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

Environmental Statement
Non-Technical Summary

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Non-Technical Summary

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Prepared by:	**Prepared for:**
RPS	**Liverpool Bay CCS Limited**

Glossary

Term	Meaning
"Do Nothing" Scenario	The environment as it would be in the future should the proposed project not be developed.
Baseline	The existing conditions as represented by the latest available survey and other data which is used as a benchmark for making comparisons to assess the impact of the Proposed Development.
CCS	Integrated process of three stages: capture of CO_2 from power stations and large industrial sources; transporting CO_2 to a storage site; and permanent storage of CO_2 in deep geological features.
Climate Change	A change in global or regional climate patterns, in particular a change apparent from the mid to late 20th century onwards and attributed largely to the increased levels of atmospheric CO_2 produced by the use of fossil fuels.
Cumulative Effect Assessment	Assessment of the likely effects arising from the offshore components of the HyNet CO_2 Transportation and Storage Project ('Proposed Development') alongside the likely effects of other development activities in the vicinity of the Proposed Development.
Effect	The consequence of an impact.
EIA Regulations	Collectively the term used to refer to The Offshore Oil and Gas Exploration, Production, Unloading and Storage (Environmental Impact Assessment) Regulations 2020; and The Marine Works (Environmental Impact Assessment Regulations) 2007 (as amended).
Environmental Impact Assessment	A statutory process by which certain planned projects must be assessed before a formal decision to proceed can be made. It involves the collection and consideration of environmental information, which fulfils the assessment requirements of the Environmental Impact Assessment Directive and Environmental Impact Assessment Regulations, including the publication of an Environmental Statement.
Environmental Statement	The document presenting the results of the Environmental Impact Assessment process for the Proposed Development.
European Protected Species	European Protected Species (such as cetaceans, marine turtles and otters) receive full protection under The Conservation of Species and Habitats Regulations 2010.
Greenhouse Gas	A gas that absorbs and emits radiant energy within the thermal infrared range, causing the greenhouse effect. Examples include carbon dioxide and methane.
Habitat	The environment that a plant or animal lives in.
Impact	A change that is caused by an action.
Inter-related Effects	Interrelationships between ES topics that may lead to environmental effects.
Magnitude	A combination of the extent, duration, frequency and reversibility of an impact.
Major Significance	These beneficial or adverse effects are considered to be important considerations and are likely to be material in the decision making process.
Marine Licence	The Marine and Coastal Access Act 2009 requires a marine licence to be obtained for licensable marine activities. In addition, licensable activities within 12 nm of the Welsh coast require a separate marine licence from Natural Resource Wales.
Maximum Design Scenario	The maximum design parameters of the Proposed Development considered to be a worst case for any given assessment but within the range of the Project Description Envelope.
Mean High Water Spring	The highest level reached by the sea at high tide during mean high water spring tide. This is defined as the average throughout the year, of two successive high waters, during a 24-hour period in each month when the range of the tide is at its greatest.
Mean Low Water Spring	The lowest level reached by the sea at low tide during mean low water spring tide. This is defined as the average throughout the year, of two successive low waters, during a 24-hour period in each month when the range of the tide is at its greatest.

Term	Meaning
Minor Significance	These beneficial or adverse effects are generally, but not exclusively, raised as local factors. They are unlikely to be critical in the decision making process, but are important in enhancing the subsequent design of the project.
Mitigation Measure	Measure which would avoid, reduce, or remediate an impact.
National Policy Statement	A document setting out national policy for the energy infrastructure against which proposals are assessed and decided upon.
Net Zero	A target of completely negating the amount of greenhouse gases produced by human activity either worldwide or by a country or organisation, to be achieved by reducing emissions and implementing methods of absorbing carbon dioxide from the atmosphere.
Policy	A set of decisions by governments and other political actors to influence, change, or frame a problem or issue that has been recognized as in the political realm by policy makers and/or the wider public.
Project	The HyNet Carbon Dioxide Transportation and Storage Project.
Project Design Envelope	Also known as the Rochdale Envelope, the Project Design Envelope concept is routinely utilised in both onshore and offshore planning applications to allow for some flexibility in design options, particularly offshore, and more particularly for foundations and turbine type, where the full details of the project are not known at application submission but where sufficient detail is available to enable all environmental impacts to be appropriately considered during the Environmental Impact Assessment.
Project Lifetime Effects	Effects that occur throughout more than one phase of the project (construction, operations 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.
Proposed Development	The offshore components of the Project which are subject of this Environmental Statement, as described in volume 1, chapter 3.
Protected Species	A species of animal or plant which it is forbidden by law to harm or destroy.
Receptor	A component of the natural or man-made environment that is potentially affected by an impact.
Receptor-led Effects	Effects that interact spatially and/or temporally resulting in inter-related effects upon a single receptor.
Residual Impact	Residual impacts are the final impacts that occur after the proposed mitigation measures have been put into place, as planned.
Scoping Opinion	Sets out the Secretary of State's response to the Applicants Scoping Report and contains the range of issues that the Secretary of State, in consultation with statutory stakeholders, has identified should be considered within the Environmental Impact Assessment.
Special Protection Area	A site designation specified in the Conservation of Habitats and Species Regulations 2017, classified for rare and vulnerable birds, and for regularly occurring migratory species. Special Protection Areas contribute to the national site network.
The Applicant	This is Liverpool Bay CCS Ltd.
Topsides	Surface structures and equipment placed on a supporting structure to provide some or all of a platform's functions.
Transboundary Effects	Impacts from a project within one state affect the environment of another state(s).
Welsh Inshore Waters	Welsh waters within 12 nm of the Welsh coast.
Welsh Offshore Waters	Welsh offshore waters.

Acronyms and Initialisations

Acronym/Initialisation	Description
BEIS	The Department For Business, Energy and Industrial Strategy, Now Replaced By The Department For Energy Security And Net Zero.
BSI	British Standards Institute
CCS	Carbon Capture and Storage
CCUS	Carbon Capture, Usage and Storage
CEA	Cumulative Effect Assessment
CEFAS	Centre For Environment, Fisheries And Aquaculture Science
CO_2	Carbon Dioxide
COP	Conference of the Parties
CtL	Consent To Locate
DCO	Development Consent Order
DECC	The Department Of Energy And Climate Change, Merged With The Department For Business, Innovation And Skills, To Form The Department For Business, Energy And Industrial Strategy
DEFRA	Department For Environment, Food And Rural Affairs
EcIA	Ecological Impact Assessment
EIA	Environmental Impact Assessment
EMF	Electromagnetic Field
EMP	Environmental Management Plan
Eni	Eni UK Limited
EPS	European Protected Species
ES	Environmental Statement
EU	European Union
FEED	Front End Engineering Design
FO	Fibre Optic
FSL	Floating Shear Legs
GHG	Greenhouse Gas
HDD	Horizontal Directional Drilling
HLV	Heavy Lift Vessel
HRA	Habitats Regulations Assessment
INNS	Invasive Non-Native Species
IPCC	Intergovernmental Panel On Climate Change
JNCC	Joint Nature Conservation Committee
LAT	Lowest Astronomical Tide
LCA/SCA	Landscape And Seascape Character Assessment
LDAR	Leak Detection And Repair
MAT	Master Application Template
MCAA	Marine And Coastal Access Act
MDS	Maximum Design Scenario
MHWS	Mean High Water Spring
MLWS	Mean Low Water Spring

Acronym/Initialisation	Description
MMMP	Marine Mammal Mitigation Protocol
MMO	Marine Management Organisation
MMV	Monitoring, Measuring And Verification
NE	Natural England
NPS	National Policy Statement
NRW	Natural Resources Wales
NRW-MLT	Natural Resources Wales – Marine Licencing Team
NSTA	North Sea Transition Authority, Known As The Oil And Gas Authority Until March 2022.
NUI	Normally Unmanned Installation
OGA	Oil And Gas Authority, Replaced By The North Sea Transition Authority In March 2022
OPRED	Offshore Petroleum Regulator For Environment and Decommissioning
PAD	Protocol For Archaeological Discoveries
PDE	Project Design Envelope
PINS	The Planning Inspectorate
PoA	Point Of Ayr
PWA	Pipeline Works Authorisation
SAT	Subsidiary Application Template
SMP	Shoreline Management Plan
SPA	Special Protection Area
SSC	Suspended Sediment Concentrations
TCPA	Town And Country Planning Act
UK	United Kingdom
UK ETS	UK Emissions Trading Scheme
UXO	Unexploded Ordnance
WFD	Water Framework Directive
WSI	Written Scheme Of Investigation
ZOI	Zone Of Influence

Units

Units	Description
%	Percent
°C	Degrees Celsius (temperature)
km	Kilometres (distance)
kV	Kilovolt (electrical potential)
kW	Kilowatt (power)
m	Metres (distance)
m^2	Metres squared (area)
m^3	Metres cubed (volume)
nm	Nautical Mile (distance; equal to 1.852 km)

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1 VOLUME 1 – INTRODUCTORY CHAPTERS

1.1 Introduction

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 Limited ('the Applicant'). The Applicant is developing the HyNet Carbon Dioxide Transportation and Storage Project (hereafter referred to as 'the Project'). The Project involves creating a system to transport and store carbon dioxide (CO_2) while producing and distributing low carbon hydrogen. This is done by capturing CO_2 emissions from industrial emitters, and hydrogen production using natural gas, and storing it (Figure 1.1). As part of the offshore components of the project, (hereafter referred to as 'the Proposed Development'), the existing offshore natural gas import pipeline from Point of Ayr (PoA) Gas Terminal will be repurposed to become a CO_2 export pipeline and will transport the CO_2 to the newly constructed Douglas CCS platform. From the Douglas CCS platform, CO_2 will be transported along the 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 infrastructure (Figure 1.2). The Proposed Development requires permits and licenses from relevant authorities to undertake development within the marine environment and to store CO_2, these are:

- a Marine Licence under the Marine and Coastal Access Act (MCAA) 2009 (administered by Natural Resources Wales Marine Licensing Team (NRW-MLT) for licensable activities in Welsh Waters (between 0 and 12 nautical miles (nm) from MHWS) (i.e. all licensable activities associated with installation of the new Douglas CCS platform, associated pipeline connections, new electrical and fibre optic cables, and related works within Territorial Waters); and
- a Storage Permit from the North Sea Transition Authority (NSTA), in accordance with the Storage of Carbon Dioxide (Licensing etc.) Regulations 2010 (SI 2010/2221) for the storage of carbon dioxide at a storage site in the licensed area (licence reference CS004). Prior to the issue of a Storage Licence the Offshore Petroleum Regulator for Environment & Decommissioning (OPRED) must approve the ES.

The Environmental Impact Assessment (EIA) Directive, even after the UK's departure from the European Union (EU), continues to guide the assessment of environmental effects. The Offshore Environmental Statement (ES) provides details of the EIA process for the Proposed Development and supports the above permit and licence applications.

1.1.1 Purpose of this document

This document is a Non-Technical Summary (NTS) of the ES. The ES constitutes the environmental information for the Proposed Development and sets out the findings of the ES. The ES together with this NTS, has accompanied the application for consent.

This NTS is intended to act as a stand-alone document that provides an overview of the Proposed Development and the likely significant effects of the Proposed Development in non-technical language. The full ES is located at: https://hynethub.co.uk/.

1.1.1 Environmental Impact Assessment

The Project consists of both Onshore and Offshore components. The Onshore elements have support from two ES:

1. an ES to support the Development Consent Order (DCO) application for the HyNet Carbon Dioxide Pipeline DCO. The ES for the HyNet Carbon Dioxide Pipeline DCO application was submitted in

October 2022. National Infrastructure Planning Examination of the application started on the 20 March 2023 and closed on the 20 September 2023. The decision from the relevant Secretary of State (SoS) is expected in Q1/Q2 2024; and

2. 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 was submitted in July 2021 and the EIA Scoping Opinion received in August 2021. Consultation on the ES closed in December 2022 and the planning applications were submitted on the 10 March 2023. The TCPA applications were approved by Flintshire County Council (FCC) on 10th January 2024.

The Offshore ES pertains to impacts from structures seawards of MHWS. The Onshore ES for TCPA covers impacts landward of Mean Low Water Spring (MLWS), resulting in overlap in assessment in the intertidal area.

In instances of overlapping jurisdiction between Offshore and Onshore consenting and regulatory processes, both the Offshore and Onshore ES present relevant technical assessments. “Offshore” refers to areas seaward of MHWS, while “Onshore” pertains to landward of MLWS.

The Offshore ES serves to support various applications, including the Storage Permit application and Marine Licence applications for activities related to the Proposed Development. The ES describes the Proposed Development (the offshore components, seaward of MHWS), provides environmental baseline information, outlines the assessment methodology, presents expected environmental effects, suggests mitigation measures, and offers reasonable alternatives considered.

This NTS offers a simplified overview of the Offshore ES findings.

The scope of assessment is guided by an earlier Scoping Opinion from OPRED. The Offshore ES focuses on topics like Physical Processes, Marine Biodiversity, Ornithology, Shipping and Navigation, Commercial Fisheries, Marine Archaeology, Infrastructure and Sea Users, Climate Change, and Inter-Related Effects. Some topics like Seascape, Landscape and Visual Resources, Aviation and Radar, and Air Quality were excluded from the assessment due to a lack of significant effects or receptor pathways.

1.1.2 Statutory Consents and Permissions

The Project is located within the jurisdictions of England and Wales; therefore, the Offshore ES will be submitted to two regulators: NRW-MLT for the Marine Licence Application in Wales; and OPRED, who will approve the ES for the Storage Permit Application to the NSTA covering England and Wales.

Further details of the other consents that will be required, consenting process, and legislation that the Proposed Development will comply with is provided in section 1.2: Policy and Legislation.

1.1.3 About the Applicant

The Applicant 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 (Eni, 2021). 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.

1.1.4 Structure of the ES

The Offshore ES is divided into four volumes:

- Volume 1 – Introductory Chapters:
  - Introduction;
  - Policy and Legislative Context;
  - Proposed Development;

  - Site selection and consideration of alternatives; and
  - EIA methodology.
- Volume 2 – Offshore ES Main Report:
  - Physical processes;
  - Marine biodiversity;
  - Ornithology;
  - Shipping and navigation;
  - Commercial fisheries;
  - Marine archaeology;
  - Infrastructure and other sea users;
  - Climate change; and
  - Inter-related effects.
- Volume 3 – Appendices and Technical Reports
- Volume 4 – Outline Management Plans

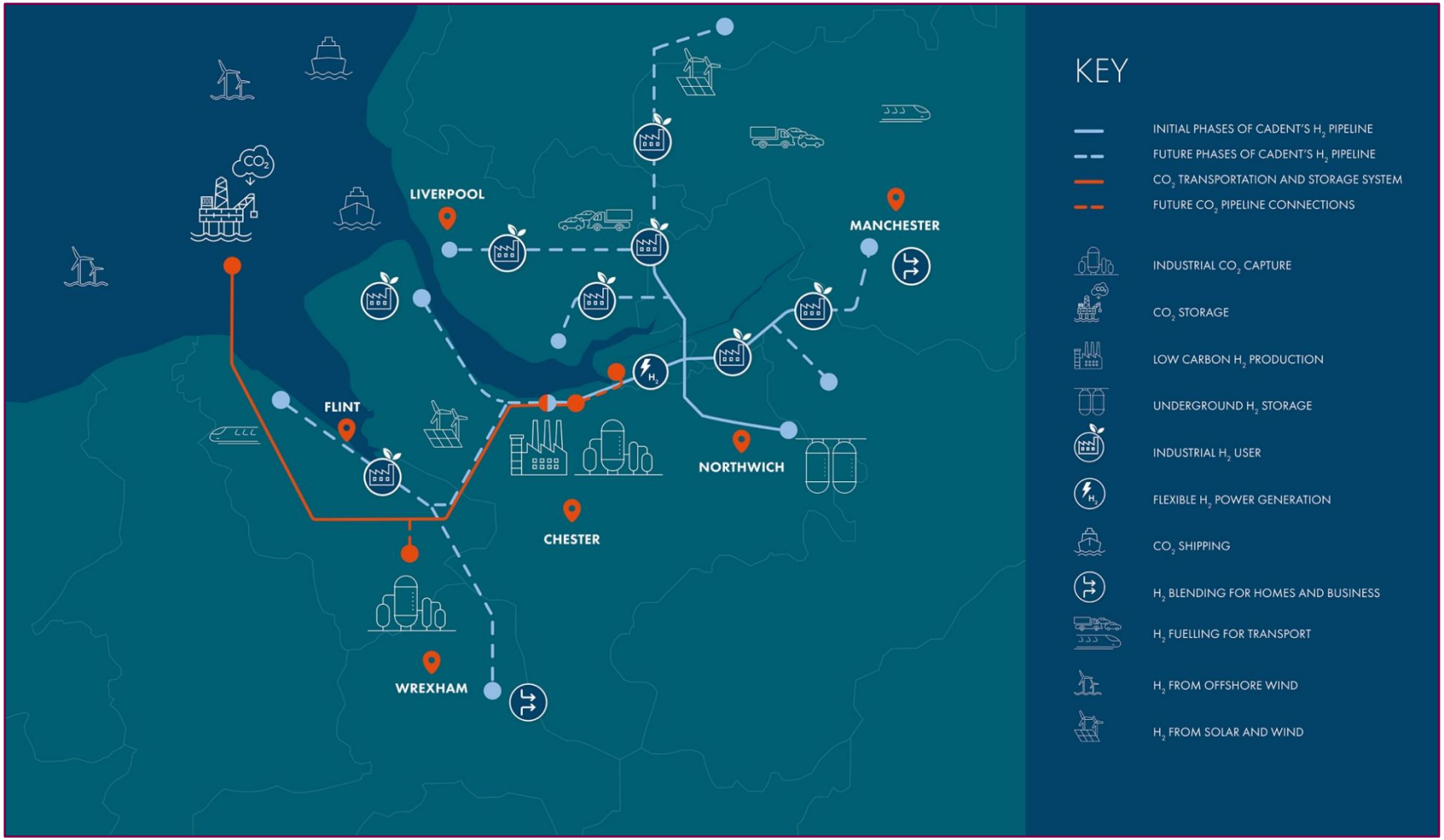

Figure 1.1: Illustrates The Hynet Carbon Dioxide Transportation And Storage Project Within The Hynet North West Project

Figure 1.2: Illustrates The Concept Of The Proposed Development (Infrastructure Seawards MHWS)

1.2 Policy and Legislation

This section of the NTS provides an overview of the policy and legislative context for the Proposed Development, specifically in relation to:

- international obligations and policy, including those derived from European legislation, relating to climate change, reducing Greenhouse Gas (GHG) emissions and the role of Hydrogen, and CCS;
- United Kingdom (UK) and Welsh climate change and energy policy and legislation;
- planning consents and environmental legislation, including the consent applications required for the construction, operation and maintenance, and decommissioning of the Proposed Development; and
- other legislation that may be relevant to the Proposed Development.

Policy and legislation relating to specific topics, particularly in respect to the impact assessment, is discussed in the relevant topic chapters of the Offshore ES.

1.2.1 Climate change and energy policy and legislation

A summary of legislation, policy and strategy in relation to the climate crisis and the role of CCS and low carbon hydrogen, is provided below:

- International Legislation:
  - United Nations Framework Convention on Climate Change;
  - Kyoto Protocol;
  - The United Nations adoption of the Paris Agreement COP21; and
  - The Glasgow Pact COP26.
- European Legislation:
  - EU (Withdrawal) Act 2018.
- UK climate change and energy policy and legislation:
  - The Climate Change Act 2008 (as amended);
  - National Policy Statement (NPS) EN-1 for CCS;
  - The Energy Act 2008;
  - The Clean Growth Strategy 2017;
  - The Ten Point Plan for a Green Industrial Revolution 2020;
  - The HM Government Energy White Paper – Powering our Net Zero Future 2020; and
  - UK Net Zero Strategy 2021.
- Welsh policy and legislation:
  - Climate policy Wales;
  - The Well-being of Future Generations (Wales) Act 2015;
  - The Environment (Wales) Act 2016; and
  - Future Wales: The National Plan 2040
- Marine Policy:
  - UK Marine Policy Statement;
  - North West Marine Plan;

- Welsh National Marine Plan; and
- North West Shoreline Management Plan.

1.2.2 Consenting Regime

Table 1.1 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 ES, as well as a Water Framework Directive (WFD) assessment, and a Report to Inform Appropriate Assessment (RIAA).

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

Table 1.1: Proposed Development Planning And Consenting Requirements

Activity	Permit/Licence/Requirement	Key Legislation
Benthic ecology baseline surveys: • intertidal benthic survey; and • 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/Installation of new pipeline spools to new platform	• Pipeline Works Authorisation (PWA) updates/renewals for the repurposed pipeline from **NSTA**. • Marine Licence Band 3 from **NRW-MLT**.	• The Petroleum Act 1988. • The Pipeline Safety Regulations 1996. • The Offshore Chemicals Regulations 2002 (as amended). • MCAA 2009.
New platform installation	• Marine Licence Band 3 from **NRW-MLT**. • Consent to Locate (CtL) for fixed installation from **OPRED**.	• MCAA 2009. • Energy Act 2008.
Drilling	• Master Application Templates (MATs) and Subsidiary Application Templates (SATs) from **OPRED** for new wells, 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 and Environmental Statement	• Scoping. • ES production. • HRA screening and appropriate assessment. • WFD assessment. • Submission and Public Notice. • ES approval for Storage Permit – **OPRED** • ES approval for Marine Licence – **NRW-MLT**	• 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 Assessment) Regulations 2007 (as amended). • HRA (Conservation of Habitats and Species Regulations 2017 (as amended); Conservation of Offshore Marine Habitats and Species Regulations 2017 (as amended)).

		• Water Framework Directive. • The Habitats and Birds Directive.
Carbon Storage	• Carbon Dioxide Appraisal and Storage Licence already awarded by **NSTA**. Licence No. CS004. • **Crown Estate** Lease. • Carbon Storage Permit from **NSTA**.	• Energy Act 2008. • The Storage of Carbon Dioxide (Licensing etc.) Regulations 2010.
Cable laying and associated activities	• Marine Licence Band 3 (Welsh waters.) from **NRW-MLT**. • PWA (English waters) from **NSTA**.	• MCAA 2009 Marine Licence. • The Petroleum Act 1988.

1.2.3 Additional consents and legislation

Additionally, the ES discusses various regulatory aspects related to a Proposed Development. A summary of the key points is provided below:

- Drilling Operations (Master Application Templates (MAT) and Subsidiary Application Templates (SAT) Permits):
  - MAT and SAT permits required for drilling operations, including monitoring wells, sentinel wells, and side-track drilling.
  - SATs include EIA Screening Direction, Chemical Permit, Consent to Locate, and Marine Licensing.
- New Offshore Pipeline:
  - Pipeline Works Authorisation needed for pipeline repurposing and new installations.
  - Chemical Permit required if chemicals used and discharged during pipeline commissioning.
- WFD:
  - WFD mandates protection of coastal waters to avoid deterioration in water body status.
  - WFD assessment required for Proposed Development activities up to one nautical mile into the sea.
- HRA:
  - Habitats Directive and Birds Directive protect habitats, species, and wild birds.
  - Proposed Development requires an HRA assessment to determine effects on European sites' integrity.
- European Protected Species (EPS) Licensing:
  - EPS Regulations protect species like cetaceans, marine turtles, otters, and sturgeons.
  - NRW-MLT administers EPS licenses, necessary for activities that might affect EPS.
- Basking Shark License:
  - Basking sharks protected under Wildlife and Countryside Act 1981.
  - NRW can issue licenses to permit activities that would otherwise harm basking sharks.
- UK Emissions Trading Scheme (UK ETS):
  - UK ETS replaces EU ETS for carbon emissions trading.
  - Certain activities exempt from surrendering credits under the scheme.
  - Ongoing development to align with UK's Net Zero Target, expected to come into force by 2024.

1.3 Proposed Development

This section of the NTS provides an outline description of the design of the Proposed Development infrastructure, as well as activities associated with the construction, operations and maintenance, and decommissioning phases.

It summarises the design and components of the Proposed Development infrastructure, based on evolving design information and refinement of the Proposed Development parameters following receipt of the Offshore EIA Scoping Opinion (OPRED, 2023), and understanding of the environment from site specific survey and desk-top analysis.

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 good practice (National Infrastructure Planning, 2018) and the 'Rochdale Envelope Principle'. The PDE concept allows for some flexibility in project design options, particularly cable installation and protection, where the full details of the project are not known at application submission but will be confirmed in detail once the installation contractor is appointed.

1.3.1 Proposed Development location

The Proposed Development is situated in the CS004 CO_2 Appraisal and Storage Licence area and Eni development area, around 12 km north of the Welsh coast and 2 km west of the English coast (Figure 1.3). The area covers about 576.82 km^2 and includes depleted hydrocarbon reservoirs such as the Hamilton, Hamilton North, and Lennox fields. The Proposed Development is defined by the pipeline-cable corridor connecting Point of Ayr Terminal to Douglas Offshore Platform (OP), mainly in water depths ranging from 0.72 m below Lowest Astronomical Tide (LAT) to 35 m LAT, with average depth of about 20 m LAT.

The Eni development area contains existing offshore platforms (Douglas OP Complex, Lennox OP, Hamilton Main OP, and Hamilton North OP) to be repurposed for CO_2 service, with plans for decommissioning, subject to regulatory approval. Eni's infrastructure is part of a larger network of projects within Liverpool Bay that includes wind farms, electrical cables, future wind projects, aggregate dredging and spoil dumping areas, and shipping lanes.

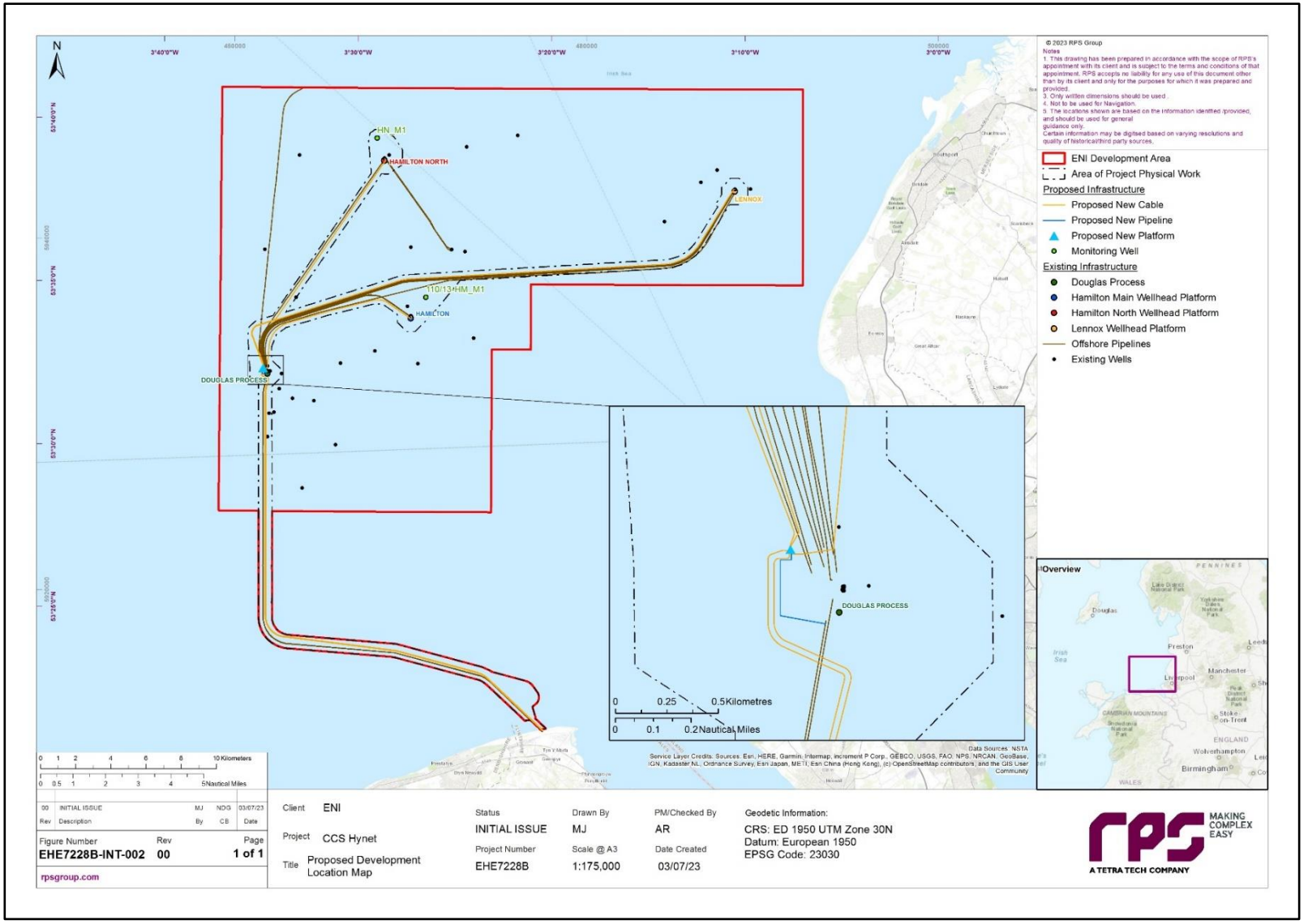

Figure 1.3: Location Of The Proposed Development And Development Area Overview

1.3.2 Offshore infrastructure

The Proposed Development, both new and repurposed existing offshore infrastructure will be situated within the Eni development area. The key components include:

- Storage Sites: Utilisation of the existing Hamilton Main, Hamilton North, and Lennox reservoirs for the injection of 109 Mt of CO_2 over a 25-year period for permanent geological storage. The storage would be divided between the three reservoirs, as follows: Hamilton Main, 53 Mt; Hamilton North, 18 Mt; and Lennox 38 Mt.
- New Douglas CCS Platform: A new platform will replace the existing Douglas Process platform. This Normally Unmanned Installation (NUI) will receive and distribute CO_2 from the onshore Point of Ayr (PoA) Terminal to Hamilton Main, Hamilton North, and Lennox wellhead platforms. The new platform will have up to eight driven piles, and its topsides will house essential equipment like pig launchers, emergency shelter, survival craft, and more.
- Pipeline Network: New sections of pipeline will connect the new Douglas CCS platform to the existing subsea natural gas pipelines. The existing subsea gas pipelines will be repurposed for CO_2 transport, and will carry CO_2 from the Douglas CCS Platform to the satellite platforms (Hamilton Main, Hamilton North, Lennox) for injection into depleted hydrocarbon reservoirs. External protection measures will be implemented at pipeline crossings using materials like rock, sandbags, and concrete mattresses.
- Satellite Platforms: The existing satellite platforms (Hamilton Main, Hamilton North, Lennox) will be redeveloped for CO_2 service. Existing topsides will be removed, and new purpose-built topsides with CO_2 injection capabilities will be installed. These new topsides will be prefabricated and integrated onto the respective jacket structures.
- Offshore Electrical and Fibre Optic Cables: New 33 kV subsea power cables with integrated fibre optic connections will link the PoA Terminal to the Douglas CCS Platform and further connect the Douglas Platform to the satellite platforms. These cables will follow the alignment of existing pipelines with slight offsets to avoid obstructions.
- Wells: The development of the Hamilton Main, Hamilton North, and Lennox reservoirs for CO_2 storage involves drilling and re-completion of wells. CO_2 injector wells will be side-tracked from existing producer wells on the platforms. Monitoring and sentinel wells will also be drilled for CO_2 conformance and containment monitoring.

The above infrastructure will be contained within the Eni Development Area. The new Douglas CCS Platform, with its topsides and jacket structure, will play a central role in CO_2 distribution and injection, and the entire Proposed Development aims to repurpose existing facilities for environmentally responsible CO_2 management.

1.3.3 Partial decommissioning programme

Prior to the commencement of the Proposed Development there will be a partial decommissioning programme (PDP) that will make ready the Liverpool Bay assets that will be repurposed for CO_2 transportation and storage. The partial decommissioning will comprise the following:

- Removal of the satellite platform topsides at Lennox, Hamilton, and Hamilton Main;
- Plugging and abandonment (P&A) of wells at Douglas, Hamilton, Hamilton North, and Lennox; and
- Removal of expansion spools, umbilicals, and exposed stabilisation features (mattresses and grout bags) in the near platform area (at Douglas, Hamilton, Hamilton North, and Lennox), which do not meet the 0.6m depth of burial criterion and therefore cannot be left in-situ.

The draft PDP and supporting Environmental Appraisal (EA) have been submitted to OPRED for review. The PDP will be finalised for approval once review comments have been addressed to OPRED's satisfaction.

Further separate Decommissioning Programmes (and respective EAs, environmental permits and consents, as required) that are out of scope of the PDP, will cover the following remaining facilities as part of Liverpool Bay Asset: Offshore Storage Installation (OSI) (unless alternative re-use options are found to be viable and more appropriate); Conwy platform (jacket, topsides, wells, and pipelines); Douglas production platform; Douglas accommodation platform; Douglas wellhead platform; Hamilton East subsea field (subsea well and integral protection structure); offshore pipelines; subsea umbilicals; subsea flexible lines; and subsea valves and components.

The proposed P&A programme included in the PDP requires an immediate abandonment activity at well 110/15-6z in the Lennox field. This is an exploration well that was previously subject to temporary P&A works that do not meet current Eni and OEUK permanent P&A standards. The well is in the Lennox field in Liverpool Bay, approximately 900 metres east of the Lennox platform and 6 km west of Southport.

The P&A work is being carried out to safely cap 110/15-6z and prevent further gas release. The required intervention programme for the P&A of this well has been subject to substantial planning. This is because the P&A works will secure the Lennox reservoir in preparation for the permanent geological storage of CO_2.

1.3.4 Offshore construction

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.

Construction of the Proposed Development is anticipated to start in late 2024, to enable operation to commence during 2026/2027.

1.3.4.1 Offshore Platforms

Existing platforms, like Hamilton Main, Hamilton North, and Lennox Oil and Gas Platforms, will be modified for CO_2 service. A new platform, Douglas CCS, will be designed for direct offshore installation. Jackets for the platforms will be transported by barge and installed using heavy lifting vessels (HLVs) or Floating Shear Legs (FSLs).

1.3.4.2 Intra-field Pipelines

Current pipelines will be repurposed for CO_2 transport, and short rerouting and seabed connections will be made to the new Douglas CCS platform. Sand wave ridges will require seabed preparation using excavation methods.

1.3.4.3 Offshore Power and Fibre Optic Cables

The cable route involves passing under the Talacre dune system via Horizontal Directional Drilling (HDD). Cables will be laid on the seabed and may require dredging for crossing obstacles like the West Hoyle Bank. After cable laying, different techniques, including ploughing, jetting, and trenching, will be used to bury the cables.

1.3.4.4 Unexploded Ordnance (UXO)

The potential for encountering UXO during construction is recognised. Different charge sizes and configurations are outlined for UXO disposal.

1.3.4.5 Vessel Utilisation

A variety of vessels, including installation, support, survey, and cable laying vessels, will be used for construction. Geotechnical and geophysical surveys will be carried out during operation for monitoring and maintenance.

1.3.4.6 Drilling

The development includes drilling CO_2 injection wells, monitoring wells, and sentinel wells. Specifics about well locations, sidetracking, and drilling depths are provided.

1.3.4.7 Monitoring Wells

Dedicated monitoring wells will be drilled at key locations for data acquisition, calibration, and containment monitoring. These wells will provide data on CO_2 conformance and containment.

1.3.4.8 Sentinel Wells

The need for fibre optics and potential interventions for sentinel wells are discussed. Data acquisition methods such as cased hole logging and downhole pressure measurement are considered.

The ES describes the planned activities, methodologies, and challenges related to the proposed offshore development project, focusing on platforms, pipelines, cables, drilling, and various aspects of construction and monitoring.

1.3.5 Operational and maintenance phase

The operational schedule for the proposed offshore development is organised into several stages based on the gas phase operating mode. These stages impact the existing platform infrastructure differently:

Stage 1 - Free Flow

During the initial operating stage, CO_2 can flow directly into the storage reservoirs without pressure boosting, which means no flow control system or continuous heating is needed.

Stage 2 - Compression at PoA

As reservoir pressures increase, a pressure boosting unit will be installed at PoA. During this stage, flow control will not be needed for the offshore configuration. Heaters will be used on satellite platforms during transient/shutdown conditions.

Stage 3 - Pressure Control at Douglas CCS

When CO_2 volumes approach a certain level, hydraulic limitations in the pipeline are possible. A pressure control system will therefore be installed at the new Douglas CCS platform to maintain minimum pipeline operating pressure and prevent cold temperatures and ice formation. Heating units are needed at Douglas and satellite platforms.

1.3.6 Operation and Maintenance Activities

During operation, fugitive emissions are minimised through a Leak Detection and Repair (LDAR) program. Venting is not routine but may occur during maintenance or decommissioning from activities such as pipeline pigging. A Monitoring, Measurement, and Verification (MMV) program will be implemented to assess CO_2 behaviour, integrity, and leakage throughout the Proposed Development life cycle.

The MMV programme developed covers the full extent of each storage complex, meeting the requirements of the CCS Directive and incorporating lessons learned from the Applicants best practices. At the core of the MMV plan, there are three main documents:

- **Monitoring Plan (MP)**: This document stems from CRA findings, providing additional safeguards through monitoring. The objective is to demonstrate effective conformance (i.e., the CO_2 plume behaviour is as expected) and to verify containment (i.e., CO_2 remains within the storage complex), identifying any deviations or irregularities.

- **Corrective Measure Plan (CMP)**: identification of corrective measures to be employed in the unlikely event of significant irregularities identified during the standard monitoring activities, defined in the Monitoring Plan.
- **Provisional Post Closure Plan (PPCP)**: The purpose of this document is to clarify how closure will take place and to demonstrate that CO_2 remains permanently enclosed in the reservoir, with the current state of technology and experience. Monitoring activities in the post-injection phase are aimed at demonstrating the absence of any detectable leakage and the conformance with the dynamic modelling.

The MMV programme will be applied for the 25-year life cycle of the Proposed Development, and throughout the post-closure phase, which is currently anticipated for a further 20 years. The plan will be updated according to the requirements and, in any case, every five years.

1.3.7 Vessel Utilisation

Unmanned offshore platforms will result in fewer supply vessels, standby vessels, and helicopter movements compared to existing operations. Cable repair and pipeline maintenance require supply and standby vessels. General inspection works will be carried out, including using high resolution Multibeam Echosounder, Side Scan Sonar, and drop-down camera of the entire cable length cable in one event every two years. From experience of existing operations, reburial of up to 500 m of cable in one event every 5-10 years is anticipated. It is anticipated that the external cable protection at existing cable crossings is unlikely to require maintenance, as the rock and concrete mattresses are expected to remain in place. Maintenance or repairs are only anticipated should the cable protection be impacted by either fishing activity, or anchor snagging. Any movement of the rock and mattresses from these external interventions would be identified through the annual asset integrity surveys, and the necessary repairs carried out accordingly.

1.3.8 Decommissioning phase

Existing UK legislation requires that when an offshore Carbon Capture, Usage, and Storage (CCUS) site is closed, the installations and injection facilities must be removed when decommissioned. In addition, all other items of equipment, infrastructure and materials that have been installed or drilled are expected to be entirely removed for disposal onshore in accordance with the government's aim to achieve a clear seabed.

When the Proposed Development reaches the end of its useful life or is no longer required, it will be decommissioned safely, with due regard to the environment. A comprehensive decommissioning and restoration plan would be developed for the Offshore Infrastructure and would be agreed with the relevant stakeholders. The decommissioning process would be undertaken in accordance with all the environmental legislation and the technology available at the time. Any necessary licences or permits would be acquired.

1.4 Site selection and consideration of alternatives

This section of the NTS summarises the process of selecting the site and design for the Proposed Development. It covers the period from the award of the Carbon Dioxide Appraisal and Storage Licence (CS004) on October 8, 2020, to the finalisation of the offshore development's design. The ES chapter has been prepared in accordance with the Offshore Oil and Gas Exploration, Production, Unloading and Storage (Environmental Impact Assessment) Regulations 2020 (The 2020 EIA Regulations) and the Marine Works (Environmental Impact Assessment) (Amendment) Regulations 2017 (The 2017 EIA Regulations).

These regulations mandate that the ES should include a description of the reasonable alternatives considered during the project's development, such as design, technology, location, size, and scale. The selected option should be justified based on its environmental effects. on the following sections summarise the alternatives studied, the decision-making process, and the reasons behind selecting the Proposed Development.

1.4.1 Assessing the 'Do Nothing' scenario

The 'Do Nothing' scenario represents the baseline projection if the project is not pursued. This section examines this scenario in the context of the Project's objectives, particularly in relation to addressing climate change. An assessment of the 'do nothing' scenario has been completed for all technical aspects as required by the EIA Regulations.

In the 'Do Nothing' scenario for the Proposed Development, after the natural gas reserves in the Liverpool Bay Area fields are depleted, the existing gas pipelines and infrastructure would be decommissioned. This would involve removing the offshore structures, leading to a more extensive decommissioning scope compared to the Proposed Development. Additionally, the Proposed Development's role in the low carbon hydrogen and CO_2 storage network in the region would not progress. As a crucial component of the HyNet Project, this would result in continued unabated carbon emissions from industrial sources in North Wales and the North West of England.

The significant risk of the 'do nothing' scenario is its inability to contribute to addressing the climate change emergency and the urgent need for decarbonisation. Climate change is a pressing global challenge, with human-induced global warming exceeding 1°C above pre-industrial levels. Without substantial and rapid carbon emission reductions across sectors, global warming is set to increase.

The most recent Intergovernmental Panel on Climate Change (IPCC) Synthesis Report (2021) highlights a limited timeframe to mitigate catastrophic events resulting from human-induced climate change. It emphasises that every ton of CO_2 emitted contributes to global warming and that quicker decarbonisation leads to noticeable reductions in the pace of climate change. Delays in reducing carbon emissions result in higher atmospheric CO_2 levels, more significant temperature increases, and the need for swifter and more extensive action to mitigate impacts.

Temperature rises beyond 1.5°C could trigger irreversible climate change, causing widespread harm to life and livelihoods. Despite global efforts, greenhouse gas emissions are projected to exceed the 1.5°C threshold by 2030 and potentially surpass 2°C after 2030. Delays now amplify the challenges for the future, making the task of combating climate change even more difficult.

1.4.2 Approach to site selection, project definition and refinement

The assessment of alternatives for the Proposed Development has followed a phased approach, initially focusing on CO_2 transportation methods, and subsequently evaluating pipeline corridors and related infrastructure. The chosen site for the development is deemed optimal due to its reuse of existing infrastructure, close proximity to both onshore and offshore facilities, and strong transport connections.

The Proposed Development strategy emphasises the utilisation of existing assets, repurposing the natural gas export pipeline to transport CO_2 to the Douglas Complex. CO_2 will then be transported through repurposed natural gas pipelines to injection points at the Hamilton, Hamilton North, and Lennox offshore platforms. The plan also involves constructing a new Douglas CCS platform approximately 500 m northwest of the existing Douglas complex.

Hamilton Main, Hamilton North, and Lennox well sites are ideal for CO_2 storage due to their significant pressure depletion and shallow depth within UK Waters. The detailed design of the Proposed Development will evolve iteratively to consider various factors, including environmental, health, safety, and engineering considerations.

While considering alternatives, the 'do nothing' option was assessed. However, the potential beneficial socioeconomic outcomes of the Proposed Development (aligning with Net Zero goals and creating local employment) and the environmental risks of not proceeding were deemed greater than the potential adverse impacts associated with construction, operation, maintenance, and decommissioning of the Proposed Development and its infrastructure.

1.4.3 Re-use of existing facilities

The alternatives assessment for the Proposed Development involves reusing existing wellhead offshore satellite platforms (Hamilton Main, Hamilton North, and Lennox) for CO_2 injection. This would require adding new modules, risers, and riser protection frames for connecting to future offshore pipelines. Structural analysis has shown that the additional equipment would cause increased loads on the platforms due to weight, wave, dynamic factors, and wind loading.

However, the structural analysis demonstrated that the existing satellite platform substructures could not support the extra equipment weight and new environmental loads. As a result, an option was identified where the existing topsides would be removed, and new topsides that accommodate the necessary equipment and reduce environmental loads installed on the existing jackets. The new topsides would be delivered to the platforms fully fabricated and lifted into place on the existing jackets.

In the case of the Douglas Complex, there was an initial concept of repurposing the existing platform for CO_2 service. However, challenges were identified during the Front-End Engineering Design (FEED) stage, which meant that removing the existing hydrocarbon facilities, and replacing it with equipment for CO_2 service once the resourcing and programme constraints were identified. Detailed analysis revealed that it would be very difficult to carry out the work safely on a congested worksite, and there was insufficient market response from potential contractors with the capability to carry out the proposed conversion.

A comparative assessment was performed among different options, including the Douglas Conversion, installing a new platform (New Douglas), or completely replacing the Douglas Complex. Criteria such as safety, environmental impact, technical feasibility, societal impacts, and cost were considered. The New Douglas option emerged as preferable due to factors such as reduced risk to personnel, lower greenhouse gas emissions, technical feasibility, and alignment with safety and environmental considerations.

1.4.4 PoA to Douglas cable routes

New power supply and fibre optic cables are needed to provide electricity and data communication to the New Douglas platform, and satellite platforms. The cable routes generally follow the alignment of the existing gas export pipelines, with micro-routing around obstacles like heritage assets and unexploded ordnance.

Cable routes have been revised based on offshore survey work and EIA findings. The protected area around the *Resurgam* wreck has been considered, and the cable route was revised to avoid this area while also allowing space for maintenance access (Figure 1.4).

Similarly, different route options have been developed for taking the new cables over the West Hoyle Bank, with the preferred option being the Orange route (Figure 1.5). The Orange route is also considered the reasonable worst-case scenario, assessed in the Offshore ES, as even though it is the most direct of the options, and follows the existing gas export pipeline, it requires dredging a channel across the West Hoyle Bank for cable laying.

Other options, such as the Yellow and Pink routes, were considered but rejected due to challenges such as changing tidal conditions, impacts on shipwrecks and shipping channels, and effects on local wildlife habitats. However, the dashed Yellow route has been retained as a potential option to the Orange route, and the Orange route is dependent on the availability of a specific cable lay vessel.

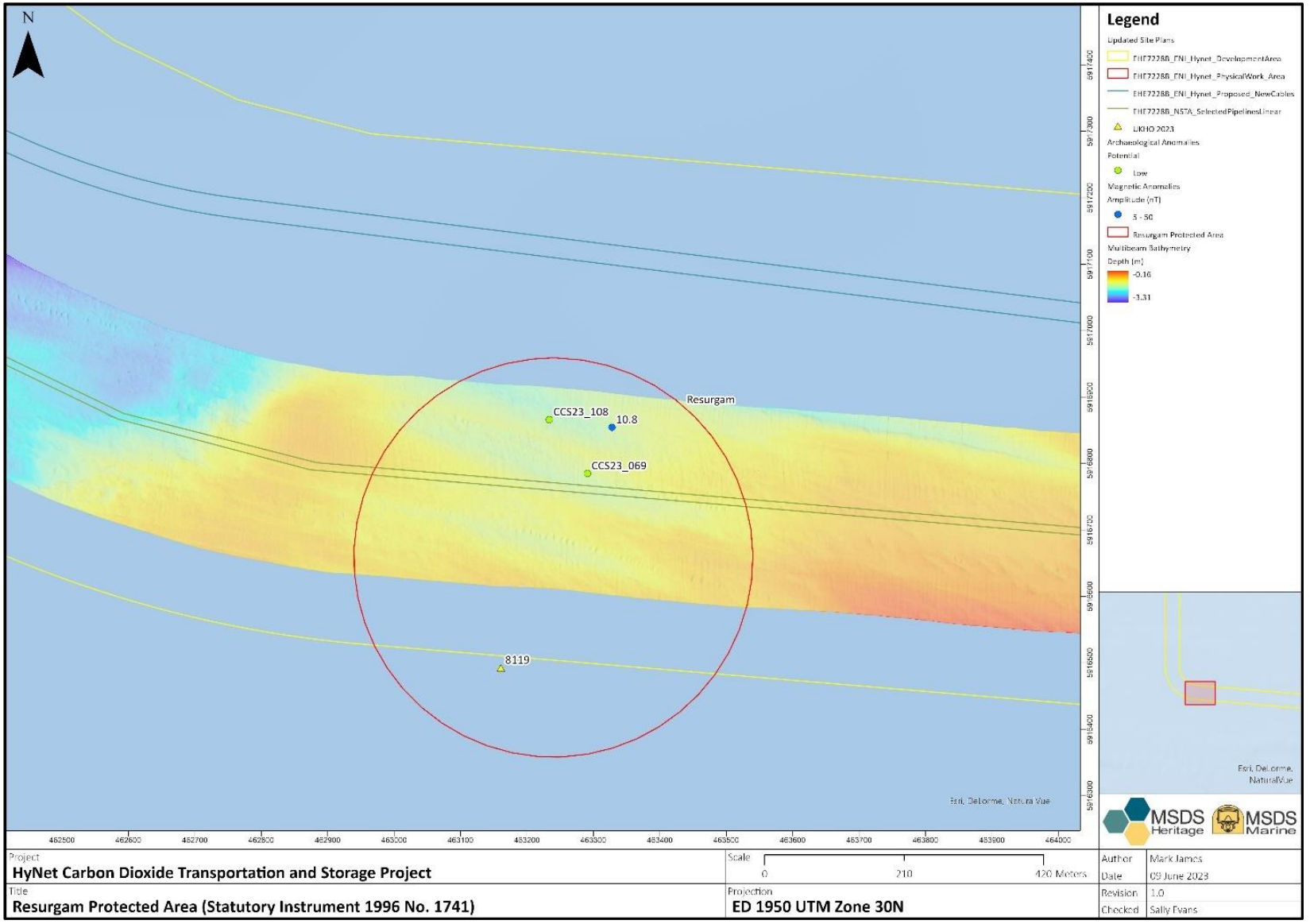

Figure 1.4: Revised Cable Routes, *Resurgam* Wreck And Protected Area

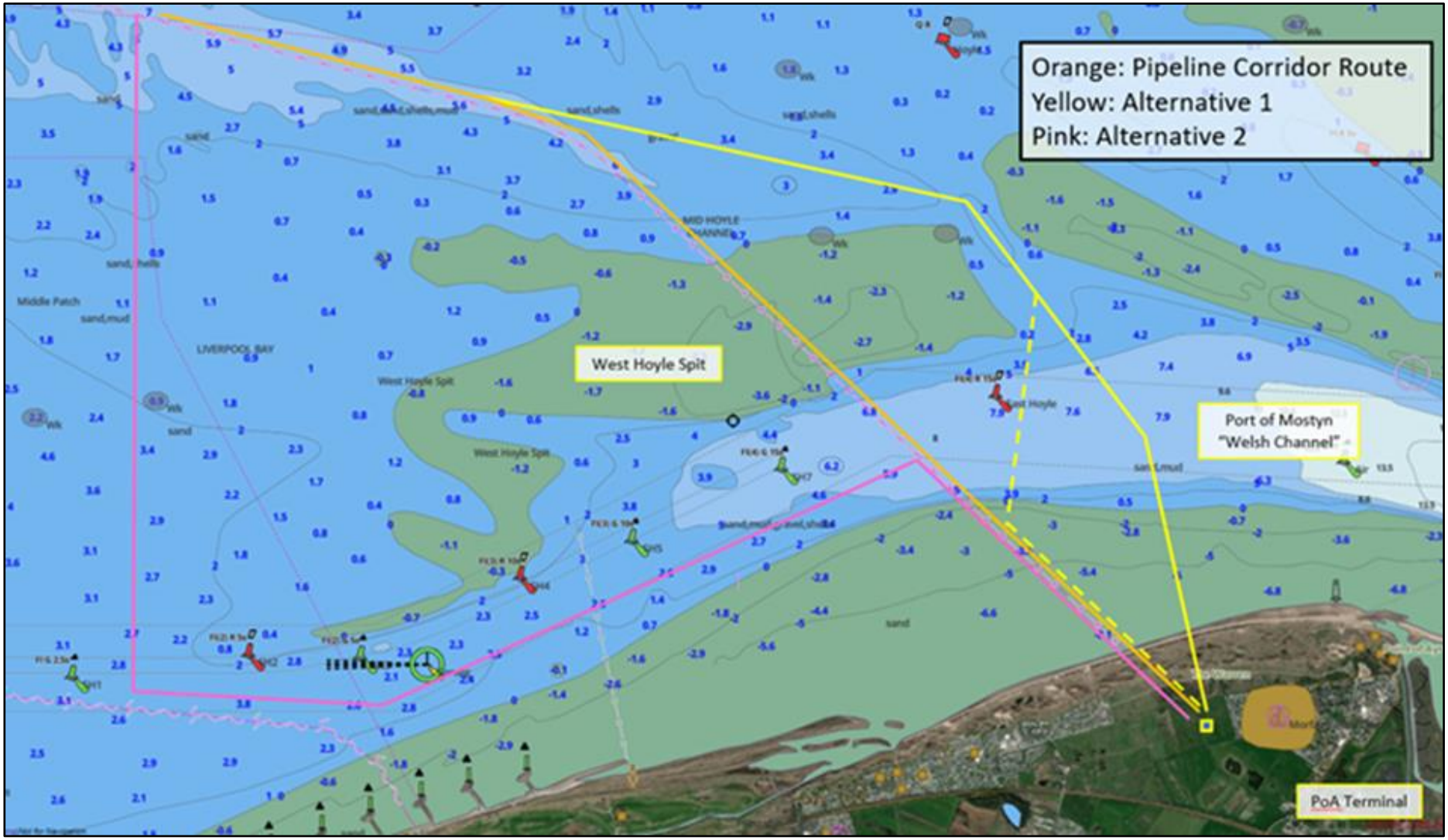

Figure 1.5: High Level Sketch Of Route Options Across West Hoyle Bank. Source: Admiralty Chart 2021 Modified By Liverpool Bay CCS Limited, 2023

1.4.5 Eni development area

Following the amendments to the PoA to Douglas cable routes, the Eni Development Area was revised accordingly, to avoid the *Resurgam* protection area, and to accommodate the options to navigate the West Hoyle Bank.

Figure 1.6 and Figure 1.7 provide an overview and a zoomed-in comparison of the original versus the revised Eni Development Area. It is noted that these are relatively minor amendments to reflect more detailed information being available during design development, and EIA. These amendments have not affected the definition of the reasonable maximum design case and the likely significant effects of the project, as no new effects or receptors have been introduced.

1.4.6 Overview of project design envelope refinements

In addition to the new Douglas CCS platform, the Eni Development Area boundary change and the updated PoA to Douglas cable route, there have been a number of refinements made to the PDE since September 2022 (upon completion of the Offshore EIA Scoping Report (Liverpool Bay CCS Limited, 2022; see volume 3, appendix A)). These refinements are summarised below:

- number and design of foundation piles for new Douglas platform;
- number and design of the external electrical cable protection required at crossings of existing pipelines and cables;
- modifications to routing of existing pipeline and electrical cable connections to new Douglas platform;
- maximum design scenario assumptions developed about the UXO that could be encountered, and the donor charges that could be used to detonate them *in situ*;
- development of electrical load profiles for air coolers, compressors, and heating duty;
- provision of baseline environmental emissions monitoring system (including CO_2 emissions) data;
- updates to location, length, and depth of wells; and
- updates to vessel and helicopter movements during installation, operation and maintenance, and decommissioning.

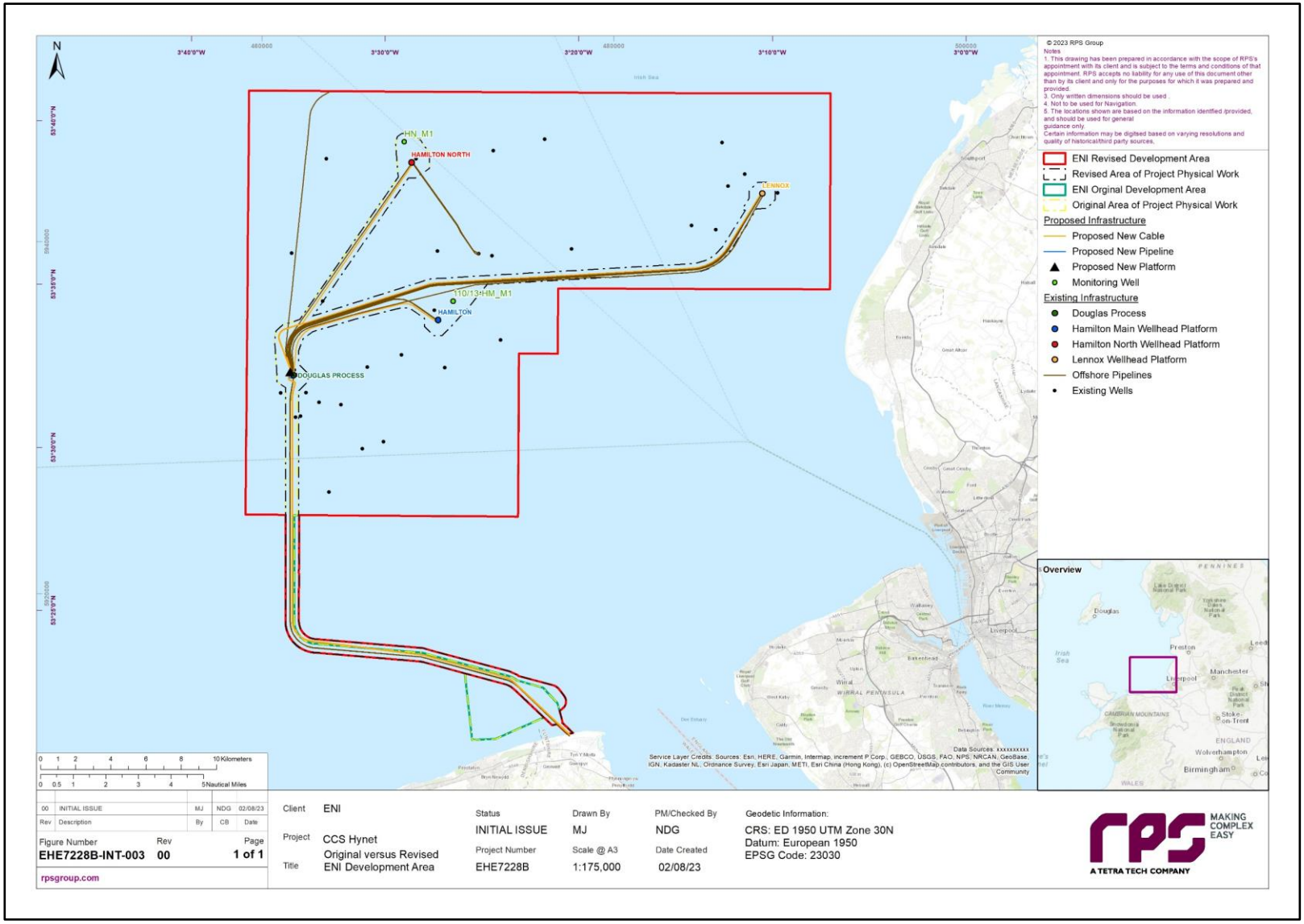

Figure 1.6: Original Versus Revised Eni Development Area

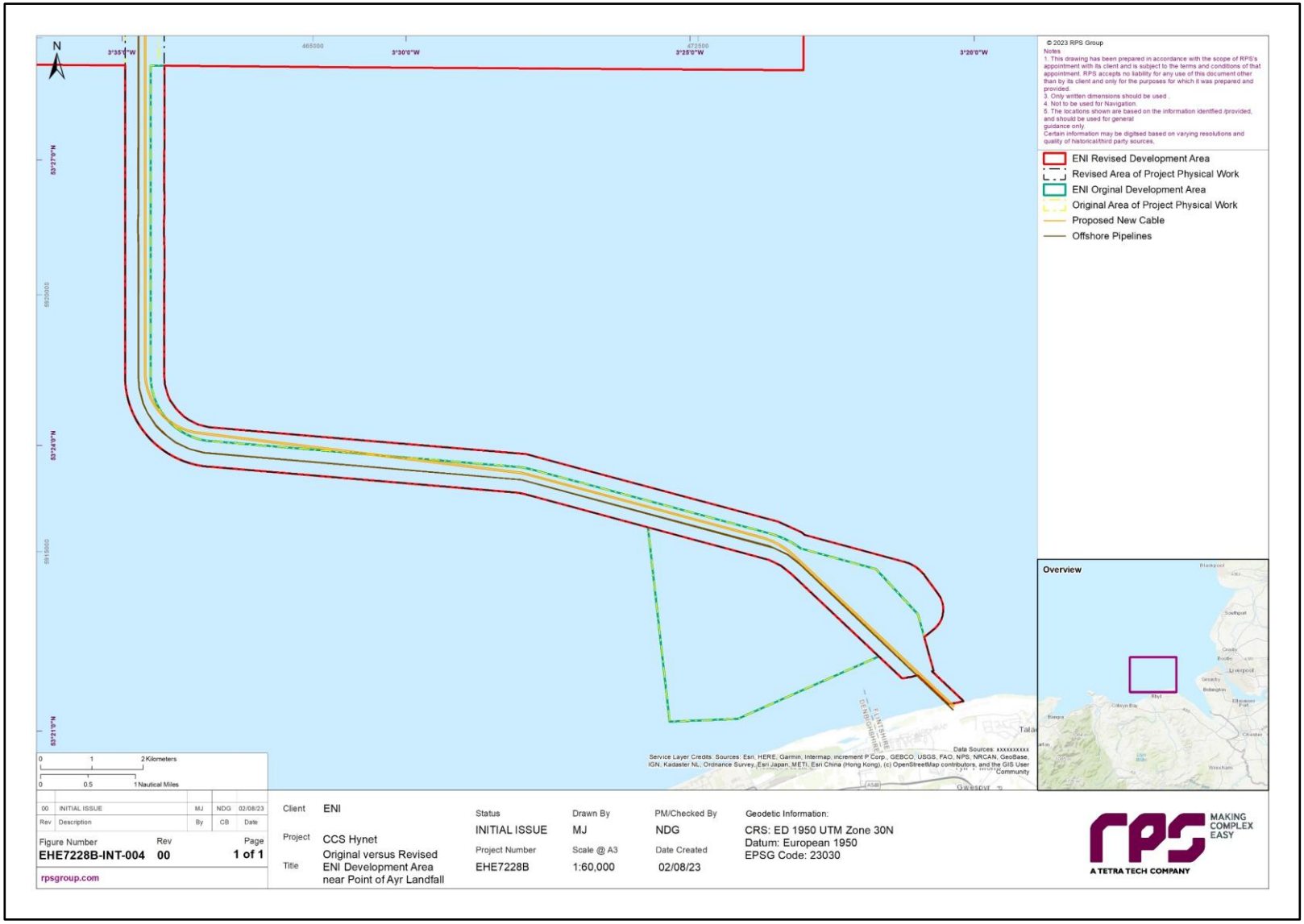

Figure 1.7: Zoomed In View Of Eni Development Area Revision Near Point of Ayr Landfall

1.4.7 Consultation and stakeholder engagement

The change in development concept from Douglas Conversion to New Douglas CCS Platform, the cable route refinements and subsequent boundary change was notified to key consultees and stakeholders.

A summary of the key issues raised during consultation relating to Site Selection and Consideration of Alternatives are outlined below in Table 1.2.

Table 1.2: Summary Of Key Consultation Issues Raised During Consultation Activities Undertaken For The Proposed Development Relevant To Site Selection And Consideration Of Alternatives

Topic	Date	Consultee and type of response	Issues raised	Response to issue raised and/or how this has influenced Site Selection and Consideration of Alternatives
Shipping and Navigation	June 2023	Royal Yachting Association (RYA) – consultation meeting	RYA noted that a key consideration would be changes to water depth due to cable protection close to the landfall.	The proposed new cable will be drilled directly underneath the dune system and buried to a target depth of 3 m below beach and seabed level, so there would be no change in datum points at landfall. The proposed new platform will be built approximately 200 m from the existing Douglas accommodation platform, within the existing 500 m safety zone. Once operational, the three existing Douglas platforms will be removed, leaving only one, smaller platform.
Shipping and Navigation	June 2023	MCA, Trinity House and Port of Mostyn – consultation meeting	Trinity House asked if cable protection would be implemented at the crossing of the West Hoyle Spit, noting that existing pipelines had become exposed due to the movement of the Spit.	The Proposed Development relies on a target burial depth of 3 m across the Spit, and cable protection is not planned to be used other than where required at cable crossings. Crossing agreements are in progress with the wind farms, noting that the wind farm cables already cross the existing pipelines. Cable route options go around the bank or go through a gap. Both options will be standard burial using ploughs.
Marine Archaeology	June 2023	Royal Commission on the Ancient and Historic Monuments of Wales (RCAHMW) – consultation meeting	Introduction to the Proposed Development; discussion of geophysical data coverage, noting the data is not full coverage; discussion of the location of *Resurgam* (Protected Wreck) and re-routing of the cables around the protected area; discussion on Archaeological Exclusion Zones (AEZs) and current routing of some cables through AEZs. Agreed a way forward which has been reflected in the documents produced as part of this application.	Key issues to be addressed are the lack of full coverage data and the routing of some cables through AEZs. Lack of full coverage data: This issue is dealt with through a commitment to collect and assess full coverage data prior to seabed impacts. This data will be reviewed by a competent and experienced marine archaeological geophysicist. Routing of cables through AEZs: This assessment makes a commitment to either investigate the AEZs and to amend them if appropriate, or to re-route around them and assess the wider area. There will be no impacts to AEZs by construction activities. The Written Scheme of Investigation (WSI) will clearly set out how this investigation and mitigation is to be achieved. See volume 4, appendix U of the Offshore ES.
Route alternatives	10 May 2023	NRW – comments received in relation to planning application to FCC, application reference FUL/000246/23: DETAILED	Environmental Statement (ES) Chapter 4: Consideration of Alternatives, paragraph 4.5.10 Foreshore Cables, explains that "*The yellow route was discounted, but the dashed yellow option*	The dashed yellow and orange routes both remain under consideration and were both assessed within the Offshore ES, and the HRA. See Figure 4.2. The dashed yellow and orange routes are in the same location (east side of the existing PoA to Douglas Pipeline between MHWS and MLWS), following the same alignment up to

		PLANNING APPLICATION FOR THE RETENTION AND REUSE OF THE POINT OF AYR GAS TERMINAL AND ASSOCIATED GAS PIPELINE TO THE MEAN LOW WATER SPRING MARK FOR THE MANAGEMENT AND PROCESSING OF CO_2; THE CONSTRUCTION OF 33KV ELECTRICITY AND FIBRE OPTIC CONNECTIONS FROM POINT OF AYR GAS TERMINAL TO THE MEAN LOW WATER SPRING MARK; AND OTHER ASSOCIATED DEVELOPMENT AT LAND WEST OF STATION ROAD, TALACRE.	*may eventually be selected over the orange option depending on the shifting nature of the sand banks*". We advise that you seek clarification on whether the dashed yellow route is still in scope for this application and whether it has been assessed.	the MLWS covered by the Onshore ES and HRA supporting the Planning Application FUL/000246/23. The benefit of the dashed yellow route is that it follows the orange route onshore, so it does not protrude east and provides a more accessible route for construction vessels. However, the issue associated with constructability between the two spits offshore remains (water rushes between the two spits at speed). Therefore, the dashed yellow route and the orange route are both still under consideration. The final choice will be made during detailed design. This is because each route requires bespoke cable installation vessels to implement, and the availability of the vessels cannot be confirmed at this time. Sediment dispersion modelling has been carried out for the reasonable worst-case installation scenario, and both options are being assessed in the Offshore EIA that supports the Marine Licence application to NRW-MLT. This has been taken into consideration within the Offshore ES.

1.5 Environmental Impact Assessment Methodology

This section presents an outline of the EIA methodology that has been employed for the Proposed Development in the preparation of the ES. The ES for Proposed Development describes the likely effects on the environment arising from the construction, operations and maintenance, and decommissioning phases. Where likely significant effects are predicted, it identifies mitigation to reduce the significance of these effects (where practicable).

1.5.1 Environmental Impact Assessment legislation and guidance

The assessment of effects methodology employed in the Offshore ES draws upon relevant legislation, policy, and guidance, including those listed below:

1.5.1.1 Legislation

- The Offshore Oil and Gas Exploration, Production, Unloading and Storage (Environmental Impact Assessment) Regulations 2020 ('the 2020 EIA Regulations') (relevant to the Carbon Storage Permit application to the NSTA);
- The Marine and Coastal Access Act 2009 (as amended) (relevant to the Marine Licence application);
- The Marine Works (Environmental Impact Assessment Regulations) 2007 (as amended) (the 2007 EIA Regulations) (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;
- The Conservation of Habitats and Species (Amendment) (EU Exit) Regulations 2019;
- The Marine Environment (EU Exit) (Amendment) Regulations 2019; and
- The Environmental Permitting (England and Wales) Regulations 2016.

1.5.1.2 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).

1.5.1.3 Guidance

- The Offshore Oil and Gas Exploration, Production, Unloading and Storage (Environmental Impact Assessment) Regulations 2020 – A Guide (BEIS, OPRED, 2021d);
- Environmental Impact Assessment for marine activities (NRW, 2023);
- 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 United Kingdom (UK) and Ireland (CIEEM, 2018);
- 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);
- Guidelines for data acquisition to support marine environmental assessments of offshore renewable energy projects (CEFAS, 2012); and
- Nature conservation considerations and environmental best practice for subsea cables for English Inshore and UK offshore waters (Natural England and JNCC, 2022).

1.5.2 Consultation and scoping

Consultation on the proposed offshore EIA methodology (including the Cumulative Effects Assessment (CEA) methodology and approach to assessing transboundary and inter-related effects) was undertaken at the offshore EIA scoping stage. The HyNet Carbon Dioxide Transportation and Storage Project – Offshore EIA Scoping Report (Liverpool Bay CCS Limited, 2022) presented these methodologies and requested feedback on the proposed approaches. A summary of the key issues raised during consultation relating to this chapter are outlined below in Table 1.3, together with how these issues have been considered in the production of this chapter.

Table 1.3: Summary Of Key Consultation Issues Raised Relevant To The EIA Methodology

Consultee	Issue Raised	Response to Issue Raised
OPRED (Scoping Opinion)	Application Process and Cumulative Assessment: Associated elements of the wider HyNet Carbon Dioxide Transportation and Storage Project are likely to be considered as part of the cumulative and in-combination effects of the Proposed Development. The ES should therefore demonstrate consideration of the wider HyNet Carbon Dioxide Transportation and Storage Project when assessing the environmental effects of the Proposed Development.	The Project, including the DCO and TCPA applications being progressed by the Applicant for the Onshore elements of the HyNet Carbon Dioxide Transportation and Storage Project, are included in the Cumulative Effects Assessment (CEA).
	Best Practice Advice for Evidence and Data Standards: When completing the ES, the Developer should make use of the guidance document called 'Nature conservation considerations and environmental best practice for subsea cables for English Inshore and UK offshore waters.' This has been jointly developed by Natural England and the Joint Nature Conservation Committee (JNCC) in collaboration with the European Subsea Cable Association and provides high level advice on the main pressures, sensitive habitats and best practice for subsea cables.	This guidance has been accessed and used to inform the assessment of effects methodology.
	Cumulative and In-combination Effects: The ES should identify, describe and evaluate the environmental effects that are likely to result from the Project in combination with other major developments and activities that are being, have been or will be carried out in the vicinity of the Project, for example other oil and gas developments, offshore wind and dredging activities. In particular (subject to the available information) the following types of projects should be factored in: 1. Existing completed projects; 2. Approved but incomplete projects; 3. Ongoing activities; 4. Plans or projects for which an application has been made and which are under consideration by the consenting authorities (i.e. scoping projects); and 5. Plans and activities which are reasonably foreseeable (i.e. projects for which an application has not yet been submitted but are likely to progress before completion of the Project and for which sufficient information is available to assess the likelihood of cumulative and in combination effects).	The types of projects listed in the scoping opinion are included in the CEA.
	Environmental Data: All relevant environmental data is expected to be sourced, analysed and presented in relation to the project. A non-exhaustive list of potential sources of environmental information is provided, but the developer is expected to consult such other sources as it considers necessary. Relevant local environmental data should also be sourced from the appropriate local bodies which may include local environmental records centre, the local wildlife trust, local geo-conservation groups or other recording societies.	Where required, additional environmental data has been sourced and analysed to inform the ES.
	Landscape and visual impacts: It is advised that details of local landscape and seascape character areas (mapped at a scale appropriate to the Project's site) and any relevant management plans or strategies pertaining to the area are included. The ES should include assessments of visual effects of the Project (such as	Following the scoping opinion, the topic and the reasons for scoping it out are discussed within the ES.

Consultee	Issue Raised	Response to Issue Raised
	landscape and seascape) together with any physical effects (such as changes in topography). It is advised that the ES includes an assessment of the potential impacts of the Project on local landscape character using the methodology outlined within the landscape and seascape character assessment (LCA/SCA) which is almost universally used for landscape and visual impact assessment. It is also advised that this assessment includes effects of the special qualities of the designated landscape as set out in the statutory management plan for the area.	

1.5.3 Key principles of the EIA

Within the ES, the assessment of each topic (e.g. physical processes, ornithology, shipping and navigation, etc.) is included in a separate chapter. Within each of the topic chapters, the following matters will be considered:

- Identifying the study area for topic-specific assessments.
- Describing the planning policy and guidance context.
- Summarising consultation activities and comments received.
- Describing the environmental baseline conditions.
- Presenting impact assessments, including design scenarios, mitigation measures, assessment of impacts' significance, and more.
- Identifying required monitoring and assessing cumulative and transboundary effects.

1.5.3.1 Proportionate EIA

The principle of producing a proportionate EIA is emphasised, with efforts made to provide accessible information to stakeholders. Proportionality is achieved through using existing evidence and embedded mitigation measures.

Two main concepts, the "Existing Evidence Basis" and "Mitigation Measures," are detailed:

- Existing Evidence Basis: Utilising available data and knowledge about the project area to establish baseline environmental conditions.
- Mitigation Measures: Describing how the EIA can influence project design to avoid, manage, or reduce impacts. These measures can be primary (inherent), secondary (foreseeable), or tertiary (inexorable).

1.5.3.2 Design envelope approach and Maximum Design Scenario

The Proposed Development ES has employed a PDE approach, (also known as the ‘Rochdale Envelope’ approach). The PDE approach allows the EIA process to be conducted on the basis of a realistic scenario (i.e. the maximum project design parameters or Maximum Design Scenario (MDS)) which is selected from different design and construction scenarios. For each of the impacts assessed within the topic chapters, the MDS is identified from the range of potential options for each parameter within the Proposed Development.

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 therefore be concluded that the impact (and therefore the effect) will be no greater for any other design or construction scenario than that assessed for the MDS. By employing the MDS approach, the Applicant retains some flexibility in the final design of the Proposed Development, but within certain maximum parameters, which are fully assessed in the ES.

1.5.3.3 Impacts and effects

The Proposed Development has the potential to create a range of 'impacts' and consequent 'effects' with regard to the physical, biological and human environment. The term 'impact' is defined as a change that is caused by an action. The term 'effect' is defined as the consequence of an impact. For example, the laying of a cable (action) results in seabed disturbance (impact), with the potential to disturb benthic habitats and species (effect).

For each of the impacts assessed in the ES, a magnitude has been assigned. The magnitude of an impact considers the spatial extent, duration, frequency, and reversibility of the impact from the construction, operations and maintenance, or decommissioning phase of the Proposed Development.

Receptors are defined as the physical or biological resource or human user group that could be affected by the Proposed Development impacts. These receptors are identified through available data and baseline studies that have been reviewed in the preparation of the ES. In defining the sensitivity for each receptor, the vulnerability, recoverability, and value/importance has been taken into consideration.

The overall significance of an effect is evaluated by considering the magnitude of the impact alongside the sensitivity of receptor. Each chapter defines the approach taken to the assessment of significance. Unless set out otherwise within the chapter, the matrix approach shown in Table 1.4 has been adopted as a guide.

Table 1.4: Matrix Used For The Assessment Of The Significance Of Effect

Sensitivity of Receptor	Magnitude of Impact			
	Negligible	**Low**	**Medium**	**High**
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 is considered a ‘significant’ effect for the purposes of the EIA. A level of effect of minor or less is 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.

In cases where significant effects are identified, the EIA employs a "feedback loop" methodology. The assessment begins by determining the significance of potential environmental effects. For impacts that cause major or substantial adverse outcomes, adjustments are typically made to the Proposed Development's design (primary mitigation) to mitigate impact magnitude. For impacts that lead to moderately significant adverse outcomes, mitigation measures such as engineering controls or construction methods (secondary and tertiary mitigation) are applied to reduce impact magnitude.

1.5.4 Cumulative Effect Assessment

A CEA is mandated by the EIA Regulations. It involves evaluating the impacts of the Proposed Development on its own and in combination with other related plans, projects, and activities. Cumulative effects refer to the combined impact of the Proposed Development with effects from various other projects on the same aspect.

The CEA requires identifying foreseeable developments or activities that could interact with the Proposed Development to create cumulative impacts. All phases of the Proposed Development may contribute to cumulative impacts. Other major developments in the area must be considered in the CEA, including those already constructed, under construction, permitted but not implemented, submitted applications not yet determined, and reasonably foreseeable projects.

1.5.4.1 Screening Stage

The screening stage involves creating a preliminary list of potential projects to be considered in the CEA. The Zone of Influence (ZOI) is defined based on the maximum area potentially affected by the Proposed Development, often related to environmental factors.

This initial long list is then refined based on conceptual overlap, physical overlap, and temporal overlap:

- Conceptual overlap: Impacts that directly or indirectly affect the same receptors.
- Physical overlap: Impacts from multiple projects overlapping in physical extent on receptors.
- Temporal overlap: Overlapping periods when impacts from multiple projects occur.

Projects remaining after this screening process move on to the assessment stage.

1.5.4.2 Assessment Stage

After screening, information about projects selected for the CEA is gathered. If the significant effect of the proposed development on its own is negligible or localised, it might not be considered for cumulative effects assessment.

The CEA process follows a tiered approach:

- Tier 1 assessment: Focuses on the Proposed Development.
- Tier 2 assessment: Includes Tier 1 projects, plus operational, under construction, consented, and submitted but not determined projects.
- Tier 3 assessment: Includes Tier 2 projects, plus projects with a Scoping Report.
- Tier 4 assessment: Includes Tier 3 projects, plus projects likely to emerge with a granted Agreement for Lease.

All projects in the CEA are allocated to one of these tiers and assessed accordingly. The CEA considers publicly available plans, projects, and activities up to three months prior to the Proposed Development consent applications.

1.5.5 Transboundary effects

Transboundary effects arise when impacts from a project within one state affect the environment of another state(s). Transboundary effects have been considered in each topic chapter of the ES, based on the outcome of the transboundary screening.

1.5.6 Inter-related effects

The EIA Regulations necessitate the examination of inter-related effects, which pertain to the complex connections between different aspects assessed in the EIA. These connections can result in environmental effects. Inter-related effects are categorised into two groups:

- Project Lifetime Effects: These effects span multiple project phases (construction, operation, maintenance, decommissioning), interacting to potentially create more significant impacts on a receptor than when assessed individually in each phase.
- Receptor-Led Effects: These effects occur when impacts spatially and/or temporally interact, resulting in interconnected consequences for a single receptor. For instance, the combined impacts of increased sedimentation on benthic ecology might yield a different or greater effect when multiple sources of impact converge, compared to considering single impacts in isolation. These receptor-led effects could be short-term, temporary, transient, or long-term in nature.

In the Offshore ES, the assessment of inter-related effects specifically focuses on the potential occurrence of such effects concerning receptor groups. "Receptor group" signifies that the approach does not typically assess each individual receptor separately but rather considers potentially vulnerable groups of receptors.

In cases where the significance of an effect within the topic-specific assessment is determined as "no effect across all project stages", it is assumed that these effects cannot contribute to any inter-related effects. As a result, these effects are not included in the assessment of inter-related effects, given that they would not occur throughout the lifespan of the Proposed Development.

2 VOLUME 2 – OFFSHORE ES MAIN REPORT

2.1 Physical Processes

2.1.1 Existing baseline description

Physical processes refer to the coastal and marine processes as well as tidal currents, wave climate and sediment transport. The physical processes receptors applicable to the Proposed Development were numerically modelled using datasets collected from a series of site-specific surveys, including geophysical and grab sampling data. This was coupled with a detailed desktop review of existing studies and publicly available datasets.

Bathymetry - The Proposed Development's bathymetry features water depths ranging from 0.72 m nearshore to 35 m offshore, with an average depth of about 20 m. Notably shallow zones exist along the cable route, particularly across West Hoyle Bank.

West Hoyle Bank - West Hoyle Bank, despite lacking formal designation, holds ecological significance as a sandbank satisfying the Annex 1 habitat criteria of the European Commission Habitats Directive. The dynamic nature of this sandbank arises from tidal forces and sediment availability, leading to considerable constant changes in its geomorphology. West Hoyle Bank is understood to influence the exchange of sediments with the adjacent coastline and the wave climate approaching the coastline. The removal of this sandbank could potentially elevate the risk of coastal flooding by intensifying wave energy reaching the shoreline.

Geology - The geology of the region predominantly comprises Permo-Triassic and Carboniferous sandstone, mudstone, and limestone. These bedrock formations are covered by Quaternary sediments that display variability in properties due to historical fluctuations of ice sheets during the last glacial period.

Hydrography - The hydrography involves varying tidal ranges, with the UK Hydrographic Office indicating mean tidal ranges ranging from approximately 3.65 m at the Standard Port of Holyhead to 4.55 m at Douglas. Although the physical models were calibrated based on the Standard Port of Llandudno, which has an average tidal range of 5.40 m. The Irish Sea's predominant physical process involves semi-diurnal tides originating from the Atlantic Ocean through the North Channel and St Georges Channel. Spring tides yield higher tidal currents, often exceeding 0.80 m/s at flood and 0.60 m/s at ebb. Littoral currents are a result of tidal, wave, and meteorological influences.

Wave climate - Wave climate in the eastern Irish Sea is characterised by waves generated by local and remote winds (swell waves). Predominantly, waves arrive from westerly sectors, which combine wind and swell. Maximum annual significant wave heights of 1.39 m occur between the Isle of Man and Anglesey, declining closer to the coast, with values as low as 0.73 m within the physical processes study area. The average wave height within this area spans from 0.80 m to 1.10 m, with over 40% of waves originating from the west. Wave direction aligns with wind direction, particularly from the western and southwestern sectors.

Seabed sediments - The seabed in this environment consists of varying sediment types atop bedrock lithologies like Triassic and Carboniferous sandstone and mudstone. The Quaternary sediment thickness ranges from less than 20 m in central Irish Sea locations to around 50 m in the east and west portions. Notably, the seabed sediments in the Eni development area primarily comprise circalittoral fine sand, deep circalittoral coarse sediment, and deep circalittoral sand. This composition transitions into circalittoral muddy sand, circalittoral coarse sediment, and circalittoral coarse rock as the existing offshore pipeline approaches the Welsh coast.

Sediment quality and contamination - aspects are highlighted within the ES, with sediment contamination levels surpassing those in seawater. The type of sediment significantly influences contamination levels, with finer sediments having greater potential to adsorb contaminants. Various contaminants were assessed through grab samples, including heavy metals, Polycyclic Aromatic Hydrocarbons (PAHs), Total Hydrocarbon Concentrations (THC), PCBs, and organotins. The results were compared against reference levels, indicating

variability in concentrations across different metals and contaminants. The results are provided in the Marine Biodiversity chapter.

Sediment transport - The sediment transport within the region is driven by residual currents, with sediment movement being most pronounced during spring tides. These tides lead to total sediment loads reaching up to 0.001 $m^3/s/m$ during flood tides and 0.0005 $m^3/s/m$ during ebb tides. The coastline experiences erosion and retreat, particularly along sediment subcell Formby Dunes. The physical processes study area coincides with the Solway Firth sediment cell, characterised by sediment transport from west to east, influencing the southeast shoreline.

Suspended sediments - Suspended sediment concentrations (SSC) are regulated by tidal currents, intensifying during wind-driven storm events. Mean annual SSC values are higher nearshore, exceeding 30 mg/l in Liverpool Bay due to river discharges.

Water quality - Water quality is affected by contamination from various sources, including rivers, sewage effluent, and historical oil and gas activities, leading to low dissolved contaminant concentrations in seawater samples.

Designated sites - Designated sites are identified, including Flyde Marine Conservation Zones (MCZs), The Dee Estuary Special Areas of Conservation (SACs), Ribble and Alt Estuaries Special Protection Areas (SPAs); Mersey Narrows and North Wirral Foreshore SPA; The Dee Estuary SPA, and Dee Estuary Sites of Scientific Interest (SSSIs); North Wirral Foreshore SSSI; Ribble Estuary SSSI; Sefton Coast SSSI. These areas hold ecological significance and are subject to protection and conservation measures. Furthermore the bathing waters at Rhyl, Ainsdale, West Kirby, and Southport were considered.

Future baseline scenario - Regarding the future baseline scenario, the baseline environment is expected to undergo natural changes over time, influenced by factors such as climate change, resulting in sea level rise and increased storminess. These changes might alter wave climates and sediment transport patterns, though the influence of tides and sediment availability on features like West Hoyle Bank is projected to persist. The precise impact of climate change on wave climates in the Irish Sea remains uncertain.

2.1.2 Assessment of significance

Two potential impacts on the physical processes receptors due to the construction, operations and maintenance, and decommissioning phases of the Proposed Development, were identified:

- Increased SSCs and sediment deposition;
- Changes to seabed morphology; and
- Activities affecting surrounding water quality.

The ES evaluates the potential effects of seabed preparation and cable installation activities on sand waves, sediment concentrations and deposition, considering scenarios such as sand wave clearance and cable installation across various designated areas. The impacts are generally localised, short-term, and of low magnitude, affecting areas like the Dee Estuary SAC/SPA/SSSI and West Hoyle Bank. Despite temporary increases in suspended sediment levels and sedimentation, the sensitivity of these areas to changes remains low due to their recoverable nature. There would be a short-term change is seabed morphology due to altered bed levels. The changes will fall within the natural range of variability due to the highly mobile nature of the sand waves and would not interfere with their eastern migration. Additionally, any excavated material is expected to remain within the sediment cell and settle in the direct vicinity. Consequently, the overall impact is deemed of minor adverse significance for the construction, operational and maintenance, and decommissioning phase, which is not significant in EIA terms. No additional mitigation beyond existing designed measures was considered necessary for these effects.

During the construction phase of the project, activities such as trenching for cable routes could lead to increased SSC near the coastline, potentially affecting local tidal patterns and wave climate. These heightened SSC levels might release contaminants from disturbed sediments, impacting water quality and potentially

harming marine life. The construction process could also generate sediment plumes, reducing light penetration and affecting primary production and marine species like shellfish. Accidental spills and pollution from construction vehicles and vessels pose further risks. However, sediment contamination assessments suggest that significant releases of sediment-bound contaminants are unlikely due to construction activities. Similar impacts are expected during the operation and maintenance phase, with potential effects from cable repair activities. Despite these concerns, embedded mitigation measures, adherence to environmental management plans (EMP), and compliance with regulations, such as MARPOL, are expected to minimise adverse effects. The decommissioning phase, involving infrastructure removal, is anticipated to have impacts comparable to the construction phase. These impacts are projected to be of low to negligible magnitude, with sensitivity generally considered high. The significance of effects was evaluated to be minor or moderate, which is not significant in EIA terms.

Cumulative effects are assessed in full in the ES. The magnitude of these cumulative effects is deemed to be low for all phases and effects to be of local spatial extent effecting receptors of low sensitivity for designated sites and West Hoyle Bank, and high for water quality. The significance of effects was therefore evaluated to be minor, which is not significant in EIA terms.

No significant transboundary effects with regard to physical processes from the Proposed Development were predicted on the interests of other states.

2.2 Marine Biodiversity

2.2.1 Existing baseline description

2.2.1.1 Benthic Subtidal and Intertidal ecology

The regional benthic ecology study area is primarily composed of deep circalittoral coarse sediment, circalittoral sandy mud, circalittoral fine sand, circalittoral muddy sand, and deep circalittoral sand, with tide-swept circalittoral mixed sediments present in certain areas. The Proposed Development benthic ecology study area similarly contains deep circalittoral coarse sediment, circalittoral fine sand or circalittoral muddy sand, and deep circalittoral sand.

Sediment contamination analysis reveals that arsenic and cadmium exceeded Cefas Action Level 1 at specific sampling stations, while mercury was above OSPAR Background Assessment Concentration levels at seven stations. Zinc was the most abundant metal, remaining within reference levels. PAHs and total hydrocarbon content were within acceptable limits, and PCBs and organotins were below detection limits.

In the ES, a diverse range of macrobenthic species was identified across the site-specific survey area, covering both Controlled Cordoned-off Sites (CCoS) and decommissioning areas. The analysis revealed 2,001 individuals and 215 taxa in CCoS stations, with the brittlestar *Amphiura filiformis* as the most abundant taxon, comprising 15.3% of all recorded individuals. Key epifaunal species in CCoS samples included the tube worm *Spirobranchus triqueter* (20% of individuals) and Actinaria (30% of samples). In decommissioning samples, 13,332 individuals and 322 taxa were recorded, with Nemertea and *Kurtiella bidentata* being prevalent in 98% of samples. The epifaunal community was characterised by common brittlestar *Ophiothrix fragilis* and Actiniaria as the most frequently occurring taxon. Analysis of Particle Size and macrobenthic data revealed a diverse and heterogeneous substrate across the survey area, with varying contributions of sand, mud, and gravel resulting in an intricate mosaic of substrates.

The Phase 1 Intertidal Walkover survey documented species and biotopes typical for the area, located within the Dee Estuary/Aber Dyfrdwy SAC. This Special Area of Conservation was chosen primarily for the Annex I Habitat (1140) Mudflats and sandflats not covered by seawater at low tide, encompassing various biotopes including talitrids on the upper shore and strand-line, polychaete/bivalve-dominated muddy sand shores, barren or amphipod-dominated mobile sand shores, and *Macoma balthica* and *Arenicola marina* in littoral muddy sand. Species recorded during the intertidal survey included polychaetes, bivalves, gastropods, various fish, and shellfish species.

Important Ecological Features (IEFs) taken forward for assessment include:

- Subtidal habitats and species:
  - Subtidal Sands and Gravels;
  - Mud Habitats in Deep Water;
  - Subtidal Mixed Muddy Sediment;
  - Annex I Reef; and
  - Ross Worm (*Sabellaria spinulosa*).
- Intertidal Habitats and Species:
  - Mudflats and sandflats not covered by seawater at low tide.
- Designated Sites:
  - Dee Estuary/Aber Dyfrdwy SAC; and
  - Fylde Marine Conservation Zone (MCZ).

Future baseline scenario - The ES complies with the Offshore Oil and Gas Exploration, Production, Unloading and Storage (Environmental Impact Assessment) Regulations 2020 and The Offshore Environmental Impact Assessment (The Marine Works (Environmental Impact Assessment) Regulations 2007 (as amended), necessitating the inclusion of a future baseline assessment in case the Proposed Development does not proceed. The thorough baseline depicted in the ES, accurately captures the environment, accounting for seasonality and interannual variability. However, this baseline is not static and will undergo more significant natural shifts over longer periods due to inherent cycles, processes, and potential climate change influences. This long-term change persists irrespective of the Proposed Development, necessitating contextualisation of potential impacts during the anticipated 25-year operational span. Beyond climate change effects, physical process variations and long-term changes can directly and indirectly affect benthic habitats and communities in the mid- to long-term, influenced by both climatic processes and anthropogenic activities. These influences may alter seabed communities, impacting processes like nutrient cycling and larval supply. The Department for Environment, Food and Rural Affairs (DEFRA) focuses on climate change-related risks to ecosystem services. These include the impacts of invasive non-native species, disease spread due to shifting distributions, and the effects of ocean acidification and elevated water temperatures, emphasising the complex interplay between climatic changes and marine ecosystems (HM Government, 2022).

2.2.1.2 Fish and Shellfish Ecology

The regional fish and shellfish ecology study area contains a diverse array of marine fish species, encompassing demersal, pelagic, and benthopelagic categories. Within the demersal group, a variety of species like sandeels, blennies, gobies, wrasses, and an assortment of flatfish, including flounder, halibut, lemon sole, plaice, and more, live in these waters. Benthopelagic inhabitants comprise anglerfish, cod, hake, haddock, and several others, while the pelagic species feature herring, mackerel, and potential residents like anchovy, sardine, and garfish. Alongside these, diadromous fish like Atlantic salmon, European eel, sea lamprey, and others migrate the regional fish and shellfish ecology study area during specific phases of their migratory life cycle. Elasmobranchs, including sharks, rays, and skates, alongside various shellfish species like mussels, cockles, scallops, and lobsters, contribute to the rich marine ecosystem.

Furthermore, the regional fish and shellfish ecology study area contains both spawning and nursery grounds for several ecologically and economically significant fish and shellfish species. This includes species such as cod, mackerel, plaice, and more. Comprehensive data from sources like Cefas and fisheries sensitivity maps provide spatially explicit diagrams illustrating the distribution of nursery and spawning areas for these key species. Recent reports have supplemented this information, enhancing our understanding of spawning and nursery grounds. Additionally, the ES employs a habitat suitability assessment to evaluate the potential for herring and sandeel spawning within the Proposed Development. This assessment, based on habitat

preferences related to sand, gravel, and mud compositions, provides insight into suitable and unsuitable areas for these species, offering a crucial perspective on the impact of seabed disturbance.

IEFs taken forward for assessment include:

- Demersal Fish (Flatfish):
  - Lemon sole;
  - Plaice;
  - Sole;
  - Other flatfish species;
  - Demersal Fish (Gadoids);
  - Cod;
  - Ling; and
  - Whiting.
- Demersal Fish (Others):
  - Anglerfish; and
  - Sandeel species.
- Pelagic Fish:
  - Herring;
  - Mackerel; and
  - Sprat.
- Elasmobranchs:
  - Basking shark;
  - Spotted ray;
  - Spurdog;
  - Thornback ray; and
  - Tope.
- Diadromous Fish:
  - Atlantic salmon;
  - Allis shad;
  - European eel;
  - River lamprey;
  - Sea lamprey;
  - Sea trout;
  - Smelt; and
  - Twaite shad.
- Shellfish:
  - Freshwater pearl mussel;
  - Spiny lobster;
  - Blue mussel;
  - Brown crab;
  - Common whelk;
  - European lobster;
  - King scallop;
  - Queen scallop;
  - Velvet swimming crab; and
  - Norway lobster.

Future baseline scenario - The ES has conducted an evaluation of future baseline conditions aligned with the Offshore Oil and Gas Exploration, Production, Unloading and Storage (Environmental Impact Assessment) Regulations 2020 and The Offshore Environmental Impact Assessment (The Marine Works (Environmental Impact Assessment) Regulations 2007 (as amended), necessitating the inclusion of a future baseline assessment in case the Proposed Development does not proceed. The extensive and accurate representation of the baseline environment detailed in the ES, incorporates seasonality and interannual variations. This baseline is dynamic and is subject to significant natural changes over extended periods due to inherent cycles, processes, and potential climate change influences. This long-term evolution is anticipated even without the Proposed Development. Thus, it is crucial to contextualise potential impacts throughout the anticipated 25-year operational lifespan of the Proposed Development within the impact assessments. Expected direct and indirect alterations in fish and shellfish populations and communities within the Irish Sea are outlined, prompted by variable and long-term changes, including rising sea temperatures and changing temperature patterns. These modifications, coupled with the known decline in Irish Sea fish populations, are projected to be compounded by increasing temperatures and extreme weather events, affecting predator-prey interactions

and fish population survival rates. Rising sea temperatures could also amplify the impact of diseases on shellfish populations, potentially threatening long-term survival and overall population levels, alongside the detrimental effects of ocean acidification on shell strength and economic value. Amid uncertainties regarding the impact of climate change on the marine environment, accurately predicting the future baseline scenario is challenging, necessitating consideration of changes within the operational timeframe of the Proposed Development amid heightened variability and sustained trends on national and international scales.

2.2.1.3 Marine Mammals and Marine Turtles

In the regional marine mammal study area, there are five cetacean species that are likely to be present and occur regularly. These species include the bottlenose dolphin (*Tursiops truncatus*), harbour porpoise (*Phocoena phocoena)*, minke whale (*Balaenoptera acutorostrata*), Risso's dolphin (*Grampus griseus*), and short-beaked common dolphin (*Delphinus delphis*). The regional marine mammal study area's boundaries were informed by species Management Units (MUs), and recent abundance estimates for each species in their respective MUs are available in the ES and from the Inter-Agency Marine Mammal Working Group (IAMMWG, 2022).

Abundance estimates with 95% confidence intervals for these cetacean species are provided in the ES. For instance, the harbour porpoise's estimated abundance in the Celtic and Irish Sea Management Unit (MU) is 62,517 (with a confidence interval of 48,324 – 80,877). Similarly, the bottlenose dolphin's estimated abundance in the Irish Sea is 293 (with a confidence interval of 108 – 793), while it's 10,947 (with a confidence interval of 6,727 – 17,814) in the Offshore Channel, Celtic Sea and South West England.

Regarding pinnipeds, the regional marine mammal study area is likely to have two species present: the grey seal (*Halichoerus grypus*) and the harbour seal (*Phoca vitulina*). Abundance estimates and population data for these species are provided for various Mus, including Northern Ireland, SW Scotland, NW England, Wales, and SW England. However, for certain areas like NW England, the grey seal population estimate is unavailable.

Marine Mammal population densities for different species are also presented. These densities, measured as animals per square kilometre (km^2), vary by species and MU. For example, the population density of harbour porpoises in the Celtic and Irish Sea MU is approximately 0.0861 individuals per km^2. The densities for bottlenose dolphins – 0.0082 to 0.035, common dolphins – 0.018, Risso's dolphins – 0.0313, minke whales - 0.0173, grey seals – 0.467 to 4.06, and harbour seals – 0.0049 to 0.593.

Regarding marine turtles, six species have been documented in UK and Irish waters. These include the green turtle (*Chelonia mydas*), hawksbill turtle (*Eretmochelys imbricata*), Kemp's ridley turtle (*Lepidochelys kempii*), leatherback turtle (*Dermochelys coriacea*), loggerhead turtle (*Caretta caretta*), and olive ridley turtle (*Lepidochelys olivacea*). Due to limited data compared to marine mammals, these turtle species are grouped collectively as "marine turtles" for assessment purposes. Information about their distribution and abundance primarily comes from records of sightings and strandings dating back to 1748. A total of 2,882 marine turtle records have been documented over the course of 273 years, with leatherback turtles being the most commonly recorded species.

IEFs taken forward for assessment include:

- Bottlenose dolphin;
- Common dolphin;
- Grey seal;
- Harbour porpoise;
- Harbour seal;
- Marine turtles;
- Minke whale; and

- Risso's dolphin.

Future baseline scenario – The ES complies with the Offshore Oil and Gas Exploration, Production, Unloading and Storage (Environmental Impact Assessment) Regulations 2020 and The Offshore Environmental Impact Assessment (The Marine Works (Environmental Impact Assessment) Regulations 2007 (as amended) by evaluating future baseline conditions in the absence of the Proposed Development. The ES, accurately represents the environment, accommodating seasonal and interannual variations. However, it is acknowledged that this baseline is dynamic, subject to natural changes over extended periods due to inherent cycles, processes, and potential climate change impacts, even without the development. Human activities like offshore projects, fishing, and shipping threaten marine mammals and turtles, with Avila *et al*. (2018) revealing that almost all marine mammal species (98%) faced threats between 1991 and 2016. Marine turtles encounter hazards such as fisheries bycatch, coastal development, and entanglement in debris. Climate change indirectly endangers marine mammals, potentially shifting species distributions due to rising sea temperatures, impacting predator-prey relationships and habitats. Wider effects include altered reproduction, increased stress, and pathogen proliferation, with predicted toxic algal blooms causing mass die-offs. The intricate influence of climate change on the marine environment remains uncertain, necessitating an understanding of changes during the Proposed Development's lifespan against a backdrop of heightened variability and long-term trends on national and international marine scales.

2.2.2 Assessment of significance

2.2.2.1 Benthic subtidal and intertidal ecology

Eight potential impacts on the benthic subtidal and intertidal ecology receptors due to the construction, operations and maintenance, and decommissioning phases of the Proposed Development, were identified:

- temporary subtidal habitat loss and/or disturbance;
- increased SSCs and associated deposition;
- long-term subtidal habitat loss;
- introduction of artificial habitat and colonisation of hard structures;
- increased temperature impacting benthic communities;
- impacts resulting from the release of sediment bound contaminants;
- accidental pollution to the surrounding area; and
- increased risk of introduction and spread of Invasive Non-Native Species (INNS).

With the measures adopted as part of the Proposed Development (e.g. cable burial where possible) in place, all of these impacts result in effects of either negligible or minor adverse significance, which is not significant in EIA terms.

Temporary and long-term habitat loss/disturbance was deemed to be of negligible (Ross worm IEF) to minor adverse significance (all other IEFs; not significant in EIA terms). This conclusion was reached, based on the small proportion of habitat loss predicted in the context of available habitats in the Proposed Development and, as most of the disturbed habitat is sedimentary, the habitat is likely to recover following disturbance/loss. Additionally, no significant effects were predicted on protected potential reef habitats, on the assumption that measures to avoid direct impacts to these features will be implemented.

Increases in suspended sediment concentrations and associated deposition were deemed to be of minor adverse significance (not significant in EIA terms) for all IEFs. This conclusion was reached due to the short-term nature of the impact with sediments quickly dispersing and most of the IEFs being of low sensitivity to this type of impact. Again, no significant effects were predicted on protected potential reef habitats, on the assumption that measures to avoid direct impacts to these features will be implemented.

Long-term habitat loss was deemed to be of negligible to minor adverse significance (not significant in EIA terms) for all IEFs (no long-term habitat loss in the intertidal is predicted). This conclusion was reached due to the small area affected in relation to the benthic subtidal and intertidal ecology study area. Again, no significant effects were predicted on protected potential reef habitats, on the assumption that measures to avoid direct impacts to these features will be implemented.

Introduction of artificial habitat and colonisation of hard structures was deemed to be of minor adverse significance (not significant in EIA terms) for all IEFs. A minor adverse significance has been concluded as this impact will only affect a small proportion of the Eni Development Area (0.01%) in which these IEFs occupy.

Increased temperature impacting benthic communities was deemed to be of negligible adverse significance (not significant in EIA terms) for all IEFs. Although temperature increases are unlikely to occur in the first place, it is likely that only deep burrowing species or sessile benthic species within centimetres from the pipelines could be impacted. Due to the natural fluctuations in temperature throughout the year, it is also likely that benthic subtidal and intertidal receptors will be tolerant to small temperature increases associated with this impact.

Impacts resulting from the release of sediment bound contaminants was deemed to be of minor adverse significance (not significant in EIA terms) for subtidal habitats and species IEFs and the Fylde MCZ IEF. There is a lack of information available on the sensitivities of the subtidal habitats and species IEFs to the contaminants mentioned, with the majority of available sources now somewhat dated. This has resulted in no MarESA available for the relevant pressures for this impact for any IEFs. Therefore, based on the absence of information, and the potential intolerance of many benthic species to contamination (bivalves and echinoderms in particular), the sensitivity of these receptors has been assessed on a precautionary basis.

Accidental pollution to the surrounding area was deemed to be of minor adverse significance (not significant in EIA terms) for all IEFs. The assessment has been undertaken on the same reasoning as the above impact and on a precautionary basis.

Increased risk of introduction and spread of INNS was deemed to be of minor adverse significance (not significant in EIA terms) for subtidal habitats and species IEFs and the Fylde MCZ IEF. This is due to the small proportion of the Eni Development Area that may be colonised by INNS and due to the precautionary high sensitivity of the receptor. However, embedded mitigation, such as the INNS Management Plan, will ensure that the risk of introduction is controlled as far as reasonably practicable.

Cumulative effects from aggregate extraction activities, dredging activities, cables and pipelines, remedial works and other offshore renewable developments were assessed for their impact in relation to: temporary habitat loss and/or disturbance; increased SSC and associated deposition; long-term habitat loss; introduction of artificial habitat and colonisation of hard structures; and increased risk of introduction or spread of INNS. The cumulative effects assessment predicted that there were no plans, projects, or activities identified within the CEA for the construction, operation and maintenance, and decommissioning phases.

No transboundary effects with regard to benthic subtidal and intertidal ecology from the Proposed Development were predicted on the interests of other states.

2.2.2.2 Fish and shellfish ecology

Four potential impacts on the fish and shellfish ecology receptors due to the construction, operations and maintenance, and decommissioning phases of the Proposed Development, were identified:

- temporary subtidal habitat loss and/or disturbance;
- long-term subtidal habitat loss;
- underwater noise impacting fish and shellfish receptors; and
- increased SSCs and associated deposition.

With the measures adopted as part of the Proposed Development (e.g. implementation of piling soft-start and ramp-up measures), all these impacts in all project phases result in effects of either negligible or minor adverse significance, which are not significant in EIA terms.

Temporary and long-term subtidal habitat loss and/or disturbance were both deemed to be of negligible (diadromous IEF) to minor adverse significance (all other IEFs; not significant in EIA terms) to fish and shellfish receptors, as the proportion of habitat lost within the Proposed Development was predicted to be small in the context of other similar available habitats in the wider fish and shellfish ecology study area.

The impact of underwater sound was deemed to be of minor adverse significance (all other IEFs; not significant in EIA terms) to both moving and static fish, and shellfish receptors, due to the limited piling activities (800 minutes) to be undertaken on an intermittent basis.

Increased SSCs and associated deposition was assessed as negligible adverse (all IEFs) and minor adverse (Herring IEF; not significant in EIA terms) to fish and shellfish receptors, due to the low sensitivity to smothering events, except for herring whereby the sensitivity to smoothing is increase at spawning sites.

Cumulative effects from aggregate extraction activities, dredging activities, cables and pipelines, remedial works and other offshore renewable developments were assessed for their impact in relation to: Temporary subtidal habitat loss and/or disturbance, long-term subtidal habitat loss, underwater noise impacting fish and shellfish receptors, and increased SSCs and associated deposition. The cumulative effects assessment predicted that there were no plans, projects, or activities identified within the CEA for the construction, operation and maintenance, and decommissioning phases.

No transboundary effects on the interests of other states are predicted for fish and shellfish ecology from the Proposed Development.

2.2.2.3 Marine Mammals and Marine Turtles

Seven potential impacts on the marine mammals and marine turtles' receptors due to the construction, operations and maintenance, and decommissioning phases of the Proposed Development, were identified:

- injury, Disturbance, and Displacement from Underwater Noise Generated during Piling;
- injury, Disturbance, and Displacement from Underwater Noise Generated during UXO Clearance;
- injury, Disturbance, and Displacement from Underwater Noise Generated during Geophysical and Seismic Site Investigation Surveys;
- injury, Disturbance, and Displacement from Vessel Activity and other Noise Producing Activities;
- injury due to Collision with Marine Vessels; and
- effects on Marine Mammals and Marine Turtles due to changes in Prey Availability.

With the measures adopted as part of the Proposed Development (e.g. the inclusion of low order techniques as a UXO clearance option) in place, these impacts result in effects of either negligible or minor adverse significance, which is not significant in EIA terms.

Injury and disturbance from elevated underwater sound during the five listed impacts above was deemed to be of negligible to minor adverse significance (not significant in EIA terms) to marine mammals; whilst underwater sound modelling predicted ranges of impact which had the potential to result in injury and disturbance to a small number of animals. For the assessment of injury, with measures adopted as part of the Proposed Development in place in the form of a draft Marine Mammal Mitigation Protocol (MMMP), the impact would result in a very small risk of injury, as animals will be deterred beyond the predicted injury range. For the assessment of disturbance, it was considered that whilst a small number of animals could experience mild disturbance, this was unlikely to lead to population level effects. In addition, population modelling was carried out to explore the potential of disturbance during piling to affect the population trajectory over time for harbour porpoise, bottlenose dolphin, minke whale and grey seal, which confirmed the assessment that this impact was unlikely to lead to population level effects.

Injury due to collision with marine vessels was deemed to be of minor adverse significance (not significant in EIA terms). An increase in vessel movements could lead to an increase in interactions between marine mammals and vessels, resulting in fatal and non-fatal injuries. Vessels travelling at 7m/s or faster are those most likely to cause death or serious injury to marine mammals. Largely, vessels involved in the construction phase are likely to be travelling considerably slower than this, and all vessels will be required to follow the provisions set out in the offshore EMP. With adherence to this EMP, in combination with the likelihood that animals will be deterred by the noise of moving vessels, the risk of collision is reduced.

Effects on marine mammals and marine turtles due to changes in prey availability was assessed as minor adverse significance (not significant in EIA terms). This was due to the ability of the receptor to be tolerant to changes in prey availability.

Cumulative effects were assessed for the following: injury, disturbance, and displacement from underwater noise generated during piling; injury, disturbance, and displacement from underwater noise generated during UXO clearance; injury, disturbance, and displacement from underwater noise generated during geophysical and seismic site investigation surveys; injury, disturbance, and displacement from vessel activity and other noise producing activities; and injury due to collision with marine vessels. Overall, in the CEA there were no significant cumulative effects identified for any plans, projects, or activities on marine mammals and marine turtles.

No transboundary effects with regard to marine mammals from the Proposed Development were predicted on the interests of other states.

2.3 Ornithology

2.3.1 Existing baseline description

Offshore ornithology - The offshore ornithology study area is defined as the area encompassing the Eni Development Area, which includes the offshore structures, offshore cables and subsea cables (including intertidal habitats up to MHWS), plus an additional 10 km buffer. 10 km was applied to account for the displacement of sensitive divers and sea ducks which are highly sensitive to vessel movements (Schwemmer et al., 2011; Burger et al., 2019) and are present in the Liverpool Bay in internationally important numbers.

The ES describes the potential disturbance and displacement of bird species within the context of the Proposed Development. Three designated sites, including Liverpool Bay/Bae Lerpwl SPA, Dee Estuary SPA, and Ribble and Alt Estuaries SPA, were identified as overlapping with the offshore ornithology study area. To determine potential offshore interactions of birds, a foraging range of 315 km was considered. Species accounts provided peak density estimates based on various sources, with consideration of displacement vulnerability scores and foraging ranges for species such as little tern, common tern, common scoter, red-throated diver, and others. The displacement results were evaluated for different project phases, including the construction phase and the operation of the Douglas platform. The SNCB Matrix table approach was employed, incorporating species' sensitivity, habitat specialisation, and abundance. Mortality rates and potential displacement figures were estimated for species including common scoter, red-throated diver, great cormorant, manx shearwater, and more, with rates being approached cautiously due to the constrained nature of construction activities. The impact of the Douglas platform's operation on species such as sandwich tern, manx shearwater, northern gannet, and northern fulmar was assessed, and the annual mortality estimates did not surpass a 1% increase in baseline mortality for the evaluated species.

Intertidal ornithology - The intertidal ornithology study area sits at the mouth of the Dee Estuary, which is an important stop-off for many species of wintering and passage waders and wildfowl, in addition to providing nesting habitat for the UK's largest colony of breeding little tern. The intertidal ornithology study area is mostly composed of sand and mudflats and/or nearshore waters. The area is mostly used by gulls, waders, and waterfowl, with small numbers of common scoter and red-throated diver utilising the nearshore waters. The nearshore waters also provide the foraging ground for breeding and passage terns.

Three internationally designated sites with intertidal waterbird features are situated within 20 km of the proposed development's landfall, two of which are also Ramsar sites. The sites include the Dee Estuary SPA and Ramsar area, Liverpool Bay SPA, and Mersey Narrows and North Wirral Foreshore SPA and Ramsar site. These sites host a range of non-breeding and breeding waterbird species, such as cormorants, shelducks, teal, pintail, wigeon, great crested grebes, oystercatchers, grey plovers, knots, dunlins, and more. Additionally, four SSSIs with intertidal waterbird features are present within the same proximity, with one supporting the Mersey Narrows and North Wirral Foreshore SPA and the remaining three underpinning the Dee Estuary SPA. The survey results encompass 51 waterbird species across various taxonomic groups, with peak counts provided for species like mute swans, Canada geese, common scoters, great northern divers, gannets, kittiwakes, cormorants, and numerous wader species.

2.3.2 Assessment of significance

Eight potential impacts on the benthic subtidal and intertidal ecology receptors due to the construction, operations and maintenance, and decommissioning phases of the Proposed Development, were identified:

- temporary habitat loss leading to displacement/disturbance of birds;
- disturbance and displacement from airborne sound and presence of vessels and infrastructure;
- collision with static offshore infrastructure;
- indirect impacts to birds from changes in prey availability;
- accidental pollution in the surrounding area; and
- creation of roosting and nesting habitats among project infrastructure.

Temporary habitat loss leading to displacement/disturbance of birds was deemed to be negligible to minor adverse significance (not significant in EIA terms) to the seabird species within the Proposed Development. This is due to the limited impact on habitat, and displacement found to be below to 1% mortality threshold.

Disturbance and displacement from airborne noise and presence of vessels and infrastructure was deemed to be of either negligible to minor adverse significance (not significant in EIA terms) to the seabird species within the Proposed Development. This is due to the short-term nature of the impact during the construction, operation and maintenance, and decommissioning phases.

Collision with static offshore infrastructure was deemed to be of no change (not significant in EIA terms) to the seabird species within the Proposed Development. This is due to limited infrastructure present and species ability to avoid non-moving structures.

Indirect impacts to most birds from changes in prey availability was deemed to be of negligible to moderate adverse significance (not significant in EIA terms) to the seabird species within the Proposed Development. This is due to the changes in prey availability found to be below to 1% mortality threshold. The exception is for breeding terns, which would experience a significant effect should the cable installation works be carried out during the breeding period. Avoidance of the breeding period for cable installation will prevent adverse effects on little tern from occurring.

Accidental pollution in the surrounding area was deemed to be of negligible adverse significance (not significant in EIA terms) to the seabird species within the Proposed Development. This is due to regulations in place that manage vessels and their hazardous products onboard, such as fuels.

Creation of roosting and nesting habitats among project infrastructure was deemed to be of minor beneficial significance (not significant in EIA terms) to the seabird species within the Proposed Development. This is due to the creation of suitable roosting habitat within the Proposed Development.

Cumulative effects were assessed for temporary habitat loss leading to displacement/disturbance of birds, disturbance and displacement from airborne sound and presence of vessels and infrastructure and indirect impacts to birds from changes in prey availability. Overall, there were no significant cumulative effects identified for any plans, projects, or activities in the CEA for ornithology.

No transboundary effects with regard to offshore ornithology from the Proposed Development were predicted on the interests of other states.

2.4 Shipping and navigation

2.4.1 Existing baseline description

Navigational features – The Proposed Development's Douglas CCS platform is located within the existing safety zone at the Douglas complex, north of the accommodation platform. This zone is within an Area to be Avoided and falls within the separation zone of the Liverpool Bay Traffic Separation Scheme (TSS). The Liverpool Bay TSS is a crucial route for vessels accessing ports in the River Mersey via the Queen's Channel.

The Port of Liverpool includes container docks, tanker facilities, and passenger ferry terminals. Its boundaries extend into Liverpool Bay, encompassing platforms like Lennox and Hamilton, along with cable routes related to the Proposed Development. The Port of Mostyn is another significant area, accessed via the Welsh Channel, with its limits extending beyond the Dee Conservancy to include the channel. The proposed cable route intersects the Gwynt y Môr wind farm, which is expected to extend further west.

Various subsea cables are present, including export cables from wind farms like Burbo Bank, North Hoyle, and Gwynt y Môr, which the Proposed Development crosses. The development also intersects the Western Link power cable running from Hoylake to Ireland. Other cables between England, Ireland, and the Isle of Man are located north of the Proposed Development. Existing pipelines may be repurposed as part of the project.

The area features aids to navigation (AtoN) such as the Hamilton OSU, buoys marking pilot boarding stations, and structures associated with wind farms. One charted wreck is found within the Physical Work Area, situated 1.2 nm south of the proposed Douglas platform.

Emergency response resources and historical incident review – The ES provides an overview of emergency response resources and historical incident data near the Proposed Development. Search and Rescue (SAR) helicopter services, managed by Bristow Group on behalf of His Majesty's Coastguard (HMCG), are available from 10 UK base stations. The closest station to the development is at Caernarfon, responding to most tasks in the shipping and navigation study area. HMCG coordinates SAR through 11 Maritime Rescue Coordination Centres (MRCC), including a Joint Rescue Coordination Centre (JRCC) based in Hampshire. The Proposed Development falls within Area 15 of the MCA's operation regions. RNLI stations in proximity have responded to numerous incidents, with Rhyl station accounting for 34% of callouts, and over a decade, an average of 158 incidents occurred annually, mainly along the coastline. Common incidents include "Person in Danger" (37%) and machinery failures (16%). Marine Accident and Investigation Branch (MAIB) records an average of 12 to 13 incidents annually within the shipping and navigation study area, involving types like machinery failures (22%) and "Accident to Person" (19%). Various vessel types contribute to incidents, including "other commercial" (35%), cargo vessels (22%), service ships (15%), and recreational craft (11%).

Vessel traffic - The ES presents the vessel traffic baseline for the shipping and navigation study area, based on 2022 AIS data. The average daily vessel count was 54 within the shipping and navigation study area, peaking at 64 in July and dropping to 45 in February, mainly due to summer recreational activity. In the Physical Work Area, an average of 31 unique vessels per day were present. The vessel density indicates high traffic areas, including the Queen's Channel, Liverpool Bay TSS, wind farms, and main routes to Ireland. Cargo vessels were most common (29%), followed by wind farm vessels (18%) and tankers (17%). Cargo and tankers used main routes, while wind farm vessels were near the coastline and wind farms. Notably, the Port of Liverpool's frequent maintenance dredging contributed to high traffic. Larger vessels favoured defined routes, while smaller ones included wind farm and pilot vessels. Anchored vessels (7-8 per day) concentrated between Gwynt y Môr and Burbo Bank wind farms, particularly tankers (45%), cargo vessels (29%), and wind farm vessels (22%). Fishing activity, primarily in the north and Gwynt y Môr wind farm, averaged one vessel per day. Two unique recreational vessels per day were recorded, peaking at seven in August, mainly around Mersey ports and Conwy Bay.

Future baseline scenario - The construction of wind farms like Mona, Morgan, Morecambe, and Awel y Môr could alter vessel routes and increase wind farm vessel traffic at the Port of Mostyn. Commercial vessels are expected to maintain a minimum mean distance of 1 nm from wind farm structures. Port arrival statistics from 2017 to 2021 show an 8% decline in port arrivals at Liverpool, Manchester, and Garston, potentially influenced by Brexit and the COVID-19 pandemic. While Peel Ports plans to invest £200 million in sustainable port infrastructure projects by 2024, no detailed expansion plans for Liverpool or Manchester are available. Fishing and recreational trends are uncertain due to factors like fish stocks, quotas, legislation changes, and evolving recreational vessel types and locations.

2.4.2 Assessment of significance

It is important to note that the shipping and navigation chapter uses different impact assessment criteria from other chapters. The significance of the impact is assessed based upon As Low As Reasonably Possible (ALARP) principles. Further risk control measures may be required to mitigate a hazard in line with the ALARP principles. For the purposes of the shipping and navigation assessment:

- A level of effect of Unacceptable will be considered a ‘significant’ effect in terms of the EIA Regulations; and
- A level of effect of Broadly Acceptable or Tolerable (if ALARP) will be considered ‘not significant’ in terms of the EIA Regulations.

Nine potential impacts on the shipping and navigational receptors due to the construction, operations and maintenance, and decommissioning phases of the Proposed Development were identified:

- vessel displacement leading to increased vessel to vessel collision risk between third-party vessels;
- increased vessel to vessel collision risk between a third-party vessel and a project vessel;
- vessel to platform allision risk;
- reduced access to local ports;
- anchor interaction with subsea cable;
- fishing gear interaction with subsea cable;
- vessel grounding due to reduced under keel clearance;
- interference with magnetic compasses; and
- reduction of emergency response capability due to increased incident rates for SAR responders and increased demand on the available resources.

Vessel displacement leading to increased vessel to vessel collision risk between third-party vessels was deemed to be of broadly acceptable adverse significance (not significant in EIA terms) to the shipping and navigation receptors within the Proposed Development. In the event of a collision incident between third-party vessels, the most likely consequences are minor contact between the vessels resulting in minor damage to property and minor reputational effects on business but no perceptible effect on people. However, regulations are in place to ensure that the likelihood of collisions are reduced.

Increased vessel to vessel collision risk between a third-party vessel and a project vessel was deemed to be of broadly acceptable adverse significance (not significant in EIA terms) to the shipping and navigation receptors within the Proposed Development. The reasoning is similar to that presented in the point above.

Vessel to platform allision risk was deemed to be of broadly acceptable adverse significance (not significant in EIA terms) to the shipping and navigation receptors within the Proposed Development. A 500 m safety zone will be in place around infrastructure to reduce the potential for vessel to platform allision.

Reduced access to local ports was deemed to be of broadly acceptable adverse significance (not significant in EIA terms) to the shipping and navigation receptors within the Proposed Development. Cable installation

and Landfall construction works may result in some disruption to vessels using the Port of Mostyn, however, due to the localised and temporary nature of cable installation works in the Welsh Channel, the disruption to port access is reduced.

Anchor interaction with subsea cable was deemed to be of broadly acceptable adverse significance (not significant in EIA terms) to the shipping and navigation receptors within the Proposed Development. While exposed any vessel anchor could interact with the cables. If an anchor becomes snagged on the cable, there could be a risk of injury in trying to free it. If the anchor cannot be freed the safest action is to slip it, and not attempt to raise or cut the cable. However, mitigation includes circulation of information to make mariners aware of the exposed cable and use of guard vessels where cable exposures are considered to present significant risk to navigation, will reduce the likeliness of this impact.

Fishing gear interaction with subsea cable was deemed to be of broadly acceptable to tolerable adverse significance (not significant in EIA terms) to the shipping and navigation receptors within the Proposed Development. There is higher risk of snagging from demersal gear if the cable is exposed, however, having a Fisheries Liaison Officer (FLO) in place and circulation of information (e.g. via Kingfisher and local communications) will help ensure fishers are aware of the exposed cable and avoid fishing directly over it. In addition, guard vessels will be used in any areas where cable exposures are considered to present significant risk to fishing gear snagging.

Vessel grounding due to reduced under keel clearance was deemed to be of tolerable adverse significance (not significant in EIA terms) to the shipping and navigation receptors within the Proposed Development. Should a vessel grounding occur, the most likely consequences are minor damage to property and minor reputational effects on business but no perceptible effect on people. However, the maximum height of cable protection will be 0.8 m. The average draught of vessels crossing the Physical Work Area was 5.1 m, with a maximum draught of 14 m, recorded crossing the cable route within the Liverpool Bay TSS in approximately 25 m of water depth, therefore this impact is unlikely.

Interference with magnetic compasses was deemed to be of broadly acceptable adverse significance (not significant in EIA terms) to the shipping and navigation receptors within the Proposed Development. The majority of commercial vessel traffic uses non-magnetic gyrocompasses as the primary means of navigation, which are unaffected by Electro Magnetic Frequency (EMF). Therefore, in general it is considered unlikely that any EMF interference created by the proposed cables will have a significant impact on vessel navigation near the Proposed Development.

Reduction of emergency response capability due to increased incident rates for SAR responders and increased demand on the available resources was deemed to be of broadly acceptable adverse significance (not significant in EIA terms) to the shipping and navigation receptors within the Proposed Development. Increased vessel activity during the construction phase may reduce emergency response capability by increasing the number of incidents or reducing access for the responders. However, Due to the limited number of vessels involved and temporary nature of the construction phase works and given that the proposed new Douglas CCS platform will be unmanned and within the existing Douglas Complex, this risk is reduced.

Cumulative effects were assessed for vessel displacement leading to increased vessel to vessel collision risk between third-party vessels, increased vessel to vessel collision risk between a third-party vessel and a project vessel, vessel to platform allision risk, reduced access to local ports, anchor interaction with subsea cable, fishing gear interaction with subsea cable, vessel grounding due to reduced under keel clearance, interference with magnetic compasses, and reduction of emergency response capability due to increased incident rates for SAR responders and increased demand on the available resources. Overall, there were no significant cumulative effects identified for any plans, projects, or activities in the CEA for shipping and navigation.

No transboundary effects with regard to shipping and navigation from the Proposed Development were predicted on the interests of other states.

2.5 Commercial Fisheries

2.5.1 Existing baseline description

The ES presents the existing baseline for commercial fisheries using data from 2012-2016 for European Union Data Collection Framework (EU DCF), 2016-2021 for MMO, and 2016-2020 for MMO Vessel Monitoring System (VMS) data. It provides an overview of landings from the commercial fisheries study area (ICES rectangles 35E6 and 36E6) and analyses specific fisheries. Landings data shows that the UK vessels landed an annual average of £4.8 million from 2016 to 2021, dominated by shellfish species. Irish vessels dredged for scallop and Belgian beam trawlers targeted sole and plaice. Potting fishery, mainly by UK vessels, focused on whelk, lobster, crab, and prawn. The dredge fishery targeted scallops, primarily king scallop. The otter trawl fishery involved Northern Irish and Manx vessels targeting herring, queen scallop, king scallop, and nephrops. English and Belgian vessels participated in the beam trawl fishery, targeting sole and plaice. The passive netting fishery by Welsh vessels targeted European sea bass, thornback ray, and flounder. Hook fisheries involving English and Welsh vessels under 10 m in length targeted bass, flounder, and pollack.

Evolution of the baseline - Commercial fisheries patterns are influenced by various factors, both natural and management-related. These include market demand, prices, stock abundance, fisheries management plans, environmental regulations, technological advancements, and sustainability considerations. These variations and trends in commercial fisheries activity are crucial for establishing baseline assessments. However, the existing baseline data may not fully capture changes resulting from the UK's withdrawal from the EU. The Trade and Cooperation Agreement (TCA) between the UK and the EU allows both parties continued access to each other's Exclusive Economic Zones for fishing until 2026, with discussions on fisheries opportunities and the possibility of tariffs in case of access changes. In the commercial fisheries study area, the impact of Brexit on fishing activities by non-UK vessels is not yet clear, but changes are expected to be limited due to the primarily non-quota shellfish-focused fleets in the region.

2.5.2 Assessment of significance

Nine potential impacts on commercial fisheries due to the construction, operations and maintenance, and decommissioning phases of the Proposed Development were identified:

- 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;
- Supply chain opportunities for local fishing vessels; and
- Loss or damage to fishing gear due to snagging gear on project infrastructure.

With the measures adopted as part of the Proposed Development (e.g. appointment of a FLO) in place, and in some cases with the implementation of further mitigation, the majority of these impacts result in effects of negligible or minor adverse significance which is not significant in EIA terms.

Loss or restricted access to fishing grounds was deemed to be of moderate adverse significance to the UK potting fishery (significant in EIA terms), and minor adverse significance (for all other receptors; not significant in EIA terms) to the shipping and navigation receptors within the Proposed Development. Additional mitigation is proposed to reduce the residual impact to minor adverse significance through the justifiable disturbance payment procedure as outlined in the FLOWW guidance documents (2014 and 2015).

Impacts on commercially valuable fish and shellfish species/resources was deemed to be of minor adverse significance (not significant in EIA terms) to the shipping and navigation receptors within the Proposed Development. Temporary noise and seabed disturbances during activities may displace commercially

important fish and shellfish populations from the area, however, due to localised spatial extent this impact on important fisheries, this impact is lessened.

Interference with fishing activity was deemed to be of minor adverse significance (not significant in EIA terms) to the shipping and navigation receptors within the Proposed Development. All fishing fleets are considered able to avoid vessel movements related to the Proposed Development activities.

Temporary increases in steaming distances to fishing grounds was deemed to be of negligible to minor adverse significance (not significant in EIA terms) to the shipping and navigation receptors within the Proposed Development. In relation to ground within the area of project physical work, all commercial fisheries fleets are considered to have medium to high availability of alternative fishing grounds and an operational range that is not limited to this Eni Development area.

Supply chain opportunities for local fishing vessels was deemed to be of minor beneficial significance (not significant in EIA terms) to the shipping and navigation receptors within the Proposed Development. The opportunity exists for local fishing vessel owners to apply for specific roles or positions within the Proposed Development.

Loss or damage to fishing gear due to snagging gear on project infrastructure was deemed to be of minor adverse significance (not significant in EIA terms) to the shipping and navigation receptors within the Proposed Development. It is considered likely that fishermen will operate appropriately (i.e. avoiding the indicated infrastructure and cable protection at the defined location) given adequate notification of the locations of any snagging hazards; and are highly likely to avoid the infrastructure and cable protection within safety zones. Embedded mitigation details that the target minimum burial depth of cables is to 2 m, where possible and detailed Cable Burial Risk Assessment, the results of which will be communicated to fisheries stakeholders.

Cumulative effects were assessed for loss of access to fishing grounds as a result of activities associated with the Proposed Development and other plans and projects in the region. Overall, there were no significant cumulative effects identified for any plans, projects, or activities in the CEA for commercial fisheries.

No transboundary effects with regard to commercial fisheries from the Proposed Development were predicted on the interests of other states.

2.6 Marine Archaeology

2.6.1 Existing baseline description

The marine archaeology baseline covers various aspects, including submerged prehistory, maritime and coastal remains, aviation crash sites, and historic seascape character. The assessment spans multiple archaeological periods, and includes periods like the Palaeolithic, Mesolithic, Neolithic, Bronze Age, Iron Age, Roman, Medieval, post medieval and modern.

The ES identifies designated heritage assets, such as the Protected Wreck of the *Resurgam*, a 19th-century experimental submarine, within the Area of Project Physical Work[1]. Two other designated assets lie within the Study Area, beyond the project boundaries: the Scheduled wreck of the Lelia and the Grade II Listed Point of Ayr Lighthouse.

Non-designated heritage assets encompass a range of categories and types. These include wreck remains, other maritime remains like debris and navigational aids, geological features, palaeolandscape features, terrestrial and coastal features, and documentary records like aircraft crash sites and navigational aids.

[1] The Area of Project Physical Work covers a restricted area in which Proposed Development activities and the insertion of new infrastructure including cable laying, well drilling and platform construction, as well as associated activities such as sand wave clearance are to be focused.

The assessment indicates that the prehistoric archaeological record extends from early human occupation to the end of the Roman invasion in AD 43. Geological deposits within the site play a role in understanding archaeological potential. The potential for remains from different periods varies, with more evidence available from the post-medieval period onward, including wrecks and navigational aids.

While no known aircraft crash sites exist within the marine archaeology study area, potential for such sites is identified, particularly associated with a WWII Spitfire training camp. The historic seascape character is characterised by modern installations, fishing methods, navigation routes, wrecks, and seabed types.

2.6.2 Assessment of significance

Five potential impacts on marine archaeology due to the construction, operations and maintenance, and decommissioning phases of the Proposed Development were identified:

- sediment disturbance and deposition leading to indirect impacts on marine archaeology receptors (the exposure or burial of receptors);
- direct damage to marine archaeology receptors (e.g. wrecks, debris, submerged prehistoric receptors (palaeolandscapes and associated archaeological receptors);
- direct damage to coastal/intertidal archaeological remains through cable installation at the landfall site;
- alteration of sediment transport regimes leading to potential erosion or burial of archaeological sites; and
- change of use: effects on Historic Seascape Character.

The implementation of a Written Scheme of Investigation (WSI) will ensure that, where possible, known archaeological sites are avoided, any new observations are recorded, and sites are protected or preserved by record where required.

Sediment disturbance and deposition leading to effects on known marine archaeology was deemed to be of minor adverse significance which is not significant in EIA terms. The indirect impacts on marine archaeology receptors during the construction, operations and maintenance and decommissioning of the Proposed Development is predicted to be of local spatial extent, short term duration (though impacts from sediment deposition may be longer term), intermittent and medium reversibility. It is predicted that the impact will affect marine archaeology indirectly and may result in a benefit to sites, through additional burial, though this is likely to be limited in extent. Exposure of sites is mitigated through use of the protocol for reporting finds of archaeological interest.

Direct damage to marine archaeology receptors was deemed to be of minor adverse significance which is not significant in EIA terms. This will be mitigated through the implementation of Archaeological Exclusion Zones (AEZs) around each known shipwreck site and potential site, and review of pre-construction surveys to inform the refined layout of infrastructure around any newly identified archaeological constraints. Provision will also be made for the recording of any new discoveries.

Direct damage to deeply buried marine archaeology receptors was deemed to be of minor adverse significance which is not significant in EIA terms. The implementation of a WSI and Protocol for Archaeological Discoveries (PAD) will provide a system for the reporting of any prehistoric archaeological material that may be uncovered during the lifetime of the Proposed Development.

Alteration of sediment transport regimes which may affect archaeological features is of negligible adverse significance which is not significant in EIA terms. Additionally, while impacts from erosion would be adverse, burial may lead to a beneficial effect.

Change of use effects on historic seascape character were deemed to be of no change significance and not taken forward for assessment. This was on the basis that the proposed development would be in line with the modern installations already present within the area, though would form a new type of development (CCS).

Cumulative effects were assessed for direct damage to marine archaeology receptors (e.g. wrecks, debris, submerged prehistoric receptors (palaeolandscapes and associated archaeological receptors); direct damage to coastal/intertidal archaeological remains through cable installation at the landfall site; sediment disturbance and deposition leading to indirect impacts on marine archaeology receptors (the exposure or burial of receptors)l and alteration of sediment transport regimes leading to potential erosion or burial of archaeological sites. Overall, there were no significant cumulative effects identified for any plans, projects, or activities in the CEA for marine archaeology.

No transboundary effects with regard to marine archaeology from the Proposed Development were predicted on the interests of other states.

2.7 Infrastructure and Other Sea Users

2.7.1 Existing baseline description

The ES delves into two distinct areas: the ‘infrastructure and other sea users regional study area’, and the ‘infrastructure and other sea users local study area’.

Within the regional study area, there are two marine aggregate extraction sites, Liverpool Bay Area 457 and Hilbre Swash 393. These sites are operated by Westminster Gravels Ltd and Mersey Sand Suppliers respectively. The ES acknowledges the presence of dredger routes in relation to these extraction sites, covered in the Shipping and Navigation chapter. Shifting to marine aggregate disposal sites, a total of nine are identified, with industrial waste prohibited since 1992 and sewage sludge since 1998 for disposal at sea. Furthermore, six wreck diving sites and eight recreational bathing sites are found within this area.

In the context of the local study area, the ES identifies offshore energy projects, including offshore wind farms, oil and gas activities, and carbon capture and storage initiatives. Cable and pipeline operators are integral to this area, with specific mention of power cables such as the Western HVDC link and offshore wind farm export cables. Additionally, offshore microwave fixed communication links and recreational activities including sailing, motor cruising, and recreational fishing fall are located withing the local study area.

Within the Proposed Development, operational and proposed offshore wind farms can be found. Notable operational wind farms include Gwynt y Môr, Burbo Bank Extension, North Hoyle, Rhyl Flats, Burbo Bank, West of Duddon Sands, Barrow, Walney Extension (3 and 4), Walney 1, Walney 2, and Ormonde. Cables, specifically power cables, interconnect the region, comprising the Western HVDC link, Gwynt y Môr offshore wind farm export cable, North Hoyle offshore wind farm export cable, and the Burbo Bank Extension offshore wind farm export cable. Moving to oil and gas license blocks, a selection of five blocks currently overlaps with the local study area, presenting involvement by various operators. It is crucial to note that more licenses might be awarded in the future, as evidenced by the recent 33rd Oil and Gas Licensing Round. Finally, offshore oil and gas platforms like Douglas Process Platform, Hamilton North Wellhead Platform, Hamilton Main Wellhead Platform, and Lennox Wellhead Platform are distributed across the local study area, interconnected by pipelines, and contributing to the intricate offshore infrastructure network.

Future baseline scenario - The ES complies with the Offshore Oil and Gas Exploration, Production, Unloading and Storage (Environmental Impact Assessment) Regulations 2020 and The Offshore Environmental Impact Assessment (The Marine Works (Environmental Impact Assessment) Regulations 2007 (as amended) by evaluating future baseline conditions in the absence of the Proposed Development.

The future baseline scenario for recreational activities is considered unlikely to change substantially from that presented above, in the absence of the Proposed Development. The future baseline scenario for offshore cables and marine aggregates is subject to gradual change as new projects and sites are identified. The future baseline scenario for oil and gas activities and associated development (including platforms, wells, and pipelines) is considered subject to the greatest degree of change, which will depend upon currently unknown outcomes of, for example, acquisitions, exploration and development, and decommissioning.

2.7.2 Assessment of significance

Five potential impacts on infrastructure and other users due to the construction, operations and maintenance, and decommissioning phases of the Proposed Development were identified:

- displacement of recreational activities;
- increased SSCs and associated deposition affecting recreational diving and bathing sites;
- impacts to existing cables or pipelines or restrictions on access to cables or pipelines;
- increased SSCs and associated deposition affecting aggregate extraction areas; and
- reduction or restriction of oil and gas exploration activities (including surveys, drilling and the placement of infrastructure)

With the measures adopted as part of the Proposed Development in place (e.g. commercial crossing agreements), these impacts result in effects which are of minor adverse significance and not significant in EIA terms.

Displacement of recreational activities was deemed to be of negligible adverse significance which is not significant in EIA terms. Recreational vessels are able to alter their route, dependent on the target destination. Notices to Mariners will be promulgated regularly during the construction phase, advising of the location and nature of construction works, and information and notices will be posted at the landfall location, ensuring that recreational activities can be planned accordingly.

Increased SSCs and associated deposition affecting recreational diving and bathing sites was deemed to be of negligible to minor adverse significance which is not significant in EIA terms. Six identified recreational diving sites and nine recreational bathing sites (Southport, Ainsdale, Formby, West Kirby, Prestatyn, Rhyl, Rhyl East, Marine Lake (Rhyl) and Kinmel Bay (Sandy Cove)) are within the area within the infrastructure and other sea users regional study area. These sites may be impacted by an increase in SSCs in the short term, although as stated it is anticipated that any deposited fine sediments would be subject to redistribution under the prevailing coastal processes.

Impacts to existing cables or pipelines or restrictions on access to cables or pipelines was deemed to be of minor adverse significance which is not significant in EIA terms. Restriction of access to an active cable for inspection and maintenance activities could be critical to the operator of that cable. However, crossing and proximity agreements are common across the UKCS and there are established mechanisms for controlling the level of impact to both parties, in the form of the ICPC Recommendation 3-10C guidance. No active pipelines other than those operated by the Applicant exist within the infrastructure and other sea users local study area.

Increased SSCs and associated deposition affecting aggregate extraction areas was deemed to be of minor adverse significance which is not significant in EIA terms. Westminster Gravels Ltd dredge coarse sand deposits from the Liverpool Bay 457 dredging area and Mersey Sand Suppliers dredge coarse sand deposits from Hilbre Swash 393, a resource of value to the regional economy. Dredging operators are adaptable as they are able, to some extent, to screen out unwanted fine sediment load. Furthermore, it is known that the existing tidal currents and waves can carry fine grained sand across the area.

Reduction or restriction of oil and gas exploration activities (including surveys, drilling and the placement of infrastructure) was deemed to be of minor adverse significance which is not significant in EIA terms. There are five currently licensed blocks overlapping with the infrastructure and other sea users local study area. These are blocks 110/13b, 11013a, 110/15a (all operated by the Applicant) and blocks 110/14a and 110/14c (both operated by Chrysaor Resources (Irish Sea) Limited (part of Harbour Energy)). There is also potential for blocks to become licenced in future (i.e. through Oil and Gas Licensing Rounds), but the assessment of this potential impact is complicated by a degree of uncertainty.

Cumulative effects were assessed for displacement of recreational activities and increased SSCs and associated deposition affecting aggregate extraction areas. Overall, there were no significant cumulative effects identified for any plans, projects, or activities in the CEA for infrastructure and other sea users.

No transboundary effects with regard to infrastructure and other sea users from the Proposed Development were predicted on the interests of other states.

2.8 Climate Change

2.8.1 Existing baseline description

The current baseline environment for the Proposed Development comprises three existing OPs and connecting submarine pipelines and cables. These OPs form part of the Douglas OP Complex, comprising the current Douglas OP which is the control hub for operations and contains facilities for personnel; alongside the Lennox, Hamilton North, and Hamilton Main OPs, which are all unmanned oil and gas wellhead platforms.

Such infrastructure has been used for the extraction and transport of natural gas from gas reservoirs in Liverpool Bay to the PoA gas terminal. As emissions associated with such activity are attributed to the existing Douglas OP, where changes to its operation and decommissioning not included within the scope of this application, current baseline emissions are considered to be zero.

Land within the Climate Change study area that is not currently occupied by OP foundations, pipelines and cables, consists of various subtidal habitats of mixed sediments (including coarse sediment, sandy mud, fine sand, muddy sand, and deep sand) supporting diverse benthic communities.

2.8.2 Assessment of significance

Five potential impacts on infrastructure and other users due to the construction, operations and maintenance, and decommissioning phases of the Proposed Development were identified:

- the impact of GHG emissions arising from the manufacturing and installation of the Proposed Development, including materials, transport and use of plant/offshore marine vessels;
- the impact of GHG emissions arising from materials and use of offshore marine vessels required for operation and maintenance;
- the impact of GHG emissions associated with energy and fuel use during the operation phase;
- the impact of GHG emissions from decommissioning works (plant, fuel, and vessel use) and recovery or disposal of materials; and
- the impact of CO_2 transportation, sequestration and long-term storage.

The potential impact of greenhouse gas (GHG) emissions due to the Proposed Development, resulting in an effect on the global atmospheric GHG concentration that contributes to climate change, has been assessed and reported in the ES.

The construction-stage impact due to the extraction of raw materials, manufacturing and transportation of the proposed infrastructure has been assessed. The GHG impacts were calculated to be approximately 137,772 tCO_2e, causing a moderate adverse effect that is significant. These impacts are immediate at the time of construction.

The operational phase GHG effects arise due to the energy requirement from activities on the offshore platforms, material replacement, and vessel and helicopter movements. Such emissions total 81,661 tCO_2e, and account for operation and maintenance emissions over the lifetime of the Proposed Development (25 years). The operational GHG impact of the Proposed Development has been determined to have a minor adverse effect that is not significant.

The construction- and operational-stage GHG effects have been minimised through the reduction of emissions associated with vessel movements by specifying the use of lower sulphur-content fuel, ensuring an efficient and optimised vessel schedule, and avoiding the use of older vessels. Operational GHG effects have been further minimised through the implementation of energy efficiency measures to reduce operational energy consumption at the offshore platforms.

Construction- and operational-stage GHG effects can be minimised via engagement with the supply chain and procurement decisions that consider GHG emissions performance as documented through Environmental Product Declarations, to ensure that the materials and products selected are those manufactured under conditions with minimised GHG impacts.

When accounting for the CO_2 that will be stored within depleted oil and gas reservoirs, enabled by the Proposed Development over its operational lifetime (25 years), approximately 110,250,000 tCO_2 will be removed and stored. When combined with the emissions associated with periodic venting of the infrastructure during routine maintenance, the total emissions captured during the operational lifetime of the Proposed Development totals -110,247,682 tCO_2e. This has been determined to have a beneficial effect that is significant.

The whole-life impact of the Proposed Development (considering the impact of the Proposed Development over its lifetime) has been determined to have a beneficial effect that is significant, in line with the definitions of IEMA's guidance for GHG impact assessment. Although a significant initial carbon cost of manufacturing and installation is incurred, the scale of CO_2e that can be captured during the Proposed Development's lifetime ensures that the Proposed Development meets policy goals for the rate of carbon reduction in the context of UK carbon budgets.

It should be noted that such a beneficial effect should not be considered in isolation, as onshore infrastructure forming part of the wider carbon capture and storage (CCS) project also plays a role in enabling the capture and transportation of CO_2 to the underground storage. When considering the emissions associated with all projects part of the wider CCS project, a net total of -109,730,517 tCO_2e will be avoided (accounting for total emissions associated construction, operation, and decommissioning).

Cumulative effects were assessed for cumulative changes in GHG emissions from other energy generation sources and found to have a beneficial significance.

No transboundary effects with regard to climate change from the Proposed Development were predicted on the interests of other states.

2.9 Inter-Related Effects

The ES is required to consider indirect and secondary likely significant impacts. For example, the separate impacts of noise and habitat loss may have an effect upon a single receptor such as marine mammals. The inter-related effects assessment is presented in a separate chapter of the ES.

Based on one, or a combination, of the following factors, the overall significance of any inter-related effects was not judged to increase above the significance value assessed for individual effects in the topic-specific chapters:

- The low sensitivity of receptors;
- Small scale nature of effects;
- Availability of alternative habitats;
- Measures adopted as part of the Proposed Development; and
- Project lifetime effects.

Inter-related effects can originate from impacts occurring on a receptor group over several phases of the Proposed Development. For example, a receptor group may experience impacts during the construction and decommissioning phase. These inter-related effects are collectively described as project lifetime effects.

For all receptor groups identified, following the implementation of measures adopted as part of the Proposed Development and further mitigation (if required), impacts arising during the construction, operations and maintenance and decommissioning phase are unlikely to result in significant project-lifetime effects.

Inter-related effects may also occur where a receptor group experience impacts across several different aspects of the environment. For example, a protected species may be impacted by habitat loss, noise, and dust during the construction phase of the Proposed Development. These inter-related effects are collectively described as receptor-led effects.

All the potential receptor-led effects identified during the construction, operations and maintenance and decommissioning phase of the Proposed Development have already been considered within the relevant chapters of the ES. Therefore, the potential significance of receptor-led effects of the Proposed Development on each of the identified receptor groups was not considered further in the Inter-related effects (offshore) chapter of the ES.

2.10 Next Steps

The ES supports applications for licences and permits from both the NSTA, and NRW. Consultees are therefore invited to consider all the information provided in this NTS and the ES and to provide their comments in respect of these applications. A single response can be prepared covering both applications and shared with each of NRW, and OPRED. There are a few ways that stakeholders can provide feedback on the ES.

Anyone who could potentially be affected by or may have an active interest in the Proposed Development is encouraged to view, and feedback on the applications on the Proposed Development website: https://hynethub.co.uk/. Copies of the ES can also be downloaded from this website.

The Applicant will refine further the Proposed Development design and ES based upon the consultation responses received in relation to the ES.

2.10.1 Natural Resources Wales – Application for a Marine Licence

You can see the Marine Licence application documents free of charge from the NRW online public register; https://publicregister.naturalresources.wales/. You can search for the documents using the application reference number identified in the public notice.

Representations, comments, or questions in respect of the application should be made in writing to:

Marine Licensing Team, Cardiff Permitting Service, Natural Resources Wales, 29 Newport Road, Cambria House, Cardiff, CF24 0TP, or

e-mail: marinelicensing@naturalresourceswales.gov.uk within **28 days** of the date of the public notice, quoting the relevant application reference.

In your representation please include an email or postal address to which correspondence may be sent. Please be aware that representations received will be shared with the applicant and may be made publicly available, after redacting personal details in line with General Data Protection Regulation.

2.10.2 North Sea Transition Authority – Applications for Carbon Dioxide Storage Permit, and Pipeline Works Authorisation

Representations, comments, or questions in respect of the application should be made in writing to:

Business Support Team, Offshore Petroleum Regulator for Environment & Decommissioning Department for Energy Security and Net Zero, AB1 Building, Crimon Place, Aberdeen, AB10 1BJ, or

e-mail: BST@energysecurity.gov.uk. within **30 days** of the date of the public notice, quoting the relevant application reference.

In your representation please include an email or postal address to which correspondence may be sent. Please be aware that representations received will be shared with the applicant and may be made publicly available, after redacting personal details in line with General Data Protection Regulation.

2.11 References

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