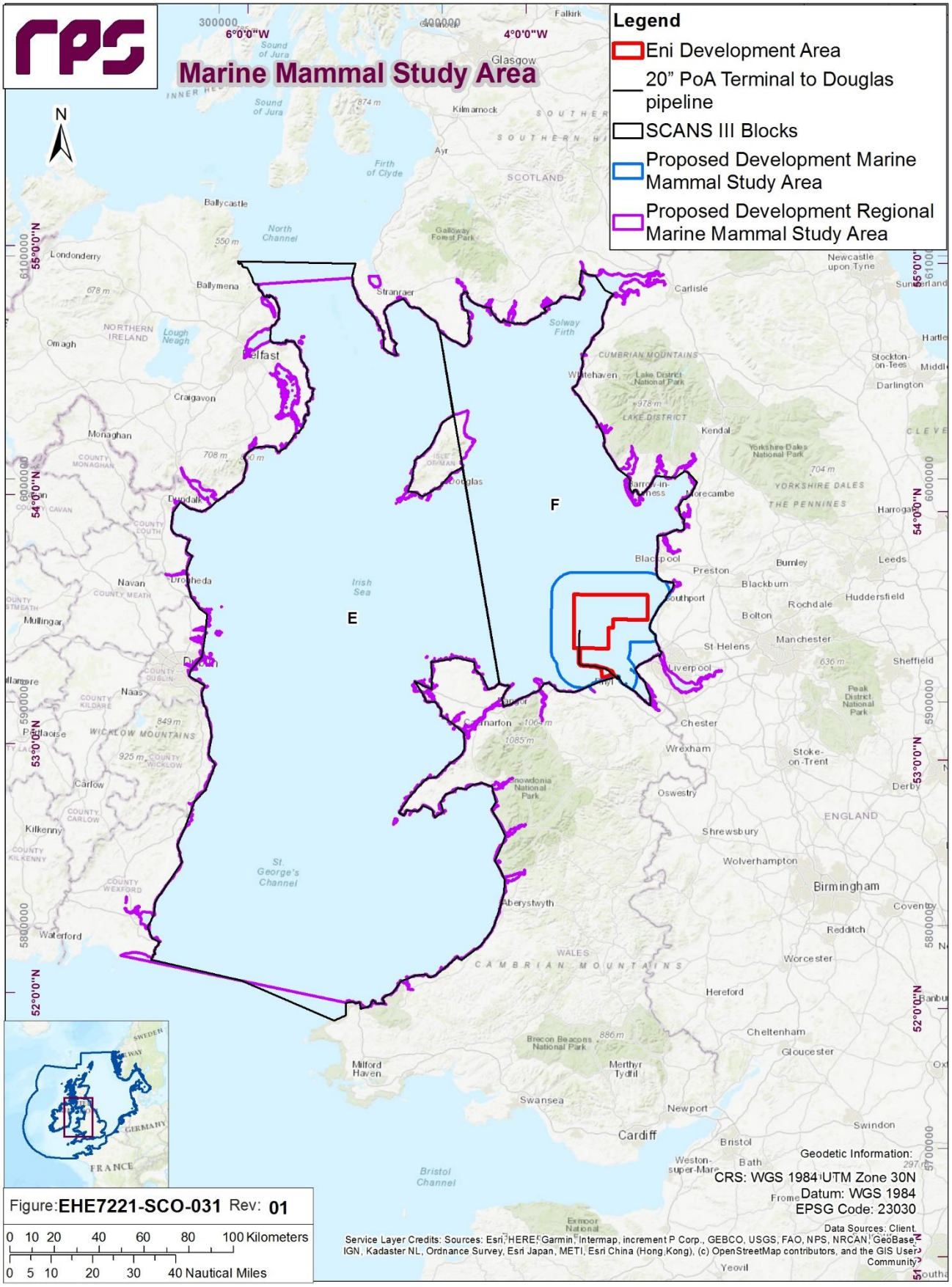

Figure 7-8: Illustrates SCANS III Blocks E and F in Relation to the Development Area.

The following table details the estimated abundance and density values of harbour porpoise, bottlenose dolphin, Risso's dolphin and minke whale in survey blocks E and F (Table 7-13). Harbour porpoise was the only cetacean species that was observed within survey block F. Bottlenose dolphin, Risso's dolphin, and minke whale were not observed in block F and therefore do not have any density and/or abundance values, but estimates were given for Block E for all three species. JCP Phase III density estimates also gave densities up to 2 bottlenose dolphins per km^2 in the Irish Sea (Paxton *et al*., 2016), driven by high densities in Cardigan Bay (which has two SACs designated for bottlenose; Cardigan Bay SAC and Pen llyn a'r Sarnau SAC). Common dolphin and long finned pilot whale were not observed within blocks E or F during the SCANS III survey (Hammond *et al*., 2021).

Table 7-13: Cetacean density and abundance estimates within the Irish Sea SCANS III Blocks (Hammond *et al.,* 2021).

Species	Survey Block	Density (animals)	Abundance
Harbour porpoise	E	0.239	8,320
	F	0.086	1,056
Bottlenose dolphin	E	0.0082	288
	F	-	-
Risso's dolphin	E	0.0313	1,090
	F	-	-
Minke whale	E	0.0173	603
	F	-	-

The development area is located within the Celtic and Irish Sea Management Unit (MU) for harbour porpoise, the Irish Sea MU for bottlenose dolphin, and the Celtic and Greater North Seas MU for common dolphin, Risso's dolphin, and minke whale (Figure 7-9) (IAMMWG, 2021). Within these MU's, estimates of overall abundance are based on SCANS III survey estimates and the Irish Sea ObSERVE programme (Rogan *et al.,* 2018). The following table details the estimated MU abundances of the key cetacean species found within the development area marine mammal study area based on the aforementioned programme data (Table 7-14).

Table 7-14: Cetacean abundance estimates within the regional marine mammal study area based on Management Unit (IAMMWG, 2021).

Species	Management Unit (MU)	Abundance of animals in MU
Harbour porpoise	Celtic and Irish Sea	62,517
Bottlenose dolphin	Irish Sea	293
Common dolphin	Celtic and Greater North Seas	102,656
Risso's dolphin		12,262
Minke whale		20,118

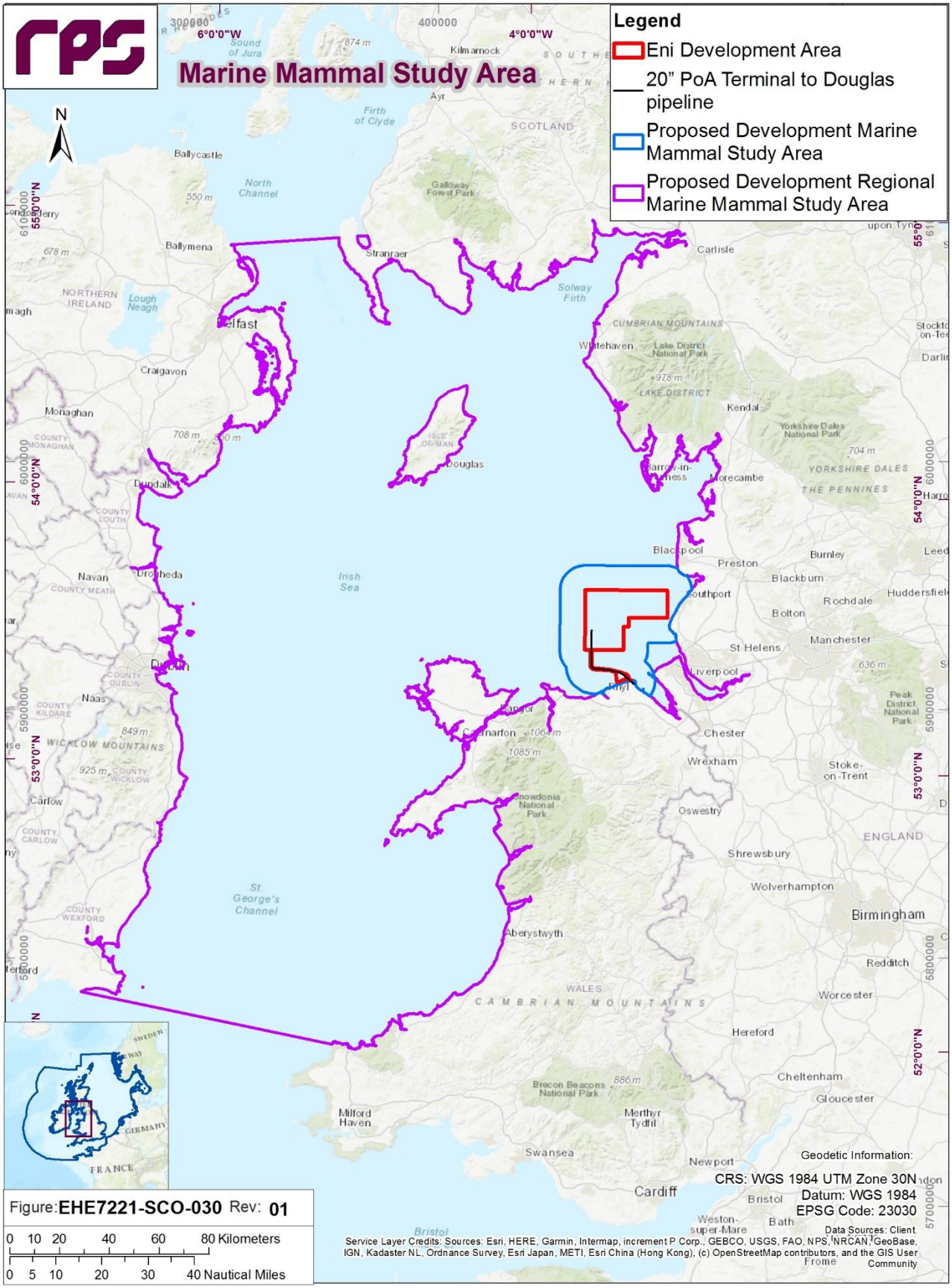

Figure 7-9: Illustrates Survey Blocks E and F in relation to the Celtic and Irish Seas Management Unit (MU), the Irish Sea MU, and the Celtic and Greater North Seas MU.

Marine mammal surveys were undertaken at the Gwynt y Mor OWF, located within the southwest corner of the development area, between the months of December 2003 and March 2005 (CMACS, 2005). The surveys were conducted monthly over a full annual cycle to indicate potential seasonal variations in population abundance.

Vessel based line transects, static acoustic loggers, and land based visual surveys were utilised to assess marine mammal populations within the regional marine mammal ecology study area. From the survey data analysis, it was found that only harbour porpoise and bottlenose dolphin were identified within the Gwynt y Mor OWF array area and subsequently the development area marine mammal study area (CMACS, 2005). Due to the nature of the surveys, there were a small number of cetacean sightings that could not be identified to species level (CMAC, 2005).

Peak numbers of harbour porpoise were observed from April to May during vessel-based line transects, whilst a single group of bottlenose dolphins were observed on just one occasion during land-based surveys in the month of November (CMACS, 2005). During this encounter, approximately 20 individuals were observed, including calves, travelling through the area (CMACS, 2005). Additionally, bottlenose dolphin were only detected on one occasion from static acoustic loggers. Therefore, the study concluded that bottlenose dolphin were deemed to be transient in nature, unlike the harbour porpoise which were observed and regularly detected year-round the static acoustic loggers (CMACS, 2005).

Findings from the SCANS III and Gwynt y Mor OWF marine mammal surveys, in addition to the updated abundance estimates for cetacean MU's in UK waters, confirm that waters surrounding the development area within Liverpool Bay are lower in terms of species richness and overall abundance of cetacean species as compared to other coastal areas within the UK. In comparison, harbour porpoise and minke whale are predominantly found along the north-eastern coast of England and the eastern coasts of Scotland in the North Sea, while bottlenose dolphin and common dolphin are predominantly found along the southwestern coasts of England and Ireland in the Celtic Sea and Atlantic Ocean (OSPAR, 2017). Risso's dolphin is predominantly observed along the northeast coast of Scotland, near the Hebrides and North Atlantic Ocean (Reid *et al*., 2003).

Based on the review of relevant datasets and prior surveys undertaken in the area, harbour porpoise, bottlenose dolphin, common dolphin, Risso's dolphin, and minke whale have the potential to occur within the development area. Findings illustrate that while the harbour porpoise and bottlenose dolphin are more frequently observed and detected within the development area, common dolphin, Risso's dolphin, and minke whale are known to occur regularly within the wider Irish Sea and therefore are key species within the regional marine mammal study area.

Pinnipeds

There are only two native pinniped species that are known to occur in the British Isles. These species are the harbour seal (*Phoca vitulina*) and grey seal (*Halichoerus grypus*) (Baines and Evans, 2009; Sorenson *et al*., 2010). While neither of these species are abundant within Liverpool Bay, the grey seal is observed frequently along the surrounding coastline and at haul-out sites near the Dee Estuary and Hoyle Bank, in proximity to the development area (JNCC, 2004; CMACS, 2005). Harbour seal are widespread around the UK shoreline, predominantly found at haul-out sites on the coasts of Scotland, the Wash (northeast England), and in Strangford Lough, Northern Ireland (JNCC, 2021a). Research has illustrated that harbour seal populations can be divided into three geographically coherent groups: southeast England populations, northeast populations (Scotland, Moray Firth, Orkney, and Shetland), and northwest populations (West Scotland and Western Isles) (Thompson *et al*., 2019).

Additional details regarding grey seal and harbour seal found in the Irish Sea, and specifically Liverpool Bay are further detailed in Table 7-15.

Table 7-15: Key pinniped species likely to be found within the development area marine mammal study area.

Species	Taxonomic Name	Distribution	Habitat Preference	Favourable Conservation Status (FCS): UK assessment[1]	IUCN Status	Additional Information
Harbour seal	*Phoca vitulina*	Harbour seals are the most widely distributed pinniped species in the world and are known to inhabit North Atlantic and North Pacific seas (CMACS, 2005; Thompson *et al*., 2019). Harbour seals are rare visitors to the eastern Celtic and Irish Sea, and more specifically Liverpool Bay. The species is known to prefer areas along the eastern coasts of England and western coasts of Scotland (CMACS, 2005). Results indicate that the current UK harbour seal populations are similar to estimates made in 1990, with significant declines and increases in specific populations worldwide (Thompson *et al.,* 2019).	Modelled results in addition to aerial surveys showed that harbour seal densities were found to be substantially high near haul-out areas and sites of ~30m water depth and low mud content (Aarts, *et al*., 2016). Harbour seals come ashore in sheltered waters, often on sandbanks and within estuaries and rocky areas utilised for protection (SCOS, 2021).	Range and Future Prospects: Favourable; Population and Habitat: Favourable; Overall FCS: Favourable.	Least Concern	Harbour seals are known to be opportunistic feeders, hunting crustaceans, molluscs, and fish species in coastal and offshore waters, typically within 50 km of haul-out sites (CMACS, 2005; Vance *et al*., 2021; SCOS, 2021). Their diets in the UK have been evidenced to predominantly be comprised of sandeel, cod, and saithe in spring and summer months, and herring and gadids during winter months (Jones *et al.,* 2017). The majority of harbour seal haul-out sires are found on the coasts of Scotland, The Wash, Northern England, and Strangford. Lough, Northern Ireland (JNCC, 2021a).
Grey seal	*Halichoerus grypus*	Grey seals are the most commonly observed pinniped species in UK waters, accounting for approximately 40% of the world population and 95% of the European population (JNCC, 2004; CMACS, 2005). Within	Grey seals regularly forage in the open sea at depths of up to 100 m and return to haul-out sites where they rest, moult and breed (SCOS, 2021). The species generally prefers	Range and Future Prospects: Favourable; Population and Habitat: Favourable; Overall FCS:	Least Concern	Grey seals are a qualifying feature of three SACs in Wales and are long lived top predators (Langley *et al*., 2020). SACs often serve as de facto monitoring sites that

Species	Taxonomic Name	Distribution	Habitat Preference	Favourable Conservation Status (FCS): UK assessment[1]	IUCN Status	Additional Information
		Liverpool Bay, grey seals are most commonly observed along the coastline and at haul-out sites located at the mouth of the Dee Estuary and West Hoyle Bank CMACS, 2005). During 2019 and 2020 surveys, grey seal counts at Walney Island, approximately 60 km from the development area and within the regional marine mammal study area were found to be 248 and 300 individuals respectively (SCOS, 2021).	isolated habitats, away from the presence of humans and other terrestrial predators (Kierly *et al*., 200). These environments are typically more exposed to the elements and grey seals tend to favour haul-out sites in remote mainland areas (SCOS, 2021).	Favourable.		are the focus of ongoing management efforts (Russel *et al*., 2019). Prey species include flatfish and gadoids as well as invertebrates and squid (SMRU, 2002; CMACS, 2005). The species has been recorded at the River Dee Estuary, Walney Island, Isle of Man, and Cardigan Bay (SCOS, 2021).Grey seals are listed as an Annex II species in the EU Habitats Directive (Langley *et al*., 2020).

Findings from the Special Committee on Seals (SCOS) estimated total UK harbour seal minimum populations around Wales and Northern Ireland to be <10 and 1,000 individuals respectively (SCOS, 2021). Comparatively, grey seal breeding populations in Northern Ireland and Wales have been estimated to be between 5,000 and 7,000 individuals respectively (ENI, 2021).

Harbour seals in the Irish Sea tend to be concentrated along the coastlines of Northern Ireland and in the southwest of Scotland. Surveys conducted in 2017 and 2018 along the west coast of Ireland illustrated that there was little overlap between major haul-out areas for both harbour and grey seals (Morris and Duck, 2019). Furthermore, a total of 4,007 harbour seals and 3,698 grey seals were enumerated over the 2017-2018 survey, a steady increase compared to prior surveys conducted along the western coast of Ireland, located within the regional marine mammal study area (Morris and Duck, 2019).

There are no known harbour seal breeding sites located along the Welsh coast and therefore none in close proximity to the development area (ENI, 2021). In contrast, a large portion of the Irish Sea is considered to be important to grey seals for haul-out and foraging opportunities in both Wales and Ireland (ENI, 2021). These grey seal haul-out locations have been identified around Pembrokeshire, the Lleyn Peninsula, Firth of Clyde, Cardigan Bay and Liverpool Bay (ENI, 2021). The nearest known haul-out site for grey seals in proximity to the development area is located in the River Dee, approximately 8.8 km to the southeast of the development area (ENI, 2021).

Results have shown that harbour seal distributions within the vicinity of the development area are very low, with less than one individual per 25 km^2, while distributions for grey seals are only moderate, with less than 50 individuals per 25 km^2 (ENI, 2021).

Harbour and grey seal distribution maps created by Carter *et al*. (2020) and Russell *et al*. (2017) illustrated that neither species were found to be present in high densities within the development area and regional marine mammal area. Higher densities of grey seals were observed near the River Dee and Mersey estuaries, while harbour seal densities were highest along the eastern coast of Northern Ireland (Russell *et al*., 2017; Carter *et al*., 2020).

Marine mammal surveys conducted at the Gwynt y Mor OWF found that the grey seal was the only pinniped species recorded within the region through both visual transects and land-based surveys (CMACS, 2005). During visual surveys undertaken in the area, grey seals were observed most frequently from the months of April to May (CMACS, 2005).

These results confirm findings that the grey seal is the most common pinniped species within the waters of the eastern Irish Sea and more specifically Liverpool Bay. Harbour seals are less likely to occur within the development area although they may transit through the area given their occurrence off Northern Ireland. The infrequent number of seals that were recorded through the Gwynt y Mor marine mammal surveys help to validate the other studies presented and further illustrate that the numbers of seals within this region are not considered significant in the context of the entire UK population (CMACS, 2005).

7.4.3 Designated Sites

There are a number of designated sites that occur within the regional marine mammal study area. The designated sites in closest proximity to the development area are illustrated in Figure 7-5 and those within the regional marine mammal study area are further detailed in Table 7-16.

Of particular interest to marine mammal ecology, the North Anglesey Marine SAC is located approximately 39.6 km from the development area marine mammal study area and within the regional marine mammal study area. This SAC is situated in both Welsh territorial and offshore waters, with harbour porpoise being a protected feature listed as an Annex II species within the Celtic and Irish Sea MU (JNCC, 2022). Due to the migratory nature of marine mammals, Table 7-16 details additional designated sites with relevant marine mammal features within the regional marine mammal study area.

Table 7-16: Illustrates the Designated Sites with Qualifying Features related Marine Mammal Ecology.

Designated Site	Distance to Eni Development Area	Qualifying Features Related to Marine Mammals and Site Description
North Anglesey Marine SAC	39.6 km	The North Anglesey Marine SAC stretches from the northern coast of the Isle of Anglesey into the Irish Sea. **Qualifying Features**: The SACs conservation objective is to maintain site integrity in order for the harbour porpoise to maintain its Favourable Conservation Status (FCS) in UK waters (JNCC, 2019b).
Lleyn Peninsula and the Sarnau SAC	85.7 km	The Lleyn Peninsula and Sarnau SAC encompasses area of sea, coast, and estuary that is known to support a wide array of marine habitat, flora and fauna. **Qualifying Features**: The SAC supports a significant presence of grey seal, bottlenose dolphin, and otter (*Lutra lutra*) (NRW, 2018).
North Channel SAC	91.4 km	The North Channel SAC comprises an area of 1,604 km^2, located along the east coast of Northern Ireland and extending into the northern portion of the Irish Sea (JNCC, 2017). **Qualifying Features**: The North Channel SAC is designated for the Annex II species harbour porpoise and works towards aiding the management of harbour porpoise populations within UK waters (JNCC, 2017).
West Wales Marine SAC	94.8 km	The West Wales Marine SAC covers an area of 7,377 km^2, extending into the Irish Sea from North Wales to West Wales. The average water depth in the area ranges from 40-50 m and up to 100 m. **Qualifying Features**: The West Wales Marine SAC is designated for the Annex II species harbour porpoise and works towards aiding the management of harbour porpoise populations within UK waters (NRW and JNCC, 2015).
Strangford Lough SAC	123.5 km	The main feature of the Strangford Lough SAC is the sea inlet itself, which is known to have emerged from melting ice sheets and is less than 10 m in depth (EHS, 2001). **Qualifying Features**: Strangford Lough SAC has many contributing qualifying features, however, the harbour seal and its natural range within this area is most important with regard to marine mammals (EHS, 2001).
Murlough SAC	127.2 km	This SAC is relatively shallow (depth up to 33 m) with subtidal habitat features of qualifying interest. **Qualifying Features:** harbour seal is a qualifying feature, but not the primary reason for site selection of the Murlough SAC (AFBI, 2015).
Rockabill to Dalkey Island SAC	139.0 km	This site includes a range of dynamic inshore and coastal waters win the Western Irish Sea and is roughly 7 km wide and 40 km long (NPWS, 2013). **Qualifying Features:** Rockabill to Dalkey Island SAC is designated for the Annex II species harbour porpoise (NPWS, 2013).
Lambay Island SAC	143.1 km	Lambay is the largest Irish east coast island, situated approximately 4 km off the Dublin coast dominated by igneous rock, ash, shale and limestone (NPWS, 2013b). **Qualifying Features:** Lambay Island SAC is designated in part for Annex II species the grey seal and harbour seal (NPWS, 2013b).

Designated Site	Distance to Eni Development Area	Qualifying Features Related to Marine Mammals and Site Description
Cardigan Bay SAC	148.3 km	Cardigan Bay SAC is a multi-interest site and is one of the largest bays in the British Isles, measuring more than 100 km in length from Lleyn Peninsula to St. David's Head (NRW, 2018). **Qualifying Features**: Cardigan Bay SAC is designated for seven features, two of which are bottlenose dolphin and grey seal (NRW, 2018).
Slaney River Valley SAC	161.4 km	The Slaney River Valley SAC overlaps Raven Point Nature Reserve SAC, The Raven SPA and Wexford Harbour and Slobs SPA (NPWS, 2011). **Qualifying Features**: The Slaney River Valley SAC is designated for multiple interests, but those most important to this marine mammal section are harbour seal and otter (NPWS, 2011).

Additional information to support a full and comprehensive screening of European sites with relevant qualifying features related to marine mammal ecological features will be provided within the HRA Screening Report. The relevant features that are screened into the HRA will be considered in full and assessed in the appropriate sections, with additional information utilised to further support the assessment on European sites and features provided in the RIAA.

7.4.4 Potential Project Impacts

A range of potential project impacts on marine mammal ecology have been identified which could potentially occur during the construction, operation and maintenance, and decommissioning phases of the Proposed Development.

Impacts that have been scoped into the assessment are outlined in Table 7-17, while impacts that have the potential to be scoped out of the assessment are presented in Table 7-18.

Table 7-17: Impacts Proposed to be Scoped into the Assessment for Marine Mammal Ecology.

Potential Impact	Project Phase			Justification
	C	O	D	
Injury, disturbance, and displacement from vessel activity and other noise producing activities	✓	✓	✓	**All phases** • The impact of vessel use during the construction, operation and maintenance, and decommissioning phases of the Proposed Development have the potential to cause injury, behavioural disturbances, and associated displacement of marine mammals. Noise producing activities (e.g., seabed preparation, drilling, and rock placement over the cables) could additionally result in disturbances to marine mammals within the development area.
Potential for barrier effects due to subsea noise	✓	✗	✓	**Construction and decommissioning phase** • The noise producing activities associated with the Proposed Development (offshore vessel movements and seabed preparation/ rock placement over cables) has the potential to result in barrier effects which could ultimately prevent movement between key habitats of importance to marine mammals in the area.

Potential Impact	Project Phase			Justification
	C	O	D	
Injury to marine mammals from collision risk with marine vessels	✓	✓	✓	**All phases** • Increases in marine vessel traffic during the construction, operation and maintenance, and decommissioning phases of the Proposed Development could potentially result in collisions risks for marine mammals within the development area and surrounding environment.
Effects on marine mammals due to changes in prey availability	✓	×	✓	• **Construction and decommissioning phase** There is potential for changes in prey abundance resulting from construction, operation and maintenance, and decommissioning activities to have a direct impact on the foraging abilities of marine mammals within the development area and surrounding vicinity.

Table 7-18: Impacts Proposed to be Scoped out of the Assessment for Marine Mammal Ecology.

Potential Impact	Project Phase			Justification
	C	O	D	
Effects of subsea noise on marine biodiversity from UXO detonation	✓	×	×	**Construction phase** • The potential for displacement and disturbance to marine mammal species from UXO detonation during the construction phase of the Proposed Development has been scoped out due to the historical oil and gas developments in the area. It is unlikely that UXOs that need to be removed and/or detonated have not already been encountered as the area has been fully utilised for decades.
Impacts to marine mammal ecology due to electromagnetic fields (EMF)	×	✓	×	**Operation and maintenance phase** • Low-frequency EMFs are present along subsea cables used to transmit electricity from the development area to appropriate substations and terminal locations. Cables within the development area will be buried and/or protected therefore, there is little expected impact on marine mammals. Additionally, there is limited data illustrating marine mammals being affected by, or seals responding to EMF.
Accidental pollution during construction, operation and maintenance, and decommissioning phases	✓	✓	✓	**All phases** • The potential for accidental pollution to be released during the construction, operation and maintenance, and decommissioning phases of the Proposed Development is present. This pollution could potentially result from sources including vessels/vehicles and equipment/machinery. However, the risk of these events is managed through EMP, PPGs, and Marine Pollution Contingency Plans.

Potential Impact	Project Phase			Justification
	C	O	D	
Injury, disturbance, and displacement to marine mammals from operational noise	×	✓	×	**Operation and maintenance phase** • The operational noise expected to occur from the Proposed Development will be minimal due to the nature of the development. Additionally, the development area exhibits varying levels of subsea ambient noise sources, the most dominant being offshore shipping. Operational noise is unlikely to add to the existing subsea noise baseline in any significant manner given the context of industrial shipping in the vicinity.
Increased suspended sediment concentrations and associated deposition	✓	×	✓	**Construction and decommissioning phase** • Increased suspended sediment concentrations and sediment deposition from construction and decommissioning activities related to subsea pipeline refurbishment and cable installation/protection may potentially result in indirect impacts on marine mammal ecology related to effects on prey species; however, marine mammals are well known to forage in tidal areas where water conditions are turbid and visibility conditions are subsequently poor. • Whilst elevated levels of suspended sediment concentrations (SSC) arising during construction of the offshore development may decrease light availability in the water column and produce turbid conditions, the maximum impact range is expected to be localised with sediments rapidly dissipating over one tidal excursion.

7.4.5 Proposed Assessment Methodology

The marine mammal ecology EIA Report will consider the potential impacts of the construction, operation and maintenance and decommissioning phases of the development area within the marine mammal ecology study area and will follow the methodology outlined in Section 5. The following guidance documents will also be considered:

- Guidance for Ecological Impact Assessment in the UK and Ireland: Terrestrial, Freshwater, Coastal and Marine (Chartered Institute of Ecology and Environmental Management (CIEEM, 2019). These guidelines combine Guidelines for Ecological Impact Assessment in the UK and Ireland: Terrestrial, Freshwater and Coastal, 2nd edition (2016); Guidelines for Ecological Impact Assessment in Britain and Ireland: Marine and Coastal (2010);
- Guidelines for data acquisition to support marine environmental assessments of offshore renewable energy projects (Judd, 2012);
- Guidelines for minimising the risk of injury to marine mammals from geophysical surveys (JNCC, 2017);
- Good practice guide to underwater noise measurement (NPL, 2014);
- Review of underwater acoustic propagation models (NPL) (Wang *et al.,* 2014);
- National Oceanic and Atmospheric Administration (NOAA) technical guidance for assessing the effects of anthropogenic sound on marine mammal hearing;
- Underwater acoustic thresholds for onset of permanent and temporary threshold shifts (NMFS, 2018);

- Marine mammal noise exposure criteria: Updated scientific recommendations for residual hearing effects (Southall *et al.,* 2019);
- Statutory nature conservation agency protocol for minimising the risk of injury to marine mammals from piling noise (JNCC, 2010);
- Guidance on noise management in harbour porpoise SACs (JNCC, 2020);
- The European Union (EU) Marine Strategy Framework Directive (Directive 2008/56/EC). This seeks to achieve good environmental status (GES) in Europe's seas by 2020. The qualitative descriptors for determining GES include "Introduction of energy, including underwater noise, is at levels that do not adversely affect the marine environment." This Directive was transposed into United Kingdom (UK) law by the Marine Strategy Regulations 2010;
- National Policy Statement (NPS) EN-1 Section 5.11, noise and vibration (DECC, 2011); and
- Draft NPS-1 Section 5.12, noise and vibration (BEIS, 2021a).
- In addition, the Marine Mammal impact assessment has considered the legislative framework as defined by:
- The Wildlife Act 1997 (Amendment 2000); and
- European Communities (Birds and Natural Habitats) Regulations 2011.

7.4.5.1 Cumulative Effects

The potential effects related to the construction, operation and maintenance and decommissioning of the Proposed Development on marine mammal communities will assess potential sources of underwater noise from other projects and/or activities that take place within the regional marine mammal study area. Other projects include seismic surveys to be undertaken for the Proposed Development but under a separate phase of the project and consented separately by BEIS. These third-party sources of underwater noise could potentially include disturbance from vessels, UXO clearance, seismic surveys, and pile driving activities associated with other offshore installations or projects in the area.

7.4.6 Potential Mitigation

The following embedded mitigation measures are proposed in relation to marine mammals:

- Development of an appropriate Code of Construction Protocol (CoCP);
- Development of an Environmental Management Plan (EMP), including a Marine Pollution Contingency Plan (MPCP);
- Development of a Vessel Management Plan (VMP);
- Development of a Marine Mammal Mitigation Protocol (MMMP); and
- Implementation of a Decommissioning Plan.

Additional mitigation requirements related to marine mammal ecology are dependent upon the significance of effects and further identified during the ESIA process.

7.5 Offshore Ornithology

7.5.1 Study Area

The development area offshore ornithology study area is defined as the area encompassing the development area, offshore pipeline and subsea cables (including intertidal habitats up to MHWS), associated inter-platform cables, and an additional 10 km buffer to account for the displacement of red-throated divers (*Gavia stellata*) – a qualifying feature of the Liverpool Bay Special Protection Area (SPA) (Figure 7-10). Some species, such as divers and seaducks, are known to be sensitive to vessel movements (Schwemmer *et al*. 2011; Burger *et al*. 2019). The development area will contain minimal infrastructure with the potential to impact on offshore ornithology receptors. Therefore, the development area offshore ornithology study area is suitable for characterising the offshore ornithology features and for considering potential impacts from the Proposed Development.

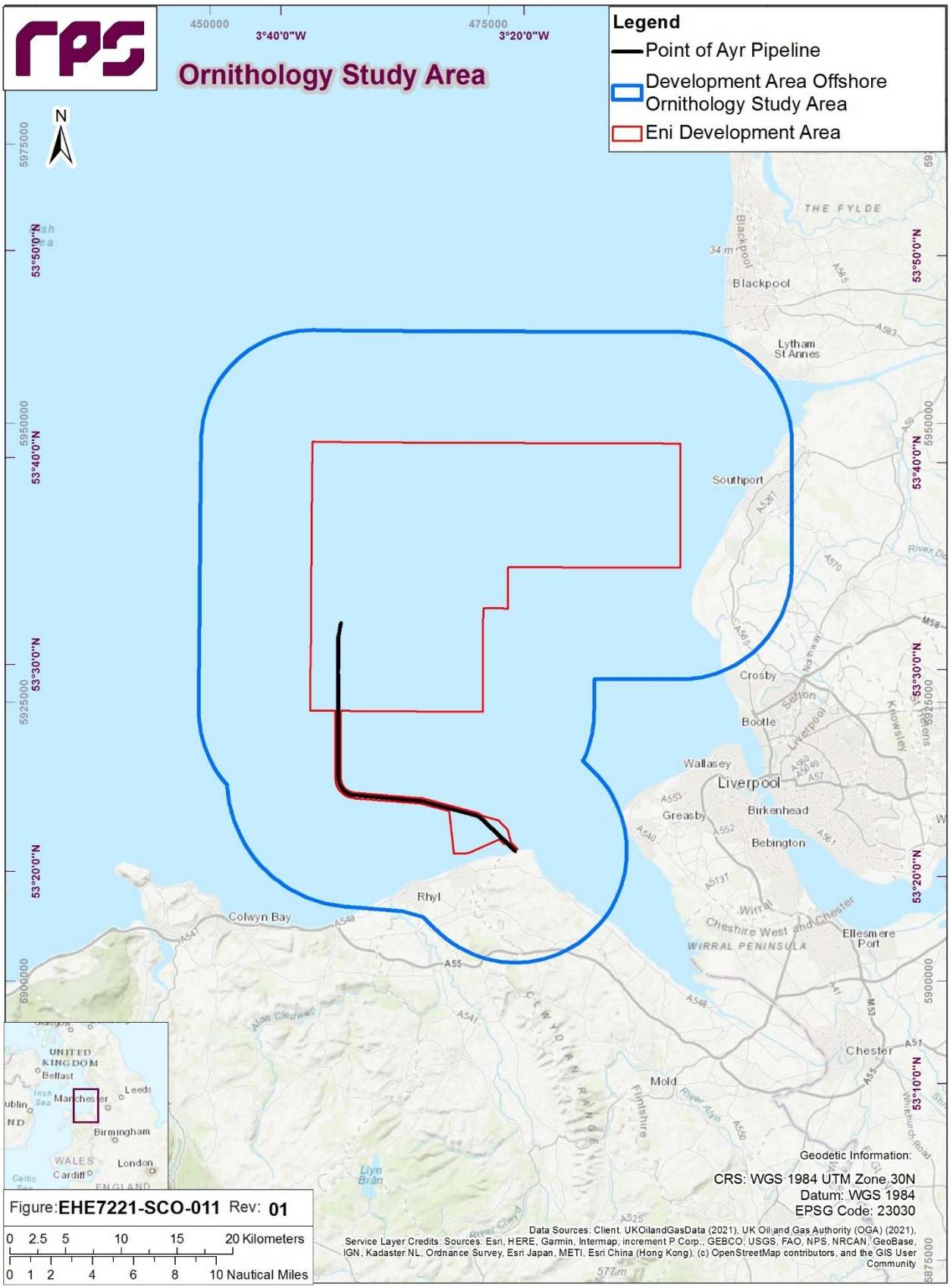

Figure 7-10: Illustrates the Development Area Offshore Ornithology Study Area.

7.5.2 Baseline Environment

Information regarding the offshore ornithology in Liverpool Bay has been collated through a detailed and comprehensive review of currently accessible studies and datasets. To provide a wider context, the desktop review has considered the seabirds present within the broader offshore area in proximity to the development area and the greater Irish Sea. Key data sources are listed in Table 6-5, noting that this list is not exhaustive.

Table 7-19: Summary of Key Desktop Data Sources to Inform Offshore Ornithology Scoping Assessment.

Title	Source	Year	Author
An Assessment of the Numbers and Distributions of Wintering Waterbirds and Seabirds in Liverpool Bay	JNCC	2016	Lawson *et al*.
LBA CCS Transport and Storage Project Feasibility Study Pre-ENI	ENI Progetti	2021	ENI
Seabird Monitoring Programme Report 1986-2019	JNCC	2021	JNCC
SEA678 Data Report for Offshore Seabird Populations	University College Cork	2006	Mackey and Giménez
Desk-based revision of seabird foraging ranges used for HRA screening	BTO Research Report	2019	Woodward *et al*.
UK Offshore Energy Strategic Environmental Assessment OESEA3	DECC	2016	DECC

7.5.2.1 Desktop Study

There are 25 species of seabird that are known to breed in colonies located in the UK, Republic of Ireland, Isle of Man and the Channel Islands (Mitchell *et al*., 2004; Mackey and Giménez, 2006; JNCC, 2021b). A significant proportion of the world's seabird population occurs within the UK waters. The Irish Sea supports both truly pelagic seabirds such as northern gannet (*Morus bassanus)*, northern fulmar (*Fulmarus glacialis)*, Manx shearwater (*Puffinus puffinus)* and auks, and other species which spend part of their annual life cycle at sea, such as divers, gulls and seaducks. Many seabird species are present in the UK, Republic of Ireland, Isle of Man and the Channel Islands in internationally important numbers, including Manx shearwater (80% of world population), great skua (*Stercorarius skua)* (60% of world population), northern gannet (56% of world population), lesser black-backed gull (*Larus fuscus*) (38% of world population), European shag (*Phalacrocorax aristotelis)* (34% of world population), and razorbill (*Alca torda)* (20% of world population) (JNCC, 2021b).

Irish Sea

Ship-based seabird surveys undertaken in the Irish Sea, Cardigan Bay, North Channel, and eastern section of the St. George Channel (collectively referred to as Sea 6) from 1980-2003 have been utilised to gain a better understanding of seasonal distribution and abundance of seabirds in proximity to the development area (Mackey and Giménez, 2006).The surveys found that Manx shearwater were recorded in high densities (up to 8 individuals/km^2) during the breeding and post breeding seasons (Mackey and Giménez , 2006). Additionally, northern gannet was also recorded in high densities (up to 2.5 individuals/km^2) during the post breeding season. Herring gull (*Larus argentatus*) and black-legged

kittiwake (*Rissa tridactyla*) were recorded in high densities (up to 5 individuals/km^2 and 2 individuals/km^2) respectively within Sea 6 (Mackey and Giménez, 2006).

Further species that were identified from survey findings as being present within the Irish Sea include the great cormorant (*Phalacrocorax carbo*), northern fulmar, arctic skua (*Stercorarius parasiticus*), European shag, great skua, black-headed gull (*Chroicocephalus ridibundus*), common gull (*Larus canus*), lesser black-backed gull, great black-backed gull (*Larus marinus*), common tern (*Sterna hirundo*), arctic tern (*Sterna paradisaea*), black guillemot (*Cepphus grylle*), common guillemot (*Uria aalge*), razorbill , and Atlantic puffin (*Fratercula arctica)* (Mackey and Giménez , 2006).

The Storm Petrel (*Hydrobates pelagicus)*, Leach's Storm Petrel (*Oceanodroma leucorhoa*), pomarine skua (*Stercorarius pomarinus*), and long-tailed skua (*Stercorarius longicaudus*) were additionally identified from survey findings as being present within the Irish Sea (Mackey and Giménez, 2006). These species have been found to have lower concentrations within the Irish Sea than the aforementioned species, typically recorded as passage migrants, and more frequently observed in offshore waters, as opposed to coastal or nearshore waters (Mackey and Giménez, 2006).

Similar to findings from Mackey and Giménez (2006), the predominant breeding species of seabird in the Irish Sea were more recently found to be the Manx shearwater, gannet, lesser black-backed gull, guillemot, and herring gull (DECC, 2016).

There are seasonal variations in the distribution and abundance of seabird species in the Irish Sea. In summer, auk species such as common guillemots and razorbills are concentrated in offshore waters near their breeding colonies and make regular foraging trips between their colonies and offshore foraging areas Seabirds have species-specific foraging distances from their colonies/breeding sites (Woodward *et al*., 2019). Foraging ranges are shown in Table 7-20. In winter, most seabirds have a pelagic distribution and are therefore present in lower densities across the Irish Sea.

Table 7-20: Mean max foraging ranges with standard deviation (SD) for seabird species (Woodward *et al.,* 2019). Sample sizes are shown in parentheses (i.e., no. of individuals tracked).

Species	Mean Max foraging range + SD
Northern fulmar (*Fulmarus glacialis)*	542.3±657.9 (16)
Manx shearwater (*Puffinus puffinus)*	1346.8±1018.7 (6)
Great skua (*Stercorarius skua)*	443.3±487.9 (3)
Lesser black-backed gull (*Larus fuscus*)	127±109 (18)
European shag (*Phalacrocorax aristotelis)*	13.2±10.5 (17)
Razorbill (*Alca torda)*	88.7±75.9 (16)
Herring gull (*Larus argentatus*)	58.8±26.8 (10)
Black-legged kittiwake (*Rissa tridactyla*)	156.1±144.5 (37)
Great cormorant (*Phalacrocorax carbo*)	25.6±8.3 (4)

Species	Mean Max foraging range + SD
Northern fulmar, arctic skua (*Stercorarius parasiticus*)	542.3±657.9 (16)
Black-headed gull (*Chroicocephalus ridibundus*)	18.5 (1)
Common gull (*Larus canus*)	50 (1)
Great black-backed gull (*Larus marinus*)	73 (1)
Common tern (*Sterna hirundo*)	18.0±8.9 (16)
Arctic tern (*Sterna paradisaea*)	25.7±14.8 (9)
Black guillemot (*Cepphus grylle*)	4.8±4.3 (2)
Common guillemot (*Uria aalge*)	3.2±80.5 (16)
Atlantic puffin (*Fratercula arctica)*	137.1±128.3 (7)
Storm Petrel (*Hydrobates pelagicus)*	336 (1)
Leach's Storm Petrel (*Oceanodroma leucorhoa*)	N/A[1]
Pomarine skua (*Stercorarius pomarinus*)	-
Long-tailed skua (*Stercorarius longicaudus*)	-

1. Data excluded as these were drawn from shore-based counts

Herring gulls are known to be present year-round within the Irish Sea. These species tend to aggregate offshore and in coastal waters in the central Irish Sea, with the greatest abundance occurring from mid to late summer (DECC, 2016; ENI, 2021).

Development Area

Winter aerial surveys were conducted over eight seasons (from 2004 to 2011) to assess seabird aggregations in Liverpool Bay (Lawson *et al*., 2016). Based on overlaps of the aerial survey effort and the development area offshore ornithology study area, as many as 11 surveys were undertaken from 2004 to 2011 across the development area (Lawson *et al*., 2016).

Population estimates were produced for twenty seabird species. The surveys found that a total of 85,340 seabirds regularly utilise Liverpool Bay (Lawson *et al*., 2016). Overall, it was found that red throated diver (*Gavia stellata*), common scoter (*Melanitta nigra*), common eider (*Somateria mollissima*), great cormorant, and red-breasted merganser (*Mergus serrator)* occurred in numbers exceeding the 1% threshold of national importance (Lawrence *et al*., 2016).

Black-legged kittiwakes have been found to have a wide distribution and are one of the most abundant species of seabird in proximity to the development area (DECC 2016; ENI, 2021). Additionally, northern fulmar, great cormorant, common gull, guillemot, lesser black-backed gull, and herring gull are abundant during the over-winter period and post breeding periods (DECC, 2016; ENI, 2021).

7.5.3 Designated Sites

There are a number of designated sites that occur within the development area offshore ornithology study area. The designated sites in closest proximity to the development area are illustrated in (Figure 7-11) and further detailed in Table 7-21.

Of particular interest to offshore ornithology, the Liverpool Bay SPA, Ribble and Alt Estuaries SPA, Mersey Narrows and North Wirral Foreshore SPA, Dee Estuary SPA, and Mersey Estuary SPA have qualifying features relevant to offshore ornithology and are located within the development area offshore ornithology study area (Table 1.12).

The most relevant designated site overlapping the development area is the Liverpool Bay SPA. The Liverpool Bay SPA is located in the eastern portion of the Irish Sea, bordering the coastlines of northwest England and north Wales. The SPA encompasses marine areas supporting large aggregations of wintering red-throated diver and common scoter. The SPA also hosts important marine foraging areas for little terns breeding within the Dee Estuary SPA, and foraging areas for common terns breeding at the Mersey Narrows and North Wirral Foreshore SPA (JNCC, 2015).

Additionally, there are 10 SPAs that are in and/or adjacent to Liverpool Bay that provide protection for waterbird and seabird species (JNCC, 2022). The species that are protected within these 10 SPAs include the red throated diver, little tern (*Sterna albifrons*), common tern (*Sterna hirundo*), sandwich tern (*Sterna sadivicensis*), roseate tern (*Sterna dougallii*), Arctic tern, lesser black-backed gull, common scoter, great cormorant, and great crested grebe (*Podiceps cristatus*) (JNCC, 2022).

The PoA offshore pipeline and associated subsea cables (offshore components of the development area) are located within the north-eastern most corner of the Dee Estuary SPA. The Dee Estuary SPA lies on the boundary between England and Wales, a large, funnel shaped and sheltered estuary that supports extensive areas of intertidal sandflats, mudflats, and saltmarsh (Natural England, 2014). The SPA is of major importance to waterbirds. During winter months, the intertidal flats and saltmarshes provide feeding and roosting sites for large populations of ducks and waders (Natural England, 2014).

Additional information to support a full and comprehensive screening of European sites with relevant qualifying features related to offshore ornithology features will be provided within the Habitats Regulation Assessment (HRA) Screening Report. The relevant features that are screened into the HRA will be considered in full and assessed in the appropriate sections, with additional information utilised to further support the assessment on European sites and features provided in the Report to Inform Appropriate Assessment (RIAA).

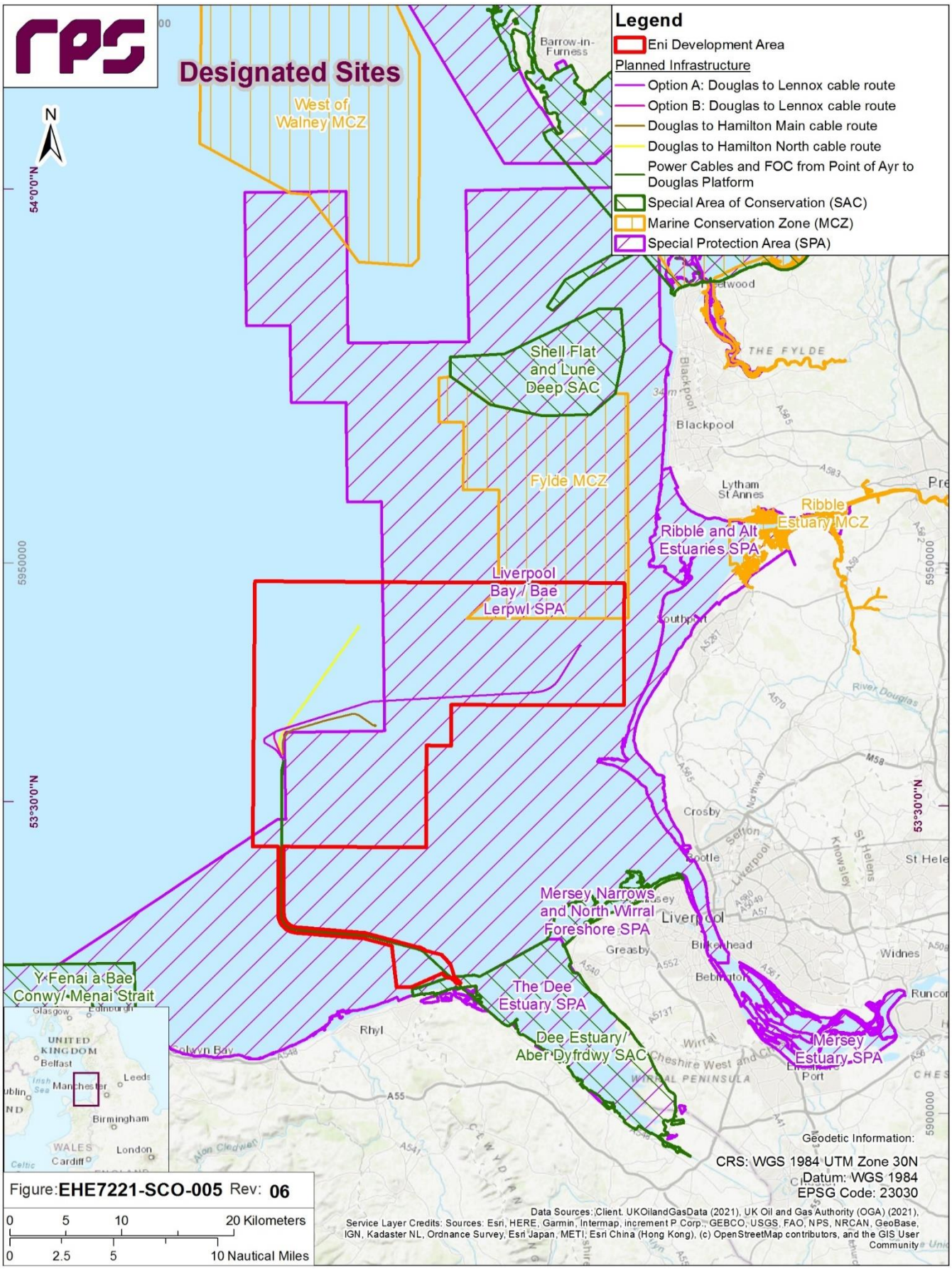

Figure 7-11: Designated Sites in Proximity to the Eni Development Area.

Table 7-21: Illustrates the Designates Sites Located Within the Development Area Offshore Ornithology Study Area.

Designated Site	Distance to Eni Development Area	Qualifying Features and Site Description
Liverpool Bay SPA	0.0 km	The Liverpool Bay SPA comprises an area of approximately 2,528 km^2, and borders the coastlines of both England and Wales, extending beyond the 12 nm territorial limit (MMO, 2016). The Liverpool Bay SPA overlaps the Flyde MCZ. **Qualifying Features:** The site supports non-breeding red-throated diver, little gull, and common scoter, in addition to breeding common tern (*Sterna hirundo)* and little tern (*Sterna albifrons*). The Liverpool Bay SPA also supports and internationally important waterbird assemblage (MMO, 2016).
Dee Estuary SPA	0.0 km	The Dee Estuary marine area is comprised of the Dee Estuary SPA and the Dee Estuary / Aber Dyfrdwy SAC. The Dee Estuary is one of the largest estuaries within the UK, comprising an area of over 140 km^2, with an intertidal area made up of predominantly mudflats, sandflats and saltmarsh (ENI, 2021). The estuary lies on the boundary between England and Wales and is known to be a site of major importance to waterbird species (MMO, 2019a). **Qualifying Features:** This site supports non-breeding common shelduck, Eurasian teal, Northern pintail, Eurasian oystercatcher, grey plover, red knot, dunlin, clack-tailed godwit, Eurasian curlew, common redshank, sandwich tern, and breeding common tern and little tern (Natural England, 2019).
Ribble and Alt Estuaries SPA	1.0 km	The Ribble and Alt Estuaries SPA lies on the coast of Lancashire and Sefton in NW England, overlapping the Ribble Estuary SSSI and the Sefton Coast SSI (UK GOV, 2021). The site consists of extensive areas of sandflats, mudflats, and saltmarsh (MMO, 2019b). **Qualifying Features**: The site supports breeding ruff (*Philomachus pugnax*), common tern (*Sterna hirundo*) and lesser black-backed gull (*Larus fuscus graellsii*). The site also supports wintering Bewick's swan (*Cygnus columbianus bewickii*), whooper swan (*Cygnus cygnus*), golden plover (*Pluvialis apricaria*), bar-tailed godwit (*Limosa lapponica*), pink-footed goose (*Anser brachyrhynchus*), shelduck (*Tadorna tadorna*), wigeon (*Anas Penelope*), teal (*Anas crecca*), pintail (*Anas acuta*), oystercatcher (*Haematopus ostralegus*), grey plover (*Pluvialis squatarola*), knot (*Calidris canutus islandica*), sanderling (*Calidris alba*), dunlin (*Calidris alpina alpine*), black-tailed godwit (*Limosa islandica*), redshank (*Tringa tetanus*). The Ribble and Alt Estuaries SPA also supports passage populations of ringed plover (*Charadrius hiaticula*), sanderling (*Calidris alba*), and redshank (*Tringa tetanus*).
Mersey Narrows and North Wirral Foreshore SPA	13.0 km	This site is comprised of intertidal habitats and is an important feeding habitat for wading birds at low tide and as a nesting site for tern species (MMO, 2021c). **Qualifying Features:** The site supports non-breeding bar-tailed godwit, little gull, knot, and breeding common tern in addition to

Designated Site	Distance to Eni Development Area	Qualifying Features and Site Description
		supporting internationally important waterbird assemblages (MMO, 2021c).
Mersey Estuary SPA	25.0 km	Mersey Estuary SPA covers an estuarine area of approximately 50 km^2 including saltmarshes and large areas of intertidal sands and mudflats (MMO, 2021f). The site is important for a variety of bird species during both the winter and spring seasons. **Qualifying Features**: This site supports over wintering golden plover, black-tailed godwit, dunlin, pintail, redshank, shelduck, and teal (*Anas crecca*) and migratory redshank and ringed plover on passage (MMO, 2021f). The area also supports an internationally important waterbird assemblage (MMO, 2021f).

7.5.4 Proposed Additional Data Collection

Subject to the baseline data and information identified above, intertidal and nearshore waterbird surveys should be undertaken to effectively characterise baseline conditions along the transmission infrastructure, specifically near the inshore areas that are known to overlap with key concentrations of divers and scoters.

Given the wealth of information and currently existing data on marine seabird distribution within the Liverpool Bay Area and the wider Irish Sea, additional baseline surveys beyond those identified above are not required.

7.5.5 Potential Project Impacts

A range of potential project impacts on offshore ornithology have been identified which could potentially occur during the construction, operation and maintenance, and decommissioning phases of the Proposed Development.

Impacts that have been scoped into the assessment are outlined in Table 7-22 while impacts that will potentially be scoped out of the assessment are detailed in Table 7-23.

Table 7-22: Impacts Proposed to be Scoped into the Assessment for Offshore Ornithology.

Potential Impact	Project Phase			Justification
	C	O	D	
Temporary habitat displacement and disturbance	✓	×	✓	**Construction and decommissioning phase** • There is potential for the presence of marine vessels and construction and decommissioning work to temporarily disturb birds from foraging and resting areas.
Indirect impacts from construction/ decommissioning noise	✓	×	✓	**Construction and decommissioning phase** • Temporary reduction or disruption of prey availability may cause reduced energy intake with the potential to affect productivity or survival
Disturbance of contaminated sediments releasing contaminants into the	✓	×	✓	**Construction and decommissioning phase** • There is potential for increased suspended sediment concentrations and sediment deposition from construction activities related to

Potential Impact	Project Phase			Justification
	C	O	D	
surrounding environment				cable installations and drill cuttings to release contaminants into the surrounding environment. This indirect impact could potentially increase turbidity and water quality. This may impact on prey availability and accessibility, and potentially reduce seabird energy intake in the area.
Accidental pollution in the surrounding area	✓	✓	✓	**All phases** • There is a risk of pollution to water, air and sediment through accidental release of chemicals and pollutants from vessels and/or vehicles and equipment and/or machinery during all stages of installation in the development area. The consequences could range from direct mortality (i.e., poisoning) to disruption or reduction of prey availability (indirect effect on seabirds).
Creation of roosting and nesting habitats among project infrastructure	×	✓	×	**Construction and decommissioning phase** • The introduction of newly refurbished infrastructure and additional OP components has the potential to create new roosting and nesting habitats, which may attract some species of seabirds. Additionally, new foraging opportunities may be created with increasing prey availability (i.e., shellfish colonisation of new man-made structure)

Table 7-23: Impacts Proposed to be Scoped out of the Assessment for Offshore Ornithology.

Potential Impact	Project Phase			Justification
	C	O	D	
Operational underwater noise	×	✓	×	**Operation and maintenance phase** • Underwater noise during the project's ongoing operation is unlikely to result in noise levels that would impact surrounding bird species.
Injury to biodiversity from potential collision with marine vessels	✓	✓	✓	**All phases** • The presence of construction, maintenance and decommissioning marine vessels, in addition to increased vessel traffic in the area is unlikely to cause injury to seabirds through vessel strikes and collision risks given the industrialised nature of Liverpool Bay. • Shipping and marine traffic is heavily prevalent within Liverpool Bay and seabirds and vessel strikes have not been documented within the area. The majority of seabird strikes is a direct result of attraction and sometimes associated

Potential Impact	Project Phase			Justification
	C	O	D	
				collision with lights (Ronconi *et al*., 2015). Although unpredictable, poor weather, precipitation and cloud cover have been known to exacerbate the effects of nocturnal attraction to lights (Ronconi *et al*., 2015).

7.5.6 Proposed Assessment Methodology

The offshore ornithology EIA Report will consider the potential impacts of the construction, operation and maintenance, and decommissioning phases of the development within the offshore ornithology study area and will follow the methodology outlined in Section 5. The assessment will consider the magnitude of the impact and the sensitivity of the receptor to the impact, making use of available literature on the vulnerability of seabird and waterbird species to disturbance impacts (e.g., Furness *et al*., 2013; Wade *et al*., 2016; Cutts *et al.*, 2013). The following guidance documents will also be considered:

- Guidelines for Ecological Impact Assessment in the UK and Ireland: Terrestrial, Freshwater, Marine and Coastal published by the Chartered Institute of Ecology and Environmental Management (CIEEM, 2018);
- Birds Directive – Council Directive 79/409/EEC on the Conservation of Wild Birds;
- The Conservation of Habitats and Species Regulations 2017;
- The Conservation of Offshore Marine Habitats and Species Regulations 2017; and
- Wildlife and Countryside Act 1981.

7.5.6.1 Cumulative Effects

The potential effects related to the construction, operation and maintenance and decommissioning of the Proposed Development on seabirds are unlikely to be localised within the footprint of the development area. Seabirds are known to have vast ranges and distributions, capable of travelling long distances from their breeding sites to forage. Therefore, there is potential that cumulative effects could occur on offshore ornithology related to other projects and/or activities that take place within the development area offshore ornithology study area and the wider region.

7.5.7 Potential Mitigation

The following embedded mitigation measures are proposed in relation to offshore ornithology:

- Development and adherence of Vessel Management Plan (VMP);
- Development of a Project Environmental Monitoring and Management Programme (PEMMP) to include the construction, operation and maintenance, and decommissioning phases of the Proposed Development; and
- The PEEMP should include comprehensive planning regarding accidental spills, addressing potential development area contaminant releases and emergency contact details.

8 OFFSHORE HUMAN AND SOCIO-ECONOMIC ENVIRONMENT

8.1 Introduction

This chapter of the Offshore EIA Scoping Report identifies the offshore human and socio-economic environmental receptors of relevance to the development area, which includes the pipelines and cables from MHWS to the offshore infrastructure. This chapter considers the potential impacts from the construction, operation and maintenance, and decommissioning of the offshore and intertidal components (seaward of the MHWS mark) of the Proposed Development. Specifically, this chapter will provide baseline data, proposed additional data collection, potential impacts, assessment methodologies, and mitigation measures related to impacts of the development area on commercial fisheries and aquaculture, shipping and navigation, civil and military communications, marine archaeology and ordnance, infrastructure and other user of the sea, and socio-economics.

8.2 Commercial Fisheries and Aquaculture

8.2.1 Study Area

To effectively analyse findings related to the commercial fisheries and aquaculture baseline data, a broad and inclusive study area has been defined. The proposed study area includes areas within territorial waters of England and Wales. Such an inclusive commercial fisheries and aquaculture study area will allow for the characterisation of all applicable receptors within the eastern Irish Sea, accounting for migration, variations in fishing effort, and seasonal variability.

The development area commercial fisheries and aquaculture study area is therefore defined as the area encompassing the International Council for the Exploration of the Sea (ICES) Statistical Area VIIa (statistical rectangles 35E6 and 36E6), development area, offshore pipeline and subsea cables (including intertidal habitats up to the MHWS) and associated inter-platform cables in Liverpool Bay (Figure 8-1).

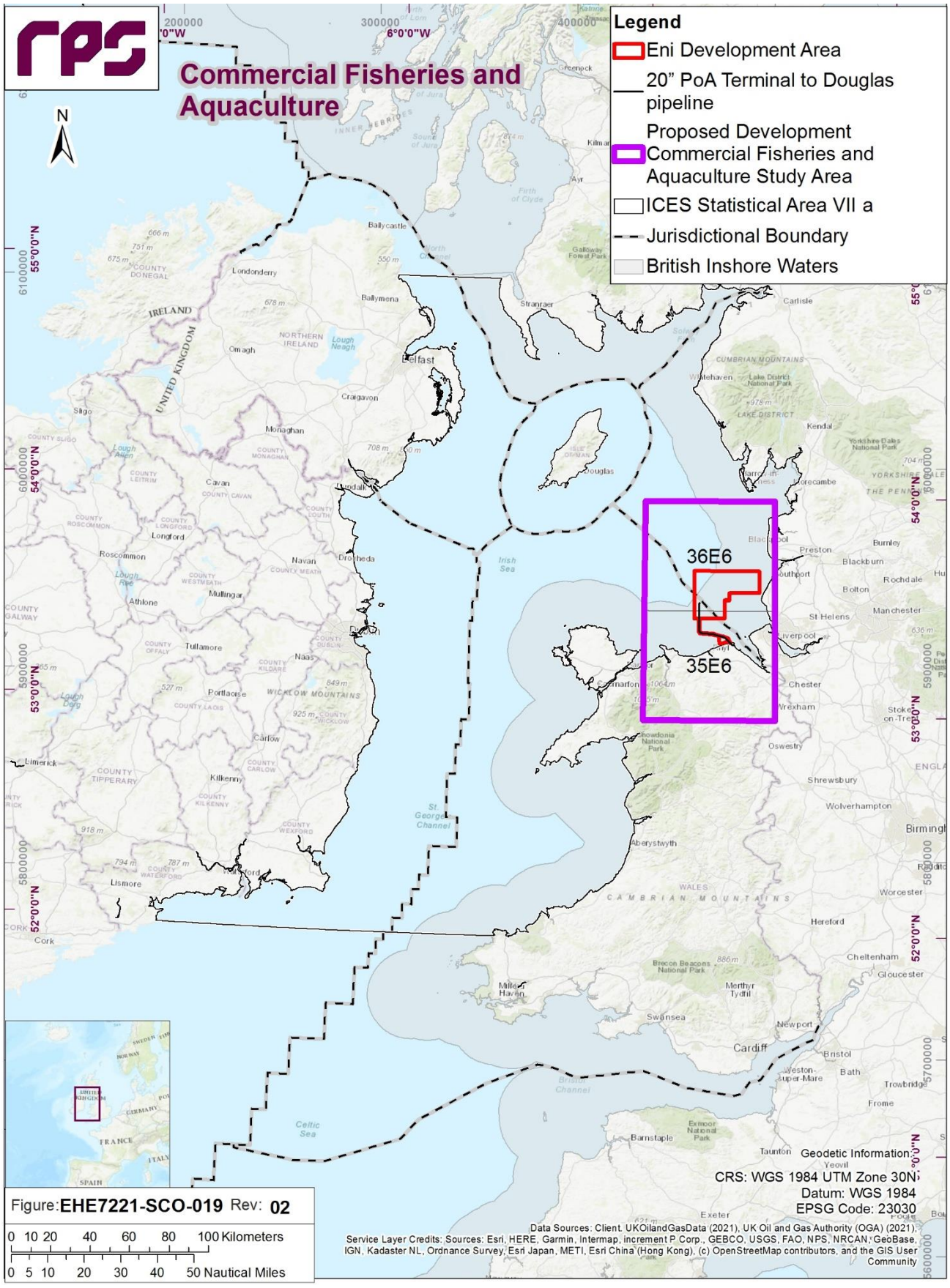

Figure 8-1: Illustrates the Development Area Commercial Fisheries and Aquaculture Study Area.

8.2.2 Baseline Environment

Information regarding the commercial fisheries and aquaculture in Liverpool Bay has been collated through a detailed and comprehensive review of currently accessible studies and datasets. To provide a wider context, the desktop review has considered the commercial fisheries and aquaculture present within the broader offshore area in proximity to and surrounding the development area. Key data sources are listed in Table 7-1, noting that this list is not exhaustive.

A description of the bathymetry is provided in Section 6.2.1 Physical Processes, which shows the development area and associated infrastructure is located in water depths ranging from 0.72 m to 35 m. On average, water depths across the development area are 20 m. Sediments within the development area and surrounding inter-platform cables are dominated by circalittoral fine sand and circalittoral muddy sand. As the PoA offshore pipeline and proposed cables route moves from the Douglas OP to the Onshore project components near landfall in Wales, sandy sediments grade into circalittoral sandy mud and coarse rock.

Table 8-1: Summary of Key Desktop Data Sources to Inform Commercial Fisheries and Aquaculture Scoping Assessment.

Title	Source	Year	Author
Landing Statistics from 2015 to 2019	MMO	2020	MMO
UK Sea Fisheries Statistics	MMO	2020	MMO
VMS Data for EU mobile bottom contacting gear vessels (>12m)	ICES	2018	ICES
Awel y Mor Offshore Wind Farm Preliminary Environmental Information Report	RWE	2021	RWE
Guidance: Managmeent of the Wales Whelk Fishery 200 to 2023	Welsh Government	2022	Welsh Government
Welsh Whelk Fishery	Welsh Government	2016	Rossiter
Estimated relative fishing activity (Welsh waters)	Welsh National Marine Plan	2019	Welsh National Marine Plan
Gwynt y Mor Offshore Wind Farm Marine Ecology Technical Report	CMACS	2005	CMACS

8.2.2.1 Desktop Study

Commercial Fisheries

The development area commercial fisheries and aquaculture study area is located within the ICES Division VIIa (Celtic Sea Ecoregion) statistical area, located within the greater Irish Sea. These areas are further refined into ICES statistical rectangles, of which the development area is situated in 35E6 and 36E6. The annual average value of landings for these ICES rectangles was £3.91 million for all UK vessels for the years 2015 to 2019 (MMO, 2020). The landing quantity for 2020 within the ICES Division VIIa (Celtic Sea Ecoregion) statistical areas showed that shellfish dominated the overall landings with pelagic and demersal species landings occurring at significantly lower levels in both tonnes and overall value (Table 8-2). However, it is worth noting that although shellfish were predominantly caught within the development area commercial fisheries and aquaculture study area, it was also the most severely hit sector during the pandemic as the demand for shellfish from the hospitality sector in the UK and abroad dropped significantly (MMO, 2020). Between the two ICES statistical rectangles over which the development area commercial fisheries and aquaculture study area is located, there are slight differences in landings (Table 8-2).

The differences illustrate that demersal fish and shellfish landings are greater in both tonnes and value within ICES statistical rectangle 36E6 as compared to 35E6. Statistical rectangle 35E6 is predominantly located within inshore waters, while 36E6 is situated predominantly in offshore waters, approximately 12 nm off the Welsh coast.

Table 8-2: Landings of demersal fish, pelagic fish, shellfish species by the UK fleet in 2020 by ICES rectangle (MMO, 2020).

ICES Statistical Rectangle		Pelagic Fish	Demersal Fish	Shellfish
35E6	Landings (tonnes)	>0-249	>0-69	≥500-999
	Value (£ million)	>0-0.19	>0-0.09	≥0.7-0.9
36E6	Landings (tonnes)	>0-249	≥ 70-199	≥1,000-1,499
	Value (£ million)	>0-0.19	≥0.3-0.59	≥-1.9

Key fleets that have been found to operate across the development area commercial fisheries and aquaculture study area include UK vessels targeting shellfish species, particularly whelk (*Buccinum undatum*), king scallop (*Pecten maximus*), queen scallop (*Aequipecten opercularis*), European lobster (*Homarus gammarus*), common prawn (*Palaemon serratus*), and brown crab (*Cancer pagurus*) (RWE, 2021). Additionally, UK vessels are known to target mixed demersal species of fish, including bass (*Dicentrachus Labrax*), flounder (*Platichthys flesus*), and thornback ray (*Raja clavata*) (RWE, 2021).

Mapping by Global Fishing Watch utilising fishing vessel Automatic Identification Systems (AIS) data illustrated that during 2021, fishing effort (hours/8 km^2) was greatest in late spring to early/mid-summer, with a smaller peak in November and December (GFW, 2022).

Fisheries landings from fleets within the area illustrated that shellfish species accounted for more than 90% of landings between 2015 and 2019, with the remaining 10% coming from predominantly demersal species (RWE, 2021). The most commonly landed species within the development area commercial fisheries and aquaculture study area were found to be whelk, queen scallop, king scallops, lobster, brown crab, brown shrimp, and common prawn (RWE, 2021). King scallop landings peak in late autumn to late spring, while queen scallop landings peak during summer months. Whelk fisheries are one of the largest fisheries in Wales and fishing effort has increased notably in recent years. Fishing for whelk occurs year-round but peaks in spring and winter months, decreasing in summer when some vessels switch from targeting whelk to alternate species (Rossiter, 2016). According to guidance presented for the Management of the Wales whelk fishery from 2022 to 2023, scientific monitoring and catch data will be utilised to set an Annual Catch Limit (ACL) of 5,298 tonnes for the entire permitted fleet beginning in March 2022 (Welsh Government, 2022).

The scallop sector is one of the most valuable commercial fisheries within the UK (Cappell *et al*., 2018). King scallops are more commercially valuable than queen scallops due to their increased size and lower catch efficiency (Hinz *et al*., 2009). Additionally, king scallop are subject to the following controls: minimum legal landing sizes, gear restrictions, seasonal closures, and fishing effort restrictions on larger commercial vessels.

Lobster, brown shrimp (*Crangon crangon*), and brown crab are controlled through the enforcement of minimum landing size. Lobster is one of the highest value per kilogram, commercially exploited shellfish species found in UK waters. Over the past 25 years, lobster has consistently been the highest value

shellfish species within the UK, accounting for a value of over £115 million GBP in 2019 (MMO, 2019). Fishing activity for the species typically peaks between July and September in ICES statistical rectangle 36E6.

The heightened levels of shellfish landings in the development area commercial fisheries and aquaculture study area mean that pots and traps are the most common and valuable type of fishing gear in the area. As shellfish are the predominant species, dredging, specifically for scallops, is the next most common fishing measure.

Pots are usually rigged in 'fleets' or strings' that vary in length, configuration, and number based on the target species. These 'fleets' are anchored to the sea floor and marked on the surface by flagged buoys and cans. King scallop dredging is predominantly comprised of Newhaven scallop dredge, which uses a toothed bar which is raked through the sediment by a vessel to catch and land the species. Queen scallop dredges are typically wider and higher than traditional Newhaven scallop dredges and lack the toothed bar. Instead, these dredges utilise a metal grid or chain to get the scallops to lift up off of the seabed and swim into the accompanying net dredge. A small percentage of scallop catch (both king and queen) are taken by hand using SCUBA divers in the UK (Beukers-Stewart, 2009). For demersal fish and elasmobranch species, drift, fixed, and trawl nets are common practice, in addition to hook-and-line methods.

Demersal finfish are also commonly landed in this region. Bass are a common species in Liverpool Bay, breeding in the Irish Sea from February to May. However, ICES (2020) have found bass spawning stock biomass has been declining since 2005, as a result of increased fishing pressure and decreased management measures (ICES, 2020a). In Welsh waters, commercial fishing of bass is under seasonal restrictions (prohibited in February and March) and gear restrictions (only hook and line or gillnets) (RWE, 2021).

Sole (*Solea solea)* is another fish stock which was in decline historically, but has been able to recover to sustainable levels, subject to total allowable catch regulations and technical measures. Other demersal fish are also caught in this area but largely as bycatch, notably, flounder (*Platichthys flesus)*, red mullet (*Mullus surmuletus*), and plaice (*Pleuronectes platessa*).

Elasmobranchs are also caught within the development area commercial fisheries and aquaculture study area. Previous studies conducted at Awel y Mor, located in the southwestern corner of the development area, highlight thornback rays (*Raja clavata*) as being common around the northern Welsh coastline, moving close to shore in the spring when they are targeted and/or caught incidentally as bycatch. ICES data from 2017 to 2020 advises that a precautionary approach is applied to the thornback ray, with no more than 1,663 tonnes being landed in each respective year (ICES, 2020b). Information on the stock status is low but is not currently thought to be of concern (RWE, 2021).

Findings from the Gwynt y Mor OWF illustrated that there were no large-scale commercial fisheries landings made within Liverpool Bay (CMACS, 2005). It was evidenced that ICES statistical rectangle 35E6 was predominantly located in inshore waters and subsequently deemed important for flatfish and ray species. However, shellfish landings were much greater in the offshore waters of the adjacent ICES statistical rectangle 36E6 (CMACS, 2005). At the time of the study, the principal species of finfish, by landed weight within ICES statistical rectangles 35E6 and 36E6 were plaice, skates, rays, whiting, flounder, sole, cod, gurnards, and spurdog (CMACS, 2005).

The Welsh National Marine Plan illustrates that while mobile and static gear are both utilised across the development area itself and the development area commercial fisheries and aquaculture study area, mobile gear is increasingly used in offshore waters, towards the centre of the Irish Sea, away from the development area commercial fisheries and aquaculture study area, and static gear is predominantly used near Anglesey and within inshore waters (WNMP, 2019).

Aquaculture

Currently there is no record of aquaculture activity in the development area commercial fisheries and aquaculture study area.

The only project which has been active was out by Deepdock Ltd. At North Hoyle OWF which is operated by RWE, approximately 7.5 km off the coast of North Wales, between the towns of Rhyl and Prestatyn. The project was a trial and ran over the summer of 2010, involving seabed cultivation for the harvesting of wild mussel stock spats (approximately 1 year old) which are then moved to other intertidal and subtidal sites to be cultivated to maturity (Shellfish Association of Great Britain, 2012). The project was largely deemed successful with very few concerns centred around health and safety and navigation.

In 2018 Baitbox Ltd. Submitted an environmental impact statement for the licensing of a Rainbow Trout farm within Gwynt y Mor offshore windfarm off the coast of North Wales. The project would involve anchoring four cages to the seabed with the maximum production of 3,228 tonnes of rainbow trout every two years (Blanchard, 2018). There is currently no information to suggest that this project was or is operational.

8.2.3 Proposed Additional Data Collection

Qualitative data inputs through consultation with Commercial Fisheries sector and regulatory and science bodies.

Commercial fisheries catch and effort, plus landings and sales notes data is collated by ICES statistical rectangle; compiled annually and made publicly available by the Marine Management Organisation (MMO) and applied to inform this scoping report.

However, an ICES statistical rectangle spatial unit is approximately 30 nm^2. As such, the resolution of the data can lack the granularity to determine actual fishing activity and catch across the development area. Care is therefore required when interpreting these data and qualitative inputs from experts with local knowledge should be considered e.g., officers from the Northwest Inshore Fisheries Conservation Authority (IFCA) responsible for managing commercial fisheries within the 6 nm; plus inputs through consultation with Fisheries Representatives to further refine and accurately interpret data.

This additional qualitative information on fishing practices and behaviours may illuminate any trends that may be apparent from quantitative sets and may aid the identification of key biological / ecological events and pathways significant for commercial fisheries e.g., spawning times and grounds, nursery grounds and migratory routes, which can be cross checked with literature and national scientific bodies.

VMS Data

Consideration should also be given to the fleet metier operating within the development area. UK, European and third-party fishing vessels over 12m in length operating within UK waters are required to be equipped with vessel monitoring systems (VMS) which pole position data every 2 hours to their respective national authority.

Data representing each position are aggregated by general gear type in a grid of sub-rectangles approximately 5.3 nm^2 (i.e., at a resolution of 200^{th} of an ICES rectangle) and provide a more precise picture of fishing activity by using vessel speed as a proxy: vessel speeds above 1 knot but below 4 knots are distilled form the data to provide an indication of fishing density per spatial unit.

These data can be analysed with landings values, thereby providing both effort and value of each sub-rectangle for mobile and static gears. Spatially disaggregated effort and landings data for UK and EU fishing fleets can be obtained from UK Sea Fisheries Statistics Reports, and the European Commission Scientific, Technical and Economic Committee for Fisheries (STECF) data; and flag-specific effort data can be obtained from transversal data available in STECF Annual Economic Reports.

I-VMS (Inshore Vessel Monitoring System)

Fleets operating within the 12 nm inshore territorial boundary are more likely to be under 15m vessel length category; and under 10 m in length if fishing within 6 nm of shore. Although a statutory

requirement exists for vessels over 12 m to be equipped with VMS, actual uptake has been hindered by a number of technical and broader issues.

However, going forward, legislation is due to come into force in 2022 which will make it a legal requirement for all vessels under 12 m in length to have an I-VMS installed and transmitting data to the MMO when they are at sea in English and Welsh waters (within the 12 nm boundary). Note that legislation requiring the use of VMS on all licensed under 12 m fishing vessels that operate in Welsh Waters, and Welsh vessels wherever they are fishing, will come into force on 15 February 2022 (The Sea Fishing Operations (Monitoring Devices) (Wales) Order 2022 (legislation.gov.uk).

For English vessels under 12 m roll-out of I-VMS has been staggered by length category as show in Table 8-3.

Table 8-3: English vessels under 12m roll-out of I-VMS

Vessel length group (m)	Start date	Device must be installed by
10m to 11.99m	15/02/2022	w/c 14/03/22
8m to 9.99m	16/03/2022	w/c 16/05/22
6m to 7.99m	18/05/2022	w/c 15/08/22
Below 6m	17/08/2022	w/c 12/12/22

I-VMS is similar to VMS tracking devices utilised by fishing vessels 12m and greater in overall length. It provides positional information such as latitude and longitude, course, speed and date and time of each positional report e.g., every 10 minutes but can be set to report more frequently if required e.g., fishing within an MPA.

However, rather than transmitting data via satellite, it reports data via mobile phone signal (GPRS). When the device is located outside GPRS range, the device continues to store the positional information and submit the data once GPRS coverage next becomes available. This data will be sent to the MMO UK VMS Hub.

MMO Catch App

The digital catch recording app, developed by the Marine Management Organisation (MMO), is intended for all English and Welsh non-sector under 10m vessels that fish in UK waters to create and submit catch records.

The scope of the app is intended to create a record for everything caught within a fishing trip: effort details, live weight, conversion factors, quota species, sizes of fish species subject to controls.

The key improvement on existing logbooks and sales notes is the resolution of data referred to at the beginning of this section. The reporting spatial unit is significantly smaller and will create a more precise understanding of catch and effort within the study area.

The reporting spatial unit is based on dividing an ICES statistical rectangle into a further nine equal sub-areas (Figure 8-2).

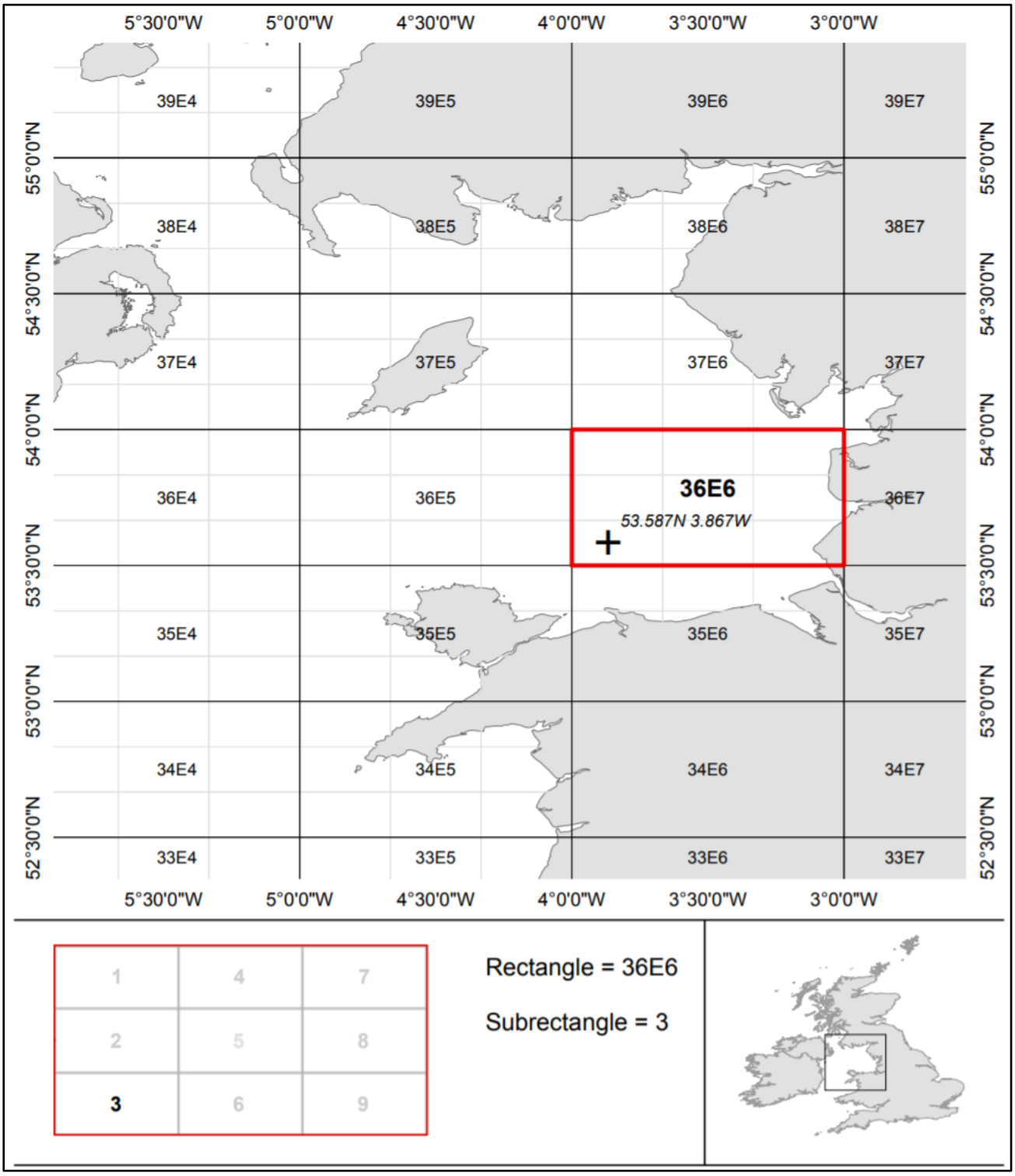

Figure 8-2: Illustrates the ICES statistical rectangles and sub areas.

The scope of the reporting is comprehensive:

Records must be submitted within 24 hours of landing:

- for quota species or species with catch limits, records must be created prior to removing the catch from the vessel
- for species not subject to quotas or catch limits, records must be created within 24 hours of landing.

Catches of non-quota species or species not subject to catch limits that are retained onboard or in keep pots for landing at another time must also be reported.

A new catch record must be created whenever an ICES sub-area boundary is traversed during a single fishing trip e.g., from 6a to & 7a:

- In affect a separate catch record for each ICES Area fished.

It will be mandatory requirement for under-10m electronic to report using the Catch App platform for English vessels from Monday, 28 February 2022; and according to Fishing News publication dated 07/02/2022, 88% of the 2,110 English- registered vessels have signed up to use the App. Using the Catch App has been a licencing condition for Welsh vessels since 28 February 2020.

Teething problems have been reported by fishermen and the MMO will allow a transition period to resolve issue. But once resolved a rich data set will be available to inform the project.

Surveillance Data

Patrols are undertaken by IFCAs, Royal Navy Fisheries Patrol Vessels and patrol aircraft. UK surveillance aircraft are used to construct an on-going picture of fishing activity within the UK EEZ and to make effective use of patrol vessel activity by coordinated use of surveillance data.

Surveillance activities, whether from sea patrol or aerial reconnaissance may provide a further picture of fishing activity by gear type and cross referenced to VMS data to identify fleet activity but the quality of the data has recognised limitations e.g., identifying relatively smaller vessels by length category, detection of vessels fishing at night and representative of just a snapshot of fishing activity.

8.2.4 Potential Project Impacts

A range of potential project impacts on commercial fisheries and have been identified which could potentially occur during the construction, operation and maintenance, and decommissioning phases of the Proposed Development.

Impacts that have been scoped into the assessment are outlined in Table 8-4, while impacts that have the potential to be scoped out of the assessment are presented in Table 8-5.

Table 8-4: Impacts Proposed to be Scoped into the Assessment for Commercial Fisheries and Aquaculture (Project Phase refers to Construction (C), Operation and Maintenance (O), and Decommissioning (D).

Potential Impact	Project Phase			Justification
	C	O	D	
Loss or restricted access to fishing grounds	✓	✓	✓	**All phases** • The potential implementation of safety zones around construction, operation and maintenance, and decommissioning works could result in the temporary loss of, or restricted access to fishing grounds within the development area. • The inter-array cable configuration may prohibit specific gear types particularly mobile gears: hinder safe navigation, gear deployment and recovery.
Impacts on commercially valuable fish and shellfish species/resources	✓	✓	✓	**Operation and maintenance phase** • There is potential for operation and maintenance activities to cause habitat disturbance and displacement to commercially important fish and shellfish species within and surrounding the development area. These disturbances and displacements are further detailed in Chapter 7 Section 2: Fish and Shellfish Ecology.
Interference with fishing activity	✓	✓	✓	**All phases** • There is potential for increased vessel traffic within fishing grounds as a direct result of changes to shipping routes and Proposed Development vessel traffic within and in proximity of the development area. This has the potential to increase the overall interaction with fishing vessels.
Temporary increases in steaming distances to fishing grounds	✓	✓	✓	**All phases** • The potential implementation of safety zones around construction, monitoring and decommissioning works could result in temporary increases in steaming distances for fishermen travelling to and from fishing grounds.
Loss or damage to fishing gear due to snagging gear on project infrastructure	✗	✓	✗	**Operation and maintenance phase** • There is potential for gear to become snagged on the offshore pipeline, inter-platform cables, and other project infrastructure e.g., mobile demersal gears such as scallop dredges or bottom trawling.
Appointment of Fishing Industry Representatives (FIRs)	✓	✓	✓	**All phases** • In line with FFLOW guidelines the development should be inclusive throughout all phases of the project. Representatives from the fishing sector and integrated into the project communication strategy: all project phases and associated activities are understood, and fishery concerns are considered.

Potential Impact	Project Phase			Justification
	C	O	D	
Supply chain opportunities for local fishing vessels	✓	✓	✓	**All phases** • The potential requirement for assorted marine vessels (such as guard vessels) during all phases of the project may beneficially provide supply chain opportunities for local fishing vessels and the local community.

Table 8-5: Impacts Proposed to be Scoped out of the Assessment for Commercial Fisheries and Aquaculture.

Potential Impact	Project Phase			Justification
	C	O	D	
Displacement of fishing activity into other areas	✓	✓	✓	**All phase** • Given that Liverpool Bay has historically been a site for offshore oil and gas, the displacement of fishing activities into other surrounding areas is unlikely. The Proposed Development will utilise pre-existing infrastructure and essentially turn the oil and gas OPs into a novel CCS site, with little change to the surrounding marine environment.
Long-term increased steaming distances to fishing grounds during operation and maintenance	×	✓	×	**Operation and maintenance phase** • Following construction of the Proposed Development, fishing vessels will be able to transit through and around the site as they have done so in the past. The presence of the CCS infrastructure and the associated development area should not have a direct effect on steaming distances to/from adjacent fishing grounds in the area.

8.2.5 Proposed Assessment Methodology

The commercial fisheries and aquaculture EIA Report will consider the potential impacts of the construction, operation and maintenance, and decommissioning phases of the development area within the commercial fisheries and aquaculture study area and will follow the methodology outlined in Section 5. The following guidance documents will also be considered:

- The Static Gear Code of Practice for Relations Between the Oil and Gas Industry and Near-Shore Fishermen (The UK Offshore Operators Association (UKOOA) and the National Federation of Fishermen's Organisations (NFFO), 2006;
- Fishing and Submarine Cables – Working Together (International Cable Protection Committee (ICPC), 2009);
- Best Practice Guidance for Fishing Industry Financial and Economic Impact Assessments (United Kingdom Fisheries Economics Network (UKFEN), 2012;
- FLOWW Best Practice Guidance for Offshore Renewables Development: Recommendations for Fisheries Liaison: FLOWW (Fishing Liaison with Offshore Wind and Wet Renewables Group) (FLOWW, 2014); and

- FLOWW Best Practice Guidance for Offshore Renewables Developments: Recommendations for Fisheries Disruption Settlements and Community Funds. FLOWW (Fishing Liaison with Offshore Wind and We Renewables Group) (FLOWW, 2015).

8.2.5.1 Cumulative Effects

The potential effects related to the construction, operation and maintenance, and decommissioning of the Proposed Development on commercial fisheries and aquaculture will assess potential cumulative effects that could occur on commercial fisheries and aquaculture receptors related to alternate projects and/or activities that take place within the development area commercial fisheries and aquaculture study area.

8.2.6 Potential Mitigation

The following embedded mitigation measures are proposed in relation to commercial fisheries and aquaculture:

- Ongoing liaison with the fishing industry via the Proposed Development Fisheries Liaison Office (FLO) and Fishing Industry Representative (FIR);
- Development of a Fisheries Liaison and Coexistence Plan;
- Adherence to good practice guidance with regards to fisheries liaison (e.g., Fishing Liaison with Offshore Wind and Wet Renewables Group (FLOWW), 2014; 2015);
- Advance warning to fishing fleets of construction, maintenance and decommissioning activities;
- Timely and efficient distribution of Notices to Mariners (NTM) of the location and nature of construction, maintenance and decommissioning works;
- Notification to the United Kingdom Hydrographic Office (UKHO) of the works to facilitate the promulgation of maritime safety information and updating of nautical charts and publications;
- Use of advisory clearance distances and safety zones during construction and periods of major maintenance;
- Use of guard vessels where required by risk assessment;
- Marking and lighting of Proposed Development in accordance with International Association of Marine Aids to Navigation and Lighthouse Authorities (IALA) guidance and in consultation with the Maritime and Coastguard Agency (MCA) and Trinity House;
- Cables to be buried to a suitable depth, where possible, to avoid interaction with fishing gear;
- Undertaking of post-lay and cable burial inspection surveys and monitoring; and
- Any external cable protection to be designed to enable trawling to occur over it.

8.3 Shipping and Navigation

8.3.1 Study Area

To support the development of the shipping and navigation section, the development area shipping and navigation study area is defined as the area encompassing the development area, which includes the offshore pipeline and proposed subsea cable, associated inter-platform cables, and a buffer area extending 10 nautical miles (Figure 8-3).

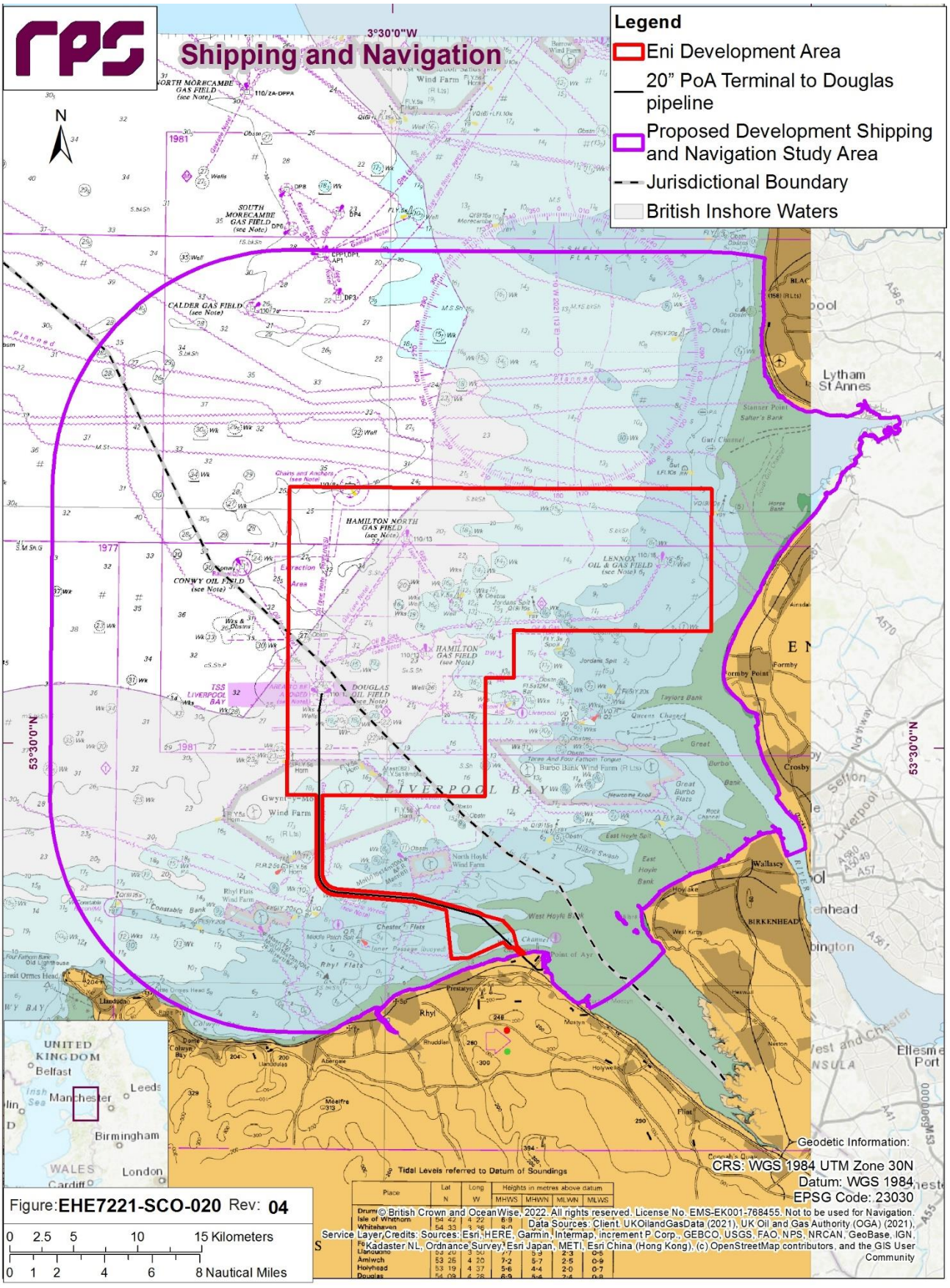

Figure 8-3: Illustrates the Development Area Shipping and Navigation Study Area.

8.3.2 Baseline Environment

Information regarding shipping and navigation has been collated through a detailed and comprehensive review of currently accessible studies and datasets. To provide a wider context, the desktop review has considered the shipping and navigation receptors present within the development area shipping and navigation study area. Key data sources have been provided in Table 7-1.

Table 8-6: Summary of Key Desktop Data Sources to Inform Shipping and Navigation Scoping Assessment.

Title	Source	Year	Author
Automatic Identification System (AIS) vessel traffic data	Marine Management Organisation (MMO)	2017 (full calendar year)	Maritime and Coastguard Agency (MCA)/MMO
Cables and pipelines	Kis-Orca	2021	Kis-Orca
Helicopter Search and Rescue (SAR) locations	The Bristow Group	2021	The Bristow Group
International Maritime Organization (IMO) Traffic Separation Schemes (TSS)	Oceanwise	2021	Oceanwise
Marine aggregate sites and disposal sites	The Crown Estate	2021	The Crown Estate
Offshore wind farms	The Crown Estate	2021	The Crown Estate
Oil and gas platforms	Oil and Gas Authority	2021	Oil and Gas Authority
UK Coastal Atlas of Recreational Boating	Royal Yachting Association (RYA)	2018	RYA
Vessel Monitoring Systems (VMS) data	MMO	2019	MMO

It is noted that the COVID-19 pandemic may have had short-term effects on the observed traffic pattern, and therefore a pre-COVID period has been used. In addition, Brexit has also affected shipping routes in the Irish Sea, post-2019.

8.3.2.1 Desktop Study

Navigational Features

The development area is located in the eastern Irish Sea, where shipping routes presently operate and safely co-exist alongside a number of notable marine assets and activities, including (but not limited to):

- Pilot boarding stations;
- Ports and marine terminals;
- Offshore wind farms;
- Commercial ship anchorages;
- Aggregate production areas;
- Disposal grounds;
- International Maritime Organisation Traffic Separation Schemes (IMOTSS). Of particular note is the navigationally sensitive operation involving the presence of cable-laying vessels, restricted in

manoeuvrability at times, crossing the TSS lanes north and south of the existing Douglas Process OP;

- Oil and gas assets and activities;
- Commercial fishing activities; and
- Recreational cruising routes.

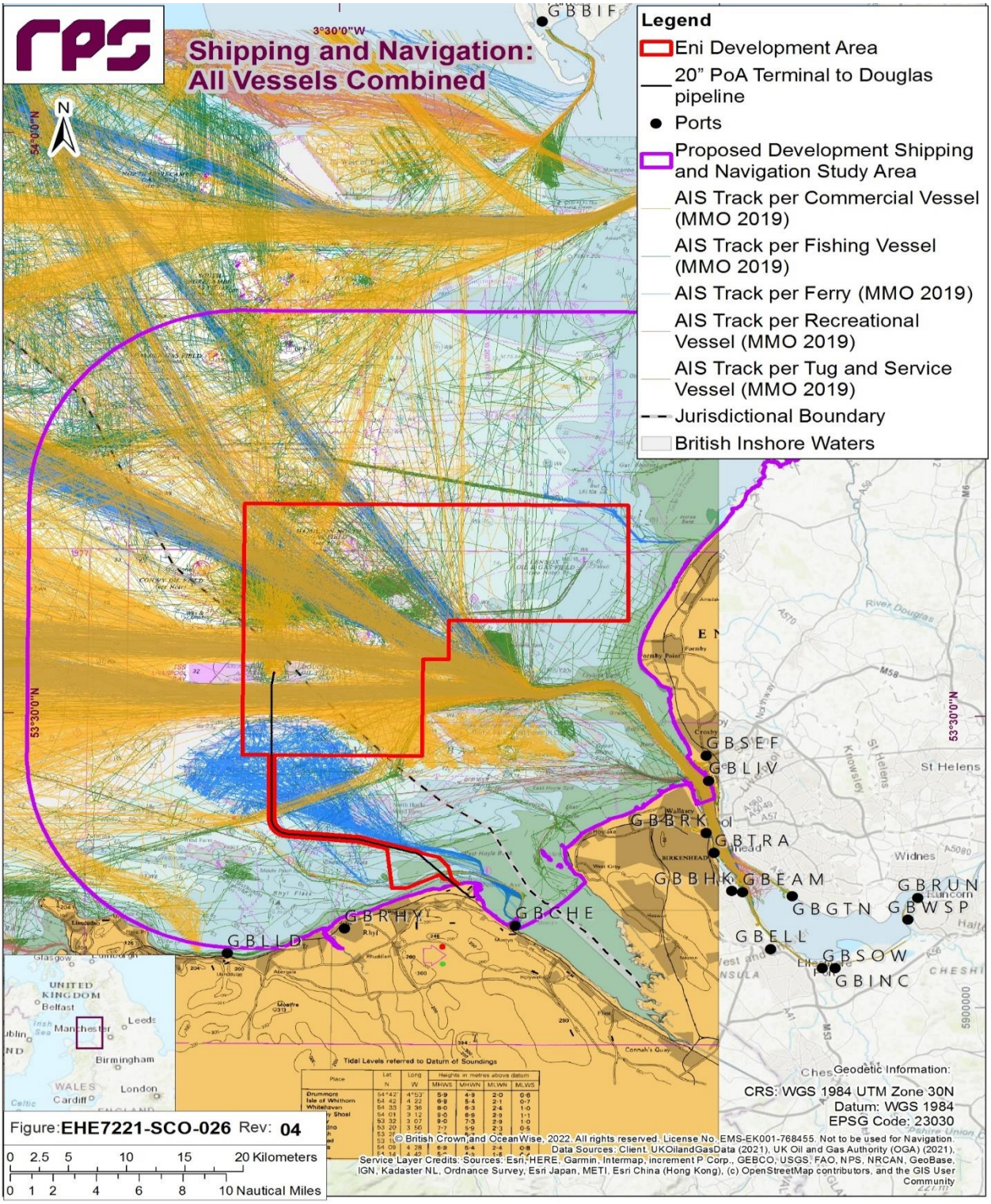

Figure 8-4: Illustrates all vessels within the Development Area Shipping and Navigation Study Area.

Commercial Vessel Analysis

Automatic Identification System (AIS) data was used to determine the density of vessels transiting through the Eastern Irish Sea and Liverpool Bay. AIS data for commercial shipping, fishing vessels, ferries, recreational vessels, tugs and service vessels, and a collated map of vessel data can be found in Figure 8-5.

AIS commercial shipping data within the Irish Sea indicates that there is a high density of shipping routes off the northern coast of Anglesey and concentrated along the western coast of Ireland, however, AIS is not mandatory for all vessels including smaller fishing vessels (below 15m in length), and recreational vessels. Commercial shipping in the development area shipping and navigation study area predominantly operates out of Liverpool and the River Mersey. While commercial shipping routes are prominent throughout the entirety of the Irish Sea, those transecting the development area shipping and navigation study area tend to intersect the development area itself towards the western boundary of the shipping and navigation study area, in offshore waters (Figure 8-5).

The southern half of the shipping and navigation study area is busiest due to east-west commercial shipping between the Off Skerries TSS (off Anglesey) and Liverpool heading via the In Liverpool Bay TSS. There are also routes between Liverpool and the Isle of Man, as well as vessels passing to/from Liverpool passing to the south and north of the Isle of Man in passage to destinations further afield such as Clyde and Belfast.

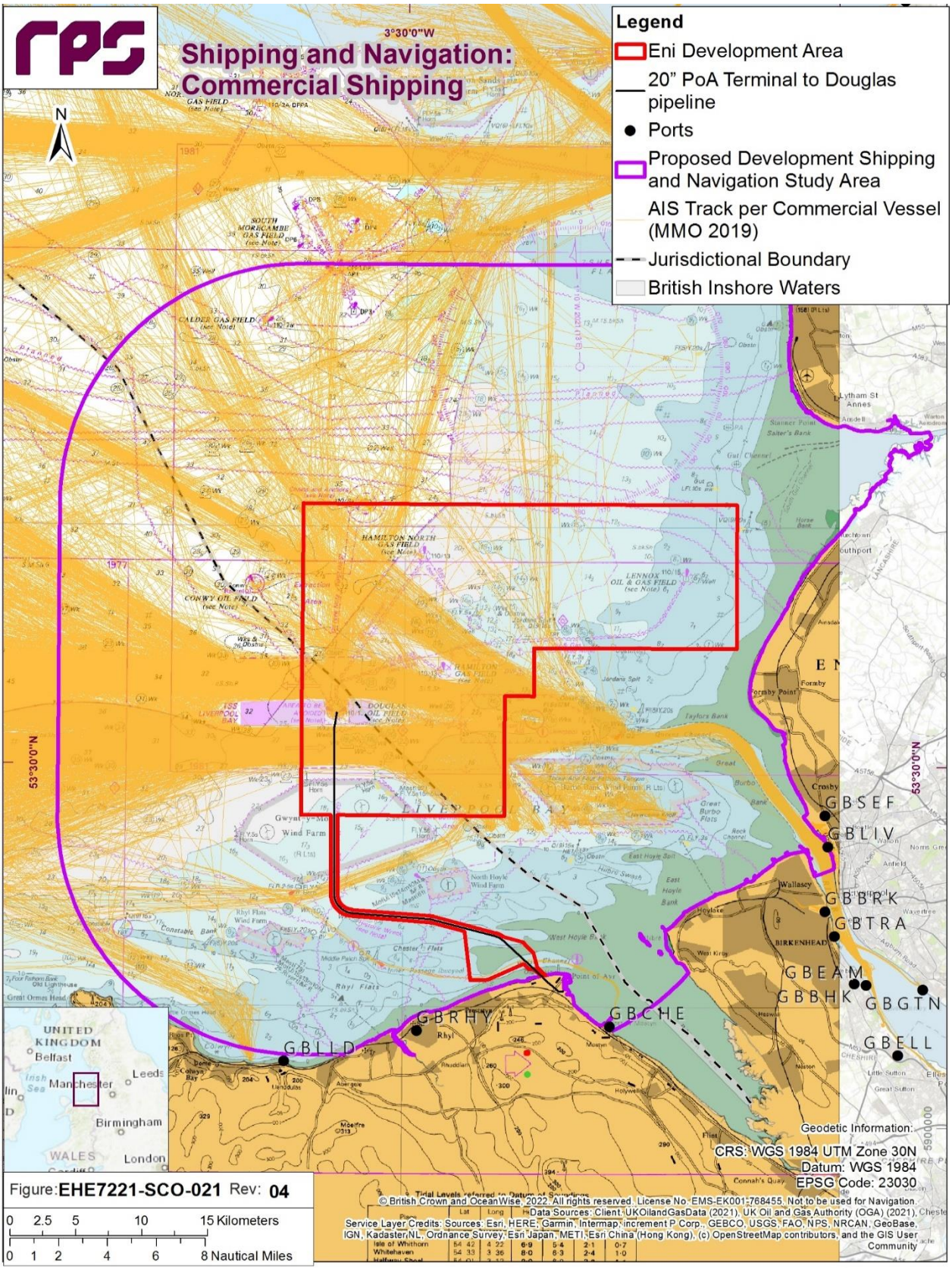

Figure 8-5: Illustrates commercial shipping within the Development Area Shipping and Navigation Study Area.

Ferry route AIS data indicates a high density of regular and routes. Ferry routes passing through the development area shipping and navigation study area include Liverpool to Douglas and Liverpool to Belfast. The majority of ferries leaving Liverpool from the River Mersey will follow a common route that transects the development area along its south eastern boundary and carries on through its western boundary to terminal locations (Figure 8-6). The Belfast and Douglas routes are oriented North West to South East and vary with weather conditions. The Liverpool-Dublin ferry route is the busiest route and separates by direction due to the TSS In Liverpool Bay, with different routes eastbound and westbound.

Key commercial ferry operators include Isle of Man Steam Packet Company, Seatruck Ferries, P&O ferries, Mersey ferries, Irish Ferries and Stena Line. The majority of routes to and from Heysham pass well to the north of the development area shipping and navigation study area, with anomalies potentially due to weather routeing.

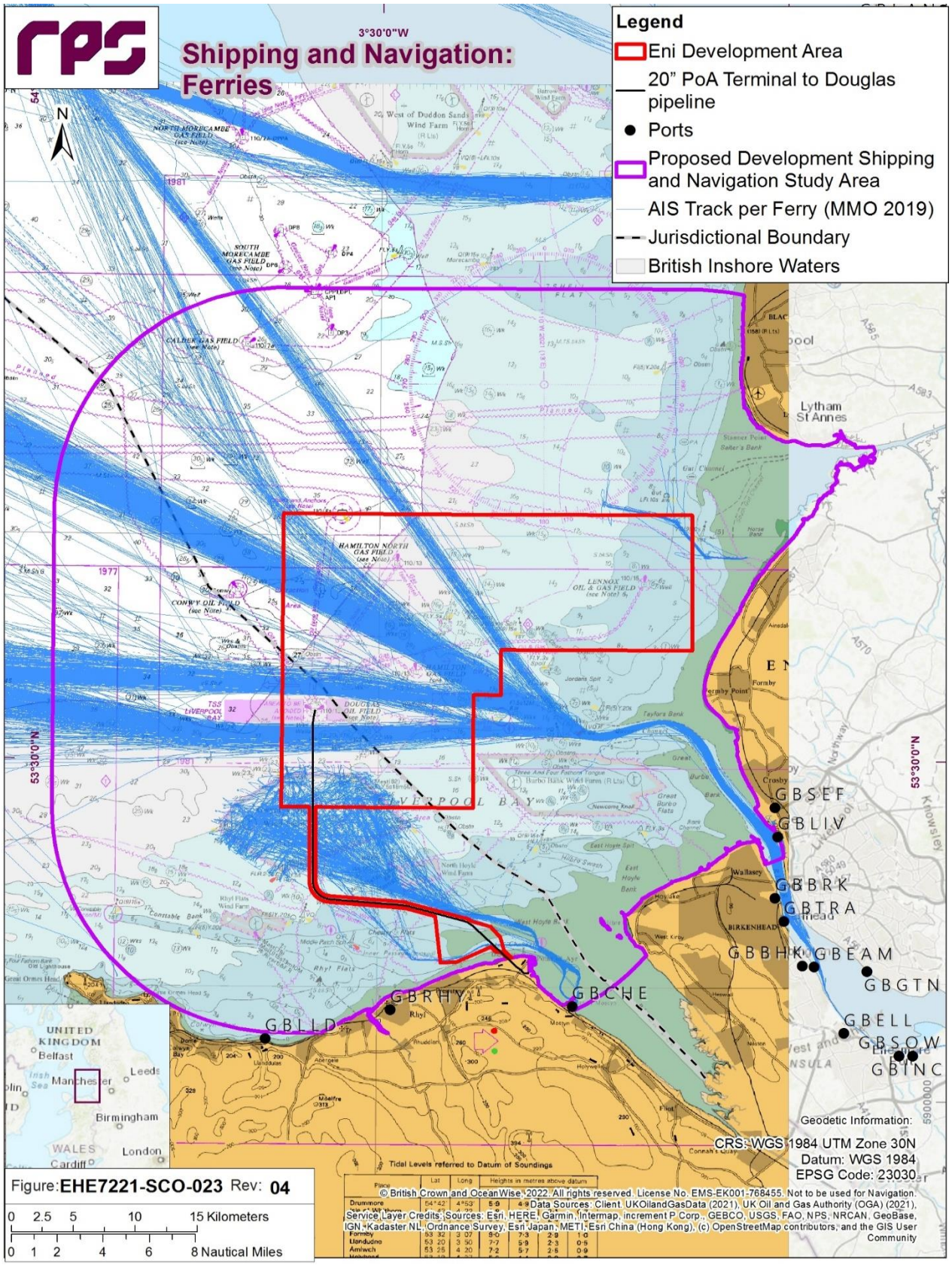

Figure 8-6: Illustrates the ferry routes within the Development Area Shipping and Navigation Study Area.

Fishing vessels greater than 15 m in length only are required by law to carry AIS, therefore there is insufficient data to make a scoping assessment on inshore fishing vessels, as these are usually smaller than 15 m. The consultation, Navigational Risk Assessment (NRA), and section 8.1: Commercial Fisheries and Aquaculture, will provide further information on inshore fishing vessel activities and gear types. Fishing vessels transmitting AIS data indicate a high density of activity to the north and northeast of the development area shipping and navigation study area. Additionally, data illustrates that while the development area specifically does not have a high density of AIS fishing vessel tracks compared to other areas within Liverpool Bay and the Irish Sea, fishing vessels have and will continue to transit through the development area shipping and navigation study area Figure 8-7).

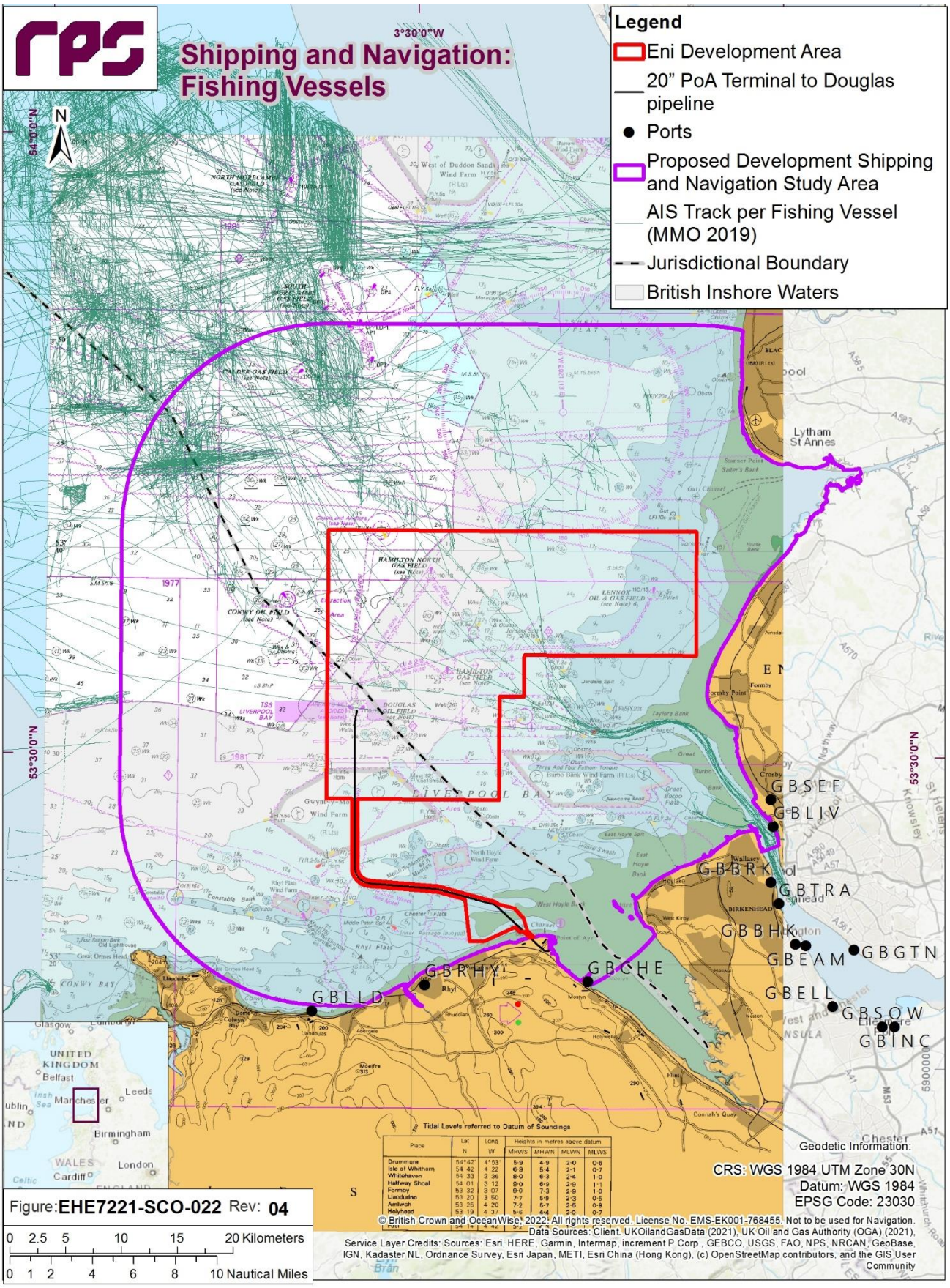

Figure 8-7: Illustrates the fishing vessel tracks located within the Development Area Shipping and Navigation Study Area.

Recreational AIS data indicates low recreational vessel activity within the development area, however, vessel activity within the shipping and navigation study area includes some intense activity inshore (Figure 8-8). A separate source of longer-term data from the RYA Coastal Atlas shows considerable recreational activity is concentrated inshore and nearer Anglesey, with only sporadic use of offshore cruising routes along the UK mainland. It is important to note that not all recreational vessels carry AIS (Figure 8-9).

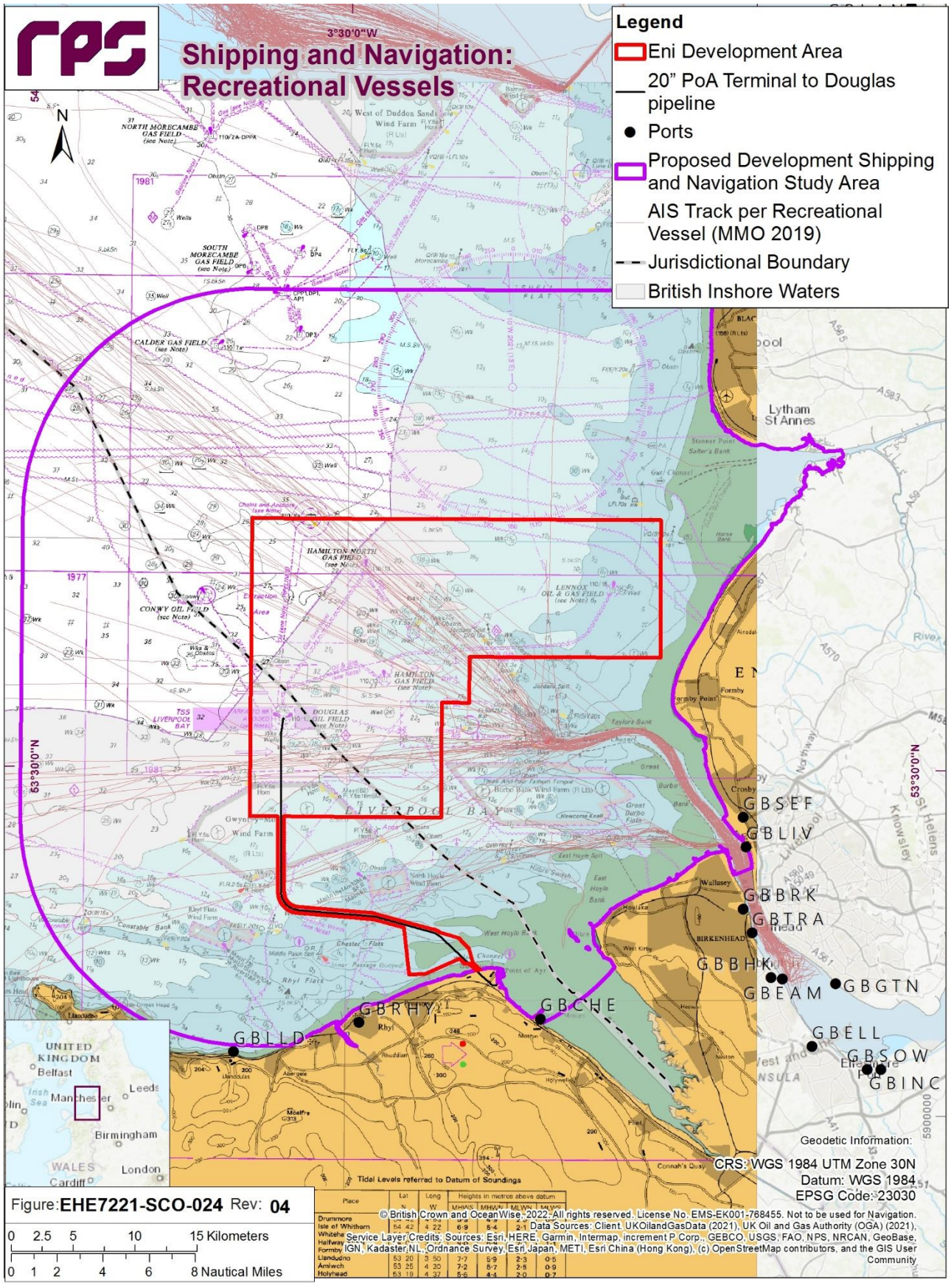

Figure 8-8: Illustrates the recreational vessel routes within the Development Area Shipping and Navigation Study Area.

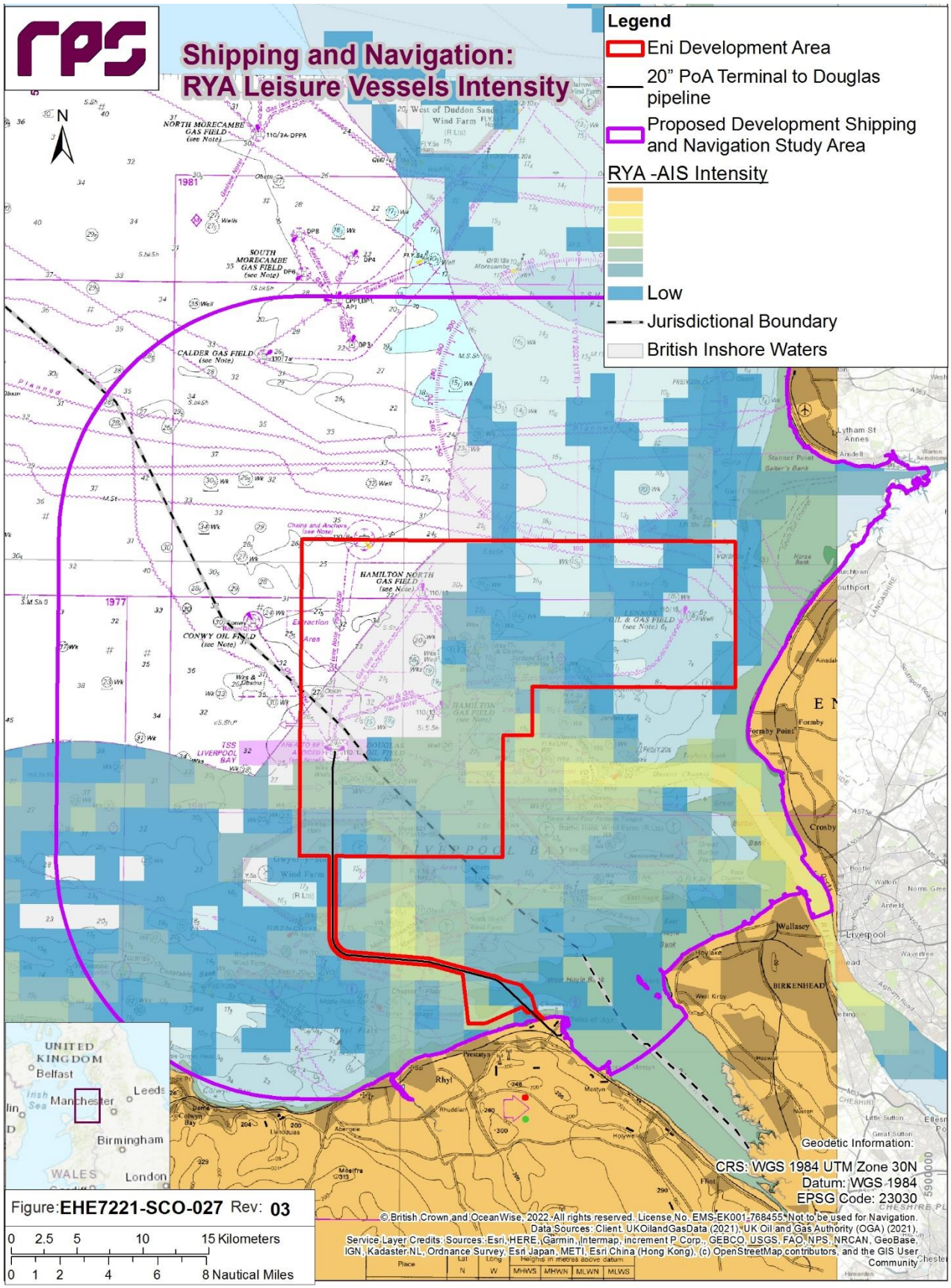

Figure 8-9: Illustrates RYA leisure vessel intensity within the Development Area Shipping and Navigation Study Area.

Tugs and service vessels (i.e., Port-related vessels such as harbour tugs and pilot boats, oil and gas support vessels including supply vessels and Emergency Response and Rescue Vessels at offshore platforms, and Offshore wind farm support craft) support ongoing operations associated with other infrastructure projects within the eastern Irish Sea. AIS data indicates that vessels are concentrated in harbours and within/between other offshore assets, which overlap with both the development area itself and the development area shipping and navigation study area (Figure 8-10). There are designated anchorage areas outside the Port of Liverpool, but these will not contain all the anchored vessels.

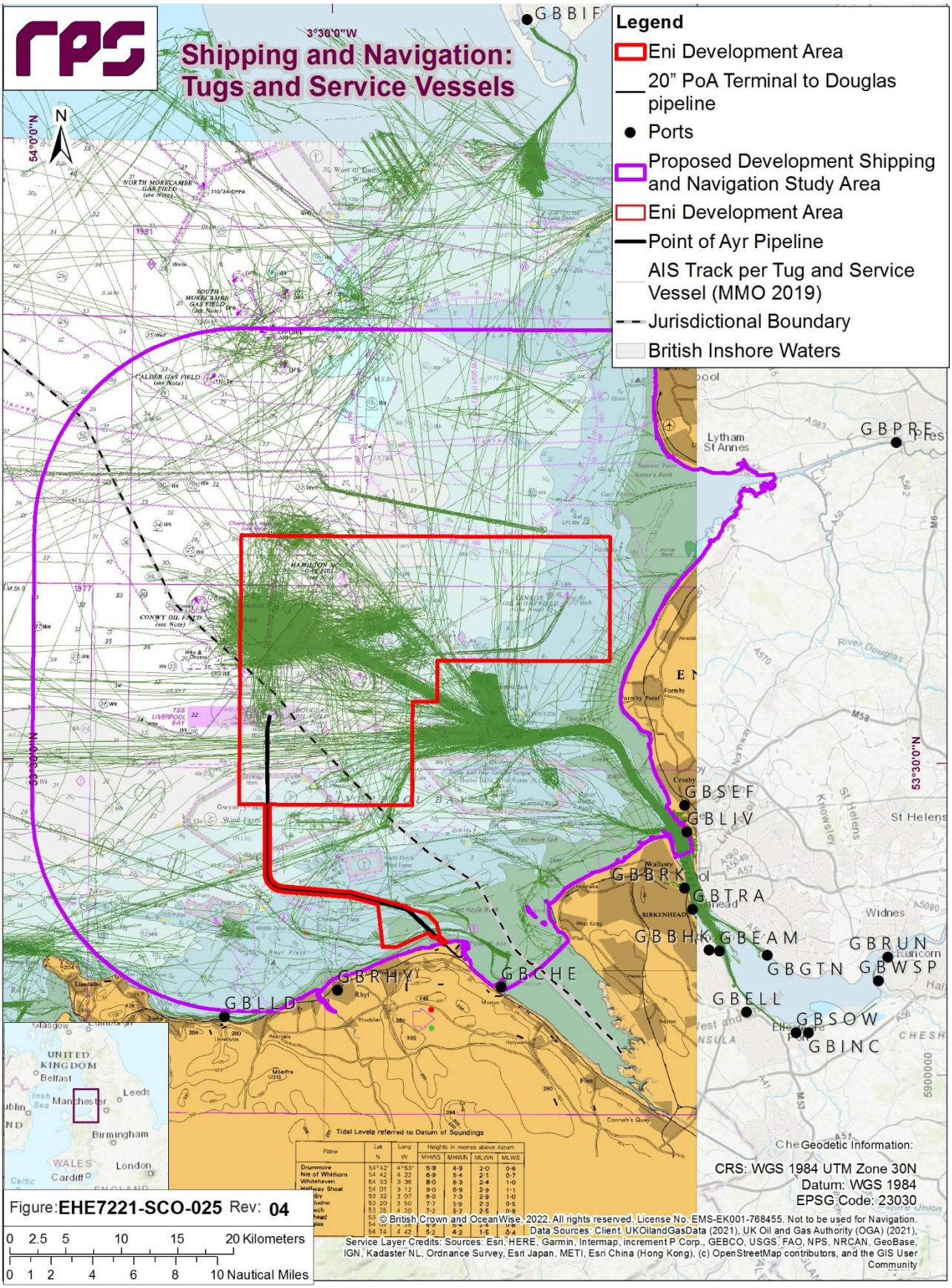

Figure 8-10: Illustrates tug and service vessel routes within the Development Area Shipping and Navigation Study Area.

Usage of the IMOTSS ensures the separation of opposing streams of traffic to aid navigational safety. It should be noted that this data is preliminary and will be further informed by the marine traffic surveys that are being undertaken to inform the NRA.

Search and Rescue (SAR)

Search and Rescue (SAR) within the UK is coordinated by the Maritime and Coastguard Agency (MCA), with other organisations providing declared assets to undertake SAR operations. These different organisations are outlined below. The MCA provides a coordination service for SAR, counter pollution and salvage. SAR is coordinated through a network of Maritime Rescue Coordination Centres (MRCC) situated throughout the UK, a Maritime Rescue Sub Centre (MRSC) based in London, and the Joint Rescue Coordination Centre (JRCC) in Fareham. The development area falls within the area of responsibility of the Holyhead MRCC. SAR helicopters are available to the MCA for use during SAR incidents and are provided by the Bristow Group.

The Royal National Lifeboat Institution (RNLI) provides a 24-hour SAR service maintaining a fleet of lifeboats from stations positioned around the coast of the UK and Ireland. There are a number of lifeboat stations positioned along the coast of north Wales and northwest coast of England that operate a variety of both smaller inshore lifeboats and larger all-weather lifeboats that are capable of high speeds and able to safely undertake operations in all weather. The closest lifeboat station to the development area is the Hoylake Lifeboat Station. The Hoylake lifeboat station is located approximately 6 nm east of the development area PoA pipeline and is therefore within the development area shipping and navigation study area.

In addition to the organisations previously discussed, other offshore operators (e.g., oil and gas and other renewable energy developments) have resources which could be used to assist with an incident in the vicinity of development area.

Maritime Accidents and Incidents

Data on maritime accidents and incidents will be analysed as part of the NRA for the Proposed Development to further inform the assessment. This will include Marine Accident Investigation Branch (MAIB) Marine Incident Data and Royal National Lifeboat Institution (RNLI) incident data.

8.3.3 Proposed Additional Data Collection

Marine Traffic Surveys

Data presented in this scoping report is preliminary and will be further informed by the marine traffic surveys that are being undertaken to inform the NRA.

Consultation

A marine hazard workshop will be held as part of the NRA. The Maritime Coastguard Agency, Trinity House and a number of local stakeholders representing all maritime interests (including ports, fishing, commercial shipping, oil and gas, recreation) will be invited to the marine hazard workshop.

Individual consultation meetings will also be held with key stakeholders including the Maritime Coastguard Agency, Trinity House, Peel Ports, and the Royal Yachting Association. Survey data analysis may reveal other important / regular users to be consulted.

8.3.4 Potential Project Impacts

A range of potential project impacts on shipping and navigation have been identified which could occur during the construction, operation and maintenance, and decommissioning phases of the Proposed Development.

Impacts that have been scoped into the assessment are outlined in Table 8-7.

Table 8-7: Impacts Proposed to be Scoped into the Assessment for Shipping and Navigation of the Eni Development Area.

Potential Impact	Project Phase			Justification
	C	O	D	
Deviations to commercial routes.	×	✓	×	**Operation and maintenance phase** • The presence of construction/maintenance vessels within the development area shipping and navigation study area may require deviations to shipping routes and result in increased transit times.
Increased vessel to vessel collision risk.	✓	✓	✓	**All phases** • Activities within the development area shipping and navigation study area will increase the number of vessels operating and may increase the risk of collision between project vessels and other vessels. The localised deviation around a particular vessel or activity taking place within the development area shipping and navigation study area may increase the number of vessel interactions which may increase collision risk. The most sensitive area would be the TSS north and south of the Douglas Platform. These are trafficked by larger numbers of vessels per day, so any obstruction caused is going to need tailored mitigation measures to manage and make tolerable. • Displacement of existing activities (such as fishing and recreational users) into adjacent shipping routes may additionally increase the risk of collision.
Increased allision (contact) risk to vessels.	✓	✓	✓	**All phases** • The presence of construction/maintenance vessels and vessels restricted in manoeuvrability in open sea areas within the development area shipping and navigation study area may increase the risk of allision from passing vessels following engine failure or human error.
Increased risk of anchor and gear snagging for commercial vessels and commercial fishing vessels.	✓	✓	✓	**All phases** • The presence of power cables and inter-platform cables associated with the development area shipping and navigation study area may increase the likelihood of anchor and gear interaction for third party vessels including a snagging risk.
Reduction of under keel clearance	×	✓	×	**Operation and maintenance phase** • The presence of cable protection associated with the development area shipping and navigation study area may reduce water depths and therefore reduce under keel clearance for third party vessel traffic.
Reduction of emergency response capability due to increased incident rates for SAR responders and	✓	✓	✓	**All phases** • The development area shipping and navigation study area will increase the number of vessels in the area which may result in an increased number of incidents requiring emergency response bySAR responders.

Potential Impact	Project Phase			Justification
	C	O	D	
increased demand on the available resources.				

8.3.5 Proposed Assessment Methodology

The shipping and navigation EIA Report will consider the potential impacts of the construction, operation and maintenance and decommissioning phases of the development area within the shipping and navigation study area and will follow the IMO Formal Safety Assessment methodology. Following the completion of the NRA, this information will be fed into the shipping and navigation EIA. The following guidance documents will be considered:

- MGN 654 (M+F) Safety of Navigation: Offshore Renewable Energy Installations (OREIs) - Guidance on UK Navigational Practice, Safety and Emergency Response (MCA, 2021)
- The Marking of Man-Made Offshore Structures (IALA, 2021); and
- Guidelines for FSA for use in the International Maritime Organisation rule-making process (IMO, 2018).

8.3.5.1 Cumulative Effects

The potential effects related to the construction, operation and maintenance, and decommissioning of the Proposed Development on shipping and navigation will assess the potential cumulative effects that could occur on shipping and navigation receptors related to alternate projects and/or activities that take place within the development area shipping and navigation study area.

8.3.6 Potential Mitigation

The following embedded mitigation measures are proposed in relation to shipping and navigation:

- The use of advisory clearance distances and safety zones during construction and periods of major maintenance;
- The use of existing statutory 500m zones around the platforms, which provides embedded mitigation;
- The use of guard vessels where required by risk assessment;
- Construction vessel traffic monitoring;
- Marking and lighting of the development area in accordance with International Association of Marine Aids to Navigation and Lighthouse Authorities (IALA) guidance and in consultation with the MCA and Trinity House;
- Marine coordination and promulgation of information using Notices to Mariners and fishermen's awareness charts;
- Development of, and adherence to marine coordination and project-specific emergency response procedures.; and
- Cable Burial Risk Assessment.

8.4 Civil and Military Aviation and Communications

The Proposed Development plans on reutilising the historic offshore oil and gas platforms within Liverpool Bay and therefore, it is proposed that Civil and Military Aviation and Communications are scoped out of the EIA Report.

Given the pre-existing nature of the development area, it is unlikely that there will be any potential effects and/or impacts resulting from the construction, operation and maintenance, and decommissioning of the development area as compared to those previously exhibited in the area.

Specifically, the Proposed Development will incorporate the same Helicopter Main Routes (HMRs) that have previously supported the transport of personnel and equipment to the offshore oil and gas installations, which are now being transformed int CCS infrastructure. HMRs do not have a specified airspace status and subsequently assume background airspace classification within which they lie (Class G Airspace). Similar to requirements for offshore oil and gas installations, the development area will maintain a safe operating environment consultation zone of a 9 nm radius (CAA, 2016).

As the Proposed Development will not incorporate any novel, above surface major project infrastructure, civil and military radar in the area will be unaffected.

Additionally, there are considered to be no additional impacts on forms of telecommunication such as interference with cellular telephone service coverage, TV scanning telemetry or non-aviation radar, satellite communications (e.g., with offshore oil and gas), maritime communications, VHF radio and / or microwave links or any other forms of cabling (telecommunications and interlinks).

The sole telecommunications cable that is present within the development area is the Western High-Voltage Direct Current (HVDC) Link. This subsea electrical link is located off of Leasowe, England and is routed to West Kilbride, Scotland (KIS ORCA, 2022).

8.5 Marine Archaeology and Ordnance

8.5.1 Study Area

The development area Marine Archaeology Study Area (MASA) is shown in Figure 8-11. The MASA is defined as the development area with an additional 2 km buffer (blue). This encompasses the Proposed Development elements and allows the site-specific data to be put into a wider context.

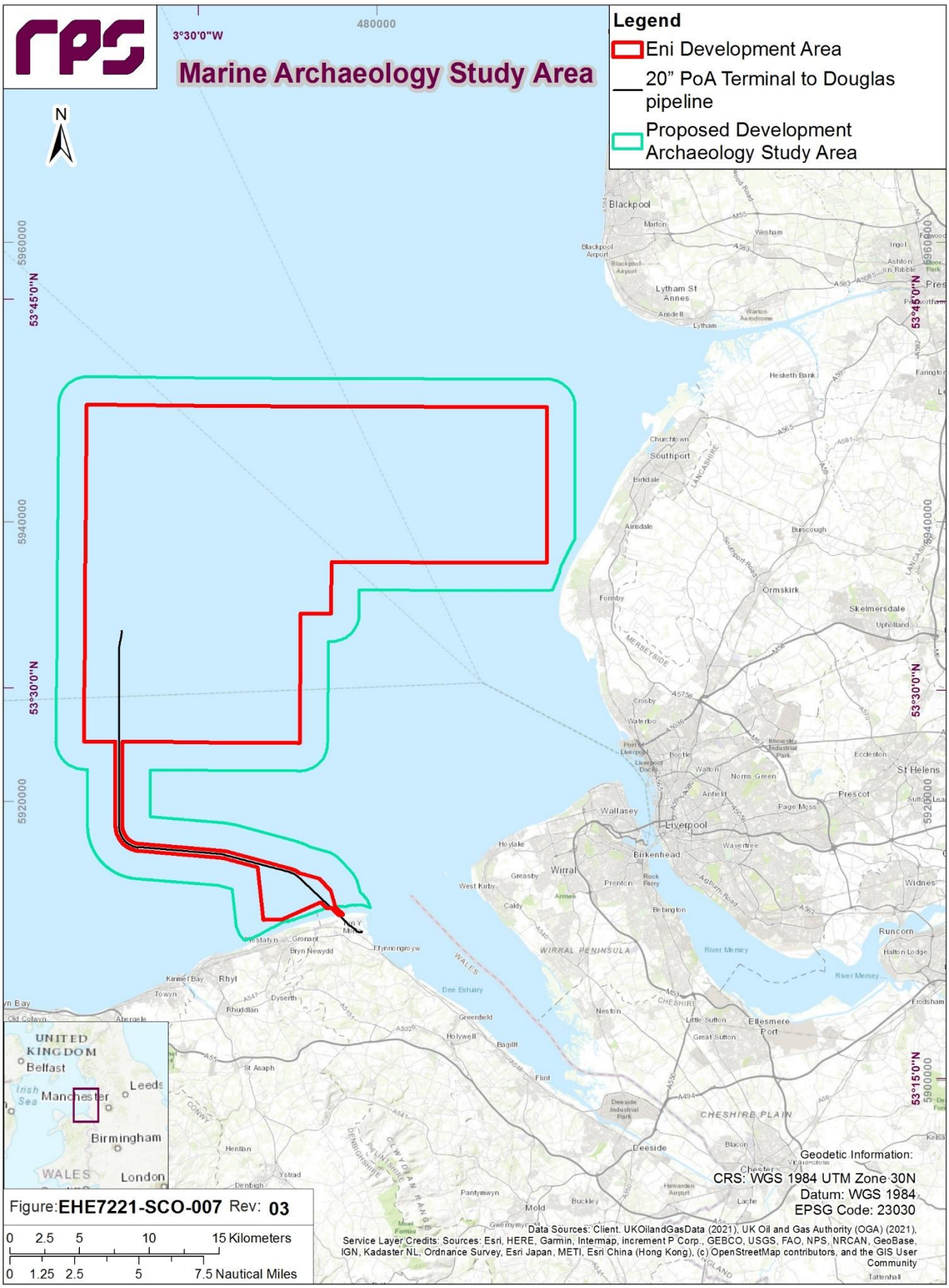

Figure 8-11: The Development Area Marine Archaeology Study Area.

8.5.2 Baseline Environment

Information regarding the marine archaeology in Liverpool Bay has been collated through a detailed and comprehensive review of currently accessible studies and datasets. To provide a wider context, the desktop review has considered the marine archaeology present within the broader offshore area in proximity to the development area and the greater Irish Sea. Key data sources are listed below, noting that this list is not exhaustive:

- The United Kingdom Hydrographic Office (UKHO) wrecks database, containing recorded wreck and obstruction data;
- Records held by the National Record of the Historic Environment (NRHE), which includes:
  - Monuments records
  - Archaeological event records
  - Maritime records
  - Aircraft crash sites
  - Find locations
- National Monuments Records Wales (NMRW) held by the Royal Commission on the Ancient and Historical Monuments of Wales (RCAHMW);
- Relevant mapping including Admiralty Charts, British Geological Survey (BGS), Ordnance Survey and historic maps; and
- Relevant primary and secondary sources and grey literature, available through the Archaeological Data Service (ADS) and other websites, including published and unpublished archaeological reports relevant to the vicinity of the Proposed Development.

In order to compile a marine archaeological baseline as presented in this scoping report, these sources were compiled into gazetteers (see Appendix 0).

The historic environment records have been classified between records where material is known to be on the seabed and ‘recorded losses’. Recorded losses are events of vessels that are known to have been lost in the area, but with which no accurately located remains are associated.

Where multiple entries across the datasets occur that relate to the same archaeological receptor, the coordinates from the UKHO dataset have been used, as they are most frequently updated with the latest survey positions.

8.5.2.1 Desktop Study

This section provides a high-level overview of the marine archaeological baseline environment within the MASA. The baseline environment is structured into the following categories:

- Submerged prehistoric archaeology: This includes palaeochannels and other inundated terrestrial landforms that may preserve sequences of sediment of palaeoenvironmental interest, Palaeolithic and Mesolithic sites and artefacts;
- Maritime archaeology: relates generally to craft or vessels and any of their associated structures and/or cargo; and
- Aviation archaeology: this comprises all military and civilian aircraft crash sites and related wreckage.

A gazetteer of the known marine archaeology within the MASA is in Appendix 0.

8.5.2.2 Submerged Prehistoric Archaeology

There is one entry within the NMRW data relating to palaeolandscapes, which is that of a glacial tunnel valley, suggesting that there is potential for glacial features across the MASA. The locations of these are shown in Figure 5.2.

Submerged Prehistoric Archaeology Potential

The potential for submerged prehistoric archaeology within the MASA is moderate with any surviving evidence likely to be found in association with palaeolandscape features. Archaeological assessment of the proposed geophysical and geotechnical survey data (see section 8.5.3) will provide further information on the potential for submerged prehistoric archaeology within the MASA.

Prior to 5,500BC, fluctuations in sea level presented opportunities for early hominids to occupy and traverse the now submerged Liverpool Bay area (Fitch *et al*., 2011). When sea levels were low, the Liverpool Bay area was a landscape that connected the Isle of Man to mainland Britain (Coles, 1988). These falls in sea level were associated with the last three glacial maximums and the retreat of the ice sheets.

The earliest known occupation of the area near the MASA is located on the north coast of Wales, at the Pontnewydd Cave site, Llandudno which dates to c. 225,000BP and confirms that this area was being exploited during the low to mid Palaeolithic period.

The Last Glacial Maximum (LGM) began c.18,000BP and ice sheets began to retreat around 13,000BP. It is thought that human and animal reoccupation of mainland Britain was swift, and that this reoccupation came from crossing the now submerged palaeolandscape of Doggerland from mainland Europe (Fitch *et al*., 2011). There is therefore a potential that this exploitation of the landscape continued across mainland Britain and over to the Isle of Man via the now submerged palaeolandscape identified within the MASA.

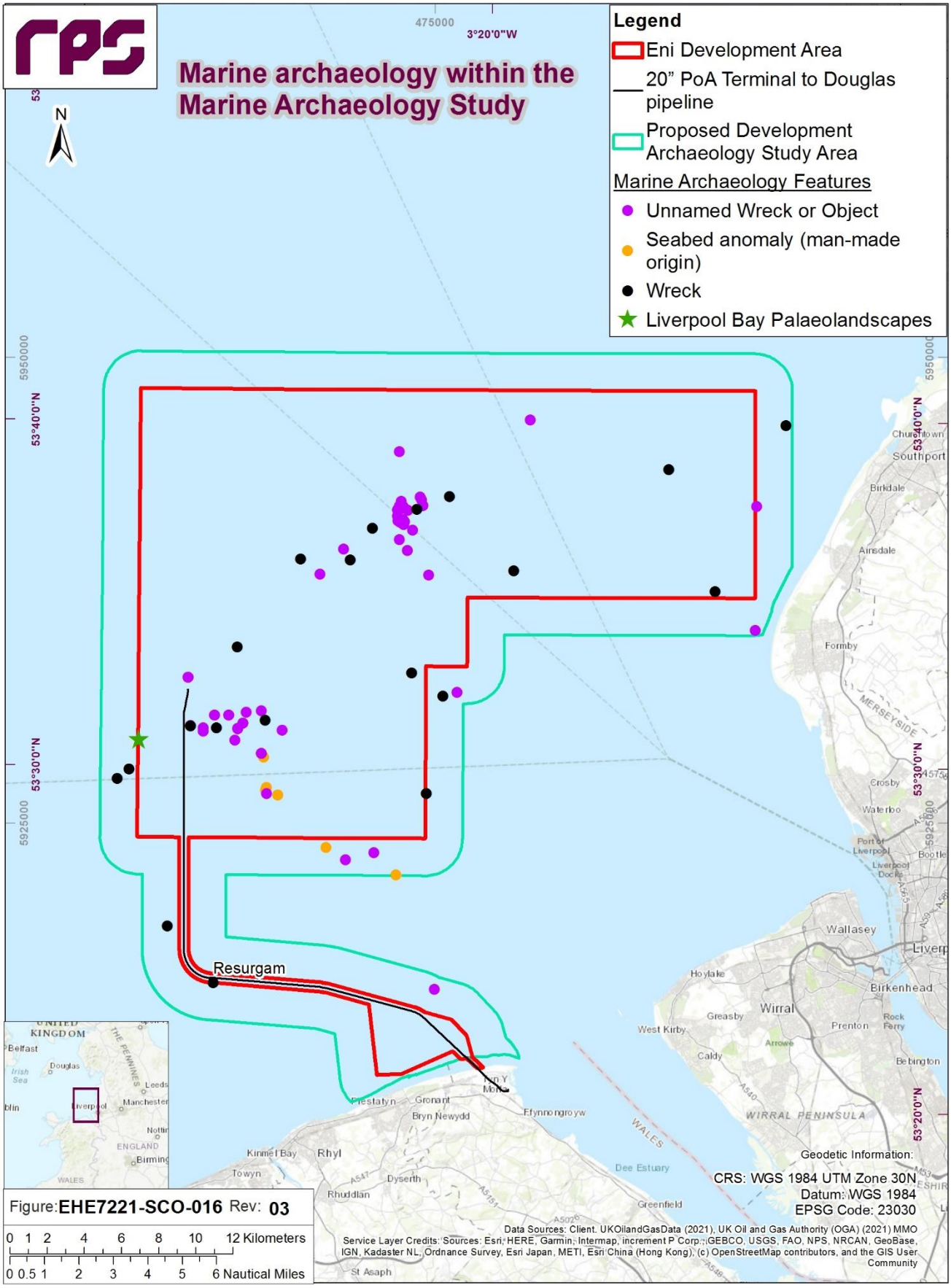

Figure 8-12: Marine archaeology within the MASA.

8.5.2.3 Maritime Archaeology

The known maritime archaeology within the MASA is shown in **Figure 8-12** and described below.

8.5.2.3.1 Designated sites

There is one designated maritime archaeology site within the MASA.

The *Resurgam* is an example of an early submarine that is designated as a Historic Wreck under the Protection of Wrecks Act 1973 (PWA). There is an area of protection around the wreck, with a radius of 300m. Diving or any interference including survey and excavation within the protected area of a designated wreck is a criminal offence, unless a license has first been obtained from the Welsh Government. Cadw should be contacted in the first instance.

The *Resurgam* is located towards the southern extent of the MASA, within the footprint of the pipeline.

8.5.2.3.2 Non-Designated Maritime Archaeology

There are a further 19 'live' wrecks within the MASA recorded in the UKHO, NMWR and NRHE data. Of these identified wreck sites, eight are from the post-Medieval period and nine were lost during World War II. One is a modern shipwreck and therefore considered less significant in archaeological terms. The locations of the known wreck sites are shown in **Figure 8-12** and further details are listed in Appendix 0.

Within the UKHO data there are 16 wreck sites which are listed as 'dead', indicating that no remains have been located and therefore the wreck is considered not to exist at the location given. However, it is worth noting that 'dead' wrecks may still be present at the locations indicated but are buried or flattened and therefore no longer represent a navigational hazard. Archaeological interpretation of the proposed geophysical survey data will clarify whether archaeological material survives at these locations.

There are 52 unknown wreck sites recorded in the NMRW, NRHE and UKHO data about which no further information is known. These entries within the datasets are attributed unverifiable positions and therefore may not exist within the MASA. Archaeological interpretation of the proposed geophysical survey data will determine whether they relate to the presence of archaeological material.

There are seven seabed anomalies recorded as being of man-made origin, which may also indicate the presence of archaeological material. Archaeological assessment of the proposed geophysical survey data will determine the nature of the anomalies.

8.5.2.3.3 Maritime Archaeology Potential

Maritime archaeological sites and materials can be defined as the physical remains of boats and ships that have been wrecked, sunk or have foundered and artefacts which rest upon the seabed as the result of being jettisoned or lost overboard (for example, anchors, cannon or fishing gear).

There are 86 recorded losses attributed to coordinates within the MASA. Recorded losses represent maritime and aviation losses that are known to have occurred in the vicinity but to which no specific location can be attributed. Recorded losses are often grouped with reference to a geographic, hydrographic or other point of reference, making the positional data of these records unreliable. However, they do provide information on the historical maritime traffic of the general region.

Records of known wreck sites and losses in UK waters are biased towards the recent, predominantly post-Medieval and Modern periods. Although the existence and survival of Palaeolithic watercraft are highly speculative in the UK, Bronze and Iron Age sea-going vessels are likely to have been lost in the east Irish Sea.

The potential for the survival of Medieval maritime archaeology is higher than from prehistoric periods but still rare as ship construction at the time relied heavily on organic building materials that are less likely to survive on and in the seabed.

The post-Medieval and Modern periods present the greatest potential for unrecorded archaeology to be discovered. The increasing incorporation of metal structural elements into vessel designs during this period means that wrecks for the 19th and early 20th centuries are also often more visible on the seabed than their wooden predecessors. They are visible to bathymetric and geophysical survey, and also generate strong magnetic anomalies, and this greater visibility is reflected in the increased number of known wrecks (i.e., those that have been located on the seabed) in contrast to earlier periods.

8.5.2.4 Aviation Archaeology

There are no known aviation remains within the MASA.

8.5.2.4.1 Aviation Archaeology Potential

Thousands of military and civilian aircraft casualties have occurred in UK waters since the advent of powered flight in the early 20th century. The bulk of these casualties date to World War II and most are concentrated off the south and southeast coasts of England. However, there is evidence for substantial numbers of aircraft casualties in the east Irish Sea (Wessex Archaeology, 2008).

Whilst this aviation archaeology record is potentially very large, the ephemeral nature of aircraft wrecks ensures that many sites remain unknown and unrecorded. In addition, although records of aircraft losses at sea are extensive, they are seldom tied to an accurate position, which further complicates any assessment of the likely presence of aircraft wreckage on any area of the seabed.

Since World War II, despite the volume of both military and civilian air traffic, there have been few aviation losses off the west coast of England, in the vicinity of the Proposed Development. The potential for post-war aircraft remains to be discovered within the MASA is therefore considered to be low. Civilian aircraft wrecks are not subject to protection under the terms of the Protection of Military Remains Act 1986.

8.5.2.5 Unexploded Ordnance (UXO)

There are no known munitions dumping grounds within the MASA. However, the possibility of UXO on the seabed cannot be discounted. The proposed geophysical surveys, in particular the use of magnetometry, will establish the presence of any UXO within the development area.

8.5.3 Proposed Additional Data Collection

On the basis of the baseline information currently available, additional data will need to be collected to inform the EIA. Data collected by ENI's proposed geophysical and geotechnical surveys, will be assessed and the requirement for additional surveys assessed at that time.

While multibeam and sidescan sonar allow for the interpretation of physical expressions on the seabed they are most effective when used in conjunction with seismic survey which allows penetration beneath the seabed, which is particularly recommended for the interpretation of deposits and stratigraphy. Magnetometry survey should also be used in conjunction with multibeam and sidescan sonar to identify the presence of ferrous metals commonly used in shipbuilding and UXO.

Geophysical data should be collected to a specification appropriate to achieve the following interpretation requirements.

- Magnetometer: identification of anomalies > 5 nT
- Sidescan sonar (SSS): ensonification of anomalies > 0.3 m
- Sub-bottom profiler (SBP): penetration > 10 m, and
- Multibeam bathymetry (MBES): ensonification of anomalies < 1.0 m.

Geotechnical survey should be carried out in order to groundtruth areas of palaeo-landscape potential identified through the geophysical survey, this is recommended to be conducted using boreholes or vibrocores. All geophysical and geotechnical survey data should be analysed by a suitably qualified archaeologist.

8.5.4 Potential Project Impacts

A range of potential project impacts on marine archaeology have been identified which could potentially occur during the construction, operation and maintenance, and decommissioning phases of the Proposed Development. The impacts that have been scoped into the assessment are outlined in **Table 8-8**.

On the basis of the baseline information currently available and the Proposed Development project description, no impacts are proposed to be scoped out of the assessment for marine archaeology.

Table 8-8: Impacts Proposed to be Scoped into the Assessment Marine Archaeology.

Potential Impact	Project Phase			Justification
	C	O	D	
Sediment disturbance and deposition leading to indirect impacts on known archaeological receptors	✓	✓	✓	**Construction and decommissioning phase** • Construction works, including seabed preparation, may cause seabed sediment disturbance and associated deposition, which could lead to indirect impacts on known archaeological receptors. Effects from decommissioning are likely to be similar to effects from construction. **Operation and maintenance phase** • Maintenance operations, including repair activities, may cause seabed sediment disturbance and associated deposition, which could lead to indirect impacts on known archaeological receptors.
Direct damage to known archaeological receptors	✓	✓	✓	**Construction and decommissioning phase** • Construction works could directly affect any archaeological receptors present within the development area. These effects will likely be localised, but should they occur, they could lead to adverse and irreversible damage to known archaeological receptors. Where receptor locations are already known, measures adopted as part of the Proposed Development for their avoidance and protection include implementing Archaeological Exclusion Zones (AEZs). Effects from decommissioning are likely to be similar to effects from construction. **Operation and maintenance phase** • Maintenance operations, including the anchoring of vessels for repair activities, may cause adverse and irreversible damage to known archaeological receptors. Where receptor locations are already known, measures adopted as part of the Proposed Development for their avoidance and protection include implementing Archaeological Exclusion Zones (AEZs).
Alteration of sediment transport regimes	✗	✓	✗	**Operation and maintenance phase** • The physical presence of infrastructure and any scour/cable protection may lead to localised changes in the wave and tidal regime, affecting the distribution of sediment, which could be directed towards or away from known archaeological receptors causing damage.

8.5.5 Proposed Assessment Methodology

The marine archaeology EIA Report will consider the potential impacts of the construction, operation and maintenance and decommissioning phases of the development area within the MASA and will follow the methodology outlined in Section 5. The following guidance documents will also be considered:

- Standard and Guidance for Historic Environment Desk-Based Assessment, Chartered Institute for Archaeologists (CIfA) (2014)
- Historic Environment Guidance for Offshore Renewable Energy Sector, Collaborative Offshore Wind Research into the Environment (COWRIE) (2007)
- Guidance for Assessment of Cumulative Impacts on the Historic Environment from Offshore Renewable Energy, COWRIE (2008)
- Joint Nautical Archaeology Policy Committee (JNAPC) Code of Practice for Seabed Development, JNAPC (2006)
- Model Clauses for Archaeological Written Schemes of Investigation, Offshore Renewables Projects, The Crown Estate (2010)
- Protocol for Archaeological Discoveries: Offshore Renewables Projects, The Crown Estate (2014).

8.5.5.1 Cumulative Effects

There is potential for cumulative effects to arise from other projects or activities within the east Irish Sea area where projects or activities could act collectively with the Proposed Development to affect marine archaeological receptors. The cumulative assessment will consider the maximum design scenarios for each of the projects or activities.

8.5.6 Potential Mitigation

The following embedded mitigation measures are proposed in relation to marine archaeology:

- The identification and implementation of Archaeological Exclusion Zones (AEZs) around receptors identified as having a known archaeological potential. The size of the AEZ will be evidence based and established using the precautionary principle to ensure that it is of sufficient size to protect the site from the nature of the impact (Wessex Archaeology, 2007; Wessex Archaeology for The Crown Estate, 2020).
- The development of, and adherence to, a draft Written Scheme of Investigation (WSI) for the construction phase.
- Provision of a Protocol for Archaeological Discoveries (PAD) similar to that set out by The Crown Estate (TCE 2014) for unexpected archaeological discoveries made during the course of the development.
- Archaeological input into specifications for and analysis of future pre-construction geophysical surveys.
- Archaeologists to be consulted in the preparation of any pre-construction Remotely Operated Vehicle (ROV)/diver surveys and, if appropriate, in monitoring and checking of data.
- Archaeological input into specifications for and analysis of pre-construction geotechnical surveys. This might include the presence of a geoarchaeologist on board the survey vessel and provision for sampling, analysis and reporting of recovered cores. The results of all geoarchaeological investigations to be complied in a final report which includes a sediment deposit model.
- The requirement for and feasibility of any mitigation measures will be dependent on the significance of effects and will be consulted upon with statutory consultees throughout the EIA process.

8.6 Infrastructure and Other Sea Users

8.6.1 Study Area

To support the development of the infrastructure and other sea users section, two study areas are defined (Figure 8.1):

Development area infrastructure and other sea users study area: This area (with an additional 1 km buffer) includes the development area, offshore pipeline and subsea cables (including intertidal habitats up to the MHWS) and associated inter-platform cables, in addition to the extent of potential direct physical overlap between the Proposed Development activities and the following receptors (if identified):

- Offshore energy projects (e.g., offshore wind farms, wave and tidal projects, oil and gas projects);
- Cable and pipeline operators;
- Carbon capture and storage, natural gas storage and underground coal gasification;
- Sailing and motor cruising;
- Recreational fishing;
- Water sports; and
- Bathing waters

Regional infrastructure and other sea users study area: This area is based on one tidal excursion of the development area and relates to the potential for increases in suspended sediments to occur relating to the Proposed Development activities. This study area is related to only those receptors which are susceptible to increases in Suspended Sediment Concentrations (SSCs), specifically:

- Marine aggregate extraction and disposal sites; and
- Recreational diving.

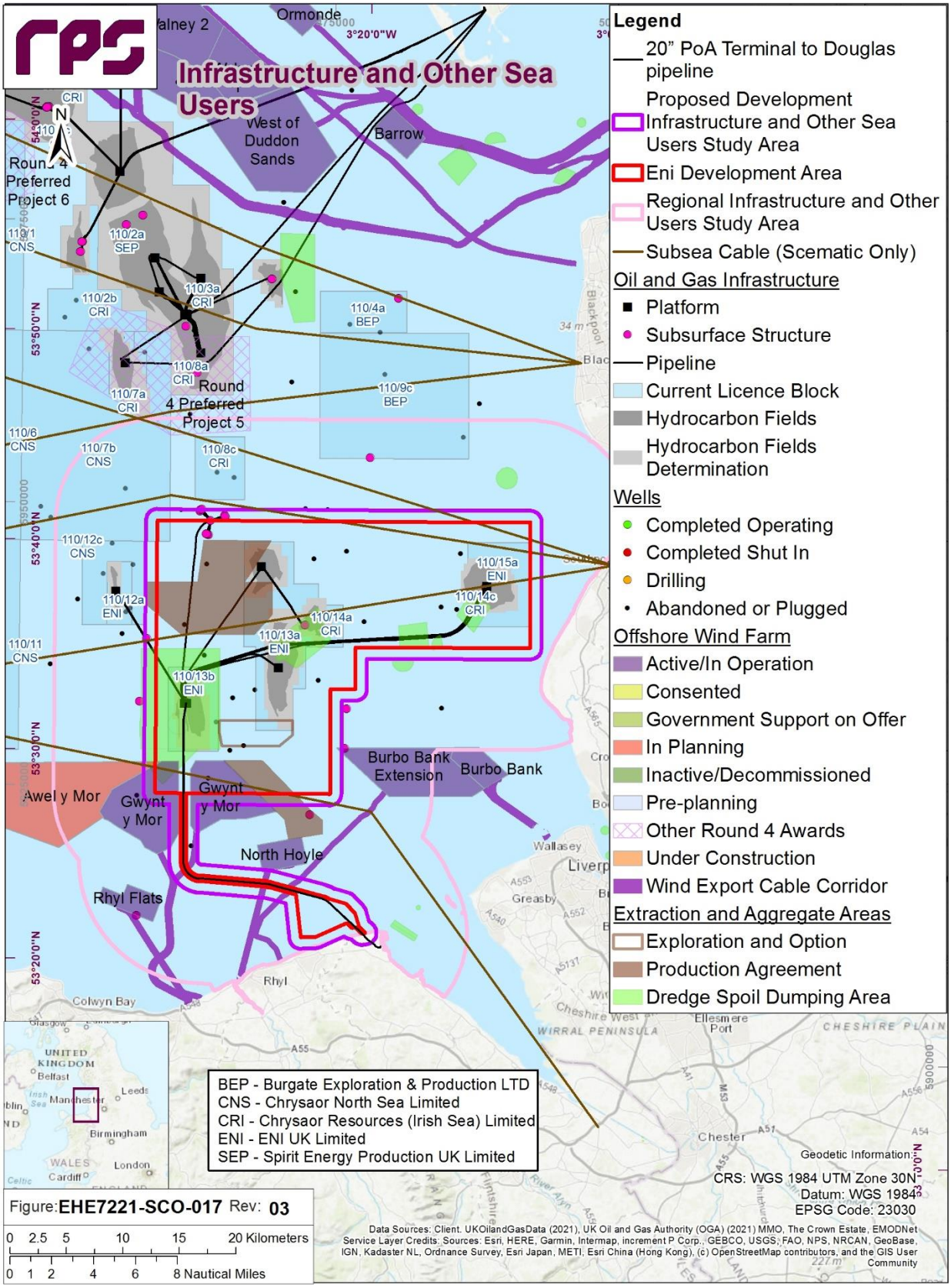

Figure 8-13: Illustrates the Development Area Infrastructure and Other Sea Users Study Area and the Regional Infrastructure and Other Sea Users Study Area.

8.6.2 Baseline Environment

Information regarding the infrastructure and other sea users section has been collated through a detailed and comprehensive review of currently accessible studies and datasets. Key data sources are listed in Table 6-8, noting that this list is not exhaustive. This section provides a high-level overview of the Infrastructure and other sea users baseline environment within the development area infrastructure and other sea users study area and regional infrastructure and other sea users study area.

This section considers the extent of potential direct physical overlap between the Proposed Development activities and the following receptors:

- Marine aggregate extraction and disposal sites;
- Offshore energy projects (including oil and gas activities, CCS, and offshore wind farms);
- Cable and pipeline operators;
- Military training areas;
- Sailing and motor cruising;
- Diving;
- Recreational fishing;
- Water sports; and
- Bathing waters

The following topics are further considered as separate sections within this Offshore scoping Report: Chapter 8 Section 8.1 Commercial Fisheries and Aquaculture, Chapter 8 Section 8.2 Shipping and Navigation, Chapter 8 Section 8.4 Marine Archaeology, and Chapter 8 Section 8.6 Socio-economics and Tourism.

Table 8-9: Summary of Key Desktop Data Sources to Inform the Infrastructure and Other Users of the Sea Scoping Assessment.

Title	Source	Year	Author
Cable routes	Kis-Orca	2021	Kis-Orca
Disposal sites	EMODnet	2015	EMODnet
Offshore wind farms	The Crown Estate (TCE)	2021	TCE
Aggregate extraction areas	TCE	2021	TCE
Pipelines	Oil and Gas Authority (OGA)	2021	OGA
Wells	OGA	2021	OGA
Oil and gas platforms	OGA	2021	OGA
Subsurface structures	OGA	2021	OGA
Hydrocarbon fields	OGA	2021	OGA
Oil and gas licence block	OGA	2021	OGA
United Kingdom Continental Shelf (UKCS) block	OGA	2021	OGA

Title	Source	Year	Author
Marinas	UK Coastal Atlas of Recreational Boating	2018	Royal Yachting Association (RYA)
Recreational activities	UK Coastal Atlas of Recreational Boating	2018	RYA
RYA clubs	UK Coastal Atlas of Recreational Boating	2018	RYA
RYA training centres	UK Coastal Atlas of Recreational Boating	2018	RYA
General boating areas	UK Coastal Atlas of Recreational Boating	2018	RYA
Wrecks (diving sites)	UKDiving.co.uk	2010	UK Diving
Recreational Fishing	Cefas	2021	Cefas

8.6.2.1 Desktop Study

8.6.2.1.1 Marine Aggregate Extraction

There are three marine aggregate and extraction areas located within the regional infrastructure and other sea users study area for the proposed HyNet CCS development. Two of these are production agreement areas, located in the north-west and south of the study area, whilst the third is an exploration and option area, located in the south of the study area, to the east of the PoA Terminal to Douglas OP pipeline (Figure 8-13).

8.6.2.1.2 Disposal Sites

There are eight dredge disposal sites located within the regional infrastructure and other sea users study area, five of which are located within the development area infrastructure and other sea users study area for the proposed HyNet CCS development (Figure 8-13).

There are no disposal sites for explosive material, chemical munitions (post 1945) or radioactive waste sites (1946 to 1993) located within the regional infrastructure and other users of the sea study area, according to DECC, 2011 (see Figure A3h.21 in DECC, 2011).

8.6.2.1.3 Offshore Wind Farms

Offshore wind farms in the east Irish Sea are shown in Figure 8-13. There are four offshore wind farms within the regional infrastructure and other sea users study area, two of which are situated within the development area infrastructure and other sea users study area. In order of proximity to the development area, the Gwynt y Môr OWF, Burbo Bank OWF, North Hoyle OWF, and Rhyl Flats OWF. Collectively, these OWFs are predominantly located towards the southernmost portion of the development area.

Other operational wind farms within the east Irish Sea include Walney, Walney Extension, West of Duddon Sands, and Ormonde and Barrow to the north of the development area infrastructure and other sea users study area.

The nearest offshore wind farms in planning are the Morgan, Mona, Morecambe and Awel y Môr offshore wind projects, located approximately 30 km to the northwest, 2 km to the west, 7 km to the

north, and adjacent to the southwest of the development area infrastructure and other sea users study area, respectively.

8.6.2.1.4 Oil and Gas Operations

The regional infrastructure and other sea users study area overlaps with seven licence blocks currently licenced for the exploration and extraction of gas, while the development area infrastructure and other sea users study area overlaps with five of the aforementioned licence blocks (Figure 8-13). Within the development area infrastructure and other sea users study are, two of these licences are operated by Chrysaor North Sea Ltd (110/14a and 110/14c), while three operated by Eni (block 110/13a, 110/13b and 110/15a).

There are five oil and gas platforms located within the regional infrastructure and other sea users study area operated by Eni (Figure 8-13). These OPs are referred to as Douglas, Hamilton, Hamilton North, Lennox and Conwy. Douglas, Hamilton, Hamilton North, and Lennox OPs are located within the development area infrastructure and other sea users study area. Additionally, there is one floating storage unit (Douglas OSI floating storage unit) on the northern edge of the development area infrastructure and other sea users study area. Douglas, Hamilton, Hamilton North, and Lennox OPs will become reutilised offshore infrastructure comprising the Proposed Development.

Subsurface structures (including protective structures, pipe junctions, manifolds, wellheads, trees and valves) are usually protected by a 500m safety zone. There are eleven subsurface structures located within the regional area infrastructure and other sea users study area, nine of which are further located within the development area infrastructure and other sea users study area.

Wells are classified into the following four categories: completed wells (ready for production), drilling wells (wells in the process of being drilled), plugged and abandoned wells (where work has ceased because it has become non-productive or non-viable) and suspended wells (a well may be temporarily suspended if an operator intends to carry out further operations at a later date). Completed and drilling wells typically have a 500m safety zone. Plugged, abandoned, and suspended wells do not have safety zones attached to their location. There are 42 wells within the development area and therefore situated within the development area infrastructure and other sea users study area, which are completed and either operational (31) or shut-in (11). An additional 58 plugged and abandoned wells are located within the development area and therefore the development area infrastructure and other sea users study area.

Consultation will take place with Chrysaor North Sea Ltd to further understand the nature of their operations within the area.

8.6.2.1.5 Cables

There are four subsea power cable routes which intersect the development area infrastructure and other sea users study area. These are shown on Figure 8-13, for schematic purposes only.

8.6.2.1.6 Pipelines

The PoA Terminal to Douglas OP pipeline is located within the development area infrastructure and other sea users study area at the southwest edge and connects the Douglas platform to the Point of Ayr onshore gas processing terminal on the North Wales coast. Twenty other pipelines are located within the development area infrastructure and other sea users study area, which transport oil, water, condensate, gas, methanol, chemicals or power between the smaller production platforms and the Douglas platform.

8.6.2.1.7 Military Training Areas

The nearest military training area or practice and exercise area (PEXA) is situated 92 km north of the development area, west of Ravenglass near the Lake District.

8.6.2.1.8 Sailing and Motor Cruising

Recreational sailing is generally divided into two categories: offshore and inshore. Offshore sailing is usually undertaken by yachts in the form of either cruising or organised offshore racing. Inshore sailing is typically undertaken by smaller vessels including dinghies and recreational vessels that are used for either cruising at leisure or racing. Cruising may include day trips between local ports and often includes a return journey to the home port on the same day. Inshore racing takes place around racing marks and navigational buoyage.

Recreational vessel intensity was found to be highest near the central and southern portions of the development area infrastructure and other sea users study area and regional infrastructure and other sea users study area (Figure 8-14). Specifically, RYA recreational vessel intensity is highest near the ports within the River Mersey, adjacent to the city of Liverpool and southeast of the development area (Figure 8-14).

8.6.2.1.9 Diving

There are six known recreational wreck dive sites within the broader regional infrastructure and other sea users study area (Figure 8-14).

Chagres and Calcium wreck dive sites are located within the regional infrastructure and other sea users study area, while Ocean Monarch, Cairnross, City of Brussels, and Munster are further located within the development area infrastructure and other sea users study area (Figure 8-14). The dive sites range in depth from approximately 14 m (Calcium) to 36 m (Chagres).

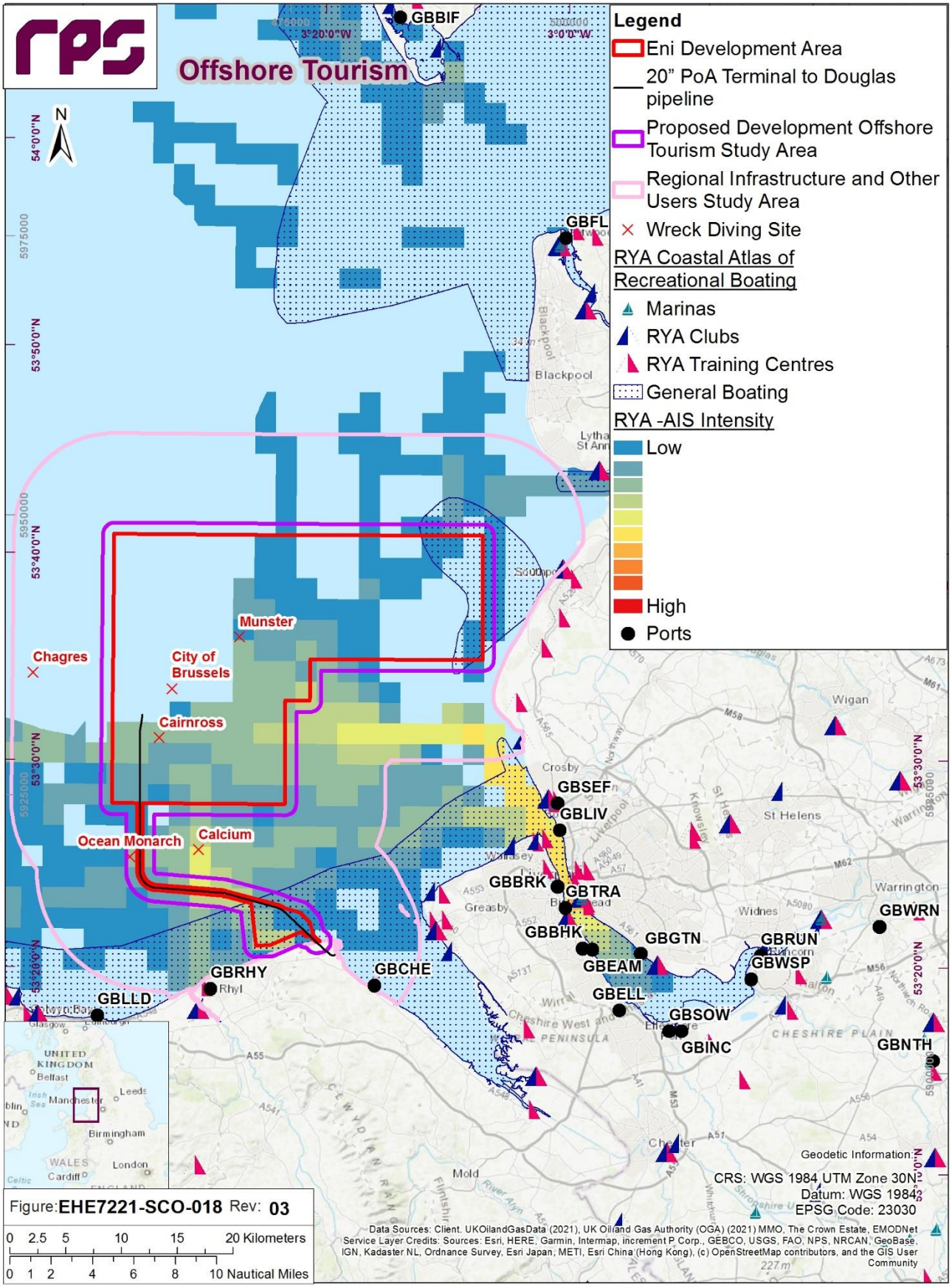

Figure 8-14: Illustrates recreational boating and diving that take place in the vicinity of the Development Area, as well as RYA marinas, clubs, and training centres.

8.6.2.1.10 Recreational Fishing

Recreational fishing vessels in terms of their impacts to risk and increased traffic will be further considered in Chapter 8 Section 8.2: Shipping and Navigation.

Sea fishing trips run from Conwy, North Wales and specialise in wreck fishing, deep sea fishing and reef fishing from Anglesey to Liverpool Bay (Sea Fishing, 2022). Additionally, sea fishing trips run from the Isle of Man and Fleetwood, Lancashire amongst other ports along the coasts adjacent to both the development area infrastructure and other users study area and the regional infrastructure and other users study area. It is therefore considered possible that recreational sea fishing may occur within both of the aforementioned study areas.

8.6.2.1.11 Water Sports and Bathing Waters

Kite surfing, surfing and wind surfing all occur almost entirely in coastal waters, usually within one nautical mile (nm) of the shore. The kite surfing school and club, Pro Kitesurfing is located on the north coast of Wales at Rhyl, situated southwest of the development area infrastructure and other users study area. Based on the distance of the offshore infrastructure within the development area and the lack of water sport schools and clubs near Talacre beach, where the PoA pipeline intersects, it is unlikely to that substantial water sports will occur within the development area infrastructure and other sea users study area.

Although there is no physical restriction on the offshore range of kayaks and canoes, for logistical and safety reasons most will stay relatively close to the shore, undertaking coastal rather than seaward trips. The closest kayaking and canoeing centre to the development area infrastructure and other sea users study area is Dee River Kayaking, located north of the town of Chester, approximately 40 km to the southeast of the development area.

Bathing waters in Wales are designated and monitored by Natural Resources Wales (NRW) and are important for coastal communities, visitors and the economy in Wales. As of 2018, there were 11 designated bathing waters along the North Wales coastline from Prestatyn to Llan fairfechan (NRW, 2018). Of these 11 bathing water sites, five have been classified as excellent, five as good, and one as sufficient (NRW, 2018). Bathing waters are open between May and September, acting as a natural asset to the local communities and tourists alike (NRW, 2018). The 11 aforementioned bathing waters are located between one and 40 km from the development area infrastructure and other sea users study area.

8.6.3 Proposed Additional Data Collection

Supporting data and information will also be obtained through consultation with relevant other sea users receptors with activities and interest in proximity to the development area of the Proposed Development.

Data utilised for the scoping report and therefore the EIA Report will be comprised of a mixture of project design data and published reference data. In specific cases where project data will be difficult and timely to collect, reliance will be on published studies to be used as proxy data.

8.6.4 Potential Project Impacts

A range of potential project impacts on infrastructure and other sea users have been identified which could potentially occur during the construction, operation and maintenance, and decommissioning phases of the Proposed Development.

The impacts that are proposed to be scoped into the assessment are detailed in Table 6-9. No impacts are proposed to be scoped out of the assessment related to infrastructure and other sea users.

Table 8-10: Impacts Proposed to be Scoped into the Assessment for Infrastructure and Other Sea Users of the Eni Development Area (Project Phase refers to Construction (C), Operation and Maintenance (O), and Decommissioning (D).

Potential Impacts	Project Phase			Justification
	C	O	D	
Impacts to existing cables or pipelines or restrictions on access to cables or pipelines.	✓	✓	✓	**All phases** • There are multiple active cables within the development area infrastructure and other sea users study area and therefore there is potential for impact to existing cables or restrictions on access to cables from installation, maintenance and decommissioning activities. • Crossing and proximity agreements will be established where required with known existing cables operators. .
Increased suspended sediment concentrations and associated deposition affecting aggregate extraction areas.	✓	✓	✓	**All phases** • Installation, operation and maintenance, and decommissioning of the cable has the potential to lead to increased suspended sediment concentrations and deposition, which could cause a change in aggregate resource in aggregate extraction areas.
Alterations to sediment transport pathways affecting aggregate extraction areas.	×	✓	×	**Operation and maintenance phase** • The presence of additional infrastructure has the potential to affect sediment transport pathways, which could affect aggregate resources in aggregate extraction areas.
Reduction or restriction of oil and gas exploration activities (including surveys, drilling and the placement of infrastructure) within the Eni CCS development area.	✓	✓	✓	**All phases** • The installation, operation and maintenance, and decommissioning of infrastructure associated with the Proposed Development may reduce or restrict oil and gas exploration activities within the development area.
Displacement of recreational activities.	✓	✓	✓	**All phases** • Safety zones and advisory clearance distances established during construction, maintenance and decommissioning activities may displace recreational activities.
Increased suspended sediment concentrations and associated deposition	✓	✓	✓	**All phases** • Increased suspended sediment concentrations and associated deposition arising from construction, maintenance and decommissioning activities could affect

Potential Impacts	Project Phase			Justification
	C	O	D	
affecting recreational diving sites.				diving within the regional infrastructure and other users study area.

8.6.5 Proposed Assessment Methodology

The infrastructure and other sea users EIA Report will consider the potential impacts of the construction, operation and maintenance and decommissioning phases of the development area infrastructure and other sea users study area and regional infrastructure and other sea users study area and will follow the methodology outlined in Section 5. The following guidance documents will be considered:

- European Subsea Cables UK Association (ESCA) guideline no 6, the proximity of offshore renewable energy installations and submarine cable infrastructure in UK waters (ESCA, 2016)
- The International Cable Protection Committee (ICPC) recommendations:
- recommendation No.2. Recommended routing and reporting criteria for cables in proximity to others (ICPC, 2015)
- recommendation No.3. Criteria to be applied to proposed crossings submarine cables and/or pipelines (ICPC, 2014)
- Pipeline crossing agreement and proximity agreement pack (Oil and Gas UK, 2021)
- Submarine cables and offshore renewable energy installations proximity study (TCE, 2012).

8.6.5.1 Cumulative Effects

The potential effects related to the construction, operation and maintenance, and decommissioning of the Proposed Development on infrastructure and other sea users will assess the potential cumulative effects that could occur on infrastructure and other sea users receptors related to alternate projects and/or activities that take place within the infrastructure and other sea users study area.

8.6.6 Potential Mitigation

The following embedded mitigation measures are proposed in relation to infrastructure and other sea users:

- Promulgation of information advising on the nature, timing and location of activities, including through Notices to Mariners;
- Navigational aids and marine charting;
- Consultation with oil and gas operators and other energy infrastructure operators will promote and maximise cooperation between parties and minimise both spatial and temporal interactions between conflicting activities; and
- Installation of infrastructure over or adjacent to existing or future cables or pipelines will be subject to crossing or proximity agreements between the two parties, prior to the start of the construction phase.

The requirement for and feasibility of any mitigation measures will be dependent on the significance of effects and will be consulted upon with statutory consultees throughout the EIA process.

8.6 Socio-economics

The Proposed Development plans on reutilising the historic offshore oil and gas platforms within Liverpool Bay and therefore, it is proposed that offshore socio-economics are scoped out of the EIA Report.

Given the pre-existing nature of the development area, it is unlikely that there will be any potential effects and/or impacts resulting from the construction, operation and maintenance, and decommissioning of the development area as compared to those previously exhibited on offshore socio-economics in the area.

Specifically, the Proposed Development will not alter any current socio-economic opportunities within the vicinity of the development area, as the Proposed Development will utilise the existing Point of Ayr (PoA) terminal and plans on having unmanned OPs within the development area. Additionally, there will only be routine maintenance events and the majority of operations can be run through the onshore control room and terminal located at Point of Ayr.

The Proposed Development offshore infrastructure is located most closely to Liverpool Council and Flintshire Council. Additionally, the PoA Terminal to Douglas OP pipeline connects the offshore infrastructure to the PoA Terminal, located on the northern coast of Wales, within Flintshire County.

At the macro level, Liverpool's economy is worth approximately £27 billion with a total population of 500,500 individuals as of 2021 population estimates (LCR, 2016; LCC, 2022). Of this population, almost 70% are aged between 16 and 64, slightly higher than the UK average (LCC, 2022).

As of 2013, the largest sector in terms of employment within Liverpool was human health and social work (18.1%), wholesale and retail (14.9%), education (9.2%), manufacturing (8.1%), administrative supportive services (7.2%), and public administration (7.1%) (LCR, 2013). Gross Value Added (GVA) is an economic productivity metric that measures the contribution of a company and/or sector to the local economy and/or region. Manufacturing accounted for the largest sector in terms of GVA at 12.8% (LCR, 2013). These findings illustrate that the overwhelming majority of socio-economic opportunities are present and currently originate within the onshore environment.

Comparatively, Flintshire was found to have a population of approximately 154,000 individuals during the 2016 mid-year population estimates (Flintshire Government, 2018). The largest employment sector in Flintshire is manufacturing, accounting for 24.7% of overall employment, followed by retail, business and administration, and support services (Flintshire Government, 2018). Analogous to findings from Liverpool's socio-economic status, Flintshire's opportunities are predominantly located within the onshore and urban environments.

9 SUMMARY OF THE OFFSHORE SCOPING REPORT

9.1 Overview

The Proposed Development is part of the HyNet North West Project and is located within the Liverpool Bay area of the east Irish Sea approximately 12 km to the north of the Welsh coastline and 2 km west of the English coastline.

The HyNet North West Project is a hydrogen supply and Carbon Capture and Storage (CCS) project. The goal of the HyNet North West Project is to reduce carbon dioxide emissions from industry, homes and transport and support economic growth in the North West of England and North Wales. The HyNet North West Project will include infrastructure to produce and distribute low carbon hydrogen. The hydrogen is produced using natural gas, with the resultant CO_2 emissions captured and stored in depleted hydrocarbon reservoirs offshore, in addition to the CO_2 emissions which will be captured from existing industrial sources.

Within the Proposed Development, the existing offshore natural gas import pipeline from PoA gas Terminal will be re-purposed to become a CO_2 export pipeline and will transport the CO_2 to the repurposed Douglas platform. From the Douglas platform, CO_2 will be transported along re-purposed natural gas pipelines to the Hamilton Main platform for injection into the Hamilton Main reservoir, to the Hamilton North platform for injection into the Hamilton North reservoir, and to the Lennox platform for injection into the Lennox reservoir.

The Proposed Development will also require new electrical and fibre optic transmission infrastructure seawards of Mean High Water Spring (MHWS), connecting the PoA Terminal to the offshore infrastructures.

The information set out in this Offshore EIA Scoping Report is provided to support a request for a formal Scoping Opinion in relation to the Proposed Development from the Offshore Petroleum Regulator for Environment and Decommissioning (OPRED) and Natural Resources Wales (NRW).

This Offshore EIA Scoping Report has identified the potentially significant effects associated with the construction, operation and maintenance, and decommissioning phases of the Proposed Development, on a range or receptors. These are detailed in Section 6 to Section 8 of this Offshore EIA Scoping Report and are summarised in 9.1. The proposed approach to assessment has been provided in each section.

This Offshore Scoping Report and the subsequent Offshore EIA relate to those impacts and receptors associated with the offshore environment, including potential impacts of offshore infrastructure on onshore and offshore receptors. The Offshore Scoping Report relates to those impacts from infrastructure seawards of Mean High-Water Spring (MHWS).

Table 9-1: Summary of Impacts Proposed to be Scoped into the EIA Assessment

Impact	Project Phase		
	C	O	D
Section 6: Offshore Physical Environment			
Section 6.1: Physical Processes			
Increased suspended sediment concentrations and sediment deposition	✓	✓	✓
Activities affecting surrounding water quality	✓	×	✓
Changes to seabed morphology and water quality due to the utilisation of jack-up vessels	✓	×	✓
Presence of infrastructure may lead to changes in the local tidal regime, wave climate, and sediment transport	×	✓	×
Section 6.2: Subsea Noise			
Covered in the related topic chapters			
Section 6.3: Air Quality			
Emissions to the atmosphere	✓	✓	✓

Impact	Project Phase		
	C	O	D
Exhaust emissions from offshore vessels	✓	×	×
Potential effects on air quality from dust and emissions	×	×	×
Odour during construction activities	×	×	×
Section 6.4: Climate Change			
GHG emissions associated with construction/refurbishment activities, including materials, transport and use of plant / offshore marine vehicles	×	✓	✓
In-combination effects of climate change with other environmental impact pathways	✓	✓	✓
Climate change risk to the development and resilience/adaptation measures	✓	✓	✓
Section 7: Offshore Biological Environment			
Section 7.1: Benthic Subtidal and Intertidal Ecology			
Temporary subtidal habitat loss and/or disturbance	✓	✓	✓
Increased suspended sediment concentrations and associated deposition	✓	×	✓
Long-term subtidal habitat loss	×	✓	✓
Introduction of artificial habitat and colonisation of hard structures	✓	✓	✓
Increased temperature impacting benthic and marine communities	×	✓	×
Accidental pollution to the surrounding area	✓	✓	✓
Increased risk of introduction and spread of Invasive Non-native Species (INNS)	✓	✓	✓
Impacts resulting from the release of sediment bound benthic contaminants	✓	×	✓
Impacts to benthic ecology due to electromagnetic fields (EMF)	×	×	×
Section 7.2: Fish and Shellfish Ecology			
Temporary habitat loss and/or disturbance	✓	✓	✓
Subsea noise impacting fish and shellfish receptors	✓	×	✓
Increased suspended sediment concentrations and associated deposition	✓	×	✓
Long-term subtidal habitat loss	×	✓	×
Introduction of artificial habitat and colonisation of hard structures	×	✓	✓
Effects of subsea noise on marine biodiversity from UXO detonation	×	×	×
Subsea noise from marine vessels during construction, operation and maintenance and decommissioning phases	×	×	×
Impacts to fish and shellfish ecology due to electromagnetic fields (EMF)	×	×	×
Accidental pollution during construction, operation and maintenance, and decommissioning phases	×	×	×
Section 7.3: Marine Mammals			
Injury, disturbance, and displacement from vessel activity and other noise producing activities	✓	✓	✓
Potential for barrier effects due to subsea noise	✓	×	✓
Injury to marine mammals from collision risk with marine vessels	✓	✓	✓
Effects on marine mammals due to changes in prey availability	✓	✓	✓
Effects of subsea noise on marine biodiversity from UXO detonation	×	×	×
Impacts to marine mammal ecology due to electromagnetic fields (EMF)	×	×	×
Accidental pollution during construction, operation and maintenance, and decommissioning phases	×	×	×
Injury, disturbance, and displacement to marine mammals from operational noise	×	×	×

Impact	Project Phase		
	C	O	D
Increased suspended sediment concentrations and associated deposition	×	×	×
Section 7.4: Offshore Ornithology			
Temporary habitat displacement and disturbance	✓	×	✓
Indirect impacts from construction/ decommissioning noise	✓	×	✓
Disturbance of contaminated sediments releasing contaminants into the surrounding environment	✓	×	✓
Accidental pollution in the surrounding area	✓	✓	✓
Creation of roosting and nesting habitats among project infrastructure	×	✓	×
Offshore Human and Socio-economic Environment			
Section 8.1 Commercial Fisheries and Aquaculture			
Loss or restricted access to fishing grounds	✓	✓	✓
Impacts on commercially valuable fish and shellfish species/resources	✓	✓	✓
Interference with fishing activity	✓	✓	✓
Temporary increases in steaming distances to fishing grounds	✓	✓	✓
Loss or damage to fishing gear due to snagging gear on project infrastructure	×	✓	×
Appointment of Fishing Industry Representatives (FIRs)	✓	✓	✓
Supply chain opportunities for local fishing vessels	✓	✓	✓
Displacement of fishing activity into other areas	×	×	×
Long-term increased steaming distances to fishing grounds during operation and maintenance	×	×	×
Section 8.2 Shipping and Navigation			
Deviations to commercial routes	×	✓	×
Increased vessel to vessel collision risk.	✓	✓	✓
Increased allision (contact) risk to vessels.	✓	✓	✓
Increased risk of anchor and gear snagging for commercial vessels and commercial fishing vessels.	✓	✓	✓
Reduction of under keel clearance	×	✓	×
Reduction of emergency response capability due to increased incident rates for SAR responders and increased demand on the available resources.	✓	✓	✓
Section 8.3 Marine Archaeology and Ordnance			
Sediment disturbance and deposition leading to indirect impacts on known archaeological receptors	✓	✓	✓
Direct damage to known archaeological receptors	✓	✓	✓
Alteration of sediment transport regimes	×	✓	×
Section 8.4 Infrastructure and Other Users of the Sea			
Impacts to existing cables or pipelines or restrictions on access to cables or pipelines.	✓	✓	✓
Increased suspended sediment concentrations and associated deposition affecting aggregate extraction areas.	✓	✓	✓
Alterations to sediment transport pathways affecting aggregate extraction areas.	×	✓	×
Reduction or restriction of oil and gas exploration activities (including surveys, drilling and the placement of infrastructure) within the Eni CCS development area.	✓	✓	✓
Displacement of recreational activities.	✓	✓	✓

Impact	Project Phase		
	C	O	D
Increased suspended sediment concentrations and associated deposition affecting recreational diving sites.	✓	✓	✓
Topics to be scoped out			
Socio-economics	×	×	×

9.2 Cumulative Effects

This Scoping Report has proposed an approach to Cumulative Effects Assessment (CEA) for each topic in this report. A detailed CEA will be undertaken to support the ES, in line with the methodology outlined in Chapter 5, Section 5.3.8.

9.3 Transboundary impacts

The following receptor topics will be further considered in the EIA process for transboundary impacts:

- Fish and shellfish ecology;
- Marine mammals;
- Offshore ornithology;
- Commercial fisheries; and
- Shipping and navigation.

9.4 Next Steps

Consultees are invited to consider the information presented in this EIA Scoping Report and advise on whether or not they agree with the conclusions. Several broad questions are presented below to encourage reflection of the key elements discussed in this EIA Scoping Report:

- Are there any additional baseline data sources available that could be used to inform the EIA?
- Does the reader agree that the proposed study areas are appropriate for each of the EIA topics?
- Have all potential impacts resulting from the Proposed Development been considered?
- Project transmission assets been identified for each of the EIA topics within this EIA Scoping Report?
- Does the reader agree with the impacts to be scoped in, and out, of the assessment?
- For those impacts scoped in, does the reader agree that the methods described are sufficient to inform a robust impact assessment?
- Are there any specific developments or infrastructure schemes which should be taken into account when considering potential cumulative impacts?

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None

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Appendix A: Gazetteer of known marine archaeology within the Marine Archaeology Study Area

ID	X	Y	Name	Description	Period
6732 / 892845	465844.5716	5930485.154	Alarm	Remains of the 1911 wreck of an iron-hulled lightship which foundered following a collision with the SS *Pacuare*, approximately 18 nautical miles WNW of New Brighton.	20th century
6769 / 906906	463234.66	5930076.407	Cairnross	Remains of the 1940 wreck of an English cargo vessel which foundered after detonating a mine laid by the German submarine U-30, approximately 19 nautical miles north-west of New Brighton.	WWII
83810 / 906998	464351.7841	5934445.8	City of Brussels	Remains of the 1883 wreck of an English liner which foundered in Liverpool Bay following a collision with the cargo vessel *Kirkby Hall*. It was an iron-hulled steamer, en route from New York to Liverpool with passengers and a general cargo.	Post Medieval
7604 / 907034	487546.5124	5943954.706	Coniston (Probably)	Remains of a steam ship located 5.8 nautical miles west of Southport. This may be the remains of an English steam ship which foundered following an explosion in 1868, while on route from Liverpool to Lancaster with a general cargo.	Post Medieval
7203 / 907033	475753.0986	5942517.307	Counsellor III	Remains of the 1940 wreck of an English cargo vessel which foundered after detonating a mine laid by the German submarine U-30 approximately 17 nautical miles north-west of New Brighton. It was a steel-hulled steamer, built in 1926.	WWII
6853 / 906846	457894.779	5927358.069	Dublin	Remains of the 1888 wreck of a British steamship, which foundered in Liverpool Bay following a collision with the paddle steamer *Longford*.	Post Medieval
7256 / 907032	474019.9718	5941821.935	El Oso	Remains of the 1940 wreck of an English tanker which foundered after detonating a magnetic mine laid by the German submarine U-30, approximately 17 nautical miles north-west of New Brighton. El Oso was a steel-hulled steamer, en route from Lobitos.	WWII
	467794.5674	5925173.114	Find	Find scatter	Post Medieval
	468653.5038	5923892.228	Find	Find scatter	Post Medieval

ID	X	Y	Name	Description	Period
	460307.6595	5920696.29	Find	Stack of slates	Post Medieval
6937	475395.2357	5931801.597	Gorsethorn	Built in 1917, foundered near the Bar Light, 13 nautical miles north-west of New Brighton in 1940.	WWII
6907 / 1521994	474524.1778	5926568.014	Lelia	Remains of 1865 wreck of English paddle steamer, located approximately 8 miles NNW of the Point of Ayr, in Liverpool Bay. Lelia sprang a leak and foundered en route from Liverpool for Nassau, Bermuda with coal, iron and a general cargo on its maiden voyage.	Post Medieval
6988 / 892884	473740.651	5933030.6	Letty	Remains of the 1940 wreck of an English cargo vessel which foundered 14 nautical miles off New Brighton, Liverpool Bay, after detonating a mine. *Letty* was a steel-hulled steamer, en route from Liverpool to Buncrana with a cargo of coal.	WWII
	459058.4234	5929486.187	Liverpool Bay palaeolandscapes	Glacial tunnel valley	Palaeolithic
6757	461835.4764	5930200.614	Lugar	On September 23rd, 1891, the British cargo ship *Lugar*, built in 1857 by Richardson, Duck & Co. Ltd. was on voyage from Garston to Dublin with a cargo of coal, sank after a collision in fog with the steamer SS *Saxon Prince* at the mouth of the River Mersey.	Post Medieval
7324 / 907030	470429.1634	5939106.214	Munster	Remains of the 1940 wreck of an Irish ferry which foundered 17 miles north-west of New Brighton, after detonating a mine laid by the German submarine U-30. It was en route from Belfast to Liverpool with passengers and a general cargo.	WWII
6962 / 907015	490054.7134	5937418.142	Nazarine	Possible remains of the 1872 wreck of an English cargo vessel driven ashore at Burbo Bank. It was en route from Liverpool to Havana with a cargo of coal. Built of wood, it was a sailing vessel.	Post Medieval

ID	X	Y	Name	Description	Period
8111	460593.3285	5919435.612	Ocean Monarch	The *Ocean Monarch* was a wooden sailing barque built by D McKay. On 24 August 1848, the ship was on passage from Liverpool to Boston when the ship caught fire and fell into the sea off of Great Orme.	Post Medieval
6803	458534.1616	5927890.165	Penstone	The *Penstone* was built in 1926 by the Manchester Dry Dock Company, Ellesmere Port and wrecked in 1948 in a collision with *Villanger*.	Post Medieval
8336	463061.8115	5916398.881	Resurgam	An experimental submarine built in 1879 by Reverend George William Garrett, the *Resurgam* was wrecked in 1880 en route to Gosport. This site was designated as a Historic Wreck under Protections of Wrecks Act 1973 (Designation No 1, 1996) on 6 July 1996. The protected area around the wreck is a radius of 300m	Post Medieval
	472887.3904	5922179.711	Seabed anomaly (man-made origin)	Findspot	Post Medieval
	469137.6042	5923670.032	Seabed anomaly (man-made origin)	Findspot	Post Medieval
	466537.302	5926478.404	Seabed anomaly (man-made origin)	Findspot	Post Medieval
	466537.302	5926478.404	Seabed anomaly (man-made origin)	Findspot	Post Medieval
	465885.6112	5926743.243	Seabed anomaly (man-made origin)	Findspot	Post Medieval
	465922.6665	5926881.756	Seabed anomaly (man-made origin)	Findspot	Post Medieval
	465782.8148	5928510.711	Seabed anomaly (man-made origin)	Findspot	Post Medieval

ID	X	Y	Name	Description	Period
7303 / 907029	479211.7076	5938534.517	Speke (Possibly)	Remains of the 1943 wreck of an English cargo vessel which foundered near Jordan's Spit Buoy while en route from Garston to Preston with a cargo of wood pulp.	WWII
7323 / 892895	467763.5992	5939155.224	Stanleigh	Remains of the 1941 wreck of an English collier which foundered in Liverpool Bay, 18 nautical miles north-west of New Brighton, after being bombed by German aircraft. This steel steam vessel, built in 1912, was en route from Devonport to Barrow-in-Furnes.	WWII
	470167.89	5923005.518	Unknown	Ballast mound, wreck	Post Medieval
8399	474945.166	5916032.014	Unknown	Wreck	Unknown
	471694.7054	5923371.928	Unknown	Wreck	Post Medieval
	465920.2824	5926552.739	Unknown	Wreck	Post Medieval
6889	465648.3467	5928725.024	Unknown	Wreck	Unknown
	465648.7874	5928726.819	Unknown	Wreck	Post Medieval
6801	464235.4282	5929430.856	Unknown	Light ship	Unknown
6768	462521.6698	5929913.27	Unknown	Wreck	Unknown
6774	466762.4101	5929953.851	Unknown	Barge	Unknown
6773	464372.7219	5930049.146	Unknown	Wreck	Unknown
	464373.2574	5930050.828	Unknown	Wreck	Post Medieval
	462526.886	5930082.883	Unknown	Wreck	Post Medieval
	461843.003	5930219.265	Unknown	Wreck	Post Medieval
6744	464662.2553	5930343.655	Unknown	Wreck	Unknown
	464662.1188	5930344.87	Unknown	Wreck	Post Medieval

ID	X	Y	Name	Description	Period
6722	463903.0601	5930774.024	Unknown	Wreck	Unknown
	463903.0685	5930778.178	Unknown	Wreck	Post Medieval
6720	463118.6058	5930781.938	Unknown	Wreck	Unknown
	463119.0177	5930784.16	Unknown	Wreck	Post Medieval
6714	464843.3313	5930917.128	Unknown	Barge	Unknown
6712	465646.182	5931011.351	Unknown	Barge	Unknown
6709	476163.9688	5931997.911	Unknown	Wreck	Unknown
7079 / 892881	461701.8762	5932803.263	Unknown	Probably a late 19th century steamer	19th century
7079	461701.8762	5932803.263	Unknown	Steam ship	Unknown
	461701.6968	5932806.115	Unknown	Wreck	Post Medieval
6950 / 892885	492202.7042	5935313.275	Unknown	Wooden wreckage	Unknown
7308	474650.2242	5938287.985	Unknown	Wreckage	Unknown
7307	468806.0589	5938345.302	Unknown	Wreck	Unknown
7357 / 892896	473497.2452	5939627.543	Unknown	Wreckage	Unknown
892897 / 7355	470064.609	5939696.316	Unknown	Small area of unidentified wreckage	Unknown
7279	473078.1568	5940204.743	Unknown	Wreck	Unknown
7273	473783.4698	5940723.666	Unknown	Wreck	Unknown
7261	473290.0035	5941004.58	Unknown	Wreckage	Unknown
7258	473293.9315	5941113.959	Unknown	Wreck	Unknown
7257	473094.4927	5941133.638	Unknown	Wreck	Unknown

ID	X	Y	Name	Description	Period
7254	473357.1389	5941178.501	Unknown	Wreck	Unknown
7251	473129.1344	5941215.028	Unknown	Wreck	Unknown
7250	473000.2454	5941232.454	Unknown	Wreck	Unknown
7249	473270.4987	5941258.725	Unknown	Wreck	Unknown
7243 / 892899	472971.8213	5941466.255	Unknown	Wreck	Unknown
7236 / 892900	473530.3667	5941791.286	Unknown	Wreck	Unknown
7235	472963.8171	5941800.07	Unknown	Wreck	Unknown
7232 / 892902	473219.9616	5941870.922	Unknown	Small area of wreckage, probably part of El Oso	WWII
7229	473288.7976	5941957.681	Unknown	Wreck	Unknown
7215	492287.5913	5941986.472	Unknown	Wreck	
7221 / 892904	473070.826	5942007.135	Unknown	Wreck	Unknown
7218 / 892903	474330.8586	5942029.761	Unknown	Wreck	Unknown
7211 / 892906	473167.1419	5942273.6	Unknown	Probably collapsed wreck	Unknown
7210 / 892907	474250.9261	5942328.735	Unknown	Small area of wreckage	Unknown
7204 / 892908	474191.1711	5942486.675	Unknown	Probably partially buried wreck	Unknown
7575	473058.9734	5944940.667	Unknown	Wreck	Unknown
7446	480099.7668	5946631.911	Unknown	Sailing vessel	Unknown
7270 / 907031	471617.3762	5940804.834	Ystroom (Probably)	Remains of the 1940 wreck of a Dutch cargo vessel which foundered after detonating a German mine. It was a steel-hulled vessel, en route from Teignmouth to Runcorn with a cargo of china clay.	WWII

ID	X	Y	Name	Description	Period
7449 / 907036	493855.1514	5946328.634	Zealandia	Remains of the 1917 wreck of an American cargo vessel stranded on the Horse Bank, three miles west of Southport Pier. It was an iron-hulled steamer, en route from New York to Liverpool with a general cargo including sheep.	Modern

Appendix B: Sampling and Analysis Plan (SAP) for the Development Area

Note: The SAP incorporates some Eni decommissioning work which is outside of the scope of this EIA Scoping Report.

EHE7221_Benthic Subtidal Sampling an