Mersey Tidal Power

EIA Scoping Report: Volume 1 Chapters

September 2024

ITS TIME FOR TIDAL

Mersey Tidal Power

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Document History

Version	Author	Reviewer	Approver	Date	Comments
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EXECUTIVE SUMMARY

This Request for a Scoping Opinion has been prepared and submitted in respect of a new tidal range project in Liverpool City Region (LCR), known as Mersey Tidal Power Project (the 'Project'). The Developer is Liverpool City Region Combined Authority (LCRCA).

This is the largest publicly led renewable project in the UK and an inter-generational opportunity to make a bold commitment to start using renewable marine energy resources on our doorstep to produce low carbon electricity close to the growing demand of the urban port city region.

THE PROJECT

The proposal is to construct a tidal range barrage across the River Mersey, creating a lagoon using the natural river-bank and voluminous body of the water upstream. Power generation will be achieved by capturing the potential energy in the rise (flood) and fall (ebb) of the tides to drive submerged turbines to produce electricity.

The Project will have a generating capacity of up to 1 GW and provide the first-ever above ground connection between the banks of the Mersey in Liverpool, creating the potential for active travel, flood protection and climate mitigation responses. It will also include locks as part of the marine navigation system for vessels to continue to pass through.

THE NEED – NATIONAL AND REGIONAL

The Project will meet national needs for Climate Change and contribute to the Government policy aim for increasing Renewable Electricity, as required in the Climate Change Act (2008) and National Policy Statement (EN1) respectively. The Project will provide domestic generation that is predictable, reliable and consistent with the vision of a modern UK energy system that relies on electrification of transport and heating, displacing fossil fuels.

The Project was enabled through the Devolution Deal signed by UK Government and Liverpool City Region Combined Authority (LCRCA) in 2015 and has been steadily developed since that Agreement to the point of this Scoping Opinion submission to the Planning Inspectorate, under the Planning Act (2008). The intent to submit this Scoping Report was approved by LCRCA (including Local Authorities) on 15 March 2024.

The Project is a cornerstone of the LCRCA Five Year Climate Action Plan and, as a priority clean energy project, is listed in the 2024-2028 Corporate Plan. It is part of the LCRCA Plan for Prosperity (2022) and identified in the Spatial Development Strategy (2023) underlining the regional alignment.

The new Government have committed to supporting LCRCA in the development of Mersey Tidal, and the Chancellor visited the region and discussed the project with the LCRCA Mayor on 22 Aug 2024.

PROJECT ACTIVITY STATUS

The Project is currently in development phase activity including the preparation of a DCO application, expected in 2026. The next phase will include the Front-End Engineering Design (FEED) and collation of information for the Environmental Impact Assessment (EIA) in addition to undertaking statutory consultation on our proposals.

In the period May 2020 to July 2024, we have held over 100 stakeholder meetings including a series of over ten regular meetings with statutory environmental consultees, to build visibility of the project and the areas of consideration. In 2021, we commenced the process of agreeing the scope of ornithology surveys for breeding, passage and wintering birds. These surveys are now completing with three years of data available, to supplement the desk top studies and historical data sets obtained.

The Applicant has recently secured a Marine Licence for surveys from Marine Management Organisation (MMO) to allow the intended ecology surveys to commence in line with our schedule based on scope proposed to, and agreed with, Stakeholders.

OUTCOMES AND BENEFITS

The Project is looking to contribute to the increased clean energy supply requirements as part of Net Zero ambitions, accelerating economic green sector activity in the region and extending social and community opportunities for the residents of LCRCA.

The attainment of Net Zero is predicated on halving the overall regional use of energy (petrol, gas and electricity) as we progress an energy transition that is powered by low carbon electricity. The Project is creating an asset that is there for the UK target of 2050 and for 2150 – this really is a long-term low carbon generator.

The economic activity of a large infrastructure in the North-West will be significant, creating the opportunity for a regional supply chain for this project and for future projects. The employment, skills, training and education offered will compliment and extend that already offered for offshore wind, low carbon Hydrogen and electrification of heat and transport.

We also recognise the sensitive nature of the Mersey and surrounding areas and embark on this project with the belief that there can be a beneficial project that contributes to national and regional needs and provides a mitigation to climate change impact concerns.

SUMMARY

This Request for Scoping Opinion is built on knowledge gained from four years of engagement with regional stakeholders combined with the expert advice of our Consultants, and so represents a comprehensive undertaking to support the decision to build a major new asset in LCR.

ADDITIONAL DCO INFORMATION SHEET

THE DCO PLANNING PROCESS

The Project is deemed a 'Nationally Significant Infrastructure Project' under the Planning Act and therefore an application for Development Consent Order (DCO) will be required and this will be determined by the Planning Inspectorate on behalf of Secretary of State for Energy Security and Net Zero. The application is likely to be submitted in 2026, two years from now and will contain full details of the proposed scheme and be accompanied by an Environmental Impact Assessment (EIA) and significant supporting documentation as required.

The purpose of this Scoping Report is:

- To provide early information about the proposals, focusing on the key issues and requesting responses from stakeholders to the Planning Inspectorate as they prepare the Scoping Opinion;
- To outline the scope of the technical topics which are scoped in or out of the Environmental Impact Assessment (EIA) which will support the DCO application, in addition to outlining other associated reports and assessments which are interrelated; and
- To provide methods of collating baseline information and basis for technical approaches and methods, building on those already commenced where appropriate.

Once the Opinion response is received, the project development activity will continue with further information on the tidal barrage proposals becoming available progressively over two years up to submission of the Planning Application. We will welcome comments to our engagement and consultation events in due course.

Note – Public Engagement Meetings will be held over October and November 2024 in Liverpool City Region to share the current status of the Project.

1 INTRODUCTION TO SCOPING REPORT

1.1 PURPOSE OF THE SCOPING REPORT

1.1.1 This Scoping Report outlines the process of identifying the appropriate scope for an Environmental Impact Assessment (EIA) in support of an application for Development Consent Order (DCO), for a proposed tidal barrage project with a capacity of up to 1 gigawatt (GW) in the Mersey estuary and within the Liverpool City Region (Figure 1.1) (referred to as 'the Project'). This Scoping Report has been prepared on behalf of Mersey Tidal Power (hereafter 'the Applicant'), led by Liverpool City Region Combined Authority (LCRCA).

1.2 THE APPLICANT

LIVERPOOL CITY REGION COMBINED AUTHORITY

1.2.2 The LCRCA is a mayoral combined authority which established The Halton, Knowsley, Liverpool, St Helens, Sefton and Wirral Combined Authority Order 2014 and The Halton, Knowsley, Liverpool, St Helens, Sefton and Wirral Combined Authority (Election of Mayor) Order 2016.

1.2.3 The LCRCA is a local authority in its own right and is constituted by the elected Metro Mayor and elected councillors from the principal constituent councils of Halton, Knowsley, Liverpool, St Helens, Sefton and Wirral. The LCRCA is the strategic decision-making body for the Liverpool City Region.

1.2.4 In 2015, the LCRCA signed with Government the LCRCA Devolution Agreement (the Devolution Deal) which set out the terms of an agreement between Government and the leaders of the Liverpool City Region to devolve a range of powers and responsibilities to the LCRCA and a new directly elected mayor (HM Treasury, Liverpool City Region, 2015). The Devolution Deal marked a critical step in a progressive process of devolving funding, responsibilities and powers from central government to the Liverpool City Region.

1.2.5 The LCRCA is led by Mayor Steve Rotheram, who together with the six Local Authority leaders approved the intent to produce and submit a Request for a Scoping Opinion at the Combined Authority Meeting on 15 March 2024.

LCRCA AND MERSEY TIDAL POWER

1.2.6 The Project is a central part of enabling a substantial transition to electrification for Liverpool City Region using the natural resources close to the demand of the urban port city region. The potential was recognised in the initial Devolution deal and remains a national and regional project supported by Policy.

1.2.7 In respect of energy, the Devolution Deal states,

"A next step in the river's recent evolution could be to harness its huge tidal range to produce power for the City Region's businesses and citizens. Technology is in development that could deploy a large tidal energy system into the river that could have the potential to produce significant volumes of clean and predictable energy well into the next century.

The Liverpool City Region estuary has one of the largest tidal ranges in the UK and the Liverpool City Region considers it to be one of the best locations in the UK for a tidal power scheme. The government recognises that the River Mersey and Liverpool Bay area is a key asset that has the potential to drive growth within the Northern Powerhouse and the government commits to supporting Liverpool City Region by providing guidance to support Liverpool City Region's development of a cost-effective tidal power scheme proposal for the River Mersey or Liverpool Bay that could generate low carbon energy for businesses and consumers.

Once an economic and environmental case is made, the government will consider the Liverpool City Region scheme on its merits. Liverpool City Region will continue to explore options to make the development more cost effective and deliverable, principally through expedited planning processes and direct local use of the power generated."

1.2.8 The LCRCA itself has committed to the development of Mersey Tidal Power in its 2022 Plan for Prosperity which sets out the LCRCA policy framework up to 2035. In a spotlight on Mersey Tidal Power, the Plan for Prosperity states,

"The City Region is developing what would be the UK's first tidal range energy project. A range of schemes are being considered with the largest able to power up to a million homes for over 120 years. Mersey Tidal Power is a potential mega-project, using the energy from the tides in Liverpool Bay and Mersey Estuary to generate plentiful clean, reliable, and predictable energy. The City Region and wider north-west will require double the volume of power available today in order to switch its transport, industrial use and heating to clean

hydrogen or electricity. This project is vital in meeting regional & national carbon targets.

Generating power up to four times a day, this helps to balance more intermittent and unpredictable sources like wind and solar, helping to balance the grid locally and nationally. As well as generating green energy, the Mersey Tidal Power Project has the potential to generate thousands of jobs across design, construction, start-up, operations, and maintenance. Every stage of the project will create jobs and opportunities for today and the future in the new green economy.

The Mersey Tidal Project is perfectly positioned to be the UK's first tidal range energy project and the trailblazer for a new industry. There is a predicted global tidal range energy potential of 3TW, which is the equivalent to 1,000 Hinckley C power stations. The UK has a resource that can provide more than twice our current electricity demand. Harnessing just 10% of this is 20% of our electricity needs."

1.2.9 Mersey Tidal Power is also one of the key actions (E3) in the LCRCA Five Year Climate Action Plan with the priority on activities in the short term (2024-25) to advance Consenting and development (LCRCA, 2023).

1.2.10 The LCRCA Spatial Development Strategy (SDS) was published in November 2023 with consultation from 24th November 2023 to February 16th, 2024 (LCRCA, 2023). This is the first SDS for a Combined Authority outside London and will be submitted to the Planning Inspectorate.

1.2.11 When finalised it will set out a framework for building and development for the Liverpool City Region looking ahead for at least the next 15 years. It will also identify strategic areas for growth and infrastructure provision and will form part of the 'Development Plan' for the city region along with Local Plans and Neighbourhood Plans.

1.2.12 The SDS refers to Mersey Tidal Power as an LCRCA led initiative, supporting the vision for a Fairer, Stronger and Cleaner City Region.

1.2.13 LCRCA has formed a Special Purpose Vehicle (SPV) called Mersey Tidal One for the purposes of the delivering the project.

1.3 OVERVIEW

1.3.1 Section 14 of Part 3 of the Planning Act 2008 defines which major infrastructure projects constitute Nationally Significant Infrastructure Projects (NSIPs). In this

case, the Project qualifies as an NSIP as the tidal barrage will consist of the construction of a generating station under section 14 (1) (a) and as per section 15 is:

"(2) A generating station is within this subsection if:

(a) it is in England

(aa) it does not generate electricity from offshore wind;

(b) it is not an offshore generating station; and

(c) its capacity is more than 50 megawatts."

1.3.2 This definition has been used as the tidal barrage will be in an estuarine location, not offshore, and involves the creation of the barrage leading to the formation of an inland lagoon using the natural features of the river.

1.3.3 As an NSIP, and as required by section 31 of the Planning Act 2008, a DCO application will be submitted to the relevant Secretary of State (SoS) under Part 4 of the Planning Act 2008 (HM Government, 2008).

1.3.4 To support the DCO application, an EIA is required to be undertaken, which will involve the production of an Environmental Statement (ES) to set out the detailed assessment and findings of the EIA. The Planning Inspectorate will examine the DCO application and make a recommendation to the SoS for Department for Energy Security and Net Zero (DESNZ) to grant or refuse consent.

1.3.5 This Scoping Report is submitted to the Planning Inspectorate by the Applicant under Regulation 10 of The Infrastructure Planning (Environmental Impact Assessment) Regulations 2017 ("the Regulations"), as a request for a formal written opinion, the 'Scoping Opinion', on the scope, and level of detail, of the information to be provided in the environmental statement for the Project (HM Government, 2017).

1.3.6 The EIA Regulations (Regulation 10(3)) prescribe the information that a request for an EIA Scoping Opinion must include. **Table 1-1** presents those information requirements and where each can be found in this Scoping Report.

Table 1-1: Information Required to Accompany a Request for a Scoping Opinion

Information Required	Location within this Scoping Report
A plan sufficient to identify the land.	Figure 1.1 Scoping Boundary
A description of the nature and purpose of the development, including its location and technical capacity.	Chapter 1: Introduction Chapter 2: Site Context and Project Description
An explanation of the likely significant effects of the development on the environment.	Chapter 5-30 of this Scoping Report

1.3.7 In addition to the above, Regulation 10(3)(d) of the EIA Regulations requires *'such other information or representation as the person making the request may wish to provide or make'*. This additional information is set out in **Table 1-2** below.

Table 1-2: Other Information Provided within this EIA Scoping Report

Information Required	Location within this Scoping Report
An overview of the conditions present on site and in the surrounding area, together with a brief overview of the relevant planning policy context.	Chapter 1: Introduction Chapter 2: Site Context and Project Description
Outline of the scope and assessment methodology (including the significance criteria to be adopted) for assessing the likely significant environmental effects to be employed for each aspect to be reported in the ES.	Chapter 3: Approach to EIA in addition to Chapters 5-30

Information Required	Location within this Scoping Report
The approach to dealing with alternatives.	Chapter 3: Approach to EIA
The approach to undertaking the cumulative assessment.	Chapter 31: Cumulative
The proposed approach to the EIA and an appraisal of the key environmental aspects and matters to be covered in the EIA (i.e., 'scoped in') and the aspects and matters not requiring further consideration (i.e., 'scoped out').	Chapter 3: Approach to EIA in addition to Chapters 5-31
The proposed structure and format of the ES	Chapter 3: Approach to EIA

1.3.8 The Applicant has engaged with stakeholders for over three years and has shared information, proposed and agreed approaches to desk top review, data availability and has commissioned new surveys in key thematic areas.

1.3.9 The submission of this Scoping Report ensures that future resources and the planned timescales for the EIA are effectively managed and that efforts are concentrated on the key environmental issues and their likely significant effects.

1.3.10 Moreover, this Scoping exercise minimises the need for further information requests following the submission of the ES and DCO application, particularly where uncertainty exists in relation to a potential effect, enhancing the proportionality of the EIA process (Institute of Environmental Management and Assessment, 2012).

1.3.11 As the Project lies within the North-West Inshore Area waters (HM Government, 2021), an application for a Marine Licence (ML) will be required, as set out by the Marine and Coastal Access Act 2009 (HM Government, 2009).

1.3.12 Under the Planning Act 2008, there is the power to "deem" a ML within the DCO application. This will be confirmed by the Applicant following receipt of the Scoping Opinion and prior to submission of the DCO application.

1.4 THE PROJECT

1.4.1 The Project is proposed as a new renewable energy generation asset close to the demand of the urban port city region of Liverpool with a population of 1.6m residents – with a stated aspiration for attaining Net Zero including meeting Government targets for electrification, and retirement of fossil fuels.

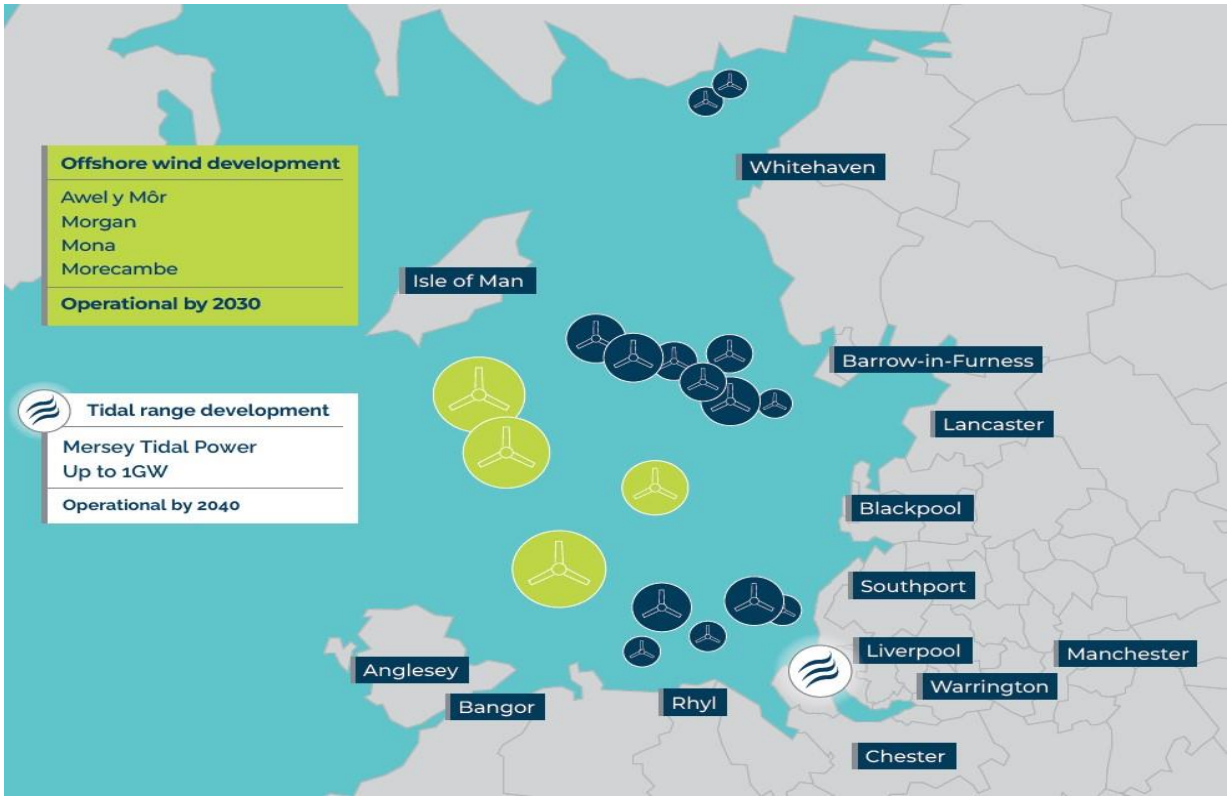

Plate 1.1: Site Context

1.4.2 The Liverpool City Region and surrounding Irish sea has already established considerable offshore wind assets and has four more major schemes in development shown in **Plate 1.1**. The Project will provide additional diversity and increased security of domestic electricity supply in line with Government ambitions for Net Zero, Security and Resilience.

1.4.3 The Project will have generating capacity of up to 1 GW, provide the first-ever above ground connection between the banks of the Mersey, in Liverpool, creating the potential for active travel, flood protection and climate mitigation responses.

1.4.4 The Project consists of the following main components:

- A tidal range barrage located within the channel of the Mersey Estuary which contains:
  - A Power Generation System with control equipment and a sub-structure housing turbines with an expected electrical output of up to 1 GW;
  - A Hydro Control System (including sluice gates);
  - A Marine Navigation System (including locks);
  - A Power Export System;
  - Onshore operational facilities including control centre, maintenance, stores and office buildings, car parks; and
  - Associated rock armour and breakwaters.
- An onward grid connection to a National Grid substation or other substations; and
- Utilisation of the surrounding port facilities during the construction phase in addition to other potential associated developments which may support the construction phase.

1.4.5 Further details of the Project and its associated development are presented in **Chapter 2: Site Context and Project Description**.

1.4.6 The tidal barrage will generate electricity using energy captured by turbines from the large tidal range which can be up to 10 metres (33 feet). The tidal range is the difference between high and low water and is a distinguishing feature of the Mersey Estuary.

1.4.7 Electricity can be produced as dual generation using the rising tide (flood) and then again using the outgoing tide (ebb) from the twice daily tides. One-way generation is also possible, when the tide is allowed to 'flood' in through the sluice gates and turbines without generation with electricity then produced with the falling tide (ebb) only.

1.4.8 The electricity will be exported from the tidal barrage to the National Electricity Transmission System (NETS) via an existing National Grid substation or connected to other substations. It is anticipated that enough energy could be generated to power up to 300,000 – 500,000 homes.

1.4.9 The Project is a key contributor to Liverpool City Region's Pathway to Net Zero by 2040 and is a core component of the action being taken to directly tackle the

climate emergency that the City Region has collectively declared. The drive to support clean and renewable energy generation across the region is a pillar of the City Region's ambitious commitment to achieving net zero carbon by 2040.

1.4.10 The Project has an expected operational life of 120 years, and creates a long-term investment in low-carbon energy, providing clean generation not just for 2040 or 2050 but onwards to 2150.

1.5 STRUCTURE OF THIS SCOPING REPORT

1.5.1 The objective of this Scoping Report is to identify the scope and level of detail of the information to be provided in the environmental statement. The latter will identify, describe and assess in an appropriate manner, in light of each individual case, the direct and indirect significant effects of the proposed development on the factors identified in Regulation 5 of the Regulations. The factors include population and human health; biodiversity, with particular attention to protected species and habitats; land, soil, water, air and climate; material assets, cultural heritage and the landscape and the interaction between each of the factors.

1.5.2 Where impacts that are unlikely to have a significant effect on relevant receptors are identified, they are proposed to be scoped out of the EIA if there is clear justification for doing so. This is outlined in **Chapter 3: Approach to EIA**.

1.5.3 Key consultees will be provided with information on the Project through this Scoping Report to allow for engagement on the scope. Feedback and comments on this Scoping Report will be sought from key consultees including the Planning Inspectorate and integrated into the EIA process.

1.5.4 Following the submission of the Scoping Report and receipt of the scoping opinion, the Applicant will continue to engage statutory consultees and non-statutory consultees throughout the ongoing phases of the Project in relation to EIA, the Habitats Regulations Assessment (HRA) and the Water Framework Directive. **Chapter 3: Approach to EIA** outlines the current proposed approach to this engagement.

1.5.5 The findings of the EIA will be reported in a Preliminary Environmental Impact Report (PEIR) and in an ES which will be provided in support of the application for development consent in addition to other assessments (see 1.5.10 below).

1.5.6 The results of the EIA will also be used to inform the detailed design of the Project and, where appropriate, mitigation measures will be incorporated to minimise residual effects on the environment or measures identified to enhance beneficial effects.

1.5.7 To allow feedback, this Scoping Report has been structured to provide an overview of the Project and describe the proposed content of the ultimate ES within the individual chapters.

1.5.8 This Scoping Report is accompanied by a HRA Screening Report in addition to the Water Framework Directive Scoping Report. A Health Impact Assessment (HIA) will be produced as part of the EIA, reviewing the receptors which are sensitive to potential health impacts.

1.5.9 **Chapters 1 – 4** provide an introduction and overview to the proposed content of the individual chapters of the ES as outlined in **Table 1-3**. For each environmental subject area (**Chapters 5 – 31**), the chapters in this Scoping Report have been structured as follows:

- Proposed assessment methodology;
- Study area;
- Overview of the existing environment baseline conditions;
- Embedded mitigation and commitments;
- The scope of potential impact to be assessed; and
- The scope of potential significant effects.

1.5.10 This Scoping Report is also supported by additional Appendices, which are referenced throughout, including **Appendix 1.1: Acronyms, Abbreviations and Glossary**.

1.5.11 The outputs of the EIA process, to be undertaken following receipt of the Scoping Opinion will be twofold:

- Preparation of a Preliminary Environmental Information Report (PEIR), produced in connection with the formal statutory consultation for the Project. The PEIR will present the current understanding of the potential likely significant effects of the Project at the time of the consultation and its purpose will be to provide information that enables interested parties, including members of the public, local authorities and statutory bodies, to understand the likely environmental effects so that they can provide meaningful feedback.
- The PEIR will be followed by the ES, which will be produced as part of the application for development consent for the Project. The ES will report on a detailed assessment of the likely significant effects resulting from the Project, the proposed mitigation measures to be implemented and the residual effects anticipated to arise following the implementation of that mitigation.

Table 1-3: Overview of Scoping Report chapters

Chapter Number	Title	Overview
1	Introduction	Introduction to the EIA Scoping Report, the Project and the Applicant.
2	Project Description	Outlines the description of the Project taking a Project Design Envelope approach for assessment of the Project and summary of the key design components.
3	Approach to EIA	Outlines the EIA process and the overarching methodology for EIA, and the structure of the EIA.
4	Planning and Policy	Outlines national, regional and local planning policy and technical guidance relevant to the Project.
5	Coastal Processes	Considers the likely significant effects on marine and coastal processes from the Project.
6	Benthic, Subtidal and Sediment Quality	Considers the likely significant effects on benthic and subtidal environments and sediment quality from the Project.
7	Invasive Non-native Species	Considers the likely significant effects on invasive non-native species from the Project.
8	Marine Mammals	Considers the likely significant effects on marine mammals from the Project.
9	Marine and Intertidal Ornithology	Considers the likely significant effects on marine and intertidal ornithology from the Project.
10	Fish and Shellfish	Considers the likely significant effects on fish and shellfish from the Project.

Chapter Number	Title	Overview
11	Commercial Fisheries	Considers the likely significant effects on commercial fisheries from the Project.
12	Underwater Noise and Vibration	Considers the likely significant effects on underwater noise and vibration receptors from the Project.
13	Terrestrial Ecology and Biodiversity	Considers the likely significant effects on terrestrial ecology and biodiversity from the Project.
14	Socio-economics	Considers the likely significant effects on socio-economic receptors from the Project.
15	Major Accidents and Disasters	Considers the likely risk from major accidents and disasters in relation to the Project.
16	Shipping and Navigation	Considers the likely significant effects on local shipping and marine transportation from the Project.
17	Marine Archaeology and Cultural Heritage	Considers the likely significant effects on marine archaeology and cultural heritage from the Project.
18	Terrestrial Archaeology and Cultural Heritage	Considers the likely significant effects on terrestrial archaeology and cultural heritage from the Project.
19	Water Resources and Flood Risk	Considers the likely significant effects on local water resources and the flood risk from the Project.
20	Land Use, Recreation and Tourism	Considers the likely significant effects on surrounding land uses, recreation and tourism from the Project.
21	Air Quality	Considers the likely significant effects on air quality from the Project.

Chapter Number	Title	Overview
22	Onshore Noise and Vibration	Considers the likely significant effects on onshore noise and vibration receptors from the Project.
23	Geology and Ground Conditions	Considers the likely significant effects on geology and Ground Conditions of the Project.
24	Terrestrial Traffic and Transport	Considers the likely significant effects on local traffic and transport resources from the Project.
25	Seascape, Landscape and Visual	Considers the likely significant effects on the local seascape and landscape and the visual impacts from the Project.
26	Infrastructure and Other Marine Users	Considers the likely significant effects on local infrastructure and marine users from the Project.
27	Civil and Military Aviation	Considers the likely significant effects on military, aviation and telecommunications receptors from the Project.
28	Greenhouse Gases	Considers the likely significant effects on greenhouse gases from the Project.
29	Climate Change Resilience	Considers the likely significant effects and resilience of the Project, with regard to future projected climate changes.
30	Materials and Waste	Considers the likely significant effects on natural resources and from waste from the Project.
31	Cumulative Effects	Considers the likely intra and inter cumulative significant effects from the Project.
Appendix 3.1	Commitments Register	Outlines the mitigation measures which the Applicant has committed to, which will avoid,

Chapter Number	Title	Overview
		minimise and reduce potential adverse environmental impacts during design, construction, operation and maintenance and decommissioning of the offshore elements of the Project.
Appendix 3.2	Outline Construction Environmental Management Plan	Outlines strategies and processes for control of construction activities to mitigate environmental effects.
Appendix 3.3	Habitat Regulations Assessment Screening Report	Assesses the potential of the Project to have likely significant effects (LSE) on European and Ramsar sites of nature conservation importance. Screening is the first stage of this assessment. Where a plan or project is likely to have a significant effect on a European site either alone or in combination with other reasonably foreseeable plans or projects then an Appropriate Assessment is then required as the next stage in the assessment.
Appendix 3.4	Water Framework Directive Scoping Report	Assesses the offshore and estuarine elements of the construction, operation and maintenance (O&M) and decommissioning activities of the Project in relation to requirements under the WFD.
Appendix 3.5	Health Impact Assessment	Outlines the potential health effects of the policy, programme or project and makes recommendations to enhance the potential benefits, while minimising the potential adverse effects, and reduce health inequalities.
Appendix 4.1	Planning and Policy	Outlines individual legislation, national and local planning policy of relevance to the EIA.

Chapter Number	Title	Overview
Appendix 4.2	Transboundary Matrix	Considers the likely significant effects on European Economic Area (EEA) States from the Project.

1.6 REFERENCES

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2 SITE CONTEXT AND PROJECT DESCRIPTION

2.1 INTRODUCTION

2.1.1 This Chapter provides an overview of the Project and its environmental and social context and characteristics in addition to describing the main components of the Project.

2.1.2 It also provides a description of the key activities to be undertaken during the construction, operation and decommissioning of the Project including the parameters, timescales and assumptions to be used as the basis of assessment.

2.2 OVERVIEW OF THE PROJECT

OVERVIEW

2.2.2 The Project will have a generating capacity of up to 1GW, connecting the banks of the Mersey, in Liverpool with an above ground structure, and creating the potential for active travel, flood protection and climate mitigation responses.

2.2.3 The Project consists of the following main components:

- A tidal range barrage located within the channel of the Mersey Estuary which contains:
  - A Power Generation System with control equipment and a sub-structure housing turbines with an expected electrical output of up to 1GW;
  - A Hydro Control System (including sluice gates);
  - A Marine Navigation System (including locks);
  - A Power Export System;
  - Onshore operational facilities including control centre, maintenance, stores and office buildings, car parks; and
  - Associated rock armour and breakwaters.
- An onward grid connection to a National Grid substation or other substations; and
- Utilisation of the surrounding port facilities during the construction phase in addition to other potential associated developments which may support the construction phase.

2.2.4 A range of other ancillary developments and facilities may also be required as part of the Project including access, utility connections, boundary treatments, security infrastructure, temporary and permanent laydown areas, hard and soft landscaping, drainage, cables, plant, and equipment. These are included within the stated design envelope and will be assessed as part of the EIA for the Project.

SCOPING BOUNDARY

2.2.5 The Scoping Boundary encompasses the main components as outlined in **Section 2.2.2** and **2.2.3** and covers an area of approximately 16.6km^2. This is shown on **Figure 1.1**.

2.2.6 This Scoping Boundary includes the likely areas where the Project will require permanent structures (such as the tidal barrage and potentially grid connection) and also temporary areas which facilitate the construction phase.

2.2.7 The Scoping Boundary has defined two Development Areas (shown in **Figure 2.1**):

- Tidal Barrage Development Area: The area within which the tidal barrage will be located within. This area currently encompasses approximately 2.4km^2.
- Grid Connection Development Area: The area within which the grid connection and its associated route may also be installed and currently covers an approximate area of 14.2km^2.

2.2.8 The Scoping Boundary also contains potential port and marine facilities which overlap the two Development Areas.

2.2.9 The Applicant is progressing ecology studies, engineering design, ground investigation and stakeholder engagement to determine the final location and alignment of the tidal barrage within the Tidal Barrage Development Area. The final location will be refined following receipt of the Scoping Opinion and responses from the non-statutory consultation.

2.2.10 The potential route corridors for Grid Connection will be further defined, based on final alignment of the tidal barrage and the confirmed National Grid / SP Energy Networks Connection point(s).

DESIGN ENVELOPE

2.2.11 In accordance with industry standard practices “the Rochdale Envelope”, a parameter-based “design envelope” approach has been adopted in respect of

the Project. The design envelope approach is widely used for major infrastructure projects in the UK, and is recognised by the Planning Inspectorate in their guidance Advice Note Nine: Rochdale Envelope (Planning Inspectorate, 2018) which states:

"*At the time of the Scoping Request, it may be necessary to leave certain matters open. For example, details of the Proposed Development may not have been finalised and, indeed, may not be finalised for some time…..*"[1]

2.2.12 The maximum design envelope is intended to identify key parameters that are suitable to enable scoping of environmental assessments to be carried out in a robust and proportionate manner. This will also enable the subsequent Environmental Impact Assessment (EIA) to be based on a description of the location, design and size of the Project that is suitable to allow a comprehensive assessment of its likely significant environmental effects, whilst retaining sufficient flexibility to accommodate further refinement during detailed design. Further details of this approach are provided in **Chapter 3: Approach to EIA**.

2.2.13 At this stage, a maximum envelope has been used, with maximum parameters provided where relevant. The assessments contained within this EIA Scoping Report therefore assess a worst-case scenario or present options, including a worst-case option. The design envelope will be refined as the Project continues to evolve through the key subsequent stages of the iterative design and EIA process, culminating in the preparation of an Environmental Statement (ES) that will form part of the application for Development Consent.

2.3 SITE CONTEXT AND CHARACTERISTICS

RIVERINE, ESTUARINE AND MARINE ENVIRONMENT

2.3.2 The UK has some of the largest tidal ranges in the world, with the north-west region of the UK having a tidal range (the difference between Mean High Water Springs (MHWS) and Mean Low Water Springs (MLWS) of 7.2m at Llandudno, 8.27m at Liverpool, 8.49m at Heysham and 7.42m at Workington. These are measured at the UK's tidal recording network.

2.3.3 The North-West Coast is suited to Tidal Range scheme deployment. Tides are predictable with a time of 12h 25.2 minutes from peak to peak and a pattern that repeats itself every 17.6 years.

[1] Paragraph 4.5

2.3.4 The River Mersey flows from the Peak District in the North-West of England, through Manchester and Warrington and then out to sea at Liverpool. The River is tidal up to Warrington and has the second highest tidal range in the UK.

2.3.5 **Table 2-1** provides an overview of the reference water levels at the Liverpool Tide Gauge taken from the UK National Tidal and Sea Level Facility for the years 2008 - 2026 and UK Admiralty chart 3490 (The National Oceanography Centre, 2024).

Table 2-1: Water Levels

Sea Level	Chart Datum 2020 (mCD)	Ordnance Datum 2020 (mOD)
Highest Astronomical Tide (HAT).	10.37	5.44
Mean High Water Springs (MHWS).	9.39	4.46
Mean High Water Neaps (MHWN).	7.45	2.52
Mean Sea Level (MSL).	4.93	0
Mean Low Water Neaps (MLWN).	3.16	-1.77
Mean Low Water Springs (MLWS).	1.12	-3.81
Lowest Astronomical Tide (LAT).	0.02	-4.91

2.3.6 The following section provides an overview of the environmental characteristics of the surrounding area.

Estuarine Environment

2.3.7 The Mersey Estuary stretches for a distance of approximately 48 kilometres (km) from the upper tidal limit of Howley Weir in Warrington to the sea (as seen on **Plate 2.1**). At its widest point, between Oglet on the north shore and Ince Bank on the south, it is approximately 4.5km across.

2.3.8 From the mouth of the estuary, the Mersey passes through the ‘Narrows’ – a substantial area of reclamation over 200 years on the Liverpool side of the River (right bank). The lower ‘bowl’ of the Mersey is adjacent to the Manchester Ship Canal, which together with the River Weaver are all interconnected through locks and sluices.

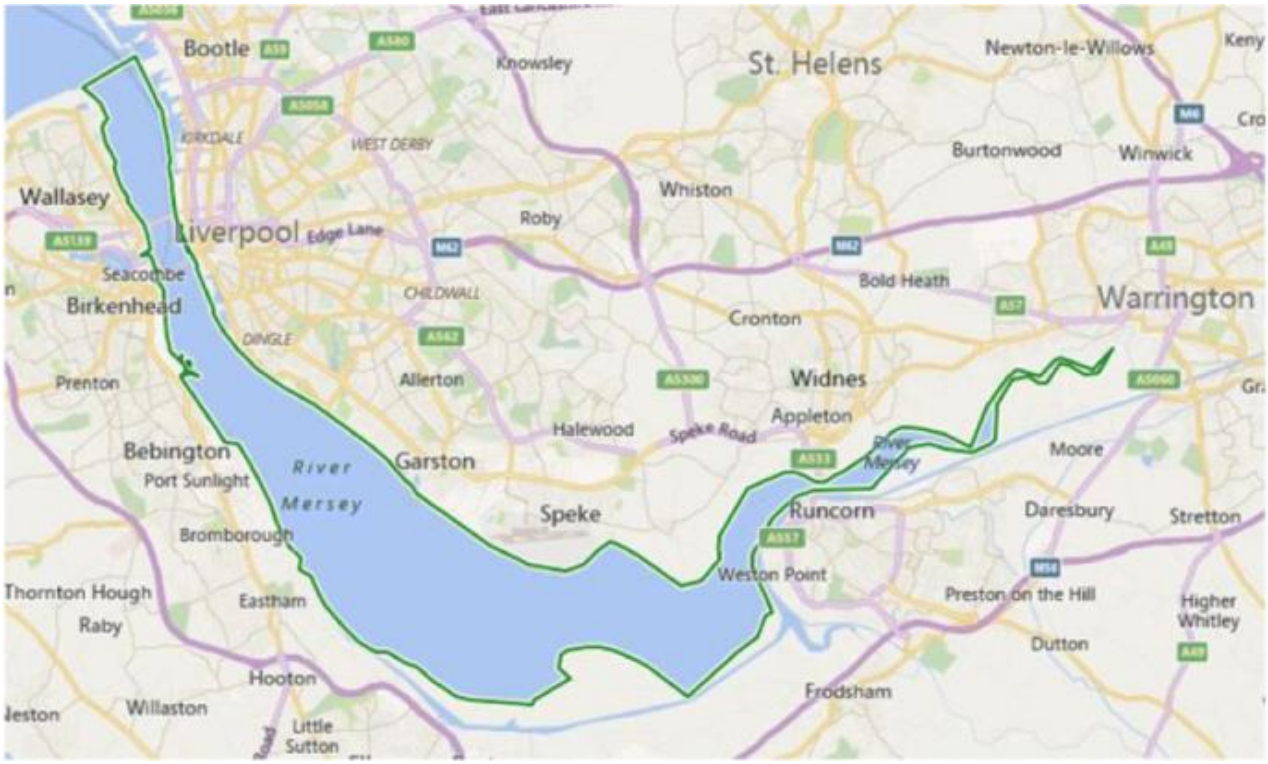

Plate 2.1: River Mersey

Riverine Environment

2.3.9 Water quality in the River Mersey has been severely affected by industrialisation in the region. The Tidal Barrage Development Area sits within the Mersey Water Body which has a water body type of transitional water and a hydro-morphological designation of heavily modified. The ecological status is classified as 'Moderate' whilst the chemical status is 'Fail'. The Target Status is 'Good by 2027'.

2.3.10 Chemical and Petro-chemical industries remain active on the River from Liverpool to the upper reaches of the Mersey, Manchester Ship Canal and River Weaver.

2.3.11 Discharges from Water Treatment Works (WTW) are present in the Tidal Barrage Development Area.

2.3.12 The River Mersey has undergone an extensive clean up known as the Mersey Basin Campaign. Beginning in 1985, this 25-year government backed scheme aimed to clean up the entire river system. Efforts continue to this day, with the Mersey Rivers Trust working to preserve, restore and develop the local rivers and waterways (Mersey Rivers Trust, No Date).

Marine Environment

North West Marine Plan

2.3.13 Marine plans are intended to set out detailed policy and spatial guidance for a particular area. The Project is located within English waters covered by the North West Marine Plan, published in 2021 to provide guidance for sustainable development and inform decision-making (HM Government, 2021). The vision for the Plan lists areas such as Liverpool as acting as catalyst for further regional development.

2.3.14 The Project lies within the 'North West Inshore Area', which stretches from the Solway Firth border with Scotland to the River Dee border with Wales (as shown in **Figure 2.2**). The Plan contains a number of policies as listed in section 1.4 of the Plan.

2.3.15 The North West Marine Plan sets out the following four objectives in relation to achieving a sustainable marine economy:

- Infrastructure is in place to support and promote safe, profitable and efficient marine businesses.
- The marine environment and its resources are used to maximise sustainable activity, prosperity and opportunities for all, now and in the future.
- Marine businesses are taking long-term strategic decisions and managing risks effectively. They are competitive and operating efficiently.
- Marine businesses are acting in a way which respects environmental limits and is socially responsible. This is rewarded in the market place.

Shoreline Management Plan

2.3.16 Shoreline Management Plans (SMPs) identify the most sustainable approach for managing the risk from coastal flooding and erosion over the short (0 to 20 years), medium (20 to 50 years) and long (50 to 100) term. Local authorities and the Environment Agency have led the development of these plans, working together in regional Coastal Groups.

2.3.17 The Tidal Barrage Development Area lies within the Great Ormes Head to Scotland SMP, specifically within the Llandudno to Southport 11A area (as shown in Figure 2.2). The Wirral peninsula separating the Dee and Mersey estuaries includes a range of commercial and industrial assets, with major cities such as Liverpool encompassing substantial residential areas (Department for

Environment Food and Rural Affairs, No Date). The Units of relevance are as follows:

- Unit 11A7.1 which encompasses the left bank of the River Mersey from Perch Rock to Riverwood Road / Eastham Park employs a 'hold the line' approach to adapt to flood risk and erosion.
- To the south of this, lies Unit 11A7.2 on the left bank stretching from Eastham Park to Eastham Ferry. Currently, there are no active interventions in place for this Unit.
- The next section, Unit 11A7.3, runs from Eastham Ferry to Runcorn Bridge and maintains a 'hold the line' approach. The summary management approach states that there is currently potential for damage to the internationally designated sites (17 are referenced within the SMP Unit approach) in the long term that would need to be offset elsewhere within the SMP. Adaptation to coastal changes is recognised as potentially being needed in addition to risks from flooding, erosion and ground stability.
- Situated on the right bank of the River Mersey is Unit 11A7.9, which runs from Garston Industrial Estate to Seaforth. This Unit also maintains a 'hold the line' approach (Department for Environment Food and Rural Affairs, No Date). It is largely wharfage and urban development, including sea wall and promenade created in 1970's.
- The area to the south on the right bank, Unit 11A7.8, runs from Garston, around John Lennon Airport towards West Bank (Widnes), and is maintaining local activity only. This area is largely natural with some river wall in the vicinity of the railway bridge at Widnes.

ENVIRONMENTAL CONTEXT

Designated Sites

2.3.18 The estuary of the Mersey contains multiple national and international designations. The key sites within the area are:

- The Mersey Narrows and North Wirral Foreshore is of national and international importance as a designated Site of Special Scientific Interest (SSSI), a Natura 2000 Special Protection Area (SPA)[2], Special Area of Conservation (SAC) and Ramsar site. Located at the mouth of the Mersey

[2] Natura 2000 designated sites references used at the time of writing but these are now also known as National Site Networks.

river, the site comprises large areas of saltmarsh and extensive intertidal sand and mud flats, with limited areas of brackish marsh, rocky shoreline and boulder clay cliffs.

- The intertidal flats are internationally important feeding grounds for waders: the site regularly supports more than 20,000 waterbirds, including 2.4% of the Calidris *Canutus islandica* (Redknot) population and 2.8% of the *Limosa lapponica* (Bar tailed Godwit) population. The wetland provides ecosystem services including shoreline stabilisation and dissipation of erosive forces, sediment trapping and water supply (Ramsar Sites Information Service, No Date,c).
- The Mersey Estuary, a designated RAMSAR, SSSI and Natura 2000 SPA site, is a large, sheltered estuary comprising large areas of saltmarsh and intertidal sand and mudflats.
- The site includes brackish marsh, rocky shoreline, and cliffs set in a rural and industrial environment. There are significant areas of river wall and wharfage.
- Internationally important numbers of various species of waterbirds feed and roost at the site in winter, or stage at the site in spring and autumn, notably *Charadrius hiaticula* (Common ringed Plover) (Ramsar Site Information Service, No Date,a).
- The Ribble and Alt Estuaries is a designated SPA and RAMSAR site comprising, extensive sand and mudflats, saltmarsh and dunes. The tidal flats and saltmarsh support internationally important populations of wintering waterbirds, vegetation communities and amphibian populations (Ramsar Site Information Service, No Date, b).

2.3.19 In addition, this area is overlapped by the Sefton Coast SAC and SSSI, characterised by the annex 1 habitats found there, including shifting dunes and fixed coastal dunes with herbaceous vegetation. As well as the annex 2 species Petalwort (Petalophyllum ralfsii) and Great crested newt (Triturus cristatus) (Joint Nature Conservation Committee, No Date).

2.3.20 The Ribble and Alt Estuaries are outside the Scoping Boundary.

Additional Designated Sites

2.3.21 Additional designated sites include within 10km are as follows and as shown on **Figure 2.3**:

- Liverpool Bay Marine Protection Area (MPA) and SPA;

- Sefton Coast SAC;
- Dee Estuary SAC;
- Dibbinsdale SSSI;
- Meols Meadows SSSI;
- Thurstaston Common SSSI;
- The Dungeon SSSI;
- Heswall Dales SSSI;
- New Ferry SSSI; and
- Multiple local nature reserves.

2.3.22 Only the Liverpool Bay, New Ferry and Meols Meadows sites are within the Scoping Boundary.

Scheduled Monuments and Heritage

2.3.23 Multiple scheduled monuments are found within and near to the Scoping Boundary (as shown in **Figure 2.4**), including:

- Birkenhead Priory;
- Bromborough Court House;
- Site of church and churchyard in Upton;
- Irby Hall;
- Storeton Hall;
- Speke Hall; and
- West Derby motte and Bailey Castle.

2.3.24 The Liverpool Maritime Mercantile city, is a former United Nations Educational, Scientific and Cultural Organisation (UNESCO) designated World Heritage Site (listed 2004 – Delisted 2021). This was a collection of six locations in Liverpool (right bank).

URBAN ENVIRONMENT

2.3.25 This includes the residential, commercial, infrastructure and industrial settings of the Project.

Residential Areas

2.3.26 Liverpool City Region has a population of c. 1.6m across the six Local Authorities (Halton, Knowsley, Liverpool, Sefton, St Helens and Wirral). According to the Office of National Statistics (ONS), 2021, the population size of Liverpool is 486,100 and Wirral is 320,200 (Office for National Statistics, 2022).

2.3.27 On the Wirral side of the Project, the town of Wallasey is located north of the Kingsway Tunnel towards the mouth of the estuary, with the suburbs New Brighton and Egremont located closest to the River Mersey.

2.3.28 Major residential development is progressing at Wirral Waters between Wallasey and Birkenhead and is also progressing across Liverpool Waters between the Pier Head and Bramley Moore Dock (new Everton FC Stadium). Major regeneration continues in Liverpool North, with the redevelopment of the Tobacco dock buildings and surrounding areas.

2.3.29 South of the Kingsway Tunnel and on the eastern side of Wirral, are the towns of Birkenhead, Bebington and Bromborough, which includes the residential suburbs of Tranmere, New Ferry and the villages of Port Sunlight and Eastham.

2.3.30 On the Liverpool side of the Project and beyond the mixed-use (marine, industry, offices) frontage to the river, to which the A565 runs perpendicular, lie the more residential areas of Seaforth, Kirkdale and Vauxhall.

Infrastructure

2.3.31 There has been significant marine infrastructure development within the Mersey and Liverpool region over the last century. The frontage of the River Mersey is dominated by the area's maritime and industrial heritage, with port and dock facilities along the water's edge. Historically, the River Mersey has always been a gateway for transatlantic transportation and the cargo industry. Over the last two decades, the scale and type of new marine infrastructure has included a new container terminal, offshore wind farms, a road bridge and additional port and landing stages.

2.3.32 On the Liverpool side of the Project, the bank of the Mersey has a series of port facilities (Royal Seaforth Dock, Gladstone Lock, Langton Lock, Bramley Moore Dock, Princess Dock, Pier Head, Liverpool Marina and Garston Dock).

2.3.33 The restrictions in vessel size that can be handled by Seaforth Dock, through Gladstone Lock, resulted in a significant expansion of wharfage to produce the Liverpool 2 deep-water container terminal, purpose built for its strategic location

to import and export markets (Peel Ports Group, No Date) and support US and Asia freight routes.

2.3.34 Commercial port facilities on the Wirral side include Birkenhead Docks, Cammell Laird Shipyard, Tranmere Oil Terminal, Mersey Wharf, Queen Elizabeth II dock and the entrance to the Manchester Ship Canal at Eastham.

2.3.35 Coastal structures are also present along the Wirral coast, with Wirral Council being responsible for 19 miles of sea and river walls between the borough boundaries. This includes a large sea wall built to protect New Brighton from coastal flooding (Wirral Council, No Date). Known as the King's Parade Sea Wall, the curved design of the wall was constructed in the 1930's to reduce the impacts of the waves (Coastal Processes, No Date). An additional rock defence scheme was completed in 2022, covering a 1.1km stretch of north Wirral, to protect residential properties and significant environmental designations from coastal flooding (Wirral Globe, 2022).

2.3.36 Ferry terminals are located at Birkenhead, Seacombe, Woodside and Eastham on the left bank (Wirral) and Bootle, Princes Dock and Pier Head on the right bank (Liverpool). Services that operate include:

- Eastham to Vigo;
- Woodside / Seacombe to Pier Head;
- Birkenhead to Belfast;
- Bootle to Dublin;
- Bootle to Belfast; and
- Princess dock to Isle of Mann.

2.3.37 There are two toll road tunnels within the Scoping boundary, that cross underneath the Mersey, which carry the A59 (Kingsway Tunnel – twin bore) to and from Wallasey and the A41 (Queensway Tunnel – single bore) to and from Birkenhead. There is also a railway tunnel within the Scoping Boundary between Hamilton Square station in Birkenhead and St James station in Liverpool used by Merseyrail trains and owned by Network Rail.

2.3.38 Two toll road bridges span the River Mersey, north of Runcorn and connecting the towns of Runcorn and Widnes, the Silver Jubilee Bridge and the Mersey Gateway Bridge (both carrying the A533). Neither are within the Scoping Boundary.

2.3.39 There is also a railway bridge adjacent to the Silver Jubilee Bridge between Runcorn and Widnes. This carries the West Coast Main Line from Liverpool to London.

2.3.40 The Silver Jubilee Bridge is the first 'over-river' crossing on the Mersey to offer pedestrian and cycling crossing.

2.3.41 Burbo Bank Offshore and Extension windfarm lies approximately 10km north of Wallasey on the Burbo Flats in the Liverpool Bay and is an operational windfarm, generating up to 348 megawatts (MW). There are 12 further offshore wind farms off Liverpool in the Irish Sea.

2.3.42 The Lennox and Hamilton gas fields are in Liverpool Bay, and visible from Liverpool City Centre.

Industrial Features

2.3.43 South of the Kingsway Tunnel on the left bank, the Mersey is bordered primarily by industry, including chemical and food storage, Tranmere Oil Terminal, the Cammell Laird shipyard, Eastham Oil Refinery, Energy from Waste generation, STOR units and various other industrial estates and properties, including brownfield land.

2.3.44 The Manchester Ship Canal (MSC) entrance locks are located at Eastham, providing access to Ellesmere Port wharfs, Stanlow Oil Refinery and on to Runcorn, Warrington and Irlam. The Queen Elizabeth II Dock at Eastham is located alongside the entrance to the Manchester Ship Canal and accommodates marine tankers that are too large to enter the MSC. Substantial petro-chemical manufacturing extends from Ellesmere Port to Runcorn.

2.3.45 Garston Dock on the Liverpool side is used for small freight and bulk materials / aggregates. The docks are adjacent to the Garston Rail Freight Terminal and close to the Mersey Estuary Business Park, and the Automotive manufacturing and medical production centres at Halewood.

2.3.46 There is also substantial manufacturing and distribution facilities on the Liverpool side of the Mersey around Widnes including the Mersey Multi-Modal Gateway (3MG) sites that includes heavy industry, rail, energy from waste and food production.

2.3.47 The major coal generation power station (2000MW) at Fiddlers Ferry near Widnes has now closed and commenced decommissioning and dismantling.

Social and Recreational Features

2.3.48 Seacombe, Egremont and Magazines Promenades run on the bank of the river north of Seacombe Ferry Terminal and provide a largely traffic free route along the north-western section of the Wirral, adjacent to the Mersey.

2.3.49 South of Seacombe Ferry it is possible to follow the river and near river cycle way to Eastham country park.

2.3.50 On the Liverpool side, there is no current public for large sections of the river front from Seaforth to Princess Dock.

2.3.51 From Princess Dock there is generally a continuous pathway to Cressington including an area of park land at Festival Gardens, adjacent to open space and playing fields at Otterspool with a traffic free promenade, which also forms part of the Transpennine trail.

2.3.52 On the Wirral, near to the river, there is the educational centre at Eureaka, the Floral Pavilion at New Brighton, Perch Rock Fort and the wider resort facilities

2.3.53 Liverpool City Centre contains multiple heritage and recreational facilities, including, near to the river, Royal Liver Building, British Music Experience, the Maritime Museum, Tate Liverpool, The Beatles Story Museum, Royal Albert Dock, the new Everton Stadium, Exhibition Centre Liverpool and the M&S Bank Arena.

MARINE TRAFFIC

2.3.54 An initial marine study has indicated that around 25,000 vessel movements in and out of the Mersey Estuary. with around ~60,000 vessel movements within the estuary (includes Mersey Ferries). Around 30% of marine traffic movement entering the Mersey is destined for Liverpool 2 or Seaforth / and Gladstone Dock.

2.3.55 According to the Department for Transport, an average of 32 million tonnes of freight is processed through the Port of Liverpool each year, with 33,422 freight vehicles moving through the port in 2022.

2.4 DESCRIPTION OF THE TIDAL BARRAGE

2.4.1 The following sections provide a description of the main components of the tidal barrage and indicative key parameters.

2.4.2 The tidal barrage will be a permanent structure across the River Mersey providing above ground connectivity between Liverpool and Wirral for the first time. It will contain multiple marine turbines that generate electricity from renewable tidal range energy.

2.4.3 The barrage has the potential to provide an active travel route for pedestrians and cyclists, and flood protection as a mitigation against future sea level rise.

2.4.4 The tidal barrage would contain the following components which are described in more detail below and as partially shown on **Plate 2.2**.

- A Power Generation System with control equipment and a sub-structure housing turbines with a maximum electrical output of up to 1GW;
- Hydro Control System;
- Marine Navigational System; Marine Navigational System including locks allowing ships to pass;
- Power Export System; and
- Onshore operational facilities.

- The configuration of the various components of the tidal barrage is subject to further detailed design and so is subject to change; for example the Marine Navigational Systems could be in the centre of the structure, and the arrangements of the Power Generation System and Hydro Control System could change.
- The barrage will be a partially submerged structure, with the vast majority of the structure beneath the water level and into the estuary bed. The tidal barrage will be made of reinforced concrete or similar material, with various steel components (subject to detailed design).

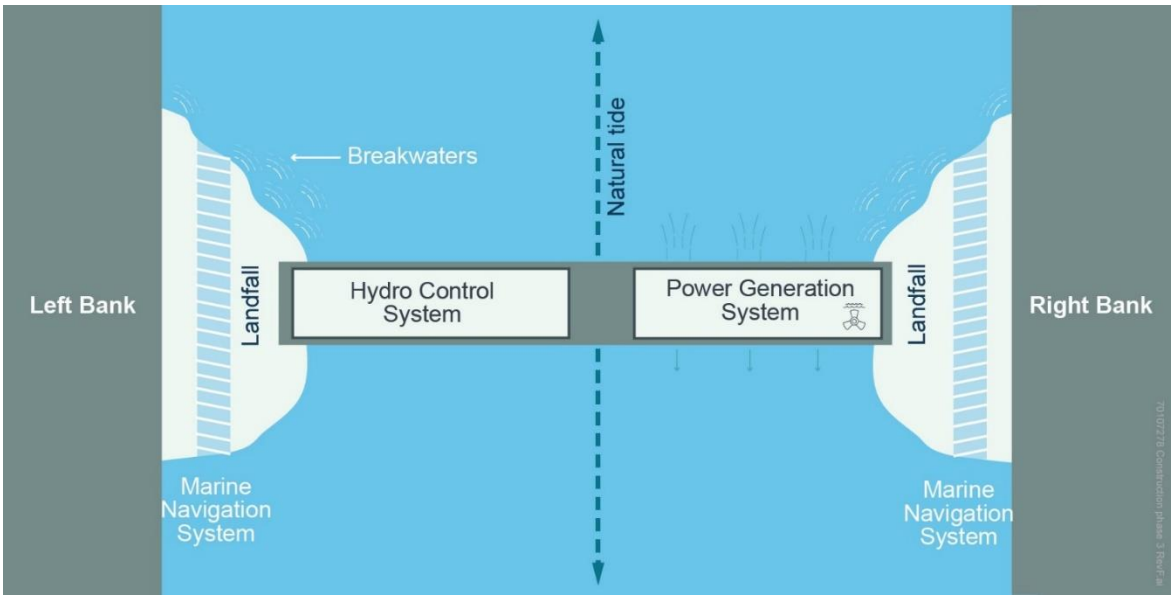

Plate 2.2: Indicative Configuration

2.4.5 The tidal barrage is expected to operate for 120 years or more and would generate electricity utilising the energy available from the tidal range (up to 10.37m in height) within the Mersey Estuary.

2.4.6 The approach to construction has not been finalised and could involve a temporary coffer dam, modular caissons and in-situ caissons. The different construction techniques will require aspects of enabling works, construction and assembly within the marine and terrestrial environments.

2.4.7 Once operational, the tidal barrage will include new offices, workshop facilities and car park and related security fencing, lighting and closed-circuit television (CCTV). Operation and Maintenance equipment such as a gantry crane will be provided and be able to travel along the length of the tidal barrage structure.

Table 2-2: **Indicative Parameters for Tidal Barrage**

Description	Parameter
Maximum width of river channel	Structure up to 2km in length to cross bank to bank within Tidal Barrage Development Area.
Maximum Height of Tidal Barrage above Water.	+7.2m AOD (level with onshore roads and 2040 HAT at 6.9m AOD. +8.5m AOD parapet on either side. Gantry crane height up to 40m AOD.

Description	Parameter
Maximum Depth below Water (to CD).	-30m AOD

Connection to the Bank

2.4.8 As shown in Plate 2.2, there is likely to be an area of reclamation land (reclaimed from river) at each end of the structure. A breakwater will protect the reclamation areas and provide access to structure.

2.4.9 The breakwaters will be a watertight structure likely consisting of a concrete or rock filled core, faced with rock or suitable material, with a height commensurate with climate change predictions. These will be similar in appearance to, but higher than, the Groynes already present in the river around the Wirral promenade.

2.4.10 The size of the breakwaters will depend on the final design configuration but it is anticipated to be approximately up to 600m of the bank to bank distance within the channel.

Table 2-3: Indicative Parameters of the Breakwaters

Description	Parameter
Total length (from up to 2 areas to left and right banks).	Up to 600m.
Crest Level (currently estimated).	8.5m AOD seaside for wave overtopping.

POWER GENERATION SYSTEM

2.4.11 The Power Generation System is contained within the tidal barrage structure, housing up to 50 no. bi-directional turbine generators mounted into the structure with an inlet and outlet draft tube allowing water to enter and leave the turbine casing and drive the turbine blades to produce electricity.

2.4.12 A typical cross-section is shown in **Plate 2.3**.

2.4.13 The turbines will be fixed or variable speed bulb type (or similar), and likely with the bulb orientated upstream. The final number, dimensions and model of the individual turbine cannot be confirmed until design and procurement has

progressed. The arrangement of a single turbine is included for information in **Table 2-4** below.

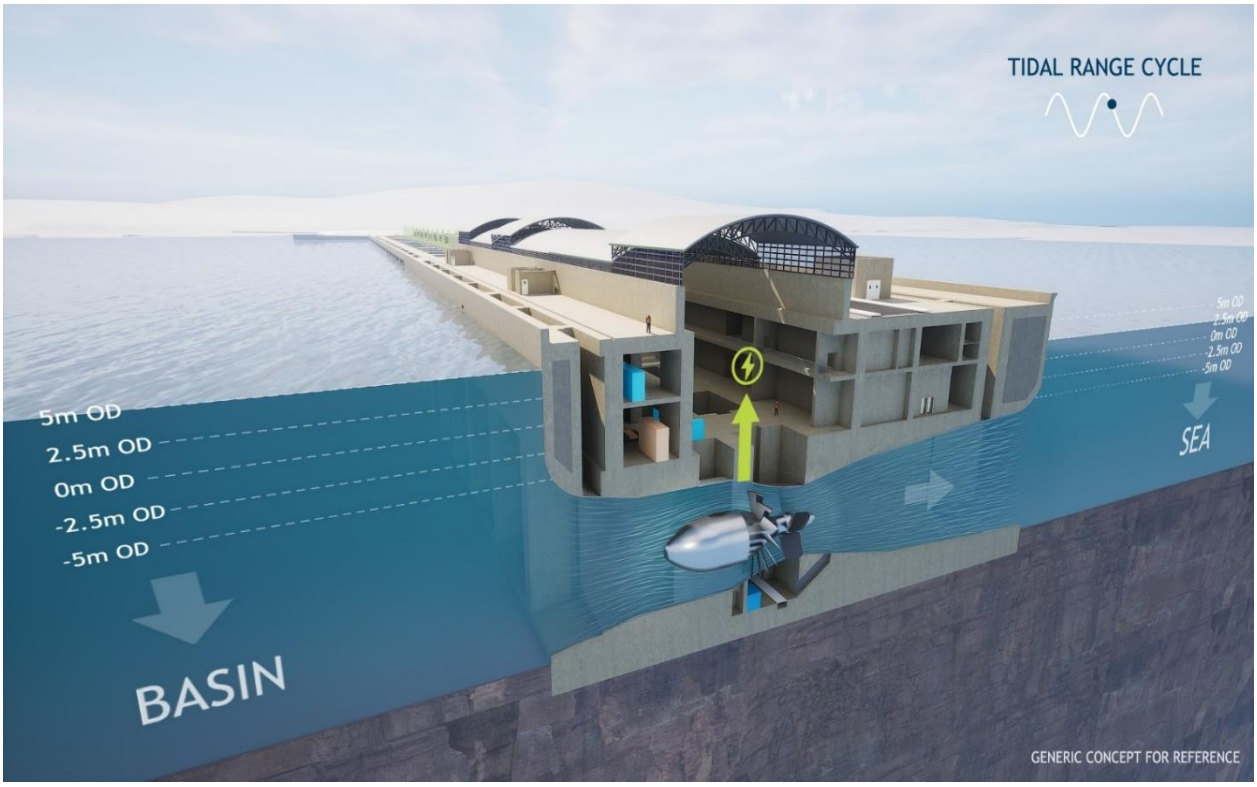

Plate 2.3: Typical Cross Section of Power Generation System

2.4.14 The turbines will be fully submerged at all times and could be located in the deepest part of the River channel which is approximately -23.5m AOD. The electricity would be produced as either one way or two-way generation using the incoming (flood) and outgoing (ebb) tides or a combination of both.

2.4.15 The draft tubes that allow water to enter and leave the structure are wider in diameter than the turbine. On some occasions the entry to the draft tubes may be visible above the water level.

2.4.16 A debris screen may be required, subject to further research and will be confirmed at Development Consent Order (DCO) Submission.

2.4.17 Stop log grooves will be present on each of the draft tubes, allowing stop logs to be dropped into position at each end of the tubes. This allows a turbine to be closed off from the River and facilitate de-watering of the structure during maintenance.

Table 2-4: Indicative Parameters for Power Generation System

Description	Parameter
Maximum number of turbines.	Up to 50 no.
Maximum MWe per turbine.	Up to 30MWe.
Maximum speed per turbine.	95 rpm (dependent upon manufacturer).
Indicative operational flow.	Minimum flow 150m^3/s. Maximum flow 500m^3/s.
Maximum diameter of turbine. Indicative width of draft tubes.	10m (dependent upon manufacturer). 20m (dependent on design).
Indicative depth (of structure).	-30m AOD.

2.4.18 The Power Generation System would also include a variety of auxiliary systems to support operation and wider equipment including internal cranage, firefighting equipment, pumps for dewatering and shaft sealing emergency provisions in addition to low pressure air systems for ventilation, electrical network and oil treatment systems.

2.4.19 A cooling water system will also be required for the turbines. This is likely to primarily take the form of pipework which would also connect to another water supply system (for example for firefighting) before being discharged to the channel but could also include a coolant. This will be confirmed through the detailed design stage.

HYDRO CONTROL SYSTEM

2.4.20 The Project will incorporate a Hydro Control System structure in the form of vertical or radial sluice gates. The Hydro Control System consists of stationary foundation units and movable gates to allow water to pass when required. The foundation units are partially submerged. Sluice gates are required to control water levels and flows.

2.4.21 The main foundation units are likely to be reinforced concrete with the sluice gates a combination of reinforced concrete / steel and other materials.

Table 2-5: Indicative Parameters of Hydro Control System

Description	Parameter
Maximum number of sluice gates.	Up to 50.
Indicative sill level.	-17.5m AOD.
Maximum depth (of structure).	-30m AOD.
Minimum width (of structure).	Up to 70m.

2.4.22 A cathodic protection system may also be used to protect other steel elements such as steel reinforcement in concrete where it is exposed to alternate wetting and drying. Other steel elements not continuously submerged may also have passive (coating or sacrificial elements) rather than active cathodic protection. This will be confirmed within the ES.

2.4.23 As with the Power Generation System, stop log grooves will be installed to enable dewatering for maintenance and inspection events.

MARINE NAVIGATION SYSTEM

2.4.24 The tidal barrage will include a Marine Navigational System likely to be in the form of a combination of locks, which will allow for navigation of marine vessels during the operation of the tidal barrage. The lock could be located together on one side of the structure or on both sides. Locks will be sized based on vessel requirements (such as large leisure, commercial and military vessels).

2.4.25 The size and number of locks are subject to further studies and discussions with port operators. The locks will be operated from a control room and be operational for 24 hours, all year round.

2.4.26 As part of the Marine Navigation System, there is the potential for guide walls to create a navigation channel on approach to the tidal barrage providing vessel access to facilities upstream.

2.4.27 This could take the form of a guide wall, as an extension perpendicular to the barrage. Where a guide wall is proposed there may be need to consider embankment work to ensure the channel is navigable and can be maintained.

2.4.28 Navigational equipment and controls will be required as part of the Project to aid vessels who need to approach or transit the tidal barrage. These will include buoys, dolphin piles, visual barriers, signs and safety zones.

2.4.29 In addition, it is anticipated that the Harbour Master and Maritime and Coastguard Agency (MCA) will require any vessels (during construction and operational phases) to display the correct lights and shapes / sounds and signals in accordance with the International Regulations for Preventing Collisions at Sea (COLREGS).

ONSHORE OPERATIONAL BUILDINGS

2.4.30 The tidal barrage will also require a range of Onshore Operational Buildings which will include operational, maintenance, stores, offices buildings, control room and car parks.

2.4.31 As part of the Power Export System, there will be the need for a control equipment, switch house and substation.

2.4.32 The Onshore Operational Buildings may be distributed across the barrage structure and the reclaimed land areas.

POWER EXPORT SYSTEM

2.4.33 The electricity produced by the Turbine Generators will be collected via a range of equipment in the Power Export System (cables, control cubicles, transformers and export substation).

2.4.34 The tidal barrage requires an overhead line or underground cable connection route in order to transmit the electricity generated by the tidal barrage to the National Grid Transmission System or to SP Energy Networks distribution system.

2.5 CONSTRUCTION OF THE TIDAL BARRAGE

2.5.1 The following sections provide a description of the construction phase. Final construction methods have not yet been developed, therefore an illustrative method is provided and is subject to further studies:

PREPARATION AND ENABLING

2.5.2 The construction phase may be preceded with some site preparation works such as exclusion of public areas for safety purposes, road and public access diversions in addition to removal of street furniture and utilities.

2.5.3 Construction would require the establishment of site compounds and working areas adjacent to both structure landfalls. This area will include laydown,

storage, aggregate receipt and batching plants, offices, changing rooms and workshops.

2.5.4 Dredging of river material and soil treatment of river bed may be required whereby the sediments and / or bedrock is injected with concrete to prepare and stabilise the ground for the construction of the temporary or permanent structures. Further geotechnical investigations and analysis of river bed will confirm the requirement and extent of this (if and where required).

2.5.5 From each bank, areas of reclaimed land will be created. This will consist of a breakwater wall being created by placing rock and aggregate from predominantly marine vessels but potentially the use of land transport.

CONSTRUCTION OF THE MARINE NAVIGATION SYSTEM

2.5.6 Construction of the Marine Navigational System will likely involve dredging and installation of temporary coffer dam, or other similar structure, with a watertight diaphragm wall in order to provide a dry working area. A coffer dam would extend from and around the reclaimed area and could be installed using percussive or vibro-piling techniques to install sheet piles. Once the coffer dam is installed, the area will be dewatered.

2.5.7 It is anticipated that the Lock walls, floors and gates will be a combination of in-situ and offsite manufacture. The completion of the Lock facilities is expected to be an early Project activity to allow a route for the passage for vessels

CONSTRUCTION OF HYDRO CONTROL SYSTEM & POWER GENERATION SYSTEM

2.5.8 These structures are likely to be constructed either or in a combination of the following methods:

- Within a dry working area with a coffer dam (see example in Plate 2.4). The coffer dam would be installed and then dewatered to enable the dry working area. As construction progresses, where required, pre-fabricated concrete units will be lifted into place using cranes (either within the coffer dam or marine based). Once construction is complete, the coffer dam is removed; or
- Using pre-fabricated caissons which would be towed to the marine working area at high tides and potentially using buoyancy aids. Dependent upon the height of the tides, the caissons may be required to be temporarily sunk in a downstream position within close proximity to either the right or left banks. It is then refloated and towed to the final location. The pre-fabricated caisson is then sunk into position using water, concrete or sand ballast, and positioned

using cranes located on either the adjacent structures or on mobile vessels. It may also be possible to use previously dredged material although this would be subject to further testing for suitability.

Plate 2.4: Example image of coffer dam La Rance Tidal Barrage under construction in a coffer dam (reproduced courtesy EdF)

2.5.9 If caissons are required, it is envisaged that these would be fabricated in an offsite port outwith the immediate Liverpool area or be fabricated locally within a graving dock close to the marine working area.

2.5.10 Preparatory works such as localised dredging and soil treatment would be undertaken in advance of the installation of the System structure. The channel of the Mersey Estuary is still navigable throughout these construction activities.

COMPLETION WORKS

2.5.11 Once the tidal barrage is fully installed across the channel, the top slab will be cast across the top of the tidal barrage and the surface prepared for operational access. Any remaining rock armour or protection measures would be installed,

landscaping would be completed and the tidal barrage would be ready for commissioning.

KEY PRINCIPLES

2.5.12 The above section outlines an example sequence of construction, however until detailed design, further surveys are undertaken, the likely sequence is subject to refinement and change. For example, at present it cannot be confirmed whether the Power Generation System will follow the Hydro Control System construction or vice versa, however at some point, the structure is completed and that requires the Marine Navigation Systems to be commissioned and operational. Therefore the Applicant has embedded key principles within the construction sequencing. These include:

- Minimised impediment to natural tidal cycles throughout the construction phase; and
- Navigation will be possible throughout the construction phase.

2.5.13 The Applicant also intends for the construction phase to be predominantly contained within the marine environment, including delivery of large equipment and materials to the working area. However terrestrial works such as construction routes, compounds and access will be required in the immediate vicinity of the tidal barrage landfalls.

MARINE WORKING AREA, LOGISTICS & EQUIPMENT

2.5.14 A 1km marine working area will be required upstream and downstream of the confirmed tidal barrage location. This is to allow for temporary facilities, dredging, engineering works, potential areas to sink pre-fabricated structures if required and installation of marine protection and safety measures (for example, navigational aids for the locks).

2.5.15 Any existing marine safeguarded areas will be avoided where possible to limit interference with existing operations and where this is unavoidable appropriate management plans will be put in place to limit the impacts.

2.5.16 The Applicant intends for the Project to be predominantly marine based logistics for the delivery of materials and equipment, thereby minimising the requirement for terrestrial logistics as far as possible. The following marine vessels are anticipated to be required during the construction phase:

- Tugs;

- Supply and hopper barges;
- Excavators and dredgers;
- Mobile cranes; and
- Jack up rigs.

2.5.17 The tidal barrage is likely to use a wide range of marine plant and vessels including self-propelled modular transporters (SPMTs).

2.5.18 Workers will be distributed accordingly between the marine working areas, reclaimed areas and port and marine facilities. The proposals for work force transport within the work site have not been developed but may include temporary site access points, temporary bridges and if needed water taxis.

2.5.19 Land based construction vehicles will be required on the reclaimed areas and within coffer dams. These are likely to include excavators, transportation vehicles such as Moxy earth moving equipment, piling rigs and cranes in addition to concrete batching plants.

2.5.20 Vehicles and Equipment will be delivered to the Site in line with the corresponding activity for that equipment. Specialist equipment, such as piling rigs and cranes, will arrive at times of key activities taking place within the construction phase.

DREDGING

2.5.21 Dredging / excavation will be required to facilitate the installation of the main structures and will vary depending on the final location, configuration and construction method.

2.5.22 It is anticipated that between 7,000,000 to 20,000,000m^3 of material could be removed (dependent on confirmed location of the tidal barrage) within the marine working area. This would occur throughout the construction phase and whilst it is proposed to reuse as much dredged material as possible, should disposal be required, this would be in the following methods:

- Within a marine disposal facility either under control by the Applicant or a third party marine disposal area under agreement; or
- Contribute to a marine enhancement project within the locality (subject to testing and volumes).

CONSTRUCTION SCHEDULE

2.5.23 The construction schedule is dependent upon the final construction method, however it is envisaged that construction would be expected to be 7-10 years but will reflect the construction method and contracting model.

2.5.24 The Applicant acknowledges there are currently restrictions in place around pilotage of certain vessels when waves heights in the estuary exceed 1m. The Applicant expects restrictions will be in place to ensure safe working in the marine environment during construction and these will be developed further during front-end engineering and design (FEED) studies and subsequent construction planning.

TEMPORARY CONSTRUCTION LAYDOWN AND COMPOUNDS

2.5.25 The reclaimed areas on the left and rights banks will serve as the primary areas of construction compounds, containing welfare, offices and administration in addition to construction storage and laydown areas.

2.5.26 Secondary laydown and compounds may be established in port facilities in order to facilitate the Applicants commitment to maintaining marine based logistics.

2.5.27 Other ancillary structures may also include temporary wharf or jetties to facilitate water taxi style logistics for workers.

CONSTRUCTION UTILITIES

2.5.28 Power requirements are currently being developed, however it is anticipated that the use of diesel generators (or clean energy equivalents) may be required initially for a short duration until connections to the local power network can be established.

2.5.29 Potable water will be required during the construction phase and this is likely to utilise existing connections.

2.5.30 Effluent from construction activities and foul water from welfare facilities are expected to connect into existing facilities and networks given the proximity of urban areas.

WORKFORCE

2.5.31 It is anticipated that up to 5,000 temporary construction staff will be required at peak during the construction phase.

2.5.32 It has been assumed that the vast majority of the required construction workers at peak would come from within 1 hour commute of the Project and be focused on the tidal barrage. A small number would be required on the grid connection (if this remains part of the Project).

WORKING HOURS

2.5.33 It is envisaged that standard daytime working hours of 06:00 – 20:00 Hours on Monday – Friday and 06:00 – 18:00 Hours on weekends will be implemented during the construction phase, although these are subject to confirmation.

2.5.34 Longer durations may be required at peak and for critical path activities, working over weekends, at night and for 24 hours (such as for concrete pours). In these cases, it is anticipated that such hours would accord with the local authority's standard weekend / bank holiday requirements.

2.5.35 The only exception to this would be the delivery of pre-fabricated structures to the marine working areas which will be reliant on the tides. The required navigational safety messages and notifications will be made in addition to any other public announcements as required in such instances.

2.6 COMMISSIONING OF THE TIDAL BARRAGE

2.6.1 Commissioning is expected to last approximately up to 2 years and will vary depending on the final number of turbines and constructability phasing. This includes all aspects of the tidal barrage with the turbines specifically undertaking dry and wet tests (this includes load testing and no load testing).

2.6.2 Generation (for the purposes of testing and early production) will take place in advance of final completion date subject to the ability to allow vessels to navigate through the Marine Navigation System during this time.

2.7 OPERATION OF THE TIDAL BARRAGE

OPERATIONAL LIFESPAN

2.7.2 For the purposes of the EIA, it is anticipated that the Project will have a design life of up to 120 years. It is likely that operation can continue beyond this period but this would be subject to the applicable consents required at the time of application.

2.7.3 Active travel will remain throughout the operational lifespan of the tidal barrage and be linked to onwards active travel routes, with public realm and open space also available once operational.

GENERATION AND OPERATIONAL MODES

2.7.4 The tidal barrage has the ability to operate 24 hours a day, dependent on the tide movements, operational mode and requirement to generate. The tidal barrage can generate electricity by utilising either the incoming and outgoing (two way) or just outgoing (ebb) tidal movements with the Mersey Estuary channel without the need to utilise pumping. Depending on the operational mode, up to four generation periods is possible in a 24 hour period. Sluice gates within the Hydro Control System will facilitate the filling and emptying of the impoundment basin alongside the turbines within the Power Generation System.

2.7.5 Variable speed turbines offer improved efficiency and allow slower speeds to improve fish passage. They also have the ability to be used more efficiently in a pumping mode. Pumping mode can be used once the generation cycle has finished (in other words when the head difference is low) and is used to increase the volume of storage available for generation. It works on the principle of pumping at low heads and generating energy from the pumped water at a higher head thereby increasing net energy generation.

2.7.6 The mode of operation (combination of modes) for the tidal barrage will be developed based on final configuration and machine selection, with regard to future requirements such as generation demand and management of water levels.

WATER LEVELS DURING OPERATION

2.7.7 The Applicant recognises that one of the key considerations for tidal barrage schemes proposed within estuarine environments is the potential reduction in tidal range which could result in changes to water levels upstream of the tidal barrage.

2.7.8 Acknowledging the Mersey contains a significant area of designated intertidal mudflat, sandflat and saltmarsh areas in addition to its supporting qualifying features, modelling work has been undertaken to support establishment of a robust baseline from which the likely effects and impacts on associated habitats as a result of the development and operation of the tidal barrage can be judged.

2.7.9 During any operational mode of the barrage, if low water levels are raised, lower intertidal areas which are currently exposed to the natural tidal range will become

permanently inundated. Conversely, if high water levels are lowered, upper intertidal and salt marsh areas may be permanently exposed.

2.7.10 In addition, as the tidal barrage has the ability to control the amount of water going in and out of the estuary and so can provide protection from sea level rise and tidal flooding to areas upstream of the structure. Using a representative location south of the Mersey Tunnels (an area known as the Narrows), initial modelling has highlighted the potential alleviation benefits (see **Plates 2.5** and **2.6**).

2.7.11 Reference and nominal locations within the Tidal Barrage Development Area have also been utilised for hydrodynamic modelling, demonstrating that effects depending on the operation mode can be anticipated, noting that the water levels within the Mersey estuary vary considerably from spring to neap tides. This is outlined in more detail in **Chapter 5: Coastal Processes**.

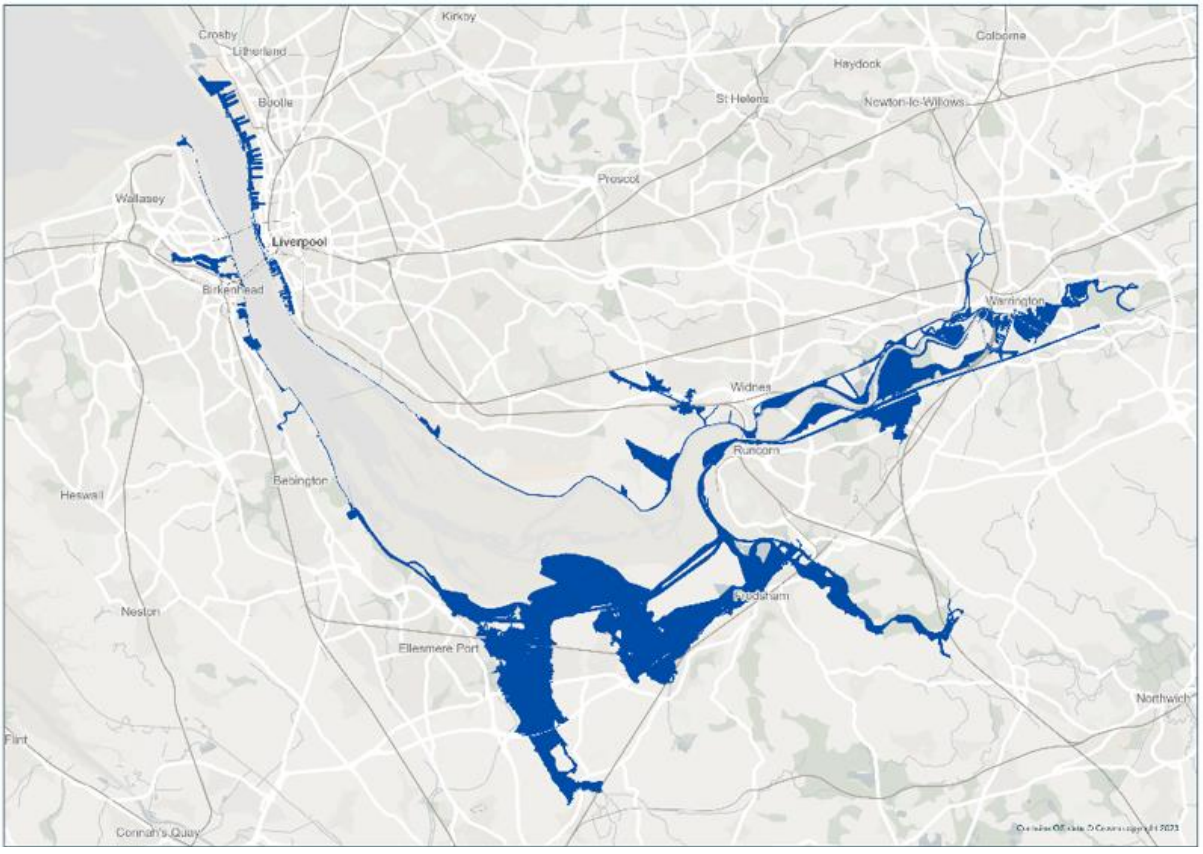

Plate 2.5: Predicted flood extent at year 2150, mean sea level – tide only

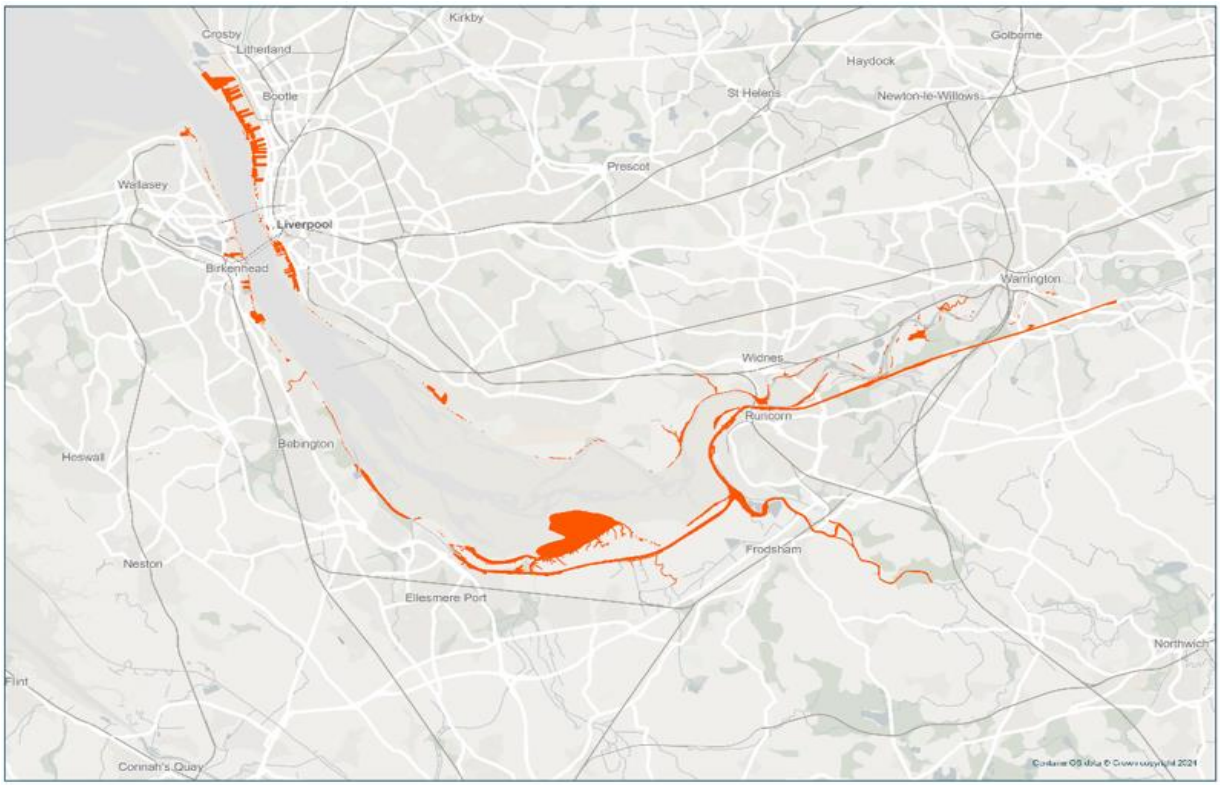

Plate 2.6: Predicted flood extent at year 2150, mean sea level, with barrage located south of the Mersey Tunnels - tide only

EMERGENCY SCENARIOS

2.7.12 In the event of an emergency scenario, the tidal barrage will be able to allow the natural tidal flows in and out of the estuary through the sluice gates, or conversely restrict flows coming in or out by partial closure. These emergency scenarios could be triggered by flood conditions from a tidal surge, or upstream rainfall.

MAINTENANCE

2.7.13 Maintenance activities will range from daily observations of the structures to the required frequency of inspections and replacement of equipment and machinery throughout the operational lifespan of the Project.

2.7.14 Internal cranes within the tidal barrages structures and workshops will aid the movement of heavy machinery. Externally It is anticipated that this will require vehicles such as vans and heavy goods vehicles (HGVs) for day to day maintenance.

2.7.15 The following maintenance frequencies are anticipated throughout the operational lifespan.

Table 2-6: Indicative Design Life and Major Maintenance Periods

Element	Design Life (minimum)	Major Maintenance
Main civils structures (locks, Powerhouse, sluice gate structures).	120 years	40 years
Breakwaters	120 years	N/A
Turbines	40 years	12-20 years
All control equipment.	15 years	N/A
Sluice gates and lock gates.	50 years	15-20
Stop Logs	30 years	15 years

MAINTENANCE DREDGE

2.7.16 In order to maintain continuous operation and navigation of the tidal barrage, dredging is likely to be required. The frequency will be confirmed subject to the chosen location of the tidal barrage. It is anticipated that water injection methods will be used around the operational tidal barrage, allowing the sediment to

remain within the channel and settle accordingly. Whilst unlikely, should any significant dredging be required, therefore generating larger volumes, offsite disposal may be considered if necessary.

UTILITIES

Power Generation

2.7.17 The tidal barrage will generate electricity which will be exported via the Power Export Systems. However, the tidal barrage may require import power from pumping operations and for Onshore Operational Buildings and facilities such as external lighting. The former will be sourced from the Grid Connection and the latter from the distribution network connection.

Potable and Wastewater

2.7.18 It is assumed that connections to local networks will be possible.

Surface Water

2.7.19 Rainwater falling on the barrage structure (namely from the access road across the top of the barrage) will collate into dedicated surface water drains and discharge to the Mersey.

WORKFORCE

2.7.20 Once operational, the tidal barrage will employ approximately 70-100 direct full time equivalents (FTEs) in order to undertake operational engineering activities, manage the control room and within the administrative buildings.

2.7.21 An additional temporary workforce would be required during the maintenance activities.

2.7.22 There is the potential for further employment within other ancillary buildings such as public realm or the visitors centre. This will be confirmed as part of the DCO process.

SAFETY

2.7.23 Safety zones will be implemented for both navigational and human safety to avoid any potential damage to property or persons from vessel allision or human interference with any part of the tidal barrage structure.

2.7.24 Lighting will be required during the hours of darkness on the tidal barrage structure. This will include navigational lighting, security and amenity.

2.8 DECOMMISSIONING OF THE TIDAL BARRAGE

2.8.1 It is the assumption for the EIA that the Project will be decommissioned at the end of the operational lifespan, either prior to or at 120 years. It is recognised that wholesale decommissioning is not appropriate for the tidal barrage given the proposed length of operational life and the environmental equilibrium which will have established during this time.

2.8.2 For the purposes of the EIA is its assumed that:

- All terrestrial ground structures will be demolished and removed at ground level or just below.
- Any concrete materials will be crushed, with other materials such as metal, sorted and recycled where possible.
- Some removal of materials off-site is likely by road and possibly via marine vessels. It is anticipated that the turbines will be removed, and sold or recycled.
- Any below ground structures will be left in-situ, including piles, pipework, and cables.
- It is anticipated that the breakwaters will remain in situ and erode over time as per natural processes.

2.8.3 A Decommissioning Plan (including environmental management) will be prepared at the appropriate time to consider the potential risks of decommissioning the relevant elements of the Project. It will include details of marine infrastructure available and appropriate at the time, other routes for offsite removal of materials and likely phasing of activities.

2.8.4 It is anticipated that any removal works will take approximately 12 months depending on level of decommissioning agreed with stakeholders and confirmed in the Decommissioning Plan.

2.9 GRID CONNECTION

POINT OF CONNECTION

2.9.1 Depending on the confirmed location of the tidal barrage and subject to discussions with National Grid, the tidal barrage has the potential to connect to

four existing substations. These are contained within the Grid Connection Development Area (as shown on **Figure 2.5**) and are; Birkenhead (275kV), Capenhurst (400kV), Lister Drive (275kV) and Breck Road Substation (132kV).

2.9.2 The Applicant has been in discussions with National Grid regarding a suitable connection with capacity of up to 1GW assumed to be in place by 2035 to enable the current commissioning date of 2035, and operation by 2038 of the Tidal Barrage.

2.9.3 The refinement and confirmation of the routes will be progressed through 2024 and early 2025 and therefore the areas outwith the routeing corridors shown on Figure 2.5 are still required to allow for potential routes until this decision is made.

2.9.4 The Applicant is liaising with National Grid over the capacity available in each of the connection points in addition to the responsibility for the consenting and implementation of the grid connection. Therefore, this may not remain within the remit of this Project but at present is included.

ROUTEING

2.9.5 Significant upgrade plans have been published in the Electricity System Operator (ESO) Beyond 2030 report (2024) which outlines upgrade plans for the northern element of the Mersey Ring network from 275kV to 400kV within the timeframe for the Tidal Barrage. This would create new capacity and higher voltage connection in the northern part of the Mersey Ring at Lister Drive, and new capacity in the Southern part of the Mersey Ring, at Birkenhead.

2.9.6 If the Mersey Ring re-enforcement is realised, then there is potential for a shorter connection point(s) for the Project. If the Mersey Ring re-enforcement is not realised then a connection to Capenhurst will possibly be required.

2.9.7 The grid connection to Birkenhead, Capenhurst or Breck Road Substation could be a 275kV buried underground cable for the entirety of the terrestrial route from the Power Export System to the point of connection at the existing substation(s). Alternatively, it may involve the restringing and reinforcement of the existing overhead lines. This will be confirmed at Preliminary Environmental Impact Report stage and assessed accordingly.

2.9.8 For connection to Lister Drive substation there is the option to utilise the existing underground route via Queensway tunnel and existing disused railway tunnels.

2.9.9 Depending on the final location of the tidal barrage, there may be the requirement to have a section of the grid connection cable within the marine environment before it transitions to the terrestrial route.

INSTALLATION, OPERATION AND DECOMMISSIONING

2.9.10 The construction of the grid connection is likely to take up to 3 years (depending on the installation method), but could be less depending on the point of connection and length of route.

2.9.11 If the cable is buried, both open cut and trenchless techniques will be considered. Trenchless techniques may be utilised on sensitive areas or for crossing existing utilities, roads and watercourses and also in urban environments unless open cut is also possible.

2.9.12 Construction compounds will be required along the route, and near crossing locations where trenchless techniques are employed so that entry and exit pits can be installed.

2.9.13 Localised improvements to the existing substation are anticipated.

2.9.14 Once the operational life has ceased, it is assumed that all above ground structures associated with the grid connection (for example jointing bays and substation) will be removed to 1m below ground level and the area reinstated. The cable is likely to remain insitu if buried.

2.10 OTHER ASSOCIATED DEVELOPMENT

PORT AND MARINE FACILITIES

2.10.1 Several existing port facilities have been identified within the Scoping Boundary given their location and ability to support the Project in addition to being nominated within the Spatial Development Strategy (SDS) (Liverpool City Region Combined Authority, No Date). The Applicant is exploring options to utilise these existing and established areas for temporary construction laydown and compounds, and as such, no construction phase is anticipated for these facilities. Some site preparation works may be required, and this will be confirmed in the Preliminary Environmental Impact Report (PEIR). Subject to the confirmed location of the tidal barrage and construction method, the required port and marine facilities will be refined.

2.10.2 Once the construction phase is complete, any port and marine facilities utilised will be reinstated as agreed with the site operators.

OFFSITE CONSTRUCTION WORKER ACCOMMODATION AND LOGISTICS

2.10.3 At present no project specific worker accommodation (i.e. worker village) is proposed as it is assumed that sufficient workforce is available within commuting distance, and that sufficient temporary accommodation will be available for any workforce travelling in for the Project construction phase.

2.10.4 In addition, no offsite logistics facility (road logistics hub or worker park and ride) has been identified at this stage to support construction. For the purposes of this Scoping Report it is assumed that all workers and traffic will travel to the Project utilising existing public transport options and individual means.

2.10.5 If required, the Applicant will confirm the requirement for these offsite facilities in the PEIR for the purposes of consultation. A worker accommodation strategy will be included with the DCO application.

MARINE DISPOSAL AREA

2.10.6 It has not yet been determined whether a project specific marine disposal area may be required. This will be determined following further refinement of the likely volume of dredged material to be generated, availability in existing disposal areas and also the potential for reuse in construction works and ecological enhancements (both subject to the required testing and suitability). This will be confirmed within the PEIR.

2.11 ENHANCEMENTS AND OPPORTUNITIES

ARCHITECTURAL DESIGN

2.11.1 All operational, permanent buildings and the aesthetic of the tidal barrage will be designed for safety and functionality, but where possible the Applicant will embed architectural design which is in keeping and respectful of the surrounding environs. The Applicant will be mindful of and respond to guidance in Overarching National Policy Statement for Energy (EN-1), section 4.6 ‘Criteria for “Good Design” for Energy Infrastructure’ which advises on high quality in aesthetics and function. In addition, the recently published National Infrastructure Commission “Design Principles for National Infrastructure” will also be considered.

VISITORS CENTRE

2.11.2 There is the potential for a visitor centre associated with the Project, and the Applicant is in discussions with local stakeholders on the potential requirement

and likely location of this facility. This may be in close proximity to the tidal barrage but could equally be located close to other attractions, with a key viewpoint looking towards the tidal barrage.

2.11.3 Based on other tidal schemes across the world, up to 100,000 visitors a year could be attracted to such a facility. The Applicant continues to engage on the potential for this feature.

FISH PASSAGE

2.11.4 At present it is not proposed to construct a dedicated fish passage given the use of the hydro-control system structures. However, this will be reviewed subject to further baseline surveys and consultation with stakeholders.

TEMPORARY CONSTRUCTION STRUCTURES

2.11.5 Any localised ancillary structures which are required to support the construction phase will be decommissioned and removed when the construction phase is complete. However those structures which may not pose a navigational risk could remain or be repurposed if a suitable responsibility for their maintenance can be established and secured. The Applicant is exploring these opportunities and will identify any such opportunities through ongoing engagement.

2.12 ENVIRONMENTAL MANAGEMENT AND SAFETY MEASURES

CONSTRUCTION ENVIRONMENTAL MANAGEMENT PLAN

2.12.1 An Outline Construction Environmental Management Plan (OCEMP) will be prepared and submitted as part of the ES to record mitigation measures proposed to minimise potential effects such as noise, vibration, dust and disturbance to terrestrial and marine receptors. The OCEMP will be the mechanism that ensures the successful management of the likely environmental effects resulting from the construction activities. A full CEMP will need to be prepared by the Applicant's appointed contractor ahead of works commencing.

2.12.2 The OCEMP will provide the overarching framework for other topic specific management plans which will be prepared as part of the EIA process. **Chapter 3: Approach to EIA** outlines the likely framework of management plans which will be prepared but this list is not exhaustive and will be informed by continuing liaison with the relevant bodies with a Commitments Register contained within **Appendix 3.1**.

LIGHTING

2.12.3 Construction lighting will be required for both critical path activities which require working at night and also for security. The location, type and also lux levels will be designed accordingly to avoid likely significant effects to nearby users, residential dwellings and also ecological features such as bats. Further detail on the proposed lighting strategy will be available in the ES for assessment.

NAVIGATIONAL MEASURES DURING CONSTRUCTION

2.12.4 The use of marine vessels for the purposes of construction activities is likely to reach its peak during the completion of the Hydro Control and Power Generation Systems given the parallel activities during this time. Safety zones will be implemented throughout the construction phase.

2.12.5 If pre-fabricated caissons are required, these will be towed in to position and so there may be the requirement to manage interactions any other navigational movements in the Mersey channel for safety reasons to allow safe passage for these units to their required position. This may be required for specific tidal conditions and their duration (over neap tidal cycles) but this will be confirmed once the construction method is chosen. This is essential for safety reasons as once the towing vessels have entered the channel, given the weight and momentum of the pre-fabricated structures, stopping these structures is challenging.

PROXIMITY DISTANCES

2.12.6 Safety zones or proximal buffers will be implemented during the construction phase in order to avoid and / or minimise adverse effects. These will be identified and agreed once the final location of the tidal barrage is confirmed but are likely to include COMAH and industrial sites, other infrastructure (such as the Mersey Tunnels) and areas of urban development. It is also acknowledged that John Lennon Airport has an extended centreline safety zone. This will be confirmed via consultation and contained within the ES.

2.12.7 Specific requirements will be confirmed through engagement and consultation with the relevant parties once the location of the tidal barrage is confirmed.

CRANE ARCS

2.12.8 The maximum height of cranes utilised during the construction phase may be above 145m. As per Civil Aviation Authority guidance (2021), aviation lighting will be installed where necessary.

MATERIALS

2.12.9 The construction phase is expected to require substantial volumes of materials such as buildings materials (concrete, bricks and blocks), steel, pipework and cables and organic materials.

2.12.10 Likely volumes are currently being investigated and will be available for assessment within the EIA process. The Applicant is currently reviewing sustainability proposals during the construction phase and will confirm a target as part of the PEIR.

2.12.11 Construction materials will be sourced by marine activities such as existing port dredging activities or the re-use of construction phase dredging materials. Terrestrial logistical methods are also possible for lesser volumes of materials. Any materials delivered to site are likely to have been sourced within the UK (with the exception of locally won marine materials and any pre-fabricated structures which are made in an offsite port facility).

2.12.12 A Waste Management Plan will be prepared and included with the ES. This will also include the outline of a Materials Management Plan, both of which will be completed and finalised by the Principal Contractor.

2.13 REFERENCES

Civil Aviation Authority, (2021). *CAP1096: Guidance to crane users on the crane notification process and obstacle lighting and marking*. Available online at: https://www.caa.co.uk/our-work/publications/documents/content/cap1096/ (Accessed: May 2024).

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3 APPROACH TO EIA

3.1 INTRODUCTION

3.1.1 This Chapter describes the principles of Environmental Impact Assessment (EIA) and the approach being taken to identify and evaluate likely significant effects of the Project on the environment. The approach to Scoping is outlined, along with the broad principles relating to the establishment of baseline conditions, embedded environmental measures, and the methodology for the assessment of effects that will be adopted for the EIA. This Chapter also sets out the proposed stakeholder engagement that will be undertaken as part of the EIA process. The proposed temporal, spatial and technical scope of the environmental assessments are also described.

3.2 EIA SCOPING

3.2.1 Effective EIA Scoping enables agreement to be reached on the aspects and methodologies to be taken forward and reported in much greater detail in the Environmental Statement (ES). Whilst voluntary, the EIA Scoping Report refines the scope of the assessment and focus on the key issues. It also provides an opportunity for early interaction with stakeholders, strengthening the assessment evidence base through the collation of desk based and site specific data and allowing active participation of interested parties in project development and decision-making. This can in turn improve project design, environmental performance and social acceptability.

3.2.2 For the purposes of the EIA and this Scoping Report, the term ‘impacts’ is used to describe the changes that arise as a result of the Project (for example, changes in the river and surrounding environments) and the term ‘effects’ are the consequences of those changes (for example, habitats and practises of reliant ecological species which are changed by an alteration in the river composition, flows or tidal ranges).

3.2.3 Schedule 4 of the Infrastructure Planning (Environmental Impact Assessment) Regulations 2017 (HM Government, 2017) and Schedule 3 of the Marine Works (Environmental Impact Assessment) Regulations 2007 (HM Government, 2007) states that the description of the likely significant effects should cover the direct effects and any indirect, secondary, cumulative, transboundary, short-term, medium-term and long-term, permanent and temporary, positive and negative effects of the development.

3.2.4 The EIA will consider all of these types of effects in the environmental aspects outlined in Chapters 5 to 31 considering the topic specific requirements such as the use of source-pathway-receptor analysis, assessing likely significant effects and any modelling or assessment tools which may need to be utilised.

3.2.5 Whilst some terms are self-explanatory, a definition of effects has been provided to confirm how these terms will be applied throughout the EIA process:

- Direct effects: Those effects that result directly from the Project, i.e. effects that are made directly to a receptor. An example would be effects of construction activities on species and habitats.
- Indirect and secondary effects: Those effects that are not caused immediately by the Project but arise as a consequence of it. An example would be where indirect employment is created as suppliers increase their activities and hire new workers to provide the additional goods and services required by the Project.
- Inter-related effects: Effects resulting from two or more project impacts acting together, to result in a new or changed effect on a single receptor.
- Cumulative effects: Effects resulting from the combined impacts of the Project with other projects / plans on the same single receptor.
- In-combination effects: Effects resulting from the combined impacts of the Project with other projects / plans on European Sites within the national site network.

3.2.6 The Scoping Opinion of the Planning Inspectorate, on behalf of the Secretary of State (SoS), is being sought on the following:

- The environmental aspects that should be assessed within the ES;
- The likely significant effects of the construction; operation and maintenance; and decommissioning of the Project;
- Those effects that are not likely to be significant and can be scoped out of the EIA;
- The approach to defining the study areas for each environmental aspect;
- The data that has been gathered and will be gathered to support the assessments;
- The assessment methods that will be used to determine likely significant effects;

- The approach to determining the environmental measures that could be incorporated into the Project to avoid, reduce or compensate for significant effects; and
- The approach to the assessment of cumulative and inter-related effects.

3.2.7 Under Regulation 10(6) of the EIA Regulations, the SoS must undertake consultation with statutory consultation bodies, including environmental bodies (such as Natural England, the Environment Agency and Historic England) and relevant planning authorities (Liverpool City Council, Wirral Borough Council, Sefton Borough Council, Cheshire West and Chester Council amongst others) before adopting a Scoping Opinion.

3.2.8 Ongoing dialogue will be held between the Applicant and the Planning Inspectorate, local authorities and stakeholders with regards to the scope of the assessment, and with a view to reaching agreement over the scope. Future changes in the design of the Project or new environmental information will also be subject to discussion over whether there is a need for any consequent changes to the scope of the assessment.

3.3 STAKEHOLDER ENGAGEMENT

3.3.1 Effective stakeholder engagement and consultation is intrinsic to the Planning Act 2008 (HM Government, 2008) and fundamental to the success of the Project.

3.3.2 The process of engagement is critical to the development of a comprehensive and balanced ES. The views of statutory and non-statutory consultees serve to focus the environmental studies and to identify specific issues that require further investigation and will be an ongoing process.

3.3.3 The Project has a wide range of stakeholders (including landowners, statutory consultees, local communities, local industry, infrastructure, port and marine facility operators, cultural interest groups and specialist interest groups) with differing interests that will require varied levels of consultation. Specific communication activities therefore need to be focussed to meet the needs of particular individuals and groups. This requires an understanding of the stakeholders and their interests in the Scheme.

3.3.4 Stakeholder engagement for the Project is based on the following principles:

- Early and ongoing engagement to inform and influence the design process and survey programme;

- Seeking feedback in the iterative design and assessment process and taking this feedback into consideration;
- Building of long-term relationships with key stakeholders throughout the different stages of the Scheme to help better understand their views;
- Addressing concerns where possible and practicable; and
- Ensuring appropriate statutory consultation is undertaken in compliance with requirements of the Planning Act 2008 (HM Government, 2008), EIA Regulations (HM Government, 2017) and associated guidance.

PREVIOUS AND ONGOING STAKEHOLDER ENGAGEMENT

3.3.5 The Applicant and Liverpool City Region Combined Authority has undertaken significant engagement on the Project over the last four years in various different aspects. This includes scheme development, technical engagement on hydrodynamic modelling, baseline survey data collection and marine licence applications for baseline surveys.

3.3.6 This engagement has taken place with a range of stakeholders, including (but not exclusive to) the following:

- The Environment Agency (EA);
- Natural England (NE);
- Historic England HS);
- The Marine Management Organisation (MMO);
- The Crown Estate Commissioners (CEC);
- The Crown Estate (TCE);
- Natural Resources Wales (NRW);
- Wildlife Trusts - North West Wildlife Trust (NWWT), Cheshire Wildlife Trust (ChWT), Lancashire Wildlife Trust (LWT) and Cumbria Wildlife Trust (CuWT;
- The Mersey Estuary Conservation Group (MECG);
- Centre for Environment, Fisheries and Aquaculture Science (CEFAS);
- The North-West Inshore Fisheries & Conservation Area (NW-IFCA);
- Mersey Rivers Trust (MRT);
- Mersey Gateway Environmental Trust (MGET);
- Dee Estuary Conservation Group (DECG);

- North West Coastal Monitoring Group (NWCMG);
- Nature Connected (NC);
- The Nature Partnership (NP);
- Royal Society for Protection of Birds (RSPB);
- Lancashire Environmental Record Network (LERN); and
- Surrounding local authorities including Liverpool City, Sefton, Chester West & Chester, St Helens, Knowsley and others.

3.3.7 This engagement has predominantly been through discussive and collaborative workshops on technical environmental matters including an Environmental Stakeholder Forum which has been held regularly since 2020. Key project environmental issues, such as surveys and hydro-dynamic modelling, have been discussed, as outlined in **Table 3-1**.

Table 3-1: Environment Stakeholder Group Engagement Undertaken to Date

Workshop		Date	Agenda Topics	Invitation List
1	Project Introduction	14.10.2020	Environmental Strategy Environmental Constraints Environmental Stakeholder Plan Mapping and Scoring Environmental Constraints	EA, NE, RSPB, LWT, ChWT, NW-IFCA, HE, Cefas, MMO, NRW, LERN / Record, TCE
2	Workshop Engagement 2	11.11.2020	Environmental Constraints Mapping Outputs Environmental Data Evidence Strategy	EA, NE, RSPB, LWT, CWT, NW-IFCA, MMO, MRT, MGET
3	Project Status Briefing & Environmental Survey	30.06.2021	Initial Survey Approach (inc. fish, habitats and non-breeding birds)	NE, RSPB, LWT, NW-IFCA, HE, NRW, TCE, MRT, MGET, NWWT
4	Briefing on Environmental Survey and Scope	30.09.2021	Non-breeding bird survey scope and approach Environmental status update	EA, NE, LWT, NW-IFCA, HE, NRW, MRT, MGET, MMO
5	Project Status Briefing & Progress with Environmental Surveys	09.12.2021	Project status update Non-breeding bird survey scope and approach Habitats Fish - approach and baseline survey requirements Water Quality Ecological Survey Schedule Hydrodynamic modelling update Evidence Plan approach	EA, NE, LWT, NW-IFCA, HE, NRW, MRT, MGET, MMO, TCE, RSPB, CWT, NWT
6	Progress with In-River Review and Habitats Scope	10.01.2022	Plan for topic-based technical discussions moving forward Habitat Scope Discussion Update of Non-Breeding Birds	EA, NE, LWT, NW-IFCA, NRW, MRT, MGET, TCE, CWT

Workshop		Date	Agenda Topics	Invitation List
H1	Hydro-environmental Modelling Workshop 1	11.05.2022	Project Status Update Hydro-environmental modelling workplan Hydro-environmental model calibration and validation	EA, NE, LWT, MRT, MGET, TCE, DECG, MMO, NWT,MECG
7	MTPP Environmental Stakeholders Workshop 7	17.05.2023	Provide an update on project status Introduction to desk-based studies Update on surveys Progress report with Bird Surveys and desk-based study Wider Data Gathering and Analysis Hydro-environmental Modelling Update	EA, NE, LWT, MRT, MGET, TCE, DECG, MMO, NWT,MECG
8 & H2	MTPP Environmental Stakeholders Workshop 8 Hydro-environmental Modelling Workshop 2	30.08.2023	Provide an update on project status Hydro-environmental Modelling Update Update on desk-based studies and next steps for baseline surveys Update on surveys	EA, NE, LWT, MRT, MGET, TCE, DECG, MMO, NWT,MECG
H3	Hydro-environmental Modelling Workshop 3	13.11.2023	Hydro-environmental modelling update Main findings on energy, hydrodynamics, intertidal exposure and water quality Next steps for hydro-environmental modelling	EA, NE, Savills
9	MTPP Environmental Stakeholders Workshop 9	16.11.2023	Provide an update on project status Consenting Management Habitats and Licensing Hydro-environmental Modelling Update Update on surveys	EA, NE, LWT, MRT, MGET, MMO, NWT, RSPB, CWT
10	MTPP Environmental Stakeholders Workshop 10	14.02.2024	Provide an update on project status EIA & Engagement update Fish, MM and Birds update	EA, NE, MRT, MGET, MMO, RSPB, CWT, DECG, MECG,
11	MTPP Environmental Stakeholders Workshop 11	15.05.2024	Environment update Engagement update DCO process	EA, NE, MRT, MGET, MMO, RSPB, CWT, DECG, MECG,

3.3.8 A marine licence application has been granted (August 2024) (shown on **Figure 3.1**) to undertake further marine based surveys (ref MLA/2023/00552), and engagement has been undertaken to facilitate this determination.

3.3.9 In addition, the Applicant has undertaken further technical engagement on the approach to scoping with between May 2024 and July 2024 in advance of the Scoping Report being submitted. This engagement is outlined in more detail with the topic chapters, where these discussions have informed and shaped the approach to the EIA.

CONSULTATION REQUIREMENTS FOR NATIONALLY SIGNIFICANT INFRASTRUCTURE PROJECTS

3.3.10 The Development Consent Order (DCO) process has a number of statutory requirements regarding consultation. These requirements stipulate that certain stakeholder groups and the community must be consulted as part of the pre-application process, as set out in Sections 42, 47 and 48 of the Planning Act 2008 (HM Government, 2008) and Regulation 13 of the EIA Regulations (HM Government, 2017).

3.3.11 Further requirements set out how the Project must be publicised, and specific documents produced, including a Statement of Community Consultation (SoCC), Preliminary Environmental Information Report (PEIR) and a Consultation Report. In accordance with Sections 42, 47 and 48 of the Planning Act 2008 (HM Government, 2008) the Applicant will be holding a statutory consultation part way through the undertaking of the EIA to inform the community of our plans and seek their feedback. Feedback will be recorded and documented in a consultation report.

3.3.12 Feedback from both the non-statutory consultation and the EIA process will feed into the statutory consultation. In advance of formal submission of the ES, both non-statutory and statutory consultation and engagement will be carried out to give stakeholders and members of the public with an interest in the Project the opportunity to feedback on the Project and to inform the scope of studies, surveys and assessments being undertaken. This will be delivered in accordance with relevant legislation, guidance and best practice and will build on the feedback to be provided by consultees in the Scoping Opinion and further define the scope of studies, surveys and assessments, as required.

NON-STATUTORY CONSULTATION

3.3.13 A non-statutory public consultation will be held in late 2024 to introduce stakeholders and local communities to the Project and give them an opportunity to share their views.

3.4 APPROACH TO THE EIA PROCESS

3.4.1 An EIA is a process for identifying the likely significant environmental effects of a project (positive and negative) to inform the decision-making process for development consent. The EIA process will culminate in the provision of an ES, written in accordance with the EIA Regulations. The ES will describe the likely significant effects associated with the Project during its construction, operation and maintenance, and decommissioning phases.

3.4.2 The current Scoping phase involves a process to identify anticipated content of the ES and the various methodologies that will be used for the assessment. These will be discussed with key stakeholders prior to Scoping submission and based on recognised good practice and guidelines specific to each environmental topic or discipline as set out in **Chapters 5 to 31**.

3.4.3 The assessment phase of the EIA process comes next, which involves the assessment of effects, statutory stakeholder consultation, and the production of the ES following an objective, factual and evidence led process.

3.4.4 In practice, the approaches to EIA (i.e. the way in which the assessment is conducted) and the assessment criteria applied across different environmental and socio-economic aspects vary. The term ‘aspects’ refers to the individual environmental topics or disciplines that are assessed in the EIA. Chapters 5 to 31 outline the proposed approaches to the environmental aspects that will be addressed in the EIA.

3.5 PROPORTIONATE EIA

3.5.1 Scoping is intended to inform a proportional and robust approach to assessment through initial evaluation and reporting of identified likely significant effects in a Scoping Report.

3.5.2 In accordance with guidance and legislation, this Scoping Report seeks to ensure that the EIA and resultant ES are robust and focused to help inform the decision-making process. This means that where appropriate, this Scoping Report seeks to scope out environmental aspects and specific matters under an aspect from further assessment with suitable justification and evidence provided.

This will focus the assessment on likely significant effects and ensure the EIA for the Project is proportionate in accordance with The Infrastructure Planning (Environmental Impact Assessment) Regulations 2017 (HM Government, 2017) and the Institute of Environmental Management and Assessment's (IEMA's) Delivering Proportionate EIA guidance document (IEMA, 2017).

3.5.3 A proactive, early stage Scoping process is a way of ensuring that the EIA process and ES are robust whilst suitably focused on aspects of the environment likely to be subject to significant effects. Where more certainty in relation to information exists, this Scoping Report aims to focus the scope of the proposed assessments on material issues to ensure the EIA is appropriate and proportionate.

3.5.4 The following key tools / approaches have been adopted at the Scoping stage for the Project, to assist in the delivery of proportionate EIA:

- Use of existing evidence base; and
- Inclusion of embedded environmental measures (informed by the site selection exercise, and good or standard practices).

EVIDENCE BASE

3.5.5 Where available, the existing evidence base has been collated, supplemented and drawn upon for the purposes of this Scoping Report to help inform the scope of the forthcoming environmental assessments. Further details are provided in Chapters 5 to 31 for each of the relevant individual environmental aspects, where in addition to stakeholder engagement, this existing data and information has been utilised to:

- Inform the understanding of current and future baseline environment;
- Scope out matters from further consideration in the EIA where appropriate and justifiable; and
- Scope in matters for further assessment as part of the EIA.

3.5.6 The existing evidence base will continue to be expanded as the EIA progresses and as further data collection and environmental survey and modelling work is carried out. The evidence base will be regularly discussed with relevant stakeholders to ensure that it is appropriate.

ENVIRONMENTAL MEASURES

3.5.7 As part of the ongoing Scoping process, to enable refinement of the likely significant effects of the Project to be taken forward and assessed as part of the EIA, early stage environmental measures will be implemented as part of the Project and will be embedded into the design.

3.5.8 These include a range of environmental measures covering proposed avoidance measures that have been informed by ongoing Project refinement, and good practice measures identified with reference to legislative requirements. Also included are best practice design commitments that are considered to be sectoral practices and procedures for major infrastructure projects.

3.5.9 These measures have been used to inform the scope of the individual assessments and are set out in each environmental aspect section in Chapters 5 to 31 and within the Commitment Register (**Appendix 3.1**)

DESIGN ENVELOPE

3.5.10 As outlined in **Chapter 2: Site Context and Project Description**, the EIA for the Project will adopt a parameter-based design envelope approach. The provision of a design envelope is intended to identify key parameters to enable the EIA to be carried out whilst retaining sufficient flexibility to accommodate further refinement during detailed design. The design envelope approach is widely used for major infrastructure projects in the UK, and is recognised by the Planning Inspectorate in their guidance Advice Note Nine: Rochdale Envelope (Planning Inspectorate, 2018).

3.5.11 Paragraph 4.5 of the Advice Note Nine states:

"At the time of the Scoping Request, it may be necessary to leave certain matters open. For example, details of the Proposed Development may not have been finalised and, indeed, may not be finalised for some time….."

3.5.12 There is also guidance for the design envelope approach within the National Policy Statement for Renewable Energy Infrastructure (EN-3) (Department of Energy Security & Net Zero, 2023).

3.5.13 The parameters for the Project design envelope are outlined in further detail in **Chapter 2: Site Context and Project Description**.

TECHNICAL, SPATIAL AND TEMPORAL SCOPE

3.5.14 The following sections provide details of the technical, spatial and temporal definitions and scope which will be considered within the EIA for this Project. This acknowledges that given the scale of the Project (and its respective components), the technical and temporal scope outlined in the topic chapters can be applied irrespective of the confirmed location of the tidal barrage and grid connection within the respective Development Areas. Where this is also applies to the spatial extents, this is explained, or where the spatial extent will be refined post-Scoping (for example, terrestrial ecology on the grid connection route) this is outlined in the next steps.

3.5.15 Conversely, where a topic (or its technical, spatial of temporal scope) is not relevant to a specific aspect of the Project, this is outlined clearly in the introductory section of the topic chapter.

Technical scope

3.5.16 The technical scope of assessment for each environmental aspect is detailed in Chapters 5 to 31. Justification is provided for the individual approach and scoping of matters to be considered in the assessment for each environmental aspect. The technical scope also details the approach to baseline data collection and assessment methodologies. This also includes the approach to any material considerations in relation to future baseline and how this will be considered (or not) within the technical scope.

3.5.17 Given the nature of the Project, there will be aspects of the technical scope outlined in Chapters 5 to 31 which will be relevant to only certain Project components (for example solely marine or terrestrial environments). This is clarified in the introduction sections of all topic chapters and also outlined below in **Table 3-2**.

Table 3-2: Technical relevance to Project Components

Chapter		Relevant to Tidal Barrage	Relevant to Grid Connection	Relevant to Port & Marine Facilities
5	Coastal Processes	Yes	Potentially (1)	No
6	Benthic Ecology & Plankton	Yes	Potentially (1)	No

Chapter		Relevant to Tidal Barrage	Relevant to Grid Connection	Relevant to Port & Marine Facilities
7	Invasive Non-Native Species	Yes	Potentially (1)	No
8	Marine Mammals	Yes	No	No
9	Offshore & Intertidal Ornithology	Yes	Yes (2)	No
10	Fish & Shellfish	Yes	Potentially (1)	No
11	Commercial Fisheries	Yes	Potentially (1)	No
12	Underwater Noise & Vibration	Yes	Potentially (1)	No
13	Terrestrial Ecology & Biodiversity	Yes	Yes	Yes
14	Socio-economics	Yes	Yes	Yes
15	Major Accidents & Disasters	Yes	No	Yes
16	Shipping & Navigation	Yes	No	Yes
17	Marine Archaeology & Cultural Heritage	Yes	Potentially (1)	No
18	Terrestrial Archaeology & Cultural Heritage	Yes	Yes	Yes
19	Water Resources & Flood Risk	Yes	Yes	Yes
20	Land Use & Recreation	Yes	Yes	Yes
21	Air Quality	Yes	Yes	Yes

Chapter		Relevant to Tidal Barrage	Relevant to Grid Connection	Relevant to Port & Marine Facilities
22	Terrestrial Noise & Vibration	Yes	Yes	Yes
23	Geology & Ground Conditions	Yes	Yes	No
24	Terrestrial Traffic & Transport	Yes (3)	Yes	Yes
25	Seascape, Landscape & Visual	Yes	Yes	Yes
26	Infrastructure & Other Marine Users	Yes	Potentially (1)	Yes
27	Military & Civil Aviation	Yes	No	No
28	Greenhouse Gases	Yes	Yes	Yes
29	Climate Resilience	Yes	Yes	Yes
30	Waste & Materials	Yes	Yes	Yes
31	Cumulative	Yes	Yes	Yes

(1) Only for subsea cable section if this is required

(2) In relation to Functionally Linked Habitat (FLH)

(3) To the tidal barrage (for example workers and materials)

Spatial Scope (General)

3.5.18 The geographical context within which the Project is located is shown in **Figure 1.1**. The spatial scope for each aspect assessment will depend on the nature of the potential effects and the location of features that could be affected. The study area relevant to each environmental aspect is described in the aspect sections within Chapters 5 to 31 where appropriate. The spatial scope of the technical assessments will therefore take account of:

- The physical or developable area of the Project, and areas included to facilitate construction works;
- The nature of the baseline environment; and
- The manner and extent to which environmental effects may occur within the developable area or beyond its boundaries.

3.5.19 The methodology for setting the aspect-specific study area will then be applied to the final location of the components and supporting infrastructure. The study area for any given aspect may need to be refined in consultation with relevant consultees to ensure they still adequately reflect the area of potential influence for likely significant environmental effects.

3.5.20 The applicability of the above areas, relevant to each environmental aspect is described in the aspect sections within Chapters 5 to 31 where appropriate.

Spatial Scope (Marine Ecology Aspects)

3.5.21 There are four spatial boundaries that apply to all marine ecology aspects which will be applied within this report, including the Scoping Boundary, Study Area and Survey Area. Additionally, for marine mammals a Regional Study Area is defined which will allow the assessment of potential population-level impacts. This larger area will consider marine mammal ecology, behaviour, abundance and distribution of species within the appropriate Management Unit (MU) for cetaceans and pinnipeds. The Regional Study Area is species-specific and is synonymous with the respective species' MU.

3.5.22 The Scoping Boundary encompasses the main components of the Project and includes the likely areas where the Project will require permanent structures (such as the tidal barrage and potentially grid connection) and also temporary areas which facilitate the construction phase.

3.5.23 The Study Area is typically a topic-specific area within which the baseline and potential effects will be characterised. The Study Areas at scoping stage are preliminary and represent a precautionary approach based on the available design information and data at this early stage. As the Project progresses through to PEIR and ES stage and more design information and data becomes available, the Study Areas will be refined further. Study Area refinement will relate to the extent of the largest (spatially) potential impact.

3.5.24 The Survey Area is a subset of the Study Area, within which nearfield effects are most likely and where Project specific data collection has been or will be

undertaken. Outside of the Survey Area characterisation will be based on existing datasets through a desk-based review.

3.5.25 The spatial extent of the Study Area and Survey Area for each aspect of the assessment will depend on the nature of the potential effects, the location of features that could be affected and also recognise of guiding principles which have informed the current extents.

3.5.26 The current Study Areas recognise the interfaces between topics (such as coastal processes and benthic) will be subject to refinement as further modelling and / or baseline information in collated in addition to stakeholder engagement.

Approach to the land-water interface

3.5.27 The Marine and Coastal Access Act 2009 (MCAA) sets out the planning system for marine and environmental management and a requirement to obtain marine licences for licensable marine activities. There are seven categories of activity which may need a marine license (ML), including construction comprising of any works in or over the sea or on or under the sea bed (Marine Management Organisation, 2019). The MMO will assess the marine licence application and make decisions in accordance with the Marine Policy Statement.

3.5.28 Section 104 of the Planning Act 2008 requires the SoS to have regard to "*the appropriate marine policy documents (if any), determined in accordance with section 59 of the Marine and Coastal Access Act 2009*" relevant to the NSIP. Elements of the Project may involve works within the UK Marine Area. The appropriate marine policy documents are defined at section 59 of the MCAA, which includes any Marine Policy Statement (MPS) which is in effect and to the extent that the decision relations to a marine plan area (section 59(3)) (HM Government, 2009), noting the existence of the North West Marine Plan (NWMP) (Department for Environment, Food and Rural Affairs, 2021).

3.5.29 The term 'marine (or either riverine or estuarine as appropriate, depending on location within the Mersey)' refers to environmental features located on the water environment side of Mean High Water Spring (MHWS) and 'terrestrial' refers to environmental features on the landward side of Mean Low Water Spring (MLWS). It is acknowledged that this approach creates an area of overlap, i.e. the 'intertidal' area between MLWS and MHWS. This is considered appropriate given the overlap between the respective consenting regimes (namely the Planning Act and MCAA). The approach to the assessment of the intertidal zone is indicated within each aspect section in the study area description (within Chapters 5 and 31).

3.5.30 The relationship across the land-water interface is also of importance with regards to assessments of potential effects under the Water Framework Directive (WFD) which covers transitional waters such as estuaries.

3.5.31 The HRA will be considered holistically with no differentiation of approach at the land-water interface.

Temporal Scope

3.5.32 The temporal scope refers to the time periods over which impacts and effects may be experienced by sensitive receptors and this will be defined further for each aspect in discussion with relevant consultees. The EIA will assess effects during the construction, operation and where appropriate, decommissioning phases of the Project. **Chapter 2: Site Context and Project Description** provides further detail on the durations of these phases.

3.5.33 Environmental effects will be compared to the situation prevailing before the Project commences development (the current baseline) and will also take into consideration the projected future baseline (i.e. the theoretical situation that would exist in the absence of the Project) where possible. For example, predictable changes such as climate change, or changes that can be expected based on reasonable assumptions and modelling calculations, will be taken into account. Each environmental aspect chapter of the ES will define the baseline (current and future where possible) against which the environmental effects of the Project will be assessed. The baseline conditions to be assessed for each environmental aspect are outlined in Chapters 5 to 31 of this Scoping Report.

3.6 ASSESSMENT OF EFFECTS AND DETERMINING SIGNIFICANCE

3.6.1 The general methodological framework that will be applied in order to assess effects on environmental receptors and features, and used to determine the significance of their effects in the ES is outlined in Plate 3.1. The assessments will broadly consider the magnitude of impacts and the value or sensitivity of receptors and features that could be affected in order to classify the significance of effects.

3.6.2 In practice, the approaches and criteria applied across different environmental aspects could vary. Therefore, professional judgment in the application of standards mandated by professional bodies (for example the Chartered Institute of Ecology and Environmental Management (CIEEM) or the Landscape Institute) is applied.

3.6.3 Professional judgement is also based on the experience of technical teams and experts who have previously carried out EIA's for NSIPs, have insight into the environmental and social impacts of developments and are appropriately experienced, knowledgeable and with relevant qualifications. This is further informed by consultee responses to approaches undertaken for previous NSIP projects.

3.6.4 Where professional judgement has been applied, further detail and justification will be provided.

3.6.5 The environmental aspect sections in Chapters 5 to 31 provide greater detail on the approaches to the assessment that will be addressed in the EIA.

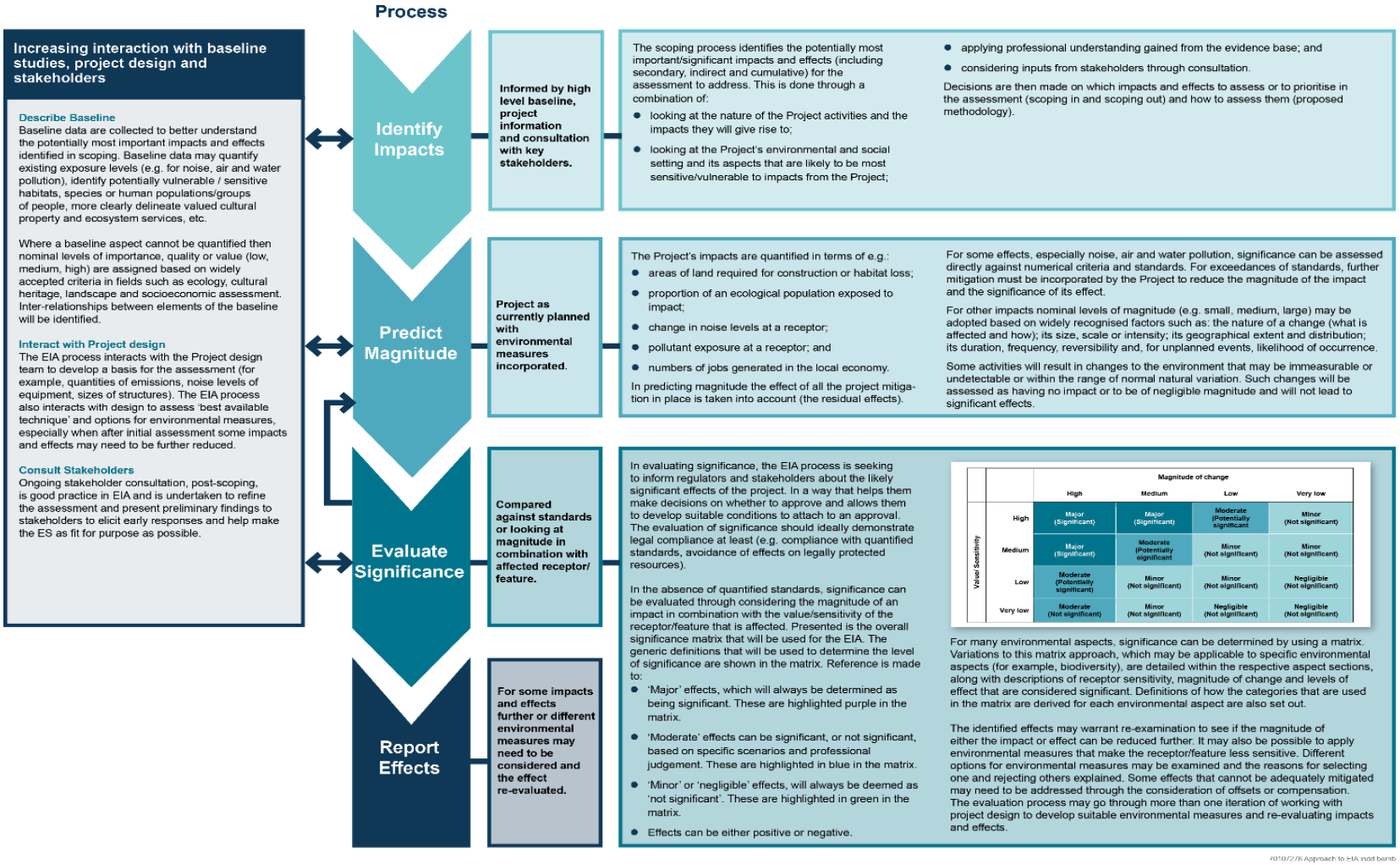

Plate 3.1: Methodological framework that will be applied

RECEPTOR (OR FEATURE) SENSITIVITY OR VALUE

3.6.6 The sensitivity or value of a receptor (or 'feature' when referring to ecological receptors) is largely a product of its societal importance, as informed by legislation and policy, and as qualified by professional judgement. For example, higher value receptors for landscape, biodiversity or the historic environment may be defined as being of international or national importance; lower value receptors may be designated as being sensitive or important at a council area or district level.

3.6.7 The use of a receptor also plays a part in its classification. For example, when considering visual amenity, a receptor that is residential in nature may be valued more than a place of work as the environmental quality of the residential receptor is more likely to be an important part of that receptor's use.

3.6.8 **Table 3-3** sets out the generic guidelines for the assessment of sensitivity and value of a receptor or feature. Guidelines specific to each aspect are provided in each aspect section within **Chapters 5** to **31**.

Table 3-3: Generic guidelines for the assessment of sensitivity or value

Value or sensitivity	Guidelines
High	Value: Feature or receptor possesses key characteristics that contribute significantly to the distinctiveness, rarity and character of the site or receptor (for example designated features of international or national importance). Sensitivity: Feature or receptor has a very low capacity to accommodate the proposed change.
Medium	Value: Feature or receptor possesses key characteristics that contribute significantly to the distinctiveness and character of the site or feature (for example designated features of regional importance). Sensitivity: Feature or receptor has a low capacity to accommodate the proposed change.
Low	Value: Feature or receptor possesses characteristics which are locally significant. Feature or receptor which is either not designated or is designated at a local or district level. Sensitivity: Feature or receptor has some tolerance to accommodate the proposed change.

Value or sensitivity	Guidelines
Very Low	Value: Feature or receptor characteristics do not make a significant contribution to local distinctiveness and not designated. Sensitivity: Feature or receptor is generally tolerant and can accommodate the proposed change.

MAGNITUDE OF CHANGE

3.6.9 The magnitude of change affecting a receptor that would result from the Project will be identified on a scale from minor alterations or change, up to major changes or the total or substantial loss of the receptor. For certain aspects, the magnitude of change would be related to guidance on levels of acceptability (for example, for air quality or noise), and is therefore based on numerical parameters. For others it will be a matter of professional judgement to determine the magnitude of change, using descriptive terminology.

3.6.10 **Table 3-4** sets out the generic criteria of the assessment of the magnitude of change.

Table 3-4: Generic criteria for the assessment of magnitude of change

Magnitude	Guidelines
High	Large scale changes over the whole development area and potentially beyond to key characteristics or features of the particular environmental aspect's character or distinctiveness.
Medium	Medium scale changes over the majority of the development area and potentially beyond to key characteristics or features of the particular environmental aspect's character or distinctiveness.
Low	Noticeable but small-scale changes over part of the development area and potentially beyond to key characteristics or features of the particular environmental aspect's character or distinctiveness.
Very Low	Noticeable but very small-scale change or barely discernible changes over a small part of the development area and potentially beyond, to key characteristics or features of the particular environmental aspect's character or distinctiveness.

ENVIRONMENTAL MEASURES AND RESIDUAL EFFECTS

3.6.11 For each environmental aspect, the EIA process will systematically identify impacts and effects and take into consideration environmental measures that the Project will adopt. These environmental measures include both avoidance, best practice and design commitments.

3.6.12 Regulation 14, Part (2 c) requires that the ES to provide "*a description of any features of the proposed development, or measures envisaged in order to avoid, prevent or reduce and, if possible, offset likely significant adverse effects on the environment*". These are commonly referred to as mitigation measures.

3.6.13 The Project will adopt a standard hierarchical approach to identifying mitigation requirements:

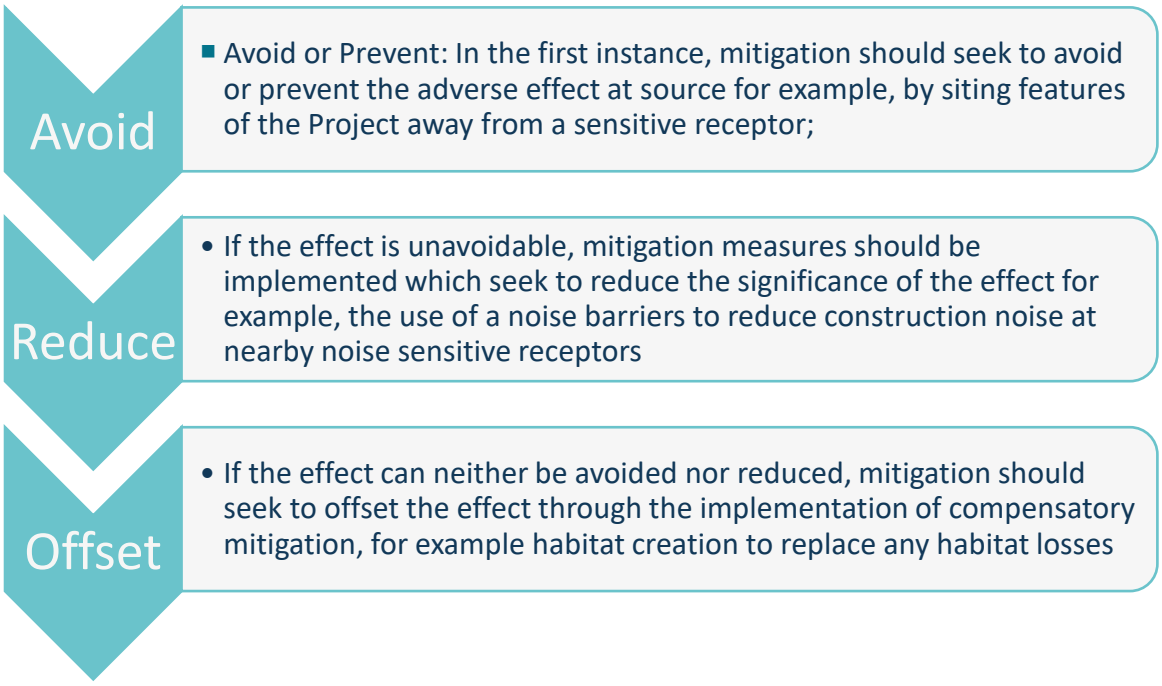

Plate 3.2: Mitigation hierarchy

3.6.14 The IEMA Guide to Shaping Quality Development (IEMA, 2015) provides guidance on three categories of environmental measures: primary, secondary or tertiary measures:

- Primary – "*these are modifications to the location or design of the development made during the pre-application phase that are an inherent part of the Project and do not require additional action to be taken". These are referred to as 'design (or embedded) measures*';

- Secondary – "*actions that will require further activity in order to achieve the anticipated outcome. These may be imposed as part of the planning consent or through inclusion in the ES*". These are referred to as 'additional measures'; and
- Tertiary – "*actions that would occur with or without input from the EIA process. These include actions that will be taken to meet legislative requirements, or those considered to be standard practice and used to manage commonly occurring environmental effects*". These are referred to as 'good practice measures'.

3.6.15 Opportunities for design measures will be identified throughout the evolution of the design and implementation strategy for the Project and the EIA process. This allows potential significant adverse environmental effects to be fed back into the design process, to verify whether they can be avoided or otherwise mitigated in accordance with the hierarchy. **Appendix 3.1** provides the Commitments Register which identifies embedded design measures which have been incorporated into the Project at this stage, and which will be updated in the ES for the final Project design.

3.6.16 In addition, relevant and proportionate opportunities for environmental enhancement and good practice measures will be identified where appropriate, in accordance with applicable statutory, policy and guidance requirements. These design measures and good practice measures will be included within the Project plans and drawings and thus are integrated into the overall design strategy as embedded environmental measures.

3.6.17 Environmental measures will be subject to ongoing review to ensure that the Project can be adaptive to changes or unexpected outcomes. The ES will report on the anticipated effects of the Project following the implementation of environmental measures, known as 'residual effects'. A clear statement will be made as to whether the likely residual effects are significant or not significant in EIA terms. Residual effects may be beneficial as well as adverse.

3.6.18 During the construction phase, adherence to a Construction Environmental Management Plan (CEMP) (or equivalent) will be required. The outline CEMP to be submitted with the DCO application will contain a range of environmental and health and safety considerations.

3.6.19 Environmental measures will be recorded in a Commitments Register to enable them to be secured (where required) and implemented. Opportunities will be provided for stakeholders to provide feedback on the commitments as part of the

planned stakeholder engagement exercises. The Commitments Register will be provided alongside the ES.

3.6.20 The environmental measures will be secured through DCO Requirements or conditions on any relevant secondary licences as necessary.

3.7 CONSIDERATION OF ALTERNATIVES

3.7.1 Regulation 14(2)(d) of the EIA Regulations (HM Government, 2017) states that an ES should include:

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

3.7.2 As part of the iterative design process, the Project will continue to evolve to take account of matters such as environmental constraints and opportunities. This will be recorded within the ES as embedded mitigation.

3.7.3 The PEIR and the ES will present the consideration of reasonable alternatives for the Project studied by the Applicant, as well as the key reasoning for selecting the chosen location and configuration taking into account environmental effects.

3.8 ASSESSMENT OF TRANSBOUNDARY EFFECTS

3.8.1 Regulation 32 of the EIA Regulations (HM Government, 2017) sets out the procedural duties required where the SoS deems that a Nationally Significant Infrastructure Project (NSIP) is likely to have significant effects on the environment in a European Economic Area (EEA) State; or where an EEA State deems that its environment is likely to be significantly affected by an NSIP.

3.8.2 Further guidance is provided in the Planning Inspectorate's Advice Note 12: Transboundary Impacts and Process (Planning Inspectorate, 2015). As such, a description of any transboundary impacts that will be experienced as a result of the Project will be provided in the ES and this assessment of transboundary effects will be of effects experienced in other EEA States as a consequence of the Proposed Scheme.

3.8.3 An initial screening of potential transboundary effects is provided in **Appendix 4.2**.

3.9 ASSESSMENT OF HEAT AND RADIATION

3.9.1 Schedule 4 to the EIA Regulations (HM Government, 2017) requires consideration of the likely significant effects of the Project resulting from the emission of heat, light and radiation. However, no significant sources of such emissions are anticipated and as such it is proposed to scope this topic out of the ES.

3.9.2 Further information on this can be found in **Chapter 25: Seascape, Landscape and Visual** and **Chapter 15: Major Accidents and Disasters** of this EIA Scoping Report.

3.10 STRUCTURE AND SCOPE OF THE PEIR AND ES

3.10.1 At this stage it is anticipated that the PEIR and ES will be structured in a similar format and topic base as the Scoping Report, although it is recognised that further in-depth data collation and analysis will be presented in these documents. Therefore, the use of separate volumes may be required to aid the reader and facilitate access, such as a separate volume for the Non-Technical Summary.

3.10.2 The ES structure will be confirmed in the PEIR.

3.10.3 It is anticipated that the following topics will be scoped out of the assessment given the scale, nature and environmental context of the Project, as outlined in Table 3-5. There are also aspects within topics which are also scoped out on an individual receptor or phase basis, and these are justified further within Chapters 5-31.

Table 3-5: Topics to be Scoped Out

Topic	Justification
Civil & Military Aviation	Please see **Chapter 27** of this EIA Scoping Report
Emissions of Heat, Light and Radiation	No significant sources of such emissions are anticipated, further detail is provided in **Chapter 25 Landscape and Visual** and **Chapter 15 Major Accidents and Disasters** of this EIA Scoping Report.

3.10.4 A number of supporting application documents which will not form part of the ES, but which will be relied upon and referred to within the ES, will be submitted as part of the application for development consent. Such documents will include, but

not limited to, the ES Non-Technical Summary (NTS) and a Commitments Register.

3.11 OTHER SUPPORTING ASSESSMENTS

3.11.1 There are several other associated assessments that will be undertaken to support the application for development consent. As shown in **Plate 3.3**, the EIA is the core functional assessment with inter-relationships and interfaces with these supporting assessments and reports, which are subject to their Regulations, legislative requirements and remits. The sections below describe those which have been identified at this stage, however further assessments may be undertaken to support the DCO application as necessary.

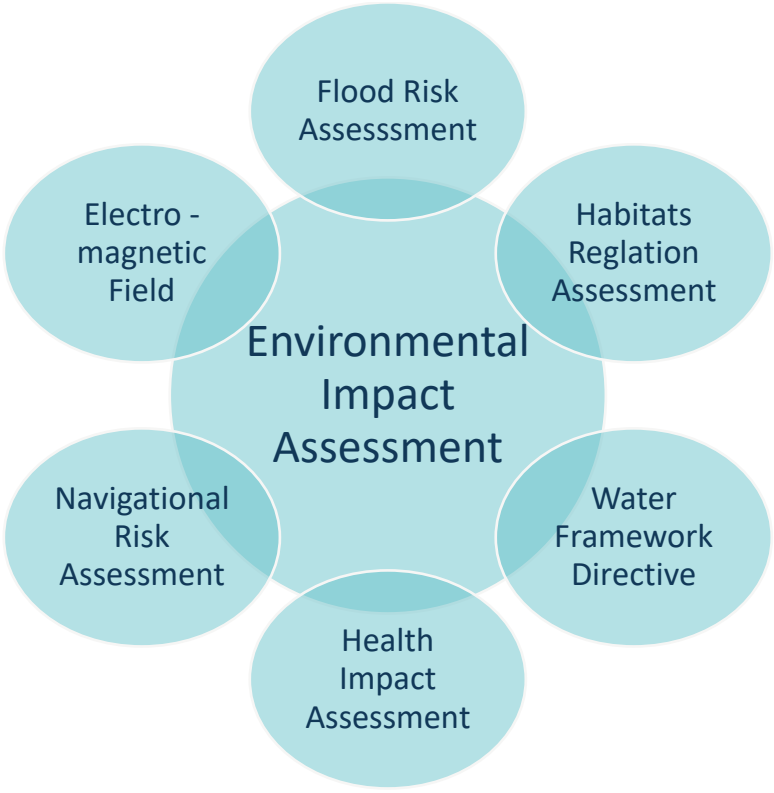

Plate 3.3: EIA and other inter-related assessments

HABITAT REGULATIONS ASSESSMENT

3.11.2 The overarching aim of the Habitat Regulations Assessment (HRA) is to determine, in view of a site's conservation objectives and qualifying interests, whether a plan (either in isolation and / or in-combination with other plans or projects) could lead to adverse effects on the integrity of a National Network Site (either a statutory designated Special Protection Area (SPA) or Special Area of Conservation (SAC)) (Department for Environment, Food & Rural Affairs, Natural England, Welsh Government and Natural Resources Wales, 2021).

3.11.3 Given the sensitivities of certain surrounding habitats and the range of species they can support, works at the site are likely to require assessment of other important ecological features (Department for Environment, Food & Rural Affairs, Natural England, Welsh Government and Natural Resources Wales, 2021) and an HRA will be prepared. If 'likely significant effects' (LSE) are identified, a detailed assessment will be provided to assess whether the proposals could result in adverse effects on the integrity of relevant international sites. Further information on habitats and associated species can be found in the relevant topic marine and terrestrial biodiversity chapters.

3.11.4 Whilst the overarching objectives of EIA and HRA are similar, their scope, level of detail and terminology vary. As such, these processes will be undertaken separately. However, the scope presented within this EIA Scoping Report has been developed to ensure that the needs of these processes have been considered to ensure a coordinated assessment.

3.11.5 The HRA Screening Report, which is a precursor to a more detailed HRA contained in **Appendix 3.3.**

WATER FRAMEWORK DIRECTIVE ASSESSMENT

3.11.6 The WFD assessment will comprise a screening assessment (stage 1), scoping assessment (stage 2), with the requirement for impact assessment (stage 3) determined at the conclusion of the scoping stage.

3.11.7 The WFD assessment will consider the potential for both construction and operational impacts from the Project upon the relevant WFD quality elements, for WFD surface water and groundwater bodies likely to be impacted. This includes identifying likely risks to: biodiversity; the biological, physico-chemical and hydromorphological quality of the WFD surface water bodies and; groundwater quality of the WFD groundwater bodies; and the likely ability of good-practice methods to manage risks associated with pollutants typically experienced during construction and during the operational phase.

3.11.8 The WFD Screening and Scoping Report is contained within **Appendix 3.4**.

FLOOD RISK ASSESSMENT

3.11.9 The Tidal Barrage Development Area is located within Flood Zone 3, with port facilities and key infrastructure areas located adjacent to the Tidal Barrage Development Area located in Flood Zones 1, 2 and 3. Port Sunlight is an exception to this, being located entirely within Flood Zone 1.

3.11.10 Areas within proximity to Birkenhead and Capenhurst existing substations within the Grid Connection Development Area interact with Flood Zone 3 at various locations, areas around Breck Road and Lister Drive do not interact with Flood Zone 3 at any location, with the exception of the Mersey and the flood risk associated with the docks along the Mersey.

3.11.11 As such, a Flood Risk Assessment (FRA) will be required to assess the potential implications on the Project, on flood risk to people and property, as well as assess the potential risk of flooding to the Project. The assessment will also consider, from a strategic perspective, any anticipated temporary drainage solutions which will be implemented during the construction phase of the Project.

NAVIGATION RISK ASSESSMENT

3.11.12 The overarching aim of the Navigation Risk Assessment (NRA) is to determine, in view of the Project location on the River Mersey, whether the tidal barrage could lead to adverse effects on navigation within the river. The NRA will consist of river navigation analysis, the identification of baseline risk controls, stakeholder engagement and risk assessments. The NRA will inform the proposed Marine Navigation chapter of the ES.

ELECTROMAGNETIC FIELD ASSESSMENT

3.11.13 An assessment of electromagnetic fields (EMF) may be required depending on the method of protection of the turbines. This will form an appendix to the ES and be referenced by the appropriate chapters if it is necessary to be prepared.

HEALTH IMPACT ASSESSMENT

3.11.14 A Health Impact Assessment (HIA) will be undertaken to identify and assess both the beneficial and adverse effects of the Project, and will make recommendations to enhance the potential benefits, while minimising the potential adverse effects, and reduce health inequalities where possible. This will be prepared and submitted alongside the ES within the DCO application, as opposed to a separate chapter within the ES.

3.11.15 An outline of the HIA Scoping Report is contained in **Appendix 3.5**.

3.12 REFERENCES

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4 PLANNING POLICY

4.1 CONSENTING FRAMEWORK

4.1.1 This chapter of the EIA Scoping Report provides an overview of the regulatory, planning and energy policies of relevance to the Project, and where those policies identify the need for the Project. Each technical chapter of this EIA Scoping Report details the relevant legislation and policy which will inform the aspect's assessment.

4.1.2 The application for development consent will include a Planning Statement which will set out in more detail the policies of relevance to the Project and include an assessment of how it complies with that policy.

4.1.3 The following summary sets out the policies relevant to the Project. A full explanation of the relevant policy and legislation will be provided in the Planning Statement.

4.2 KEY LEGISLATION

PLANNING ACT 2008

4.2.2 The Planning Act 2008 (PA 2008) established the first legal framework for applying for, examining and determining applications for Nationally Significant Infrastructure Projects (NSIPs).

4.2.3 The Project qualifies as an NSIP as the tidal barrage will consist of the construction of a generating station under section 14 (1) (a) and as per section 15 as:

(2) A generating station is within this subsection if:

(a) it is in England

(aa) it does not generate electricity from offshore wind;

(b) it is not an offshore generating station; and

(c) its capacity is more than 50 megawatts.

4.2.4 This definition has been used as the tidal barrage will be in an estuarine location, not offshore.

4.2.5 As required by section 31 of the PA 2008, a DCO application will be submitted to the relevant Secretary of State under Part 4 of the Planning Act 2008 (UK

Government, 2008). To support the DCO application, an EIA is required to be undertaken, which will involve the production of an Environmental Statement (ES) to set out the detailed assessment and findings of the EIA. The Planning Inspectorate will examine the DCO application and make a recommendation to the Secretary of State for Department for Energy Security and Net Zero (DESNZ) to grant or refuse consent.

4.2.6 Under Section 104 of the Act PA 2008 regime the policy framework for examining and determining applications for development consent is provided by National Policy Statements (NPSs). The NPSs are the primary policy used by the relevant SoS to examine and determine applications for NSIPs.

THE INFRASTRUCTURE PLANNING (ENVIRONMENTAL IMPACT ASSESSMENT) REGULATIONS 2017

4.2.7 The Infrastructure Planning (Environmental Impact Assessment) Regulations 2017 (as amended) ('the EIA Regulations') govern the EIA process relevant to NSIPs.

4.2.8 Schedule 1 of the EIA Regulations lists those projects for which an EIA is required and Schedule 2 lists projects which may be considered an EIA development, based on the selection criteria provided in Schedule 3 on characteristics of the development, its location and the types and characteristics of the potential impacts.

4.2.9 The Project is not listed in Schedule 1, but Schedule 2 is applicable which states at paragraph 3:

> "***3.*** *Energy industry*
>
> *(a) industrial installations for the production of electricity, steam and hot water (projects not included in Schedule 1 to these Regulations)"*

4.2.10 The Project is therefore subject to the EIA regulations of which at regulation 5(2) states that the EIA:

"must identify, describe and assess in an appropriate manner, in light of each individual case, the direct and indirect significant effects of the proposed development"

4.2.11 It states that the EIA must undertake the above in relation to the following factors: population and human health, biodiversity, land, soil, water, air, climate, material assets, cultural heritage, and landscape.

4.2.12 Regulation 5(4) also requires the EIA to include, where relevant: *"the expected significant effects arising from the vulnerability of the Project to major accidents or disasters that are relevant to that development".*

MARINE AND COASTAL ACCESS ACT 2009

4.2.13 The planning system for the management of the marine environment was introduced by the Marine and Coastal Access Act 2009 (MCCA 2009). This introduced a requirement to obtain Marine Licences for any offshore construction works. For the purposes of the EIA, the marine environment is defined as any area seaward of the mean high-water springs (MHWS) mark of any tidally influenced water body.

4.2.14 As set out in **Chapter 2: Site Context and Project Description** of this EIA Scoping Report, the Project includes a new tidal barrage and associated construction works within the Mersey Estuary. On this basis the MCCA 2009 is applicable.

4.2.15 The PA 2008 enables an applicant for a DCO to apply for 'Deemed Marine Licence' as part of the DCO process by virtue of Section 149A of the Act which was inserted by the MCAA 2009.

NATIONAL POLICY STATEMENTS

4.2.16 Section 104 of the PA 2008 states that where an NPS has effect, the SoS must determine the application in accordance with the relevant NPS and appropriate marine policy documents. The SoS should have regard to any local impact report produced by the relevant local planning authority (if any), any matters prescribed in relation to development of the description to which the application relates, and any other matters which the SoS thinks are both "*important and relevant*" to their decision, unless this would:

- Lead to the UK being in breach of its international obligations;
- Be in breach of any statutory duty that applies to the SoS;
- Be unlawful;
- Result in the adverse impacts of the development outweighing the benefits; or
- Be contrary to any condition prescribing how decisions regarding an NSIP application are to be taken.

4.2.17 The revised NPSs for energy infrastructure were designated on 17 January 2024. The following updated NPSs are considered relevant for the Project:

- Overarching National Policy Statement for Energy (EN-1);
- National Policy Statement for Renewable Energy Infrastructure (EN-3); and
- National Policy Statement for Electricity Networks Infrastructure (EN-5).

NATIONAL PLANNING POLICY FRAMEWORK

4.2.18 The National Planning Policy Framework (NPPF), introduced in March 2012 (updated December 2023), sets out the Government's planning policies for England. It is a material consideration in planning decisions. Although paragraph 5 of the NPPF confirms that NSIPs are to be determined in accordance with the decision-making framework of the Act and relevant NPSs, decisions on NSIPs should also take account of any other matters that are "relevant", which may include the NPPF. The NPPF is supported by the Planning Practice Guidance (PPG), which provides more detailed guidance on various aspects of planning.

4.2.19 Section 2 'Achieving sustainable development' paragraph 7 confirms that the purpose of the planning system is to contribute to the achievement of sustainable development, summarised as "*meeting the needs of the present without compromising the ability of future generations to meet their own needs*". Paragraph 8 goes on to identify three overarching objectives to the achievement of sustainable development, which are interdependent and need to be pursued in mutually supportive ways. These are:

(a) "An economic objective – to help build a strong, responsive and competitive economy, by ensuring that sufficient land of the right types is available in the right places and at the right time to support growth, innovation and improved productivity; and by identifying and coordinating the provision of infrastructure;

(b) A social objective – to support strong, vibrant and healthy communities, by ensuring that a sufficient number and range of homes can be provided to meet the needs of present and future generations; and by fostering a well-designed, beautiful and safe places, with accessible services and open spaces that reflect current and future needs and support communities' health, social and cultural well-being; and

(c) An environmental objective – to protect and enhance our natural, built and historic environment; including making effective use of land, improving biodiversity, using natural resources prudently, minimising waste and pollution, and mitigating and adapting to climate change, including moving to a low carbon economy."

4.2.20 The NPPF is supportive of infrastructure projects. One of the methods of fulfilling the objective of sustainable development listed at paragraph 8 is through the "*provision of infrastructure*". Central to the NPPF is 'a presumption in favour of sustainable development', which is set out in Paragraph 11.

4.2.21 Paragraph 157 in Section 14 'Meeting the challenge of climate change, flooding and coastal change' states that:

"The planning system should support the transition to a low carbon future in a changing climate … it should help to: shape places in ways that contribute to radical reductions in greenhouse gas emissions, minimise vulnerability and improve resilience; encourage the reuse of existing resources, including the conversion of existing buildings; and support renewable and low carbon energy and associated infrastructure".

4.2.22 Paragraph 163 states that when determining applications for renewable and low carbon development, there should be no requirement for applicants to demonstrate the overall need for renewable or low carbon energy and that applications for renewable or low carbon development should be approved if their impacts are (or can be made) acceptable.

4.2.23 It should be noted that a new version of the NPPF is now undergoing consultation (30 July 2024 to 24 September 2024). In its current form, the consultation version has no significant changes to the text above, noting that there are material changes to what is currently the published paragraph 163. In the proposed version of paragraph 163, the text bolsters the weight that should be applied to the consideration of a Project's contribution to renewable energy generation and a net zero future.

4.2.24 NPPF policies of particular relevance include:

- Building a strong, competitive economy;
- Making effective use of land;
- Meeting the challenge of climate change, flooding and coastal change; and
- Conserving and enhancing the natural environment.

4.2.25 A summary of individual legislation, national policy and local planning policy of relevance to this EIA is set out in **Appendix 4.1**.

4.3 REFERENCES

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5 COASTAL PROCESSES

5.1 INTRODUCTION

5.1.1 The hydrodynamic modelling and coastal processes chapter considers the potential likely significant effects on coastal processes (including changes in: bathymetry, water levels, waves, currents, seabed geology and sediment transport) and on water and sediment quality that may arise from the construction, operation and maintenance (O&M) and decommissioning activities of the Project, namely the tidal barrage. This chapter does not consider the existing port and marine facilities or the proposed onshore operational buildings or grid connection.

5.1.2 This section of the Scoping Report describes the methodology to be used within the Environmental Impact Assessment (EIA), an overview of the baseline conditions within the Tidal Barrage Development Area (as defined in **Chapter 2: Site Context and Project Description**), the datasets to be used to inform the EIA, the potential likely significant effects to be considered, and how these will be assessed for the purpose of the EIA.

5.1.3 The hydrodynamic modelling and coastal processes chapter interfaces with other chapters and as such, should be considered alongside these; namely:

- **Chapter 6: Benthic Ecology and Plankton**– Changes in coastal processes and water / sediment quality may act as a pathway for effects on benthic ecology and plankton;
- **Chapter 8: Marine Mammals** – Changes in coastal processes may act as a pathway for effects on marine mammals;
- **Chapter 9: Marine and Intertidal Ornithology** – Changes in coastal processes may act as a pathway for effects on marine ornithology;
- **Chapter 10: Fish and Shellfish** - Changes in coastal processes and water quality may act as a pathway of effect on fish and shellfish species;
- **Chapter 17: Marine Cultural Heritage and Archaeology** - Changes in coastal processes have the potential to affect marine archaeological remains;
- **Chapter 19: Water Resources and Flood Risk** - Changes in coastal processes have the potential to affect water resources and flood risk;
- **Chapter 23: Geology and Ground Conditions** - This chapter considers superficial geology which may be affected by changes to coastal processes; and

- **Chapter 29: Climate Resilience** - This chapter considers the effects of coastal processes including sea level rise and waves.

5.1.4 A Water Framework Directive (WFD) Screening and Scoping report, which also considers the onshore elements of the proposed barrage, has been undertaken to accompany this Scoping Report and is included at **Appendix 3.4** to this EIA Scoping Report.

5.1.5 Overarching relevant legislation and policy context which has informed the scope of the assessment is outlined in **Chapter 4: Planning Policy,** with topic specific considerations outlined in **Appendix 4.1**.

5.2 TECHNICAL GUIDANCE

5.2.1 Technical guidance that has been used to define the assessment is set out in **Table 5-1**.

Table 5-1: Relevant technical guidance

Guidance reference	Relevance to the assessment
North West Inshore and North West Offshore Marine Plan (DEFRA, 2021).	Provides guidance and objectives for the development of a sustainable marine economy.
Guidelines for the use of metocean data through the lifecycle of a marine renewable energy development (C666) (Cooper *et al.*, 2008).	Identifies and recommends uses of metocean data through the lifecycle of a marine renewable energy development.
Guidance on best practice for marine and coastal physical processes baseline survey and monitoring requirements to inform EIA of major development projects. Report No 243. 2018 (Brooks *et al.*, 2018).	Review of published guidance relevant to physical processes EIA studies, including likely data requirements, pathways for change, baseline surveys, and monitoring requirements.
Clearing the Waters for All (EA, 2023).	Guidance on how to assess the impact of activities in transitional and coastal waters for WFD compliance.

Guidance reference	Relevance to the assessment
Canadian Sediment Quality Guidelines for the Protection of Aquatic Life comprising: Introduction – updated 2001; Protocol - 1995; Summary Tables - updated 2002. [1].	Establish interim sediment quality guidelines and probable effects levels for assessment of sediment quality.
Advice Note Eighteen: Water Framework Directive [2].	Explains the information that the Inspectorate considers an Applicant must provide with an NSIP application in order to clearly demonstrate that the WFD and the 2017 regulation shave been appropriately considered.
Planning Practice Guidance (PPG) – Flood Risk and Coastal Change [3].	Advises how to take account of and address the risks associated with flooding and coastal change in the planning process.
Planning Practice Guidance (PPG) – Water supply, wastewater and water quality [4].	Advises on how planning can ensure water quality and the delivery of adequate water and wastewater infrastructure.

5.3 STUDY AREA

5.3.1 The study area for the coastal processes chapter will be defined in relation to the potential Zone of Influence (ZoI) of relevant physical processes. This will be identified and agreed in consultation with stakeholders. The preliminary study area is presented in **Figure 5.1**.

5.3.2 For initial purposes, the study area has been considered in terms of an 'inshore area' and an 'offshore area'. The inshore area extends from the normal tidal limit of the River Mersey (at Howley Weir, Warrington) to the northern extent of the Tidal Barrage Development Area at Gladstone Dock. The offshore area extends 35km from the inshore boundary and includes the Dee Estuary as far inland as Connah's Quay.

5.3.3 This study area was determined by plotting tidal ellipses from tidal speed and direction data and calculating the maximum distance of tidal excursion. This area is also consistent with the modelling domain used by HR Wallingford in their assessment of barrage options. This initial modelling gives an indication of the extent of different likely effects and indicates that for some types of effect it is likely that the study can be refined at a later stage in the EIA process based on the outcomes of further modelling.

5.3.4 It is anticipated that this study area will allow for robust characterisation of baseline coastal processes, whilst also encompassing any likely significant effects as a result of the tidal barrage. The study area accounts for the potential location and regional effects of the tidal barrage on hydrodynamics and sedimentary processes. Outside the study area, impacts on coastal processes attributable to the tidal barrage have been predicted to be very small.

5.4 CONSULTATION

5.4.1 Consultation is a key part of the application process. The assessment has been and will be informed by engagement and discussion with various stakeholders such as the MMO, EA and Natural England.

5.4.2 A summary of the key issues raised during consultation to date, specific to hydrodynamic modelling and coastal processes, is outlined in **Table 5-2**, together with how these issues will be considered in the production of the EIA.

Table 5-2: Consultation

Date	Consultee	Consultation and Key Comments	How this is accounted for
3 July 2024	Mersey Gateway Environmental Trust.	Key comments (identified via meeting): ▪ Inclusion of water quality as part of the baseline in the estuary.	Considered in this scoping chapter. Proposed water quality surveys are expected to commence at the end of the year.
17 July 2024	RSPB	Key comments (identified via meeting):	Desk-based assessments and hydrodynamic modelling to consider

Date	Consultee	Consultation and Key Comments	How this is accounted for
		▪ Consideration of effects further away (e.g. River Dee) and impacts on coastal habitats.	the effects on these receptors.
18 June 2024	Sefton Council.	Key comments (identified via email): ▪ Impact on coastal nature sites; ▪ Impact of a new structure on coastal / estuary processes and coastal defences; and ▪ Impacts of movement of sediment / scouring around the River Alt.	Desk-based assessments and hydrodynamic modelling to consider the effects on coastal processes, including sedimentation/ scour (and therefore the coastal nature sites and River Alt).
25 June 2024	Mersey Rivers Trust.	Key comments (identified during meeting): ▪ Water levels and hydrodynamic modelling.	Hydrodynamic modelling is currently being undertaken in support of this ES.
March 2024	Natural England.	Discretionary advice service comments from environmental stakeholder engagement workshop, including comments on hydrodynamic modelling. Next stage of modelling should allow understanding of the flexibility of project location. A full rationale for excluding alternative locations is advised to inform the ES and HRA. Tidal survey gauge locations should replicate historical locations	These comments will be incorporated in the modelling plan for further work.

Date	Consultee	Consultation and Key Comments	How this is accounted for
		to validate data or fill data gaps in the understanding of the Mersey. Ecological assessment must be informed by the study of the hydrodynamic environment and the ES will need to examine linkages between changes in hydrodynamic regime predicted by the study and each of the relevant supporting processes feature attributes identified in the Conservation Advice packages for the relevant sites. Guidance for expectation for assessment of: suspended sediment concentrations, sediment distribution and topography, sedimentation rates, sediment regime / supply, sediment budget, emergence regime changes including tidal level, wave climate, water flow (hydrodynamics, tidal current etc.) including sediment transport considerations, and coastal squeeze. Modelling requirements for inclusion of: outline of restrictions on the Mersey Estuary Channel movement; sufficient spatial scale; output errors, assumptions, and limitations; main tributaries of the Mersey Estuary; effects of part-constructed options; worst-case scenario of fluvial and surge extreme events; 3D modelling	

Date	Consultee	Consultation and Key Comments	How this is accounted for
		including flow and sediment; and appendix outlining datasets used to create and validate models. Coastal processes assessment and modelling will need to adequately incorporate the timescales of construction, operation, and decommissioning, also considering weather patterns and natural variation in the physical processes. In-combination and cumulative impact assessments will be critical given the nature of the project and scale of development.	
November 2023	Environment Agency	Hydro-environmental modelling workshop. Discussion points: ▪ Method of assessment for long-list to short-list options; ▪ Calibration standards and availability of data; ▪ Barrage flushing and outfall results; ▪ Intertidal availability and water levels assessed; and ▪ Next steps (fine sediment transport, salinity, initial impact assessment for preferred scheme).	These comments will be incorporated in the modelling plan for further work.

Date	Consultee	Consultation and Key Comments	How this is accounted for
1 July 2024		Pre-scoping discussion. No issues of note were raised relevant to this chapter.	-

5.4.3 Building on the technical engagement to date, the Applicant will continue discussions with regard to the Modelling Plan which will be prepared to inform future hydro-dynamic modelling, and therefore further workshops will be organised following submission of the Scoping Report.

5.5 ASSESSMENT METHODOLOGY

5.5.1 The Project-wide approach to the assessment methodology is set out in **Chapter 3: Approach to EIA**. This will be implemented to assess the likely significant effects on coastal processes pathways (and receptors) from the construction, O&M, and decommissioning of the Project.

5.5.2 The specific legislation and guidance outlined in **Appendix 4.1** will also be considered in relation to the assessment, in addition to consultation with the stakeholders outlined above.

5.5.3 Consultation with the Environment Agency will be undertaken to support the Preliminary Environmental Information Report (PEIR) and to confirm the need and methodology for a WFD Compliance Assessment, based on the WFD Screening and Scoping Report at **Appendix 3.4** of this report.

5.5.4 The significance level attributed to each effect will be assessed based on the magnitude of change due to the tidal barrage and the sensitivity of the affected tidal water receptor. The sensitivity of the affected receptor is assessed on a scale of very high, high, medium, or low (**Table 5-3**).

Table 5-3: Importance of receptors

Importance / sensitivity	Criteria	Example
Very high	Receptor has a high quality and rarity on a	WFD status classification ‘High’ (and consideration of target status), Site

Importance / sensitivity	Criteria	Example
	regional, national or international scale.	protected / designated under EC or UK habitat legislation (SAC, SPA, SSSI, Ramsar site), salmonid migration route. Designated bathing water at 'Excellent' status. Species protected by EC legislation.
High	Receptor has a high quality and rarity on a local scale.	WFD status classification 'Good' (and consideration of target status), Designated bathing water at 'Good' status. Species protected under EC or UK habitat legislation. Designated bathing water at 'Good' status. Designated Shellfish Water.
Medium	Receptor has a medium quality and rarity on a local scale.	WFD status classification 'Moderate' (and consideration of target status). Designated bathing water at 'Sufficient' status. Water or sediment quality conditions supporting designated use, such as cooling water abstraction or general amenity use.
Low	Receptor has a low quality and rarity on a local scale.	WFD status classification 'Poor' (and consideration of target status).

5.5.5 The likely magnitude or extent of an impact (or change) arising from the tidal barrage on coastal processes is assessed using the criteria set out in **Table 5-4**. Potential effects can be both adverse and / or beneficial. The derivation of magnitude is carried out independently of the importance / sensitivity of the receptor.

Table 5-4: Impact Magnitude Criteria

Magnitude of impact		Definition
Large	Adverse	Large far-field spatial extent with scale of change greater than the natural variability with a continuous signal extending long-term. Long-term change requiring substantial change in the Shoreline Management Plan. Major long-term deterioration of WFD status or deterioration of one or more of the WFD quality elements (e.g. physico-chemical, hydromorphological, chemical) at water body scale. Major pollution of the waterbody.
	Beneficial	Large scale or major improvement of resource quality; extensive restoration or enhancement; major improvement of receptor quality.
Medium	Adverse	Near-field spatial extent with scale of change the same order as the natural variability, frequently occurring in the long-term; or immediate spatial extent with the scale of change greater than the natural variability, occurring frequently over a short timescale. Some contribution or reduction of pollution entering feature, but insufficient to change WFD classification. Moderate pollution of the waterbody.
	Beneficial	Benefit to, or addition of, key characteristics, features, or elements which improve quality.
Small	Adverse	Near-field spatial extent with scale of change smaller than the natural variability, frequently occurring over a short / temporary timescale.

Magnitude of impact		Definition
		Minor temporary changes in water quality such that ecology is temporarily affected. Equivalent to a temporary minor but measurable change within WFD status class. Minor pollution of the waterbody.
	Beneficial	Minor benefit to or addition of a key characteristic, feature, or element; some beneficial impact on a receptor or a reduced risk of a negative impact occurring.
Negligible	Adverse	Immediate spatial extent, with scale of impact smaller than the natural variability, occurring infrequently over a short / temporary timescale. Negligible risk of pollution.
	Beneficial	Very minor benefit to or positive addition of one or more characteristics, features, or elements.
No change	No loss or alteration of characteristics, features, or elements; no observable beneficial or adverse impact.	

5.5.6 Once the sensitivity and value of the affected receptor and magnitude of the impact are both assessed, the potential effect can be derived on a scale of major to neutral (**Table 5-5**), defined as follows:

- Major effect - acute effect on a national or international scale, of long-term or permanent duration, and clearly above accepted guidelines or standards (or against best practice policy or illegal in nature). Where these effects are adverse, they will generally require extensive impact reduction or mitigation.
- Moderate effect - of a local to regional nature, of medium to long-term duration and / or where effects are anticipated to potentially be above accepted guidelines / standards. Where these effects are adverse, they will usually require some impact reduction or mitigation measures where feasible.
- Minor effect - discernible but tolerable.
- Neutral effect - insignificant change not having a discernible effect.

Table 5-5: Significance of potential effects

Importance / sensitivity	Magnitude of impact			
	Large	Medium	Small	Negligible
Very high	Major	Moderate	Minor	Neutral
High	Moderate	Minor	Neutral	Neutral
Medium	Minor	Neutral	Neutral	Neutral
Low	Neutral	Neutral	Neutral	Neutral

5.6 BASELINE CONDITIONS

DATA INFORMATION SOURCES

5.6.2 An initial desk-based review has been undertaken of publicly available data sources outlined in **Table 5-6** to determine the baseline character of the study area and inform the assessment process.

Table 5-6: Key sources of hydrodynamic modelling, coastal processes and water / sediment quality data

Source	Date	Summary	Coverage of Study Area
EMODnet Map Viewer [5].	2024	The European Marine Observation and Data Network (EMODnet). Used to view freely available Digital Terrain Model (DTM) for the European sea regions. DTM is based upon a collection of bathymetry surveys, Composite DTMs and Satellite Derived Bathymetry.	Offshore and inshore.

Source	Date	Summary	Coverage of Study Area
UKHO Total Tide Version 19 [6].	No Date.	UK Hydrographic Office (UKHO) software providing accurate tidal height and tidal stream predictions for more than 7,000 ports and 3,000 tidal streams worldwide.	Offshore and inshore.
UK Renewables Atlas [7].	2024	Tidal range, tidal currents, waves, winds. Shapefile for download for tides, wind and waves (tiles around UK).	Offshore.
WaveNet buoy Liverpool Bay [8].	2024	Long-term measurement of wave conditions using a Directional Waverider buoy.	Offshore.
North West England and North Wales Shoreline Management Plan SMP2 [9].	2012	Shoreline Management Plan for North West England and North Wales written by Halcrow. Appendix C4-E outlines baseline coastal processes in the Mersey Estuary.	Inshore.
Offshore Wind Strategic Environmental Assessment [10].	2003	High level overview of hydrography and physical processes in regions, including Liverpool Bay, used for consideration in offshore wind energy generation.	Offshore.
BGS Borehole Records [11] and GeoIndex (offshore) [12].	2024	British Geological Survey records of borehole surveys and mapping of offshore seabed sediments.	Offshore and inshore.
OSPAR Quality Status Report 2000	2000 and 2017	Reports produced by the Convention for the Protection of the Marine Environment in the North Atlantic covering aspects including hydrography and contamination.	Offshore.

Source	Date	Summary	Coverage of Study Area
[13] & 2017 Update [14].		Study area covered by Region III - Celtic Seas.	
Cefas Suspended Sediment Mapping around the UK [15].	2016	Mapping of the spatial distribution of average annual suspended sediment concentrations across the UK continental shelf.	Offshore.
EA Water Quality Archive [16].	2024	Monitoring stations providing data on water quality sampling carried out by the Environment Agency. Inshore location Mersey Estuary, offshore location N Wirral.	Offshore and inshore.
EA Catchment Data Explorer [17].	2024	Database including information on the water quality status of waterbodies within England. Inshore waterbody Mersey, offshore waterbody Mersey mouth.	Offshore and inshore.
DEFRA Magic Map [18].	2024	Interactive mapping of the UK including land and marine based designated sites.	Offshore and inshore.

EXISTING BASELINE

5.6.3 This section describes the present conditions which constitute the existing baseline environment for coastal processes and water and sediment quality within the study area.

5.6.4 As described in Section 5.3 of this Chapter, the coastal processes study area has been split into an inshore area and an offshore area based on potential tidal excursion distances. The inshore area includes the whole barrage scoping area and continues upstream to the normal tidal limit of the River Mersey at Warrington. The offshore area extends 35km from the northern boundary of the barrage scoping area and includes the Dee Estuary (up to Flintshire Bridge).

5.6.5 The locations of data sources used to define the existing baseline conditions are shown in **Figure 5.2** and **Figure 5.3**.

Bathymetry

Inshore

5.6.6 In the Tidal Barrage Development Area, typical maximum depths are between -10 to -20mCD (-14.9 to -24.9mOD) in the centre of the dredged channel [5] [19]. UK Admiralty chart 3490 (Port of Liverpool) also provides an overview of bathymetry and tidal data within the Mersey Estuary from the entrance to Eastham and Garston.

5.6.7 The approach and entrance to the River Mersey is dredged to allow access and safety of navigation to the docks and Manchester Ship Canal. Maintenance dredging is carried out to maintain the current levels. Bathymetry and tidal data for the approaches to Liverpool is given in UK Admiralty chart 1951 and for the approaches to the River Dee in UK Admiralty chart 1952.

5.6.8 Upstream from the Tidal Barrage Development Area, the level of the river bed increases from approximately +1mCD (-3.9mOD) to +8mCD (+3.1mOD) with an average river bed gradient of approximately 1 in 3500.

5.6.9 With the exception of the dredged channel, there are no unusual or irregular bathymetric or bed morphological features of significant interest (for example trenches, sand waves, megaripples etc.) within the study area.

Offshore

5.6.10 In the offshore extent of the study area, typical depths increase from +2mCD (-2.9mOD) (adjacent to the coast) up to a maximum of -30mCD (-34.9mOD), with a generally constant bed slope of approximately 1 in 800.

Water Levels

5.6.11 The River Mersey is subject to a macrotidal regime with a typical spring tidal range of 8.3m. Standard tidal elevations at Liverpool (Gladstone Dock, at the northern edge of the Tidal Barrage Development Area) are given in **Table 5-7** (sourced from UKHO Total Tide). At this location, Chart Datum (CD) is 4.9m below Ordnance Datum (OD).

Table 5-7: Standard tidal elevations at Liverpool (Gladstone Dock) 53°27'N 3°01'W

Tidal state	Elevation (mCD)	Elevation (mOD)
Highest Astronomical Tide (HAT).	+10.30	+5.40
Mean High Water Springs (MHWS).	+9.40	+4.50
Mean High Water Neaps (MHWN).	+7.50	+2.60
Mean Sea Level (MSL).	+5.25	+0.35
Mean Low Water Neaps (MLWN).	+3.20	-1.70
Mean Low Water Springs (MLWS).	+1.10	-3.80
Lowest Astronomical Tide (LAT).	+0.00	-4.90

Waves

Inshore

5.6.12 Halcrow (2012) notes that *"the narrow mouth of the Mersey Estuary, combined with the shallow nearshore bathymetry (with the exception of the dredged access channel) and numerous sand banks within the inner estuary, limits the propagation of waves into the estuary. South westerly and north westerly winds funnel water into the estuary, and also generate local waves within it, which are fetch-limited and unlikely to exceed 2m in height*". There are no known wave buoys in the inshore study area with historic data available.

Offshore

5.6.13 The ABPmer Renewables Atlas was used to obtain representative annual and seasonal mean significant wave heights (H_s) in the offshore extent of the study area. **Table 5-8** shows typical values in the middle of the offshore area, approximately 15km offshore of the Tidal Barrage Development Area (with an average depth of 7m). Closer to the offshore boundary of the study area the mean wave heights are typically 0.1 to 0.25m larger.

Table 5-8: Annual and seasonal mean significant wave heights

	Annual H_s (m)	Spring H_s (m)	Summer H_s (m)	Autumn H_s (m)	Winter H_s (m)
ABPmer atlas ID 1390	0.84	0.76	0.64	0.91	1.06

5.6.14 Measured wave data were sourced from the WaveNet Directional Waverider buoy, deployed approximately 24km offshore in Liverpool Bay between November 2002 and April 2024. The buoy is located 23km offshore, in approximately 24m water depth.

5.6.15 **Plate 5.1** shows a rose plot of the data, with typical significant wave heights up to 3m, and a maximum recorded significant wave height of 5.8m. The most frequent, and largest, waves originate from a westerly direction.

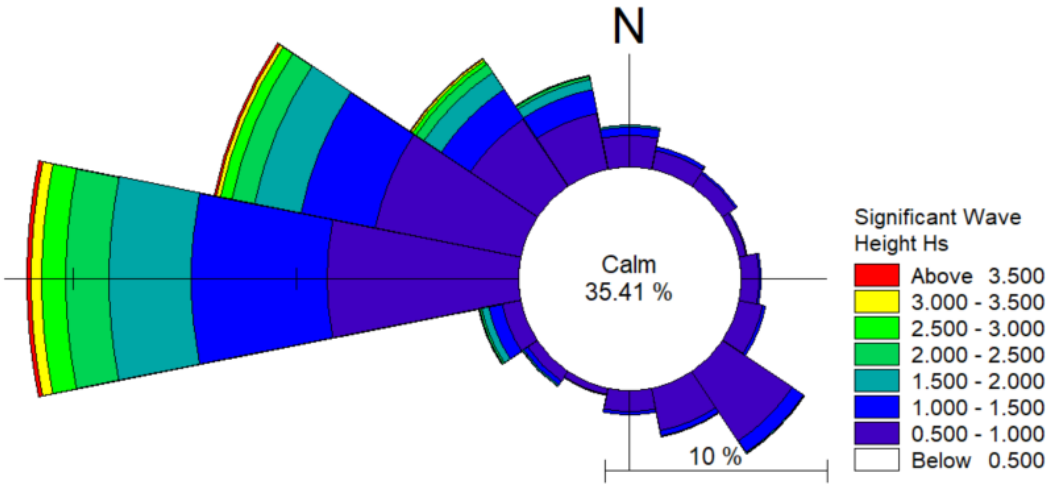

Plate 5.1: Rose plot of significant wave height in Liverpool Bay November 2002 to April 2024

Currents

Inshore

5.6.16 According to Halcrow (2012), "*the inshore area, particularly within the Tidal Barrage Development Area, experiences significant tidal currents (generally up to 1m/s in the Narrows but with velocities >2m/s provided for the closest UKHO tidal stream prediction points). These currents encourage scour and prevent sediment accumulation which helps to maintain the channel depth. The tidal*

current velocities reduce upstream as the estuary widens (upstream of the Tidal Barrage Development Area), leading to deposition of sediments".

5.6.17 Tidal stream data were extracted from UKHO Total Tide at two locations within the Mersey Estuary; station SN045L (located 3km inland) and station SN045N (located 10km inland). The associated data for these tidal diamonds are given in **Table 5-9**.

Table 5-9: Inshore Tidal Streams

Time (hr)	Station SN045L (53°25'N 3°01'W)			Station SN045N (53°22'N 2°58'W)		
	Direction (°)	Spring rate (m/s)	Neap rate (m/s)	Direction (°)	Spring rate (m/s)	Neap rate (m/s)
-6	337	0.46	0.26	302	0.46	0.26
-5	191	0.21	0.10	-	0.00	0.00
-4	171	1.13	0.62	142	0.41	0.21
-3	172	2.01	1.13	144	1.54	0.87
-2	175	2.06	1.13	147	2.31	1.23
-1	172	1.44	0.77	147	1.70	0.93
HW	166	0.62	0.31	147	0.67	0.36
1	15	1.18	0.67	287	0.98	0.51
2	348	2.52	1.39	311	1.90	1.03
3	346	2.37	1.29	313	1.80	0.98
4	344	1.90	1.08	318	1.34	0.72

Time (hr)	Station SN045L (53°25'N 3°01'W)			Station SN045N (53°22'N 2°58'W)		
	Direction (°)	Spring rate (m/s)	Neap rate (m/s)	Direction (°)	Spring rate (m/s)	Neap rate (m/s)
5	342	1.34	0.72	323	0.93	0.51
6	341	0.72	0.36	309	0.62	0.31

Offshore

5.6.18 Tidal stream data was extracted from UKHO Total Tide at two offshore locations (to cover the offshore extents of the study area); station SN045P (located 32km offshore) and station SN045I (located 10.5km offshore). The data for these tidal diamonds are given in **Table 5-10**.

Table 5-10: Offshore Tidal Streams

Time (hr)	Station SN045P (53°33'N 3°29'W)			Station SN045I (53°28'N 3°11'W)		
	Direction (°)	Spring rate (m/s)	Neap rate (m/s)	Direction (°)	Spring rate (m/s)	Neap rate (m/s)
-6	291	0.15	0.10	291	0.26	0.15
-5	81	0.15	0.10	57	0.36	0.21
-4	99	0.51	0.26	101	0.77	0.41
-3	98	0.72	0.41	111	1.08	0.62
-2	99	0.62	0.31	115	0.87	0.46
-1	89	0.21	0.15	113	0.51	0.31
HW	240	0.05	0.00	174	0.15	0.10

Time (hr)	Station SN045P (53°33'N 3°29'W)			Station SN045I (53°28'N 3°11'W)		
	Direction (°)	Spring rate (m/s)	Neap rate (m/s)	Direction (°)	Spring rate (m/s)	Neap rate (m/s)
1	269	0.26	0.15	262	0.36	0.21
2	273	0.57	0.31	284	0.67	0.36
3	276	0.77	0.41	289	0.77	0.41
4	278	0.77	0.41	293	0.67	0.36
5	282	0.62	0.31	292	0.57	0.31
6	287	0.31	0.15	289	0.41	0.21

5.6.19 Data from the ABPmer Renewables Atlas was extracted at the same locations (**Table 5-11**). The ABPmer velocities are lower than the peak values predicted by Total Tide, with the difference increasing further offshore. For example, Station SN045I shows a greater difference between the two datasets than Station SN045P. It should be noted that these velocities are depth-averaged, whereas the values extracted from Total Tide are surface values. Both the ABPmer and Total Tide data are modelled predictions rather than measured data and surface tidal currents can be affected significantly by wind conditions.

Table 5-11: Peak spring and neap tidal rates

Location	Peak spring rate (m/s)	Peak neap rate (m/s)
ABPmer atlas ID 68572 (Total Tide Station SN045P).	0.67	0.34
ABPmer atlas ID 72053 (Total Tide Station SN045I).	0.49	0.25

5.6.20 The baseline depth averaged residual currents in the area (i.e. net water movement over all tidal cycles) plotted by HR Wallingford as part of sediment transport modelling they have undertaken are shown in **Plate 5.2.**

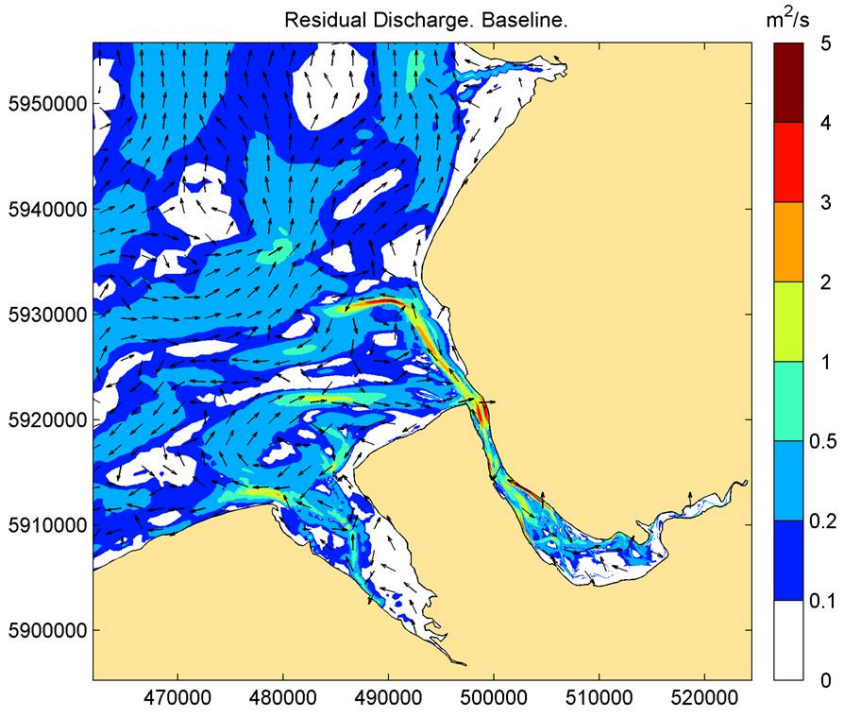

Plate 5.2: Pattern and magnitude of residual discharge, baseline condition

Seabed Geology

Inshore

5.6.21 Borehole data and mapping from the British Geological Survey indicates that the geology in the inshore area consists of sedimentary sandstone bedrock overlain with tidal deposits of sand, silt, and clay (approximate bedrock depth ranging from 10-15m below ground based on limited borehole locations). Closer to the banks of the River Mersey, there are areas of made ground and fill. Mott MacDonald (2024) identified the presence of a "*channel of interconnected bedrock hollows"* within the barrage Scoping Boundary, where there are glacial deposits between the bedrock surface and tidal deposits.

5.6.22 The distribution of surface sediments within the Mersey Estuary is shown, using the Folk classification, in **Plate 5.3** (based on British Geological Survey data).

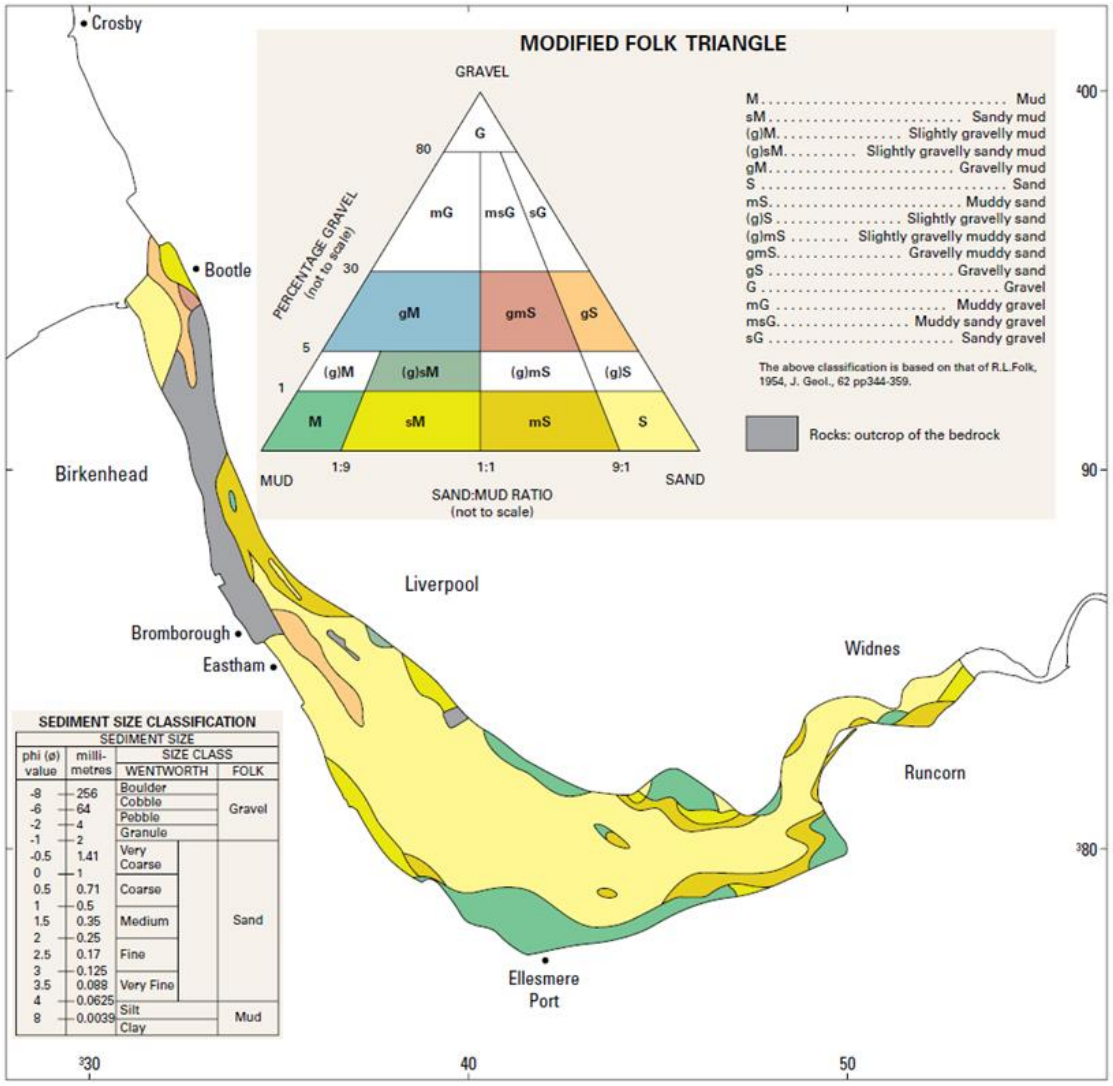

Plate 5.3: Distribution of sediment types in the Mersey Estuary

5.6.23 The Shoreline Management Plan baseline processes understanding (Halcrow, 2012) notes that sediments within the inner estuary are mainly fine sand, with medium sand more abundant within the narrows (where the Tidal Barrage Development Area is located) because strong tidal currents prevent the accumulation of finer sediment.

5.6.24 A geophysical survey carried out within the Tidal Barrage Development Area in August 2023 [20] found that bed sediments were generally comprised of ripples and gravelly sand. The thickness of this sediment layer varies from approximately 1m, in the deepest areas at the centre of the channel, to over 8m closer to the bank.

Offshore

5.6.25 BMT Cordah (2003) summarises the offshore area of the study area as "*characterised by sand and muddy sand, with localised areas of muddier and*

coarser sediments. There are also a small number of subtidal rock outcrops and gravel areas". In general, sediment becomes coarser moving further offshore (based on EMODnet mapping).

Sediment Transport

5.6.26 The main transport pathways for non-cohesive sediment transport in the Liverpool Bay and Mersey Estuary area have been mapped by Pye & Blott (2010), as shown in **Plate 5.4**.

Inshore

5.6.27 Halcrow (2012) summarise the inshore sediment transport regime as follows: "*In the River Mersey, there are sediment inputs from both offshore and fluvial sources, however the offshore sources are more significant with upstream erosion of the riverbanks providing a comparatively limited source of sediment. Generally, the inner estuary accumulates sediment, particularly mud. Changes to tidal hydrodynamics due to anthropogenic interventions, such as dredging and port construction, has resulted in a large-scale movement of sediment into the estuary which has now reached an equilibrium. Despite the long-term trends of siltation in the wider area, there is less accretion in the narrows at the mouth of the River Mersey, compared to the inner estuary, due to higher tidal currents which encourage scour and maintain the channel depth*".

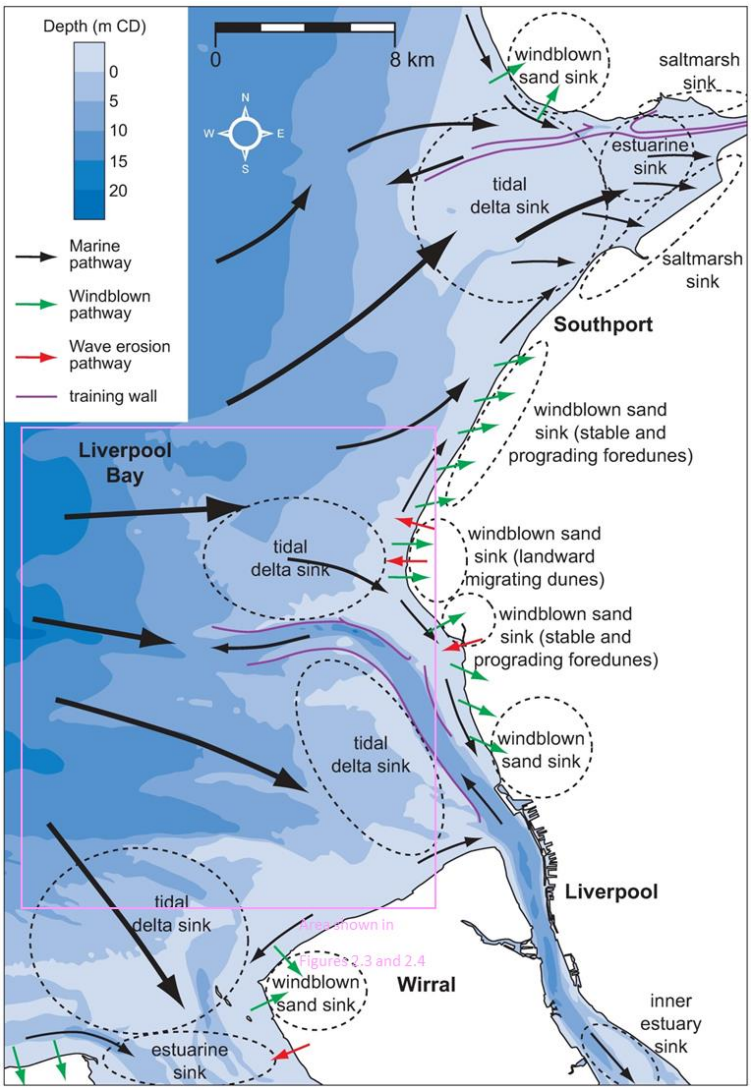

Plate 5.4: Sediment transport in Liverpool Bay

Offshore

5.6.28 In the offshore extent of the study area, there is a high easterly transport of sand over wide sand flats at the mouth of the Mersey Estuary. This transport is partially controlled by groynes and other coastal defences.

5.6.29 According to BMT Cordah (2003), "*along the coast, to the north of the River Mersey, sediment transport is predominantly wave induced, and coastal squeeze and engineered changes to the morphology of the area have caused sediment transport patterns to change over time*". This is similar to the sediment transport patterns to the south of the mouth of the River Mersey.

Sediment Quality

5.6.30 There is little recently collected information on sediment quality within the Mersey Estuary, where any mobilisation of sediments during the construction and

operation of the proposed works will occur. Most of the available recent data relates to specific projects (such as the Mersey Gateway Bridge and the Pierhead), so available information tends to be localised. However, a limited amount of sediment contaminant information is available for the offshore part of the study area.

5.6.31 Historic industrial activity has left a legacy of contaminants in the estuary sediments, particularly in the reaches upstream of the Tidal Barrage Development Area, including mercury contamination arising from historic use of the Castner Kellner process for production of caustic soda and chlorine in the Runcorn area.

5.6.32 Further inland, sediments in the area around Wigg Island have been subject to the effects of contaminants released from former chemical works on the site and leached from an associated landfill. Chemicals produced included mustard gas during World War II.

5.6.33 RSK [21] identified records of elevated levels of heavy metals and PAH in sediments in the vicinity of the new Isle of Man Ferry Terminal.

5.6.34 In the offshore part of the study area, a BMT-Cordah report on offshore wind energy [10] provides indicative ranges of contaminants in sediments from Burbo Bank in Liverpool Bay, showing the following concentration ranges: cadmium (<0.1-0.5 mg/kg), copper (2.7-11.6 mg/kg), lead (7-20 mg/kg), mercury (0.01-0.30 mg/kg) and zinc (49-115 mg/kg).

5.6.35 Further data collection will be required to validate historic data and support the assessment of potential effects of mobilisation of sediment-borne contaminants during construction and operation of the tidal barrage.

Water Quality

Inshore

5.6.36 EA water quality monitoring data analysed in the Environmental Statement for the Mersey Gateway Bridge project (approximately 26km upstream of the Tidal Barrage Development Area) showed that the concentration of suspended solids in the estuary varied in the range 100mg/l to 600mg/l between 1978 and 2006 [22].

Offshore

5.6.37 Cefas mapping of average annual suspended sediment concentrations in 2016 shows that concentrations ranged from 26mg/l close to the shore to 3mg/l at the offshore extent of the study area [15].

Throughout the Study Area

5.6.38 Specific inputs that affect the water quality, within and around the study area, include industrial activities in the Mersey (e.g. shipbuilding, manufacturing of chemicals and other port activities), and direct discharge from outfalls (including treated sewage) (OSPAR Commission, 2000).

5.6.39 **Table 5-12** gives water contaminant concentrations sourced from EA monitoring stations (North Wirral (offshore, 5 Jan 2024) and Mersey Estuary (inshore, 3 Dec 2023)) and the OSPAR Quality Status Report 2000 for the Celtic Sea. The 2017 update to the OSPAR Quality Status report stated that, since 2010, water contamination levels in the region had decreased below levels likely to harm marine species, but not to background levels.

Table 5-12: Typical concentrations of water contaminants throughout the study area

Contaminant	Mersey Estuary (3 Dec 2023) µg/l	North Wirral (5 Jan 2024) µg/l	OSPAR Commission (2000) µg/l
Cadmium	0.039	< 0.03	0.01 - 0.03
Mercury	< 0.01	< 0.01	0.0002 - 0.0005
Lead	0.13	< 0.04	0.5 - 5
PAHs	0.0376	N/A	> 0.5
Total hydrocarbons.	N/A	N/A	0.3 - 0.64
Arsenic	3.6	1.7	N/A

Contaminant	Mersey Estuary (3 Dec 2023) µg/l	North Wirral (5 Jan 2024) µg/l	OSPAR Commission (2000) µg/l
Copper	3.5	0.87	1.3
Iron	N/A	< 100	N/A
Zinc	18	2.9	10 - 30
Nickel	2.1	0.55	N/A

WFD Water Body Status

5.6.40 The Project has the potential to affect the following water bodies defined in relation to implementation in the UK of the Water Framework Directive:

- The Mersey transitional water body within which the Tidal Barrage Development Area is located;
- The Mersey Mouth coastal waterbody which is immediately offshore of the Tidal Barrage Development Area;
- River water bodies discharging into the Mersey Estuary (in relation to migratory fish only); and
- Groundwater bodies underlying the Tidal Barrage Development Area, particularly upstream of the barrage.

5.6.41 Transitional and coastal waters are discussed further in this chapter. River water bodies and groundwater bodies are discussed in **Chapter 19: Water Resources and Flood Risk**. More detailed consideration of all water body types is presented in the WFD Screening and Scoping Report at **Appendix 3.4**.

5.6.42 Note that all Liverpool Docks (from Royal Seaforth Dock in the north to Brunswick Dock in the south) are part of the Mersey transitional water body. Birkenhead Docks (East Float and West Float) are part of the Birket including Arrowe Brook and Fender river water body.

Inshore

5.6.43 The Mersey transitional water body (Waterbody ID: GB531206908100) is designated as a heavily modified waterbody (EA, 2024). Its overall classification is ‘moderate’ from the most recent assessment in 2022; this was determined based on the ‘moderate’ ecological potential, which was limited by invertebrates, phytoplankton, physico-chemical quality elements (particularly dissolved inorganic nitrogen) and specific pollutants (particularly zinc), and failure to meet chemical status criteria for mercury, PAH, PBDE, heptachlor epoxides and dichlorvos.

5.6.44 The Mersey water body does not require assessment for its chemical status (which was ‘fail’ in 2019 due to the presence of benzo(b)fluoranthene, benzo(g-h-i)perylene, heptachlor and cis-heptachlor epoxide, mercury and its compounds and polybrominated diphenyl ethers). The water body has an objective to achieve ‘good’ chemical status by 2063 to allow for natural recovery time (noting that no known technical solution is available).

Offshore

5.6.45 The Mersey Mouth water body (Waterbody ID: GB641211630001) is designated as a heavily modified waterbody (EA, 2024) Its overall classification is ‘moderate’ from the most recent assessment in 2022; this was determined based on the ‘moderate’ ecological potential which was limited by phytoplankton and physico-chemical quality elements (particularly dissolved inorganic nitrogen).

5.6.46 The Mersey Mouth water body does not require assessment for its chemical status (which was ‘fail’ in 2019 due to the presence of benzo(g-h-i)perylene, mercury and its compounds, and polybrominated diphenyl ethers). However, the water body has an objective to achieve ‘good’ chemical status by 2063 to allow for natural recovery time (noting that no known technical solution is available).

5.6.47 There are eight designated bathing waters located along the coastline of the study area (EA, 2024). Based on EA water sampling, the southernmost site (West Kirby) is classified as ‘good’, the Meols, Moreton, Wallasey, and Formby sites are classified as ‘excellent’, and the northernmost sites (Ainsdale, Southport, and St Annes) are ‘sufficient’.

5.6.48 The nearest designated Shellfish Waters are located on the coastline, south west of the mouth of the River Mersey (North Wirral (East) and North Wirral (West)) (DEFRA, 2024). The Dee (East) Shellfish Waters are located south of the Wirral sites, within the Dee Estuary and over 13 km by sea from the Tidal Barrage Development Area, and the Ribble Shellfish Waters site is located on the coast,

at the northern extent of the study area, over 25 km by sea from the Tidal Barrage Development Area.

Designated Sites

5.6.49 **Table 5-13** details sites designation for nature conservation interest (located using DEFRA Magic Map) within the study area, that could be affected by the Tidal Barrage Development Area. These sites include Sites of Special Scientific Interest (SSSI), Marine Protection Areas (MPA), Special Protection Areas (SPA), Special Areas of Conservation (SAC), Ramsar sites, and Marine Conservation Zones (MCZ). These sites are shown on **Figure 5.4**.

Table 5-13: Designated sites and relevant qualifying interests

Name	Proximity to Tidal Barrage Development Area	Designation(s)	Relevant Qualifying Interest(s)
Mersey Estuary.	Within / immediately adjacent to the Tidal Barrage Development Area.	SSSI / SPA / Ramsar.	▪ Waterfowl and supporting habitats (SSSI / SPA / Ramsar). ▪ Saltmarsh and boulder cliff flora (SSSI).
New Ferry.	Within / immediately adjacent to the Tidal Barrage Development Area.	SSSI	▪ Waterfowl and supporting habitats.
Mersey Narrows and North Wirral Foreshore.	Within / immediately adjacent to the Tidal Barrage Development Area.	SSSI (2 sites) / SPA / Ramsar site.	▪ Waterfowl and supporting habitats (SSSI / SPA / Ramsar).
Dee Estuary.	Within / immediately adjacent to the Tidal Barrage Development Area.	SAC / Ramsar site.	▪ Sea lamprey species; Atlantic salt meadows, estuaries, mudflats and sandflats; dunes (SAC / Ramsar).

Name	Proximity to Tidal Barrage Development Area	Designation(s)	Relevant Qualifying Interest(s)
Dee Estuary / Aber Afon Dyfrdwy.	12km south west of the Tidal Barrage Development Area.	SSSI / SPA.	▪ Sandstone cliff and associated flora/fauna; saltmarsh vegetation (SSSI). ▪ Waterfowl and supporting habitats (SSSI / SPA / Ramsar).
Sefton Coast.	2.5km north of the Tidal Barrage Development Area.	SSSI	▪ Intertidal mud and sandflats, dunes, geomorphological features, saltmarsh vegetation, waterfowl, and amphibians.
Ribble and Alt Estuaries.	2.5km north of the Tidal Barrage Development Area.	SPA / Ramsar site.	▪ Waterfowl and supporting habitats, saltmarsh vegetation (SSSI / SPA). ▪ Dunes, vegetation, and amphibians (Ramsar). ▪ Smelt species (MCZ).
Liverpool Bay / Bae Lerpwl.	Within / immediately adjacent to the Tidal Barrage Development Area.	MPA / SPA.	▪ Waterfowl and supporting habitats (SPA / MPA).
Fylde	25km north of the Tidal Barrage Development Area.	MCZ	▪ Subtidal sand and mud habitats.

HR Wallingford Modelling

5.6.50 HR Wallingford have been conducting preliminary hydrodynamic, sediment and water quality modelling since 2022 to support the optioneering for the tidal barrage. Baseline conditions defined for the modelling are indicated in the plots in this Section.

5.6.51 Morphological modelling included examination of cohesive sediment transport. The baseline situation is depicted in **Plate 5.5**, which shows the baseline bed level change (no barrage scenario) over a spring-neap tidal cycle (following initial model spin-up). In these plots the yellow to red colours indicate net accretion and increasingly dark blue indicate erosion.

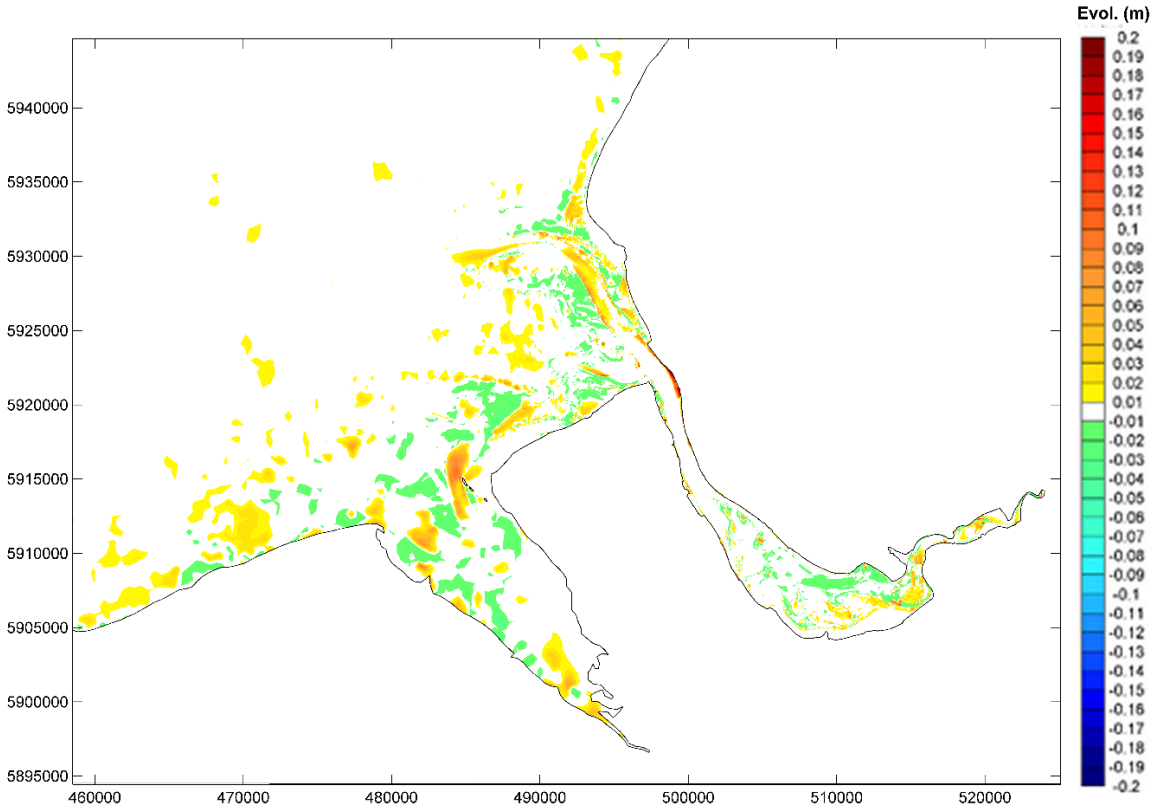

Plate 5.5: Baseline pattern of seabed level change over a spring neap cycle

5.6.52 Baseline plots prepared for 3D-modelling of water quality were also prepared by HR Wallingford, including suspended sediment concentration where maximum and mean depth-averaged baseline values are shown in **Plate 5.6**.

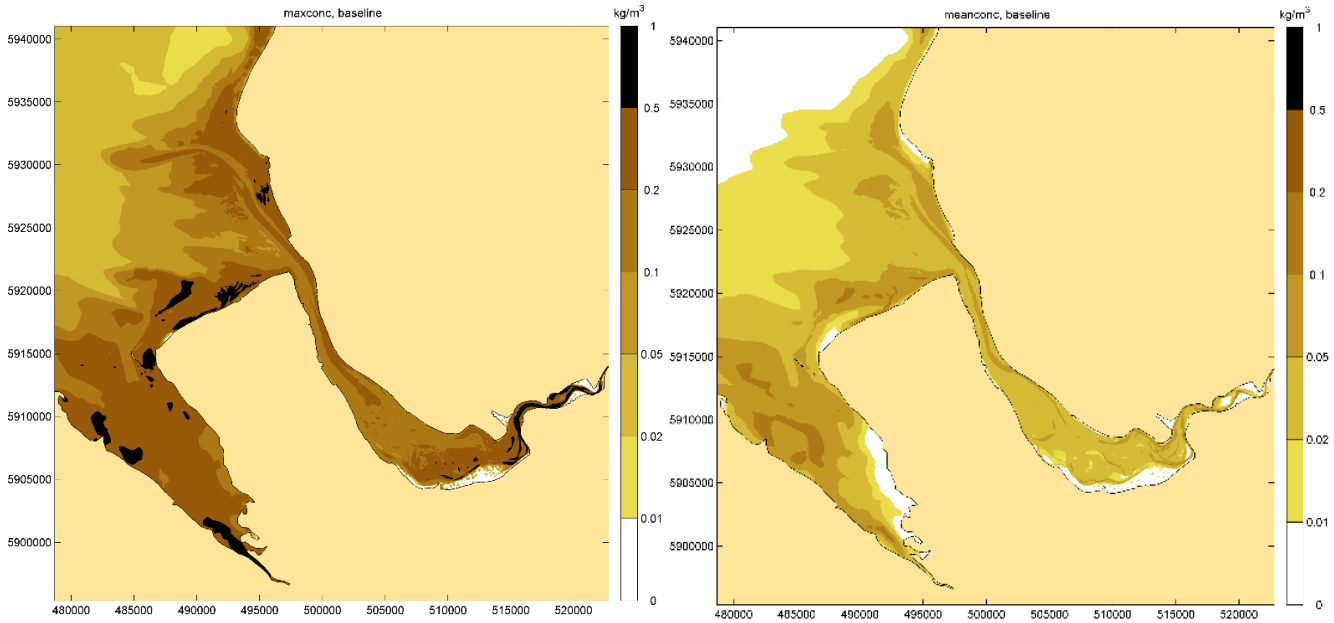

Plate 5.6: Maximum (left) and mean (right) suspended sediment baseline concentrations (kg/m^3)

5.6.53 Salinity was also modelled and simulated maximum and minimum mid-depth baseline values within the Mersey Estuary are shown in **Plate 5.7.**

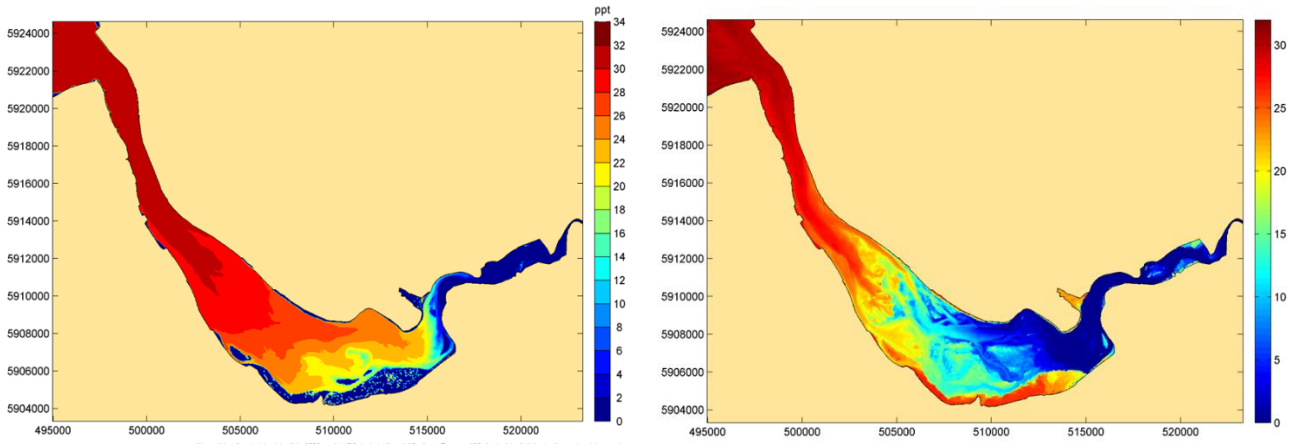

Plate 5.7: Maximum (left) and minimum (right) mid-depth salinity baseline values (salinity units)

5.6.54 Modelling was also undertaken to examine the effect of sewage discharges during a storm event lasting 12 hours, assuming treated discharges from sewage treatment works of three times dry weather flow, an allowance for predicted flows from combined sewer overflows (CSO) and inputs of Q_{10} flows from the River Mersey and River Weaver. This was considered to represent a reasonably challenging test case for the effects of sewage discharges on sewage derived contamination in the estuary.

5.6.55 The modelling was undertaken using the bacterium *Escherichia coli* (*E. coli*), naturally present in sewage in high numbers, as a tracer for the presence of sewage in the estuary.

5.6.56 A plot representing the baseline (no barrage) scenario at the end of the storm event is given in **Plate 5.8**.

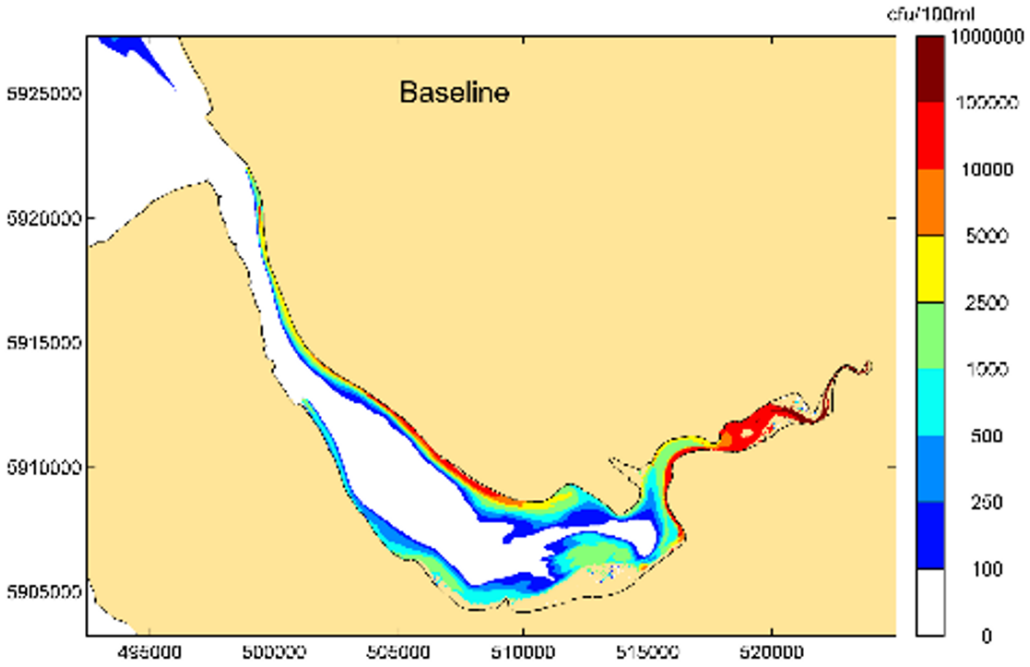

Plate 5.8: Predicted *E. coli* concentration immediately after end of storm discharge event – baseline condition (cfu/100ml)

5.7 FUTURE BASELINE

5.7.1 Future baseline conditions that can be reliably predicted over the lifetime of the tidal barrage will be primarily affected by climate change predictions. This includes sea level rise, changes in sea temperature and salinity, changes to extreme weather conditions (including river flow hydrographs), and groundwater levels. Bathymetric and coastal changes could also affect the tidal barrage, but these are not expected to change dramatically and are difficult to predict reliably over the operational lifetime of the Project.

Sea Level Rise

5.7.2 Tidal water levels for present day conditions (2024) have been uplifted to account for sea level rise for the anticipated year of completion of construction (2038, assuming a worst-case programme) and a future epoch covering the design life of the Project (2158, accounting for a 120 year operational period).

5.7.3 Projections for sea level rise (based on the UKCP18 RCP 8.5 time-mean sea level anomaly predictions) are given in **Table 5-14**. A MHWS, 1 in 100 year and 1 in 200 year return period event have been considered for both the 70th and 95th percentile scenarios (where the percentile describes the proportion of possible scenarios that fall below it) and the maximum credible H++ (based on a 1.9m increase from 1990 to 2100).

Table 5-14: Future sea level rise projections

Year	Scenario	Sea State	Level (mOD)
2024 (uplifted from 2017 baseline).	UKCP18 RCP8.5 70th percentile.	MHWS	4.50
		1 in 100yr Return Period.	6.32
		1 in 200yr Return Period.	6.45
	UKCP18 RCP8.5 95th percentile.	MHWS	4.51
		1 in 100yr Return Period.	6.33
		1 in 200yr Return Period.	6.46
	H++	MHWS	4.59
		1 in 100yr Return Period.	6.41
		1 in 200yr Return Period.	6.54
2038	UKCP18 RCP8.5 70th percentile.	MHWS	4.58
		1 in 100yr Return Period.	6.40
		1 in 200yr Return Period.	6.53

Year	Scenario	Sea State	Level (mOD)
	UKCP18 RCP8.5 95th percentile.	MHWS	4.61
		1 in 100yr Return Period.	6.43
		1 in 200yr Return Period.	6.56
	H++	MHWS	4.83
		1 in 100yr Return Period.	6.65
		1 in 200yr Return Period.	6.78
2158	UKCP18 RCP8.5 70th percentile.	MHWS	5.84
		1 in 100yr Return Period.	7.66
		1 in 200yr Return Period.	7.79
	UKCP18 RCP8.5 95th percentile.	MHWS	6.39
		1 in 100yr Return Period.	8.21
		1 in 200yr Return Period.	8.34
	H++	MHWS	6.91
		1 in 100yr Return Period.	8.73
		1 in 200yr Return Period.	8.86

Wind and Waves

5.7.4 Wind speeds and extreme wave heights are also likely to increase as a result of increasing water depths and changes to storm frequency, severity, and duration. The required uplifts for climate change allowance and sensitivity testing are given in **Table 5-15** for the same years as sea level rise was analysed. It should be noted that current guidance states these uplifts are applicable to 2125, however no values are given for epochs beyond this.

5.7.5 The sensitivity test values should be assessed as credible maximum scenarios for projects of national significance to ensure that the development can adapt to large-scale climate change over its lifetime.

Table 5-15: Offshore wind speeds and extreme wave height climate change allowances

Year	Offshore wind speed		Extreme wave height	
	Allowance	Sensitivity test	Allowance	Sensitivity test
2038	5%	10%	5%	10%
2158	10%	10%	10%	10%

5.8 BASIS FOR SCOPING ASSESSMENT

5.8.1 The coastal processes scoping assessment is based on the following key assumptions which are also set out in **Chapter 2: Site Context and Project Description**:

- The tidal barrage has a construction period of up to 10 years, and an operational lifetime of 120 years;
- The marine working area is defined as being up to 1km upstream and downstream of the tidal barrage;
- Turbines will be fully submerged during operation and located in the deepest part of the channel;
- The tidal barrage structure will incorporate a Hydro Control System structure (vertical or radial sluice gates) to control water levels and flows during all tidal cycles;

- A breakwater will connect the right bank of the Mersey with the Marine Navigation System (including the locks, which are to be located within the tidal barrage structure). The total length and crest level are set out in **Table 2.3** of **Chapter 2: Site Context and Project Description**;
- Erosion control, rock armour and scour protection measures are to be incorporated within the tidal barrage (exact locations to be confirmed);
- Port and marine facilities are not being considered as these are existing and will only be used for construction purposes; and
- The proposed grid connection is not being considered as part of the coastal processes scoping assessment, as this will comprise above water and land-based development.

5.8.2 The source-pathway-receptor linkage between Project infrastructure and / or activities and the receptor groups for this aspect are described in **Table 5-17**.

5.9 EMBEDDED ENVIRONMENTAL MEASURES

5.9.1 Embedded mitigation measures have been identified and are proposed to be adopted as part of the evolution of the Project Design (embedded into the Project Design). These measures will evolve over the development process as the EIA progresses and in response to consultation. They will be fed iteratively into the assessment process. These measures typically include those that have been identified as good or standard practice and include actions that would be undertaken to meet existing legislation requirements.

5.9.2 As there is a commitment to implementing these environmental measures, and also to various standard sectoral practices and procedures, they are considered inherently part of the design of the Project and have therefore been considered in the scoping assessment.

5.9.3 In addition to the specific embedded mitigation measures relevant to coastal processes listed in **Table 5-16**, consultation will be undertaken with all relevant consultees such as the Marine Management Organisation, Environment Agency and Natural England.

Table 5-16: Relevant hydrodynamic modelling and coastal processes embedded environmental measures

ID	Mitigation Measures embedded into the project design	How the measure will be secured
OM1	A Construction Environmental Management Plan (CEMP) will be implemented by the contractor. The contractor will ensure that the relevant environmental measures and health and safety procedures within the CEMP are implemented in accordance with legislation and government and industry standards, to minimise impacts wherever possible. The CEMP will identify the project management structure roles and responsibilities with regard to managing and reporting on the environmental impacts of the construction phase. The CEMP will be the securing mechanism for many measures. Other measures that that feed into the CEMP include: ▪ CP2 – MPCP; ▪ CP3 – PEMP; ▪ CP4 – control of materials used; ▪ CP5 – control of coatings used; ▪ CP6 – Scour Protection Management Plam (SPMP); and ▪ CP7 – minimisation of sediment mobilisation.	DCO Requirement - CEMP Marine licence conditions and contract terms.
OM2	A Marine Pollution Contingency Plan (MPCP) will be developed and implemented. This MPCP will outline procedures to protect personnel and to safeguard the marine environment, as well as mitigation measures in the event of an accidental pollution event arising from estuarine or marine operations relating to the Project. The MPCP will also include relevant key emergency contact details.	DCO Requirement - CEMP.

ID	Mitigation Measures embedded into the project design	How the measure will be secured
OM3	A Project Environmental Monitoring Programme (PEMP) will be developed and implemented. This will set out commitments to environmental monitoring in pre-, during and post-construction phases of the Project.	DCO Requirement - CEMP.
5-1	Materials placed in the estuary as part of the barrage construction will be subject to approval by MMO to ensure that any material to be deposited in the sea (metal components, concrete, armouring) does not contain toxic materials that could leach into the estuary water and result in toxic effects.	Marine licence conditions DCO Requirement - CEMP.
5-2	Coatings on submerged elements of the barrage will be subject to approval by MMO to ensure that they do not contain toxic materials that could leach into the estuary water and result in toxic effects.	Marine licence conditions DCO Requirement - CEMP.
OM4	A Scour Protection Management Plan (SPMP) will be developed and implemented. It will include details of the need, type, quantity, location(s) and installation methods for scour protection.	Marine licence conditions DCO Requirement - CEMP
5-3	Turbidity in the water column caused by sediment mobilisation during construction will be minimised by selection of best practice construction methods.	Agreed Construction Method Statement DCO Requirement - CEMP.

5.10 LIKELY SIGNIFICANT EFFECTS

5.10.1 In line with the EIA Regulations 2017, the EIA for the Project will consider those impacts where there is a risk of a likely significant effect only. The following Section draws on industry experience and expertise to identify those effect-

receptor pathways that may potentially lead to a significant impact. Where experience and available evidence indicates an effect-receptor pathway will not lead to a significant impact with regards to the EIA Regulations 2017 the pathway is scoped out from assessment.

5.10.2 The likely significant effects on coastal processes and water and sediment quality are summarised in **Table 5-17**. The scoping assessment is based on a combination of the Project definition at the scoping stage, embedded environmental measures, understanding of the baseline conditions at this stage, the evidence base for hydrodynamic modelling and coastal processes, the identification of potentially impacted receptors, initial modelling and professional judgement. The approach to this assessment is set out in **Chapter 3: Approach to EIA**.

5.10.3 The early identification of likely significant effects is used here as a tool aimed at delivering a proportionate approach to the EIA. In doing so, it sets out a high-level assessment of all potential effects, significant or not. The basis for scoping out certain effects, and therefore no longer considered, is presented after the table, supported by the evidence base.

5.10.4 Please note that coastal processes are treated as an impact 'pathway' as well as having associated receptors in their own right. Potential effects linked to coastal processes (for example the inundation and / or reduction in water levels on habitats) or changes in water and sediment quality can be found within other chapters, notably **Chapter 6: Benthic Ecology and Plankton** and **Chapter 10: Fish and Shellfish**. Therefore, a pathways assessment will be included within the subsequent PEIR and ES Chapter for coastal processes.

Initial and Proposed Hydrodynamic Modelling

5.10.5 Preliminary hydrodynamic modelling was carried out by HR Wallingford using the TELEMAC model and its GAIA sediment transport and bed evolution module.

5.10.6 A brief examination has been made at this stage of preliminary model outputs for various barrage locations and operating scenarios to provide indications of the potential spatial scale of changes in coastal processes and water and sediment quality, to inform the EIA scoping process.

5.10.7 Following the identification of a preferred location for the tidal barrage, further modelling will be carried out in accordance with consultation with stakeholders. A separate modelling plan will be prepared to define the requirements for this work which will be shared and agreed with the relevant stakeholders in advance of future modelling work. This modelling will likely include (but not be limited to):

- Modelling of hydrodynamics (water levels, currents, and waves);
- Modelling of sediment transport (changes to erosion / accretion patterns);
- Modelling of water quality (including sediment dispersion);
- Geomorphological assessment (expert review informed by metocean data collection and modelling studies); and
- Sea level scenarios (with and without a tidal surge), to assess potential flooding extents.

5.10.8 The following observations on spatial extent of potential changes have been made based on the preliminary model outputs.

- Effects of the barrage on variations in seabed level over the spring-neap tidal cycle may extend a limited distance outside the Mersey Estuary into Liverpool Bay. This will need to be considered in the EIA process, including potential effects on benthic ecology (see **Chapter 6: Benthic Ecology and Plankton**), although this is likely to affect only a small proportion of the offshore study area.
- Changes in suspended solids concentration as a result of the Project may extend throughout much of the offshore study area, as well as within the Mersey Estuary. These changes may have effects on phytoplankton growth, so the scope of assessment of effects on phytoplankton (see **Chapter 6: Benthic Ecology and Plankton**) will need to include the whole offshore study area, as well as the Mersey Estuary.
- Preliminary modelling showed minor changes in salinity within the Mersey Estuary as a result of the modelled barrage scenarios but no visible change in the offshore study area. Therefore, it is anticipated that the scope of the assessment of effects of salinity change on biota and other users can be confined within the estuary itself.
- Modelling undertaken using *E. coli* as an indicator for sewage behaviour in the Mersey Estuary during a storm event showed significant increases in concentration of this tracer compared with baseline for some barrage scenarios. As sewage discharges are likely to be one of the principal sources of inorganic nutrients (particularly nitrogen and phosphorus) entering the impounded area created by the barrage, the potential for of changes in nutrient concentrations in the estuary as a result of the Project will be assessed. Changes in nutrient concentrations combined with a reduction in suspended solids concentrations, may affect phytoplankton growth, which will be considered within the scope of **Chapter 6: Benthic Ecology and Plankton**).

Table 5-17: Likely significant hydrodynamic, coastal processes and water and sediment quality effects

Activity and Impact		Embedded Measures	Effect	Proposed approach to assessment (scoped in or scoped out)	Receptor	Further data baseline requirements
Generation of sediment disturbance / plumes.	Construction ▪ Caissons / cofferdams; ▪ Dredging; and ▪ Breakwaters / reclaimed land. O&M ▪ Turbine operation; and ▪ Maintenance dredging. Decommissioning ▪ Demolition of structures.	OM1, 5-3	Potential increase in turbidity and changes to erosion / accretion patterns due to increased sediment mobilisation.	Scoped in. Proposed quantitative assessment of the spatial extent of sediment disturbance, including indicative suspended sediment concentration changes or other quantitative indication of sediment disturbance and subsequent settling. Sediment dispersion	Sub-tidal riverbed / seabed and surrounding riverbank / coastline. Adjacent waterbodies and designated sites, including Bathing Waters and Shellfish Waters. Inhibition of fish migration (see **Chapter 6: Benthic Ecology and Plankton**).	Bathymetry survey and sediment sampling. Collected through a combination of desktop study and marine surveys.

Activity and Impact		Embedded Measures	Effect	Proposed approach to assessment (scoped in or scoped out)	Receptor	Further data baseline requirements
				modelling to be completed.		
Mobilisation and redeposition of contaminated sediments.	Construction ■ Caissons / cofferdams; ■ Dredging; and ■ Breakwaters / reclaimed land. O&M ■ Turbine operation; and ■ Maintenance dredging. Decommissioning ■ Demolition of structures.	OM1, 5-3	Potential temporary increase in contaminant concentrations in the water column. Redeposition of contaminated sediments in less contaminated areas.	Scoped in: sediment contamination known to be an issue in the Mersey. Use sediment quality data and output from sediment disturbance assessment above to identify effect on contaminant concentrations.	Compliance with WFD water quality targets Secondary effects on estuary biota (see **Chapter 6: Benthic Ecology and Plankton**).	Sediment and water quality data.

Activity and Impact		Embedded Measures	Effect	Proposed approach to assessment (scoped in or scoped out)	Receptor	Further data baseline requirements
Changes to metocean conditions.	Construction ▪ Caisson / cofferdam; and ▪ Breakwaters / reclaimed land. O&M ▪ Blockage effects from barrage and associated structures; and ▪ Turbine operation. Decommissioning	OM1, OM3	Direct effects on physical processes (water-levels, currents, waves) within the vicinity of the tidal barrage.	Scoped in. The potential impacts will be assessed by a thorough analysis of existing data and expert quantitative analysis of hydrodynamics, through the completion of hydrodynamic modelling.	Sub-tidal riverbed / seabed and surrounding riverbank / coastline. Adjacent waterbodies and designated sites, including Bathing Waters and Shellfish Waters.	Bathymetry survey and oceanographic measurements (wave heights, current speeds, turbulence, water levels, sea temperature, and salinity). Collected through a combination of desktop study and marine surveys.

Activity and Impact		Embedded Measures	Effect	Proposed approach to assessment (scoped in or scoped out)	Receptor	Further data baseline requirements
	▪ Natural erosion of breakwaters.					
Disturbance of seabed geology and morphology.	Construction ▪ Dredging; ▪ Breakwaters / reclaimed land; and ▪ Bedrock stabilisation. O&M ▪ Turbine operation; ▪ Maintenance dredging; and ▪ Blockage effects from barrage and	OM1, OM3, 5-3	Potential direct effects on seabed geology and features within the vicinity of the tidal barrage. Secondary scour of designated sites / existing infrastructure.	Scoped in. The potential impacts will be assessed by a thorough analysis of existing data and expert geomorphological assessment / quantitative analysis of hydrodynamics and sediments, through the completion of hydrodynamic modelling.	Sub-tidal riverbed / seabed and surrounding riverbank / coastline. Adjacent waterbodies and designated sites.	Bathymetry survey and sediment sampling. Collected through a combination of desktop study and marine surveys.

Activity and Impact		Embedded Measures	Effect	Proposed approach to assessment (scoped in or scoped out)	Receptor	Further data baseline requirements
	associated structures.					
Changes in retention time of estuary water.	O&M ▪ Operational mode of the tidal barrage.	OM3	Settlement of suspended solids, increasing water clarity, leading to increased phytoplankton growth. Changed retention times and potential effects on stratification may affect occurrence and extent of algal blooms.	Scoped in. High nutrient levels have been identified as a cause of failure to meet WFD standards.	WFD compliance with quality elements such as oxygen regime (with secondary effects on estuary biota (see **Chapter 6: Benthic Ecology and Plankton**).	Nutrient and algal baseline data.
Changes in retention time of estuary water.	O&M ▪ Operational mode of the tidal barrage.	OM3, 5-3	Changes in turbidity leading to changes in bacterial mortality	Scoped in: significant inputs of treated sewage to the estuary and potential significant effect	Compliance with EQS at nearby bathing waters.	Baseline data on *E. coli* and intestinal enterococci in the Mersey Estuary.

Activity and Impact		Embedded Measures	Effect	Proposed approach to assessment (scoped in or scoped out)	Receptor	Further data baseline requirements
			caused by sunlight.	on mortality (may be beneficial).		
Changes in retention time of estuary water.	O&M ▪ Operational mode of the tidal barrage.	OM3, 5-2	Changes in estuary hydrology may change effects of treated sewage inputs on the estuary dissolved oxygen regime.	Scoped in: significant inputs of treated sewage to the estuary and potential for adverse effects due to changes in hydrology.	WFD compliance with quality elements such as oxygen regime (with secondary effects on estuary biota (see **Chapter 6: Benthic Ecology and Plankton**).	Data on major treated sewage discharges inland of the barrage.
Accidental spillages of fuel, cement or other harmful materials from plant working in or over water.	Construction ▪ Use of land-based plant in intertidal area; and ▪ Use of vessels during construction	OM1, OM3, OM2	Direct effects on estuarine water quality.	Scoped out: Embedded mitigation including protocols for storage and use of material and spill response plans should reduce risk to an insignificant level.	Compliance with WFD water quality targets Secondary effects on estuary biota (see **Chapter 6: Benthic Ecology and Plankton**).	Data on materials to be used in construction.

Activity and Impact		Embedded Measures	Effect	Proposed approach to assessment (scoped in or scoped out)	Receptor	Further data baseline requirements
	O&M ▪ Spillages in power station buildings. Decommissioning ▪ As construction.					

Impacts Scoped out of Assessment

5.10.9 The following impacts have been scoped out of assessment:

- Potential effects from the marine disposal of sediment;
- Potential effects from barrage maintenance (including maintenance of any associated erosion control structures); and
- Potential effects from accidental pollution events.

5.10.10 The conclusions follow (in a site-based context) existing best practice. Each scoped out effect is considered in turn below.

5.10.11 Potential effects from marine disposal of dredged sediment are scoped out of this chapter. This is because it is assumed that, unless otherwise specified, sediment of appropriate quality will be disposed in accordance with all necessary permissions at existing licensed offshore disposal sites or used in an ecological enhancement project which have already undergone rigorous environmental assessments (with contaminated sediment to be treated in accordance with regulatory requirements).

5.10.12 Potential effects from general barrage maintenance, and the maintenance of associated erosion control structures, has been scoped out as it is assumed that the effects are likely to be negligible.

5.10.13 There is a risk of pollution being accidently released during the construction, operation (and maintenance) and decommissioning phases from sources including vessels and equipment. However, accidental pollution events are not considered likely to result in a significant effect on marine water and sediment quality features. The magnitude of an accidental spill will be limited by the size of chemical or oil inventory on construction vessels or land-based plant. The likelihood of an incident will be reduced as all vessels involved in the Project will be required to comply with strict environmental controls with the implementation of the MPCP. These plans will include planning for accidental spills, address all potential contaminant releases and include key emergency contact details. The EMP will also set out industry good practice and OSPAR and MARPOL guidelines for preventing pollution at sea. Due to the implementation of control measures and small quantities of hydrocarbons and chemicals on board vessels, it is proposed to scope this impact out of further consideration within the ES.

5.11 CUMULATIVE EFFECTS

5.11.1 Cumulative effects on coastal processes resulting from the effects of the Project and other developments that have been screened in as part of the CEA screening exercise.

5.11.2 The following impacts from the Project have the potential to act cumulatively with impacts from other developments to contribute to cumulative effects:

- Generation of sediment disturbance / plumes – This impact could interact with other changes to metocean conditions / sediment disturbance associated with construction, O&M, and decommissioning of other projects within the study area, leading to a combined increase in sediment dispersion, which could have a significant effect on receptors.
- Changes to metocean conditions – This impact could result in changes to metocean conditions (i.e. waves, currents etc) which, when combined with impacts associated with construction, O&M, and decommissioning of other projects within the study area, could result in increased sediment dispersion / plumes or secondary scour / deposition which could have a significant effect on receptors.
- Disturbance of seabed geology and morphology - This impact could interact with other disturbance to seabed geology and morphology associated with construction, O&M, and decommissioning of other projects within the study area, which could have a significant effect on receptors.
- Changes to the flushing characteristics of the estuary or to stratification of the water column could interact with effects on water quality of other projects involving water discharge activities to the Mersey Estuary or its tributary rivers.

5.12 TRANSBOUNDARY EFFECTS

5.12.1 The offshore study area for coastal processes has been initially defined based on potential tidal excursion distances and will be further refined through results from hydrodynamic modelling of far-field processes, and the inshore study area excludes impacts upstream of the tidal limit of the River Mersey. These extents were defined so that all likely potential impacts were included; outside of the study area all effects are expected to be negligible.

5.13 PROPOSED APPROACH TO ENVIRONMENTAL IMPACT ASSESSMENT

5.13.1 Further desk-based studies and analysis will be undertaken to identify and assess the coastal processes pathways and receptors. This study will be supplemented with consultation with the relevant statutory and non-statutory organisations following receipt of the Scoping Opinion and throughout the pre-application process.

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6 BENTHIC ECOLOGY AND PLANKTON

6.1 INTRODUCTION

6.1.1 The Benthic Ecology and Plankton chapter will consider the potentially significant effects on Benthic Ecology and Plankton that may arise from the construction, operation and maintenance (O&M) and decommissioning activities of the Project, specifically the tidal barrage. These receptors include intertidal and subtidal habitats/species and plankton (phytoplankton and zooplankton). This chapter considers the grid connection in the case that the selected cable route includes a section of intertidal and subsea cable. This chapter does not consider the use of existing port and marine facilities during the construction phase.

6.1.2 This chapter describes the methodology to be applied within the Environmental Impact Assessment (EIA), an overview of the baseline conditions within the Scoping Boundary (as defined in **Chapter 1: Introduction**), the datasets to be used to inform the EIA, the potential likely significant effects to be considered for Benthic Ecology and Plankton, and how these will be assessed for the purpose of the EIA.

6.1.3 The Benthic Ecology and Plankton chapter interfaces with other topic areas and as such, should be considered alongside the following chapters:

- **Chapter 5: Coastal Processes**: There are potential pathways of effect from marine processes on potentially sensitive Benthic Ecology and Plankton receptor species, therefore information on the marine geology, oceanography, physical processes, water quality, sediment chemistry and sediment dynamics will be required to inform the Benthic Ecology and Plankton assessment.
- **Chapter 7**: **Invasive Non-Native Species**: There are potential pathways of effect from the spread of Invasive Non-Native Species (INNS) on potentially sensitive Benthic Ecology and Plankton receptor species. Therefore, information on the presence of INNS within the Mersey Estuary will be required to inform the Benthic Ecology and Plankton assessment.
- **Chapter 9: Marine & Intertidal Ornithology**: Marine & Intertidal Ornithology receptor species are sensitive to changes in intertidal benthic prey resource and habitats. The marine and intertidal ornithology section will therefore, inform the Benthic Ecology and Plankton assessment.

- **Chapter 10: Fish & Shellfish**: The fish & shellfish chapter will include key intertidal and subtidal benthic shellfish species that characterise benthic habitats. The fish & shellfish chapter will therefore, inform the Benthic Ecology and Plankton assessment.
- **Chapter 15: Major Accidents & Disasters**: There is potential for accidental pollution associated with major accidents and disasters to affect Benthic Ecology & Plankton receptors.
- **Chapter 16: Shipping & Navigation**: There are potential pathways of effects from increased vessel activities on Benthic Ecology and Plankton receptor species (i.e. increased risk of accidental pollution and introduction of INNS). Information in the shipping and navigation chapter will therefore inform the Benthic Ecology and Plankton assessment.

6.1.4 For Overarching relevant legislation and policy context which has informed the scope of the assessment is outlined in **Chapter 4: Planning Policy**, with topic specific considerations outlined in **Appendix 4.1**.

6.2 TECHNICAL GUIDANCE

6.2.1 Technical guidance that has been used to define the assessments is set out in **Table 6-1**.

Table 6-1: Relevant technical guidance

Guidance Reference	Relevance to the assessment
Chartered Institute of Ecology and Environmental Management (CIEEM) guidelines for Ecological Impact Assessment for Terrestrial, Freshwater and Coastal Environments (2018).	Guidelines on the approach to EIA recommending that the conservation values of receptors are considered.
Guidance from the Marine Life Information Network (MarLIN) on assessing habitat sensitivity using Marine Evidence based Sensitivity Assessment (MarESA).	Provides an approach to examine the biology or ecology of a feature, compile the evidence of the effect of a given pressure on the feature (species or habitat) in question, assess the likely sensitivity of the feature to the pressure against standard

Guidance Reference	Relevance to the assessment
	scales, and to document the evidence used and justify assessments made.

6.3 STUDY AREA

6.3.1 For the purposes of this scoping chapter, the Study Area for the Benthic Ecology and Plankton assessment is consistent with the study area for Coastal Processes and is based on spring tidal excursion distances (considering tidal current speeds and directions). The Study Area for Benthic Ecology and Plankton will be reviewed further at PEIR and ES stage and may change following the outcome of consultation of this scoping chapter and any future hydrodynamic modelling undertaken. It is anticipated that the Study Area will allow for the robust characterisation of benthic intertidal and subtidal habitats and species within the Mersey Estuary and in nearby areas outside of the Estuary. The Benthic Ecology and Plankton Study Area is presented in

6.3.2 In the case of the Benthic Ecology and Plankton receptors the Survey Area extends in parts beyond the defined Study Area for the Project. The Survey Area has been defined as a consistent area across all Marine Ecology Chapters within this Scoping Report and it's outer bound is defined by the range of receptors. Data collected as part of planned surveys within the Survey Area and supplemented by desk-based review of existing datasets will therefore, be used to characterise and assess potential impacts upon the Benthic Ecology and Plankton within the Study Area.

6.3.3 The Benthic Ecology and Plankton EIA Study Area will be reviewed and further defined in consultation with stakeholders as the Project progresses. Following the provision of updated hydrodynamic modelling outputs it is anticipated that the Study Area will likely be reduced.

6.4 CONSULTATION

6.4.1 Consultation is a key part of the application process. The assessment has been and will be informed by engagement and discussion with various stakeholders including but not limited to the following: Planning Inspectorate (PI), Environment Agency (EA), Natural England (NE), MMO, Joint Nature Conservation Committee (JNCC), local councils (i.e. Warrington Borough Council) and other stakeholders via public consultation. Regular Environmental Stakeholders Workshops and Hydro-environmental Modelling Workshops have also been undertaken since October 2020, full details of these workshops is provided within **Table 3-1** of **Chapter 3 (Approach to EIA)** and is summarised for the consultation events of particular relevance to this Chapter within **Table 6-2**.

6.4.2 A summary of the key issues raised during consultation and workshops to date, relevant to Benthic Ecology and Plankton, is outlined in **Table 6-3** together with how these issues will be considered in the production of the EIA.

Table 6-2: Consultation Events

Date	Consultee	Agenda Topics
30.06.2021	NE, RSPB, LWT, NW-IFCA, HE, NRW, TCE, MRT, MGET, NWWT	Environmental Stakeholder Workshop 3. Status Update and Initial Survey Approach (inc. fish, habitats and non-breeding birds)
09.12.2021	EA, NE, LWT, NW-IFCA, HE, NRW, MRT, MGET, MMO, TCE, RSPB, CWT, NWT	Environmental Stakeholder Workshop 5. Status update, Habitats, Water Quality, Ecological Survey Schedule, Hydrodynamic modelling update, Evidence Plan approach.
10.01.2022	EA, NE, LWT, NW-IFCA, NRW, MRT, MGET, TCE, CWT	Environmental Stakeholder Workshop 6. Status update, Progress on In-River barrage location review, Plan for topic-based technical discussions moving forward, Habitat Scope Discussion.
10.05.2022	EA, NE, LWT, MRT, MGET, TCE, DECG, MMO, NWT, MECG	Hydro-environmental Modelling Workshop 1. Status Update, Hydro-environmental modelling workplan, Hydro-environmental model calibration and validation.

Date	Consultee	Agenda Topics
17.05.2023	EA, NE, LWT, MRT, MGET, TCE, DECG, MMO, NWT, MECG	Environmental Stakeholder Workshop 7. Provide an update on project status, Introduction to desk-based studies, Update on surveys, Wider Data Gathering and Analysis, Hydro-environmental Modelling Update.
30.08.2023	EA, NE, LWT, MRT, MGET, TCE, DECG, MMO, NWT,MECG	Environmental Stakeholder Workshop 8. Status update, Hydro-environmental Modelling Update, Update on desk-based studies and next steps for baseline surveys, Update on surveys.
16.11.2023	EA, NE, LWT, MRT, MGET, MMO, NWT, RSPB, CWT	Environmental Stakeholder Workshop 9. Status update, Habitats and Licensing, Hydro-environmental Modelling Update, Update on surveys.
30.08.2023	EA, NE, LWT, MRT, MGET, TCE, DECG, MMO, NWT,MECG	Hydro-environmental Modelling Workshop 2. Status Update, Hydro-environmental modelling update.

Table 6-3: Consultation Comments

Date	Consultee	Consultation and Key Comments	How this is accounted for
2022	EA	The EA were satisfied that that all of the relevant existing baseline data had been identified and that the summary of range of potential effects and historic studies was comprehensive for this stage of the study and project. It was noted that there was a need to ensure that the legal requirement associated with the WFD were considered, particularly in relation to the Mersey Estuary Transitional Water Body. It was recommended to undertake future liaison with Warrington Borough Council about the environmental	Relevant legislation associated with the WFD have been considered in **Section 6.2** and Chapter 4 (Planning and Policy). A WFD Assessment will be conducted as part of the project (see WFD Screening and Scoping Report submitted with this EIA Scoping Report). Consultation will be undertaken with Warrington Brough Council as part of the development of the project baseline.

Date	Consultee	Consultation and Key Comments	How this is accounted for
		assessment and data associated with the proposed Warrington Western Link Road scheme in the upper Mersey Estuary.	
2022	NE	NE were satisfied that that all of the relevant existing baseline data had been identified and that the summary of range of potential effects and historic studies was comprehensive for this stage of the study and project. The project should consider the timely manner in which consents will be required for the proposed surveys and to ensure that adequate time was allocated within the programme for this.	Consideration has been given to acquiring the appropriate consents required when defining the survey scope and mobilising the survey programme.

Date	Consultee	Consultation and Key Comments	How this is accounted for
2022	MMO	The MMO concluded that the survey plan showed suitable consideration to the relevant marine habitats that may be potentially impacted by development. Furthermore, it was stated that the types of surveys are suitable to collect the required information to adequately determine benthic assemblages and habitats.	N/A
2022	EA	Advised EA would take organisational approach to assessing any scheme. EA advised that it is possible a tidal range scheme could have a life span longer than 100 years. Therefore, to ensure climate resilience and adaptation (and therefore the projects long term	The EIA process will consider the future baseline conditions (as far as reasonably practical. This will include consideration of climate change scenario requirements with other key nationally significant infrastructure types. Additionally, a climate resilience chapter will be produced as part

Date	Consultee	Consultation and Key Comments	How this is accounted for
		sustainability) it would be sensible to compare climate change scenario requirements with other key nationally significant infrastructure types e.g. nuclear. The EA agreed with proposed sampling windows for subtidal benthic invertebrates.	of the project (see Climate Resilience Chapter submitted with this EIA Scoping Report).
2022	EA	The EA provided advice on the relevant legislation and guidance it considers when consenting tidal lagoon schemes including: The EU Habitats and Wild Birds Directives and the EU WFD set high thresholds for the protection of natural habitats, species and water quality. Among other relevant legislation are the EU	Relevant legislation to Benthic Ecology and Plankton is provided in **Section 6.2** and Chapter 4 (Planning and Policy). A tidal lagoon option for the Project has been removed and only the tidal barrage option will be considered for the Project. Several potential pathways leading to impacts on water

Date	Consultee	Consultation and Key Comments	How this is accounted for
		Bathing Waters Directive, the Salmon and Freshwater Fisheries Act 1975, the Eels (England and Wales) Regulations 2009, the Water Resources Act 1991, the Wildlife and Countryside Act 1981, Marine and Coastal Access Act 2009, Marine Strategy Framework Directive, Environmental Impact Assessment and the Environmental Permitting (England and Wales) Regulations 2010. EA advised that Potential water quality impacts are not restricted to human health and could include impacts on benthic ecology. Where there are several lagoons in-combination the likely impacts may have a very large	quality including changes in suspended solids, mobilisation of contaminants and changes to flushing regime have been considered and scoped into further assessment within **Table 6-15**. Additionally, a WFD Assessment will be produced as part of the project (see WFD Screening and Scoping Report submitted with this EIA Scoping Report) and water quality has been considered in Chapter 5: Coastal Processes.

Date	Consultee	Consultation and Key Comments	How this is accounted for
		ZoI and cause deterioration to water quality at a considerable distance from the developments themselves. These impacts will affect not just the immediately affected coastal areas but upstream rivers and, in the Severn, the high value wildlife sites.	
2022	NRW	NRW provided guidance on key considerations regarding the consenting and assessment process including a non-exhaustive list of legislation to be considered. Impacts concerning key receptors were also provided alongside advice relating to how other NRW functions should be considered within assessments such as its responsibilities	Relevant legislation for Benthic Ecology and Plankton is provided in **Section 6.2** and Chapter 4 (Planning and Policy).

Date	Consultee	Consultation and Key Comments	How this is accounted for
		surrounding flood risk management, fisheries and navigation.	
2023	NE	NE highlighted the need to consider the national site network project and subsequent Habitat Regulations Assessment (HRA) requirement for survey work. Consent and assent requirements by NE were also brought to our attention for the Sites of Scientific Special Interest (SSSI)s in relation to the proposed project. Supplementary data layers were brought to the attention of Mersey Tidal Power (MTP) to identify	Designated sites within the Study Area are presented in **Figure 6.4** and **Table 6-12**. Consideration will be given to acquiring the appropriate consent and assent required for SSSIs when defining the survey scope. Supplementary data layers used to identify priority habitats (i.e. seagrass) that may be affected by the Project are highlighted in **Table 6-8**.

Date	Consultee	Consultation and Key Comments	How this is accounted for
		priority habitats that may be affected by development.	
2023	NE	NE advises that it would be beneficial to add the EA Saltmarsh Extent layer and the NE Priority Habitats Inventory layer in addition to the online imagery sources from European Nature Information System (EUNIS) and JNCC. NE recommends that quadrat sampling is carried out (typically at least 5 quadrats in each homogenous vegetation community), with the vegetation zonation reflected in sampling. It is also suggested that data is collected following the Common Standards Monitoring Guidance	The EA Saltmarsh Extent layer, NE Priority Habitats Inventory layer and online imagery sources from EUNIS and JNCC have been considered in **Table 6-8**. Comments will be taken into account when defining the scope for surveys. Saltmarsh survey design will also be considered as part of an HRA evidence plan.

Date	Consultee	Consultation and Key Comments	How this is accounted for
		for Saltmarsh (and possibly sand dunes if that is in the area).	
2023	CE	The CE confirmed that licenses/consents would not be needed for habitat/walkover surveys but that they would be required for grab sampling and the removal of any sediment and for any works that would involve alterations to the seabed.	Comments will be taken into account when defining the survey scope for benthic grab sampling.
2023	MMO	MMO confirmed that for licensing and consents the focus would be on benthic core samples taken within protected sites and the grab samples proposed to be taken offshore, and also advised that grab and core samples must be placed 25 metres apart from other grab samples, cannot	Comments will be taken into account when defining the survey scope for benthic grab sampling.

Date	Consultee	Consultation and Key Comments	How this is accounted for
		exceed four cubic metres in volume and the number of samples cannot exceed five in order to be eligible to be licensed via a self-service license.	
2023	EA, NE, Savills	Hydro-environmental Modelling Workshop 3. Status Update, Hydro-environmental modelling update. Hydro-environmental modelling update, Main findings on energy, hydrodynamics, intertidal exposure and water quality, Next steps for hydro-environmental modelling and location assessment.	Consideration of discussions on hydro-environmental modelling given in developing this EIA scoping chapter.

6.5 ASSESSMENT METHODOLOGY

6.5.1 The Project-wide approach to the assessment methodology is set out in **Chapter 3: Approach to EIA**. This will be implemented to assess the likely significant effects on Benthic Ecology and Plankton receptors from the construction, O&M, and decommissioning of the Project.

6.5.2 Relevant legislation and guidance will also be considered in relation to the assessment, in addition to consultation with the stakeholders outlined above.

6.5.3 The assessment approach will be based on the conceptual 'source-pathway-receptor' model. This model identifies likely environmental effects resulting from the construction, O&M and decommissioning of the Project. This process provides an easy to follow assessment route between effect sources and potentially sensitive receptors ensuring a transparent impact assessment.

6.5.4 Iterative steps involved in the assessment approach will include:

- Determination of potential interactions between the Project and ecological receptors (for construction, O&M and decommissioning phases);
- Definition of benthic ecology and plankton environment within the influence of the Project;
- Assessment of the sensitivity of benthic ecology and plankton receptors;
- Assessment of the magnitude of impact;
- Assessment of the significance of effects;
- Proposal of mitigation measures to reduce, prevent or where these are not possible, to offset, any adverse significant effects;
- Assessment of the residual effects after any mitigation measures have been considered; and
- Assessment of cumulative effects.

RECEPTOR SENSITIVITY/VALUE

6.5.5 The criteria for defining the value and sensitivity of Benthic Ecology and Plankton receptors within the Benthic Ecology and Plankton EIA chapter are outlined in **Table 6-4** and **Table 6-5**, respectively. The definitions have been informed by the CIEEM guidelines for Ecological Impact Assessment (CIEEM, 2018) and MarESA (Tyler-Walters *et al*., 2023).

6.5.6 It should be noted that the value of the receptor and sensitivity are not necessarily linked for a particular effect. For example, a receptor could be of international or national importance (e.g. a feature of a protected site) but have a low or negligible sensitivity to an impact and vice versa. Consequently, when determining the sensitivity level taken forward to assessment this will be taken into account, with species-specific considerations and professional judgement being used.

Table 6-4: Value criteria for Benthic Ecology and Plankton receptors

Value	Definition
High - International	Features of an internationally designated site. Species protected under international law. Globally threatened species (i.e. Critically endangered or endangered on the International Union for Conservation of Nature (IUCN) Red list). Regularly occurring populations of internationally important species that are rare or threatened in the UK or of uncertain conservation status. A regularly occurring, nationally significant population/number of any internationally important species. Habitat/species possess important biodiversity, social/community value and / or economic value.
Medium - National	Feature of a nationally designated site. Species protected under national law. Annex I habitat which is not listed as qualifying interest of any SACs within the Study Area. Vulnerable or lower on IUCN Red list. Habitat/species are highly regarded for their important biodiversity, social/community value and / or economic value.
Low - Regional	WFD biological element.

Value	Definition
	Any regularly occurring significant population that is listed in a Local Red Data Book. Significant populations of a regionally/county important species. Habitat/species possess moderate biodiversity, social / community value and / or economic value.
Very Low - Local	Areas of habitat identified in a local BAP or in the relevant Natural Area profile. Sites that the designating authority has determined meet the published ecological selection criteria for designation, including Local Nature Reserves. Local Nature Recovery Strategy (LNRS) biodiversity opportunity areas. Sites/features that are scarce within the local or which appreciably enrich the local habitat resource. Species are abundant, common or widely distributed. Habitat/species possess low biodiversity, social/community value and / or economic value.

6.5.7 The criteria for defining sensitivity in this chapter are outlined in **Table 6-5** below. Sensitivity will be considered as required when assessing effects, and information relating to sensitivity of receptors to impacts will be clearly indicated in the assessment narrative where appropriate. It should be noted that the value and vulnerability/ recoverability of a receptor can be very different. For example, it is possible for a low or regional value receptor to have a high vulnerability or low recoverability to an impact. In such cases, it will usually be the highest sensitivity rating that is taken forward to assessment, however, professional judgement will also be used to determine the overall sensitivity of the receptor to the impact.

Table 6-5: Sensitivity criteria for Benthic Ecology and Plankton receptors

Sensitivity	Definition
High	Vulnerability: The receptor cannot or has very low capacity to avoid, adapt or tolerate the impact. Recoverability: The effect on the receptor is anticipated to be permanent or partial recovery is only likely to occur after about 10 years and full recovery may take over 25 years. Value: The receptor is of international value.
Medium	Vulnerability: The receptor has limited capacity to avoid, adapt or tolerate the impact. Recoverability: Only partial recovery is likely within 5 years and full recovery is likely to take up to 10 years. Value: The receptor is of national value.
Low	Vulnerability: The receptor has a reasonable capacity to avoid, adapt or tolerate the impact. Recoverability: Full recovery will occur but will take many months (or more likely years) but should be complete within about five years. Value: The receptor is of regional or local value.
Very low	Vulnerability: The receptor has a high capacity to avoid, adapt or tolerate the impact. Recoverability: The receptor is anticipated to recover immediately (days to a few months). Value: The receptor is of local value.

MAGNITUDE OF IMPACT

6.5.8 The criteria for defining the magnitude within the Benthic Ecology and Plankton EIA chapter are outlined in **Table 6-6.** Where the specific criteria for extent, duration, frequency and consequences are not all met, professional judgement will be used to determine which magnitude level is applicable.

Table 6-6: Impact magnitude criteria for Benthic Ecology and Plankton.

Magnitude	Definition
High	Extent: Impact can extend from near-field to the boundary of the Study Area. Duration: The impact is anticipated to be permanent or long-term (>5 years). Frequency: The impact will occur constantly throughout the relevant project phase. Consequences: Permanent changes to key characteristics or features of the particular environmental aspect's character or distinctiveness.
Medium	Extent: Impact across the near-field and far-field areas. Duration: The impact is anticipated to be medium term (1-5 years) or long-term (>5 years). Frequency: The impact will occur constantly throughout a relevant project phase. Consequences: Noticeable change to key characteristics or features of the particular environmental aspect's character or distinctiveness.
Low	Extent: Impact mainly in the near-field. Duration: The impact is anticipated to be short term (<1 year). Frequency: The impact will occur frequently throughout a relevant project phase. Consequences: Barely discernible to noticeable change to key characteristics or features of the particular environmental aspect's character or distinctiveness.

Magnitude	Definition
Very Low	Extent: Impact immediately adjacent to the source. Duration: The impact is anticipated to be momentary (seconds to minutes) to brief (lasting less than one day). Frequency: The impact will occur once or infrequently throughout a relevant project phase. Consequences: No discernible to barely discernible change to key characteristics or features of the particular environmental aspect's character or distinctiveness.

SIGNIFICANCE OF EFFECT

6.5.9 The significance of the effect upon Benthic Ecology and Plankton receptors will be determined by taking into account the sensitivity of the receptor and the magnitude of the impact. Effects may be either negative (adverse) or positive (beneficial) and are defined initially without mitigation. Where the resulting effect could be allocated more than one significance level (according to **Table 6-7**), the final significance level applied will be based upon consideration of the available information and professional judgement.

6.5.10 Residual effects that are classified as moderate or above are considered to be 'significant' in EIA terms. Residual effects classified as Minor or below are considered to be 'not significant'.

6.5.11 The following terms have been used to define the significance of the effects identified:

- **Major Effect:** Project could be expected to have a considerable effect (either positive or negative) on Benthic Ecology and Plankton receptors;
- **Moderate Effect:** Project could be expected to have a noticeable effect (either positive or negative) on Benthic Ecology and Plankton receptors;
- **Minor Effect**: Project could be expected to result in a small, barely noticeable effect (either positive or negative) on Benthic Ecology and Plankton receptors; and
- **Negligible**: No discernible effect is expected as a result of the Project on Benthic Ecology and Plankton receptors.

6.5.12 In some instances an impact pathway – receptor combination has been scoped out of further assessment due consideration of a specific benthic ecology and plankton receptor and the absence of any route to effect. Other impact pathway – receptor combinations have been scoped out based on consideration of available project design information (see **Chapter 2: Site Context and Project Description)**, embedded mitigation measures and/or professional judgement. Where this is the case, clear reasoning has been provided in **Section 6.11**.

Table 6-7: Significance of effect criteria for the Benthic Ecology and Plankton assessment.

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

6.6 BASELINE CONDITIONS

DATA INFORMATION SOURCES

6.6.2 An initial desk-based review has been undertaken of publicly available data sources outlined in **Table 6-8** to determine the baseline characteristics of Benthic Ecology and Plankton present within the Study Area and to inform the assessment process (RSK, 2023).

Table 6-8: Key sources of Benthic Ecology and Plankton data

Source	Year	Summary	Coverage of Study Area
European Marine Observation and Data Network (EMODnet, 2023).	2023	Benthic habitat classification mapping.	Partial coverage of Study Area.
Department for Environment, Food, & Rural Affairs (DEFRA), Multi-Agency Geographic Information for the Countryside (MAGIC), (DEFRA, 2023).	2024	Data map showing location of designated sites.	Full coverage of Study Area.
JNCC Marine Protected Area (MPA) Mapper (JNCC, 2020).	2024	Data map showing MPA boundaries within the UK.	Full coverage of Study Area.
National Biodiversity Network (NBN) Atlas (NBN Trust, 2024).	2024	Occurrence data for benthic species (excluding entries not licensed for commercial use).	Full coverage of Study Area.
Cefas OneBenthic portal (CEFAS, 2024).	2024	Predictive map of subtidal benthic assemblages.	Full coverage of Study Area.

Source	Year	Summary	Coverage of Study Area
EA Catchment Data Explorer (EA, 2023a).	2024	Information on the biological quality elements used to assess status of water bodies under the WFD.	Full coverage of Study Area.
EA Ecology & Fish Data Explorer (EA, 2024).	2024	Transitional and Coastal (TraC) phytoplankton and benthic invertebrate records data.	Full coverage of Study Area.
Kennington & Rowlands (2006).	1954 - 2005	Overview of plankton ecology of the Irish Sea	Full coverage of Study Area.
Bunn *et al*., (2004).	2001 - 2003	Plankton surveys conducted within the eastern Irish sea.	Beyond the Study Area.
Langstone *et al*., (2006).	2006	Overview of the Mersey Estuary European Marine Site (EMS) including biological communities.	Partial coverage of Study Area.
RSK (2024)	2023	Results of the site-specific intertidal walkover survey for the Project.	Full coverage of Study Area.

Source	Year	Summary	Coverage of Study Area
Liverpool 2 and River Mersey Approach Channel Dredging (ABPmer, 2005, cited in Royal Haskoning DHV, 2012).	2003 - 2004	Results of boat-based seabed surveys and intertidal walkover surveys of the Seaforth Triangle and Blundellsands foreshore conducted as part of the L2 project.	Partial coverage of Study Area.
Liverpool 2 and River Mersey Approach Channel Dredging (APEM, 2007; APEM, 2008, cited in Royal Haskoning DHV, 2012).	2007 – 2008	Results of biotope surveys of the Sefton Coast conducted as part of the L2 project.	Partial coverage of Study Area.
The Mersey Barrage Company (1992).	1990 – 1991	Results of the stage III environmental feasibility studies to develop an understanding of the ecology of the Mersey Estuary including data for plankton (phytoplankton, zooplankton and meroplankton), subtidal benthic and intertidal organisms, and saltmarsh.	Partial coverage of Study Area.
MTP Feasibility Study (APEM, 2010a; APEM 2010b).	2009 - 2010	Results of phytoplankton sampling and subtidal invertebrate surveys conducted as part of the Mersey Tidal Feasibility Study. Non-ecological information of relevance such as hydrodynamic and coastal process information.	Partial coverage of Study Area.

Source	Year	Summary	Coverage of Study Area
Mersey Gateway pre-construction monitoring (APEM, 2014).	2012 - 2013	Results of plankton, intertidal and subtidal benthic surveys conducted as part of the Mersey Gateway project.	Partial coverage of Study Area.
Liverpool Cruise Terminal (APEM, 2017, cited in Waterman, 2017).	2017	Results of subtidal grab survey conducted as part of the Liverpool Cruise Terminal project. Non-ecological information of relevance such as hydrodynamic and coastal process information.	Partial coverage of Study Area.
Isle of Man ferry Terminal (APEM, 2018, cited in Waterman, 2018).	2018	Results of subtidal grab survey conducted as part of the isle of Man ferry Terminal. Non-ecological information of relevance such as hydrodynamic and coastal process information.	Partial coverage of Study Area.
JNCC UK Protected Areas (JNCC, 2022).	2022	Information on nature conservation designations (e.g. SPA, SAC, SSSI) to determine habitats and associated species of conservation importance.	Full coverage of Study Area.

Source	Year	Summary	Coverage of Study Area
Natural Resources Wales (NRW) Habitats Network (NRW, 2022a).	2022	Water Watch Wales for WFD data on location of WFD waterbodies and status (interactive map).	Partial coverage of Study Area.
OSPAR Habitats – point data (2022).	2022	Compilation of OSPAR habitat data for the northeast Atlantic.	Partial coverage of Study Area.
European EA, European Nature Information System (EUNIS), (EUNIS, 2024).	2024	Location of nature conservation sites, different habitat types and species information.	Full coverage of Study Area.
Marine Biological Association (MBA), Data Archive for Seabed Species and Habitats (DASSH), (MBA, 2024).	2024	Location of nature conservation sites, different habitat types and species information.	Partial coverage of Study Area.
NE Marine Habitats and Species Open Data (England), (NE, 2024a).	2024	A spatial dataset that contains a collation of marine habitat and species biotope records.	Full coverage of Study Area.

Source	Year	Summary	Coverage of Study Area
NE Priority Habitats Inventory (England), (NE, 2024b).	2022	A spatial dataset that described the geographic extent and location of Natural Environment and Rural Communities Act (2006) Section 41 habitats of principal importance.	Full coverage of Study Area.
NE, Living England Habitat Map (NE, 2022).	2022	NE have produced spatial mapping of habitat extent and distribution using satellite imagery, field records and other geospatial data integrated using artificial intelligence. The data, published in April 2022, covers the whole of England and is mapped to 10 m resolution covering broad terrestrial habitat types that can be aligned to Phase 1 and UKHAB habitat categories. Individual habitat polygons are assigned a probability value as an output of the AI analysis. Some intertidal habitats are also mapped, drawing in other existing datasets.	Full coverage of Study Area.
NE National (England) Seagrass layer (NE, 2022c).	2022	Comprehensive geospatial dataset of surveys of both current and historical spatial seagrass. The layer identifies a current seagrass extent; using the best and most recent available evidence.	Full coverage of Study Area.

Source	Year	Summary	Coverage of Study Area
NE reports. Ribble Estuary SSSI / Ribble & Alt SPA Intertidal sediments surveys and condition monitoring (Natural England, 2015; Natural England, 2008; English Nature, 2006).	2005, 2007, 2013	Phase I and Phase II survey report with invertebrate density data and biotopes indicated for the four largest units of the Ribble Estuary SSSI (2013 survey report for NE by APEM (published in 2015))). Separate NE intertidal survey reports are also available for 2005 and 2007.	Partial coverage of Study Area.
NE reports. Dee Estuary SAC intertidal surveys and condition monitoring (Natural England, 2017; Natural England, 2011).	2011, 2015	Phase I and Phase II survey report with invertebrate density data and biotopes indicated for the Dee Estuary SAC (2015 survey report for NE by APEM (published in 2017)). A separate NE intertidal survey report is also available for 2011.	Partial coverage of Study Area.
JNCC Sandbank (GIS) Layer (JNCC, 2019).	2019	Polygon shapefiles detailing potential areas of sandbanks have been produced using depth, gradient, and sediment data.	Full coverage of Study Area.
DEFRA Saltmarsh Change (GIS) Layer (2008).	2008	Compares the 'baseline' version of national Saltmarsh Extent (2006-2009) with its 'most recent' version. The most recent version is based on imagery captured between 2016- 2019. It allows identification of where areas of gain and loss in saltmarsh have occurred.	Full coverage of Study Area.

Source	Year	Summary	Coverage of Study Area
EA Saltmarsh Extent and Zonation (2023b).	2023	The EA have produced a polygon later to show the extent of saltmarsh in England for the use of flood and coastal risk management for ecological monitoring and reporting. The extent has been interpreted by aerial imagery from data collected predominately between 2016 and 2019 (resolution of 20 cm x 20 cm).	Full coverage of Study Area.
Northwest Inshore and Northwest Offshore Marine Plan and Associated Technical Documents (DEFRA, 2021).	2021	The strategic approach to planning within inshore and offshore waters between the River Dee Welsh border and Solway First Scottish border, which provides habitat specific information.	Full coverage of Study Area.
NE National Biodiversity Climate Change Vulnerability Assessment (GIS) Layer (NE, 2020).	2020	NE have produced a GIS model that indicates the vulnerability of priority habitats to climate change based on principles of adaptation for biodiversity. It defines why areas are vulnerable and what interventions could have the greatest impact in increasing climate change resilience.	Full coverage of Study Area.
Burbo Bank Offshore Windfarm (OWF).	2006 – 2011	Pre- and post-construction benthic surveys. Non-ecological information of relevance such as hydrodynamic and coastal process information.	Partial coverage of Study Area.

Source	Year	Summary	Coverage of Study Area
Burbo Bank OWF Extension.	2013 – 2015	Pre-construction benthic grab survey. Non-ecological information of relevance such as hydrodynamic and coastal process information.	Partial coverage of Study Area.
Twelve Quays Terminal.	2018	Benthic desk-based study.	Partial coverage of Study Area.
The Mersey Gateway.	2018 – 2021	Benthic algae, phytoplankton, epifaunal trawl and subtidal grab surveys within the River Mersey from Wigg Island to Hale. Non-ecological information of relevance such as hydrodynamic and coastal process information.	Partial coverage of Study Area.
Local Biological Records Centre Data (various).	2019 - 2024	Location of protected habitat and species information in the local area.	Full coverage of Study Area.

EXISTING BASELINE

6.6.3 This section describes the present conditions which constitute the existing baseline environment for Benthic Ecology and Plankton within the Study Area.

6.6.4 Benthic ecology within estuarine environments, such as the Mersey Estuary, are strongly influenced by a range of physical, chemical and biological factors such as variability in salinity, temperature, nutrient availability, physical disturbance (i.e. tidal action) and sedimentary characteristics (Sivapriya *et al*., 2022). Benthic habitats within the Mersey Estuary are dominated by sand and mud which supports a wide range of infaunal communities.

6.6.5 The Project is situated on the River Mersey, between the Wirral to the west and Liverpool to the north-east, and is a highly industrialised and urban location, with an existing baseline level of anthropogenic activity and disturbance related to this, including that associated with shipping and foot traffic from the general public The habitats within and adjacent to the River Mersey Estuary, River Dee Estuary, Liverpool Bay and Irish Sea in the vicinity of the Project have experienced disturbance from many decades of major development, both onshore and offshore. There are four offshore windfarms in operation within the Irish Sea in the vicinity of the River Mersey Estuary, including Burbo Bank (including Extension) (<10km north-west), Gwynt y Môr (<30km west), North Hoyle (<30km west), Rhyl Flats (<40km west) and four further offshore windfarms within the same area of the Irish Sea, including West Duddon of Sands (<60km north-west), Barrow (<60km north-west), Walney (inc. extension) (<70km north-west) and Ormonde Wind Farm (<75km north-west). All of these offshore windfarms have been constructed in the last 25 years. In addition, two further offshore windfarms, Morecambe (<55km north-west) and Morgan (<80km north-west) are proposed. Significant major development has been undertaken within the River Mersey Estuary, including the Liverpool Cruise Terminal, completed in 2007, Mersey Gateway Bridge, completed in 2017, and several major developments either proposed or underway, including the Liverpool Waters (inc. Everton Stadium) and Wirral Waters. Environmental assessments for these projects have been based on desk-based data reviews and project-specific survey work, and these data sources are being considered for EIA Scoping and subsequent stages of the assessment process for the Project.

Intertidal Habitats and Species

6.6.6 Intertidal muddy sediment is the most common sediment type within the Mersey Estuary at low tide, with intertidal sand and muddy sand in areas of the inner estuary (**Figure 6.2**). These muddy shores are typical of estuarine shores where

there is enough shelter from wave action to allow fine sediment to settle. Mudflats on sheltered lower estuarine shores can support a rich infauna. The wider Mersey Estuary has important areas of intertidal habitat that support invertebrate prey species for birds, including but not limited to lugworm *A. marina*, ragworm *Nereis* spp. and bivalve molluscs, including the edible cockle *Cerastoderma edule* and Baltic tellin *Macoma balthica* (Langston *et al*., 2006). Several areas of coastal saltmarsh are also present within the inner and upper estuary including the southern bank between Ellesmere Port and Western Point, the northern bank west of Hale and the southern and northern banks within the vicinity of the Mersey Gateway bridge (**Figure 6.2**).

Intertidal Habitats and Species – Previous Site-specific Characterisations

6.6.7 Localised data collection and site characterisation information associated with the current and previous projects provides further characterisation of the type and distribution of intertidal habitats and species within the Study Area.

6.6.8 Rapid shoreline walkover surveys have been conducted to ground-truth aerial imagery and indicate the extent of broad habitats types in the intertidal zone (e.g. mud/sand flats, bedrock, different types of saltmarsh). Rapid shoreline walkover surveys were conducted by RSK in September and October 2023 focussing on four main areas including the north Wirral shore, Formby, Dee cliffs and the central Mersey Estuary (RSK, 2024).

6.6.9 The intertidal habitat of the north Wirral shore primarily comprises of intertidal mudflats and sandflats extending seawards approximately 1.5 km from the shoreline. Exposed bedrock is located around the Red Rocks headland, in the south-west of the area. At the landward extent of the mudflats and sandflats there is a band of supralittoral sandy beach (RSK, 2024), (**Figure 6.3**). The intertidal habitat at Formby is also comprised of intertidal mudflats and sandflats, with an extensive area of established sand dunes (RSK, 2024), (**Figure 6.3**).

6.6.10 The Dee cliffs contains an extensive area of intertidal mudflats and sandflats. The shoreline is dominated by supralittoral cliffs, with a thin band of supralittoral sand appearing to separate the cliffs from the intertidal mudflats and sandflats. At Thurstaston beach, this supralittoral sand extends into the Dee estuary. Patches of embryonic sand dunes and a small region of developing embryonic salt marsh are also associated with Thurstaston beach (RSK, 2024), (**Figure 6.3**).

6.6.11 The central Mersey Estuary contains extensive intertidal mudflats and sandflats. Along the northern shoreline, there is a mixture of hard engineering and natural

features including patches of established salt marsh, upper salt marsh and coastal sward vegetation at several locations. Along the southern shoreline, the estuary is largely constrained by hard engineering features, such as the Manchester Ship Canal. Notably, the estuary's southern shoreline contains an extensive area of salt marsh. Further upstream, south-west of the Silver Jubilee Bridge at Runcorn, an area of embryonic salt marsh appears to be developing on mudflats and sandflats adjacent to the southern shoreline of the estuary (RSK, 2024), (**Figure 6.3**).

6.6.12 Within the Study Area and at the mouth of the Mersey Estuary in Seaforth, intertidal habitats are characterised by mixed coarse sand, gravel and boulder habitat supporting low numbers of marine invertebrates (ABPmer, 2005, cited in Royal Haskoning DHV, 2012). In contrast, the foreshore of Blundellsands is predominately composed of clean 'tide-swept' medium/fine sand supporting typical sandy shore invertebrate assemblages including catworm *Nepthys hombergii* and *M. balthica* (ABPmer, 2005, cited in Royal Haskoning DHV, 2012). The upper and middle shores of Blundellsands is comprised of crests and troughs influenced by tides from the Mersey estuary. Characterising species of troughs include *A. marina* casts and bivalve species such as thin tellin *Angulus tenuis*, *M. balthica* and banded wedge shell *Donax vittatus* and represented by the biotope 'Polychaetes in Atlantic littoral fine sand' (EUNIS code: MA5241). Characterising species of crests include sand shrimp *Bathyporeia* spp. and polychaete worms such as *Eteone* spp, representing the biotope '*Pontocrates arenarius* in Atlantic littoral mobile sand' (EUNIS code: MA52333).

6.6.13 Within the Study Area along the Sefton Coast at the mouth of the Mersey estuary, several intertidal biotopes have been identified which are mainly characteristic of fine sand habitats, with some characteristic of both muddy sand and fine sand habitats including (APEM, 2007; APEM 2008, cited in Royal Haskoning DHV, 2012):

- 'Polychaete/amphipod-dominated Atlantic littoral fine sand' (EUNIS code: MA524);
- 'Polychaetes in Atlantic littoral fine sand' (EUNIS code: MA5214);
- 'Polychaetes and *Angulus tenuis* in Atlantic littoral fine sand' (EUNIS code: MA52412);
- '*Nephtys cirrosa*-dominated Atlantic littoral fine sand' (EUNIS code: MA52413);

- ‘Barren or amphipod-dominated Atlantic littoral mobile sand’ (EUNIS code: MA523);
- ‘Amphipods and *Scolelepis* spp. In Atlantic littoral medium-fine sand’ (EUNIS code: MA5233);
- ‘*Eurydice pulchra* in Atlantic littoral mobile sand’ (EUNIS code: MA52332);
- ‘*Scolelepis* spp. in Atlantic littoral mobile sand’ (EUNIS code: MA52331);
- ‘Polychaete/bivalve-dominated Atlantic littoral muddy sand’ (EUNIS code: MA525);
- ‘*Bathyporeia pilosa* and *Corophium arenarium* in Atlantic littoral muddy sand’ (EUNIS code: MA5254);
- ‘*Limecola balthica* and *Arenicola marina* in Atlantic littoral muddy sand’ (EUNIS code: MA5251);
- ‘*Cerastoderma edule* and polychaetes in Atlantic littoral muddy sand’ (EUNIS code: MA2552);
- ‘*Nephtys hombergii*, *Limecola balthica* and *Streblospio shrubsolii* in Atlantic littoral sandy mud’ (EUNIS code: MA6223); and
- ‘*Lanice conchilega* in Atlantic littoral sand’ (EUNIS code: MA5255).

6.6.14 Within the lower reaches of the Mersey Estuary at Princes Half-Tide and West Waterloo Dock, an intertidal walkover survey identified broad intertidal habitats including Littoral mud (EUNIS code MA6) and Littoral mixed sediments (EUNIS code MA4), (APEM, 2018, cited in Waterman, 2018).

6.6.15 Intertidal studies conducted within the upper Mersey Estuary between November 1990 and July 1991 recorded a total of 21 taxa. The polychaete *Arenicola marina* was shown to be widely distributed within the middle and inner estuary. In general the results found that centrally placed intertidal sandbanks located within the inner estuary supported an impoverished macro-invertebrate fauna of low species diversity and abundance in comparison to muddier areas of the estuary which had abundant macroinvertebrates with densities in excess of other estuaries such as the Avon, Exe, Tamar, Towey and Wyre (Mersey Barrage Company, 1992).

6.6.16 Saltmarsh studies have previously been conducted at several saltmarshes within the Mersey Estuary to establish the temporal and spatial succession of

vegetation. These included saltmarsh at Hale Head, Eastern Oglet Bay, Central Oglet Bay, Manisty Mount, Central Stanlow Banks, Stanlow Point and Ince Banks (Mersey Barrage Company, 1992). Results indicated that the vegetation of Oglet Bay saltmarsh was characterised primarily by *Spartina* spp., with the presence of other saltmarsh species in lower cover including *Aster tripolium* and *Salicorna* spp. Hale Head saltmarsh could be separated into five distinct vegetation zones in which *Salicornia europaea* and *Spartina* spp. characterised the lower shore; *Cochlearia* spp. and *A. tripolium* characterised the lower middle marsh; *Puccinellia* spp. characterised the middle marsh; *Puccinellia* spp., *Plantago maritima* and *Artriplex prostrata* characterised the upper middle marsh; and the strand line was characterised by terrestrial grasses typical of sand dunes. Similarly the Mount Manisty marsh could also be separated into five distinct vegetation zones with *Spartina* spp. and *Aster* spp. characterising the lower marsh; *Spartina* spp. and low cover *Salicornia* spp. characterising the lower to mid marsh; and dense *Puccinellia* spp. characterising the middle, middle to upper and upper marsh. The lower marsh of Stanlow Bay was characterised by *Atriplex* spp. and *Aster* spp., whilst Stanlow Point marsh was characterised by a mix of *Aster* spp. and *Suaeda* spp. Ince marshes was found to be dominated by *Pucinellia* spp. with an abundance of *Aster* spp. and *Atriplex* spp. (Mersey Barrage Company, 1992).

6.6.17 Within the upper Mersey Estuary intertidal surveys conducted upstream and downstream of the Mersey Gateway between Widnes and Runcorn recorded taxa common to estuarine environments including oligochaete worms within the family Enchytraeidae, the polychaete ragworm *Hediste diversicolor*, the polychaete bristleworm *Pygospio elegans* and the oligochaete *Paranais litoralis* (APEM, 2014). Surveys of saltmarsh on Wigg Island within the upper Mersey Estuary have also been conducted with dominant taxa including the mysid opossum shrimp *Neomysis integer*, European mud scud *Corophium volutator*, Chironomidae, *H. diversicolor*, the gastropod *Assiminea grayana* and *P. litoralis* (APEM, 2014).

Subtidal Habitats and Species

6.6.18 The initial part of this section indicates data currently available from a range of online databases. The subsequent section outlines a range of data available from projects conducted within and in the vicinity of the Mersey Estuary.

6.6.19 The EUSeaMap (2023) habitat types (Marine Strategy Framework Directive (MSFD) benthic broad habitats) mapped by EMODnet indicates the subtidal habitat within the Mersey Estuary is circalittoral seabed (EMODnet, 2023), (**Figure 6.4**).

6.6.20 The Mersey Estuary is predominantly a muddy estuary, with intertidal sand and muddy sand in areas of the inner estuary, all classed as 'Circalittoral seabed' in **Figure 6.3**. Beyond the mouth of the Mersey Estuary, habitats are a mix of 'Atlantic infralittoral sand' (EUNIS code: MB52) and 'Atlantic circalittoral sand' (EUNIS code: MC52), with a large area of 'Atlantic circalittoral mud' (EUNIS code: MC62), (**Figure 6.4**).

6.6.21 Invertebrate faunal abundance data from the EA Ecology and Fish Data Explorer is available for the Mersey Estuary WFD waterbody (EA, 2024). These data are based on the analysis of benthic 0.1 m^2 Day grab samples. A total of 14,770 individuals across 103 taxa were recorded between 2014 and 2024. Records indicate taxa and faunal communities typical of estuarine environments. The top 10 recorded species is presented in **Table 6-9**.

Table 6-9: Top 10 benthic species by number (n), from EA Ecology and Fish Data Explorer (EA, 2024).

Taxa	Taxonomic Group	Count (n)
Mytilus edulis	Mollusca	3,330
Corophium volutator	Crustacea	3,299
Nemertea	Ribbon worms	1,606
Sabellaria alveolata	Annelida	1,434
Polydora ciliata	Annelida	1,092
Tubificoides benedii	Annelida	720
Nematoda	Round worms	622
Peringia ulvae	Mollusca	517

Taxa	Taxonomic Group	Count (n)
Pygospio elegans	Annelida	396
Bathyporeia pilosa	Crustacea	385

6.6.22 Records from the NBN Atlas from within the Study Area collected between 2014 and 2024 indicated a total of 1,089 individuals across 127 taxa within the Study Area (which includes intertidal and subtidal species) (NBN Trust, 2024). Records indicated a faunal community rich in molluscs, with seven mollusc taxa within the top 10 recorded species (**Table 6-10**). It should be noted that the NBN data are from a range of sources including general observations by individuals and more conspicuous species are more likely to be included in this database.

Table 6-10: Top 10 benthic species by number (n), from NBN Atlas Species Occurrence Data (NBN Trust, 2024).

Taxa	Taxonomic Group	Count (n)
Cirripedia spp.	Crustacea	168
Buccinum undatum	Mollusca	89
Mytilus edulis	Mollusca	49
Turritellina tricarinata	Mollusca	44
Cerastoderma edule	Mollusca	43
Echinocardium chordatum	Echinodermata	37
Mactra stultorum	Mollusca	35

Taxa	Taxonomic Group	Count (n)
Ensis siliqua	Mollusca	29
Carcinus maenas	Crustacea	28
Pharus legumen	Mollusca	24

6.6.23 The OneBenthic portal from Cefas provides predictive maps of subtidal assemblages based on random forest modelling of point source data. OneBenthic indicated that faunal cluster groups (biotopes) within the Study Area were mainly characterised by cluster group D2c (Cefas, 2024), (**Table 6-11** and **Figure 6.3**). Other faunal cluster groups included D1, D2b and D2d (**Table 6-11**).

Table 6-11: Characterising Taxa for Faunal Cluster Groups Identified Within the Benthic Ecology and Plankton Study Area and Surrounding area (Cooper and Barry, 2017; Cefas, 2024)[3].

Cluster	Characteristic Taxa
D1	*Spionidae* (P), *Montacutidae* (BM), *Semelidae* (BM), *Nephtyidae* (P), *Capitellidae* (P), *Cirratulidae* (P), *Amphiuridae* (E), *Oweniidae* (P), *Nemertea* (N), *Pholoidae* (P), *Nuculidae* (BM)
D2b	*Spionidae* (P), *Amphiuridae* (E), *Nephtyidae* (P), *Lumbrineridae* (P), *Oweniidae* (P), *Cirratulidae* (P), *Capitellidae* (P), *Nemertea* (N), *Semelidae* (BM), *Ampharetidae* (P)
D2c	*Nephtyidae* (P), *Spionidae* (P), *Opheliidae* (P)

[3] (A) = Amphipod crustacean, (AT) = Ascidian tunicate, (B) = Bryozoan, (BC) = Barnacle crustacean, (BM) = Bivalve mollusc, (DC) = Decapod crustacean, (E) = Echinoderm, (NE) = Nematoda, (P) = Polychaete.

Cluster	Characteristic Taxa
D2d	*Spionidae* (P), *Glyceridae* (P), *Nemertea* (NE), *Terebellidae* (P), *Capitellidae* (P), *Fibulariidae* (E), *Syllidae* (P), *Phyllodocidae* (P), *Cirratulidae* (P), *Opheliidae* (P), *Lumbrineridae* (P), *Goniadidae* (P), *Polynoidae* (P), *Nephtyidae* (P), *Dorvilleidae* (P)

Subtidal Habitats and Species – Previous Site-specific Characterisations

6.6.24 Localised data collection and site characterisations associated with previous projects further characterises the type and distribution of subtidal habitats and species within the Study Area.

6.6.25 Within the Study Area and lower reaches of the Mersey Estuary near Princes Half-Tide and West Waterloo Dock, subtidal habitats are characterised by gravelly sand, slightly gravelly sand, sand and sandy mud sediments (APEM, 2018, cited in Waterman, 2018). Dominant taxa within this area included *M. edulis*, Nematoda, *S. alveolata*, the polychaete *Pholoe inornata*, *P. litoralis*, the amphipod *Monocorophium insidiosum*, *G. tigrinus*, lagoon cockle *Cerastoderma glaucum*, *Capitella* and *Aoridae* spp and characteristic of the biotopes 'Sublittoral sand in low or reduced salinity lagoons' (EUNIS Code A5.21[4]), 'Infralittoral Atlantic mobile sand in variable salinity' (EUNIS Code MB5241) and 'Dense *Lanice conchilega* and other polychaetes in tide-swept infralittoral sand and mixed gravelly sand' (EUNIS Code A5.137), (APEM, 2018, cited in Waterman, 2018). Large numbers of the reef forming honeycomb worm *S. alveolata* have been recorded and representative of the biotope '*Sabellaria alveolata* on variable salinity sublittoral mixed sediment' (EUNIS code MB2211) which is an Annex I habitat under the EC Habitats Directive (APEM, 2018, cited in Waterman, 2018). Sidescan sonar data indicates the potential for *Sabellaria* reef to be present, but likely very patchily distributed (APEM, 2018, cited in Waterman, 2018). At the mouth of the Mersey Estuary adjacent to Gladstone Dock, potential *S. alveolata* reef has also been identified (Royal Haskoning DHV, 2012).

6.6.26 Adjacent to Princes Half-Tide and West Waterloo Dock, subtidal sediments located at Prince's Jetty were classified as either Sand, Sandy Mud, Muddy Sandy Gravel, Gravelly Muddy Sand and Slightly Gravelly Sand (APEM, 2017

[4] EUNIS 2017 code used – no EUNIS 2022 equivalent.

cited in Waterman, 2019). Dominant taxa within this area included *M. edulis* and the bay barnacle *Amphibalanus improvisus* and the area is representative of the biotope 'Faunal communities on variable salinity Atlantic infralittoral mixed sediment (EUNIS code: MB424).

6.6.27 Within the upper Mersey Estuary subtidal benthic sampling conducted upstream and downstream of the Mersey Gateway between Widnes and Runcorn recorded taxa common to estuarine environments including: Enchytraeidae; the oligochaetes *Heterocheata costata, Nais elinguis*, *P. litoralis and N. integer*; nematode worms; the amphipods *B. pilosa*, *C. volutator*, *Gammarus tigrinus*, *Gammarus salinus* and *Gammarus zaddachi*; copepods; the crustaceans brown shrimp *Crangon crangon* and rockpool prawn *Palaemon elegans*; and the molluscs *M. edulis* and laver spire shell *P. ulvae* (APEM, 2014).

6.6.28 From surveys conducted throughout the length of the Mersey Estuary from the mouth of the estuary to the Silver Jubilee Bridge, taxa collected included *M. edulis*, nematoda, and *Nephtys* spp. Oligochaete worms were also abundant including *Enchytraeidae* spp., *Heterochaeta costata*, *T. benedii*, *P. litoralis* and *Tuificoides pseudogaster* agg (APEM, 2010a; APEM, 2010b).

6.6.29 Further surveys have been conducted within the lower and mid estuary in autumn 2009, spring 2010 and autumn 2010. The data obtained through these surveys include taxon richness, density, biomass and diversity of intertidal and subtidal benthic invertebrate macrofauna, meiofauna and epifauna. This data will be referred to in more detail within the PEIR and ES Chapter.

Non-Native and Invasive Non-Native Species

6.6.30 Several marine non-native species (including INNS) have been recorded or are known to be present within the Mersey Estuary (**Chapter 7: Invasive Non-Native Species**). These include the following:

- American jackknife clam *Ensis leei*;
- American slipper limpet *Crepidula fornicata*;
- Chinese mitten crab *Eriocheir sinensis*;
- Common cord-grass *Spartina anglica*;
- Darwin's barnacle *Austrominius modestus*;

- Diatom *Pleurosigma*[5];
- False angelwing *Petricolaria pholadiformis*;
- Jenkin's spire snail *Potamopyrgus antipodarum*;
- Leathery sea squirt *Styela clava*;
- Orange-striped anemone *Diadumene lineata*;
- Pacific oyster *Magallana gigas*;
- Sideswimmer *G. tigrinus*;
- Soft-shell clam *Mya arenaria*;
- Starlet sea anemone *N. vectensis*[6]; and
- Trumpet tube worm *Ficopomatus enigmaticus*.

Plankton

6.6.31 Phytoplankton is one of the biological quality elements used to assess status of water bodies under the WFD. The Project is within the Mersey WFD transitional water body. In the 2022 Cycle 3 round of WFD monitoring, phytoplankton was classed as being at Moderate potential, with a target of Good potential by 2027 (EA, 2023a).

6.6.32 The Mersey Estuary is an extremely turbid environment due to the strong tidal currents which erode and rework bottom channels. Consequently, the phytoplankton taxa present are likely to be well adapted to the considerable fluctuations in levels of suspended solids and associated high levels of turbidity. The phytoplankton assemblages within the Mersey Estuary are influenced by tidal movements and vary over the tidal cycle. In addition, assemblage composition and biomass of these phytoplankton change considerably on a seasonal basis which is typical of dynamic environments such as the Mersey Estuary.

6.6.33 Phytoplankton monitoring data from the EA Catchment Data Explorer is available for the Mersey Estuary WFD waterbody (EA, 2024a). A total of 137 taxa were

[5] Assumed to be *Pleurosigma simonsenii*.

[6] Although considered to be invasive, this species is also protected under the Wildlife and Countryside Act, is a Species of principal importance in England under the NERC Section 41 list and is listed as Vulnerable on the IUCN Red list.

recorded between 2014 and 2024. The most abundant phytoplankton taxon was microflagellates, followed by *Phaeocystis* sp. The most frequently recorded phytoplankton taxon (190 occurrences in 200 survey periods) was centric diatoms.

6.6.34 Phytoplankton studies conducted in 1991 found that the Mersey Estuary supported significant phytoplankton growth. The phytoplankton community during late autumn and winter was generally dominated by flagellates. From early April to the end of June, short term blooms of the diatoms *Thallassiosira* spp. and *Skeletonema costatum*, and the colonial flagellate *Phaeocycstis pouchetti* caused increases in phytoplankton density (Mersey Barrage Company, 1992).

6.6.35 From phytoplankton surveys conducted throughout the length of the Mersey Estuary from the mouth of the estuary to the Silver Jubilee Bridge in 2009 and 2010, a total of 18 phytoplankton taxa were recorded and were dominated by diatoms (APEM, 2010a; APEM 2010b). Within the upper reaches of the Mersey Estuary upstream and downstream of the Mersey Gateway between Widnes and Runcorn, phytoplankton assemblages are dominated by microflagellates during the summer and centric diatoms in spring.

6.6.36 Further surveys have been conducted within the mower and mid estuary in autumn 2009, spring 2010 and autumn 2010. The data obtained through these surveys include species richness and density of phytoplankton. This data will be referred to in more detail within the PEIR and ES Chapter.

6.6.37 Based on professional judgement, it is considered that zooplankton assemblages within the outer Mersey Estuary will be consistent with assemblages recorded within the eastern Irish Sea (Waterman, 2017; Waterman, 2018). Different zooplankton taxa peak in abundance at different times of year. Copepods (Subclass Copepoda) within the zooplankton of the Irish Sea are almost entirely calanoids (Order Calanoida), although a significant population of *Oithima* sp. (Order Cyclopoida) has also been recorded (Kennington & Rowlands, 2006). Copepod abundance is typically lower on the eastern side of the Irish Sea than on the western side (Kennington & Rowlands, 2006). Remaining zooplankton taxonomic groups recorded for the area, such as larvae of molluscs (sea snails, bivalves, squids and octopuses; Phylum Mollusca), Cladocerans (water fleas; Order Cladocera) and Echinoderm larvae (e.g. sea stars, sea urchins, sea cucumbers; Phylum Echinodermata) are only present in very low abundances in the eastern areas of the Irish Sea (Kennington and Rowlands, 2006).

6.6.38 Zooplankton studies conducted in 1991 found that zooplankton within the Mersey Estuary were abundant and the zooplankton community was dominated by copepods and was typical of estuaries. Results from the studies indicated that the abundance of the hydrozoan *Rathkea octopuncata* peaked in March at sites of lower salinity, whilst mysids formed a large proportion of the zooplankton community during the summer. At sites of higher salinity, barnacle larvae reached high abundance in spring and polychaete larvae were characteristic of both high and low salinity sites from May onwards (Mersey Barrage Company, 1992).

6.6.39 Ichthyoplankton surveys conducted in the eastern Irish Sea between 2001 and 2003 identified fish eggs from 19 species and fish larvae from 30 species, a number of which were commercially important fish species including herring *Clupea harengus*, cod *Gadus morhua*, haddock *Melanogrammus aeglefinus*, whiting *Merlangius merlangus*, and dab *Limanda limanda* (Bunn *et al*., 2004). Peak numbers of fish eggs were recorded in March-April (Bunn *et al*., 2004).

Designated Sites

6.6.40 There are several designated sites including Marine Protected Areas (MPAs), SSSIs, SACs, SPAs and MCZs of relevance to benthic ecology, within the vicinity of the Project.

6.6.41 All designated sites within the Benthic Ecology and Plankton Study Area with benthic ecology features are set out in **Figure 6.4** and **Table 6-12.**

Table 6-12: Designated sites and relevant qualifying interests within the Study Area.

Site	Distance to Scoping Boundary (km)	Relevant Qualifying Interest features
SACs		
Dee Estuary SAC	0	Annex I habitats that are primary reason for selection of this site: • [1140] Mudflats and sandflats not covered by seawater at low tide • [1310] *Salicornia* and other annuals colonizing mud and sand • [1330] Atlantic salt meadows (*Glauco-Puccinellietalia maritimae*) Annex I habitats present as a qualifying feature, but not a primary reason for selection of this site: • [1130] Estuaries
SSSIs		
Mersey Estuary SSSI	0	• Saltmarsh • Soft maritime cliff and slopes
New Ferry SSSI	0	• Littoral sediment
Mersey Narrows SSSI	0	• Littoral sediment • Saline coastal lagoons • Saltmarsh

Site	Distance to Scoping Boundary (km)	Relevant Qualifying Interest features
North Wirral Foreshore SSSI	0	• Littoral sediment • Saltmarsh
Sefton Coast SSSI	0	• Littoral sediment • Saltmarsh
Dee Estuary SSSI	4.05	• Estuaries • Saltmarsh
Ribble Estuary SSSI	20.45	• Littoral sediment • Saltmarsh • Estuaries
MCZs		
Fylde MCZ	21.26	• Subtidal mud • Subtidal sand
SPAs		
Liverpool Bay SPA	0	The Liverpool Bay SPA consists of a wide range of mobile sediments such as large areas of muddy sand stretching from Rossall Point to the Ribble Estuary, and sand predominates in the remaining areas, with a concentrated area of gravelly sand off the Mersey Estuary and a number of prominent sandbanks off the English and Welsh coasts. These habitats support qualifying features of the SPA (NE, 2018). The conservation objectives of the Liverpool Bay SPA include

Site	Distance to Scoping Boundary (km)	Relevant Qualifying Interest features
		maintaining or restoring the extent and distribution of the habitats of the qualifying features; the structure and function of the habitats of the qualifying features and the supporting processes on which the habitats of the qualifying features rely (NE, 2019a).
Mersey Estuary SPA	0	The Mersey estuary SPA comprises of large areas of saltmarsh and extensive intertidal sand and mudflats, with limited areas of brackish marsh, rocky shoreline and boulder clay cliffs. The intertidal flats and saltmarshes provide feeding and roosting sites for qualifying features (NE, 2004). The conservation objectives of the Liverpool Bay SPA include maintaining or restoring the extent and distribution of the habitats of the qualifying features; the structure and function of the habitats of the qualifying features and the supporting processes on which the habitats of the qualifying features rely (NE, 2019b).
Mersey Narrows and North Wirral Foreshore SPA	0	The conservation objectives of the Mersey Narrows and North Wirral Foreshore SPA include maintaining or restoring the extent and distribution of the habitats of the qualifying features; the structure and function of the

Site	Distance to Scoping Boundary (km)	Relevant Qualifying Interest features
		habitats of the qualifying features and the supporting processes on which the habitats of the qualifying features rely (NE, 2019c).
Ribble and Alt Estuaries SPA	0	The conservation objectives of the Ribble and Alt Estuaries SPA include maintaining or restoring the extent and distribution of the habitats of the qualifying features; the structure and function of the habitats of the qualifying features and the supporting processes on which the habitats of the qualifying features rely (NE, 2019d).
Dee Estuary SPA	4.05	The conservation objectives of the Ribble and Alt Estuaries SPA include maintaining or restoring the extent and distribution of the habitats of the qualifying features; the structure and function of the habitats of the qualifying features and the supporting processes on which the habitats of the qualifying features rely (NE, 2019e).

6.7 FURTHER DATA COLLECTION

6.7.1 An initial review of the existing Benthic Ecology and Plankton data identified a need for additional survey work to supplement existing baseline information. An extensive suite of benthic ecology surveys has been developed or are proposed to inform the Project, taking into account comments as part of environmental

stakeholder workshops prior to the commencement of EIA Scoping and Marine Licence consultation responses as outlined in **Table 6-13**. The proposed surveys will provide further characterisation of the benthic ecology and plankton community within the Study Area as well as providing information to inform the EIA assessment, particularly with respect to near-field effects. Ichthyoplankton is also included as a target survey receptor within the Fish survey programme.

6.7.2 Survey scopes were shared with environmental stakeholders during the series of Environmental Stakeholder Workshops prior to commencement of EIA Scoping Desk based review of existing data sets, as outlined in **Table 6-8**. They will be utilised to supplement proposed project-specific surveys to characterise the benthic ecology and plankton community within the Study Area and to inform the EIA assessment of both near-field and far-field effects.

6.7.3 Rapid shoreline walkover surveys have been conducted to ground-truth aerial imagery, existing habitats data and draft habitat maps to identify the extent of habitat types in the intertidal zone. Rapid shoreline walkover surveys were conducted by RSK in September and October 2023 (RSK, 2024). Habitats were mapped to a high level (e.g. mudflats/sandflats, saltmarsh, bedrock) and biotope maps were not produced from the walkover survey, therefore, Phase I survey may be conducted to map biotopes across the Study Area and inform the locations of sampling stations for Phase II quantitative survey.

6.7.4 Prey availability surveys to determine the abundance and biomass of invertebrates, focussing on key benthic species that form the diet of waders and other waterbirds were commenced in July 2024 and are programmed for a period of 12 to 24 months.

Table 6-13: Surveys proposed for the characterisation of the Benthic Ecology and Plankton baseline.

Surveys Proposed	Justification
Intertidal Surveys	
Review of Aerial imagery	To identify the extent of broadscale habitat types, and where possible biotopes, in the intertidal zone in the near and far field.

Surveys Proposed	Justification
	Review of aerial imagery and rapid shoreline walkover surveys were conducted in September and October 2023.
Phase I and drone surveys	To map biotopes across the Study Area and gather data to inform locations of sampling stations for Phase II quantitative survey.
Phase II survey	To obtain quantitative data on benthic infauna, providing taxon composition, species abundance, and presence of infaunal species of conservation importance. Samples for particle size distribution, total organic content and a range of other contaminant parameters (e.g. hydrocarbons and heavy and trace metal contaminants) will also be taken. The Phase II survey will take place over a single survey season and is anticipated to be undertaken in 2025.
Prey abundance	To obtain samples for analysis that will allow determination of abundance and biomass of invertebrates, focussing on key benthic species that form the diet of waders and other waterbirds. Prey abundance survey is proposed to commence in July 2024 for a period of 12 to 24 months.
Protected habitats of conservation interest	To undertake Phase I, Phase II and National Vegetation Council (NVC) survey techniques, focussing on habitats of conservation interest likely to be present

Surveys Proposed	Justification
	within the ZoI of the Project in intertidal and supra-littoral areas. Surveys on protected habitats of conservation interest are proposed to take place April to September 2025.
Rocky intertidal and macrofauna survey	To undertake Phase I, Phase II and NVC survey techniques, focussing on rocky shore habitats. Rocky intertidal and macrofauna survey is proposed to take place June to September 2025.
Subtidal Surveys	
Grab sampling survey	To undertake subtidal grab sampling to obtain quantitative data on subtidal benthic macro-invertebrates. Samples for particle size distribution, total organic content and a range of other contaminant parameters (e.g. hydrocarbons and heavy and trace metal contaminants) will also be taken. The subtidal grab sampling survey scope is currently under development and is proposed to take place April to July 2025.
Epifaunal survey	To undertake epibenthic trawls to obtain quantitative data on subtidal benthic macro-invertebrates. The subtidal epifaunal survey scope is currently under development and is

Surveys Proposed	Justification
	proposed to take place in 2025 alongside grab sampling.

6.8 FUTURE BASELINE

6.8.1 The EIA process will consider the existing baseline conditions within the Study Area, and future baseline conditions (as far as reasonably practical). This will include consideration of the possibility of further marine protected areas becoming designated over the lifetime of the project as well as climate change and water quality effects.

6.8.2 A consideration of climate change is required for the longer (+50 years) operational phase, and subsequent decommissioning phase of the Project. The baseline environment will exhibit some degree of natural change over time, even if the Project was not to proceed. A key consideration in assessing the future baseline conditions is the influence of climate change, changes in sea level influencing the extent of intertidal and subtidal habitats, and potential changes in water temperature and other aspects of water quality (i.e. dissolved oxygen) which could have an effect on benthic ecology and plankton. Climate change has the potential to alter benthic ecology and plankton species distribution and abundance as well as community composition and population dynamics. For example, increased winter river flows within the UK estuaries such as the Mersey, may enhance coastal eutrophication, algal blooms and hypoxia (Robins *et al*., 2016).

6.8.3 There are numerous models covering the UK which simulate the possible change in climate and the UK Climate Projections (UKCP18 (Defra, 2019)) indicate there could be increases in mean summer temperatures in the longer term and milder winters (influencing sea water temperature), changes in rainfall distribution and seasonality, more extremes of weather and sea level rise (Defra, 2019).

6.8.4 A review of the anticipated changes in benthic ecology in the study area as a result of climate change will be provided within the EIA including consideration of the UKCP18 modelling outputs.

6.8.1 Improvements to the environment will also be expected over the lifetime of the Project through measures such as those implemented under the WFD. The WFD requires all waterbodies to achieve ‘Good’ overall status, or to experience no

deterioration in status or potential status. It is expected that the WFD legislation will drive future improvements in the ecological and chemical quality of waterbodies.

6.8.2 The future baseline will be defined for the purposes of the EIA by taking into consideration the projected future baseline (i.e. the theoretical situation that would exist if the Project was not to proceed) where possible. This may include for example, predictable changes such as climate change and water quality, or changes that can be expected based on reasonable assumptions and modelling calculations.

6.9 BASIS FOR SCOPING ASSESSMENT

6.9.1 The Benthic Ecology and Plankton scoping assessment is based on the indicative parameters set out in **Chapter 2: Site Context and Project Description**.

6.9.2 The source-pathway-receptor linkages between Project infrastructure and / or activities and the receptor groups for Benthic Ecology and Plankton are described in **Table 6-15**.

6.10 EMBEDDED ENVIRONMENTAL MEASURES

6.10.1 Embedded mitigation measures have been identified and are proposed to be adopted as part of the evolution of the Project design (i.e. embedded into the Project design). These measures will evolve over the development process as the EIA progresses and in response to consultation, and they will be considered as part of the assessment process. These measures typically include those that have been identified as good or standard practice and include actions that would be undertaken to meet existing legislation requirements.

6.10.2 As there is a commitment to implementing these environmental measures, and also to various standard sectoral practices and procedures, they are considered inherently part of the design of the Project and have, therefore, been considered in the scoping assessment.

6.10.3 In addition to the specific embedded mitigation measures relevant to Benthic Ecology and Plankton listed in **Table 6-14**, consultation will be undertaken with all relevant consultees.

6.10.4 A schedule of Commitments will be presented as part of the ES. This will inform the Construction Environmental Management Plan (CEMP) which will be prepared prior to commencement of construction works. The controls and

measures within the CEMP will be implemented to mitigate against impacts during the construction phase.

Project Design Optimisation

6.10.5 There are a number of project design optimisation measures that could be considered as part of the Design Envelope evolution which could reduce effects upon benthic habitats. This would primarily be related to changes in the extent of intertidal/subtidal habitats due to changes in tidal regime under different operating scenarios and associated changes in the duration of exposure of intertidal habitats.

Additional Measures

6.10.6 There may be additional requirements for mitigation/compensation measures or net gain, which will be explored as part of the future environmental assessment stages of the Project, for example potential requirements for intertidal habitat creation. The assessment method for HRA will take account of relevant judgements and rules e.g. Sweetman case People Over Wind, and other relevant judgements. Additional measures will be identified through the EIA process and the HRA process.

Table 6-14: Relevant embedded environmental measures

ID	Mitigation Measures embedded into the project design	How the measure will be secured
OM1	Outline CEMP (OCEMP)	A OCEMP will be developed and adhered to during the construction phase of the Project. A Marine Pollution Contingency Plan (MPCP) will form part of the CEMP. The MPCP provides details of procedures to protect personnel working and to safeguard the marine environment. This includes outlining mitigation measures in the event of an

ID	Mitigation Measures embedded into the project design	How the measure will be secured
		accidental pollution event arising during the construction phase that could have an effect on benthic ecology and plankton receptors.
OM7	Development issue of a Vessel Management Plan (VMP) to all project vessel operators	Issue of a Code of Conduct to all project vessel operators to advise on how to avoid impacts on benthic habitats and species and plankton, including minimising risk of accidental pollution.
OM6	An Invasive Non-Indigenous Species Management Plan will be implemented and is included in the OCEMP	The plan will outline measures to ensure vessels comply with the International Maritime Organisation (IMO) ballast water management guidelines, it will consider the origin of vessels and contain standard housekeeping measures for such vessels as well as measures to be adopted in the event that a high alert species is recorded.

ID	Mitigation Measures embedded into the project design	How the measure will be secured
OM5	Project siting to take account of areas of conservation importance	Project siting will be considered throughout the design process and will be documented within the Design Evolution & Alternatives Chapter of the PEIR. A commitment to minimise development footprint in areas of conversation importance where feasible has been made and recorded within the Commitments Register.

6.11 LIKELY SIGNIFICANT EFFECTS

6.11.1 In line with the EIA Regulations 2017, the Benthic Ecology and Plankton ES Chapter will consider those impacts where there is a risk of a likely significant effect only. The following Section draws on industry experience and expertise to identify those impact-receptor pathways that may potentially lead to a significant effect. Where experience and available evidence indicates an impact pathway will not lead to a significant effect on a receptor with regards to the EIA Regulations 2017 the pathway has been scoped out from assessment for that receptor.

6.11.2 The scoping assessment is based on a combination of the Project definition at the scoping stage, embedded environmental measures, understanding of the baseline conditions at this stage, the evidence base for benthic ecology and phytoplankton, the identification of potentially impacted receptors, and professional judgement. The approach to this assessment is set out in **Chapter 3: Approach to EIA**.

6.11.3 The early identification of likely significant effects is used here as a tool aimed at delivering a proportionate approach to the EIA. In doing so, it sets out a high-level assessment of all potential effects, significant or not. The basis for scoping

out certain effects is presented below, supported by the evidence base. Effects scoped in are indicated in **Table 6-15**.

6.11.4 It should be noted that long-term habitat loss is anticipated to occur throughout the construction phase. However, during construction the extent and nature of this effect is continually changing as the Project construction progresses. Consequently, this effect has been considered at the Operational stage of the Project only, which represents a worst case scenario when e.g. all infrastructure is in place and all direct long-term habitat loss has occurred (this is reflected by only indicating operation and maintenance and decommissioning as the relevant phases in **Table 6-15**).

Impacts scoped Out of Assessment

6.11.5 The following impacts have been scoped out of further assessment based on consideration of benthic ecology and plankton receptors, available project design information (see **Chapter 2: Site Context and Project Description)**, embedded mitigation measures and professional judgement.

6.11.6 Increased litter into the marine environment as a result of increased vessels within the Study Area has been scoped out of further assessment, resulting from conclusion of no likely significant effect. This conclusion has been based on relevant embedded environmental measures such as the development and issue of an EVMP to all project vessel operators (**Table 6-14**).

6.11.7 Although sparse information is available in relation to potential effects of underwater noise and vibration on benthic species and plankton, sensitivity to this impact is based on their ability to detect particle motion rather than sound pressure (Popper & Hawkins, 2018) unlike many other marine ecology receptors (e.g. fish and marine mammals), making them less sensitive to some sources of noise. In addition, the noise-generating activities would be temporary and any effects on benthic species/habitats and plankton would be short-term (<1 year). For these reasons the potential effects of underwater noise and vibration has been scoped out of further consideration for Benthic Ecology and Plankton.

Table 6-15: Likely significant effects for Benthic Ecology and Plankton

Source	Pathway	Receptor	Project Phase	Embedded Measures	Scoped in or out	Justification	Data collection & analysis to characterise the baseline
Temporary placement, presence and removal of man-made infrastructure, such as cofferdams.	Temporary habitat loss.	Subtidal habitats / species Intertidal habitats / Species.	C	CEMP	In – Subtidal and intertidal habitats and species.	The placement of temporary structures during construction, such as cofferdams, will results in temporary habitat loss.	Site-specific surveys to characterise benthic assemblages.
Piling, dredging, cofferdam installation and removal, removal of man-made infrastructure (i.e. tidal barrage infrastructure and rock protection).	Penetration or disturbance of the substratum subsurface.	Subtidal habitats / species. Intertidal habitats / species.	C D	CEMP	In – Subtidal and intertidal habitats and species	Activities including piling, dredging and infrastructure removal may result in the disturbance of the substratum subsurface, causing habitat and species disturbance / displacement.	Site-specific surveys to characterise benthic assemblages.
Presence and removal of tidal barrage.	Scour causing abrasion /	Subtidal habitats / Species.	O&M D	CEMP	In – Subtidal	The operation and removal of the tidal barrage	Site-specific surveys to characterise

Source	Pathway	Receptor	Project Phase	Embedded Measures	Scoped in or out	Justification	Data collection & analysis to characterise the baseline
	disturbance of the surface of the substratum or seabed.				habitats and species.	during the operational and maintenance and decommissioning phases may result in localised scour causing habitat and species disturbance / displacement. The extent of the likely scour will be determined using hydrodynamic and sediment transport modelling.	benthic assemblages. Hydrodynamic and sediment transport modelling outputs.
Dredging, piling, presence and removal of cofferdams, presence and removal of other man-made	Changes to sediment transport regime including changes in suspended solids (water clarity) and	Subtidal habitats / species. Intertidal habitats / species. Plankton	C O&M D	CEMP	In – all receptors.	Activities such as dredging, piling and the installation and removal of infrastructure (i.e. cofferdams, rock armour, tidal barrage) may	Site-specific surveys to characterise benthic assemblages. Hydrodynamic and sediment transport

Source	Pathway	Receptor	Project Phase	Embedded Measures	Scoped in or out	Justification	Data collection & analysis to characterise the baseline
infrastructure (i.e. tidal barrage infrastructure).	associated sediment deposition.					result in changes to the transport of sediment within the Mersey Estuary affecting suspended sediment concentrations. This may cause changes to photic zone depth and changes to water quality. In addition, deposition of resuspended sediments can potentially result in smothering of benthic invertebrates.	modelling outputs.
Dredging, removal of cofferdams.	Mobilisation of contaminants.	Subtidal habitats / species.	C O&M D	CEMP	In – all receptors.	Activities such as dredging and the installation and removal of infrastructure (i.e.	Site-specific surveys to characterise benthic assemblages.

Source	Pathway	Receptor	Project Phase	Embedded Measures	Scoped in or out	Justification	Data collection & analysis to characterise the baseline
		Intertidal habitats / species. Plankton				cofferdams and tidal barrage) could result in the mobilisation of contaminants within the sediment. This may cause changes to sediment quality, water quality and species fitness / mortality.	Sediment chemistry data.
Presence and movement of vessels.	Introduction and / or spread of INNS.	Subtidal habitats / species. Intertidal habitats / species. Plankton	C O&M D	CEMP VMP INNS plan	In – all receptors.	The presence and movement of vessels could result in the introduction or spread of INNS within the Mersey Estuary and have an effect on native local species.	Site-specific surveys to characterise benthic assemblages.
Presence of artificial lighting.	Introduction of light pollution.	Plankton	C O&M	CEMP	In – Plankton	The presence of artificial lighting could potentially	Site-specific surveys to characterise

Source	Pathway	Receptor	Project Phase	Embedded Measures	Scoped in or out	Justification	Data collection & analysis to characterise the baseline
						have an effect on distribution of plankton.	benthic assemblages.
Presence of tidal barrage.	Introduction of shading.	Intertidal habitats / species. Plankton	C O&M D	N/A	In – all receptors	The presence of infrastructure may result in shading of intertidal habitats. Similarly the removal of infrastructure during decommissioning may result in the removal of structures causing shading. This may cause behavioural disturbances in intertidal benthic species and photosynthesis in plankton.	Site-specific surveys to characterise benthic assemblages.
Presence of vessels and use of equipment and plant.	Accidental pollution	Subtidal habitats / species.	C O&M D	CEMP VMP	In – all receptors	Activities may result in the accidental release of chemicals and	Site-specific surveys to characterise

Source	Pathway	Receptor	Project Phase	Embedded Measures	Scoped in or out	Justification	Data collection & analysis to characterise the baseline
		Intertidal habitats / species. Plankton				changes to sediment quality. This may cause habitat and species disturbance / displacement, behavioural disturbance, and changes to species fitness / mortality.	benthic assemblages. Sediment chemistry data.
Placement, presence and removal of permanent man-made infrastructure (i.e. tidal barrage and rock armour).	Long-term habitat loss / change.	Subtidal habitats / species. Intertidal habitats / species.	O&M D	CEMP	In – Subtidal and intertidal habitats and species.	The placement and presence of infrastructure (i.e. tidal barrage and rock armour) will result in a long term loss of sediment habitat while the barrage is in place). Similarly, the removal of infrastructure during decommissioning	Site-specific surveys to characterise benthic assemblages.

Source	Pathway	Receptor	Project Phase	Embedded Measures	Scoped in or out	Justification	Data collection & analysis to characterise the baseline
						will result in a change of hard rock or artificial substrata to sedimentary substrata. This may result in intertidal and subtidal habitat gains / losses.	
Presence and operation of tidal barrage.	Emergence regime changes.	Subtidal habitats / species. Intertidal habitats / species.	O&M D		In – Subtidal and intertidal habitats and species.	The presence and operation of the tidal barrage during the O&M phase may result in changes of extent to the intertidal zone and subtidal zone due to changes in tidal inundation, resulting in habitat loss / gain, changes to habitat connectivity and wider ecosystem	Site-specific surveys to characterise benthic assemblages. Hydrodynamic modelling outputs.

Source	Pathway	Receptor	Project Phase	Embedded Measures	Scoped in or out	Justification	Data collection & analysis to characterise the baseline
						functioning and habitat and species disturbance / displacement.	
Operation of and removal of tidal barrage.	Change to flushing regime.	Subtidal habitats / species. Intertidal habitats / species. Plankton	O&M D		In – all receptors	The operation and removal of the tidal barrage during the O&M, and decommissioning phase may cause changes to the flushing regime, resulting in changes to habitat and species disturbance / displacement, changes to water quality and changes to sediment quality.	Site-specific surveys to characterise benthic assemblages. Hydrodynamic and sediment transport modelling outputs. Water quality modelling outputs.
Operation of and removal of tidal barrage.	Long term water flow	Subtidal habitats / species.	O&M D		In – all receptors.	The operation and removal of the tidal barrage	Site-specific surveys to characterise

Source	Pathway	Receptor	Project Phase	Embedded Measures	Scoped in or out	Justification	Data collection & analysis to characterise the baseline
	(tidal current) changes.	Intertidal habitats / species. Plankton				during the O&M and decommissioning phases may result in changes to the hydrodynamic regime causing habitat and species disturbance / displacement.	benthic assemblages. Hydrodynamic modelling outputs.

6.12 CUMULATIVE EFFECTS

6.12.1 Cumulative effects on Benthic Ecology and Plankton resulting from the effects of the Project and other developments will be assessed in accordance with the guidance and methodologies set out in **Chapter 3: Approach to EIA** and considering the other developments that have been screened in as part of the Cumulative Effects Assessment (CEA) screening exercise (**Chapter 31: Cumulative Effects**).

6.12.2 The following impacts from Project have the potential to act cumulatively with impacts from other developments to contribute to cumulative effects:

- Increased underwater noise and vibration;
- Physical change to another seabed type;
- Penetration or disturbance of the substratum subsurface;
- Change to sediment transport regime;
- Change to sediment quality;
- Changes in suspended solids (water clarity);
- Mobilisation of contaminants;
- Introduction and/or spread of INNS;
- Smothering and siltation rate changes;
- Introduction of light pollution;
- Introduction of shading;
- Accidental pollution events;
- Physical habitat loss;
- Emergence regime changes;
- Change to flushing regime;
- Water flow (tidal current) changes; and
- Abrasion / disturbance of the surface of the substratum or seabed (i.e. scour).

6.13 TRANSBOUNDARY EFFECTS

6.13.1 Due to the localised nature of the potential impacts, the relatively small distances travelled by most benthic species and the fact that plankton assemblages are largely influenced by tidal and current movements, transboundary effects are considered unlikely to occur and therefore transboundary effects have been scoped out of the assessment.

6.14 PROPOSED APPROACH TO ENVIRONMENTAL IMPACT ASSESSMENT

6.14.1 Further desk-based studies and analysis will be undertaken to identify and assess Benthic Ecology and Plankton receptors. This study will be supplemented with consultation with the relevant statutory and non-statutory organisations as necessary.

6.14.2 The Benthic Ecology and Plankton assessment will be undertaken in accordance with the methodology set out in **Chapter 3: Approach to EIA,** of the Scoping Report, in addition to the following established guidance: Guidelines for Ecological Impact Assessment in the UK and Ireland (CIEEM, 2018).

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7 INVASIVE NON NATIVE SPECIES

7.1 INTRODUCTION

7.1.1 The Invasive Non-Native Species (INNS) chapter will consider the potentially significant effects relating to INNS that may arise from the construction, operation and maintenance (O&M) and decommissioning activities of the Project. Marine, terrestrial, and freshwater INNS have been considered within this chapter to encompass the tidal barrage and the grid connection route. The chapter in alignment to this wider Scoping Report does not consider the existing port and marine facilities during the construction phase.

7.1.2 INNS are organisms introduced by human activities to a habitat in which they would not normally be found. They are considered to be one of the leading threats to biodiversity and the sustainability of functional ecosystems globally, second only to habitat destruction. The impacts of INNS are well documented and include predation pressures, resource competition, transmission of disease, habitat engineering, and hybridisation [with native species]. These negative impacts both cumulatively or individually can endanger populations of native species, reducing biological diversity and ecosystem function. INNS impacts are fundamentally of most concern at the ecological level; however, they also negatively affect the value that can be obtained from ecosystem services, either by reducing yield or increasing the cost and difficultly of linked operations (such as biofouling of infrastructure or pipelines). A 2023 report published by the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (IPBE) suggested that INNS cost the global economy over 423 billion USD a year and play a key role in 60% of global plant and animal extinctions. The economic impact to the UK has been recently reviewed and is now estimated to be 4 billion GBP a year (Eschen *et al*., 2023).

7.1.3 Although INNS are often introduced to broadly suitable habitats, they do not always establish into a viable population and / or go on to become invasive (i.e. to negatively impact the environment, economy or human health and welfare). Unsuccessful establishment can be due to several factors, including the habitat being naturally resilient to change, the presence of a native predator, or other stochastic factors which influence invasion success. Even though these barriers to establishment exist, INNS are, by definition, highly adaptable, generalist species that can occupy different trophic levels and are more resilient to selective pressures.

7.1.4 The routes, mechanisms, and vectors by which INNS are introduced are generalised under the term pathways. There are many potential pathways that may result in the movement of marine and terrestrial INNS, e.g. recreational activities, movement of organisms for aquaculture or horticulture, movement on equipment, vehicles, raw materials or infrastructure.

7.1.5 Preventing the introduction of INNS is recognised as the most effective, least costly and least environmentally damaging intervention for the mitigation of impact. This is especially important in the marine environment as, once INNS are established in a new area, they are considered very difficult to eradicate or control effectively. Biosecurity planning ideally presents pragmatic, 'best practice' measures to reduce the risk of INNS introduction, establishment and spread. Implementation of robust biosecurity plans avoid or reduce the adverse impacts and costs associated with managing established invasions, protecting both local biodiversity and economies, while reducing the risk of further spread of INNS elsewhere.

7.2 SCOPE OF INNS ASSESSMENT

7.2.1 This Scoping Chapter describes the methodology to be used within the Environmental Impact Assessment (EIA), an overview of the INNS baseline conditions within the Scoping Boundary (as defined in **Chapter 1: Introduction**), the datasets to be used to inform the EIA, the potential likely significant effects to be considered, and how these will be assessed for the purpose of the EIA.

7.2.2 The INNS chapter interfaces with other aspects of the assessment and will be informed by modelling outputs and data from other topics and as such, should be considered alongside these; namely:

- **Chapter 5: Coastal Processes:** There are potential pathways of effect from marine processes on potentially sensitive INNS receptor species. Information from the marine geology, oceanography and physical processes section will inform and provide additional context for the INNS assessment.
- **Chapter 6: Benthic Ecology and Plankton**: There are potential pathways of effect from the spread of INNS on potentially sensitive Benthic Ecology and Plankton receptor species. Understanding the presence of INNS and the risk of future spread and impact within the Estuary will be required to inform the Benthic Ecology and Plankton assessment.
- **Chapter 9: Marine and Intertidal Ornithology**: Marine and Intertidal Ornithology receptor species may be sensitive to changes in INNS

assemblage and increased impacts. The marine and intertidal ornithology section will be considered in INNS assessment.

- **Chapter 10: Fish and Shellfish:** INNS have the potential to impact or place pressure upon native species of fish and shellfish. Fish and shellfish surveys and modelling have the potential to inform INNS risk and impact assessments.
- **Chapter 11: Commercial Fisheries**: INNS have the potential to impact or place pressure upon native commercial species.
- **Chapter 13: Terrestrial Ecology and Biodiversity**: INNS have the potential to impact or place pressure upon native species.
- **Chapter 15: Major Accidents and Disasters**: Accidents and disasters may have the potential to increase the spread of INNS propagules under certain scenarios.
- **Chapter 16: Shipping and Navigation**: A key pathway of INNS introduction and spread is the discharge of ballast water containing viable INNS propagules as well as biofouling of ship hulls. Increased shipping within the Study Area as a result of the project may represent an increased risk of INNS spread.

7.3 LEGISLATIVE AND POLICY CONTEXT

7.3.1 Overarching relevant legislation and policy context which has informed the scope of the assessment is outlined in **Chapter 4: Planning Policy,** with topic specific considerations outlined in **Appendix 4.1**. The Wildlife and Countryside Act 1981 is of particular relevance to INNS. The Act provides the powers to prevent the release of certain plants and animals, i.e. those not ordinarily resident or a regular visitor to Great Britain, or species included in Schedule 9 of the Act, Schedule 9 lists non-native species that are already established in the wild, which continue to pose a conservation threat to native biodiversity and habitats, so that further releases should be regulated. Species control agreements and orders (under the Infrastructure Act 2015) may be established if the authority considers that there is an INNS or a species of animal that is no longer normally present in Great Britain on the premises.

7.3.2 The Invasive Non-native Species (Amendment etc.) (EU Exit) Regulations 2019 is also of particular relevance to INNS, retaining EU Regulation 1143/2014 into UK law. The Retained Regulation imposes restrictions on a list of Species of Special Concern. A core provision of the Retained Regulation is a series of strict restrictions preventing Species of Special Concern from being brought into the

territory of Great Britain, kept, bred, transported, placed on the market, used or exchanged, allowed to reproduce, grown or cultivated, or released into the environment.

7.3.3 Alongside those stated above the Great Britain Invasive Non-Native Species Strategy 2023 to 2030 is a Department for Environment, Food, & Rural Affairs (DEFRA) published policy highlighting Great Britain's approach to INNS in the marine, terrestrial and freshwater environments. This is a product of much of relevant legislation, and its contents should be considered in work associated with this project.

7.4 TECHNICAL GUIDANCE

7.4.1 Technical guidance that has been used to define the assessment is set out in **Table 7-1**.

Table 7-1: Relevant Technical Guidance

Guidance reference	Relevance to the assessment
North West Inshore and North West Offshore Marine Plan (2021)	NW-INNS-1: Proposals must put in place appropriate measures to avoid or minimise significant adverse impacts that would arise through the introduction and transport of invasive non-native species.
WFD UK Technical Advisory Group '*Classification of Aquatic Alien Species According to their level of impact*' (2021 – working paper)	NW-INNS-2: Public authorities with functions to manage activities that could potentially introduce, transport or spread invasive non-native species should implement adequate biosecurity measures to avoid or minimise the risk of introducing, transporting or spreading invasive non-native species.

7.5 STUDY AREA

7.5.1 The INNS Study Area (hereafter referred to as the Study Area) is presented in **Figure 7.1**. This is the area in which baseline INNS records were collated and is

the area in which potential effects will be characterised. The Study Area is defined as a 15 kilometre (km) buffer from the outer perimeter of the 'Scoping Boundary'. It is identified in **Figure 7.1**. The 'Study Area' is utilised within **Section 7.8**. The Scoping Boundary for the Project represents the core project working area encompassing marine, terrestrial and freshwater habitats of the Tidal Barrage and Grid Development Areas. It should be recognised that INNS spread and impacts beyond this Area are possible over the extended timescales of the project and could be assessed once project activities are more defined. The Study Area may be increased or decreased following consultation with stakeholders, modelling and other topic area outputs. Consideration towards nearby areas, such as hubs of construction, operation and decommissioning support should be considered.

7.5.2 Additional areas referenced within this chapter include:

- **Survey Area**: This is the primary area where field and desk-based surveys are recommended. The survey area aligns in extent with the Study Area. This area is referred to within **Section 7.9**.

7.6 CONSULTATION

7.6.1 Regular Environmental Stakeholders Workshops and Hydro-environmental Modelling Workshops have been undertaken since October 2020, full details of these workshops is provided within **Table 3-1** of **Chapter 3: Approach to EIA**.

7.6.2 No specific INNS issues have been raised through consultation to date; however, INNS risk assessment and biosecurity is a condition of the North West Inshore and North West Offshore Marine Plan (2021).

7.6.3 Further consultation on INNS risk and limits of INNS Study Area will be informed by engagement and discussion with various stakeholders including, but not limited to, the Planning Inspectorate (PI), Environment Agency (EA), Natural Resources Wales (NRW), Natural England (NE), Marine Management Organisation (MMO), Joint Nature Conservation Committee (JNCC), local councils and other stakeholders via public consultation.

7.7 ASSESSMENT METHODOLOGY

7.7.1 This section describes the proposed methodology to be used within the EIA. The following sections provide an overview of the baseline conditions within the Tidal Barrage Development Area as contained within the Scoping Boundary (as

defined in **Chapter 1: Introduction**), the datasets to be used to inform the EIA, and the potential likely significant effects to be considered.

7.7.2 The Project-wide approach to the assessment methodology is set out in **Chapter 3: Approach to EIA**. This will be implemented to assess the likely significant effects on potentially sensitive receptors from the construction, O&M, and decommissioning of the Project.

7.7.3 INNS methodology also includes:

- Consideration of possible impacts caused by INNS, both direct and indirect, within the Study Area, informed by relevant GB technical guidance e.g. the UK WFD Technical Advisory Group (UK TAG) risk assessments and associated impact scores.
- Evaluation of the potential changes to the abundance, population health and / or risk of spread and impact (cumulatively referred to as fitness) of INNS within the Study Area, in response to the predicted pathway impacts of the Project.
- Identification of potential routes of INNS introduction and spread as a result of the Project activities. This includes an initial list of potential horizon species (INNS not present in the Study Area, but at risk of introduction) which could be introduced to the Study Area during the lifetime of the Project.

INNS ASSESSMENT APPROACH

7.7.4 The INNS risk will be considered using two integrated approaches: 1) a component-focused method to determine and assess the inherent risk of INNS introduction and spread that is presented by the technical parameters and O&M activities of the Project; and 2) a species-focused method to determine and contextualise how the Project may influence the fitness of INNS within the INNS Study Area, and any knock-on impacts posed by INNS to other sensitive receptors.

7.7.5 Both approaches will consider the INNS risks during the construction, O&M and decommissioning phases of the Project.

COMPONENT-FOCUSED ASSESSMENT

7.7.6 For the component-focused assessment, the relevant activities linked to the Project, across the construction, O&M and decommissioning phases will be assessed for their inherent risk of INNS introduction and spread. This assessment will utilise computational tools / models to assess the INNS risk by

providing [non-cumulative] probability scores to indicate the relative risk of INNS spread and provide a mechanism for the prioritisation of risk.

7.7.7 The different operations and components of the Project will be assessed within the computational tools, where possible, to support a qualitative / semi-quantitative risk assessment. High-risk activities and / or potential hotspots for introduction will be identified and recommendations for mitigation determined.

SPECIES-FOCUS APPROACH

7.7.8 The species-focused assessment will be based on the conceptual 'source-pathway-receptor' approach. This model will be used to identify likely environmental effects resulting from the construction, O&M and decommissioning of the Project. The assessment should consider how the predicted environmental changes (i.e. pathways of impact) as a result of the Project may influence the INNS which are already recorded (i.e. receptors) within the Study Area.

7.7.9 Iterative steps involved in the assessment approach include:

- Determination of the baseline INNS assemblage, across the marine, terrestrial and freshwater habitats, within the Study Area, including level of confidence in the baseline data.
- Assessment of the sensitivity of INNS to the pathways of impact when INNS are considered as receptors.
- Assessment of the magnitude and significance of impact upon INNS as receptors.
- Consideration of how changes to INNS fitness and assemblage could influence the other receptors, e.g. fish, within the Study Area.
- Discussion of existing, and the proposal of additional mitigation measures to reduce, prevent or, where these are not possible, offset any adverse significant effects.

SENSITIVITY OF INNS TO PATHWAYS

7.7.10 A general ecological trait of INNS is that they are highly tolerant and adaptable to a wide range of environmental conditions and disturbances. In the context of assessment, INNS can be considered as Not Sensitive or Low Sensitivity receptors where they are not expected to respond to a pathway of impact. They are categorised as Medium or High Sensitivity where they are expected to respond.

SIGNIFICANCE OF EFFECT

7.7.11 Receptor sensitivity is not indicative of a positive or negative outcome; it is simply the expected scale of response to a pathway of impact. The EIA process is, however, generally focused on highlighting negative outcomes for ecological receptors, and optioneering for mitigation and monitoring measures where appropriate.

7.7.12 With this considered, negative outcomes for INNS [as receptors] fitness have a different interpretation to that of the other receptors (e.g. protected species). This is because a reduction to INNS fitness is recognised as being a positive outcome for the wider environment and associated socioeconomics. Conversely, a pathway of impact that increases INNS fitness is a negative outcome (establishment of INNS in any ecosystem is, by definition, harmful) with potential for increased damage to the wider environment, habitats, or biodiversity.

7.7.13 The significances of impact on INNS receptors are therefore interpreted as:

- Major and Moderate – INNS fitness is expected to decrease from the current baseline – **positive outcome for the project**.
- Minor or Negligible – INNS fitness is expected to remain largely unchanged from the current baseline – **neutral outcome for the project**.
- Beneficial – INNS fitness is expected to increase above current baseline – **negative outcome for the project.**

7.7.14 Where beneficial effects for INNS are determined, species-specific considerations will be provided to summarise the possible increased magnitude of INNS impacts on: 1) native species and habitats, with a focus on protected species and sites; and 2) the Project's operations.

7.7.15 Optioneering will then be conducted to identify and propose mitigation measures.

7.8 BASELINE CONDITIONS

7.8.1 The habitats within and adjacent to the River Mersey Estuary, River Dee Estuary, Liverpool Bay and Irish Sea in the vicinity of the Project have experienced disturbance from many decades of major development, both onshore and offshore. There are four offshore windfarms in operation within the Irish Sea in the vicinity of the River Mersey Estuary, including Burbo Bank (including Extension) (<10km north-west), Gwynt y Môr (<30km west), North Hoyle (<30km west), Rhyl Flats (<40km west) and four further offshore windfarms within the same area of the Irish Sea, including West Duddon of

Sands (<60km north-west), Barrow (<60km north-west), Walney (inc. extension) (<70km north-west) and Ormonde Wind Farm (<75km north-west). All of these offshore windfarms have been constructed in the last 25 years. In addition, two further offshore windfarms, Morecambe (<55km north-west) and Morgan (<80km north-west) are proposed. Significant major development has been undertaken within the River Mersey Estuary, including the Liverpool Cruise Terminal, completed in 2007, Mersey Gateway Bridge, completed in 2017, and several major developments either proposed or underway, including the Liverpool Waters (inc. Everton Stadium) and Wirral Waters. At a high level it can be assumed that the presence of a high number of activities may represent numerous vectors for INNS introduction / spread (for example increased vessel movement), thereby increasing the baseline risk of INNS presence in or near the Study Area.

7.8.2 Some project-specific survey work has been conducted to date e.g. intertidal bird surveys and intertidal walkovers that may provide some element of incidental / observational information on INNS within the Study Area, although the surveys did not specifically target INNS. In the absence of targeted INNS surveys or an understanding of survey effort applied to the gathering of this current information it is considered that this is an incomplete data set, especially for use as a reliable baseline in this context.

7.8.3 The INNS Scoping Boundary (see **Figure 7.1**) provides a broad scope for the determination of those INNS which are present within or in close proximity to the immediate Scoping Boundary. At this stage the INNS present in this Scoping Boundary present a more tangible summary of the risk of increased spread and impact of INNS as a consequence of the project's activities.

7.8.4 The Study Area is larger than the Scoping Boundary to provide additional INNS records, thereby accounting for the movement of works and equipment, the mobile nature of some INNS, and the possible movement of marine and terrestrial project elements (i.e. the barrage and the grid connection).

7.8.5 Please see **Section 7.9** for consideration of horizon species, which have been included as potential INNS which could be spread into the Study Area as a result of the projects activities, or out of the Study Area following their future introduction into the Study Area.

DATA INFORMATION SOURCES

7.8.6 An initial desk-based review has been undertaken of publicly available data sources outlined in **Table 7-2** to determine the INNS recorded as present within the Study Area (see **Figure 7.1**).

7.8.7 INNS record data, from 21 separate data providers, were downloaded from the NBN Atlas website (http://www.nbnatlas.org; Accessed 12/07/2024) using open access licensed data only (CC-BY, CC0 and OGL[7]). Where necessary, data contributors and attribution parties have been outlined in **Table 7-10** and all data sets used have been referenced in **Section 7.17 and 7.18**. Whilst data searches have be undertaken to provide accurate and reliable information, searches are reliant on the accuracy of underlying data provided by third parties (e.g. record centres, wildlife trusts etc.). NBN records have been cross referenced, where possible, with other project reports (e.g. RSK, 2023 and APEM, 2017).

7.8.8 The NBN INNS datasets used allow full geographical coverage of the Study Area and provide a high level of confidence in baseline INNS assemblage. However, it is acknowledged that some INNS records may be held or licenced such that they are not included within the NBN search, as summarised above. To ensure a full and up-to-date understanding of the INNS baseline, further data gathering should include those identified in **Table 7-6**.

7.8.9 Note that the records of native and formally native species listed under Schedule 9 Part 1 of the Wildlife and Countryside Act have been excluded from this study. This is to ensure specific focus on the impact and management of INNS, rather than the presence of native species whose release is prohibited under the Act.

[7] Contains public sector information licensed under the Open Government Licence (OGL) v3.0, Public Domain Dedication (CC0) v1.0, Creative commons with attribution v4.0 (CC-BY).

Table 7-2: Baseline sources of INNS data (see Section 7.17 and 7.18 for full reference of datasets / providers)

Source	Date	Summary	Coverage of Study Area
NBN Atlas	12/07/2024	Open-source terrestrial INNS records licences under OGL, CC0 or CC-BY[7]	Full
NBN Atlas	12/0/2024	Open-source marine INNS records licences under OGL, CC0 or CC-BY[7]	Full
NBN Atlas	12/07/2024	Open-source freshwater INNS records licences under OGL, CC0 or CC-BY[7]	Full

7.8.10 The baseline results presented here are indicative and intended to provide an initial overview of INNS presence, not a comprehensive list of all INNS present within the Study Area. The results are incomplete (see **Table 7-6**) and, as such, should not be used to inform any EIA or decision-making processes without the data needs identified being met.

EXISTING BASELINE

7.8.11 This Section describes the current understanding of INNS records within the Study Area, constituting the existing INNS baseline, as well as identifying pathways for INNS introduction and spread as a result of the Project. Further information requirements are outlined.

7.8.12 The INNS baseline assessment identified 86 species which included 15 marine, 32 terrestrial, and 39 freshwater species. These INNS, their high-level impacts, and key related legislation are outlined in the Marine, Terrestrial and Freshwater sections below.

7.8.13 The WFD UK Technical Advisory Group (UK TAG) have compiled a reference list of INNS classified by their level of invasive impact, as determined through the UK INNS (individual species) impact risk assessment process. The list is useful for prioritised species-based decision making and provides policy makers with a quick reference for understanding the environmental risks associated with individual INNS. These impact scores do not specifically reference the current or certain impact of any INNS present within the Study Area, other than in a generalised way. UK TAG INNS impacts are defined as:

- **High Impact:** known to be invasive, having caused documented harm in habitats where they have become established. Example species: American signal crayfish (*Pacifastacus leniusculus*).
- **Low Impact:** known, based on stringent criteria, to have a low probability of becoming invasive, and where field observations have shown no adverse impacts over many years of establishment. Example species: Water hyacinth (*Eichhornia crassipes*).
- **Unknown Impact**: probability of becoming invasive is unknown, and for which a full species risk assessment is required.
- Species which clearly fall between the low and the high impact categories are assigned to the **Moderate Impact** category. Example species: Canadian pondweed (*Elodea canadensis*).

Marine INNS

7.8.14 Marine INNS identified within the baseline assessment are outlined in **Table 7-3** and mapped in **Figure 7.2**.

Terrestrial INNS

7.8.15 Terrestrial INNS identified within the baseline assessment are outlined in **Table 7-4** and mapped in **Figure 7.3.**

Freshwater INNS

7.8.16 Freshwater INNS identified within the baseline assessment are outlined in **Table 7-5** and mapped in **Figure 7.4** .

Table 7-3: Marine INNS identified within the INNS Study Area.

Species Name	WFD UKTAG Impact Score	WCA Schedule 9 Listed?	Marine Strategy Framework Listed?	Year of Most Recent Record	Summary of Species-Specific Impacts[8]
American jackknife clam (*Ensis leei*).	Unknown	No	Yes	2020	▪ Sharp edges of shells may cause injury on beaches.
American slipper limpet (*Crepidula fornicata*).	High	Yes	Yes	2014	▪ Outcompetes native species; and ▪ Pest of oyster and mussel beds.
American piddock *(Petricola pholadiformis*).	Low	No	No	2019	▪ Unknown
Chinese mitten crab (*Eriocheir sinensis*).	High	Yes	Yes	2021	▪ Burrows into river banks causing destabilisation and erosion. ▪ Outcompetes and predates upon native species; and

[8] See Section 7.16 for a list of data references used.

Species Name	WFD UKTAG Impact Score	WCA Schedule 9 Listed?	Marine Strategy Framework Listed?	Year of Most Recent Record	Summary of Species-Specific Impacts[8]
					▪ Can block infrastructure when migrating in large numbers.
Common cord-grass (*Spartina anglica*).	High**	No	No	2022	▪ Can exclude and outcompete native plant species (e.g. seagrasses); and ▪ Modify habitats and ecosystems.
Darwin's barnacle (*Austrominius modestus*).	Low	No	No	2018	▪ Biofouling species; ▪ Competes with native species; and ▪ Impacts upon aquaculture.
Diatom (*Pleurosigma*)*	Unknown	No	No	N/A	▪ Unknown
Japanese wireweed (*Sargassum muticum*).	Low	Yes	No	2015	▪ Outcompetes native species.
Leathery sea squirt (*Styela clava).*	High	No	Yes	2021	▪ Fouling species (on natural, artificial and living surfaces).

Species Name	WFD UKTAG Impact Score	WCA Schedule 9 Listed?	Marine Strategy Framework Listed?	Year of Most Recent Record	Summary of Species-Specific Impacts[8]
Orange-striped anemone (*Diadumene lineata*).	Unknown	No	Yes	2019	▪ Unknown
Pacific oyster (*Magallana gigas*).	Moderate	No	Yes	1979	▪ Outcompetes native species; ▪ Possible health and safety risk of shells on leisure beaches; and ▪ Blockage of navigational channels for recreational vessels.
Ruddy duck (*Oxyura jamaicensis*).	Not Listed	Yes	No	2011	▪ Threatens the globally endangered white-headed duck in Spain through hybridisation and competition.
Starlet sea anemone (*Nematostella vectensis*).	Not Listed	No	No	2017***	▪ Unknown
Soft-shell clam (*Mya arenaria*).	Unknown	No	No	2015	▪ May outcompete native species; and

Species Name	WFD UKTAG Impact Score	WCA Schedule 9 Listed?	Marine Strategy Framework Listed?	Year of Most Recent Record	Summary of Species-Specific Impacts[8]
					▪ May alter marine habitat.
Trumpet tube worm (*Ficopomatus enigmaticus*).	High	No	Yes	2020	▪ Outcompete native species; ▪ Alters marine habitat; and ▪ Biofouling species which can impact infrastructure.

** Assumed to be Pleurosigma simonsenii*
*** WFD UKTAG High impact in Ecoregion 17 only*
**** Not included on map (Figure 7.2)*

Table 7-4: Terrestrial INNS identified within the INNS Study Area.

Species Name	WFD UKTAG Impact Score	WCA Schedule 9 Listed?	Species of Special Union Concern?	Year of Most Recent Record	Summary of Species-Specific Impacts[9]
African sacred ibis (*Threskiornis aethiopicus*).	Not listed	No	Yes	2012	▪ Trample marsh plants, affecting vegetation development; and ▪ Predate on aquatic insects and amphibians, impacting prey populations.
American mink (*Neovison vison*).	Not listed	Yes	No	2016	▪ Predates upon native species.
Black rat (*Rattus rattus*).	Not Listed	Yes	No	1989	▪ Impact upon crops; ▪ Outcompetes and predates upon many native species; and ▪ Carrier of disease.

[9] Booy, O., Wade, M. and Roy, H., 2015. *Field guide to invasive plants and animals in Britain*. Bloomsbury Publishing. – Primary source. See Section 7.16 for other sources of information.

Species Name	WFD UKTAG Impact Score	WCA Schedule 9 Listed?	Species of Special Union Concern?	Year of Most Recent Record	Summary of Species-Specific Impacts[9]
Brazilian giant rhubarb (*Gunnera manicata*).	High	No	No	1990	▪ Form dense colonies outcompeting native species; and ▪ Can impede river flow in high flow conditions.
Chilean giant rhubarb (*Gunnera tinctoria*).	High	Yes	Yes	2024	▪ Forms large colonies suppressing native species; and ▪ Can impede river flow.
Coypu (*Myocastor coypus*).	Not listed	No	Yes	1937	▪ Burrows destabilise riverbanks and dykes; and ▪ Feed on marsh plants, impacting plant communities and contributing to coastal / soil erosion.

Species Name	WFD UKTAG Impact Score	WCA Schedule 9 Listed?	Species of Special Union Concern?	Year of Most Recent Record	Summary of Species-Specific Impacts[9]
Eastern grey squirrel (*Sciurus carolinensis*).	Not listed	Yes	Yes	2024	▪ Competitively exclude the native red squirrel; ▪ Carry and spread squirrel pox virus (fatal to red squirrels); and ▪ Damage woodland through bark stripping.
Eurasian eagle-owl (*Bubo bubo*).	Not listed	Yes	No	2007	▪ Prey on native birds and mammals (including domestic pets).
Few-flowered garlic (*Allium paradoxum*).	Not listed	Yes	No	2021	▪ No known environmental impacts.
Giant hogweed (*Heracleum mantegazzianum*).	High	Yes	Yes	2024	▪ Outcompetes native species; ▪ Can impede river flow in high flow conditions; and

Species Name	WFD UKTAG Impact Score	WCA Schedule 9 Listed?	Species of Special Union Concern?	Year of Most Recent Record	Summary of Species-Specific Impacts[9]
					▪ Sap causes skin blistering if exposed to sunlight.
Giant knotweed (*Fallopia sachalinensis*).	High	Yes	No	2020	▪ Forms dense colonise outcompeting native plants; ▪ Can impact infrastructure; and ▪ Can impede river flow in high flow conditions.
Golden dead-nettle (*Lamiastrum galeobdolon subsp. Argentatum*).	Not Listed	Yes	No	2024	▪ Can quickly outcompete native species.
Himalayan balsam (*Impatiens glandulifera*).	High	Yes	Yes	2023	▪ Outcompetes native species; and ▪ Winter dieback can lead to river bank erosion.
Himalayan cotoneaster (*Cotoneaster simonsii*).	Not Listed	Yes	No	2022	▪ Outcompetes native species.

Species Name	WFD UKTAG Impact Score	WCA Schedule 9 Listed?	Species of Special Union Concern?	Year of Most Recent Record	Summary of Species-Specific Impacts[9]
Hollyberry cotoneaster (*Cotoneaster bullatus*).	Not Listed	Yes	Yes	2015	▪ Outcompetes native species.
Hybrid japanese knotweed (*Fallopia japonica x sachalinensis = F. x bohemica*).	High	Yes	No	2020	▪ Outcompetes native species; ▪ Can cause damage to infrastructure; and ▪ Can impede river flow in high flow conditions.
Japanese knotweed (*Fallopia japonica*).	High	Yes	No	2024	▪ Outcompetes native species; ▪ Can cause damage to infrastructure; and ▪ Can impede river flow in high flow conditions.
Japanese rose (*Rosa rugosa*).	Not listed	Yes	No	2024	▪ Displaces native beach and dune vegetation;

Species Name	WFD UKTAG Impact Score	WCA Schedule 9 Listed?	Species of Special Union Concern?	Year of Most Recent Record	Summary of Species-Specific Impacts[9]
					▪ Dense thickets are species-poor; and ▪ Hinders access by visitors due to dense thickets and sharp thorns.
Montbretia (Crocosmia pottsii x aurea = C. x crocosmiiflora).	Low	Yes	No	2021	▪ Outcompetes native species.
Muntjac deer (*Muntiacus reevesi*).	Not Listed	Yes	Yes	2021	▪ Impacts upon forest biodiversity; and ▪ Road safety threat.
New Zealand flatworm (*Arthurdendyus triangulatus*).	Not listed	No	Yes	1993	▪ Predates on earthworms, depleting populations; ▪ Reduces earthworm activity, limiting plant growth and impacting agricultural yields; and

Species Name	WFD UKTAG Impact Score	WCA Schedule 9 Listed?	Species of Special Union Concern?	Year of Most Recent Record	Summary of Species-Specific Impacts[9]
					▪ Prey reduction for earthworm-feeding wildlife.
Orange balsam (Impatiens capensis).	Low	No	No	2019	▪ Unknown
Pink Purslane (*Claytonia sibirica*).	Low	No	No	2024	▪ Outcompetes native species.
Rhododendron (*Rhododendron ponticum*).	High	Yes	No	2024	▪ Outcompetes and displaces native species resulting in a monocultural stand; and ▪ Nectar is poisonous to bees, mice and cats.
Rose-ringed parakeet (*Psittacula krameria*).	Not Listed	Yes	No	2023	▪ Outcompetes native species; and ▪ Agricultural pest.
Sweet flag (*Acorus calamus*).	Low	No	No	2023	▪ Unknown

Species Name	WFD UKTAG Impact Score	WCA Schedule 9 Listed?	Species of Special Union Concern?	Year of Most Recent Record	Summary of Species-Specific Impacts[9]
Thicket creeper (*Parthenocissus inserta*).	Not Listed	Yes	No	2015	▪ Swamps trees and bushes.
Three-cornered garlic (*Allium triquetrum*).	Not listed	Yes	No	2024	▪ Potential to displace native species (e.g. bluebells).
Tree-of-heaven (*Ailanthus altissima*).	Not listed	No	Yes	2023	▪ Grows rapidly, outcompeting native species for light and space; and ▪ Toxins from bark and leaves can accumulate in the soil and inhibit the growth of other plants.
Yellow azalea (*Rhododendron luteum*).	Not listed	Yes	No	2022	▪ Unknown

Species Name	WFD UKTAG Impact Score	WCA Schedule 9 Listed?	Species of Special Union Concern?	Year of Most Recent Record	Summary of Species-Specific Impacts[9]
Virginia creeper (*Parthenocissus quinquefolia*).	Not Listed	Yes	No	2023	▪ Swamps trees and bushes; and ▪ Berries are poisonous and plant can cause allergic reactions.
Wall cotoneaster (*Cotoneaster horizontalis*).	Not Listed	Yes	No	2022	▪ Outcompetes native species.

Table 7-5: Freshwater INNS identified within the INNS Study Area.

Species Name	WFD UKTAG Impact Score	WCA Schedule 9 Listed?	Species of Special Union Concern?	Year of Most Recent Record	Impacts[10]
American signal crayfish (*Pacifastacus leniusculus*).	High	Yes	Yes	2011	▪ Predation of fish eggs and invertebrates; ▪ Increased risk of bank erosion; and ▪ Carrier of crayfish plague.
Amur bitterling (*Rhodeus sericeus*).	Not listed	No	No	2008	▪ Unknown
Bar-headed Goose (*Anser indicus*).	Not Listed	Yes	No	2011	▪ Trampling of amenity grassland and eutrophication of lakes; and ▪ Possible carrier of disease.
Barnacle goose (*Branta leucopsis*).	Not listed	Yes	No	2021	▪ Aggressive towards other birds.

[10] See Section 7.16 for a list of data references used

Species Name	WFD UKTAG Impact Score	WCA Schedule 9 Listed?	Species of Special Union Concern?	Year of Most Recent Record	Impacts[10]
Bitterling (*Rhodeus amarus*).	Unknown	Yes	No	2008	▪ Unknown
Black Swan (*Cygnus atratus*).	Not Listed	Yes	No	2021	▪ Competes with native species; and ▪ Can damage crops.
Bladder snail (*Physella acuta*).	Unknown	No	No	2021	▪ Unknown
Canada goose (*Branta canadensis*).	Not listed	Yes	No	2023	▪ Cause losses to agriculture, amenity clean up and bird-strike with aircraft; and ▪ Potential vector of avian and human pathogens.
Canadian waterweed (*Elodea canadensis*).	Moderate	Yes	No	2024	▪ Outcompete native species; ▪ Chokes waterways; and ▪ Impedes navigation and recreation.

Species Name	WFD UKTAG Impact Score	WCA Schedule 9 Listed?	Species of Special Union Concern?	Year of Most Recent Record	Impacts[10]
Cape pondweed (*Aponogeton distachyos*).	Low	No	No	2020	▪ Can overwhelm waterbodies.
Common carp (*Cyprinus carpio*).	High	No	No	2020	▪ Disturbs habitat and increases turbidity; and ▪ Can hybridise with native carp species.
Curly water weed (*Lagarosiphon major*).	High	Yes	Yes	2022	▪ Outcompete native species; and ▪ Can overwhelm waterbodies.
Demon Shrimp (*Dikerogammarus haemobaphes*).	High	No	No	2019	▪ Damages trophic system via competition and predation.
Duck-potato (*Sagittaria latifolia*).	Not listed	Yes	No	2016	▪ Can spread quickly and occupy drainage ditches.

Species Name	WFD UKTAG Impact Score	WCA Schedule 9 Listed?	Species of Special Union Concern?	Year of Most Recent Record	Impacts[10]
Egyptian goose (*Alopochen aegyptiaca*).	Not listed	Yes	Yes	2023	▪ Graze and trample habitats, droppings may cause eutrophication of still waters.
European pond turtle (*Emys orbicularis*).	Not Listed	Yes	No	1992	▪ Unknown
Floating pennywort (*Hydrocotyle ranunculoides*).	High	Yes	Yes	2024	▪ Grows in dense mats impeding navigation and recreation; and ▪ Alters native species assemblage, and obstructs surface breathing insects from reaching the waters surface.
Freshwater Mollusc (*Physella acuta*).	Unknown	No	No	2021	▪ Competes with native species; and ▪ Possible vector of disease.

Species Name	WFD UKTAG Impact Score	WCA Schedule 9 Listed?	Species of Special Union Concern?	Year of Most Recent Record	Impacts[10]
Goldfish (*Carassius auratus*).	High	No	No	2015	▪ Competes with native species; ▪ Vector of disease; and ▪ Hybridises with native species.
Grass carp (*Ctenopharyngodon Idella*).	Low	No	No	1998	▪ Unknown
Gammarus tigrinus.	Not Listed	No	No	1994*	▪ Can outcompete native species; ▪ Can occur at high densities, altering ecosystems; and ▪ Can block infrastructure (i.e. drains).
Ide / Orfe (*Leuciscus idus*).	Low	No	No	2000	▪ Hybridises with native species.

Species Name	WFD UKTAG Impact Score	WCA Schedule 9 Listed?	Species of Special Union Concern?	Year of Most Recent Record	Impacts[10]
Least duckweed (*Lemna minuta*).	Moderate	No	No	2024	▪ Forms dense mats which block out light causing deoxygenation, obstruct surface breathing insects, and reduces water temperature; and ▪ Can impede river flow.
Mandarin duck (*Aix galericulata*).	Not listed	Yes	No	2021	▪ Potential but negligible effect on native birds through competition for nesting space.
Musk Rat (*Ondatra zibethicus*).	Not Listed	No	Yes	1931	▪ Competes with native species; ▪ Burrows and grazing causes damage; and ▪ Vector of Weil's disease.

Species Name	WFD UKTAG Impact Score	WCA Schedule 9 Listed?	Species of Special Union Concern?	Year of Most Recent Record	Impacts[10]
New Zealand mudsnail (*Potamopyrgus antipodarum*).	Moderate	No	No	2022	▪ Can outcompete native species; ▪ Can occur at high densities, altering ecosystems; and ▪ Can block infrastructure (i.e. drains).
New Zealand pygmyweed (*Crassula helmsii*).	High	Yes	No	2024	▪ Outcompetes native species; and ▪ Grows in dense mats, possible exacerbating flooding.
Northern river crangonyctid (*Crangonyx pseudogracilis*).	Low	No	No	2021	▪ Competes with native species; and ▪ Its presence could alter the trophic system.

Species Name	WFD UKTAG Impact Score	WCA Schedule 9 Listed?	Species of Special Union Concern?	Year of Most Recent Record	Impacts[10]
Nuttall's waterweed (*Elodea nuttallii*).	High	No	Yes	2015	▪ Outcompete native species; ▪ Chokes waterways; and ▪ Impedes navigation and recreation.
Oblong Orb Mussel (*Sphaerium transversum*).	Unknown	No	No	1885	▪ Unknown
Parrot's-feather (*Myriophyllum aquaticum*).	High	Yes	Yes	2017	▪ Chokes waterbodies.
Red-crested pochard (*Netta rufina*).	Not Listed	Yes	No	2016	▪ Unknown
Red-eared terrapin (*Trachemys scripta* and *Trachemys scripta subsp. elegans*).	Not listed	No	Yes	2016	▪ Potential source of human salmonellosis.

Species Name	WFD UKTAG Impact Score	WCA Schedule 9 Listed?	Species of Special Union Concern?	Year of Most Recent Record	Impacts[10]
Ruddy shelduck (*Tadorna ferruginea*).	Not listed	Yes	No	2021	▪ Potential to take over nesting sites used by other birds.
Snow Goose (*Anser caerulescens*).	Not Listed	Yes	No	2002	▪ Unknown
Water fern (*Azolla filiculoides*).	High	Yes	No	2016	▪ Forms dense mats which block out light causing deoxygenation, obstruct surface breathing insects, and reduces water temperature.
Wautier's limpet (*Ferrissia (Petancylus) californica*).	Unknown	No	No	2006	▪ Unknown
Wood Duck (*Aix sponsa*).	Not Listed	Yes	No	2003	▪ Unknown

Species Name	WFD UKTAG Impact Score	WCA Schedule 9 Listed?	Species of Special Union Concern?	Year of Most Recent Record	Impacts[10]
Zebra mussel (*Dreissena polymorpha*).	High	No	No	1965	▪ Can reduce nutrients in the water, altering ecosystems; and ▪ Biofouling species impacting infrastructure.

** Not included on map (Figure 7.4)*

FURTHER DATA REQUIREMENTS

7.8.17 Within this section, 'Survey Area' refers to the same extent as the 'Study Area' – see **Figure 7.1**.

7.8.18 The information provided in **Section 7.8** is an initial high-level desk-based assessment which has been limited within the remit of this Scoping Report and the associated INNS Study Area.

7.8.19 Review of the existing open-source INNS records identified a need for additional survey work to supplement and ground-truth the existing baseline information. To date, there have been limited baseline surveys conducted on INNS presence in and around the Study Area.

7.8.20 Other topic areas have recommended surveys, or survey work is currently being conducted. INNS can be integrated into these programmes to provide further characterisation of the INNS community within the relevant Study Areas as well as providing information to inform the project's further assessment.

7.8.21 Further INNS data required for the full EIA assessment are outlined in **Table 7-6.** This includes comment on coverage, specifically the necessity of the data (necessary / optional (but recommended) / optional), and an indication of the coverage extent necessary (full / partial).

7.8.22 In summary, the further INNS data required for the full EIA assessment include:

- Further desk-based data requirements:
  - A more detailed desk-based assessment of INNS records in and around the Study Area including NBN Atlas, Local Records Centre (LRC), and EA records. This should be updated with any changes to the project area, and to ensure the most recent records have been collated (necessary).
- INNS surveys:
  - An integration of INNS surveys into existing project-specific surveys led by other topics to avoid duplication of effort and for efficiency **(necessary).**
  - Rapid assessment surveys and walk over surveys to understand a baseline composition, continued throughout construction and operation on a risk basis **(necessary).**
  - eDNA surveys to provide additional indicative presence / absence of INNS **(optional).**
- Additional data requirements:

- A review of wider literature to understand the impacts of INNS identified **(optional)**.
- An assessment and mapping of the current / baseline activities which could contribute to the introduction, spread or mitigation of INNS, or be impacted by the introduction of INNS through the development of the project **(necessary).**

Table 7-6: Further INNS data required for full EIA.

Source	Summary	Coverage
Local Environmental Record Centres (LERCS).	1) Complete INNS records (available through chargeable request) held by LERCs, i.e.: ■ RECORD – Biodiversity Information Centre for Cheshire, Halton, Warrington and Wirral; ■ BIOBANK – Merseyside BioBank; and ■ Cofnod – North Wales Environmental Information Service. 2) Extension of the Scoping Area to establish INNS baseline in nearby locations not considered within the Scoping Report. For example, the Dee SAC, increased marine extents, or origin locations for support vessel, construction material, equipment and personnel. ■ Understanding the INNS recorded at the point of origin for support equipment and personnel can feed into risk assessment and biosecurity planning with regards to the introduction of INNS to the Study Area.	**Necessary:** Survey Area – full. **Optional (recommended):** Marine Licence Boundary – full . **Operational:** Beyond Marine Licencing Boundary – partial (marine / terrestrial / freshwater high-risk areas i.e. origin locations for vessels).
Integrate INNS into the wider survey programme and recommended actions for other topics.	■ It is unlikely that dedicated (targeted) marine INNS surveys would be cost-effective; therefore, ensuring that surveys intended to cover the data gaps identified for other topics include INNS assessment will improve the confidence in the baseline INNS records.	**Necessary:** Survey Area – partial (where other surveys are taking place). **Optional:** Marine Licencing Boundary – partial (where other surveys are taking place).

Source	Summary	Coverage
Rapid Assessment surveys.	▪ Targeting existing Marinas, Ports, Harbours and infrastructure for rapid INNS assessment provides a standardised and cost-effective approach for the detection and monitoring of marine biofouling organisms. Rapid assessment surveys should be undertaken at relevant sites before the start of constructions and then repeated, on a risk basis, throughout the entirety of the construction process and operational lifecycle.	**Necessary:** Survey Area – partial (high risk areas i.e. marine structures). **Optional:** Marine Licence Boundary – partial (high risk areas i.e. marine structures).
Environmental (e)DNA survey / DNA analysis.	▪ eDNA allows for the rapid assessment of the indicative presence or absence of INNS (detected through waterborne free-DNA). Although mostly relevant for freshwater locations, eDNA and DNA assays can be used for marine survey, particularly to speciate scrape samples, such as those collected during rapid assessment survey. ▪ eDNA surveys could be carried out to provide additional baseline data, which could then be included within long-term monitoring for spread.	**Optional:** Survey Area – partial
Walk over surveys.	▪ Targeting associated terrestrial / aquatic habitats, multihabitat surveys provide a standardised and cost-effective approach for the detection and monitoring of freshwater, riparian and terrestrial INNS. Walk over surveys should be undertaken at relevant sites, such as proposed over-ground cable routes, before the start of constructions and then repeated, on a risk basis, throughout the entirety of the construction process and operational lifecycle.	**Necessary:** Survey Area – full. **Optional:** Marine Licence Boundary – partial.

Source	Summary	Coverage
	▪ Walk over surveys are also recommended for baseline data gaps of other topic areas. INNS would be included in these protocols.	
Environment Agency records.	▪ FW fish; ▪ TraC fish; ▪ River invertebrates; ▪ River macrophytes; and ▪ TraC benthic invertebrates.	**Necessary:** Within the following operational catchments: ▪ Mersey Estuary; ▪ Ditton; and ▪ Wirral.
NBN Atlas Open Source.	Repeated desk-based survey to ensure all records are captured and up to date. INNS from the following lists: ▪ Species of Union Concern; ▪ WCA Schedule 9; and ▪ WFD UKTAG.	**Necessary:** Survey Area – full. **Optional (recommended):** Marine Licence Boundary – full. **Operational:** Beyond Marine Licence Boundary – partial (high risk areas i.e. ports).
Wider literature	A review and understanding of the invasive impacts for listed INNS which are currently unknown or less understood.	**Optional:** Identified within surveys & data assessments above – partial (i.e. high-density INNS).

Source	Summary	Coverage
Assessment of INNS introduction routes and linked activities, and identification / confirmation of associated stakeholders.	■ An assessment and mapping of the current / baseline activities within the Study Area which could contribute to the introduction, spread or mitigation of INNS, or be impacted by the introduction of INNS through the development of the project. ■ Identification or confirmation of impacted stakeholders to enable further assessment of how INNS may impact current ecosystem services obtained with the Study Area.	**Necessary:** Survey Area – full. **Optional:** Marine Licence Boundary – full.

7.8.23 The EIA will consider INNS presence whilst providing information on impacts, and pathways for movement in relation to the Project.

7.8.24 The EIA will build upon the relative impacts of the species identified through review of available literature.

7.9 FUTURE BASELINE

7.9.1 The baseline assemblage is not static and will exhibit some degree of change over time, with or without the Project in place. Further introductions and natural spread will alter the geographic distribution and composition of INNS within the Study Area. As it is challenging to quantify the factors which contribute to this changing baseline, it is precautionarily assumed that INNS will continue to be introduced into the Study Area, and the distribution of those INNS already present will continue to increase. Absence of records should also not be seen as definitive proof of the absence of INNS within a specific area.

7.9.2 A horizon scanning exercise undertaken by the UK Centre for Ecology and Hydrology (Roy *et al*., 2019) identified the top 30 non-native species likely to become invasive in Britain over the next ten years. These were assessed based upon the species likelihood of 1) arrival, 2) establishment, and 3) magnitude of the potential negative impact on biodiversity or ecosystems, human health or economies. Results are listed in **Table 7-7**.

7.9.3 Whilst this predicts horizon species for only a small proportion of the expected Project life, it is an indicative starting point from which future horizon scanning exercises can be undertaken. Longer-term climate change scenarios should be considered within future horizon scanning and risk assessment processes.

Table 7-7: Top 30 non-native species likely to become invasive in Britain over the next ten years (from 2019) - species listed as in Roy et el. (2019).

Rank	Species Name	Habitat
1 - 15	Asian hornet (*Vespa velutina*).	Terrestrial
1 - 15	Asian longhorn beetle (*Anoplophora glabripennis*).	Terrestrial

Rank	Species Name	Habitat
1 - 15	Asian bush mosquito (*Aedes japonicus*).	Terrestrial
1 - 15	Comb jelly (*Mnemiopsis leidyi*).	Marine
1 - 15	Salmon fluke (*Gyrodactylus salaris*).	Freshwater
1 - 15	Chinese mystery snail (*Bellamya chinensis*).	Freshwater
1 - 15	Twoleaf water milfoil (*Myriophyllum heterophyllum*).	Freshwater
1 - 15	Sea mrytle (*Baccharis halimifolia*).	Terrestrial
1 - 15	Emerald ash borer (*Agrilus plannipennis*).	Terrestrial
1 - 15	Sponge (*Celtodoryx ciocalyptoides*).	Marine
1 - 15	Tiger mosquito (*Aedes albopictus*).	Terrestrial / Freshwater
1 - 15	Asian shore crab (*Hemigrapsus sanguineus*).	Marine
1 - 15	Clam (*Corbicula fluminalis*).	Freshwater
1 - 15	Raccoon (*Procyon lotor*).	Terrestrial
1 - 15	Raccoon dog (*Nyctereutes procyonoides*).	Terrestrial

Rank	Species Name	Habitat
16 - 30	Marbled crayfish (*Procambarus fallax*).	Freshwater
16 - 30	Brown marmorated stink bug (*Halyomorpha halys*).	Terrestrial
16 - 30	Oneseed bur cucumber (*Sicyos angulatus*).	Terrestrial
16 - 30	Dwarf surf clam (*Mulinia lateralis*).	Marine
16 - 30	European spruce bark beetle (*Ips typographus*).	Terrestrial
16 - 30	American lobster (*Homarus americanus*).	Marine
16 - 30	Citrus long-horned beetle (*Anoplophora chinensis*).	Terrestrial
16 - 30	Alexandrine parakeet (*Psittacula eupatria*).	Terrestrial
16 - 30	Japanese oyster drill (*Ocinebrellus inornatus*).	Marine
16 - 30	Northern Pacific seastar (*Asterias amurensis*).	Marine
16 - 30	Giant ragweed (*Ambrosia trifida*).	Terrestrial
16 - 30	Pine processionary moth (*Thaumetopoea pityocampa*).	Terrestrial

Rank	Species Name	Habitat
16 - 30	Nemertean worm (no common name) (*Cephalothrix simula*).	Marine
16 - 30	Round goby (*Neogobius melanostomus*).	Freshwater
16 - 30	Siberian chipmunk (*Tamias sibiricu*).	Terrestrial

7.9.4 The full EIA will use this list as a baseline whilst considering changes in assemblages since 2019, and any further horizon INNS for consideration. These INNS will be assessed for expected impacts and potential pathways for movement in relation to the Project. Furthermore, the EIA will consider the sources of pathways for movement, in particular the origin of ships bringing materials and equipment to site (in the construction phase), and the INNS associated with these locations at risk of being moved.

7.10 BASIS FOR SCOPING ASSESSMENT

7.10.1 The INNS scoping assessment is based on the understanding that the Project's construction, O&M and decommissioning phases present a risk of increasing the introduction, distribution, and impacts of INNS within the Study Area and region.

7.10.2 Preliminary INNS risk analysis indicates that there are INNS within the Scoping Area which may be influenced in distribution, movement and impact as a result of the Project, including high impact species of national / international designation. This is informed by the INNS records in the Scoping Area, and the expected construction, operation, maintenance, and decommissioning activities anticipated throughout the Project lifecycle.

7.11 EMBEDDED ENVIRONMENTAL MEASURES

7.11.1 Embedded mitigation measures have been identified and are proposed to be adopted as part of the evolution of the Project design (embedded into the Project design). These measures will evolve over the development process as the EIA progresses and in response to consultation. They will be fed iteratively into the assessment process. These measures typically include those that have been

identified as good or standard practice and include actions that would be undertaken to meet existing legislation requirements.

7.11.2 As there is a commitment to implementing these environmental measures, and to various standard sectoral practices and procedures, they are considered inherently part of the design of the Project and have, therefore, been considered in the scoping assessment.

7.11.3 In addition to the specific embedded mitigation measures relevant to INNS listed in **Table 7-8** consultation will be undertaken with all relevant stakeholders to address any concerns or issues.

7.11.4 The EIA report will include a full list of Project specific recommendations that will be derived from the results of the INNS assessment. These will be provided with the intention of reducing the risk of INNS introduction and spread as a result of the Project.

Table 7-8: Embedded environmental measures

ID	Mitigation Measures Embedded into the Project Design	How The Measure Will Be Secured
OM6	Biosecurity plan within Construction Environmental Management Plan (CEMP).	A CEMP will be developed and adhered to during the construction phase of the Project. As part of the CEMP a biosecurity plan will be developed presenting actions that will need to be implemented to reduce the risk of INNS introduction and spread during the construction phase of the project. Outline CEMP will be submitted as part of the DCO.
OM7	Development issue of an Environmental Vessel Management Plan (EVMP) to all project vessel operators.	Issue of a Code of Conduct to all project vessel operators to advise on how to avoid impacts on benthic habitats and species, in addition to reducing the risk of INNS introduction and spread.
OM6	An Invasive Non-Indigenous Species Management Plan will be implemented and is included in the CEMP.	The plan outlines measures to ensure vessels comply with the International Maritime Organisation (IMO) ballast water management guidelines, it will consider the origin of vessels and contain standard housekeeping measures for such vessels as well as measures to be adopted in the event that a high alert species is recorded.
OM2	A MPCP is included in the EMP / OCEMP.	Ensures plans are in place to manage any marine pollution spills and including key emergency contact details. Outline CEMP will be submitted as part of the DCO.

COMMENTS UPON EMBEDDED ENVIRONMENTAL MEASURES

7.11.5 The following comments have been made upon the embedded environmental measures outlined in **Table 7-9**. Comment has only been passed upon measures which either directly reference INNS, or in which INNS could be included.

- OM6: The 'Environmental Management Plan' should include necessary biosecurity to reduce the risk of INNS movement on vehicles, equipment, and materials. This could include:
  - Provision of physical biosecurity facilities (such as washdown stations and boot brushes);
  - Implementation and formalisation as Standard Operating Procedures (SOPs) of appropriate procedures (such as Check Clean Dry (CCD), or quarantine areas); and
  - Deployment of a programme of education to all employees and contractors working on the Project (such as INNS ID and reporting procedures).

7.11.6 Alternatively, a Project biosecurity plan could be developed as a separate document which could encompass all necessary measures.

- OM7: The North West Marine Plan states that: "*Proposals must put in place appropriate measures to avoid or minimise significant adverse impacts that would arise through the introduction and transport of invasive non-native species, particularly when: 1) moving equipment, boats or livestock (for example fish or shellfish) from one water body to another 2) introducing structures suitable for settlement of invasive non-native species, or the spread of invasive non-native species known to exist in the area*" and "*Proposals that do not put in place appropriate measures to avoid or minimise significant adverse impacts that would arise through the introduction and transport of invasive non-native species will not be supported*."
  - To fulfil the requirement of the marine plan, the 'Invasive Non-Indigenous Species Management Plan' should be expanded to encompass Project biosecurity requirements and protocols beyond ballast water risks. Risks for marine, freshwater and terrestrial pathways for INNS spread should be assessed specifically.

ADDITIONAL MITIGATION COMMENTS

7.11.7 **Monitoring and surveillance** throughout the lifecycle of the project allows for the introduction of new INNS and spread of existing INNS to be identified and

responded to in haste. An effective monitoring network is dependent upon: 1) ID training resources, and 2) a clear reporting procedure. Once implemented, a multitude of stakeholders can be utilised to provide monitoring capabilities including operational staff, marine business owners, local action groups, and the general public.

7.11.8 **Rapid response** protocols are important to ensure a fast and effective response to the introduction of a new INNS into the Study Area. Such protocols should be implemented at a species specific level and may include information like species information, containment and management measures, key stakeholders and accompanying roles and responsibilities. The effectiveness of rapid response is dependent upon the existence of a robust monitoring and surveillance network.

7.11.9 **Biosecurity** is a preventative measure which acts as the first line of defence against the introduction and spread of INNS propagules. INNS 'propagules' are life stages that could be transferred and viably establish at a receptor location, and include eggs, seeds, vegetative fragments, juveniles, and adults. These could be transferred via pathways for movement like the movement of equipment and materials (see **Section 7.12**). Biosecurity could include:

- Provision of physical biosecurity facilities (such as washdown stations and boot brushes);
- Implementation and formalisation as SOPs of appropriate procedures (such as CCD), or quarantine areas); and
- Deployment of a programme of education to all employees and contractors working on the Project (such as INNS ID and reporting procedures).

7.11.10 **Eradication and management** of INNS could be deployed to reduce the abundance of INNS in and around the Study Area and in turn reduce propagule pressure and the risk of transfer and spread. This should be undertaken via the development of species specific options appraisals to develop appropriate measures contextualised to the Study area.

7.12 LIKELY SIGNIFICANT EFFECTS

7.12.1 In line with the EIA Regulations 2017, the EIA for the Project will consider those impacts where there is a risk of a likely significant effect only. The following Section draws on industry experience and expertise to identify those effect-receptor pathways that may potentially lead to a significant impact. Where experience and available evidence indicates an effect-receptor pathway will not lead to a significant impact with regards to the EIA Regulations 2017 the pathway can be scoped out from assessment.

7.12.2 From an INNS perspective, the activities and possible effects resulting from Project sources are assessed from three points of focus:

1) Activities which present a potential risk for INNS introduction and spread.

2) INNS as Receptors: the impact(s) of the Project on the fitness of the INNS currently present within the Study Areas.

3) INNS as impact(s) upon other receptors: INNS have well established impacts on native species and habitats, this point of focus considered the potential for further introduction and spread in and out of the Study Area, and the changes to impacts, above baseline, which could influence and effect other sensitive receptors (e.g. native species) as a result.

7.12.3 The potential effects linked to INNS are presented in **Table 7-9**. The scoping assessment is based on a combination of the Project definition at the scoping stage, embedded environmental measures, understanding of the baseline INNS conditions, and the known / expected routes by which INNS could be introduced and spread.

7.12.4 The early identification of likely significant effects is used here as a tool aimed at delivering a proportionate approach to the EIA. In doing so, it sets out a high-level assessment of all potential effects, significant or not.

Table 7-9: Potential significant effects of INNS

Source	Pathway	Receptor	Project Phase (C, O, M, D) *	Embedded measures	Scoped in or scoped out	Justification	Data collection & analysis to characterise the baseline
Increasing INNS fitness within the Study Area and beyond.		All sensitive receptors.	All	OCEMP includes measures to safeguard the marine environment – should include INNS.	Scoped in.	A positive effect upon INNS (increased fitness).	Understanding of the INNS within the Study Area.
Transfer of construction materials, equipment, and personnel on and off the Study Area.	Facilitate the introduction, establishment and spread of marine, terrestrial, and freshwater INNS to the Study Area, resulting in pressures on existing native species, environments,	Marine, terrestrial and freshwater INNS receptor. Plus INNS having placing pressure upon all habitats, species and infrastructure.	C, M, D	OCEMP includes measures to safeguard the marine environment – should include INNS.	Scoped in.	Potential for the movement and spread of marine, terrestrial and freshwater INNS into the Study Area, representing opportunities for INNS to establish and spread through non-natural routes.	Understanding of the INNS records at source locations for construction material and equipment. Understanding the frequency and magnitude of activity and high-level understanding of baseline environmental conditions (with reference to INNS establishment) at source and Study Area.

Source	Pathway	Receptor	Project Phase (C, O, M, D) *	Embedded measures	Scoped in or scoped out	Justification	Data collection & analysis to characterise the baseline
	and operational activities.					Resulting pressures on existing native species, environments, and operational activities.	
Ballast water operations associated with transfer of materials and equipment to the Study Area.	Facilitate the introduction, establishment and spread of INNS to the Study Area, resulting in pressures on existing native species, environments, and operational activities.	INNS receptor. Plus INNS having placing pressure upon all habitats, species and infrastructure.	C, M, D	OCEMP includes measures to ensure that vessels comply with the BWMC (Ballast Water Management Convention).	Scoped in.	May facilitate the introduction, establishment and spread of INNS to the Study Area, resulting in pressures on existing native species, environments, and operational activities.	Understanding of the INNS records at source locations. Understanding the frequency and magnitude of ballast operations and high-level understanding of baseline environmental conditions (with reference to INNS establishment) at source and Study Area. Understanding of the nature of shipping and ballast operations. BWMC compliance status of individual vessels.

Source	Pathway	Receptor	Project Phase (C, O, M, D) *	Embedded measures	Scoped in or scoped out	Justification	Data collection & analysis to characterise the baseline
							This should include Port of Liverpool operational procedures and biosecurity plan.
General construction activities including dredging, civils etc. within the Study Area.	Facilitate the movement of existing INNS within the Study Area.	INNS receptor. Plus INNS having placing pressure upon all habitats, species and infrastructure.	C, M, D	OCEMP includes measures to safeguard the marine environment – should include INNS.	Scoped in.	May facilitate the introduction, establishment and spread of INNS to the Study Area, resulting in pressures on existing native species, environments, and operational activities.	Understanding of the INNS within the Study Area. Understanding the frequency and magnitude of activities.
Loss / gain of habitat due to the presence of the tidal barrage and associated structures.	May have implications for INNS fitness within the Study Area through the creation of	INNS receptor.	C, O		Scoped in.	Increased biofouling substrate allows for the increased establishment	Understanding of the proposed infrastructure.

Source	Pathway	Receptor	Project Phase (C, O, M, D) *	Embedded measures	Scoped in or scoped out	Justification	Data collection & analysis to characterise the baseline
	new hard substrate.					and spread of INNS.	
Changes to environmental conditions and habitats (i.e. water levels / wetted area, changes in salinity, temperature, hydrodynamics etc.).	Favouring current INNS populations, increasing spread and impact of existing populations.	INNS receptor.	C, O, D		Scoped in.	May facilitate the introduction, establishment and spread of INNS to the Study Area, resulting in pressures on existing native species, environments, and operational activities.	Understanding of the proposed infrastructure.

** C = construction, O = operation, M = maintenance, D = decommissioning*

IMPACTS SCOPED OUT OF ASSESSMENT

7.12.5 All INNS impacts and considerations are scoped in for further assessment. INNS may be directly impacted (benefit or disbenefit) by the Project, and / or become the source of further impacts to other sensitive receptors. It is therefore necessary to assess all potential INNS impacts within the EIA and consider specific mitigation options in detail.

7.12.6 The embedded environmental measures, as currently understood, may offer some resilience against the introduction and spread of INNS into / within the Study Area; however, further baseline data / information on proposed protocols is required before any conclusions can be made.

7.13 CUMULATIVE EFFECTS

7.13.1 INNS are a wide-reaching topic which encompass the marine, terrestrial and freshwater environments. There are many species which may impact upon and / or be impacted by the wider topics explored within the EIA.

7.13.2 Whilst INNS will primarily be assessed as receptors, it is important to understand their capacity to directly impact other sensitive receptors. This will be reflected at a high-level through the lens of the species-specific impacts.

7.13.3 Due to the longevity of the Project (expected to be operational for 100 years and beyond), the cumulative effect of stakeholder consultation, policy and legislation, and climate change in the latter operational and decommissioning stages of the Project are difficult to predict. As a result, their inclusion in the INNS assessment process will be considered at a high level (i.e. climate change may cause more invasions as local ecosystem resilience will fall) – see **Section 7.9** for more information.

7.13.4 Furthermore, it is understood that the Study Area is saturated with a number of other projects currently being undertaken. This will provide further vectors for INNS spread on and off the Study Site. A coordinated approach alongside other stakeholders operating in the Study Area may be necessary to appropriately manage the risk of spreading INNS.

7.14 TRANSBOUNDARY EFFECTS

7.14.1 Many INNS are mobile or able to spread through propagation or pathways of movement associated with the project. As a result, they are not subject to Project boundaries (with the exception of physical habitat changes) and therefore may

move beyond the scope of the Project. If INNS are introduced into the Study Area, their effects may be wide reaching due to spread over time.

7.14.2 The creation of new hard substrate may also act as an intermediate, 'stepping-stone' location for biofouling species which could facilitate their spread across the boundaries of the Study Area.

7.14.3 Furthermore, the desk-based component of the INNS assessment is subject to the natural spread of INNS. This means that whilst a species may have been recorded at a location in the past, this does not mean that it is currently present at that location. This can be said for the absence of a species records which does not necessarily mean that it is not present. This can be overcome by undertaking INNS surveys of the Study Area to have an up-to-date record of INNS distribution.

7.14.4 Whilst the natural spread of INNS is likely, the transboundary movement of INNS on and off the Study Area can be controlled through the implementation of appropriate biosecurity measures (see **Section 7.11**).

7.15 PROPOSED APPROACH TO ENVIRONMENTAL IMPACT ASSESSMENT REPORT

7.15.1 Further desk-based studies and analyses will be undertaken to identify and assess INNS receptors and the knock-on effects to other receptors. This study will be supplemented with consultation (integrated with other topic areas) with the relevant statutory and non-statutory organisations as necessary.

7.15.2 INNS should be considered and integrated within survey efforts for related topic areas. Ground-truthing of INNS record data should be undertaken.

7.15.3 The Project's INNS risk will be considered using two integrated approaches: 1) a component-focused method to determine and assess the inherent risk of INNS introduction and spread that is presented by the technical parameters and O&M activities of the Project; and 2) a species-focused method to determine and contextualise how the Project may influence the fitness of INNS within the Study Area, and any knock-on impacts posed by INNS to other sensitive receptors.

7.15.4 For any impacts considered to be of moderate or higher significance or of threat to native species and habitats, further mitigation / enhancement measures (beyond embedded measures) will be proposed / detailed to reduce the significance of effect.

7.15.5 High-risk operations will be highlighted for their potential for INNS introduction and spread, and further mitigation / enhancement measures (beyond embedded measures) will be proposed / detailed to reduce the significance of effect.

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7.17 DATA REFERENCES

Table 7-10: List of Rightsholder and Data Providers from NBN Atlas Open Source Data

Rightsholders	Data Providers
Biological Records Centre.	Biological Records Centre.
Botanical Society of Britain and Ireland and Biological Records Centre.	Birda
BTO	Botanical Society of Britain and Ireland.
Cofnod North Wales Environmental Information Service.	British Trust for Ornithology.
Conchological Society of Great Britain & Ireland.	Cofnod North Wales Environmental Information Service.

Rightsholders	Data Providers
Environment Agency	Conchological Society of Great Britain & Ireland.
Freshwater Fish Recording Scheme and Biological Records Centre.	Environment Agency
Highland Biological Recording Group.	Freshwater Fish Recording Scheme.
Joint Nature Conservation Committee (JNCC).	Highland Biological Recording Group.
Marine Biological Association.	Joint Nature Conservation Committee.
Marine Biological Association and Biological Records Centre.	Mammal Society
Merseyside BioBank	Marine Biological Association.
Natural England	Merseyside BioBank
National Museums Liverpool.	Natural England
National Trust	National Trust
Natural Resources Wales.	Natural History Museum, London.
Scottish Natural Heritage.	Natural Resources Wales.
Seasearch	NatureScot
The Mammal Society and Biological Records Centre.	Royal Society for the Protection of Birds.

Rightsholders	Data Providers
The Royal Society for the Protection of Birds.	Seasearch
	World Museum, National Museums Liverpool.

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8 MARINE MAMMALS

8.1 INTRODUCTION

8.1.1 The marine mammal chapter will consider the potentially significant effects on marine mammals that may arise from the construction, operation and maintenance (O&M) and decommissioning activities of the Project, specifically the tidal barrage. This chapter considers the grid connection in the case that the selected cable route includes a section of subsea cable.

8.1.2 These receptors include cetaceans (whales, dolphins, and porpoises) and pinnipeds (seals). This section of the Scoping Report describes the methodology to be used within the EIA, an overview of the baseline conditions within the Tidal Barrage Development Area contained within the Scoping Boundary (as defined in **Chapter 1: Introduction**), the datasets to be used to inform the EIA, the potential likely significant effects to be considered, and how these will be assessed for the purpose of the EIA.

8.1.3 Basking sharks are considered alongside other fish species in **Chapter 10: Fish and Shellfish.**

8.1.4 Marine mammals interface with other aspects and as such, should be considered alongside these; namely:

- **Chapter 5: Coastal Processes**: There are potential pathways of effect from marine processes on potentially marine mammals and prey species, therefore information on the marine geology, oceanography, physical processes, water quality and sediment dynamics will be required to inform the marine mammal assessment;
- **Chapter 6: Benthic Ecology and Plankton**: Marine mammal prey items are often strongly linked to the benthic environment. The Benthic and Subtidal chapter will be utilised for assessing potential indirect effects upon marine mammals from impacts upon their prey;
- **Chapter 10: Fish and Shellfish**: Marine mammal receptors are sensitive to changes in prey resources and habitats. The fish and shellfish chapter will therefore, inform the marine mammal assessment;
- **Chapter 11: Commercial Fisheries:** The Commercial Fisheries chapter will be utilised for assessing potential indirect effects upon marine mammals from changes to prey species;
- **Chapter 12: Underwater Noise and Vibration**: Marine Mammals are sensitive to underwater noise and vibration. There is therefore potential for

underwater noise as a result of the Project to affect marine mammal receptors. In addition, there is the potential for indirect effects from underwater noise to effect prey species. The Underwater Noise & Vibration chapter will be used to inform the assessment of the potential impact of underwater noise on marine mammals; and

- **Chapter 16: Shipping and Navigation**: There are pathways of effects from increased vessel activities on marine mammal receptors and their prey species (i.e. increased risk of accidental pollution). Information in the shipping and navigation chapter will therefore, inform the marine mammal assessment.

8.1.5 Overarching relevant legislation and policy context which has informed the scope of the assessment is outlined in **Chapter 4: Planning Policy,** with topic specific considerations outlined in **Appendix 4.1**.

8.2 TECHNICAL GUIDANCE

8.2.1 Technical guidance that has been used to define the assessment is set out in **Table 8-1**.

Table 8-1: Relevant technical guidance

Guidance reference	Relevance to the assessment
Marine Mammal Noise Exposure Criteria: Updated Scientific Recommendations for Residual Hearing Effects (Southall *et al.*, 2019)	This peer-reviewed publication is commonly used in assessments to provide information on functional hearing groups (FHGs) of marine mammals. The authors present auditory thresholds at which underwater noise levels can cause a temporary threshold shift (TTS) in hearing, meaning hearing is temporarily affected, or a permanent threshold shift (PTS) in hearing, meaning hearing is permanently affected. These values are typically used in conjunction with underwater noise modelling to assess the effect on species at the individual and population level.
2018 Revisions to: Technical Guidance for Assessing the Effects of Anthropogenic Sound on Marine Mammal Hearing	This document provides voluntary technical guidance for assessing the effects of underwater anthropogenic sound on the

Guidance reference	Relevance to the assessment
(Version 2.0): Underwater Thresholds for Onset of Permanent and Temporary Threshold Shifts. (National Marine Fisheries Service (NMFS, 2018)	hearing of marine mammal species under the jurisdiction of the NMFS. Specifically, it identifies the received levels, or thresholds, at which individual marine mammals are predicted to experience TTS and PTS for acute, incidental exposure to underwater anthropogenic sound sources.
The protection of Marine European Protected Species from injury and disturbance: Guidance for marine area in England and Wales and the UK offshore marine area (June 2010 Version) (Joint Nature Conservation Committee (JNCC), Natural England and Countryside Council for Wales, 2010)	This advice and guidance relates to regulations prohibiting the deliberate and reckless capture, injury, killing, and disturbance of marine European Protected Species (EPS), which include all cetacean species. Although seals are not EPS, the commitment measures outlined in this document can also be applied to reduce the risk of impacts to seals (and other marine species).
The Wildlife Safe (WiSe) Scheme for boat operators (the WiSe Scheme, 2018)	WiSe has developed Codes of Conduct to promote safe and sustainable watching of marine mammals.

8.3 STUDY AREA

8.3.1 The Study Area for the marine mammal assessment will be defined in relation to the high mobility and variation in foraging distances and seasonal distribution of marine mammals. Relevant study areas may be further refined and agreed in consultation with stakeholders.

8.3.2 Three Areas for cetaceans have been identified for the purposes of baseline characterisation:

- Regional Study Area (RSA);
- Study Area; and,
- Survey Area.

8.3.3 **Section 8.6** outlines the spatial scope of the surveys in relation to the study areas. Project specific surveys and data collection will be restricted to the Survey

Area. Potential impacts within the wider Study Area outside of the Survey Area will be characterised using existing datasets through a desk-based review.

8.3.4 The HRA Screening report assesses the potential for likely significant effect on marine mammal qualifying features and their Designated Site(s).

REGIONAL STUDY AREA

8.3.5 The purpose of the RSA is to assist in the assessment of population-level impacts on the species of marine mammals scoped into the assessment. This larger area will consider marine mammal ecology, behaviour, abundance, and distribution of species within the appropriate Management Unit (MU) for cetaceans and pinnipeds. The RSA is species-specific and is synonymous with the respective species' MU.

8.3.6 The boundaries of an MU are based on best understanding of the structure of biological populations and ecological differentiation within such populations, also taking into account political boundaries and the management of human activities. Therefore, a MU may be smaller than what is believed to be a 'population', to reflect spatial differences in human activities and their management (IAMMWG, 2023).

8.3.7 The following MUs are considered with respect to the relevant cetacean species in parentheses (see **Figure 8.1** and **Figure 8.2**):

- Celtic and Irish Seas (CIS) MU (harbour porpoise, *Phocoena phocoena*);
- Irish Sea (IS) MU (bottlenose dolphin, *Tursiops truncatus*); and
- Celtic and Greater North Seas (CGNS) MU (common dolphin, *Delphinus delphis*; Risso's dolphin, *Grampus griseus*; and minke whale, *Balaenoptera acutorostrata*).

8.3.8 For grey and harbour seals, the RSA is defined by haul-out preference regions presented in Carter *et al.* (2022), and consideration of the Seal Management Units (SMUs) from UK waters, as determined by the Special Committee on Seals (SCOS, 2022). SMUs are based on expert knowledge of seal ecology, using the most pragmatic approach to management of seals without inferring discrete populations. The Scoping Boundary sits within with the North West England SMU and is situated near the Wales SMU for the grey seal and harbour seal (**Figure 8.2**).

8.3.9 Using the species-specific RSAs allows a quantitative approach to assessing population-level impacts, as the species-specific MUs have associated abundance estimates for which impacts can be assessed against.

STUDY AREA

8.3.10 The Study Area is defined by a precautionary Zone of Influence (ZoI) of the works, considering JNCC (2020) guidance on Effective Deterrence Ranges (EDRs) of anthropogenic activities (e.g. pile driving of monopiles).

8.3.11 The JNCC guidance focuses on harbour porpoises with respect to assessing disturbance from underwater noise within harbour porpoise SACs. In the absence of EDRs for other species of marine mammals, using EDRs for harbour porpoises as a proxy for other species is considered precautionary given that harbour porpoises are one of the most acoustically sensitive marine mammal species in UK waters.

8.3.12 Based on the guidance, the largest EDR for harbour porpoise is 26 kilometre (km), which is used for monopile installation and UXO clearance. In taking a precautionary approach to defining the Study Area, a 40km buffer around the Scoping Boundary (**Figure 8.3**) has been used, it extends 14km beyond the most conservative EDR in the guidance. On this basis it is expected that the ZoI will be refined by the underwater noise modelling and the final Study Area within future environmental assessment stages will be refined and reduced.

8.3.13 The marine mammal baseline characterisation and potential impacts within the Study Area will be assessed using a combination of pre-existing data identified during the desk-based study and by the data obtained from the surveys proposed in **Section 8.6**. Project specific surveys and data collection will be restricted to the Survey Area. Potential impacts within the wider Study Area outside of the Survey Area will be characterised using existing datasets through a desk-based review.

CONSULTATION

8.3.14 Consultation is a key part of the application process. The assessment has been and will be informed by engagement and discussion with various stakeholders including but not limited to the following: Planning Inspectorate (PI), Environment Agency (EA), Natural England (NE), Marine Management Organisation (MMO), local councils (i.e. Warrington Borough Council) and other stakeholders via public consultation. Regular Environmental Stakeholders Workshops and Hydro-environmental Modelling Workshops have also been undertaken since October 2020, full details of these workshops is provided within **Table 3-1** of **Chapter 3: Approach to EIA** and is summarised for the consultation events of particular relevance to this Chapter within **Table 8-2**.

8.3.15 A summary of the key issues raised during consultation and workshops to date, relevant to marine mammals, is outlined in **Table 8-3** together with how these issues will be considered in the production of the EIA.

Table 8-2: Consultation Events

Date	Consultees	Agenda Topics
10.01.2022	EA, NE, LWT, NW-IFCA, NRW, MRT, MGET, TCE, CWT	Environmental Stakeholder Workshop 6. Status update, Progress on In-River barrage location review, Plan for topic-based technical discussions moving forward, Habitat Scope Discussion.
17.05.2023	EA, NE, LWT, MRT, MGET, TCE, DECG, MMO, NWT, MECG	Environmental Stakeholder Workshop 7. Provide an update on project status, Introduction to desk-based studies, Update on surveys, Wider Data Gathering and Analysis, Hydro-environmental Modelling Update.
30.08.2023	EA, NE, LWT, MRT, MGET, TCE, DECG, MMO, NWT, MECG	Environmental Stakeholder Workshop 8. Status update, Hydro-environmental Modelling Update, Update on desk-based studies and next steps for baseline surveys, Update on surveys.
16.11.2023	EA, NE, LWT, MRT, MGET, MMO, NWT, RSPB, CWT	Environmental Stakeholder Workshop 9. Status update, Habitats and Licensing, Hydro-environmental Modelling Update, Update on surveys
14.02.2024	EA, NE, MRT, MGET, MMO, RSPB, CWT, DECG, MECG,	Environmental Stakeholder Workshop 10. Status update, EIA & Engagement update, Fish & Shellfish, Marine Mammals and Marine and Intertidal Ornithology update.

Table 8-3: Consultation Comments

Date	Consultee	Consultation and Key Comments	How this is accounted for
2022	MMO	For the acoustic surveys, the survey plan proposes to use F-PODs to allow for the detection of cetacean clicks. The survey plan states that "*the F-PODs would be installed for one year with a recording duty cycle of 5 mins on, 15 minutes off. The F-PODs will be placed as two 'gates' within the Mersey to see how far up harbour porpoise travel to inform on impacts of a barrage option or placed outside the estuary to inform on general usage of the larger area for a lagoon option. Placement ideally will be in areas of lowest tidal flow possible to reduce background noise levels and maximise detection range*". The MMO agree that the devices would be ideally placed in areas of lowest tidal flow possible to reduce background noise levels and maximise detection range. It will be appropriate to discuss the locations of the F-PODs with stakeholders (as the locations of the F-PODs need to match the preferred scheme). One option may be to place one F-POD outside the estuary and two F-PODs in the barrage area to verify how long animals are spending in each area and to cover all options.	The comment has been considered in the design of the survey plan. The Project no longer includes the lagoon option and therefore comments relating to this are not considered in the response.
2023	NE	Recommendation that monthly surveys should be undertaken across a minimum of two years to provide site specific sightings baseline data for marine mammals, allowing for inter-annual variability. Surveys should be undertaken in consecutive months to capture intra-annual variation across seasons. Addition of land-based surveys in addition to boat-based and acoustic surveys to help detect cetaceans and seal haul outs within the area.	The comment has been considered in the design of the survey plan. Boat-based surveys are not considered a requirement as the proposed surveys (see **Section 8.6**) will provide sufficient

Date	Consultee	Consultation and Key Comments	How this is accounted for
			data to inform a robust assessment of near field effects.
2024	NE	Locations of FPODs should be positioned to ensure they provide coverage across the full areas of interest and considering limitations of detection distances (approximately 400m for porpoise, and up to 1km for dolphins). The addition of vantage point surveys alongside visual surveys will help cover any potential 'blind-spot' from FPODs but will help highlight other occasional marine mammal species visiting the area and provide relevant distribution data along the Mersey.	The comment has been considered in the design of the survey plan.

8.4 ASSESSMENT METHODOLOGY

8.4.1 The Project-wide approach to the assessment methodology is set out in **Chapter 3: Approach to EIA** and includes the approach to Habitats Regulations Assessment (HRA). This will be implemented to assess the likely significant effects on marine mammal receptors from the construction, O&M, and decommissioning of the Project.

8.4.2 Relevant legislation and guidance will also be considered in relation to the assessment, in addition to consultation with the stakeholders outlined above.

8.4.3 The assessment approach will be based on the conceptual 'source-pathway-receptor' model. This model identifies likely environmental effects resulting from the proposed construction, O&M, as well as decommissioning phases of the tidal barrage. This process provides an easy-to-follow assessment route between effect sources and potentially sensitive receptors ensuring a transparent impact assessment.

8.4.4 Iterative steps involved in the assessment approach will include:

- Determination of potential interactions between the tidal barrage and ecological receptors (for all project phases);
- Definition of marine mammal environment within the influence of the Project;
- Assessment of the value and sensitivity of marine mammal receptors;
- Assessment of the magnitude of impact;
- Assessment of the significance of effects;
- Proposal of mitigation measures to reduce, prevent or where these are not possible, to offset, any adverse significant effects;
- Assessment of the residual effects after any mitigation measures have been considered; and
- Assessment of cumulative effects.

8.4.5 In some instances, the Project will retain flexibility in terms of the options for methods and approaches to be applied during the construction phase. Where this is the case, for each combination of effect and receptor, the assessment will be based on the reasonable worst-case scenario and where this approach has been taken it will be clearly indicated in the Preliminary Environmental Information Report (PEIR) and ES.

Assessment Criteria

8.4.6 If the effect occurs on all of, or a proportion of, a community / population and / or the supporting habitat on a continual basis, or the effect has the potential to always occur due to the Project even if it is not continual, it can be considered to be permanent. If it is not on a continual basis or it is known the effect will cease at some point when considering the community / population and / or the supporting habitat, it can be described as temporary.

8.4.7 Timing and frequency of impacts in relation to potential periods of increased sensitivity e.g. grey seal breeding season will also be considered in the assessment.

RECEPTOR SENSITIVITY AND VALUE

8.4.8 Sensitivity and value of receptor are defined in **Chapter 3: Approach to EIA**.

8.4.9 All marine mammals are considered to have a high value given that all are either listed under Annex II of the Habitats Directive as species of Community Interest and / or are listed under Annex IV of the Habitats Directive as EPS of Community Interest and in need of strict protection.

8.4.10 It should be noted that high value and high sensitivity are not necessarily linked within a particular impact. A receptor could be of high value (e.g. an interest feature of a SAC) but have a low or negligible physical / ecological sensitivity to an impact and vice versa.

8.4.11 Value and / or Sensitivity will be considered when assessing effects. Information used to determine (the significance of effect) will be clearly indicated in the assessment narrative.

8.4.12 The definitions of value and sensitivity for marine mammal receptors are provided in **Table 8-4** and **Table 8-5**, respectively.

Table 8-4: Definition of level of value and protection for marine mammal receptors

Value	Definition
Very High	An internationally designated site or candidate site (SPA, pSPA, SAC, cSAC, pSAC, etc.) or an area which the country agency has determined meets the published selection criteria for such designation, irrespective of whether or not it has yet been notified.

Value	Definition
	Internationally significant and viable areas of a habitat type listed in Annex I of the Habitats Directive or species on Annex II of the Habitats Directive. Globally threatened species (i.e. Critically endangered or endangered on IUCN Red list) or species listed on Annex 1 of the Bern Convention. Regularly occurring populations of internationally important species that are rare or threatened in the UK or of uncertain conservation status. A regularly occurring, nationally significant population / number of any internationally important species. Habitat / species highly regarded for their important biodiversity, social / community value and / or economic value.
High	A nationally designated site (SSSI, NNR, MNR, MCZ) or a discrete area, which the country conservation agency has determined meets the published selection criteria for national designation (e.g. SSSI selection guidelines) irrespective of whether or not it has yet been notified. Regularly occurring, globally threatened species (i.e. Vulnerable or lower on IUCN Red list) or species listed on Annex 1 of the Bern Convention. Previously UKBAP habitats and species; S41 species of NERC Act. Habitat / species which have important biodiversity, social / community value and / or economic value.
Medium	Significant populations of a regionally / county important species. Habitat / species possess moderate biodiversity, social / community value and / or economic value.
Low	Species are abundant, common or widely distributed. Habitat / species have low biodiversity, social / community value and / or economic value.

Value	Definition
Very Low	Negligible or no value and / or economic value.

Table 8-5: Definition of level of sensitivity for marine mammal receptors

Sensitivity	Description
Very High	The species has very limited tolerance to sources of disturbance such as noise, prey disturbance and vessel movements.
High	The species has limited tolerance to sources of disturbance such as noise, prey disturbance and vessel movements.
Medium	The species has some tolerance to sources of disturbance such as noise, prey disturbance and vessel movements.
Low	The species is generally tolerant to sources of disturbance such as noise, prey disturbance and vessel movements.
Very Low	The species is very tolerant to sources of disturbance such as noise, prey disturbance and vessel movements.

MAGNITUDE

8.4.13 **Chapter 3: Approach to EIA** outlines the approach for the magnitude of impact to be assessed, taking into account aspects / features designed into the Project to avoid or minimise environmental effects (i.e. embedded mitigation). Guidelines to assign the magnitude of impact are provided **Table 8-6**.

Table 8-6: Definition of level of magnitude for marine mammal receptors

Magnitude	Magnitude of Impact
High	A reasonably expected change in the size or extent of distribution of the relevant biogeographic population or the population that is the interest feature of a specific protected site. This will be predicted to irreversibly alter the population in the short-to-long term and to alter the long-term viability of the population and / or the integrity of the protected site.

Magnitude	Magnitude of Impact
	Recovery to baseline levels from that change predicted to be achieved in the long-term (i.e. more than five years) following cessation of the development activity.
Medium	A reasonably expected change in the size or extent of distribution of the relevant biogeographic population or the population that is the interest feature of a specific protected site. This will occur in the short- and long-term, but which is not predicted to alter the long-term viability of the population and / or the integrity of the protected site. Recovery to baseline levels from that change predicted to be achieved in the medium-term (i.e. no more than five years) following cessation of the development activity.
Low	A unlikely or intermittent change in the size or extent of distribution of the relevant biogeographic population or the population that is the interest feature of a specific protected site. Sufficiently small-scale or of short duration to cause no long-term harm to the feature / population. Recovery to baseline levels from that change predicted to be achieved in the short term (i.e. no more than one year) following cessation of the development activity.
Very Low	An unlikely or very slight change from the size or extent of distribution of the relevant biogeographic population or the population that is the interest feature of a specific protected site. Sufficiently small-scale or of short duration to cause no long-term harm to the feature / population. Recovery to baseline levels from that change predicted to be rapid (i.e. no more than ca. six months) following cessation of the development activity.
No Change	The activity will have no interaction with the receptor.

SIGNIFICANCE OF EFFECT

8.4.14 The significance of the effect upon marine mammals will be determined by taking into account the sensitivity of the receptor and the magnitude of the impact. Effects may be either negative (adverse) or positive (beneficial) and are defined

initially without mitigation. Where the resulting effect comprises a range of significance levels, the final assessment for each effect will be based upon expert judgement.

8.4.15 Residual effects that are classified as moderate or above are considered to be 'significant' in EIA terms; however, professional judgement is applied for moderate effects. Residual effects classified as slight or below are considered to be 'not significant'.

8.4.16 The following terms have been used to define the significance of the effects identified (**Table 8-7**):

- **Major Effect:** Project could be expected to have a considerable effect (either positive or negative) on marine mammal receptors;
- **Moderate Effect:** Project could be expected to have a noticeable effect (either positive or negative) on marine mammal receptors;
- **Minor Effect:** Project could be expected to result in a small, barely noticeable effect (either positive or negative) on marine mammal receptors; and
- **Negligible:** where no discernible effect is expected as a result of the Project on marine mammal receptors.

Table 8-7: Significance of effect criteria for the marine mammal assessment

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

8.5 BASELINE CONDITIONS

DATA INFORMATION SOURCES

8.5.1 An initial desk-based review has been undertaken of publicly available data sources outlined in **Table 8-8** to determine the baseline character of the Study Areas and inform the assessment process. Pre-existing data identified during the desk-based study will be used to inform the assessment for effects within the Study Area and Regional Study Area. Near field effects would be further informed by the baseline surveys which are proposed to take place within the Survey Area (see **Section 8.6**).

Table 8-8: Key sources of marine mammal data

Source	Date	Summary	Coverage of Study Area
Atlas of cetacean: distribution in North West European waters (Reid *et al.,* 2003).	Majority of sightings from 1978 to 2003, some sightings as far back as 1940.	This report collates land-, vessel- and aerial-based marine mammal sightings in the north east Atlantic region, including Irish and Celtic Seas.	Partial coverage of Regional Study Areas; full coverage of the Study Area.
Habitat-based predictions of at sea distribution for grey and harbour seals in the British Isles (Carter *et al.,* 2020).	2005 to 2019.	This report provides estimates of at-sea distribution for both grey and harbour seals from haul-outs in the British Isles. The predictions are based on regional models of habitat preference.	Partial coverage of Regional Study Area; full coverage of the Study Area.
Revised Phase III Data Analysis of Joint Cetacean Protocol Data Resource JNCC Report No. 517 (Paxton *et al.,* 2016).	1994 to 2010.	This JNCC report estimates spatio-temporal abundance for seven cetacean species around the British Isles and the island of Ireland.	Partial coverage of Regional Study Areas; full coverage of the Study Area.
Cetacean abundance and distribution in European Atlantic shelf waters to inform conservation and management (Hammond *et al.,* 2013).	2005	Aerial- and boat-based surveys were conducted in 2005 to provide large-scale estimates of small cetacean abundance in European Atlantic waters, including for the harbour porpoise, bottlenose dolphin, Risso's dolphin, common dolphin, and minke whale	Partial coverage of Regional Study Area; full coverage of the Study Area.

Source	Date	Summary	Coverage of Study Area
Estimates of cetacean abundance in European Atlantic waters in Summer 2018 from the Small Cetacean Abundance in the North Sea (SCANS)-III aerial and shipboard surveys (Hammond *et al.,* 2021).	2018	Aerial- and boat-based surveys were conducted in 2018 to provide large-scale estimates of small cetacean abundance in European Atlantic waters, including for the harbour porpoise, bottlenose dolphin, Risso's dolphin, common dolphin, and minke whale.	Partial coverage of Regional Study Areas; full coverage of the Study Area.
Estimates of cetacean abundance in European Atlantic waters in Summer 2022 from the SCANS-IV aerial and shipboard surveys (Gilles et al., 2023).	2022	Aerial- and boat-based surveys were conducted in 2022 to provide large-scale estimates of small cetacean abundance in European Atlantic waters, including for the harbour porpoise, bottlenose dolphin, Risso's dolphin, common dolphin, and minke whale.	Partial coverage of Regional Study Areas; full coverage of the Study Area.
European Community Directive on the Conservation of Natural Habitats and of Wild Fauna and Flora (92/43/EEC). Fourth Report by the United Kingdom under Article 17 on the implementation of the Directive from January 2013 to December 2018 Conservation status assessment.	2019	This document represents the UK Report on the conservation status of the harbour porpoise, submitted to the European Commission as part of the 2019 UK Reporting under Article 17 of the EU Habitats Directive. including for the harbour porpoise, bottlenose dolphin, Risso's dolphin, common	Full coverage of Regional Study Areas; full coverage of the Study Area.

Source	Date	Summary	Coverage of Study Area
		dolphin, minke whale and grey and harbour seal.	
Irish Cetaceans Checklist (NBDC, 2022a).	2022	This report presents an overview of the cetacean species in Irish waters.	Partial coverage of Regional Study Area.
Irish Seals Checklist (NBDC, 2022b).	2022	This report presents an overview of the seal species in Irish waters.	Partial coverage of Regional Study Area.
Aerial surveys of cetaceans and seabirds in Irish waters: Occurrence, distribution and abundance (Rogan *et al.,* 2018).	2015 to 2017	This report presents the occurrence, distribution and abundance of cetaceans and seabirds in Irish waters based on visual aerial survey data.	Partial coverage of Regional Study Area.
Scientific Advice on Matters Related to the Management of Seal Populations: (SCOS, 2022; 2021).	2022	This report collates findings on seal density, abundance and breeding to identify any conservation and management issues, including ecology, behaviour, population trends and estimates, important areas and the status of both grey and harbour seals in the UK.	Full coverage of Regional Study Areas.

Source	Date	Summary	Coverage of Study Area
Sympatric Seals, Satellite Tracking and Protected Areas: Habitat-Based Distribution Estimates for Conservation and Management (Carter *et al.,* 2022).	2005 to 2019	This journal article provides estimates of at-sea distribution for both grey and harbour seals from haul-outs in the British Isles. The predictions are based on regional models of habitat preference.	Full coverage of Regional Study Areas; Full coverage of Study Area.
Review of Marine Mammal Management Units (MUs) in UK waters (IAMMWG, 2023).	2023	This report details abundance estimates for species and their MUs for the seven most common cetacean species in UK waters.	Full coverage of Regional Study Areas; Full coverage of Study Area.
Distribution maps of cetaceans and seabird populations in the north east Atlantic (Waggitt *et al.,* 2019).	2019	The study provides distribution maps for 12 cetacean species at 10km and monthly resolutions in the north east Atlantic.	Full coverage of Regional Study Areas; Full coverage of Study Area.
Modelled Distributions and Abundance of Cetaceans and Seabirds of Wales and Surrounding Waters (Evans and Waggitt, 2023).	2023	Modelled distribution maps provide spatially broad-scale relative densities and distribution between 1990 to 2020 for several cetacean species. Covers territorial seas of Wales and adjacent areas of the Republic of Ireland, Northern Ireland, Isle of Man, North Nest and South West England,	Partial coverage of Regional Study Area; Full coverage of Study Area.

Source	Date	Summary	Coverage of Study Area
		including all of the Irish Sea, Bristol Channel, and adjacent Celtic Sea.	
NBN Atlas Open Access Data (NBN, 2023).	2023	Online tool providing biological data from multiple sources within the UK.	Partial coverage of Regional Study Area; Full coverage of Study Area.
The Mammal Society Open Access Data (The Mammal Society, 2023).	2023	Provides information on distribution of marine mammals within UK.	Partial coverage of Regional Study Area; Full coverage of Study Area.
RECORD (2023).	2023	Local environmental records centre for Cheshire, Halton, Warrington and Wirral.	Partial coverage of Regional Study Area; Full coverage of Study Area.
Merseyside Biobank (2023).	2023	Provides information on species, habitats and other biodiversity information in the north Merseyside area.	Partial coverage of Regional Study Area; Full coverage of Study Area.
COFNOD (2023)	2023	Local Environmental Records Centre for Wales.	Partial coverage of Regional Study Area; Full coverage of Study Area.

Source	Date	Summary	Coverage of Study Area
Sea Watch Foundation (2023).	2023	Cetacean sightings information including distribution maps, histograms of seasonal occurrence, table of sightings, references, and interpretation of results for north east Irish Sea.	Partial coverage of Regional Study Area; Full coverage of Study Area.
Bottlenose dolphin monitoring in Cardigan Bay (Lohrengel *et al.,* 2018).	2018	The report summarises the bottlenose dolphin monitoring work conducted by the Sea Watch Foundation between 2014 and 2016 on behalf of Natural Resources Wales.	Partial coverage of Regional Study Area.
Atlas of the marine Mammals of Wales (Baines and Evans, 2012).	2012	The report provides vessel, aerial and land-based survey data of marine mammals along Welsh coast.	Partial coverage of Regional Study Area; Full coverage of Study Area.

EXISTING BASELINE

8.5.1 This section describes the present conditions which constitute the existing baseline environment for marine mammals within the Study Area.

8.5.2 The Project is situated on the River Mersey, between the Wirral to the south and west and Liverpool to the north and east, and is a highly industrialised and urban location, with an existing baseline level of anthropogenic activity and disturbance related to this, including that associated with shipping and foot traffic from the general public. The habitats within and adjacent to the River Mersey Estuary, River Dee Estuary, Liverpool Bay and Irish Sea in the vicinity of the Project have experienced disturbance from many decades of major development, both onshore and offshore. There are four offshore windfarms in operation within the Irish Sea in the vicinity of the River Mersey Estuary, including Burbo Bank (including Extension) (<10km north-west), Gwynt y Môr (<30km west), North Hoyle (<30km west), Rhyl Flats (<40km west) and four further offshore windfarms within the same area of the Irish Sea, including West Duddon of Sands (<60km north-west), Barrow (<60km north-west), Walney (inc. extension) (<70km north-west) and Ormonde Wind Farm (<75km north-west). All of these offshore windfarms have been constructed in the last 25 years. In addition, two further offshore windfarms, Morecambe (<55km north-west) and Morgan (<80km north-west) are proposed. Significant major development has been undertaken within the River Mersey Estuary, including the Liverpool Cruise Terminal, completed in 2007, Mersey Gateway Bridge, completed in 2017, and several major developments either proposed or underway, including the Liverpool Waters (inc. Everton Stadium) and Wirral Waters.

8.5.3 An initial desk-based literature review has identified the key data sources, listed in **Table 8-8** to inform the EIA.

8.5.4 From the initial desk-based assessment, twenty-six cetacean species have been recorded throughout the broader Irish Sea area (see Appendix A; NBDC, 2022a) with the following five cetacean species and two seal species identified as being the most regularly occurring in the Irish Sea:

- Harbour porpoise (*Phocoena phocoena*);
- Common dolphin (*Delphinus delphis*);
- Bottlenose dolphin (*Tursiops truncatus*);
- Risso's dolphin (*Grampus griseus*);
- Minke whale (*Balaenoptera acutorostrata*);
- Grey seal (*Halichoerus grypus*); and

- Harbour seal (*Phoca vitulina*).

8.5.5 This section provides a high-level summary of the baseline characterisation of the receiving environment and of the existing environment and seven marine mammal species listed above. The desk-based assessment will also include review of relevant and accessible grey literature on marine mammal strandings and observations within the Study Area.

Harbour Porpoise

8.5.6 The harbour porpoise is the most abundant cetacean species in UK waters. Abundance estimates for the harbour porpoise are 16,777 (CV=0.2) for the CIS MU (IAMMWG, 2023; Hammond *et al.,* 2021; Rogan *et al.,* 2018). The regional Study Area overlaps with SCANS-III survey block F (Hammond *et al*., 2021) which has an estimated density of 0.086 animals/km² (CV=0.38; Hammond *et al*., 2021; IAMMWG, 2023). The estimated harbour porpoise density for the SCANS IV CS-E block is 0.5153 animals/km (CV=0.250) (Gilles *et al.,* 2023).

8.5.7 The harbour porpoise is the most regularly observed cetacean within the Study Area, with a large concentration of sightings within the Scoping Boundary (SWF, 2023; NBN, 2023).

8.5.8 The IUCN red list designates the Atlantic population of harbour porpoise as of Least Concern (Brulik *et al.,* 2020). The current conservation status and short-term trends for harbour porpoise within UK waters are unknown, due to insufficient data for the species, however, the future prospects of the species are considered Favourable due an improvement in additional habitats by more designated SACs for the species (JNCC, 2019a).

Short Beaked Common Dolphin

8.5.9 Short-beaked common dolphins occur primarily in continental shelf waters and are present throughout the year within the CGNS MU. Sightings are relatively uncommon within the Irish Sea in comparison to the other cetacean species mentioned; however, they occur regularly in waters off the west coast of Scotland, with peak sightings in the Autumn months, as well as May and June (Paxton *et al.,* 2011; Hammond *et al.,* 2013), and off the west and south coasts of Ireland, with peak sightings in the Winter months (Rogan *et al*., 2018). Abundance estimates of common dolphins are 57,417 (CV=0.32) for the CGNS MU (IAMMWG, 2023; Hammond *et al.,* 2021; Rogan *et al.,* 2018). Common dolphins were not recorded within Block F of the SCANS-III survey (Hammond *et al.,* 2021) nor Block CS-E of the SCANS-IV survey.

8.5.10 The desktop study identified six sightings of common dolphin within the Study Area between the years 2000 and 2022 (SWF, 2023; NBN, 2023). No sightings were recorded within the Scoping Boundary.

8.5.11 The current conservation status and short-term trends for common dolphin within UK waters are unknown (JNCC, 2019b).

Bottlenose Dolphin

8.5.12 There are two separate populations of bottlenose dolphin in the North Atlantic, the 'coastal' and 'offshore' populations. The better known 'coastal' form is locally common in the Irish Sea (Cardigan Bay), off North East Scotland (the inner Moray Firth), in smaller numbers in the Hebrides (West Scotland), and off South West England.

8.5.13 Bottlenose dolphins occur in only small numbers throughout the Irish Sea, with a coastal population along coastal north and west Wales with high densities of bottlenose dolphins recorded in southern Cardigan Bay, with moderately high densities also extending to Anglesey (Baines and Evans, 2012). The abundance of bottlenose dolphins in the Cardigan Bay area in 2016 was estimated to be 289 individuals (CI = 44-160, CV = 0.33) (Lohrengel *et al.,* 2018).

8.5.14 Abundance estimates of bottlenose dolphins are 186 (CV=0.52) for the IS MU (IAMMWG, 2023; Hammond *et al.,* 2021; Rogan *et al.,* 2018), which is lower than that of the abundance estimate for Cardigan Bay (Lohrengel *et al.,* 2018).

8.5.15 Bottlenose dolphins were not recorded within Block F of the SCANS-III survey (Hammond *et al*., 2021). The estimated density of bottlenose dolphins based on the SCANS-IV survey for Block CS-E is 0.0104 animals/km^2 (CV=0.700) (Gilles *et al.,* 2023).

8.5.16 Bottlenose dolphins are sighted occasionally within the Study Area, with one record occurring within the Scoping Boundary between the years 2000 and 2022 (SWF, 2023; NBN, 2023).

8.5.17 The current conservation status and short-term trends for bottlenose dolphin within UK waters are unknown, due to insufficient data for the species (JNCC, 2019c).

Risso's Dolphin

8.5.18 Risso's dolphin occur primarily in continental shelf waters, with small numbers regularly occurring throughout the Irish Sea (Sea Watch Foundation, 2020b; Waggit *et al.*, 2020). Abundance estimates of Risso's dolphins are 8,687

(CV=0.63) for the CGNS MU (IAMMWG, 2023; Hammond *et al.,* 2021; Rogan *et al.,* 2018). Risso's dolphins were not recorded within Block F of the SCANS-III survey or Block CS-E for the SCANS-IV survey (Hammond *et al.,* 2021; Gilles *et al.,* 2023).

8.5.19 The desk-based study identified one sighting of Risso's dolphin within the Study Area in 2017 (NBN, 2023). This sighting was outside of the Scoping Boundary.

8.5.20 The current conservation status and short-term trends for Risso's dolphin within UK waters are unknown due to insufficient data (JNCC, 2019d).

Minke Whale

8.5.21 Minke whale are the most common baleen whale species around UK waters (Robinson *et al.,* 2023). Abundance estimates of minke whales are 10,288 (CV=0.26) for the CGNS MU (IAMMWG, 2023; Hammond *et al.,* 2021; Rogan *et al.,* 2018). Minke whales were not recorded within Block F in the SCANS-III survey (Hammond *et al*., 2021). The estimated density for minke whales based on the SCANS-IV survey for Block CS-E is 0.0088 animals/km² (Gilles *et al.,* 2023).

8.5.22 No sightings of minke whales were recorded in the Study Area between 2000 and 2022 (SWF, 2023; NBN, 2023). The current conservation status and short-term trends for minke whale within UK waters are unknown, due to insufficient data to establish current trends or future prospects for the species (JNCC, 2019e).

Table 8-9: Cetacean abundance estimates within SCANS-IV and UK portion of Management Unit (MU) blocks. Source: Gilles *et al.* (2023), Hammond *et al.* (2021) and IAMMWG (2023)

Species	SCANS IV Blocks CS-E	SCANS III Block F	Management Units (MUs)
Harbour porpoise.	6,325 (CV = 0.250, 95% CI-3,663-10,162)	1,056 (CV= 0.38, 95% CI=342-2,010)	**Celtic and Irish Seas (CIS):** 16,777 (CV=0.2; 95% CI=11,216-25,096).
Common dolphin.	N/A	N/A	**Celtic and Greater North Seas (CGNS):** 57,417 (CV=0.32; 95% CI=30,850-106,863).
Bottlenose dolphin.	127 (CV=0.70, 95% CI=3-353)	N/A	**Irish Sea (IS):** 186 (CV=0.52; 95% CI=70-492).
Risso's dolphin.	N/A	N/A	**CGNS:** 8,686 (CV=0.63; 95% CI=2,810-26,852).
Minke whale.	108 (CV=1.145, 95% CI=1-491)	N/A	**CGNS:** 10,266 (CV=0.26; 95% CI=6,210-17,042).

Grey Seal

8.5.23 Grey seals typically forage up to 100km off the coast and telemetry studies indicate individual movement between haul-out sites (Carter *et al.,* 2022). Grey seals are particularly vulnerable to disturbance during the breeding season (August to December) and moulting season (December to April) (SCOS, 2021; SCOS, 2022). Grey seals have a 'favourable' conservation status in the UK due to their improving population trend (JNCC, 2019f).

8.5.24 The latest population estimate for grey seals in the UK at the start of the 2022 breeding season was 162,000 individuals (approximately 95% CI 146,7000-178,5000) (SCOS, 2022). The most recent estimated counts within the North West England MU for grey seals is 300 individuals in 2021 and 900 for Wales MU (SCOS, 2022). Effort-based surveys by Sea Watch Foundation recorded a high concentration of seal sightings near Dee Estuary, in the south of the Study Area (SWF, 2023).

8.5.25 Plate 8.1 illustrates the mean predicted relative at-sea distribution for grey seals hauling out in the British Isles. The Study Area falls within 0.1% of the at sea-population (Carter *et al.,* 2020). The Study Area densities calculated for grey seals is 0.67 animals per km^2, resulting in an abundance estimate of 1,182 grey seals.

8.5.26 The West Hoyle bank, located to the West of the Hilbre Island in the Study Area, is used as a moulting and feeding haul-out area, (NRW, 2015). This is located approximately 20km from the Barrage Scoping Boundary.

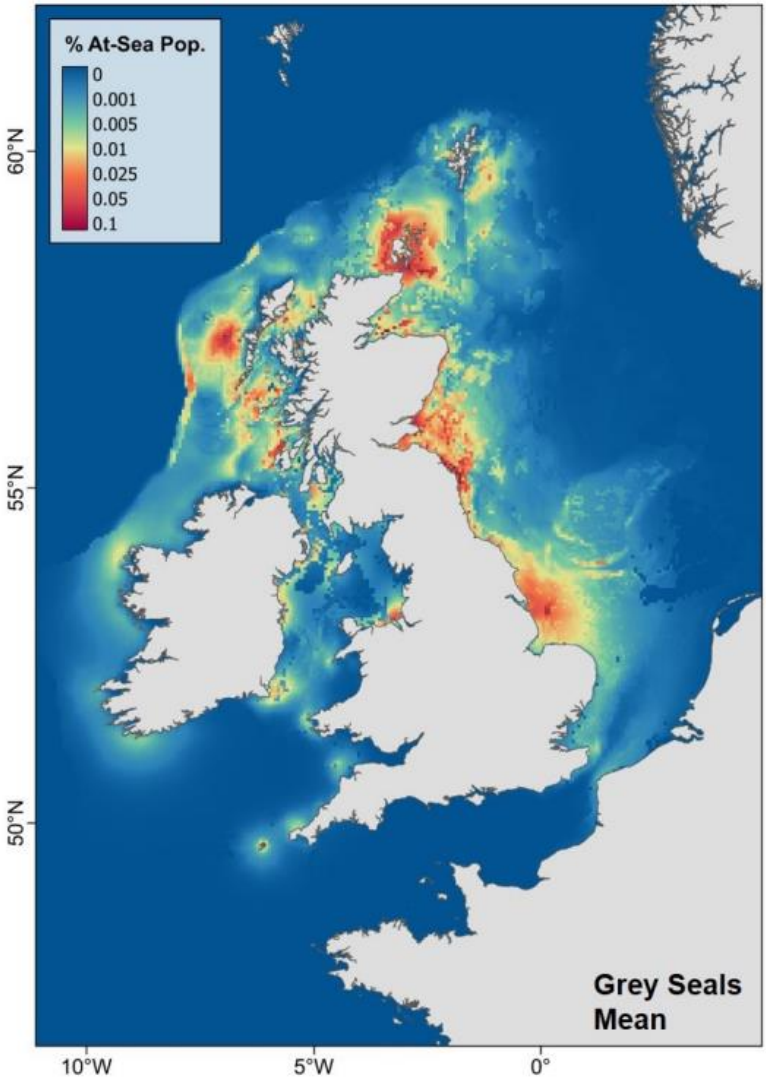

Plate 8.1: Modelled at-sea distribution (relative density) of grey seals using data from seals telemetry tagged at haul out sites in the UK and Ireland (Carter *et al.,* 2022)

Harbour Seal

8.5.27 Harbour seals are particularly vulnerable to disturbance during the breeding season in June and July, and moulting season in August and September (Paterson *et al*., 2015). Harbour seals typically forage up to 50km from haul-out sites and show high site fidelity (Carter *et al.,* 2022). The current conservation status and short-term trends for harbour seal is unfavourable-inadequate (JNCC, 2019g).

8.5.28 The latest estimated UK harbour seal population, based on surveys between 2016 and 2021 is 42,900 (approximately 95% CI, 35,100-57,000) individuals (SCOS, 2022). Estimated counts for harbour seals within the North West England MU is 7 individuals (CV = 5-9) and within the Wales MU is 13 individuals (CV = 11-18) for 2021 (SCOS, 2022). There are limited effort-based data

available for this SMU; the effort-based surveys by Sea Watch Foundation near Dee Estuary did not report any harbour seals, only grey seals.

8.5.29 **Plate 8.2** illustrates the mean predicted relative at-sea distribution for harbour seals hauling out in the British Isles. The Study Area falls within 0.005% of the at sea-population (Carter *et al.,* 2020). The Study Area densities calculated for harbour seals is 0.008 animals per km^2, resulting in an abundance estimate of 14 harbour seals.

8.5.30 Only one sighting of a harbour seal within the Study Area was reported by SWF (2023). This sighting was not within the Scoping Boundary.

Designated Sites

8.5.31 No designated sites that have a marine mammal species as a feature overlap with the Study Area. However, there are several designated sites beyond this area which contain cetacean qualifying features and may have connectivity to the Study Area, based on individuals' known range. These sites are listed in **Table 8-10.** The Study Area does not overlap with any SACs for pinnipeds, nor is it within the typical foraging range of any SACs for which grey seals or harbour seals are designated features (100km and 50km, respectively; Carter *et al*., 2022).

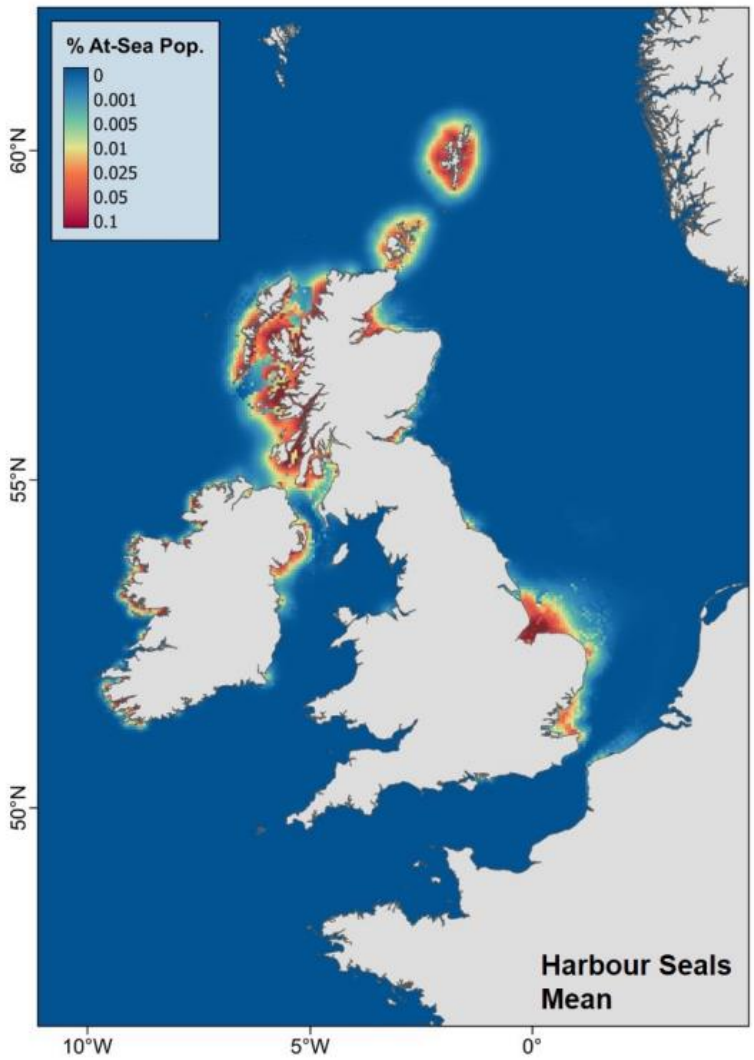

Plate 8.2: Modelled at-sea distribution (relative density) of harbour seals using data from seals telemetry tagged at haul out sites in the UK and Ireland (Carter *et al.*, 2022)

Table 8-10: Designated sites, all of which are SACs, with potential connectivity to Study Area

Designated site	Distance to Project (km)	Relevant Qualifying Interest features
North Anglesey	79	Harbour porpoise
Cardigan Bay	145	Bottlenose dolphin
Pen Llyn a`r Sarnau / Lleyn Peninsula	85	Bottlenose dolphin

8.6 FURTHER DATA COLLECTION

8.6.1 Giving consideration to relevant guidance (e.g. Sparling *et al.* (2015), the marine mammal assessment will be supplemented by vantage point surveys which will be carried out within the Study Area over a two year-period. This period would be prior to any proposed construction-related activity; therefore, these data will assist in establishing the baseline environment for marine mammals (Diederichs *et al.,* 2008).

8.6.2 It is proposed that vantage point surveys are conducted at four locations along the shoreline of the Mersey Estuary within the Survey Area, and that the vantage points that are directly opposite one another are surveyed on the same day (see **Figure 8.3**)**.** It is anticipated that the vantage point surveys will be conducted once a month, maximising available daylight and weather windows to maximise survey effort. Where possible, the surveyors will record species sighted, number of animals per sighting, location, direction of travel and behaviour, alongside environmental parameters (e.g. weather and sea state).

8.6.3 These data will be essential for addressing knowledge gaps on the presence, distribution, abundance, seasonal patterns, and habitat use of marine mammal species, and will be particularly important for the assessment of potential impacts in the nearfield, such as collision risk and barrier effects.

8.6.4 The data collected from year one of the vantage point surveys will be used to inform whether refinements to the vantage point surveys and / or any additional surveys are required in year two. The requirement for refinement to vantage point surveys and / or additional surveys will be discussed with and informed by stakeholder engagement and is anticipated to be an adaptive process.

8.7 FUTURE BASELINE

8.7.1 The EIA process will consider the existing baseline conditions within the Study Area, and future baseline conditions (as far as reasonably practical). This will include consideration of the possibility of further marine protected areas becoming designated over the lifetime of the Project as well as climate change and water quality effects.

8.7.2 The baseline environment is not static and will exhibit some degree of change over time, with or without the tidal barrage in place. Therefore, when undertaking impact assessments, it will be necessary to place any potential impacts in the context of the envelope of change that might occur naturally over the lifetime of the tidal barrage. This future baseline will be defined for the purposes of the EIA. Changes in marine mammal populations are likely to occur due to climate

change, independent of the Project being constructed or not. The main impacts are likely to relate to geographic range shifts, reduction in suitable habitats, food web alterations and increased prevalence of disease. Around the UK, evidence of range shift is increasing, with a shift north by some warmer water species (documented by Martin *et al.*, 2023). Baseline conditions are likely to exhibit some degree of change over time independent of the Project.

8.8 BASIS FOR SCOPING ASSESSMENT

8.8.1 The marine mammal scoping assessment is based on the key parameters and assumptions set out in **Chapter 2: Site Context and Project Description.**

8.8.2 The source-pathway-receptor linkage between the tidal barrage and / or activities and the receptor groups for this aspect are described in **Table 8-11.**

8.9 EMBEDDED ENVIRONMENTAL MEASURES

8.9.1 Embedded mitigation measures have been identified and are proposed to be adopted as part of the evolution of the Project design (embedded into the Project design). These measures will evolve over the development process as the EIA progresses and in response to consultation. They will be fed iteratively into the assessment process. These measures typically include those that have been identified as good or standard practice and include actions that would be undertaken to meet existing legislation requirements.

8.9.2 As there is a commitment to implementing these environmental measures, and to various standard sectoral practices and procedures, they are considered inherently part of the design of the Project and have, therefore, been considered in the scoping assessment.

8.9.3 In addition to the specific embedded mitigation measures relevant to marine mammals listed in **Table 8-11**, consultation will be undertaken with all relevant consultees to address any concerns or issues.

8.9.4 There are additional (Secondary) environmental measures which could be embedded into the Project to reduce or prevent Likely Significant Effects upon marine mammal receptors. These measures have not been considered within the scoping of Likely Significant Effects within this Chapter and are not presented as commitments at this stage but will be explored as part of the evolution of the Project Design. These measures include deploying Acoustic Deterrent Devices, early warning systems for marine mammal presence, monitoring within the near-field of the turbines (camera and sonar) and shut down agreements. These

measures among potentially others will be explored as part of the future environmental assessment stage of the Project.

Table 8-11: Relevant marine mammal embedded environmental measures

ID	Mitigation Measures embedded into the project design	How the measure will be secured
OM7	Vessel Management Plan (VMP).	A VMP will be developed and adhered to during the construction of the Project. The VMP will confirm the types and numbers of vessels that will be engaged on the Project and consider vessel coordination including indicative transit route planning.
OM1	Outline Construction Environmental Management Plan (OCEMP).	A OCEMP will be developed and adhered to during the construction phase of the Project. A Marine Pollution Contingency Plan (MPCP) will form part of the CEMP. The MPCP provides details of procedures to protect personnel working and to safeguard the marine environment and mitigation measures in the event of an accidental pollution event arising during the construction phase.
OM9	Marine Mammal Mitigation Protocol (MMMP).	A MMMP will be developed and adhered to during the construction phase of the Project. This will mitigate potential impacts from underwater noise on marine mammals and fish through good or standard practice actions, including soft-start and ramp-up measures for pile driving, to meet legislative requirements. The MMMP will evolve during the development phase and as the EIA

ID	Mitigation Measures embedded into the project design	How the measure will be secured
		progresses and in response to consultation.
OM8	Adherence to a Construction Noise Management Plan.	This will monitor the noise during piling including wind speed and direction as well as implementing use of slow and soft starts during piling activities.

8.10 LIKELY SIGNIFICANT EFFECTS

8.10.1 In line with the EIA Regulations 2017, the EIA for the Project will consider those impacts where there is a risk of a likely significant effect only. The following section draws on industry experience and expertise to identify those effect-receptor pathways that may potentially lead to a significant impact. Where experience and available evidence indicates an effect-receptor pathway will not lead to a significant impact with regards to the EIA Regulations 2017 the pathway is scoped out from assessment.

8.10.2 The likely significant effects on marine mammals are summarised in **Table 8-12** for each stage. The scoping assessment is based on a combination of the Project definition at the scoping stage, embedded environmental measures, understanding current baseline conditions, the evidence base for marine mammal effects, the identification of potentially impacted receptors, and professional judgement. The approach to this assessment is set out in **Chapter 3: Approach to EIA**.

The early identification of likely significant effects is used here as a tool aimed at delivering a proportionate approach to the EIA. In doing so, it sets out a high-level assessment of all potential effects, significant or not. The basis for scoping out certain effects, and therefore no longer considered is presented after the table, supported by evidence base. **Table 8-12** differs slightly from other chapters given the commonality between the source, pathway, receptor model during all phases of the tidal barrage and construction phase only of the port and marine facilities.

Table 8-12: Likely significant marine mammal effects

Source	Pathway	Receptor	Project Phase (C, O, M, D)	Embedded measures	Scoped in or out	Justification	Data collection and analysis to characterise the baseline [11]
Vessel movements.	Increased Collision risk.	Cetaceans and pinnipeds.	C; O; M; D	VMP	Scoped In.	Increased collision risk from vessel movements may result in exclusion and displacement, injury or mortality.	Shoreline vantage point surveys.
Vessel movements.	Increased Noise and vibration.	Cetaceans and pinnipeds.	C; O; M; D	VMP	Scoped In.	Increased noise and vibration from vessel movements may result in behavioural disturbance, exclusion and displacement, injury or mortality.	Shoreline vantage point surveys. Underwater noise modelling.
Construction activities (e.g. piling).	Increased noise and vibration.	Cetaceans and pinnipeds.	C	MMMP	Scoped In.	Increased noise and vibration from construction activities may result in behavioural disturbance, exclusion and displacement, injury or mortality.	Shoreline vantage point surveys.

[11] Details on data collection and analysis to characterise the baseline are outlined in Section 8.5: Further data collection to be undertaken.

Source	Pathway	Receptor	Project Phase (C, O, M, D)	Embedded measures	Scoped in or out	Justification	Data collection and analysis to characterise the baseline [11]
Construction of coffer dam, caisson, installation of turbines.	Barrier to movement.	Cetaceans and pinnipeds.	C	N/A	Scoped In.	Barrier to movement from coffer dam, caisson, installation of turbines may result in behavioural disturbance, exclusion and displacement.	Shoreline vantage point surveys.
Construction of coffer dam, caisson, installation of turbines, laying of subsea cable.	Temporary or permanent habitat loss.	Cetaceans and pinnipeds.	C	N/A	Scoped In.	Temporary or permanent habitat loss due to construction of coffer dam, caisson and installation of turbines may result in behavioural disturbance, exclusion and displacement.	Shoreline vantage point surveys.
Construction of coffer dam, caisson, installation of turbines.	Change in hydrodynamic regimes (increase in suspended sediment and turbidity).	Cetaceans and pinnipeds.	C	N/A	Scoped Out.	See "*Impacts Scoped out of Assessment*".	N/A

Source	Pathway	Receptor	Project Phase (C, O, M, D)	Embedded measures	Scoped in or out	Justification	Data collection and analysis to characterise the baseline [11]
Release of contaminants / pollutants.	Changes in water quality.	Cetaceans and pinnipeds.	C; O; M; D	CEMP	Scoped Out.	See "*Impacts Scoped out of Assessment*".	N/A
Impacts on prey species.	Changes in prey availability.	Cetaceans and pinnipeds.	C; O; M; D	N/A	Scoped In.	Indirect impacts resulting from direct impacts on prey species and e.g. changes in prey availability / abundance.	Shoreline vantage point surveys. Population / Stock Modelling (as described in **Chapter 10: Fish and Shellfish**).
Operational turbines.	Increased collision risk.	Cetaceans and pinnipeds.	O	N/A	Scoped In.	Increased collision risk from operational turbines may result in injury or mortality for marine mammals	Shoreline vantage point surveys.
Operational turbines.	Increased noise and vibration.	Cetaceans and pinnipeds.	O	N/A	Scoped In.	Increased noise / vibration from operation of turbines may result in behavioural disturbance,	Shoreline vantage point surveys.

Source	Pathway	Receptor	Project Phase (C, O, M, D)	Embedded measures	Scoped in or out	Justification	Data collection and analysis to characterise the baseline [11]
						exclusion and displacement, injury or mortality.	
Presence of tidal barrage.	Permanent habitat loss.	Cetaceans and pinnipeds.	O	N/A	Scoped In.	Permanent habitat loss due to the presence of tidal barrage may result in behavioural disturbance, exclusion and displacement, injury or mortality.	Shoreline vantage point surveys.
Presence of tidal barrage	Barrier to movement	Cetaceans and pinnipeds.	O	N/A	Scoped In.	Barrier to movement from presence of tidal barrage may result in behavioural disturbance, exclusion and displacement.	Shoreline vantage point surveys.
Maintenance dredge.	Change in hydrodynamic regimes (increase in suspended sediment and turbidity).	Cetaceans and pinnipeds.	M	N/A	Scoped Out.	See "*Impacts Scoped out of Assessment*".	N/A

Source	Pathway	Receptor	Project Phase (C, O, M, D)	Embedded measures	Scoped in or out	Justification	Data collection and analysis to characterise the baseline [11]
Removal of sluice gates / turbines.	Increased noise and vibration.	Cetaceans and pinnipeds.	D	N/A	Scoped In.	Increased noise / vibration from decommissioning vessels and removal of turbines and sluice gates may result in behavioural disturbance, exclusion and displacement, injury or mortality.	Shoreline vantage point surveys.
Removal of sluice gates / turbines.	Change in suspended sediment and turbidity.	Cetaceans and pinnipeds.	D	N/A	Scoped In.	Change in suspended sediment and turbidity from removal of turbines and sluice gates may result in behavioural disturbance, exclusion and displacement, injury or mortality.	Shoreline vantage point surveys.

Impacts Scoped Out of Assessment

8.10.3 Impacts from change in suspended sediment and turbidity do not have the potential to result in likely significant effect for cetaceans or pinnipeds. The maximum impact range is expected to be extremely localised to the activity, with sediments rapidly dissipating. Marine mammals, such as harbour porpoise and harbour seals, are known to regularly forage in tidal areas where water conditions are turbid and visibility conditions poor (e.g. Pierpoint, 2008; Marubini *et al*., 2009; Hastie *et al*., 2016). Therefore, low light levels, turbid waters and high suspended sediments are unlikely to negatively impact marine mammal foraging success. Consequently, potential significant effects resulting from changes in suspended sediment and turbidity have been scoped out from further assessment during all phases of the Project.

8.10.4 Impacts from change in water quality do not have the potential to result in significant effects for marine mammals. The Mersey Estuary is rated as Class 3 under the national system of classifying river pollution. Furthermore, due to the highly mobile nature of marine mammals, if changes in water quality did occur, it is anticipated that these would be short term and localised, and marine mammals could exploit alternative adjacent habitat. Therefore, potential significant effects resulting from changes in water quality have been scoped out from further assessment during all phases of the Project.

8.10.5 These conclusions have been made based on the knowledge of the baseline environment and the nature of planned works on the potential for impact from such projects more widely. The conclusions follow (in a site-based context) existing best practice.

8.11 RECEPTOR SPECIFIC MODELLING

8.11.1 Collision risk (e.g. with the turbine blades) and underwater noise may have direct impacts on marine mammals, including injury and mortality. The data collected from the proposed baseline surveys within the Survey Area, as well as pre-existing data identified during the desk-based study, will be used to inform and support any quantitative analysis which is expected to be required to enable a robust assessment of the impacts on marine mammals.

8.11.2 **Collision Risk Modelling** - There is the potential for marine mammal injury or mortality as a result of collision with operational turbine blades. Collision risk modelling can be used to assess the degree of risk posed by operational turbines on marine mammal receptors. The model will be informed by the data collected from vantage point surveys, which will provide important nearfield data to better inform the risk of collision. Results from the collision risk models will

inform any monitoring and / or mitigation measures to reduce collision risk, if required.

8.11.3 **Interim Population Consequences of Disturbance Model (iPCoD) -** If required, iPCoD modelling will be used to quantify and assess potential population-level consequences of injury and / or disturbance during the construction and operational phases of the Project. iPCoD is available for harbour porpoise, bottlenose dolphin, minke whale, grey seal and harbour seal; all other species would be assessed qualitatively.

8.11.4 **Underwater noise modelling -** Underwater noise modelling will be carried out as required. Aspects of construction (e.g. if impact pile driving is used) and operation (e.g. operational noise of the turbines) may require modelling to quantify potential impacts on marine mammals from underwater noise during these phases of the Proposed Project.

8.11.5 The results from the underwater noise modelling will determine the range of potential effects on marine mammals. Noise exposure criteria as set out in Southall *et al.* (2019) will be used to determine auditory injury for the relevant marine mammal receptors. Results from the underwater noise modelling will inform any monitoring and / or mitigation measures to reduce impacts of underwater noise, if required.

8.12 CUMULATIVE EFFECTS

8.12.1 Cumulative effects on marine mammals resulting from the effects of the Project and other developments will be assessed in accordance with the guidance and methodologies set out in **Chapter 3: Approach to EIA** and **Chapter 31: Cumulative Effects** and considering the other developments that have been screened in as part of the CEA screening exercise.

8.12.2 The following impacts from the Project have the potential to act cumulatively with impacts from other developments to contribute to cumulative effects:

- **Collision risk;** and
- **Noise and vibration.**

8.12.3 The potential cumulative effects between the Project and other developments with respect to marine mammals will be considered within the PEIR and the ES. Consultation will be held with the relevant authorities to assess which projects should be reviewed as part of this process.

8.12.4 The EIA will have to consider how the Project may bring about changes to pinnipeds or cetaceans at a population level and the geographic scope of the impact assessment will be based on consideration of the potential zone of impact depending on the Project phase.

8.13 TRANSBOUNDARY EFFECTS

8.13.1 There is potential for transboundary impacts on marine mammals due to the mobile nature of marine mammal species and the geographical scale of management units (MUs), particularly where these extend beyond the limits of UK waters. For example, grey seals can travel large distances of up to 1,200km and have been recorded crossing the English Channel moving from France to haul-out sites in the south-west of the British Isles (Vincent *et al.,* 2017).

8.13.2 Direct impacts may occur during the construction, operation and maintenance, and decommissioning phases of the Project, however, the extent cannot be determined at this stage and will be subject to assessment in the EIA. However, due to the localised nature of the potential impacts, transboundary effects are considered unlikely to occur.

8.13.3 It is proposed that impacts to marine mammal receptors are subject to transboundary assessment in the EIA. Likely significant effects upon European Sites with marine mammals as qualifying features will be assessed within the HRA.

8.13.4 Only impacts scoped in for the Project in isolation will be considered in the transboundary impact assessment.

8.14 PROPOSED APPROACH TO ENVIRONMENTAL IMPACT ASSESSMENT

8.14.1 Further desk-based studies and analysis will be undertaken to identify and assess marine mammal receptors. This study will be supplemented with consultation with the relevant statutory and non-statutory organisations as necessary.

8.14.2 The marine mammal assessment for the offshore elements of the Project will be undertaken in accordance with the methodology set out in **Chapter 3: Approach to EIA,** of the Scoping Report, in addition to the following established guidance: Guidelines for Ecological Impact Assessment in the UK and Ireland (CIEEM, 2018).

8.15 REFERENCES

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9 MARINE AND INTERTIDAL ORNITHOLOGY

9.1 INTRODUCTION

9.1.1 The marine and intertidal ornithology chapter will consider the potentially significant effects[12] on bird species that may arise from the construction, operation and maintenance (O&M) and decommissioning activities of the Project, specifically the tidal barrage. This chapter considers the grid connection in the case that the selected cable route includes a section of subsea cable. This chapter does not consider the use of existing port and marine facilities during the construction phase.

9.1.2 This section of the Scoping Report describes the methodology to be used within the Environmental Impact Assessment (EIA), an overview of the baseline conditions within the Scoping Boundary (as defined in **Chapter 1: Introduction**), the datasets to be used to inform the EIA, the potential likely significant effects to be considered, and how these will be assessed for the purpose of the EIA.

9.1.3 Marine and Intertidal ornithology includes those bird species interacting with areas below the Mean High Water Springs (MHWS). Other ornithological features are covered within further chapters.

9.1.4 Functionally-Linked Land (FLL), that may be connected to sites designated for marine and intertidal ornithological features, will also be considered and assessed within this chapter.

9.1.5 Marine and intertidal ornithology interfaces with other aspects of the assessment as birds rely on and interact with other habitats and as such, should be considered alongside these; namely:

- **Chapter 3: Approach to EIA: Electromagnetic fields (EMF).** Seabirds are sensitive to magnetic fields, which are used for navigation in the offshore environment to hunt for prey (Wynn *et al*., 2020), therefore there is potential for EMF emissions to affect ornithology receptors. The EMF section will be used to inform the marine and intertidal ornithology assessment.

[12] Other technical chapters use 'likely significant effects' and 'potential likely significant effects to accord with the EIA Regulations 2017. Within the marine and intertidal ornithology chapter the term 'potentially significant effects' is used as it accords with CIEEM guidance to describe effects that have the potential to be significant prior to their assessment (i.e. until the end of the 'scope of the assessment'), and the term 'likely significant effects', only once assessment has determined that they would indeed be significant. This is not to be confused with Likely Significant Effects (LSEs) when used in the context of the Habitats Regulations Assessment. For further information on the Project's approach to HRA, see **Chapter 3: Approach to EIA**.

- **Chapter 5: Coastal Processes:** There are potential pathways of effect from marine processes on potentially sensitive marine ornithological receptor species, therefore information from the marine geology, oceanography and physical processes section will inform the marine and intertidal ornithology assessment.
- **Chapter 6: Benthic Ecology and Plankton:** The seabird receptor species are sensitive to changes in prey resource and habitats. Therefore, the benthic, epibenthic and intertidal ecology section will inform the marine and intertidal ornithology assessment.
- **Chapter 10: Fish and Shellfish:** Marine and intertidal ornithology will include some receptor species that rely on fish and shellfish species as part of their diet and therefore impacts to fish and shellfish could impact marine ornithology receptors. The information from the fish and shellfish ecology section will be used to inform the marine and intertidal ornithology assessment.
- **Chapter 13: Terrestrial Ecology and Biodiversity:** The terrestrial ecology and biodiversity assessment will interlink with marine and intertidal ornithology due to the presence of bird species that use both intertidal and offshore habitats.
- **Chapter 29: Climate Resilience:** The interference with climate resilience with benthic, epibenthic and intertidal ecology is captured in the In-Combination Climate Impacts (ICCI) assessment. These indirect effects may impact marine and intertidal ornithology.

9.1.6 Overarching relevant legislation and policy context which has informed the scope of the assessment is outlined in **Chapter 4: Planning Policy**, with topic specific considerations outlined in **Appendix 4.1**.

9.2 TECHNICAL GUIDANCE

9.2.1 Technical guidance that has been used to define the assessment is set out in **Table 9-1**.

Table 9-1: Relevant technical guidance

Guidance reference	Relevance to the assessment
CIEEM (2018)	Guidelines on the approach to EIA recommending that the conservation values of receptors are considered. This guidance will be considered when assessing potential effects throughout the EIA process.
Furness (2015)	Provides Biologically Defined Minimum Population Scales (BDMPS) used to define non-breeding season populations. This guidance will be considered to inform species demographics and non-breeding season population assessments.
English Seabird Conservation and Recovery Pathway – Seabird Sensitivity Evidence Review (NECR456) (2022)	Provide up to date, evidence-based, auditable, and transparent assessments of the sensitivity and vulnerability of a range of seabird and waterfowl species to a range of pressures.
NatureScot (2018)	Interim guidance on apportioning effects from marine renewable developments to breeding seabird populations in SPAs. This guidance will be considered when apportioning potential effects to individuals SPAs for HRA.
Woodward *et al*., (2019)	Defines the mean maximum +1SD seabird foraging ranges used for screening statutory designated sites into apportioning calculations.

Guidance reference	Relevance to the assessment
	This guidance will be considered to define species / colonies with connectivity to the Project during the breeding season
Cutts *et al.*, (2013)	The Waterbird Disturbance Mitigation Toolkit contains information on the responses of a range of waterbird species to human activity derived primarily from studies at coastal and estuarine sites in the UK.

9.3 STUDY AREA

9.3.1 The Marine and Intertidal Ornithology Study Area (herein referred to as the Study Area) is consistent with the study area for Coastal Processes and is based on spring tidal excursion distances (considering tidal current speeds and directions).

9.3.2 This area has been selected as it is considered that it will encompass the full extent of the final Marine and Intertidal Ornithology EIA Study Area. Ahead of modelling exercises to determine the Zone of Influence (ZoI), this area allows for uncertainty in the spatial extent of potential impacts to marine and intertidal ornithology receptors. Hydrodynamic modelling undertaken to date shows alterations to the emergence regime into Liverpool Bay which may affect foraging habitat availability in waterbirds. Use of the Coastal Processes study area gives confidence that any far-field effects are captured, whilst noting that full characterisation of the baseline is focused on the areas (within the Survey Area) likely to be impacted by near-field effects, as agreed through consultation. Potential impacts within the wider Study Area outside of the survey area will be characterised using existing datasets through a desk-based review. In addition, the extent of the Study Area allows consideration of roosting and breeding locations of birds that may utilise areas within the Project Scoping Boundary. This allows for the robust characterisation of bird species. It is expected that the final Marine and Ornithology EIA Study Area will be of lesser extent than that presented here. The Study Area is presented in **Figure 9.1**.

9.3.3 The Study Area will also encompass FLL for designated sites with marine and intertidal ornithology qualifying features which may be affected by onshore infrastructure associated with the Project. Areas considered for FLL lie within the

Scoping Boundary and Supporting Infrastructure which considers the landward extent of the Project and buffers. FLL is only relevant at EIA should it support numbers of birds significant at national or regional level. Consideration of FLL in the context of designated sites will be included within the HRA Screening Report.

9.3.4 The final Marine and Intertidal Ornithology EIA Study Area will be identified and agreed in consultation with stakeholders and will be informed by hydrodynamic modelling. This will be clearly defined within the EIA chapter.

9.4 CONSULTATION

9.4.1 Consultation is a key part of the application process. The assessment has been and will be informed by engagement and discussion with various stakeholders including those concerned with marine and intertidal ornithology. Regular Environmental Stakeholders Workshops and Hydro-environmental Modelling Workshops have also been undertaken since October 2020, full details of these workshops is provided within **Table 3-1** of **Chapter 3: Approach to EIA** and is summarised for the consultation events of particular relevance to this chapter within **Table 9-2**.

9.4.2 Pre-scoping discussions have been held with the Dee Estuary Conservation Group (8 July 2024), Mersey Gateway Environmental Trust (3 July 2024) and Natural England (15 July 2024), whereby no specific species issues were raised with regards to marine and intertidal ornithology.

9.4.3 A summary of the key issues raised during consultation and workshops to date, relevant to marine and intertidal ornithology, is outlined in **Table 9-3**, together with how these issues will be considered in the production of the EIA.

Table 9-2: Consultation Events

Date	Consultees	Agenda Topics
30.06.2021	NE, RSPB, LWT, NW-IFCA, HE, NRW, TCE, MRT, MGET, NWWT.	Environmental Stakeholder Workshop 3. Status Update and Initial Survey Approach (inc. fish, habitats and non-breeding birds)
30.09.2021	EA, NE, LWT, NW-IFCA, HE, NRW, MRT, MGET, MMO.	Environmental Stakeholder Workshop 4. Status Update and Non-breeding bird survey scope and approach.
09.12.2021	EA, NE, LWT, NW-IFCA, HE, NRW, MRT, MGET, MMO, TCE, RSPB, CWT, NWT.	Environmental Stakeholder Workshop 5. Status update, Non-breeding bird survey scope and approach, Habitats, Ecological Survey Schedule, Evidence Plan approach.
17.05.2023	EA, NE, LWT, MRT, MGET, TCE, DECG, MMO, NWT, MECG.	Environmental Stakeholder Workshop 7. Provide an update on project status, Introduction to desk-based studies, Update on surveys, Progress report with ongoing Bird Surveys and update on desk-based study, Wider Data Gathering and Analysis,
30.08.2023	EA, NE, LWT, MRT, MGET, TCE, DECG, MMO, NWT, MECG.	Environmental Stakeholder Workshop 8. Status update, Update on desk-based studies and next steps for baseline surveys, Update on surveys.

Date	Consultees	Agenda Topics
16.11.2023	EA, NE, LWT, MRT, MGET, MMO, NWT, RSPB, CWT.	Environmental Stakeholder Workshop 9. Status update, Habitats and Licensing, Update on surveys.
13.11.2023	EA, NE, Savills.	Hydro-environmental Modelling Workshop 3. Status Update, Hydro-environmental modelling update. Hydro-environmental modelling update, Main findings on energy, hydrodynamics, intertidal exposure and water quality, Next steps for hydro-environmental modelling and location assessment.
14.02.2024	EA, NE, MRT, MGET, MMO, RSPB, CWT, DECG, MECG,	Environmental Stakeholder Workshop 10. Status update, EIA & Engagement update, Fish & Shellfish, Marine Mammals and Marine and Intertidal Ornithology update.

Table 9-3: Consultation Comments

Date	Consultee	Consultation and Key Comments	How this is accounted for
2021	Natural England	Natural England provided advice through their Discretionary Advice Service (DAS) on the proposed scope of the 2021/2022 non-breeding bird surveys. Key advice provided is outlined below: ■ Recommended that three years' of survey was undertaken to account for potential variation in annual use of sites. ■ Stated that the surveys should be used to inform the location, scope and nature of the Project and inform choosing the "*least damaging option*" with regards to birds. ■ Stated that based on the timing of commencement of surveys, that it would not be possible to complete autumn passage surveys during 2021. Advised that as a minimum, 2 years of autumn passage surveys should be undertaken, however that dependent on variation in results there could be a need for additional surveys. ■ Surveys should be undertaken twice per month (covering low and high tides) and should consist of	Survey scope and methodology for bird surveys.

Date	Consultee	Consultation and Key Comments	How this is accounted for
		hourly counts across an eight-hour survey. Stated that "*we would normally expect two high-tide and two low-tide surveys a month for a detailed assessment. Therefore, in future years, when surveys hone in on areas where greatest impact is predicted, an increased survey schedule may be required*". ■ Advised that the "*background data report and survey scope for ongoing works should consider nocturnal use of the area and functionally linked land*".	
2022	Representatives from Natural England, Environment Agency, Natural Resources Wales, Lancashire Wildlife Trust, Cheshire Wildlife Trust, North Wales Wildlife Trust, Mersey River Trust, Mersey Gateway Environmental Trusts, Mersey Tidal Power Project, The Crown Estate, Merseyside Environmental Advisory Service (MEAS), Marine	Stakeholder engagement workshops in addition to follow up one-to-one discussions.	Survey scope and methodology for bird surveys.

Date	Consultee	Consultation and Key Comments	How this is accounted for
	Management Organisation, Royal Society for the Protection of Birds, North Western Inshore Fisheries and Conservation Authority, and RSK Biocensus.		
2024 (January)		Commencement of prey availability survey services: The advancement of the current status of the Project baseline bird data. This will build on existing knowledge of intertidal invertebrate communities and their relationship with winter / passage birds.	Prey Availability surveys services were permitted through two separate approaches.
2024 (28 June)	Mersey Estuary Conservation Group.	Species considered to be at greatest risk from the Project within the Mersey Estuary considered to be Dunlin, Shell Duck and Redshank – evidence base for these species to be considered.	Survey scope and methodology for bird surveys.
2024 (1 July)	Local Wildlife Trusts.	Biodiversity Net Gain for terrestrial and marine environments.	Design development in line with statutory requirements as a minimum.

Date	Consultee	Consultation and Key Comments	How this is accounted for
2024 (17 July)	RSPB	Scope of EIA assessment and HRA, and consideration of distant receptors / habitats	Zones of Influence to be considered on receptor basis within the EIA.

9.5 ASSESSMENT METHODOLOGY

9.5.1 The Project-wide approach to the assessment methodology is set out in **Chapter 3: Approach to EIA** and includes the approach to Habitats Regulations Assessment (HRA). This will be implemented to assess the potentially significant effects on marine and intertidal ornithology receptors from the construction, O&M, and decommissioning of the Project.

9.5.2 Relevant legislation and guidance will also be considered in relation to the assessment, in addition to consultation with the stakeholders outlined above.

9.5.3 A 'source-pathway-receptor' model is proposed to identify any likely impacts on marine and intertidal ornithology receptors resulting from the proposed construction, O&M and decommissioning of the Project. This process provides an easy-to-follow assessment route between effect sources and potentially sensitive receptors ensuring a transparent impact assessment.

9.5.4 Iterative steps involved in the assessment approach will include:

- Determination of potential interactions between the construction, O&M and decommissioning of the tidal barrage and ornithological receptors
- Definition of the marine and intertidal bird species receiving environment within the influence of the Proposed Development;
- Assessment of the sensitivity of the receptors;
- Assessment of the magnitude of impact;
- Assessment of the significance of effects;
- Proposal of mitigation measures to reduce, prevent or where these are not possible, to offset, any adverse significant effects;
- Assessment of the residual effects after any mitigation measures have been considered; and
- Assessment of cumulative effects.

Evaluating Potential Receptors

9.5.5 The proposed assessment process will involve identifying Valued Ornithological Receptors (VORs). These receptors and their conservation value will be determined by the criteria defined in **Table 9-4**.

Table 9-4: Definition of conservation value levels for ornithological receptors

Value	Definition
High	A species for which individuals at risk can be clearly connected to a particular SPA or is found in numbers of international importance within the Study Area during a particular season. In this context 'clearly connected' refers to species for which there is a single SPA within connectivity distance from which individual birds may be drawn or there is existing tracking data demonstrating functional linkage.
Medium	A species for which individuals at risk are likely to be drawn from particular SPA populations or found in numbers of national importance within the Study Area during a particular season, although other colonies (both SPA and non-SPA) may also contribute to individuals observed in the offshore and intertidal ornithology Study Area. In this context 'likely connected' refers to species for which there are a small number of SPAs within connectivity distance from which individual birds may be drawn or a single SPA that is considerably closer to the Study Area than other potential source populations.
Low	A species for which it is not possible to attribute to particular SPAs and may be found in regionally or locally important numbers during specific seasons within the Study Area.
Very Low	All other species that are widespread and common and which are not present in locally important (or greater) numbers, and which are of low conservation concern (e.g. UK Birds of Conservation Concern 5 (BoCC5) Green List species; Stanbury *et al.*, 2021).

9.5.6 The assessment of potential receptors will consider the importance of the Study Area for the bird species under consideration. In accordance with CIEEM (2018) guidelines the focus of assessments will be on "*significant effects rather than all ecological effects*". To illustrate the rationale of this approach, whilst a VOR could be considered of high conservation importance using the criteria in **Table 9-4** the importance of the Study Area to this species may be considered limited if only a low number of sightings are recorded within the Study Area in the baseline surveys. As such, while the conservation value of the species is considered, the number of individuals of that species using the Study Area, and the nature and level of this use, is also considered. An assessment is then made of the importance of the Study Area to the species in question.

Characterising Potential Impacts

9.5.7 The sensitivity of the marine and intertidal ornithology receptors to potential impacts will be determined subjectively based on species' ecology and behaviour, using the criteria set out in **Table 9-5**. Judgement will take account of information available on the responses of VORs to various stimuli (e.g. predators, noise and visual disturbance, existing Projects where such data exist) and whether a VOR's ecology makes it vulnerable to potential impacts. A description is provided in **Table 9-5** of how sensitivity is intended to be assessed for the impact of disturbance by human activities, but the general approach can be applied to any impact.

Table 9-5: Definition of level of sensitivity for ornithological receptors

Value	Definition
High	VOR has very limited tolerance to sources of disturbance such as noise, light, vessel movements and the sight of people.
Medium	VOR has limited tolerance to sources of disturbance such as noise, light, vessel movements and the sight of people.
Low	VOR has some tolerance to sources of disturbance such as noise, light, vessel movements and the sight of people.
Very Low	VOR is generally tolerant to sources of disturbance such as noise, light, vessel movements and the sight of people.

9.5.8 Sensitivity can differ between similar species, between different populations of the same species, between different individuals within a population and also differ in the same individual during different times. Thus, the behavioural responses of marine and intertidal VORs are likely to vary with both the nature and context of the stimulus and the experience of the individual bird. Sensitivity also depends on the activity of the bird.

9.5.9 In addition, individual birds of the same species will differ in their tolerance depending on the level of human disturbance that they regularly experience in a particular area and have become habituated to (e.g. individuals that forage within close proximity to an area with high human activity levels are likely to have a

greater tolerance than those that occupy remote locations with little or no human presence).

9.5.10 Consideration of the level of sensitivity with regards to individual VORs will be one of the core components of the assessment of potential impacts and their effects.

9.5.11 In addition, sensitivity will be further assessed considering each receptor's conservation value (Sch. 1, Annex I, BoCC5 or NERC listed) and expert judgement (CIEEM, 2018) For example, herring gull could be listed as a qualifying feature of an SPA and is a red listed species of conservation concern across the UK in BoCC5 (Stanbury *et al*., 2021), but not judged to be sensitive to anthropogenic disturbance given its propensity to forage successfully on active landfill sites, utilise development structures to perch on and to breed within urban environments on industrial and residential buildings roof tops. Such reasoned judgement is an important part of the overall narrative used to determine potential impact significance and will be used, where relevant, as a mechanism for modifying the sensitivity of an effect assigned to a specific VOR.

Magnitude

9.5.12 Impacts on VORs will be judged in terms of their magnitude. Magnitude refers to the scale of an impact and will be determined on a quantitative basis where possible. This may relate to the area of habitat lost to the development footprint in the case of a habitat feature or predicted loss of individuals in the case of a population of a species of bird. Where an impact could reasonably be assigned to more than one level of magnitude, professional judgement will be used to determine which level is applicable. Magnitude is assessed within four levels, as detailed in **Table 9-6**.

Table 9-6: Definition of level of potential magnitude of change for ornithological receptors.

Magnitude	Definition
High	A change in the size or extent of distribution of the relevant biogeographic population or the population that is the interest feature of a specific protected site that is predicted to irreversibly alter the population in the short to long-term and to alter the long-term viability of the population and / or the integrity of the protected site. Recovery to baseline levels from that change

Magnitude	Definition
	predicted to be achieved in the long-term (i.e. more than five years) following cessation of the development activity.
Medium	A change in the size or extent of distribution of the relevant biogeographic population or the population that is the interest feature of a specific protected site that occurs in the short and long-term, but which is not predicted to alter the long-term viability of the population and / or the integrity of the protected site. Recovery to baseline levels from that change predicted to be achieved in the medium-term (i.e. no more than five years) following cessation of the development activity.
Low	A change in the size or extent of distribution of the relevant biogeographic population or the population that is the interest feature of a specific protected site that is sufficiently small-scale or of short duration to cause no long-term harm to the feature / population. Recovery to baseline levels from that change predicted to be achieved in the short-term (i.e. no more than one year) following cessation of the development activity.
Very Low	Very slight change from the size or extent of distribution of the relevant biogeographic population or the population that is the interest feature of a specific protected site. Recovery to baseline levels from that change predicted to be rapid (i.e. no more than circa six months) following cessation of the development activity.

9.5.13 Knowledge of how rapidly the population or performance of a species is likely to recover following loss or disturbance (e.g. by individuals being recruited from other populations elsewhere) will also be used to assess impact magnitude, where such information is available.

Table 9-7: Significance of effect criteria for the marine and intertidal ornithology assessment

Magnitude of Change	Receptor Sensitivity			
	High	Medium	Low	Very Low
High	Major	Major	Major or Moderate	Moderate or Minor
Medium	Major or Moderate	Major or Moderate	Major or Moderate	Minor
Low	Moderate or Minor	Moderate or Minor	Minor	Minor
Very Low	Minor or Negligible	Minor or Negligible	Negligible	Negligible

Impact Significance

9.5.14 The CIEEM guidelines (2018) use only two categories to classify effects: 'significant' or 'not significant'. The significance of an effect is determined by considering the overall importance (defined here as the overall sensitivity) of the receptor and the magnitude of the impact using a matrix-based approach provided in **Chapter 3: Approach to EIA**. Where possible, assessment of the magnitude of the impact on marine and intertidal ornithology is based upon quantitative criteria, together with applying professional judgement as to whether the integrity of the feature will be affected.

9.5.15 Effects are more likely to be considered potentially significant where they affect ornithological features of higher overall sensitivity or where the magnitude of the impact is high. Effects not considered to be significant would be those where the integrity of the feature is not threatened, effects on features of lower overall sensitivity, or where the magnitude of the impact is low.

9.6 BASELINE CONDITIONS

DATA INFORMATION SOURCES

9.6.2 A two-year programme of intertidal bird surveys has been undertaken between October 2021 and September 2023, with a third year currently ongoing, replicating (where appropriate) the BTO WeBS type core count surveys. The scope of baseline surveys were informed by consultation with NE, notably the

DAS response provided in 2021 (as detailed in Section 9.4) Survey data will be valid to support an assessment for a period for five years.

9.6.3 Twenty survey areas were identified within the Study Area concentrated on the North Wirral foreshore, Mersey Estuary and the coast up to Formby, based on existing WeBS core count sectors as shown in **Figure 9.2**. These were chosen to allow for comparison between the recent WeBS datasets and the results of these surveys. Existing WeBS data was neither extensive enough nor of suitable validity (age / quality) to fully inform EIA and the additional survey work ensured that all survey areas held up-to-date, valid data upon which a robust assessment could be reliably undertaken. The results of site-specific surveys are broadly in-line with WeBS data. All survey methods were informed by stakeholder engagement workshops, in addition to follow-up one-to-one discussions.

9.6.4 To supplement the field surveys, a desk-based review has been undertaken of publicly available data sources outlined in **Table 9-8** to determine the baseline character of the Study Area and inform the assessment process. It is considered that far-field effects such as emergence regime and underwater noise would be adequately covered using these additional desk-based datasets and no further surveys are deemed required.

Winter Bird Surveys

9.6.5 Winter bird surveys have been undertaken using an adapted version of the WeBS core count survey methodology, extended to comprise up to eight hourly counts over the tidal cycle. This adapted approach incorporated elements of the 'look-see' approach to 'Through the Tidal Cycle Count' methods detailed in Gilbert *et al*. (1998).

9.6.6 Counts were undertaken from Vantage Points (VPs), designed to ensure coverage of all suitable habitat whilst also determined by access and visibility. Typically, each survey was completed over two days. Start and finish times were varied so that surveys included water level changes from high to low tide, low to high tide or mid-tide to mid-tide. Start and finish times were also varied throughout the season to account for early-day bird movements or late afternoon / evening movements to obtain a representative picture of bird numbers and activity. This allows for the full capture of the tidal cycle, and with that a greater understanding of site usage as food availability changes throughout the tidal cycle. In addition, it enables the capture of any high-tide or low-tide roost data, which is not typically captured by WeBS methods. These additional elements allow for a more robust assessment of the potential impacts of the Project upon

marine and intertidal ornithological receptors. In total, 11 visits were undertaken for winter bird surveys.

9.6.7 During each survey visit, peak counts, bird activity (foraging, roosting or loafing) and flight movements (including large flocks of birds moving across the survey area) of waterfowl, waders, seabirds and gulls were recorded, focusing particularly on qualifying species associated with the SPAs / Ramsar sites within the Study Area. The locations of any key low-tide feeding sites and high-tide roosting / loafing areas were also recorded and mapped. To standardise data collection between surveyors, a field survey form was used. On completion of each survey visit, all data and mapping were quality checked and uploaded electronically to a central database.

Breeding / Passage Bird Surveys

9.6.8 The same field survey and data collection methodology as the wintering bird surveys (above) was used for the breeding / passage bird surveys, with the addition of noting the locations of any breeding sites, identified by the recording of behaviour indicative of breeding.

9.6.9 Typically, each survey was completed over two days, although some visits were undertaken over three or four days, if required. Start and finish times were varied to include water level changes from high to low-tide, low to high-tide or mid-tide to mid-tide. Start and finish times were also varied throughout the season to account for early-day bird movements or late afternoon / evening movements to obtain a representative picture of bird numbers and activity. 11 visits were undertaken for breeding / passage bird surveys.

Table 9-8: Key sources of marine and intertidal ornithology data

Source and Date	Summary	Coverage of Study Area
Joint Nature Conservation Committee and Natural Resource Wales websites .	Information on the location and extent of designated sites with potential connectivity to the Study Area.	Full coverage of the Study Area.

Source and Date	Summary	Coverage of Study Area
BTO WeBS Reports online: Woodward *et al*., (2024).	BTO WeBS data: 1. High tide core count data, Low tide data. 2. BTO WeBS Alerts and annual reports.	Partial coverage of the intertidal areas of the Study Area.
Bowland Ecology (2021) Natural England (NE).	Functionally Linked Land.	Full coverage of the Study Area.
Species conservation status as listed on Birds of Conservation Concern 5 (BoCC5) (2021). The current (2020) Avian Population Estimates Panel (APEP) population estimates of birds in Great Britain (GB) and the United Kingdom (UK) (2020). BTO WeBS Alerts identifying short-, medium- and long-term population trends (2022). Ross-Smith *et al*, (2015). Still *et al*, (2015).	Bird population trend information.	Full coverage of the Study Area.
BTO Bird Atlas: Balmer *et al.,* 2013.	Bird species distribution and population.	Full coverage of the Study Area.
Cheshire and Wirral Bird Report 2022.	Bird species distribution and population.	Cheshire and the Wirral.

Source and Date	Summary	Coverage of Study Area
Lancashire Bird Report 2022.		Lancashire (including Liverpool).
Furness (2015)	Provides Biologically Defined Minimum Population Scales (BDMPS) used to define nonbreeding season populations.	Full coverage of the Study Area.
Woodward *et al*, (2019).	Defines the mean maximum +1SD seabird foraging ranges used for screening statutory designated sites into apportioning calculations.	Full coverage of the Study Area.
APEM (2012). Rhyl Flats Aerial Surveys – Post-Construction Year Three: Final Report. Report to RWE nPower Renewables,121 pp.	Bird species and distribution are the Rhyl Flats OWF.	Rhy Flats OWF, within Liverpool Bay SPA.
DONG Energy Burbo Extension (UK) Ltd. (2013). Environmental Statement.	Bird species and distribution are the Burbo Bank OWF.	Burbo Bank OWF, within Liverpool Bay SPA.
APEM (2019). Gwynt y Môr Offshore Wind Farm Post-construction Aerial Surveys Annual Report 2018/2019 (APEM Ref P00002798). APEM Ltd., Stockport.	Bird species and distribution are the Gwynt y Môr OWF.	Gwynt y Môr OWF, within Liverpool Bay SPA.

Source and Date	Summary	Coverage of Study Area
May, J. (2008). North Hoyle offshore wind farm. Final annual FEPA monitoring report (2006-7) & five year monitoring programme summary. NWP Offshore Ltd.	Bird species and distribution are the North Hoyle OWF.	North Hoyle OWF, within Liverpool Bay SPA.
RWE Renewables UK (2022). Awel Y Môr Offshore Wind Farm, Category 6: Environmental Statement: Volume 4, Annex 4.1: Offshore Ornithology Baseline Characterisation Report	Bird species and distribution are the Awel Y Mor OWF.	Awel Y Môr OWF, within Liverpool Bay SPA.
Merseyside BioBank and Cheshire RECORD Local Record Centres.	Bird species distribution and population.	Full coverage of the Study Area.
County Bird Recorder: Steve White.	Bird species distribution and population.	Full coverage of the Study Area.

EXISTING BASELINE

9.6.10 This section describes the current conditions and key bird species likely to be present within the Study Area to MHWS, which constitute the existing baseline environment for marine and intertidal ornithology within the Study Area. This is based on results of a desk-based study (DBS), species recorded during project-specific baseline surveys undertaken to date, and the location and reasons for designation of nearby SPAs within the Study Area.

9.6.11 The Project is situated on the River Mersey, between the Wirral to the south and west and Liverpool to the north and east, and is a highly industrialised and urban location, with an existing baseline level of anthropogenic activity and disturbance related to this, including that associated with shipping and foot traffic from the general public. The habitats within and adjacent to the River Mersey Estuary,

River Dee Estuary, Liverpool Bay and Irish Sea in the vicinity of the Project have experienced disturbance from many decades of major development, both onshore and offshore. There are four offshore windfarms in operation within the Irish Sea in the vicinity of the River Mersey Estuary, including Burbo Bank (including Extension) (<10km north-west), Gwynt y Môr (<30km west), North Hoyle (<30km west), Rhyl Flats (<40km west) and four further offshore windfarms within the same area of the Irish Sea, including West Duddon of Sands (<60km north-west), Barrow (<60km north-west), Walney (inc. extension) (<70km north-west) and Ormonde Wind Farm (<75km north-west). All of these offshore windfarms have been constructed in the last 25 years. In addition, two further offshore windfarms, Morecambe (<55km north-west) and Morgan (<80km north-west) are proposed. Significant major development has been undertaken within the River Mersey Estuary, including the Liverpool Cruise Terminal, completed in 2007, Mersey Gateway Bridge, completed in 2017, and several major developments either proposed or underway, including the Liverpool Waters (inc. Everton Stadium) and Wirral Waters. As part of the wider Mersey Estuary, the Project Area is of high ornithological interest with multiple designated sites of nature conservation importance identified within the area, providing important habitats such as sandbanks, mudflats, and saltmarsh for a variety of wildfowl, waders, and other bird species. Associated sites with qualifying ornithological figures are detailed below.

Designated Site Connectivity

9.6.12 The Study Area directly overlaps with six designated sites (excluding SSSIs), for which, bird species are a feature, of these Mersey Estuary SPA and Ramsar and Liverpool Bay SPA directly overlap with the Study Area. There are further bird species that are either features of designated site or of importance, with potential connectivity to the Project.

Mersey Estuary SPA and Ramsar

9.6.13 This special protected area, located in the east of the Irish sea, covers an estuarine area of 50.23 km^2. The area includes saltmarshes, extensive intertidal sands and mudflats with some rocky shoreline and boulder clay cliffs, within a rural and industrial environment. Large population of waterbirds roost and are supported within these intertidal flats: in winter great numbers of ducks and waders populate the area, but the site is also of largely importance during spring and autumn migrations, as a stopover for waders moving along the west coast of Britain.

9.6.14 Qualifying features of the Mersey Estuary SPA are overwintering golden plover (*Pluvialis apricaria*), redshank (*Tringa totanus*), shelduck (*Tadorna tadorna*), teal

(*Anas crecca*), pintail (*Anas acuta*), dunlin (*Calidris alpina alpina*), black-tailed godwit (*Limosa limosa islandica*) and non-breeding waterbird assemblage.

9.6.15 Principal ornithology features for the Mersey Estuary Ramsar include internationally important wintering numbers of shelduck (*Tadorna tadorna*), teal (*Anas crecca*), pintail (*Anas acuta*), dunlin (*Calidris alpina alpina*) and redshank (*Tringa totanus*), and nationally important wintering numbers of wigeon (*Anas penelope*), golden plover (*Pluvialis apricaria*), black-tailed godwit (*Limosa limosa islandica*) and curlew (*Numenius arquata*). Features also includes nationally important passage numbers of ringed plover (*Charadrius hiaticula*), redshank (*Tringa totanus*) and dunlin during the passage season.

Liverpool Bay SPA

9.6.16 Liverpool Bay / Bae Lerpwl SPA is in the east of the Irish Sea, running as a broad arc from Morecambe Bay, in the north-west of England, to the east coast of Anglesey, in north Wales. It extends beyond 12 nautical miles (NM) and therefore lies partly in Welsh and English territorial waters and partly in offshore waters.

9.6.17 It is classified for the protection of red-throated diver (*Gavia stellata*), common scoter (*Melanitta nigra*), and little gull (*Hydrocoloeus minutus*) in the non-breeding season; common tern (*Sterna hirundo*) and little tern (*Sterna albifrons*) in the breeding season, and an internationally important waterbird assemblage.

Mersey Narrows and North Wirral Foreshore SPA and Ramsar

9.6.18 Mersey Narrows and North Wirral Foreshore is a designated SPA and Ramsar site located on the Irish Sea coast in north-west England, on the mouths of the Mersey and Dee Estuaries, covering an area of approximately 2,078 hectares (ha). It comprises large areas of saltmarsh and intertidal sandflats and mudflats which provide internationally important feeding grounds for waders.

9.6.19 It is classified for the protection of bar-tailed godwit (*Limosa lapponica*), little gull, and knot (*Calidris canutus islandica*) in the non-breeding season, and common tern (*Sterna hirundo*) in both the breeding and non-breeding season. The site also qualifies as it is used regularly by a wintering waterbird assemblage.

Ribble and Alt Estuaries SPA and Ramsar

9.6.20 Ribble and Alt Estuaries is a designated SPA and Ramsar site located on the coast of Lancashire and Sefton in north-west England, overlapping the Ribble Estuary SSSI and Sefton Coast SSSI, and covering an area of approximately 13,464 ha. It consists of extensive areas of sandflats and mudflats and large

areas of saltmarsh, supporting internationally important populations of wintering waterbirds.

9.6.21 The site is classified for the protection of Bewick's swan (*Cygnus columbianus bewickii*), whooper swan (*Cygnus cygnus*), golden plover, bar-tailed godwit , ringed plover, sanderling (*Calidris alba*), redshank , pink-footed goose (*Anser brachyrynchus*), shelduck (*Tadorna tadorna*), wigeon, teal, pintail , oystercatcher (*Haematopus ostralegus*), grey plover (*Pluvialis squatarola*), knot), dunlin , and black-tailed godwit in the non-breeding season, and ruff (*Philomachus pugnax*) and common tern in the breeding season. The site also qualifies for the protection of a wintering waterbird assemblage and a breeding seabird assemblage.

9.6.22 Designated sites with likely connectivity to the Study Area are described in **Table 9-9** and presented in **Figure 9.3.**

Table 9-9: Summary of statutory designated sites of ornithological interest within the Study Area including qualifying features.

SPA / Ramsar site	Distance from Study Area (km)	Qualifying features
Mersey Estuary SPA.	Overlaps	Wintering: golden plover, redshank, shelduck, teal, pintail, dunlin, black-tailed godwit, waterbird assemblage. Passage: redshank.
Mersey Estuary Ramsar site.	Overlaps	Wintering: shelduck, black-tailed godwit, redshank, teal, pintail, dunlin, waterbird assemblage. Passage: redshank.
Liverpool Bay SPA.	Overlaps	Non-breeding: red-throated diver, little gull, common scoter, waterbird assemblage.

SPA / Ramsar site	Distance from Study Area (km)	Qualifying features
		Breeding: little tern, common tern.
Mersey Narrows and North Wirral Foreshore SPA.	Overlaps	Non-breeding: bar-tailed godwit, common tern, little gull, knot, waterbird assemblage. Breeding: common tern.
Mersey Narrows and North Wirral Foreshore Ramsar site.	Overlaps	Non-breeding: bar-tailed godwit, common tern, little gull, knot, waterbird assemblage. Breeding: common tern.
Ribble and Alt Estuaries SPA.	Overlaps	Non-breeding: Bewick's swan, whooper swan, golden plover, bar-tailed godwit, ringed plover, sanderling, redshank, pink-footed goose, shelduck, wigeon, teal, pintail, oystercatcher, grey plover, knot, dunlin, black-tailed godwit, redshank, waterbird assemblage. Breeding: ruff, lesser black-backed gull, common tern, seabird assemblage.
Ribble and Alt Estuaries Ramsar site.	Overlaps	Wintering: black-tailed godwit, redshank, dunlin, grey plover, knot, sanderling, bar-tailed godwit, oystercatcher, teal, wigeon, pintail, pink-footed goose, Bewick's swan,

SPA / Ramsar site	Distance from Study Area (km)	Qualifying features
		whooper swan, waterbird assemblage. Breeding: lesser black-backed gull, wetland bird assemblage. Passage: redshank, ringed plover, sanderling.
Dee Estuary SPA.	10.8km E	Non-breeding: bar-tailed godwit, sandwich tern, redshank, shelduck, teal, pintail, oystercatcher, grey plover, knot, dunlin, black-tailed godwit, curlew, waterbird assemblage. Breeding: common tern, little tern.
Dee Estuary Ramsar site.	10.8km E	Wintering: redshank, teal, shelduck, oystercatcher, curlew, pintail, grey plover, knot, dunlin, black-tailed godwit, bar-tailed godwit, waterbird assemblage. Passage: redshank.

9.6.23 The following Sites of Special Scientific Interest (SSSIs) and National Nature Reserves (NNRs) are also within the Study Area are presented in **Table 9-10** and are shown in **Figure 9.4**.

Table 9-10: Summary of SSSIs or ornithological interest within the Study Area, including distance from the Tidal Barrage Development Area

SSSI and NNRs Sites	Distance from Tidal Barrage Development Area Area (km)
Mersey Narrows SSSI.	Overlaps
Mersey Estuary SSSI.	Overlaps
New Ferry SSSI.	Overlaps
North Wirral Foreshore SSSI.	Overlaps
Newton Marsh SSSI.	34.4km
Ribble Estuary SSSI and NNR.	22.4km
Sefton Coast SSSI.	2.3km
Dee Estuary SSSI.	10.8km
Inner Marsh Farm SSSI.	9.9km
Ainsdale Sands NNR.	14.6km
Cabin Hill NNR.	10.5km

9.6.24 All qualifying features of the above mentioned SSSIs and NNRs are considered key species for this project.

Data Sources

Initial Desk-Based Study

9.6.25 Information regarding the current occurrence of marine and coastal species of birds has been compiled from multiple sources including previous works associated with the Project, the Mersey Gateway Bridge Project (MGBP), and BTO WeBS count data.

9.6.26 A review of previous historic associated work published between 1992-2010 (including feasibility studies, winter bird reports and breeding and passage bird reports) identified occurrence records of several qualifying species of the SPAs / Ramsar sites in the area: pink-footed goose, Bewick's swan, whooper swan, shelduck, wigeon, pintail, teal, common scoter, oystercatcher, golden plover, ringed plover, grey plover, curlew, bar-tailed godwit, black-tailed godwit, knot, sanderling, ruff, dunlin, redshank, little gull, lesser black-backed gull, sandwich tern, and common tern.

9.6.27 The winter / autumn bird surveys associated with the MGBP recorded occurrences of 12 SPA / Ramsar site qualifying species and a further 29 other species. Mean highest peak counts for the SPA / Ramsar site qualifying species are displayed in **Table 9-11** covering the non-breeding season, and further broken down into autumn passage (August to September) and winter (October to March). The 2018-2021 MGBP breeding bird surveys yielded one SPA / Ramsar qualifying species (redshank), and a further 14 species.

Table 9-11: Mean highest peak counts of SPA / Ramsar site qualifying species recorded during winter and autumn bird surveys for the MGBP.

Species	Mean highest winter peak count (October – March)	Mean highest autumn peak count (August – September)
Shelduck	115	100
Wigeon	12	8
Teal	244	36

Species	Mean highest winter peak count (October – March)	Mean highest autumn peak count (August – September)
Oystercatcher	10	1
Golden plover	8	-
Ringed plover	12	25
Curlew	22	30
Bar-tailed godwit	1	-
Black-tailed godwit	-	85
Dunlin	778	108
Redshank	67	59
Lesser black-backed gull	82	191

9.6.28 BTO WeBS data, specifically high-tide core count data between 2016-2020 and the most recent low tide count data for the Mersey Estuary (2017 / 2018), Dee Estuary (2020 / 2021) and Alt Estuary (2014 / 2015), revealed occurrence records of several qualifying bird species across 31 sectors corresponding to survey locations selected for the bird surveys for the Project. A summary of the highest mean peak counts of the SPA / Ramsar qualifying bird species recorded across seasons is displayed in **Table 9-12**. The table shows the greatest mean peak counts for each season, excluding summer, as well as the low-tide maximum which is when foraging areas are fully exposed.

Table 9-12: Summary of highest mean peak counts of SPA / Ramsar qualifying bird species recorded during BTO WeBS / Low-tide counts.

Species	Highest mean peak count (Winter)	Highest mean peak count (Autumn)	Highest mean peak count (Spring)	Low-tide winter maximum
Pink-footed goose	2,345	7,544	455	8,854
Bewick's swan	-	-	-	5
Whooper swan	24	4	-	28
Shelduck	1,033	5,782	1,079	3,725
Wigeon	1,040	13	357	5,749
Pintail	78	93	2	2,864
Teal	1,243	422	177	2,942
Common scoter	9,420	9,234	997	1,400
Oystercatcher	2,784	2,061	973	43,120
Golden plover	880	155	160	1,550
Ringed plover	134	935	82	105
Grey plover	608	633	760	791
Curlew	812	920	303	2,473

Species	Highest mean peak count (Winter)	Highest mean peak count (Autumn)	Highest mean peak count (Spring)	Low-tide winter maximum
Bar-tailed godwit	2,306	2,483	807	2,204
Black-tailed godwit	1,108	813	1,605	3,169
Knot	13,201	7,222	8,115	52,606
Sanderling	1,001	1,916	1,356	771
Ruff	5	31	8	14
Dunlin	38,966	1,916	1,356	64,427
Redshank	2,522	3,194	552	5,074
Little gull	1	6	5	13
Lesser black-backed gull	313	434	311	235
Sandwich tern	-	504	48	-
Little tern	-	6	-	-
Common tern	-	626	338	-
Red-throated diver	46	33	19	12

Winter Bird Survey 2021 / 2022

9.6.29 21 of the 26 species listed as individual qualifying features of the SPA / Ramsar sites, comprising 18 named individual qualifying species during winter and three during passage / breeding were recorded during the surveys, and comprised: pink-footed goose, whooper swan, shelduck, wigeon, pintail, teal, common scoter, oystercatcher, golden plover, ringed plover, grey plover, curlew, bar-tailed godwit, black-tailed godwit, knot, sanderling, ruff, dunlin, redshank, lesser black-backed gull, and red-throated diver.

9.6.30 56 additional species which could form part of the sites wintering assemblage qualifications were also recorded. High percentages of the SPA / Ramsar site citation populations were recorded within the Study Area, in particular within those survey areas which fell within the boundaries of the designated sites.

9.6.31 Over 50% of the SPA / Ramsar site citation populations of the following seven individual winter qualifying species were recorded during the surveys: pink-footed goose, golden plover, grey plover, bar-tailed godwit, black-tailed godwit, knot, sanderling, and dunlin.

9.6.32 Of the 21 SPA / Ramsar site individual winter qualifying species recorded during the surveys, 11 were recorded in numbers which represented more than 1% of the GB population, and comprised: pink-footed goose (1.6%), shelduck (1.5%), oystercatcher (1.26%), grey plover (2.67%), curlew (1.57%), bar-tailed godwit (5%), black-tailed godwit (3.79%), knot (2.46%), sanderling (8%), dunlin (7.35%) and redshank (1.06%).

9.6.33 Initial results from the Site-specific winter bird surveys in 2021 / 2022 are broadly similar with WeBS surveys of the area, allowing for species-specific trends. The data are suitable to inform EIA and provides the additional detail with regards usage of the intertidal area and roosting locations needed to inform further assessment.

Passage / Breeding Bird Survey 2022

9.6.34 During the passage / breeding bird surveys a total of 82 species were recorded, including 24 of the 26 species listed as qualifying features of the SPAs / Ramsar sites within the Study Area during any season. Of these species, 13 are designated for their passage and / or breeding populations.

9.6.35 Only those species designated during the breeding and / or passage season and associated with SPAs / Ramsar sites which have potential connectivity to the Study Area are discussed further. These species are presented alongside their highest overall peak count recorded during surveys in **Table 9-13.**

9.6.36 Passage bird numbers relate to birds moving through the estuary and the passage / breeding season counts highlight the seasonality of species using the Survey Area, with species such as knot, present in lower numbers during these periods. Numbers captured within this does contain local breeding species such as terns, as well as moulting birds post-breeding such as shelduck. Connectivity distances are based upon Woodward *et al*. (2019) for breeding seabirds and 10km for non-breeding waders. An additional 58 species of waterbird, raptors and owls were also recorded.

Table 9-13: Highest overall peak counts for SPA / Ramsar site individual named qualifying species recorded during the 2022 passage / breeding bird survey

SPA / Ramsar qualifying breeding / passage species	Highest overall peak count	Percentage of potentially-linked SPA / Ramsar*
Shelduck	4,000	32%
Black-tailed godwit	4,129	205%
Knot	3,800	30%
Redshank	2,300	84%
Lesser black-backed gull	673	39%***
Sandwich tern	1,100	115%
Little tern	5	N/A**
Common tern	720	N/A**

*total is highest percentage of a single designated sites population from those sites considered to have potential connectivity to the Survey Area. Sites included are Liverpool Bay SPA, Mersey Estuary SPA / Ramsar, Mersey Narrows SPA, and Dee Estuary SPA / Ramsar, as well as Ribble and Alt Estuary SPA / Ramsar for lesser black-backed gull only.
**Breeding birds excluded as breeding bird surveys to census nests not undertaken.
***Passage value included.

9.6.37 Six passage qualifying species with connectivity to the Study Area were recorded: shelduck, black-tailed godwit, knot, redshank, lesser black-backed gull and sandwich tern. Grey plover, ringed plover, sanderling and dunlin were also recorded, and although they are passage qualifying features, there is no connectivity between the Study Area and these populations.

9.6.38 Three SPA / Ramsar site breeding qualifying species with connectivity to the Study Area were recorded, comprising common tern, lesser black-backed gull, little tern. with breeding colonies of common tern recorded at two sites and lesser black-backed gulls observed nesting at multiple locations. Ruff was also recorded, and although it is a breeding qualifying feature, there is no connectivity between the Study Area and the breeding population.

9.6.39 Similarly to the winter surveys, more than 1% of the SPA / Ramsar site citation populations were recorded, with survey areas which fell within the boundaries of the designated sites holding the highest percentages. Over 30% of the citation populations of six species were recorded: lesser black-backed gull, redshank, black-tailed godwit, knot, shelduck, and sandwich tern.

9.6.40 Foraging and roosting areas were the same as those recorded during the winter, with the highest levels of bird activity focused around the mouth of the Mersey Estuary and the eastern end of the River Mersey. The sites at the mouth of the Estuary supported large areas of exposed sand / mudflat providing extensive feeding opportunities at low-tide. The sites at the eastern end of the river formed an important network of less disturbed foraging and roosting habitats, including the extensive intertidal mud / sandflats and creek systems, as well as the areas of saltmarsh and grazing marshes. The areas around Birkenhead and Albert Dock recorded the least bird activity due to the limited and / or lack of suitable foraging and roosting habitats, and high levels of human disturbance.

9.6.41 The survey areas were used throughout the passage and breeding period. The levels of activity dropped during June, with higher numbers recorded in Spring (April / May) and / or Autumn (late-July to September) as birds moved around post-breeding and / or on migration.

9.6.42 Numbers of waders (including grey plover, ringed plover, black-tailed godwit, knot, sanderling, dunlin, and redshank) generally declined in June as they moved away from the Mersey / UK to breed elsewhere.

9.6.43 The survey areas were regularly used throughout the survey period by gulls (including lesser black-backed gull), with regular movements along the River Mersey and a general increase in gull numbers from July onwards as post-breeding and juvenile birds returned to the coast for winter.

9.6.44 Eleven SPA / Ramsar site individual winter qualifying species were also noted during the surveys, comprising: pink-footed goose, whooper swan, wigeon, pintail, teal, common scoter, oystercatcher, golden plover, curlew, bar-tailed godwit and little gull.

9.6.45 Generally, the majority of the sites provided limited breeding opportunities due to their urban location, high levels of human disturbance and / or lack of suitable habitat which was not inundated at high-tide. While incidental breeding observations were noted during the surveys; as full breeding bird surveys were not carried out, the survey areas were likely to support more breeding bird species than those recorded.

9.6.46 Incidental breeding observations were also noted of three other SPA / Ramsar site individual winter qualifying species (which breed in the UK), comprising shelduck, oystercatcher and ringed plover, with several large creches of young shelduck recorded at multiple sites, breeding behaviour of oystercatcher observed at four survey areas, and an unconfirmed record of breeding ringed plover adjacent to one site.

9.6.47 Initial results from the site-specific passage and breeding surveys, as with the wintering birds surveys are broadly as expected from WeBS data, with additionality to inform assessment from breeding locations, intertidal usage and roost locations. These are suitable to inform further assessment.

9.7 FURTHER DATA COLLECTION

9.7.1 An extensive bird survey programme has been developed to inform the Proposed Development and has been consulted upon by the stakeholder as outlined in **Table 9-14**. The areas of data collection are shown in **Figure 9.2**, and these surveys are continuing into their third year, and it is considered that these surveys, alongside desk-based study data, will establish a robust marine and intertidal ornithology baseline within the Study Area to inform an impact assessment. This data will be valid for a period of five years (from the date of survey commencement).

9.7.2 After consultation with stakeholders, no additional survey work to the existing programme is proposed and all additional data will be gathered through desk-based study to inform the EIA Chapter for Marine and Intertidal Ornithology. During consultation in 2021, Natural England stated that the need for nocturnal survey should be considered. Nocturnal surveys have been scoped-out of the baseline surveys, as it is considered that there would be no value in undertaking these surveys.

9.7.3 Although intertidal birds will forage nocturnally, this is typically due to foraging activity coinciding with the availability of suitable foraging habitat rather than additional benefits to foraging at night (Lourenço *et al*, 2008). It is considered unlikely that foraging behaviour would alter significantly between day and night, and therefore it is considered that the distribution and abundance of foraging birds recorded diurnally during baseline surveys will correspond with activity at night.

9.7.4 Furthermore, it is considered that GPS tagging of waders is not required, as it would not offer a great value to the understanding of usage of the estuary by wader populations due to the extensive study of bird movements within Liverpool Bay. In addition, the small sample sizes and compressed longitudinal sample length of any study would mean that additionality of the data would be minimal in terms of informing any impact assessment. When balanced against potential impacts on small and medium-sized wader species carrying a GPS unit and the fact that such tagging may lead to altered behaviour and reduced survivability (Gould *et al*. 2024), such a study is not deemed appropriate to inform this project.

Table 9-14: Surveys proposed for the characterisation of marine and intertidal ornithology baseline (first 2 years already complete and 3rd year currently ongoing, no surveys planed beyond this)

Surveys Proposed	Justification
Wintering bird surveys.	Characterisation of wintering marine and intertidal bird species present.
Breeding / passage bird surveys.	Characterisation of marine and intertidal bird species present during the passage or the breeding season.

9.8 FUTURE BASELINE

9.8.1 The current baseline description above reflects the Project's understanding of the current state of the existing environment. In the absence of significant local impacts, it is likely that the populations of bird species present will evolve in accordance with regional and national trends.

9.8.2 The overall duration of construction is anticipated to be up to 10 years with an assumed operational life of 120 years. Therefore, there exists the potential for the baseline to evolve between the time of assessment and point of impact. Outside of short-term or seasonal fluctuations, changes to the baseline in relation to marine and intertidal ornithology usually occur over an extended period. Based on current information regarding reasonably foreseeable events over the next two years, the baseline is not anticipated to have fundamentally changed from its current state at the point in time when construction impacts occur. If there are any significant changes to the baseline between scoping and EIA, this will be captured within the EIA assessment.

9.8.3 Should the Project be developed or not, changes in populations are likely to result from climatic factors (such as temperature change and subsequent impacts on species' ranges) and other natural phenomena (such as the recent avian influenza epidemic), or anthropogenic activities such as changes in fishing activities indirectly affecting marine bird communities. Baseline conditions are therefore not static and are likely to exhibit some degree of change over time, with or without the Project in place.

9.9 BASIS FOR SCOPING ASSESSMENT

9.9.1 The Marine and Intertidal Ornithology scoping assessment is based on the indicative parameters which are also set out in **Chapter 2: Site Context and Project Description**.

9.9.2 The source-pathway-receptor linkage between Project components and / or activities and the receptor groups for this aspect are described in **Table 9-16.**

9.9.3 Baseline conditions for marine ornithology were not informed by primary survey and were informed by historic data.

9.9.4 The Approved NPPF 2023 introduces new requirements, which will be taken account of in the EIA and associated consenting documents.

9.10 EMBEDDED ENVIRONMENTAL MEASURES

9.10.1 Embedded mitigation measures have been identified and are proposed to be adopted as part of the evolution of the Project Design (embedded into the Project Design). These measures will evolve over the development process as the EIA progresses and in response to consultation. They will be fed iteratively into the assessment process. These measures typically include those that have been identified as good or standard practice and include actions that would be undertaken to meet existing legislation requirements.

9.10.2 As there is a commitment to implementing these environmental measures, and also to various standard sectoral practices and procedures, they are considered inherently part of the design of the Project and have, therefore, been considered in the scoping assessment.

9.10.3 In addition to the specific embedded mitigation measures relevant to marine and intertidal ornithology listed in **Table 9-15**, consultation will be undertaken with all relevant consultees to address any concerns or issues.

9.10.4 A schedule of Commitments will be presented as part of the ES. This will inform the Outline Construction Environmental Management Plan (OCEMP) which will be prepared prior to commencement of construction works. The controls and measures within the CEMP will be implemented to mitigate against impacts during the construction phase.

9.10.5 There are additional (Secondary) environmental measures which could be embedded into the Project to reduce or prevent Potentially Likely Significant Effects upon marine and intertidal ornithology receptors. These measures have not been considered within the scoping of Potentially Likely Significant Effects within this Chapter and are not presented as commitments at this stage but will be explored as part of the evolution of the Project Design. These measures can be split into three categories; project design optimisation, construction (prevent and reduce) measures and operation (prevent and reduce) measures.

Table 9-15: Relevant marine and intertidal ornithology embedded environmental measures

ID	Mitigation Measures embedded into the Project design	How the measure will be secured
OM7	Vessel Management Plan (VMP).	A VMP will be developed and adhered to during the construction of the Project. The VMP will confirm the types and numbers of vessels that will be engaged on the Project and consider vessel coordination including indicative transit route planning.
OM1	Construction Environmental	A CEMP will be developed and adhered to during the construction phase of the Project. A Marine Pollution

ID	Mitigation Measures embedded into the Project design	How the measure will be secured
	Management Plan (CEMP).	Contingency Plan (MPCP) will form part of the CEMP. The MPCP provides details of procedures to protect personnel working and to safeguard the marine environment and mitigation measures in the event of an accidental pollution event arising during the construction phase. This will include mitigation measures to reduce the amount of above and below water noise.
OM8	Adherence to a Construction Noise Management Plan.	This will monitor the noise during piling including wind speed and direction as well as implementing use of slow and soft starts during piling activities.

9.11 POTENTIALLY SIGNIFICANT EFFECTS

9.11.1 In line with the EIA Regulations 2017, the EIA for the Project will consider those impacts where there is a risk of a potentially significant effect only. The following section draws on industry experience and expertise to identify those effect-receptor pathways that may potentially lead to a significant impact. Where experience and available evidence indicates an effect-receptor pathway will not lead to a significant impact with regards to the EIA Regulations (2017) the pathway is scoped out from assessment.

9.11.2 The scoping assessment is based on a combination of the Project definition at the scoping stage, embedded environmental measures, understanding of the baseline conditions at this stage, the evidence base for marine and intertidal ornithology, the identification of potentially impacted receptors, and professional judgement. The approach to this assessment is set out in **Chapter 3**: **Approach to EIA**.

9.11.3 The evidence base for potentially significant effects on marine and intertidal ornithology are summarised in **Table 9-16**. Potential adverse effects of the Project on European Sites have been identified using Advice on Operations (AoO) from Natural England for “Construction and operation of offshore coastal

defence structures (waves screens / breakwaters)". The AoOs for both Liverpool Bay / Bae Lerpwl SPA and Mersey Estuary SPA were used.

9.11.4 The early identification of potentially significant effects is used here as a tool aimed at delivering a proportionate approach to the EIA. In doing so, it sets out a high-level assessment of all potential effects, significant or not. The basis for scoping out certain effects, and therefore no longer considered is presented after the table, supported by the evidence base.

Table 9-16: Potentially significant marine and intertidal ornithology effects during each project phase

Source	Pathway	Receptor	Project Phase (C, O, M, D) *	Embedded Measures	Scoped in or out	Justification	Data Collection and Analysis to Characterise the Baseline
Construction of tidal barrage, temporary construction compounds, access routes.	Direct habitat loss (temporary and permanent).	Marine and intertidal ornithology plus supporting habitats.	C, D	CEMP	Scoped In.	Temporary habitat loss associated with the construction of cofferdams, laydown areas and other supporting infrastructure. This will be addressed in the construction phase assessment. The loss will be considered temporary where there are clear plans for the restoration of temporarily lost habitats. Permanent habitat loss are those that start at the time of construction and last the lifetime of the Project. Consideration will also be given to habitat fragmentation during the construction phase. Presence of infrastructure will result in temporary and permanent habitat loss which has potential for displacement,	Site specific surveys to characterise the species assemblages. Sediment deposition modelling (to inform which potential habitats would be affected).

Source	Pathway	Receptor	Project Phase (C, O, M, D) *	Embedded Measures	Scoped in or out	Justification	Data Collection and Analysis to Characterise the Baseline
						reduction of fitness and mortality of bird species.	
Presence of above water infrastructure.	Collision above and below the water with infrastructure.	Marine and intertidal ornithology.	O, M	N/A	Scoped Out.	Birds can collide with static, above water infrastructure however the risk is negligible for this project.	N/A
Construction vehicles, vessels and plant and artificial light.	Above water noise.	Marine and intertidal ornithology.	C, D	CEMP, VMP	Scoped In.	Construction and development activities will result in the generation of above water noise. This can result in displacement of bird species. Noise assessments in **Chapter 22: Onshore Noise and Vibration** will be used to assess the area over which noise thresholds for species might be exceeded.	Air-borne noise modelling.
Maintenance vehicles, vessels and plant and artificial light.	Above water noise.	Marine and intertidal ornithology.	M	CEMP, VMP	Scoped Out.	Maintenance activities will result in the generation of above water noise however, this will have a negligible effect on bird species.	N/A
Vehicles, vessels and	Underwater noise changes	Marine and intertidal ornithology plus	All phases	CEMP, VMP	Scoped In.	Activities during all phases will result in the generation of underwater noise. This can	Underwater noise modelling.

Source	Pathway	Receptor	Project Phase (C, O, M, D) *	Embedded Measures	Scoped in or out	Justification	Data Collection and Analysis to Characterise the Baseline
plant and artificial light.	and vibration.	supporting habitats.				result in the displacement of diving bird species. Noise assessments in **Chapter 12 Underwater Noise & Vibration** will be used to assess the area over which noise thresholds for specifics might be exceeded.	
Vehicles, vessels and plant and artificial light.	Visual disturbance including artificial light.	Marine and intertidal ornithology plus supporting habitats.	All phases	CEMP, VMP	Scoped In.	Activities during all phases will result in the generation of visual disturbance. This can result in the behavioural changes, such as displacement, of bird species.	Site specific surveys to characterise the species assemblages.
Construction and maintenance of tidal barrage, temporary construction compounds, access routes.	Abrasion / disturbance of the substrate on the surface of the seabed.	Supporting habitats	All phases		Scoped Out.	There is no pathway of effect and thus, this pressure has been scoped out.	N/A
Construction, maintenance and presence of tidal barrage, temporary construction	Barrier to species movement.	Marine and intertidal ornithology plus supporting habitats.	All phases	CEMP	Scoped In.	The presence of the tidal barrage, construction compounds and other infrastructure (both temporary and permanent) have potential to act as a barrier to species	Site specific surveys to characterise the species assemblages.

Source	Pathway	Receptor	Project Phase (C, O, M, D) *	Embedded Measures	Scoped in or out	Justification	Data Collection and Analysis to Characterise the Baseline
compounds, access routes.						movement resulting in behavioural changes such as displacement.	
Release of contaminants from disturbed bottom (such as dredging, piling, installation and removal of infrastructure).	Changes in suspended solids (water clarity).	Marine and intertidal ornithology plus supporting habitats.	All phases	CEMP	Scoped In.	Changes in water clarity, caused by activities during all phases may result in habitat degradation and consequent changes in availability of prey species. This can result displacement of bird species.	Site specific surveys to characterise the species assemblages. Hydrodynamic and sediment transport modelling.
Maintenance of tidal barrage, temporary construction compounds, access routes.	Emergence regime changes, including tidal level change considerations. Including indirect impacts on prey species.	Marine and intertidal ornithology plus supporting habitats.	O, M		Scoped In.	The presence and operation of the tidal barrage during the operation and maintenance phase may result in changes to the extent of the nearby intertidal zones, resulting in habitat loss and displacement of bird species.	Hydrographic modelling.

Source	Pathway	Receptor	Project Phase (C, O, M, D) *	Embedded Measures	Scoped in or out	Justification	Data Collection and Analysis to Characterise the Baseline
Maintenance of tidal barrage, temporary construction compounds, access routes.	Penetration and / or disturbance of the substratum below the surface of the seabed, including abrasion.	Supporting habitats.	O, M		Scoped Out.	There is no pathway, to ornithology receptors, of effect and thus, this pressure has been scoped out.	
Release of contaminants from disturbed bottom sediments.	Physical change (to another seabed type) .	Supporting habitats.	C, O, M		Scoped Out.	There is no pathway, to ornithology receptors, of effect and thus, this pressure has been scoped out.	
Release of contaminants from disturbed bottom sediments.	Physical change (to another sediment type).	Supporting habitats.	C, O, M		Scoped Out.	There is no pathway, to ornithology receptors, of effect and thus, this pressure has been scoped out.	
Release of contaminants from disturbed bottom during maintenance dredging	Smothering and siltation rate changes (Heavy).	Supporting habitats.	O, M		Scoped Out.	There is no pathway, to ornithology receptors, of effect and thus, this pressure has been scoped out.	

Source	Pathway	Receptor	Project Phase (C, O, M, D) *	Embedded Measures	Scoped in or out	Justification	Data Collection and Analysis to Characterise the Baseline
Release of contaminants from disturbed bottom during maintenance dredging.	Smothering and siltation rate changes (Light).	Supporting habitats.	O, M		Scoped Out.	There is no pathway, to ornithology receptors, of effect and thus, this pressure has been scoped out.	
Construction of tidal barrage, temporary construction compounds, access routes.	Wave exposure changes.	Supporting habitats.	O, M		Scoped Out.	There is no pathway, to ornithology receptors, of effect and thus, this pressure has been scoped out.	
Construction of tidal barrage, temporary construction compounds, access routes.	Water flow (tidal current) changes, including sediment transport consideratio ns.	Supporting habitats.	O, M		Scoped Out.	There is no pathway, to ornithology receptors, of effect and thus, this pressure has been scoped out.	
Presence of vessels, machinery and workforce personnel.	Accidental pollution events and litter.	Marine and intertidal ornithology plus supporting habitats.	All phases.	CEMP, EVMP	Scoped In.	The presence of vessels during all phases may result in the accidental release of pollutants and / or litter. This can cause displacement, reduction of	

Source	Pathway	Receptor	Project Phase (C, O, M, D) *	Embedded Measures	Scoped in or out	Justification	Data Collection and Analysis to Characterise the Baseline
						fitness or mortality to bird species.	

Methods Proposed to Assess Specific Effects

Outputs from Other Workstreams

9.11.5 The marine and intertidal ornithology assessment will be informed by data streams and modelling outputs from other topics within the EIA. Key interfaces are listed in **Table 9-17**.

Table 9-17: Data streams and output from other topics.

EIA Topic Area	Modelling / Study Outputs Required	Application Within Marine and Intertidal Birds Assessment
Benthic, subtidal and sediment (Chapter 7).	Changes to water quality that might affect fish and invertebrate populations that act as prey species for bird species.	Food chain effects on all marine and intertidal bird populations.
Benthic, subtidal and sediment (Chapter 7).	Changes to water quality that might affect fish and invertebrate populations that act as prey species for bird species.	Food chain effects on all marine and intertidal bird populations.
Benthic, subtidal and sediment (Chapter 7).	Changes to invertebrate populations, distribution and accessibility including those species and size classes that are bird food.	Food chain effects on invertebrate feeding bird populations.
Fish & Shellfish Chapter 10 and Commercial Fisheries (Chapter 11).	Changes to fish populations and distribution including those species and size classes that are bird food.	Food chain effects on fish-eating bird populations.
Underwater Noise & Vibration (Chapter 12)	Noise modelling output which identifies areas over	Since noise becomes attenuated with distance, noise modelling will

EIA Topic Area	Modelling / Study Outputs Required	Application Within Marine and Intertidal Birds Assessment
and Onshore Noise & Vibration (Chapter 21).	which noise effects could occur and the likely noise levels.	be used to assess the area over which noise thresholds for specific species might be exceeded.

Methods to Assess Effects on Populations

9.11.6 The majority of the potential effects arising from the construction, operation and decommissioning of the Project may act on marine and intertidal birds by causing reduced access to food supplies and / or increased energy expenditure. In turn such reduced access to food supplies and / or increased energy expenditure can result in decreased survival or decreased productivity. Either of these, subject to density dependent effects, can lead to reduced populations.

9.11.7 These population effects will be assessed using a combination of:

- Knowledge of the distribution and population of marine and intertidal birds derived from desk study and field survey
- Knowledge of the ecology (food supply, energy expenditure, survival, productivity etc) of marine and intertidal birds from desk study;
- Knowledge of the distribution and population of marine and intertidal bird food supply from field survey (principally fish and benthic invertebrates, survey methods described in **Chapters 13 and 12** respectively of this Scoping Report);
- Predictions of hydrological and sediment changes from modelling (methods described in **Chapter 8** of this Scoping Report); and
- Knowledge of the effects that hydrological and sediment changes have on bird food supplies through desk study.

9.11.8 For the Severn Tidal Power SEA (DECC, 2010), the assessment of the changes in intertidal habitat for waterbird populations was informed through two modelling approaches: Habitat Association Modelling (HAM) and Individual Based Modelling (IBM) which predicted densities and thus numbers of waterbirds on intertidal areas following proposed tidal power options (Burton *et al*., 2010a). The two approaches were used in conjunction to inform the assessment, so as to provide a measure of uncertainty in predictions.

9.11.9 In summary, HAMs aim to explain densities of waterbirds under the different options using measures of estuary morphology as a proxy for sediment and so in turn (invertebrate) food supplies. IBMs make predictions of the number of birds that can be supported by a site from the underlying physiology and behaviour of individuals (assuming that animals behave in ways that maximise their chances of survival) and require data on birds, biomass, area and tidal exposure of food resources.

9.11.10 It is proposed to continue consultation with Natural England and Natural Resources Wales on the most appropriate population modelling technique. It is assumed that HAMs and IBMs will be undertaken, as for Severn Tidal Power SEA (DECC, 2010).

Impacts Scoped Out of Assessment

9.11.11 Based on the knowledge of the baseline environment, the nature of planned works and the evidence available on the potential for impact from projects more widely, there is no pathway of effect for marine and intertidal ornithology for the following potential effects:

- Abrasion / disturbance of the substate on the surface of the seabed;
- Penetration and / or disturbance of the substratum below the surface of the seabed;
- Physical change (to another seabed type);
- Physical change (to another sediment type);
- Smothering and siltation rate changes (Heavy);
- Smothering and siltation rate changes (Light);
- Wave exposure changes; and,
- Water flow (tidal current) changes.

9.11.12 Marine and intertidal birds are not directly affected by the aforementioned effects, and indirect effects are captured in direct habitat loss (either temporary or permanent) and emergence regime changes, including tidal level change considerations.

9.12 CUMULATIVE EFFECTS

9.12.1 Cumulative effects on marine and intertidal ornithology resulting from the effects of the Project and other developments will be assessed in accordance with the guidance and methodologies set out in **Chapter 3: Approach to EIA** and

considering the other developments that have been screened in as part of the CEA screening exercise.

9.12.2 The following impacts from the Project have the potential to act cumulatively with impacts from other developments to contribute to cumulative effects on marine and intertidal ornithology:

- Direct habitat loss due to construction and decommissioning;
- Above water noise;
- Barrier to species movement;
- Changes in suspended solids (water clarity);
- Emergence regime changes, including tidal level change considerations and indirect impacts on prey species;
- Underwater noise changes; and,
- Visual disturbance.

9.12.3 All operational and consented marine and intertidal Projects within the area will be initially scoped into the assessment using the criteria set out in **Chapter 31: Cumulative Effects**. The approach to the marine and intertidal ornithology EIA will include identification of where periods of offshore construction and operation overlap across Projects and developments. The main potential effects for consideration include disturbance and displacement of birds from areas impacted by the Project. The marine and intertidal ornithology EIA for the Project will consider the worst-case scenario put forward for other Projects considered and any associated activities in line with the methodology outlined in **Chapter 3: Approach to EIA**.

9.13 TRANSBOUNDARY EFFECTS

9.13.1 There is a potential for transboundary impacts on marine and intertidal ornithology due to the mobile nature of bird species, particularly where these extend beyond the limits of UK waters.

9.13.2 Direct impacts may occur during the construction and decommissioning phases of the Project, the extent cannot be determined at this stage and will be subject to assessment in the EIA. However, due to the localised nature of the potential impacts, transboundary effects are considered unlikely to occur.

9.13.3 It is proposed that impacts to marine and intertidal receptors are subject to transboundary assessment in the EIA. Likely significant effects upon European

Sites with marine and intertidal ornithology as qualifying features will be assessed within the HRA.

9.13.4 Only impacts scoped in for the Project in isolation will be considered in the transboundary impact assessment.

9.14 PROPOSED APPROACH TO ENVIRONMENTAL IMPACT ASSESSMENT

9.14.1 Alongside the ongoing baseline surveys, further desk-based studies and analysis will be undertaken to identify and assess marine and intertidal ornithology receptors occurring beyond the near-field effects. This study will be supplemented with consultation with the relevant statutory and non-statutory organisations to determine if there is a requirement for any additional baseline data collection although this has not been requested in consultation to date.

9.14.2 The Project wide approach to the assessment methodology is set out in **Chapter 3: Approach to EIA**. While this has informed the approach that has been used in this marine and intertidal ornithology chapter, it is necessary to set out how this methodology will be applied, and adapted as appropriate, to address the specific needs of the ornithology assessment.

9.14.3 Where methods and approaches to construction are still not finalised, the assessment will be based on a precautionary 'worst-case scenario'. Where this approach is taken it will be clearly indicated in the EIA Report together with a definition of the worst-case scenario for the specific assessment, in line with SNCB guidance.

9.14.4 A separate offshore HRA screening report will be produced to consider and evaluate the potential connectivity of National Site Network sites within the assessment and report associated effects, a screening statement on HRA will be submitted together with this EIA Scoping Report.

9.14.5 Technical guidance highlighted in **Section 9.2.1** will inform environmental plans and mitigation to reduce any potential effect on marine and intertidal birds as a result of the Project.

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10 FISH AND SHELLFISH

10.1 INTRODUCTION

10.1.1 The Fish and Shellfish chapter will consider the potentially significant effects on fish and shellfish that may arise from the construction, operation and maintenance (O&M) and decommissioning activities of the tidal barrage and port and marine facilities (construction phase only). This chapter does not relate to the Grid Connection.

10.1.2 This section of the Scoping Report describes the methodology to be used within the Environmental Impact Assessment (EIA), an overview of the baseline conditions within the Scoping Boundary (as defined in **Chapter 1: Introduction**), the datasets to be used to inform the EIA, the potential likely significant effects to be considered, and how these will be assessed for the purpose of the EIA.

10.1.3 The Fish and Shellfish chapter interfaces with other aspects of the assessment and will be informed by modelling outputs and data from other topics and as such, should be considered alongside these; namely:

- **Chapter 5: Invasive Non-Native Species**: Invasive Non-Native Species (INNS) have the potential to impact or place pressure upon native species of fish and shellfish.
- **Chapter 6: Coastal Processes:** There are potential pathways of effect from marine processes on potentially sensitive fish and shellfish species, therefore information on the marine geology, oceanography, physical processes, water quality and sediment dynamics will be required to inform the fish and shellfish assessment.
- **Chapter 7: Benthic and Subtidal:** Fish and shellfish habitat preferences as well as those of their prey items are often strongly linked to the benthic environment. Information on benthic habitats will therefore, be utilised for characterising the receiving environment for fish and shellfish, as well, as assessing potential indirect effects upon fish and shellfish from impacts upon their prey.
- **Chapter 8: Marine Mammals:** Fish and shellfish are an important prey item for marine mammals, and therefore any impacts on fish and shellfish may indirectly affect marine mammals.
- **Chapter 9: Marine and Intertidal Ornithology:** Fish and shellfish are an important prey item for various species of bird, including those which are designated features of special protection areas.

- **Chapter 11: Commercial Fisheries:** Impacts upon fish and shellfish may affect commercial fisheries. Furthermore, consideration is given to the commercial value within the fish and shellfish assessment.
- **Chapter 12: Underwater Noise and Vibration:** Fish and shellfish are sensitive to underwater noise and vibration. Thus, there is potential for underwater noise and vibration as a result of the Proposed Development to affect fish and shellfish receptors. The Underwater Noise & Vibration chapter will be used to inform the assessment of the potential impact of underwater noise on fish and shellfish.
- **Chapter 15: Major Accidents and Disasters:** Fish and shellfish are sensitive to some major accidents and disasters (i.e. release of pollutants). Information on major accidents and disasters will therefore, inform the fish and shellfish assessment.
- **Chapter 16: Shipping and Navigation:** There are potential pathways of effects from increased vessel activities on fish and shellfish species (i.e. increased risk of accidental pollution and introduction of invasive non-native species). Information in the shipping and navigation chapter will therefore, inform the fish and shellfish assessment.

10.1.4 Overarching relevant legislation and policy context which has informed the scope of the assessment is outlined in **Chapter 4: Planning Policy,** with topic specific considerations outlined in **Appendix 4.1.**

10.2 TECHNICAL GUIDANCE

10.2.1 Technical guidance that has been used to define the assessment is set out in **Table 10-1**.

Table 10-1: Relevant technical guidance

Guidance reference	Relevance to the assessment
Marine Evidence based Sensitivity Assessment (MarESA) (Tyler-Walters *et al*., 2023)	Provides definitions and criteria for determining the sensitivity of receptors to a range of anthropogenic pressures.
International Union for Conservation of Nature (IUCN) Red List of Threatened Species (IUCN, 2024)	Inventory of the conservation status and extinction risk of species.

Guidance reference	Relevance to the assessment
Chartered Institute of Ecology and Environmental Management (CIEEM) guidelines for Ecological Impact Assessment for Terrestrial, Freshwater and Coastal Environments (CIEEM, 2018)	Guidelines on the approach to EIA recommending that the conservation values of receptors are considered.
Sound Exposure Guidelines (Popper *et al*., 2014)	This publication is commonly used in assessments to provide information on functional hearing groups of fish species and the threshold values at which effects (i.e. mortality, recoverable injury) may occur. These values are typically used in conjunction with underwater noise modelling to assess the effect on species at the individual and population level.
Screening Spatial Interactions between Marine Aggregate Application Areas and Sandeel Habitat: A Method Statement (Latto *et al*., 2013)	This publication provides criteria for determining substrate suitability for sandeels.
Screening Spatial Interactions between Marine Aggregate Application Areas and Atlantic Herring Potential Spawning Areas. A Method Statement produced for the British Marine Aggregates Producers Association (Reach *et al.* 2013)	This publication provides criteria for determining substrate suitability for herring spawning.

10.3 STUDY AREA

10.3.1 The Fish and Shellfish Scoping Study Area is defined as the Mersey water body and a 40 km buffer at the entrance of the Mersey Estuary. It is anticipated that this Study Area will allow for the robust characterisation of mobile fish species and receptors which may experience far-field effects (e.g. underwater noise), as well as encompassing the Zone of Influence (ZoI) for scoping of the impacts upon fish and shellfish receptors. There is no guidance or literature to support a specific distance

for the consideration of fish and shellfish receptors. Consequently, this Study Area has been determined based on expert judgement and has considered existing hydrodynamic modelling and the potential for under-water noise propagation. The Fish and Shellfish Scoping Study Area is presented in **Figure 10.1**. The Study Area gives confidence that any far-field effects (e.g. underwater noise) are captured, whilst noting that the full characterisation of the baseline is focused on the area (within the Survey Area) likely to be impacted by near-field effects and informed by project-specific fish surveys commencing in Q3 of 2024. Potential impacts within the wider Study Area outside of the Survey Area will be characterised using existing datasets through a desk-based review.

10.3.2 The Fish and Shellfish EIA Study Area will be further refined during consultation with stakeholders and will be informed by modelling outputs (i.e. underwater noise modelling and hydro-dynamic modelling) and the associated Underwater Noise and Coastal Processes Chapters during future assessment stages.

10.4 CONSULTATION

10.4.1 Consultation is a key part of the application process. The assessment has been and will be informed by engagement and discussion with various stakeholders, including but not limited to the following: Planning Inspectorate (PI), Environment Agency (EA), Natural Resources Wales (NRW), Natural England (NE), Marine Management Organisation (MMO), North West Inshore Fisheries and Conservation Authorities (NW-IFCA), Centre for Environment, Fisheries and Aquaculture Science (Cefas), Joint Nature Conservation Committee (JNCC), Mersey Rivers Trust, Mersey Gateway Environment Trust, Angling Trust, local councils (i.e. Warrington Borough Council) and other stakeholders via public consultation. Regular Environmental Stakeholders Workshops and Hydro-environmental Modelling Workshops have been undertaken since October 2020, full details of these workshops is provided within **Table 3-1** of Chapter 3 (Approach to EIA) and is summarised for the consultation events of particular relevance to this Chapter within **Table 10-2.**

10.4.2 A summary of the key issues raised during consultation and workshops to date, relevant to fish and shellfish, is outlined in **Table 10-3**, together with how these issues will be considered in the production of the EIA.

Table 10-2: Consultation Events

Date	Consultees	Agenda Topics
30.06.2021	NE, RSPB, LWT, NW-IFCA, HE, NRW, TCE, MRT, MGET, NWWT	Environmental Stakeholder Workshop 3. Status Update and Initial Survey Approach (inc. fish, habitats and non-breeding birds)
09.12.2021	EA, NE, LWT, NW-IFCA, HE, NRW, MRT, MGET, MMO, TCE, RSPB, CWT, NWT	Environmental Stakeholder Workshop 5. Status update, Habitats, Fish - RSK approach and baseline survey requirements, Water Quality, Ecological Survey Schedule, Evidence Plan approach.
10.01.2022	EA, NE, LWT, NW-IFCA, NRW, MRT, MGET, TCE, CWT	Environmental Stakeholder Workshop 6. Status update, Progress on In-River barrage location review, Plan for topic-based technical discussions moving forward, Habitat Scope Discussion.

Date	Consultees	Agenda Topics
17.05.2023	EA, NE, LWT, MRT, MGET, TCE, DECG, MMO, NWT, MECG	Environmental Stakeholder Workshop 7. Status update, Introduction to desk-based studies, Update on surveys, Wider Data Gathering and Analysis.
30.08.2023	EA, NE, LWT, MRT, MGET, TCE, DECG, MMO, NWT, MECG	Environmental Stakeholder Workshop 8. Status update, Update on desk-based studies and next steps for baseline surveys, Update on surveys.
16.11.2023	EA, NE, LWT, MRT, MGET, MMO, NWT, RSPB, CWT	Environmental Stakeholder Workshop 9. Status update, Habitats and Licensing, Update on surveys
14.02.2024	EA, NE, MRT, MGET, MMO,	Environmental Stakeholder Workshop 10. Status update, EIA & Engagement update, Fish & Shellfish, Marine Mammals and Marine and Intertidal Ornithology update.

Date	Consultees	Agenda Topics
	RSPB, CWT, DECG, MECG,	
15.05.2024	EA, NE, MRT, MGET, MMO, RSPB, CWT, DECG, MECG	Environmental Stakeholder Workshop 11: Environment update, engagement update, DCO process.

Table 10-3: Consultation Comments

Date	Consultee	Consultation and Key Comments	How this is accounted for
2022	MMO	The survey plan has mentioned wanting to carry out seine net, fyke net and beam trawl surveys. In addition to surveys currently planned you should consider the use of shellfish specific surveys to assess the abundance of shellfish species	To supplement existing shellfish data a shellfish logbook scheme, where engagement with fishermen will take place to inform the EIA of the shellfish species present within the Study Area, has been proposed.
2022	MMO	You should consider the timing of the surveys and include surveys from May–August as it is a key breeding time for many species of shellfish	No specific surveys targeting shellfish are proposed at the time of scoping.
2022	MMO	A quarterly survey over two years will not provide sufficient evidence on the abundance/presence/absence of shellfish in the proposed works, in particular as only one or two surveys would fall within the breeding time (May–August).	To supplement existing shellfish data, the use of a shellfish logbook scheme is proposed, where engagement with fishermen will take place to inform the EIA of the shellfish species present within the Study Area.

Date	Consultee	Consultation and Key Comments	How this is accounted for
2022	MMO	The seine net, fyke net and 1.5 m beam trawl surveys will be carried out in July, October, January, April, July and October each year for two years. I agree that the months selected are appropriate to gather information on the fish species present throughout the year, depending on seasonality.	Four quarterly survey periods have been proposed over the two-year monitoring programme (Spring, Summer, Autumn and Winter). Further details on proposed surveys can be found in **Table 10-12.**
2022	MMO	For the proposed shallow subtidal beam trawls, a 1.5 m trawl is intended to be used. Small beam trawls used in shallow, inshore areas vary in size, typically between 1.5 m–2 m, and target small and juvenile fishes on or close to the seabed. The Environment Agency (EA) carry out beam trawl surveys around the Mersey Estuary as part of their transitional and coastal (TraC) waters surveys. The MMO recommend that you contact the EA to establish the size of beam trawl used in their surveys. If the EA use a 1.5 m beam trawl with the same mesh size then the data collected will be comparable to the long-term data series that the EA have. If the EA use a 2 m beam trawl, the MMO would recommend considering switching to a 2 m beam trawl with the same mesh size as the EA, so that comparisons with EA	The EA utilise a 1.5 m beam trawl, which is intended to be used during Spring, Summer, Autumn and Winter. Further details on the proposed beam trawl surveys can be found in **Table 10-12.**

Date	Consultee	Consultation and Key Comments	How this is accounted for
		can be made, and to provide a larger data set to inform the characterisation of the environment for fish.	
2022	MMO	The locations for the shallow subtidal beam trawl survey areas generally seem acceptable, however, the MMO note that the exact trawl locations will be determined nearer the time once the scheme is chosen. The MMO recommend that the MMO and Cefas are consulted on this once the scheme is chosen and the project boundary is finalised	The locations proposed are preliminary at this stage. As recommended, we would seek guidance from the MMO, Cefas and Inshore Fisheries and Conservation Authorities (IFCA) on suitable locations/grounds whilst adhering to local byelaws during final trawl site selection.
2022	MMO	Otter trawl surveys are only proposed to be undertaken in April and October during the two-year survey period, which will only provide data on fish species presence for spring and autumn, but data on which species are present during winter and summer months will be absent. The MMO recommend that otter trawls are also carried out in July and January, to ensure that the seasonality of fish species presence is fully captured throughout the year	Otter trawl surveys are proposed to be scoped out of the survey programme as detailed in **section 10.7.**

Date	Consultee	Consultation and Key Comments	How this is accounted for
2022	MMO	Sandeel dredge surveys are proposed to be carried out in April and July over the two-year period. Sandeels spend most of the year buried in the sediment, emerging into the water column briefly in winter for spawning (principally December–January), after which they remain buried in the sediment until April, when they emerge for an extended feeding period in spring and summer. During their feeding period it is understood that sandeel undertake diurnal migrations of a few kilometres, moving from the seabed where they are buried at night, to deeper areas of the water column during the day to feed (Cefas, 2004; Van der Kooij *et al*., 2008). Bearing in mind their seasonal movements, April and July may not be the ideal months to target sandeel as they will largely have emerged from the sediment and be feeding in the water column, hence they will not be collected in the dredge, unless the dredge surveys are carried out a night.	Sandeel surveys are proposed to be scoped out of the survey programme. Further details can be found in **Section 10.7**.
2022	MMO	An important consideration for the locations of the sandeel dredge locations is the sediment type. Sandeel distribution is considered to be highly patchy and varies	Sandeel surveys are proposed to be scoped out of the survey

Date	Consultee	Consultation and Key Comments	How this is accounted for
		in relation to sediment type. Sandeels favour seabed habitats containing a high proportion of coarse sand and low silt content. Accordingly, data on seabed sediments within the project boundary (e.g., particle size data) should be acquired, either through existing data sources (if available) or using sediment grab samples collected as part of the characterisation surveys. Please see Latto *et al*. (2013) for suitable guidance on the classification of sediments as sandeel habitat. Once suitable sediment types for sandeel habitat have been identified across the project site, specific dredge survey locations can be determined.	programme. Further details can be found in **Section 10.7**.
2022	NE	Surveys also do not contain a pelagic component. Other projects have utilised hydroacoustic survey methods to capture schools of pelagic fish.	Ichthyoplankton trawls are included within the survey programme to capture juvenile/larval pelagic fish. Further details on the ichthyoplankton surveys can be found in **Table 10-12.**
2022	NE	The current format of the proposed surveys suggests the primary aim is to create snapshots of the marine fish community. This format is unsuitable to determine	It is proposed that a camera trap be installed at Woolston Weir fish pass to assess adult runs of salmon and

Date	Consultee	Consultation and Key Comments	How this is accounted for
		presence/absence and/or abundance protected diadromous fish species in the area (e.g. due to extreme seasonality, and rarity). A number of the nearby rivers and estuaries have designated fish features which would need to be assessed within Environmental impact assessments (EIAs), Habitat Regulation Assessments (HRAs), Marine Conservation Zones (MCZ) assessments etc. Baseline populations for impact assessments within protected sites are often based on adult run count estimates for individual rivers or catchments. Therefore, for the protected diadromous fish element we recommend contacting EA or similar for fish counter data which are likely to be in operation on key rivers such as the Dee (trap above weir in Chester, for example), Mersey, and Ribble.	other migratory species that may travel upstream in the River Mersey. This method will allow for the sampling of Annex II fish species associated with designated sites.
2022	NW IFCA	We understand that currently shellfish data has not yet been reviewed and this will be vital in determining survey locations.	A Desk Based Assessment will be undertaken to inform whether shellfish survey is required. Survey scope will be shared with NW-IFCA and other consultees for agreement prior to undertaking shellfish survey. Shellfish survey data received from

Date	Consultee	Consultation and Key Comments	How this is accounted for
			NW IFCA (in May 2023) will be considered in determining whether any shellfish specific surveys are required. Shellfish beds noted mainly in the Ribble Estuary and at Leasowe and West Kirby in the study area.
2022	NW IFCA	As surveys are only scheduled for two years, the baseline data will not be sufficiently accurate, and different species will be missed due to timings of the surveys and the how they interact with the life cycles of some species present in the region	Further discussions will be held with stakeholders during the Evidence Plan process. The need for extending the overall survey period can be discussed, as well as the need for inclusion of different periods for sampling within that overall schedule.
2022	NW IFCA	Prey availability surveys should incorporate some sampling locations within commercial shellfish beds which are of high importance for bird food requirements. Intertidal surveys should also survey intertidal areas of	Where appropriate and feasible, intertidal sample locations will consider areas important for shellfish. Further engagement with

Date	Consultee	Consultation and Key Comments	How this is accounted for
		commercial importance for shellfish as these are not included in the topic of fish and shellfish	NW-IFCA will be undertaken to agree an approach.
2024	NE	Requested reasoning for removing otter trawls and sand eel dredges. Agreement of inclusion of fin clips for DNA surveys. Agreement for using expert judgement and literature sources for fish behaviour and movement. Advised developer conduct own studies to provide local context and understanding.	Otter trawl and sandeel dredge surveys are proposed to be scoped out of the survey programme. Details are provided in **section 10.7.**
2024	EA	Inclusion of resident & inshore species and their life stages required in assessment. Water quality and temperature changes also require consideration as potential significant impacts. Justification of removal of otter trawls and sand eel dredges. Request for inclusion of eel/elver monitoring for baseline, construction & post-construction.	Confirmation of inclusion of all relevant fish and shellfish receptors within assessment and the full range of potential significant impacts. Otter trawl and sandeel dredge surveys are proposed to be scoped out of the survey programme. Details are provided in **section 10.7.** Confirmation that eel/elver characterisation monitoring is included within survey scope.

10.5 ASSESSMENT METHODOLOGY

10.5.1 The Project-wide approach to the assessment methodology is set out in **Chapter 3: Approach to EIA**. This will be implemented to assess the likely significant effects on fish and shellfish receptors from the construction, O&M, and decommissioning of the Project.

10.5.2 Relevant legislation and guidance will also be considered in relation to the assessment, in addition to consultation with the stakeholders outlined above.

10.5.3 The assessment approach will be based on the conceptual 'source-pathway-receptor' model. This model identifies likely environmental effects resulting from the construction, O&M and decommissioning of the tidal barrage. This process provides an easy to follow assessment route between effect sources and potentially sensitive receptors ensuring a transparent impact assessment.

10.5.4 Iterative steps involved in the assessment approach will include:

- Determination of potential interactions between the tidal barrage and ecological receptors (during construction, operation and maintenance, and decommissioning phases);
- Definition of the fish and shellfish receiving environment within the influence of the Proposed Development;
- Assessment of the sensitivity of the receptors;
- Assessment of the magnitude of impact;
- Assessment of the significance of effects;
- Proposal of mitigation measures to reduce, prevent or where these are not possible, to offset, any adverse significant effects;
- Assessment of the residual effects after any mitigation measures have been considered; and
- Assessment of cumulative effects.

RECEPTOR SENSITIVITY AND VALUE

10.5.5 The criteria for defining the value and sensitivity of fish and shellfish receptors within the Fish and Shellfish EIA chapter are outlined in **Table 10-4** and **Table 10-5**, respectively. The definitions have been informed by the CIEEM guidelines for Ecological Impact Assessment (CIEEM, 2018) and the Marine Evidence based Sensitivity Assessment (MarESA) (Tyler-Walters *et al*., 2023).

10.5.6 It should be noted that the value of the receptor and sensitivity are not necessarily linked for a particular effect. For example, a receptor could be of international or national importance (e.g. a feature of a protected site) but have a low or negligible sensitivity to an impact and vice versa. Consequently, when determining the sensitivity level taken forward to assessment this will be taken into account, with species-specific considerations and professional judgement being used.

Table 10-4: Value criteria for fish and shellfish receptors.

Value	Definition
High - International	Feature of an internationally designated site. Species protected under international law.
Medium - National	Feature of a nationally designated site. Species protected under national law. Annex II species which is not listed as qualifying interest of any SACs within the Study Area. Critically Endangered or Endangered on IUCN Red list. Important prey item for other species of conservation or commercial importance.
Low - Regional	Spawning and/or nursery grounds within the Study Area. High commercial importance within the Study Area.
Very Low - Local	No spawning or nursery grounds within the Study Area. Some or no commercial importance within the Study Area.

Table 10-5: Sensitivity criteria for fish and shellfish receptors.

Sensitivity	Definition
High	Vulnerability: The receptor cannot or has very low capacity to avoid, adapt or tolerate the impact. Recoverability: The effect on the receptor is anticipated to be permanent or partial recovery likely after 10 years and full recovery may take over 25 years. Value: The receptor is of international value.
Medium	Vulnerability: The receptor has limited capacity to avoid, adapt or tolerate the impact. Recoverability: Only partial recovery is likely within 5 years and full recovery is likely to take up to 10 years. Value: The receptor is of national value.
Low	Vulnerability: The receptor has a reasonable capacity to avoid, adapt or tolerate the impact. Recoverability: Full recovery will occur but will take many months (or more likely years) but should be complete within about five years. Value: The receptor is of regional or local value.
Very Low	Vulnerability: The receptor has a high capacity to avoid, adapt or tolerate the impact. Recoverability: The receptor is anticipated to recover immediately (seconds to days). Value: The receptor is of local value.

MAGNITUDE OF IMPACT

10.5.7 The criteria for defining the magnitude within the Fish and Shellfish EIA chapter are outlined in **Table 10-6**. Where an impact could reasonably be assigned to more than one level of magnitude, professional judgement will be used to determine which level is applicable.

Table 10-6: Magnitude of impact criteria for fish and shellfish.

Magnitude	Definition
High	Extent: Impact across the near-field and far-field areas beyond the study area. Duration: The impact is anticipated to be permanent or long term (>5 years). Frequency: The impact will occur constantly throughout the relevant project phase. Consequences: Permanent changes to key characteristics or features of the particular environmental aspect's character or distinctiveness
Medium	Extent: The maximum extent of the impact is restricted to the far-field (i.e., the defined study area). Duration: The impact is anticipated to be medium term (1-5 years). Frequency: The impact will occur constantly throughout a relevant project phase. Consequences: Noticeable change to key characteristics or features of the particular environmental aspect's character or distinctiveness.
Low	Extent: The maximum extent of the impact is restricted to the near-field and adjacent far-field areas. Duration: The impact is anticipated to be short term (< 1 year).

Magnitude	Definition
	Frequency: The impact will occur frequently throughout a relevant project phase. Consequences: Barely discernible to noticeable change to key characteristics or features of the particular environmental aspect's character or distinctiveness.
Very Low	Extent: The maximum extent of the impact is restricted to the near-field. Duration: The impact is anticipated to be momentary (seconds to minutes) to brief (lasting less than one day). Frequency: The impact will occur once or infrequently throughout a relevant project phase. Consequences: No discernible to barely discernible change to key characteristics or features of the particular environmental aspect's character or distinctiveness.

SIGNIFICANCE OF EFFECT

10.5.8 The significance of the effect upon fish and shellfish receptors will be determined by taking into account the sensitivity of the receptor and the magnitude of the impact. Effects may be either negative (adverse) or positive (beneficial) and are defined initially without mitigation. Where the resulting effect comprises a range of significance levels, the final assessment for each effect will be based upon expert judgement.

10.5.9 Residual effects that are classified as moderate or above are considered to be 'significant' in EIA terms; however, professional judgement is applied for moderate effects. Residual effects classified as slight or below are considered to be 'not significant'.

10.5.10 The following terms have been used to define the significance of the effects identified:

- **Major Effect:** Project could be expected to have a considerable effect (either positive or negative) on fish and shellfish receptors;

- **Moderate Effect:** Project could be expected to have a noticeable effect (either positive or negative) on fish and shellfish receptors;
- **Minor Effect:** Project could be expected to result in a small, barely noticeable effect (either positive or negative) on fish and shellfish receptors; and
- **Negligible:** where no discernible effect is expected as a result of the Project on fish and shellfish receptors.

Table 10-7: Significance of effect criteria for the fish and shellfish assessment.

		Receptor Sensitivity			
		High	Medium	Low	Very Low
Magnitude of Change	High	Major	Major	Major or Moderate	Moderate or Minor
	Medium	Major or Moderate	Major or Moderate	Major or Moderate	Minor
	Low	Moderate or Minor	Moderate or Minor	Minor	Minor
	Very Low	Minor or Negligible	Minor or Negligible	Negligible	Negligible

10.6 BASELINE CONDITIONS

DATA INFORMATION SOURCES

10.6.2 An initial desk-based review has been undertaken of publicly available data sources outlined in **Table 10-8** to determine the baseline characteristics of the fish and shellfish present within the Study Area and to inform the assessment process.

Table 10-8: Key sources of fish and shellfish data

Source	Date	Summary	Coverage of Study Area
National Fish Populations Database (NFPD): Transitional and coastal water fish	1981 to 2024	Fish species caught during beam trawl, otter trawl and seine net surveys	Full

Source	Date	Summary	Coverage of Study Area
surveys (Environment Agency (EA), 2024a)		within and outside the Mersey Estuary.	
NFPD: Freshwater fish surveys (EA, 2024b)	1975 - 2024	Dataset on diadromous fish species presence from EA monitoring work across England from 1975 to 2024.	Tributaries associated with the Mersey Estuary
UK sea fisheries annual statics (MMO, 2024)	2022	Commercial fisheries landings statistics by port and ICES rectangle.	Full
A data product derived from Northeast Atlantic groundfish data from scientific trawl surveys 1983-2020 (Lynam and Ribeiro, 2022)	1983 - 2020	Collated data set of scientific beam and otter trawls.	Full
Long-term insights into marine turtle sightings, strandings and captures around the UK and Ireland (Botterell *et al*., 2020)	1910 - 2020	Records of marine turtle sightings, strandings and captures.	Full
Mersey gateway pre-construction	2012 - 2013	Results from beam trawls, seine nets and epifaunal dredges conducted	Mersey Estuary

Source	Date	Summary	Coverage of Study Area
monitoring (APEM, 2014)		in the Mersey as part of the Mersey Gateway project.	
Mersey gateway pre-construction monitoring (APEM, 2012)	2012	Results from beam trawls, seine nets, epifaunal dredges and fish traps conducted in the Mersey Estuary as part of the Mersey Gateway project.	Mersey Estuary
Burbo Bank Extension. Environmental statement Volume 2 – Chapter 13: Fish and Shellfish Ecology (DONG Energy, 2013)	2011	Results from beam and otter trawls conducted at Burbo Bank during May and September 2011.	Partial
Spawning and Nursery Grounds Layers for Selected Fish in UK Waters in 2010 (Ellis *et al*., 2012)	2010	Informs overlap of spawning and nursery grounds of key species with the Study Area.	Full
Intertidal fish and mobile epifauna baseline surveys (APEM, 2011)	2010	Results of fyke and seine net surveys conducted throughout the Mersey Estuary as part of the Mersey	Mersey

Source	Date	Summary	Coverage of Study Area
		Tidal Power feasibility study.	
Aquatic ecology surveys Autumn 2009 Baseline Report (APEM, 2010)	2009	Results of beam trawl and dredge surveys conducted throughout the Mersey Estuary as part of the Mersey Tidal Power feasibility study.	Mersey
The Marine Conservation Society Basking Shark Watch 20-year report (1987-2006) (Bloomfield and Solandt, 2006)	1987 - 2006	Basking shark public sightings	Full
Burbo Bank ES Chapter 5: Biological environment (SeaScape Energy ltd, 2002)	2002	Results from 15 beam trawls conducted as part of pre-construction surveys for Burbo Bank Offshore Wind Farm (OWF)	Partial
Fisheries spawning and nursery areas 'Fishery Sensitivity Maps in British Waters' GIS Layers for 1998 (Coull *et al*. 1998)	1998	Informs overlap of spawning and nursery grounds of key species with the Study Area	Full

EXISTING BASELINE

10.6.3 This section describes the present conditions which constitute the existing baseline environment for fish and shellfish within the Study Area.

10.6.4 The Project is situated on the River Mersey, between the Wirral to the west and Liverpool to the north-east, and is a highly industrialised and urban location, with an existing baseline level of anthropogenic activity and disturbance related to this, including that associated with shipping and foot traffic from the general public. The habitats within and adjacent to the River Mersey Estuary, River Dee Estuary, Liverpool Bay and Irish Sea in the vicinity of the Project have experienced disturbance from many decades of major development, both onshore and offshore. There are four offshore windfarms in operation within the Irish Sea in the vicinity of the River Mersey Estuary, including Burbo Bank (including Extension) (<10km north-west), Gwynt y Môr (<30km west), North Hoyle (<30km west), Rhyl Flats (<40km west) and four further offshore windfarms within the same area of the Irish Sea, including West Duddon of Sands (<60km north-west), Barrow (<60km north-west), Walney (inc. extension) (<70km north-west) and Ormonde Wind Farm (<75km north-west). All of these offshore windfarms have been constructed in the last 25 years. In addition, two further offshore windfarms, Morecambe (<55km north-west) and Morgan (<80km north-west) are proposed. Significant major development has been undertaken within the River Mersey Estuary, including the Liverpool Cruise Terminal, completed in 2007, Mersey Gateway Bridge, completed in 2017, and several major developments either proposed or underway, including the Liverpool Waters (inc. Everton Stadium) and Wirral Waters.

10.6.5 Fish communities within estuarine environments, such as the Mersey Estuary, are strongly influenced by natural processes, such as variability in salinity, temperature and turbidity, and availability of suitable habitats (Martino and Able, 2003). Estuarine fish can be broadly categorised into the following functional groups (Elliott *et al*., 2007):

- **Marine species** – Those typically found (and live and breed) within fully marine environments but may occur within estuaries in low numbers (marine stragglers) or within estuaries in large numbers during particular life stages (in particular as juveniles) (marine migrants). For example, whiting (*Merlangius merlangus*), Atlantic herring (*Clupea harengus*) and European bass (*Dicentrarchus labrax*).
- **Estuarine species** – Species typically found within estuarine environments for their whole life cycle. For example common goby (*Pomatoschistus microps*).
- **Diadromous species** - Species that migrate between marine and freshwater environments comprising; anadromous (migrating from the sea into freshwater to

breed) and catadromous (migrating from freshwater into the sea to breed) species. For example, European eel (*Anguilla Anguilla*) and Atlantic salmon (*Salmo salar*).

- **Freshwater species** – Species typically found within freshwater environments but can be found in low numbers within estuaries in areas of low salinity (migrants) or limited to upper reaches of estuaries (stragglers). For, example, three-spined stickleback (*Gasterosteus aculeatus*).

10.6.6 The Project is located near to the mouth of the Mersey Estuary, which is characterised by estuarine species (those typically found within estuaries), marine species (stragglers and migrants) and diadromous species. It should also be noted that the Mersey Estuary is a highly developed area, with numerous docks, shipyards and sewage effluents. The Mersey Estuary has a long history of poor water quality, with pollution issues still existing (Hawkins et al., 2020; Alldred et al., 2024).

Marine and Estuarine

10.6.7 Benthic and demersal fish species of commercial importance within the Mersey Estuary include, whiting, plaice (*Pleuronectes platessa*), flounder (*Platichthys flesus*), dab (*Limanda limanda*), cod (*Gadus morhua*), lesser sandeel (*Ammodytes tobianus*), sole (*Solea solea*), pouting (*Trisopterus luscus*) and European bass (*Dicentrarchus labrax*) (Mersey Gateway Project, 2008; APEM, 2011; EA, 2024a). Pelagic species of commercial importance include sprat (*Sprattus sprattus*) and herring (APEM, 2010; 2011; 2012; 2014; EA, 2024a). Additionally, there are many species of fish with little commercial value including sea-snail (*Liparis liparis*), bullrout (*Myoxocephalus scorpius*), solenette (*Buglossidium luteum*) and sand goby (*Pomatoschistus minutus*) (EA, 2024a). Sprat, whiting, plaice and flounder were particularly abundant during otter trawls, beam trawls and seine nets conducted in the Mersey Estuary between 2002 and 2023 as part of the EA Transitional and Coastal waters (TraC) data set (EA, 2024a). Freshwater migrants and stragglers are also present in the Upper Mersey Estuary (Off Runcorn) and include common bream (*Abramis brama*), roach (*Rutilus rutilus*) and three-spined stickleback (APEM, 2011).

10.6.8 Beam and otter trawls conducted between 2002 and 2019 outside of the Mersey Estuary recorded similar species to those found in the lower reaches of the Mersey, with an abundance of dab, sole, flounder and whiting (SeaScape Energy Ltd, 2002; DONG Energy, 2013; Lynam and Ribeiro, 2022; EA, 2024). Additional species observed included scaldfish (*Arnoglossus laterna*), lesser weaver (*Echiichthys vipera*), Raitt's sand eel (*Ammodytes marinus*) and tub gurnard (*Trigla lucerna*).

Elasmobranchs

10.6.9 Elasmobranchs are fish whose skeletal structure comprises of cartilage. Elasmobranch species recorded within the Mersey Estuary include thornback ray (*Raja clavata*), with species recorded outside the Mersey Estuary and within the Study Area including small spotted catshark (*Scyliorhinus canicula*), blonde ray (*Raja brachyura*), spotted ray (*Raja montagui*) and nursehound (*Scyliorhinus stellaris*) (DONG Energy, 2013; Lynam and Ribeiro, 2022; EA, 2024).

10.6.10 There are no records of basking sharks within the Mersey Estuary, with sparse records within the study area between 1987 and 2016, restricted to a small number of records off Prestatyn and Southport between 1987 and 2016 (Bloomfield *et al*., 2006; Pikesley *et al*., 2024), and one record off Prestatyn between 2016 and 2020 (Pikesley *et al*., 2024). However, high densities of over 100+ sightings have been recorded around the Isle of Man (approx. 100 km from Mersey Estuary entrance) between 1987 – 2016 (Bloomfield *et al*., 2006; Witt *et al*., 2012).

Diadromous

10.6.11 Diadromous species present within the Mersey Estuary include European eel, European smelt (*Osmerus eperlanus*), river lamprey (*Lampetra fluviatilis*), sea lamprey (*Petromyzon marinus*), Atlantic salmon and sea trout (*Salmo trutta*).

10.6.12 Records exist of European eel throughout the Mersey Estuary and associated tributaries (Perkins, 2020; EA, 2024a, 2024b). The European eel is a catadromous species with the majority of individuals spending their adult lives in freshwater and migrating from these rivers between August to December to spawn in the Sargasso Sea (Ginneken and Maes, 2005; Righton *et al*., 2016). European eels (elvers) return to rivers between February to May (**Table 10-9**). Some yellow eels may also remain in estuarine and coastal environments for their adults lives.

10.6.13 Both river lamprey and sea lamprey spawn and spend their larval stage in freshwater and complete their life cycle in the marine environment. Sea lamprey tend to spawn from May to June, while adult river lamprey migrate upstream between October and March ahead of their spring spawning period and migrate downstream as juveniles between October and March (Maitland, 2003; Perkins, 2020). Sea lamprey have been identified in the River Mersey during environmental DNA (eDNA) surveys between 2018 and 2019 (Perkins, 2020). River lamprey have been reported in the Mersey Estuary in 2002 (EA, 2024a), River Gowy (Approx. 2.5 km South of Mersey Estuary) between 2002 and 2005 (EA, 2024b), and the River Mersey between 2018 and 2019 (Perkins, 2020). Both of the migratory lamprey species are Annex II qualifying features of the Dee Estuary SAC.

10.6.14 Atlantic salmon and sea trout are anadromous spending the first 1 – 6 years of their life in freshwater before migrating out to sea between April and June, returning to freshwater in September to November to spawn (Aas, *et al*., 2011; Perkins, 2020). Whilst the River Mersey is not a reported salmon river, Atlantic salmon have been recorded upstream in the Weaver Lower (Approx. 17.5 km from Study Area), Bollin Dean Mersey Upper (32 km East), and Goyt Etherow Tame (42 km East) catchments between 2006 and 2011 (EA, 2024b), and River Mersey during eDNA surveys between 2018 and 2019 (Perkins, 2020) and trap surveys at Woolston Weir between 2011 and 2013 (Billington, 2015). Salmon are widely distributed within the River Dee and are an Annex II qualifying feature of the Dee and Bala Lake SAC. Records exist of sea trout throughout the Mersey Estuary and associated tributaries (Perkins, 2020; EA, 2024a; 2024b).

10.6.15 European smelt is an anadromous fish that congregates in large shoals near river mouths in winter before migrating upstream to lower rivers between February and April to spawn (Barnes, 2008). This species was identified in the Mersey Estuary in 2003 and 2007 (EA, 2024a) and is a designated feature of the Ribble Estuary MCZ.

10.6.16 There are no records of twaite shad (*Alosa fallax*) or allis shad (*Alosa alosa*) occurring within the Mersey Estuary or associated tributaries, however both species have been recorded in the River Dee and Dee Estuary (RSK, 2023).

Table 10-9: Diadromous species key sensitivity

	Jan		Feb		Mar		Apr		May		Jun		Jul		Aug		Sep		Oct		Nov		Dec	
Adult salmon migration																								
Salmon smolt emigration																								
Sea lamprey immigration																								
Sea lamprey transformer emigration																								
River lamprey immigration																								
River lamprey transformer emigration																								

	Jan		Feb		Mar		Apr		May		Jun		Jul		Aug		Sep		Oct		Nov		Dec	
Glass eel/elver u/s migration																								
Silver eel d/s migration																								
Yellow eel residence																								

u/s = Upstream migration and d/s = Downstream migration.

Shellfish

10.6.17 Shellfish is an informal term used for species that bear an exoskeleton, and usually refers to species of mollusc and crustacean. Shellfish species present within the Mersey Estuary are typical of estuarine environments (i.e. those that are adapted to reduced and variable salinity). Species of shellfish recorded within the Mersey Estuary include blue mussel *(Mytilus edulis*), soft-shell clams *(Mya aranaria),* shore crabs *(Carcinus maenas*), mysids (*Neomysis integer*), and brown shrimp (*Crangon crangon*) (Connor *et al*., 2001; Stentiford and Feist, 2005; APEM, 2010; 2011; 2012; 2014; Siegenthaler *et al*., 2017).

10.6.18 Outside of the Mersey Estuary, along Liverpool Bay, shellfish species recorded include cockles (*Cerastoderma edule*), blue mussel, clams (various species) and razor clams (*Ensis* sp.) (EA, 2005; Centre for Environment, Fisheries and Aquaculture Science, 2013). Shellfish of commercial importance outside the Mersey Estuary and within the study area (ICES rectangles 35E6 and 36E6) include brown crab (*Cancer pagurus*), lobster (*Hommarus gammarus*), queen scallop (*Aequipecten opercularis*), king scallop (*Pecten maximus*) and whelks (*Buccinum undatum*) (MMO, 2024).

10.6.19 Invasive Non-Native shellfish species identified within the Mersey Estuary include American jackknife (*Ensis leei*), American slipper limpet (*Crepidula fornicata*), Chinese mitten crab (*Eriocheir sinensis*), Pacific oyster (*Magallana gigas*) and soft-shell clam (**Chapter 5: Invasive Non-Native Species**).

Spawning and nursery grounds

10.6.20 Coull *et al*. (1998) and Ellis *et al*. (2012) provide spatially explicit maps of spawning and nursery grounds for selected species.

10.6.21 Spawning grounds are defined as areas whereby individuals produce eggs. The Study Area overlaps with spawning grounds for cod, mackerel, plaice, sandeel, sole, whiting and sprat (**Figure 10.2 to 10.4**). Spawning grounds for ling occur

approximately 30 km Northwest of the Mersey Estuary entrance (**Figure 10.3**). Spawning periods for these species are presented in **Table 10-10** below.

Table 10-10: Spawning periods for key species. Peak spawning denoted by dark blue.

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Cod												
Mackerel												
Plaice												
Sandeel												
Sole												
Whiting												
Sprat												
Ling												

10.6.22 Nursery grounds are defined as areas occupied by young fish or shellfish. The Study Area overlaps with nursery grounds for herring, plaice, sole, whiting, anglerfish, cod, sandeel, spotted ray, thornback ray and tope (*Galeorhinus galeus*) (**Figure 10.2**). Nursery grounds for mackerel and spurdog (*Squalus acanthias*) occur approximately 30 km Northwest of the Mersey Estuary entrance (**Figure 10.2 and 10.5**).

10.6.23 It should also be noted that the Dee estuary is designated as a Bass Nursery Area with The Bass (Specified Areas) (Prohibition of Fishing) Order 1990 prohibiting fishing for bass by any fishing boat within this area (Hyder *et al*., 2018).

Marine turtles

10.6.24 Across the UK and Ireland, six species of marine turtle have been recorded, however only the leatherback turtle (*Dermochelys coriacea*) is considered to frequent British waters on a seasonal basis, with records across Irish waters and the West coast of the UK (Botterell *et al*., 2020). Records of leatherback turtle are sparse across Liverpool Bay and therefore the Study Area is unlikely to be of importance to this species (Hayhow, 2004; Botterell *et al*., 2020).

Conservation Importance

10.6.25 Marine and estuarine fish species that may be present within the Study Area that are listed in Section 41 of the NERC act include lesser sandeel (*Ammodytes marinus*), herring, cod, monkfish (*Lophius piscatorius*), whiting, European hake (*Merluccius merluccius*), ling (*Molva molva*), plaice, mackerel, sole and horse mackerel (*Trachurus trachurus*). Additionally, cod, spotted ray, spurdog and thornback ray are listed on the OSPAR list of threatened and/or declining species and habitats.

10.6.26 Several of the migratory species are of conservation importance. Sea lamprey, river lamprey and Atlantic salmon are listed on Annex II of the Habitats Directive (Council Directive 92/43/EEC), with European eel, European smelt, Atlantic salmon, sea trout, river lamprey and sea lamprey being listed in Section 41 of the NERC act. Additionally, European eel are listed as 'Critically Endangered' on the International Union for Conservation of Nature (IUCN) Red List of Threatened Species and are protected under the European Eel Regulation (European Commission) No 1100/2007, the Eels (England and Wales) Regulations 2009, Annex II of CITIES, Annex II of the Bonn Convention and Annex B of the European Union and Trade in Wild Fauna and Flora. River and sea lamprey are also listed on Appendix I and II of the Bern convention, Annex V of the Habitats Directive and Schedule 4 of the Conservation of Habitats and Species Regulations 2010.

10.6.27 Many elasmobranch species are listed on the IUCN Red List, with thornback ray, nursehound and blonde ray being listed as 'Near Threatened' in European waters, tope being listed as 'Vulnerable' and spurdog being listed as 'Endangered'. Lesser spotted catshark and blonde ray are both listed as 'Least Concern'.

10.6.28 Leatherback turtle is listed on the IUCN Red List as globally 'Vulnerable' and on Annex II and IV of the Habitats Directive. In addition, as a highly migratory species, leatherback turtle is protected under the CMS (Bonn Convention).

Designated Sites

10.6.29 All designated sites with fish and shellfish features within the Study Area are set out in **Table 10-11** and **Figure 10.6**.

10.6.30 Several sites designated for diadromous species occur within the Study Area, including The Dee Estuary SAC, The River Dee and Bala Lake SAC and the Ribble Estuary MCZ

10.6.31 Shellfish water protected areas are designated for the protection of shellfish growth and production under Regulation 9 of the Water Environment (WFD) Regulations

2017. Several shellfish water protected areas occur within the Study Area including Dee (East), North Wirral (west), North Wirral (East) and Ribble.

Table 10-11: Designated sites within the Study Area.

Site	Distance to Proposed Development (km)	Relevant Qualifying Interest features
SACs		
The Dee Estuary	0.0	Sea lamprey (*Petromyzon marinus*) River lamprey (*Lampetra fluviatilis*)
The River Dee and Bala Lake	10.8	Sea lamprey (*Petromyzon marinus*) River lamprey (*Lampetra fluviatilis*) Bullhead (*Cottus gobio*) Brook lamprey (*Lampetra planeri*) Atlantic salmon (*Salmo salar*)
SSSIs		
River Dee / Afon Dyfrdwy	10.8	Sea lamprey (*Petromyzon marinus*) River lamprey (*Lampetra fluviatilis*) Bullhead (*Cottus gobio*) Brook lamprey (*Lampetra planeri*) Atlantic salmon (*Salmo salar*) Freshwater pearl mussel (*Margaritifera margaritifera*) Grayling (*Thymallus thymallus*)

Site	Distance to Proposed Development (km)	Relevant Qualifying Interest features
MCZs		
Ribble Estuary	24.3	European smelt (*Osmerus eperlanus*)
Shellfish water protected areas		
North Wirral (East)	0.88	Shellfish
North Wirral (west)	5.2	Shellfish
Dee (East)	14.0	Shellfish
Ribble	26.4	Shellfish

10.7 FURTHER DATA COLLECTION

10.7.1 Review of the existing fish and shellfish data identified a need for additional survey work to supplement existing baseline information. An extensive fish survey programme has been developed to inform the Project, taking into account comments as part of informal stakeholder engagement, 1:1s and Marine Licence consultation responses as outlined in **Table 10-12**. The proposed survey programme will provide further characterisation of the fish and shellfish community within the Survey Area as well as providing information to inform the EIA assessment, particularly with respect to nearfield effects.

10.7.2 Desk based review of existing data sets, as outlined in **Table 10-8** will be utilised to characterise the fish and shellfish community within the wider Study Area and to inform the EIA assessment of both near-field and far-field effects.

10.7.3 It should be noted that an information request will be made to the NW IFCA for the catch statistics from the commercial cockle and mussel fisheries to inform the EIA

assessment. Agreements are also intended to be put in place to access additional data sets as part of the ongoing EIA process.

Table 10-12: Surveys proposed for the characterisation of fish and shellfish baseline

Surveys Proposed	Justification
Multi-method intertidal and shallow subtidal fish surveys (Seine nets, fyke nets and beam trawls)	Characterisation of marine, estuarine and diadromous fish species present including providing seasonal Catch Per Unit Effort (CPUE) and length-frequency distributions. Provide information on fish habitat utilisation and residence of migratory fish species (e.g. yellow eels) among others. Intertidal and shallow subtidal fish surveys will be undertaken quarterly over a 1-2 year period. Methodology will be WFD complaint and will consist of: ■ Up to 11 seine net survey locations using a 43 m long x 4 m deep seine net, with 14 mm knotless mesh on the wings and 6.5 mm knotless mesh on the central panel. Seine nets will be deployed and hauled on low slack water. ■ Up to 7 fyke net survey locations using double-ended Dutch 'D' type fyke nets (2 x 5.3 m long fyke nets, with a D shaped opening, 100 cm height, 10 m leader and 14 mm mesh). ■ Up to 10 beam trawl locations using a 1.5 m wide, 0.45 m high trawl with a 20 mm mesh and 5 mm cod end, towed at a constant speed of 3 knots for 200 m.
Subtidal ichthyoplankton sampling	Characterisation of ichthyoplankton to determine spawning activity and juvenile usage of the estuary. Provide seasonal CPUE and length-frequency distributions.

Surveys Proposed	Justification
	Horizontal tows will be carried out at a speed of approximately 3-5 knots using a Gulf sampler (net mesh 280 µm) at up to 7 survey locations on a quarterly basis.
Shellfish logbooks	A shellfish logbook scheme, where engagement with fishermen will take place to inform shellfish landings within the study area, has been proposed to inform the presence of shellfish species. The scope of the shellfish surveys is yet to be determined and will be informed by desk based analysis and consultation. Further engagement will be undertaken with the relevant consultees (i.e. NW-IFCA) to agree approach.
Fin clips	To inform population genetics of salmon, smelt and bass. Where possible, fin clips will be collected (where licensable) from migratory salmonids, smelt and bass when-ever these species are caught during any of the above surveys. It should be noted that the taking of fin-clips from live fish for a scientific purpose (e.g. population genetics) is a regulated scientific procedure under the Animals (Scientific Procedures) Act 1986. To undertake this regulated procedure, the organisation or University undertaking the population genetics research will need to hold a Home Office Establishment licence and Project Licence to cover fin-clipping in the field.
Subtidal epibenthic trawl*	Characterisation of epibenthic species, including benthic fish and shellfish species. Provide seasonal CPUE and length-frequency distributions.
Seabed sediment grab sampling*	Particle Size Analysis (PSA) of collected sediment samples will be used to inform suitability of the

Surveys Proposed	Justification
	area for sandeel and herring spawning and/or presence.

*denotates part of habitat survey scope with information also being utilised to characterise fish and shellfish baseline environment

10.7.4 Sandeel have very specific habitat requirements for medium to coarse sand with little mud and gravel content (Wright *et al*., 2000; Holland *et al*., 2005; Latto *et al*., 2013). Muddy sediments are widespread in the Mersey Estuary and therefore sandeel are not expected to be present within the Estuary in large numbers. Sandeel presence can be inferred via distribution mapping of sandeel habitat preferences from project-specific Particle Size Analysis (PSA) data (Latto *et al*., 2013). No project-specific surveys are therefore, proposed for sand eels and existing data sources from desk-based reviews will be used where required.

10.7.5 Beach seine and beam trawl methods are able to catch pelagic species as demonstrated during recent collaborative work (surveys August and October 2023) between Environment Agency and MTP for WFD classification using beam trawl and beach seine at New Brighton, Wirral. The multi-method fish sampling approach is considered to be sufficient to characterise the general fish assemblage of the survey area for the purposes of the fish ecology environmental assessment. It is therefore, considered that no further project-specific pelagic fish survey methods are required and as such otter trawls are not proposed as part of the planned project-specific survey programme.

10.7.6 Available information on elver and glass eel populations within the North West River Basin District (RBD) will be investigated further during future environmental assessment stages and if deemed required targeted monitoring will be considered. Targeted monitoring will aim to investigate population size and migratory periods for juvenile European eel. Should elver/glass eel monitoring become a requirement, it is likely to take the form of the deployment of traps at suitable weir locations within the RBD with monitoring undertaken during the key juvenile migration period between March and August.

10.8 FUTURE BASELINE

10.8.1 The EIA process will consider the existing baseline conditions within the Study Area, and future baseline conditions (as far as reasonably practical). This will include consideration of the possibility of further marine protected areas becoming

designated over the lifetime of the project as well as climate change and water quality effects.

10.8.2 The baseline environment will exhibit some degree of natural change over time, even if the tidal barrage was not to proceed. A key consideration in assessing the future baseline conditions is the influence of climate change and changes in water quality (in particular temperature and dissolved oxygen) on fish and shellfish communities. Climate change has the potential to alter fish and shellfish species distribution and abundance as well as community composition and population dynamics. For example, alterations may include; timing of spawning, growth and maturation as well as migratory cues (Heath *et al*., 2012).

10.8.3 Improvements to the environment will also be expected over the lifetime of the tidal barrage through measures such as the Water Framework Directive (WFD). The WFD requires all waterbodies to achieve 'Good' overall status, or to experience no deterioration in status or potential status. It is expected that the WFD legislation will drive future improvements in the ecological and chemical quality of waterbodies.

10.8.4 The future baseline will be defined for the purposes of the EIA by taking into consideration the projected future baseline (i.e. the theoretical situation that would exist if the Project was not to proceed) where possible. For example, predictable changes such as climate change and water quality, or changes that can be expected based on reasonable assumptions and modelling calculations.

10.9 BASIS FOR SCOPING ASSESSMENT

10.9.1 The Fish and Shellfish scoping assessment is based on the indicative parameters set out in **Chapter 2: Site Context and Project Description**:

10.9.2 The source-pathway-receptor linkage between the tidal barrage and / or activities and the receptor groups for this aspect are described in **Table 10-14**.

10.10 EMBEDDED ENVIRONMENTAL MEASURES

10.10.1 Embedded mitigation measures have been identified and are proposed to be adopted as part of the evolution of the Project design (embedded into the Project design). These measures will evolve over the development process as the EIA progresses and in response to consultation. They will be fed iteratively into the assessment process. These measures typically include those that have been identified as good or standard practice and include actions that would be undertaken to meet existing legislation requirements.

10.10.2 As there is a commitment to implementing these embedded measures, and also to various standard sectoral practices and procedures, they are considered inherently part of the design of the Project and have, therefore, been considered in the scoping assessment.

10.10.3 In addition to the specific embedded mitigation measures relevant to fish and shellfish listed in **Table 10-13**, consultation will be undertaken with all relevant consultees.

10.10.4 A schedule of Commitments will be presented as part of the ES. This will inform the Construction Environmental Management Plan (CEMP) which will be prepared prior to commencement of construction works. The controls and measures within the CEMP will be implemented to mitigate against impacts during the construction phase.

10.10.5 There are additional (Secondary) environmental measures which could be embedded into the Project to reduce or prevent Likely Significant Effects upon fish and shellfish receptors. These measures have not been considered within the scoping of Likely Significant Effects within this Chapter and are not presented as commitments at this stage but will be explored as part of the evolution of the Project Design. These measures can be split into three categories; project design optimisation, construction (prevent and reduce) measures and operation (prevent and reduce) measures.

Project Design Optimisation

10.10.6 There are a number of project design optimisation measures that could be considered as part of the Design Envelope evolution which could reduce effects upon fish. These are briefly summarised below and would require further consideration post-scoping;

- Mode of operation and periods of generation vs sluice operation;
- Turbine optimal design to maximise fish passage survival rates e.g. blade thickness, gaps and clearances and turbine structural alignments;
- Efficiency of turbine operation through optimal hydraulic design;
- Permeability of the structure and areas of free passage; and
- Operational regime modifications during key sensitive periods.

Construction Measures

10.10.7 In addition to the embedded measures presented in **Table 10-13** other measures to reduce construction impacts will be considered such as reducing the emission of

underwater noise and vibration, for example via refinement of construction parameters.

Operation Measures

10.10.8 Additional measures to prevent and reduce effects may also be considered such as the use of; behavioural deterrents (e.g. Acoustic Fish Deterrents (AFDs), lights, bubble curtains, early warning systems and predator control. These measures among potentially others will be explored as part of the future environmental assessment stages of the Project.

Table 10-13: Relevant fish and shellfish embedded environmental measures

ID	Mitigation Measures embedded into the project design	How the measure will be secured
OM7	Vessel Management Plan (VMP)	A VMP will be developed and adhered to during the construction of the Project. The VMP will confirm the types and numbers of vessels that will be engaged on the Project and consider vessel coordination including indicative transit route planning. As part of the VMP a Code of Conduct will be issued to all vessel operators to advise on how to avoid impacts upon fish and shellfish, including reducing risk of INNS introduction.
OM1	Construction Environmental Management Plan (CEMP)	A CEMP will be developed and adhered to during the construction phase of the Project. A Marine Pollution Contingency Plan (MPCP) and an invasive non-native species management plan will form part of the CEMP. The MPCP provides details of procedures to protect personnel working and to safeguard the marine environment and mitigation measures in the event of an accidental pollution event arising during the construction phase that could have an effect on fish and shellfish receptors.

10.11 LIKELY SIGNIFICANT EFFECTS

10.11.1 In line with the EIA Regulations 2017, the EIA for the Project will consider those impacts where there is a risk of a likely significant effect only. The following Section

draws on industry experience and expertise to identify those effect-receptor pathways that may potentially lead to a significant impact. Where experience and available evidence indicates an effect-receptor pathway will not lead to a significant impact with regards to the EIA Regulations 2017 the pathway is scoped out from assessment.

10.11.2 The scoping assessment is based on a combination of the Project definition at the scoping stage, embedded environmental measures, understanding of current baseline conditions, the evidence base for fish and shellfish, the identification of potentially impacted receptors, and professional judgement. The approach to this assessment is set out in **Chapter 3: Approach to EIA**.

10.11.3 The early identification of likely significant effects is used here as a tool aimed at delivering a proportionate approach to the EIA. In doing so, it sets out a high-level assessment of all potential effects, significant or not. The basis for scoping out certain effects, and therefore no longer considered is presented below, supported by evidence base. Effects scoped in can be found in **Table 10-14**.

Impacts Scoped out of Assessment

10.11.4 Potential effects of increased vessel numbers resulting in increased collision risk and increased noise levels have been scoped out from further assessment, resulting from a conclusion of no likely significant effect. These conclusions have been made based on the knowledge of the baseline environment and the nature of planned works on the potential for impact from such projects more widely, which indicate high levels of pre-existing vessel activities. The conclusions follow (in a site based context) existing best practice. Each scoped out effect is considered in turn below.

10.11.5 Increased vessel activities are only likely to impact upon those species which spend significant time at the surface while exhibiting stationary or slow-moving behaviours (i.e. basking sharks). All other surface or near surface dwelling species are highly mobile and are likely to be able to avoid vessels. The baseline section has determined that there is a low likelihood of basking shark occurring within the Mersey Estuary. Furthermore, existing vessel traffic within the Mersey Estuary is high, with Liverpool being the 3rd busiest UK port for commercial freight (**Chapter 16: Shipping and Navigation**). Therefore this impact has been scoped out from further assessment during all phases of the project and all potential effects on basking shark have been scoped out from further assessment.

10.11.6 Underwater noise generated from vessels is likely to be low and effects would only occur if fish remained within immediate vicinity of the vessel (i.e. within metres) for a number of hours which is highly unlikely, as fish will move away from any noise. Furthermore, existing vessel traffic within the Mersey Estuary is high (**Chapter 16:**

Shipping and Navigation) and the increase in vessel activity as a result of the Project is unlikely to significantly increase baseline noise levels. Therefore, underwater noise as a result of increased vessel activities has been scoped out from further assessment during all phases of the project.

10.11.7 Potential effects on marine turtle receptors have been scoped out from further assessment, due to the low likelihood of marine turtles occurring within the study area.

Table 10-14: Likely significant fish and shellfish effects

Source	Pathway	Receptor	Project Phase	Embedded Measures	Scoped in or scoped out	Justification	Data collection & analysis to characterise the baseline
Dredging, pilling, removal of cofferdams, removal of tidal barrage	Increased levels of suspended sediments and sediment deposition/erosion	Estuarine/ marine species Diadromous species Elasmobranchs Shellfish	C O&M D	CEMP	In – all receptors	Increased levels of suspended sediments and sediment deposition/erosion have the potential to cause a smothering effect on stationary receptors (i.e. eggs, bivalves) and spawning grounds, and to alter fish and shellfish behaviour or expose supporting habitats through erosion.	Site specific surveys to characterise fish and shellfish assemblage and area usage. Modelling of suspended sediment and deposition to ascertain concentrations of suspended sediments, depths of sediment deposition/erosion and extent.
Dredging	Entrainment from draghead	Estuarine/ marine species Diadromous species Shellfish	C O&M D	CEMP	In – benthic species	Suction of water through the draghead during dredging could impact on buried fish such as overwintering sandeel. A range of	Assessment of areas of sandy sediment, benthic fish community potentially at risk & review of published data on entrainment

Source	Pathway	Receptor	Project Phase	Embedded Measures	Scoped in or scoped out	Justification	Data collection & analysis to characterise the baseline
						dredging methods have been included within scope including water injection.	of fish through dragheads.
Pilling, dredging and armour placement	Increased underwater noise and vibration levels	Estuarine/ marine species Diadromous species Elasmobranchs Shellfish	C O&M D	CEMP & construction measures to reduce emission	In – all receptors	Construction, operation and decommissioning activities will result in the generation of underwater noise, which has the potential to cause mortalities, injuries and behavioural effects on fish and shellfish species.	Site specific surveys to characterise fish and shellfish assemblage and area usage. Underwater noise and vibration modelling interpretation based upon receptor sensitivity.
Vessel activities	Increased underwater noise and vibration levels	Estuarine/ marine species Diadromous species Elasmobranchs Shellfish	C O&M D	CEMP / VMP	Out – all receptors	Underwater noise generated from vessels is likely to be low and effects would only occur if fish species remained within immediate vicinity of the vessel (i.e. within	N/A

Source	Pathway	Receptor	Project Phase	Embedded Measures	Scoped in or scoped out	Justification	Data collection & analysis to characterise the baseline
						metres) for a number of hours.	
Vessel activities	Increased risk of collision with vessels	Estuarine/ marine species Diadromous species Elasmobranchs Shellfish	C O&M D	CEMP / VMP	Out – all receptors	Increased vessel activities are only likely to impact upon those species which spend significant time at the surface (i.e. basking sharks).	N/A
Presence of artificial lighting	Increased artificial light emissions	Estuarine/ marine species Diadromous species Elasmobranchs Shellfish	C O&M D	CEMP	In – all receptors	Temporary lighting used during construction and decommissioning, and permanent lighting used during operation may have behavioural effects upon fish and shellfish species.	Site specific surveys to characterise fish and shellfish assemblage and area usage. Lighting plan will be reviewed to assess risk & best practice adopted.
Tidal barrage	Barrier to migration, changes in migratory cues & passage routes	Estuarine/ marine species Diadromous species Elasmobranchs Shellfish	O&M	Project design optimisation, operation prevention & reduction measures	In – all receptors	The presence of the tidal barrage will alter, delay and/or prevent the migration of fish species.	Site specific surveys to characterise fish species. Hydrodynamic modelling to inform potential for impacts

Source	Pathway	Receptor	Project Phase	Embedded Measures	Scoped in or scoped out	Justification	Data collection & analysis to characterise the baseline
							upon freshwater release & exchange. Review of behavioural characteristics of fish species in subsequent EIA stages including Evidence Plan.
Turbines and sluice gates	Entrainment and injury from turbine and sluice structures	Estuarine/ marine species Diadromous species Elasmobranchs Shellfish	O&M	Project design optimisation, operation prevention & reduction measures	In – all receptors	Injury risk to fish from potential for collision with turbine & sluice structures, impacts from turbulence, hydraulic shear & sharp pressure changes.	Site specific surveys to characterise fish and shellfish assemblage and area usage. Collection of site specific data on fish characteristics and body measurements to inform modelling. Encounter and collision risk modelling.
Vessel activities, transfer of materials or equipment	Introduction of Invasive Non-Native Species (INNS)	Estuarine/ marine species Diadromous species	C O&M D	CEMP / VMP	In – all receptors	Introduction of INNS has the potential to occur via ballast release and vessel	Site specific surveys to characterise fish and shellfish assemblage and

Source	Pathway	Receptor	Project Phase	Embedded Measures	Scoped in or scoped out	Justification	Data collection & analysis to characterise the baseline
		Elasmobranchs Shellfish				hulls. Introduction and spread of INNS may result in increased predation of and out competition of native species.	area usage and identify any baseline INNS.
Vessel activities and equipment/machinery use	Change in water quality due to accidental pollution	Estuarine/ marine species Diadromous species Elasmobranchs Shellfish	C O&M D	CEMP / VMP	In – all receptors	Behavioural and physiological effects may result from the accidental release of pollutants from vessels and associated machinery.	Site specific surveys to characterise fish and shellfish assemblage and area usage
Pilling, dredging, armour placement, removal of cofferdams, removal of tidal barrage	Change in water quality due to mobilisation of contaminated sediments	Estuarine/ marine species Diadromous species Elasmobranchs Shellfish	C O&M D	CEMP	In – all receptors	Behavioural and physiological effects may result from the re-mobilisation of contaminated sediments.	Site specific surveys to characterise fish and shellfish assemblage and area usage. Sediment chemistry data alongside hydrodynamic and water quality modelling outputs.

Source	Pathway	Receptor	Project Phase	Embedded Measures	Scoped in or scoped out	Justification	Data collection & analysis to characterise the baseline
Tidal barrage	Permanent habitat loss/alteration, habitat fragmentation/ isolation	Estuarine/ marine species Diadromous species Elasmobranchs Shellfish	O&M	Project design optimisation and operation prevention & reduction measures	In – all receptors	The presence of infrastructure (i.e. tidal barrage) will result in the permanent loss of sedimentary habitats and alteration to those characterised by hard substratum. Tidal barrage may also result in changes in intertidal area extent with potential impacts upon fish habitat and prey availability.	Site specific surveys to characterise fish and shellfish assemblage and area usage Hydrodynamic modelling to ascertain changes in water level and intertidal area extent.
Pilling, Dredging, temporary cofferdams	Temporary habitat loss/modification, habitat fragmentation & isolation, changes to freshwater exchange & release	Estuarine/ marine species Diadromous species Elasmobranchs Shellfish	C, O&M, D	CEMP	In – all receptors	Maintenance activities (i.e. dredging) will result in the temporary loss of habitats. Potential for freshwater exchange & release from freshwater bodies to	Site specific surveys to characterise fish and shellfish assemblage and area usage. Areas of loss will be assessed in relation to overall habitat areas in the Study Area.

Source	Pathway	Receptor	Project Phase	Embedded Measures	Scoped in or scoped out	Justification	Data collection & analysis to characterise the baseline
						be impacted by works.	Hydrodynamic modelling to inform potential for impacts upon freshwater release & exchange.
Tidal barrage	Change in hydrodynamic regime, increase in suspended sediment & deposition, changes to freshwater exchange & release, changes to water quality as a result of alterations to hydrodynamics	Estuarine/ marine species Diadromous species Elasmobranchs Shellfish	O&M	CEMP	In – all receptors	The presence of the tidal barrage will result in alterations to current and wave regimes, which may cause alterations in supporting habitats, impact migratory & behavioural cues, changes in prey availability and behavioural effects.	Site specific surveys to characterise fish and shellfish assemblage and area usage. Hydrodynamic modelling to inform potential for impacts upon freshwater release & exchange.
Seabed cables	Creation of Electromagnetic Field (EMF) effects	Estuarine/ marine species Diadromous species Elasmobranchs Shellfish	O&M		In – all receptors	EMFs produced via operating cables have the potential to cause physiological and behavioural effects on fish and shellfish species.	Site specific surveys to characterise fish and shellfish assemblage and area usage.

Source	Pathway	Receptor	Project Phase	Embedded Measures	Scoped in or scoped out	Justification	Data collection & analysis to characterise the baseline
							Modelling of EMFs to determine intensity and extent. Review of sensitivity of receptors to EMF's.

Receptor Specific Modelling

10.11.0 Fish passage through, in particular turbines, may be a source of direct fish injury and mortality from a tidal range power scheme and consequently make a significant contribution to overall effects of a Project Development upon fish receptors in the vicinity. A tidal range power schemes will therefore, require the assessment of potential effects upon fish populations. The direct and indirect effects of fish turbine passage will be essential to assess quantitatively or qualitatively. There are effectively three components to understanding or modelling fish risk from a tidal power scheme; 1) The probability that fish become entrained and enter the turbine draft tube, 2) The probability that fish are killed or sustain mortal injury when passing through the turbine and draft tube and 3) The longer-term lethal and sub-lethal impacts of turbine passage on individuals and populations/stocks. These three model types are well used in UK power development assessments for both power stations and tidal power schemes. Model types have been used and developed in the UK over the last 20 years and have been applied to a number of tidal range power schemes including the Severn Tidal Power SEA Study and Swansea Bay Lagoon. Guidance documents are available outlining the methods and their application.

10.11.1 **Encounter Risk Modelling (ERM)** – The number of fish entrained will be a function of the density of fish upstream of the turbine and the probability that fish are within or enter the Entrainment Zone (EZ) when the turbine is operating. For mobile individuals, this probability is partly dependent on the size of the EZ, determined by flow fields upstream of the turbine and the swimming capability of fish to resist entrainment. Behavioural traits (avoidance or attraction) as well as residence/passage time in the vicinity of the Project Development, migratory paths and habitat utilisation will also affect the likelihood of fish being entrained. ERM for the Project Development will require correlation with the hydrodynamic modelling and the data acquired during site specific fish surveys.

10.11.2 **Collision Risk Modelling (CRM)** – The mechanisms by which fish are injured or killed during turbine passage are generally grouped into four categories; mechanical, pressure, shear, turbulence and cavitation. Each of these mechanisms can lead to direct mortality of a fish. Additionally, if injuries are not immediately lethal, fish may suffer delayed and indirect mortality sometime after passage through the turbine. For any given turbine the probability of a fish being injured, and the extent of any resulting injury, is dependent not only upon the species and life stage in question but also the route by which it passes through the turbine. Additionally, fish may be indirectly killed or suffer from non-lethal effects, as a result of disorientation, increased predation, delay to migration and sub-lethal stressors limiting the capacity for the normal activity of the fish including reproduction. A combination of

quantitative, semi-quantitative and qualitative modelling will be required to fully assess collision risk from the Project Development.

10.11.3 **Juvenile Fish Loss Assessment** - Juvenile fish are particularly vulnerable to being drawn into turbines due to their presence in inshore nursery areas and their small size, meaning they have relatively poor swimming capabilities. Because many fish species produce large numbers of offspring, mortality of larval and juvenile fish will not have the same effect on a population as removing the same number of adults would, due to the fact that many of the larvae and juveniles would never have survived to contribute to the spawning population. As part of the EIA there is likely to be a requirement to undertake a juvenile fish loss assessment to contextualise the impact of this loss on adult populations. The most appropriate contextualisation method for each species will depend on the functional guild, commercial exploitation, perceived primary ecological question to be answered and likely data available. Juvenile loss assessment will consider impacts at a stock/population level and the stock extent will consider the feeding range of bird species designated within nearby SPA and Ramsar sites as required.

10.11.4 **Dietary Equivalent Analysis** - Given the presence of piscivorous bird and marine mammal species in designated sites in the area, there is likely to be a requirement to assess the indirect effects of fish losses as a food resource for higher trophic level features. The method used for this determination is Dietary Equivalent Analysis (DEA) which uses bioenergetic modelling and dietary and demographic information to convert fish losses to the number of marine predators, or a proportion of the population, that would be sustained by the biomass of the fish prey had it not been lost.

10.11.5 **Population/Stock Modelling** – Assessment of individual impacts using the different identified techniques and modelling approaches assess point estimate effects upon different fish receptors rather than population level effects. Robust assessments of potential impacts at the population level are likely to be required to assess impacts on specific receptors, in particular on protected fish species. The presentation of impacts at population/stock level offers greater confidence in the development of quantitative impacts, particularly when the outputs are probabilistic and set against the observed natural variation in the fish populations/stocks.

10.12 CUMULATIVE EFFECTS

10.12.1 Cumulative effects on fish and shellfish resulting from the effects of the Project and other developments will be assessed in accordance with the guidance and methodologies set out in **Chapter 3: Approach to EIA.** Other developments will include those screened in as part of the CEA screening process.

10.12.2 The following impacts from the project have the potential to act cumulatively with impacts from other developments to contribute to cumulative effects:

- Increased levels of suspended sediments and sediment deposition;
- Increased underwater noise and vibration levels;
- Increased artificial light emissions;
- Barrier to migration;
- Entrainment and injury;
- Introduction of INNS;
- Changes in water quality;
- Permanent habitat loss and alteration;
- Temporary habitat loss;
- Change in hydrodynamic regime; and
- EMF effects.

10.13 TRANSBOUNDARY EFFECTS

10.13.1 Due to the localised nature of the potential impacts, transboundary effects are considered unlikely to occur and therefore transboundary effects have been scoped out of the assessment.

10.14 PROPOSED APPROACH TO ENVIRONMENTAL IMPACT ASSESSMENT

10.14.1 Further desk-based studies and site-specific surveys will be undertaken to identify and assess fish and shellfish receptors. This study will be supplemented with consultation with the relevant statutory and non-statutory organisations as necessary.

10.14.2 The fish and shellfish assessment will be undertaken in accordance with the methodology set out in **Chapter 3: Approach to EIA,** of the Scoping Report, in addition to the following established guidance: Guidelines for Ecological Impact Assessment in the UK and Ireland (CIEEM, 2018).

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11 COMMERCIAL FISHERIES

11.1 INTRODUCTION

11.1.1 The Commercial Fisheries chapter will consider the potential likely significant effects on commercial fisheries that may arise from the construction, operation and maintenance (O&M) and decommissioning activities of the Project, namely the tidal barrage (all phases). This chapter considers the grid connection in the case that the selected cable route includes a section of subsea cable. This chapter does not consider the use of existing port and marine facilities during the construction phase. Effects on recreational fishing receptors are considered within **Chapter 26: Infrastructure and Other Marine Users**.

11.1.2 This section of the Scoping Report describes the methodology to be used within the Environmental Impact Assessment (EIA), an overview of the baseline conditions within the Scoping Boundary (as defined in **Chapter 1: Introduction**), the datasets to be used to inform the EIA, the potential likely significant effects to be considered, and how these will be assessed for the purpose of the EIA.

11.1.3 The Commercial Fisheries chapter interfaces with other aspects of the assessment and will be informed by modelling outputs and data from other topics and as such, should be considered alongside these; namely:

- **Chapter 10: Fish and Shellfish:** The Fish and Shellfish chapter will consider impacts upon fish and shellfish receptors (including those of commercial importance), whereas the Commercial Fisheries chapter will consider impacts upon commercial fishing fleets. The Commercial Fisheries chapter will consider 'Displacement or disruption of commercially important fish and shellfish resources leading to displacement or disruption of fishing activity', the assessment of which will be informed by the outcomes of the fish and shellfish assessment.
- **Chapter 15: Major Accidents and Disasters:** Accidents and disasters may result in disruption of fishing activity.
- **Chapter 16: Shipping and Navigation:** There are potential pathways of effects from increased vessel activities on commercial fisheries and the Project has the potential to effect fishing vessel movements through the barrage locks. Possible effects on vessel activities are considered within the shipping and navigation chapter and will inform the commercial fisheries assessment.

11.1.4 Overarching relevant legislation and policy context which has informed the scope of the assessment is outlined in **Chapter 4: Planning Policy,** with topic specific considerations outlined in **Appendix 4.1.**

11.2 TECHNICAL GUIDANCE

11.2.1 Technical guidance that has been used to define the assessment is set out in **Table 11-1**.

Table 11-1: Relevant Technical Guidance

Guidance reference	Relevance to the assessment
Good Practice Guidance for assessing fisheries displacement by other licensed marine activities: Literature Review (Xodus, 2022)	Provides information and advice on the data sets to be used and limitations of those data sets. Provides criteria for determining the sensitivity and magnitude of effect of displacement of fishing activity.
Best Practice Guidance for Offshore Renewables Developments: Recommendations for Fisheries Liaison (Fisheries Liaison with Offshore Wind and Wet Renewables group (FLOWW), 2014))	This guide provides information to allow developers and the fishing industry to have constructive discussions about the potential impacts and interactions between the sectors during the planning, construction and operation of developments.
Best practice guidance for fishing industry financial and economic impact assessments (UK Fisheries Economic Network (UKFEN), 2012)	Guidelines based on outputs from a technical workshop organised by UKFEN. Provides information and advice on the data sets to be used and limitations of those data sets.

11.3 STUDY AREA

11.3.1 The Commercial Fisheries Study Area (herein referred to as Study Area) is defined as ICES statistical rectangles 35E7, 35E6 and 36E6. It is anticipated that this Study Area will allow for the robust characterisation of commercial fishing activities within the Mersey and in adjacent sea areas. The Commercial Fisheries Study Area is presented in **Figure 11.1**.

11.3.2 The Commercial Fisheries EIA Study Area will be identified and agreed in consultation with stakeholders, and will consider the Zone of Influence (ZoI) of the Tidal barrage on commercially important fish and shellfish species (as determined in **Chapter 10: Fish and Shellfish**). It is anticipated that the Commercial Fisheries EIA Study Area will also be defined as ICES statistical rectangles 35E7, 35E6 and 36E6.

11.4 CONSULTATION

11.4.1 Consultation is a key part of the DCO application process. The assessment has been and will be informed by engagement and discussion with various stakeholders via public consultation, including but not limited to the following: local commercial fishermen, the Planning Inspectorate (PI), North West Inshore Fisheries and Conservation Authorities (NW IFCA), Marine Management Organisation (MMO), Natural Resources Wales (NRW), Centre for Environment, Fisheries and Aquaculture Science (Cefas), National Federation of Fishermen's Organisations (NFFO) and local councils (i.e. Warrington Borough Council). Regular Environmental Stakeholders Workshops and Hydro-environmental Modelling Workshops have also been undertaken since October 2020, full details of these workshops is provided within **Table 3-1** of **Chapter 3: Approach to EIA**.

11.4.2 A summary of the key issues raised during consultation to date, specific to commercial fisheries, is outlined in **Table 11-2** together with how these issues will be considered in the production of the EIA.

11.4.3 It should be noted that several comments raised during consultation relate to commercially important fish and shellfish species (**Chapter 10: Fish and Shellfish Ecology, Table 10.3**), which will be accounted for within the fish and shellfish assessment. The Commercial Fisheries chapter will consider ‘Displacement or disruption of commercially important fish and shellfish resources leading to displacement or disruption of fishing activity’, the assessment of which will be informed by the outcomes of the fish and shellfish assessment.

Table 11-2: Consultation

Date	Consultee	Consultation and Key Comments	How this is accounted for
2022	NW IFCA	Fisheries engagement is proposed to begin as	Fisheries engagement will be a high priority.

Date	Consultee	Consultation and Key Comments	How this is accounted for
		soon as survey work commences.	
2023	NW-IFCA	The Project should consider: A log-book scheme, liaison with commercial fisherman, engagement with recreation fishermen and accessing the catch returns for the byelaw / regulation order controlled shell fisheries (cockle / mussel)	A shellfish logbook scheme, where engagement with fishermen will take place to inform shellfish landings within the study area, has been proposed within the scope of further evidence gathering for PEIR. Catch statistics from the commercial cockle and mussel fishing, undertaken under permit and byelaw, are to be requested and analysed to inform the baseline for the commercial fisheries EIA chapter.

11.5 ASSESSMENT METHODOLOGY

11.5.1 The Project-wide approach to the assessment methodology is set out in **Chapter 3: Approach to EIA**. This will be implemented to assess the likely significant effects on commercial fisheries receptors from the construction, operations and management (O&M), and decommissioning of the Project.

11.5.2 Relevant legislation and guidance will also be considered in relation to the assessment, in addition to consultation with the stakeholders outlined above.

11.5.3 The assessment approach will be based on the conceptual 'source-pathway-receptor' model. This model identifies likely environmental effects resulting from the

construction, O&M and decommissioning of the tidal barrage. This process provides an easy to follow assessment route between effect sources and potentially sensitive receptors ensuring a transparent impact assessment.

11.5.4 Iterative steps involved in the assessment approach will include:

- Determination of potential pathways of effect between the source and ecological receptors (for construction and operation and maintenance and decommissioning phases);
- Definition of the commercial fisheries receiving environment within the influence of the tidal barrage;
- Assessment of the sensitivity of the receptors;
- Assessment of the magnitude of impact;
- Assessment of the significance of effects;
- Proposal of mitigation measures to reduce, prevent or where these are not possible, to offset, any adverse significant effects;
- Assessment of the residual effects after any mitigation measures have been considered; and
- Assessment of cumulative effects.

RECEPTOR SENSITIVITY

11.5.5 The criteria for defining the sensitivity of the receptors within the Commercial Fisheries EIA chapter are outlined in **Table 11-3** The definitions have been informed by Good Practice Guidance for assessing fisheries displacement by other licensed marine activities (Xodus, 2022) and from previous DCO applications (i.e. Outer Dowsing Offshore Wind ES, Five Estuaries Offshore Wind Farm ES).

Table 11-3: Sensitivity criteria for commercial fisheries receptors

Sensitivity	Definition
High	Receptor cannot avoid, adapt or tolerate the impact, and recoverability is long term or not possible (i.e. no alternative fishing grounds present, and fishing fleet has a small operational range).

Sensitivity	Definition
Medium	Receptor has limited capacity to avoid, adapt or tolerate the impact, and recoverability is slow and / or costly (i.e. moderate levels of alternative fishing grounds and fishing fleet has a moderate operational range).
Low	Receptor has a reasonable capacity to avoid, adapt or tolerate the impact, and moderate levels of recoverability (i.e. high levels of alternative fishing grounds and fishing fleet has a high operational range).
Very Low	Receptor has a high capacity to avoid, adapt or tolerate the impact, and high levels of recoverability (i.e. high levels of alternative fishing grounds with only occasional utilisation of the Study Area and fishing fleet has a high operational range).

MAGNITUDE OF IMPACT

11.5.6 The criteria for defining the magnitude within the Commercial Fisheries EIA chapter are outlined in **Table 11-4.** The definitions have been informed by Good Practice Guidance for assessing fisheries displacement by other licensed marine activities (Xodus, 2022) and from previous DCO applications (i.e. Outer Dowsing Offshore Wind ES, Five Estuaries Offshore Wind Farm ES). Where an impact could reasonably be assigned to more than one level of magnitude, professional judgement will be used to determine which level is applicable.

Table 11-4: Magnitude of impact criteria for commercial fisheries

Magnitude	Definition
High	Extent: Impact across the near-field and far field area (Study Area and beyond). Duration: The impact is anticipated to be permanent or long term (> 8 years). Frequency: The impact will occur constantly throughout the relevant project phase. Consequence: Impact is anticipated to result in the substantial loss of target species or ability to carry out fishing activities.
Medium	Extent: Impact across the near-field and far field area (Study Area). Duration: The impact is of medium-term duration (3 – 8 years). Frequency: The impact will occur constantly throughout a relevant project phase. Consequence: Impact is anticipated to result in the partial loss of target species or ability to carry out fishing activities.
Low	Extent: Impact across near field (Restricted to Mersey and adjacent areas). Duration: The impact is of short-term duration (< 3 years). Frequency: The impact will occur frequently throughout a relevant project phase. Consequence: Impact is anticipated to result in the minor loss of target species or ability to carry out fishing activities.
Very Low	Extent: Impact across near field (Restricted to Mersey). Duration: Impact is of very short term (< 1 year). Frequency: The impact will occur once or infrequently throughout a relevant project phase.

Magnitude	Definition
	Impact is anticipated to result in no or slight loss of target species or ability to carry out fishing activities.

SIGNIFICANCE OF EFFECT

11.5.7 The significance of the effect upon commercial fisheries receptors will be determined by taking into account the sensitivity of the receptor and the magnitude of the impact. Effects may be either negative (adverse), positive (beneficial) or negligible and are defined initially without mitigation. Where the resulting effect comprises a range of significance levels, the final assessment for each effect will be based upon expert judgement.

11.5.8 Residual effects that are classified as moderate or above are considered to be 'significant' in EIA terms; however, professional judgement is applied for moderate effects. Residual effects classified as slight or below are considered to be 'not significant'.

11.5.9 The following terms have been used to define the significance of the effects identified:

- **Major Effect:** where the Project could be expected to have a considerable effect (either positive or negative) on commercial fisheries receptors;
- **Moderate Effect:** where the Project could be expected to have a noticeable effect (either positive or negative) on commercial fisheries receptors;
- **Minor Effect:** where the Project could be expected to result in a small, barely noticeable effect (either positive or negative) on commercial fisheries receptors; and
- **Negligible:** where no discernible effect is expected as a result of the Project on commercial fisheries receptors.

Table 11-5: Significance of effect criteria for the commercial fisheries assessment

Magnitude of Change	Receptor Sensitivity			
	High	Medium	Low	Very Low
High	Major	Major	Major or Moderate	Moderate or Minor
Medium	Major or Moderate	Major or Moderate	Major or Moderate	Minor
Low	Moderate or Minor	Moderate or Minor	Minor	Minor
Negligible	Minor or Negligible	Minor or Negligible	Negligible	Negligible

11.6 BASELINE CONDITIONS

DATA INFORMATION SOURCES

11.6.2 An initial desk-based review has been undertaken of publicly available data sources outlined in **Table 11-6** to determine the baseline characteristics of the Study Area and to inform the assessment process.

Table 11-6: Key sources of commercial fisheries data

Source	Date	Summary	Coverage of Study Area
UK fishing vessel lists (Marine Management Organisation (MMO), 2024).	2024	Vessel lists for May 2024 which includes details of administrative port, home port, port letters and number, vessel name, Registry of Shipping and Seamen number and overall length.	Full
UK sea fisheries annual statistics (MMO, 2023).	2018 - 2022	Commercial fisheries landings statistics by port, vessel length and ICES rectangle.	Full

Source	Date	Summary	Coverage of Study Area
Fishing Activity for over 15 metre United Kingdom Vessels (MMO, 2020).	2016 - 2022	Fishing activity for UK commercial fishing vessels of >15m length that are deemed to have been fishing derived from GPS-derived Vessel Monitoring Data.	Full
Summary of NW-IFCA shore sightings data (IFCA, 2019).	2017-2019	Commercial and recreational fishing activity sightings within Liverpool Bay in 2017, 2018 and 2019.	Full
Liverpool Cruise Terminal: Fishing Activity Technical Note (Brown & May Marine, 2019).	2018	Results of consultation with commercial fisherman undertaken in 2018 as part of the Liverpool cruise terminal, Mersey.	Full
UK Inshore Fishing Activities Intensity (Cefas, 2012).	2011 - 2012	ArcGIS layer showing Inshore Fishing Activity Intensity as determined from fishing vessel sightings from 2010 to 2012.	Full
Inshore Fishing Effort as determined from fishing vessel sightings (Cefas, 2009).	2007 - 2009	Fishing effort within 6 nm of English and Welsh coast from 2007 to 2009.	Full

EXISTING BASELINE

11.6.3 This section describes the present conditions which constitute the existing baseline environment for commercial fisheries within the Study Area.

11.6.4 The Project is situated on the River Mersey, between the Wirral to the west and Liverpool to the north-east, and is a highly industrialised and urban location, with an existing baseline level of anthropogenic activity and disturbance related to this, including that associated with shipping and foot traffic from the general public. The habitats within and adjacent to the River Mersey Estuary, River Dee Estuary,

Liverpool Bay and Irish Sea in the vicinity of the Project have experienced disturbance from many decades of major development, both onshore and offshore. Liverpool Bay has been subject to significant marine development for many decades including aggregate extraction, maintenance and capitol dredging, dredge and waste disposal, offshore energy projects, cables and pipelines. Further details are provided in **Chapter 26: Infrastructure and Other Marine Users**.

11.6.5 There are four offshore windfarms in operation within the Irish Sea in the vicinity of the River Mersey Estuary, including Burbo Bank (including Extension) (<10 kilometres (km) north-west), Gwynt y Môr (<30km west), North Hoyle (<30km west), Rhyl Flats (<40km west) and four further offshore windfarms within the same area of the Irish Sea, including West Duddon of Sands (<60km north-west), Barrow (<60km north-west), Walney (inc. extension) (<70km north-west) and Ormonde Wind Farm (<75km north-west). All of these offshore windfarms have been constructed in the last 25 years. In addition, two further offshore windfarms, Morecambe (<55km north-west) and Morgan (<80km north-west) are proposed. Significant major development has been undertaken within the River Mersey Estuary, including the Liverpool Cruise Terminal, completed in 2007, Mersey Gateway Bridge, completed in 2017, and several major developments either proposed or underway, including the Liverpool Waters (inc. Everton Stadium) and Wirral Waters.

Species of commercial importance

11.6.6 Species of high commercial value within the Study Area include whelks (*Buccinum undatum*), king scallops (*Pecten maximus*), queen scallops (*Aequipecten opercularis*), European lobster (*Homarus gammarus*), sole (*Solea solea*) and sea bass (*Dicentrarchus labrax*), constituting 39%, 27%, 16%, 6% and 5% of the total landed value from 2018 to 2022 (MMO, 2023). By landed weight, the species with the highest weights between 2018 to 2022 where whelks (constituting 48% of total value), queen scallops (29%) and king scallops (19%). Additional species landed which constituted <1% of total landed weight included thornback ray (*Raja clavata*), lobster, bass, sole, flounder (*Platichthys flesus*) and plaice (*Pleuronectes platessa*).

11.6.7 The annual landed value and weight from within the Study Area (ICES 35E7, 35E6 and 36E6), for the top ten species, is shown below in **Plate 11.1** and **Plate 11.2**.

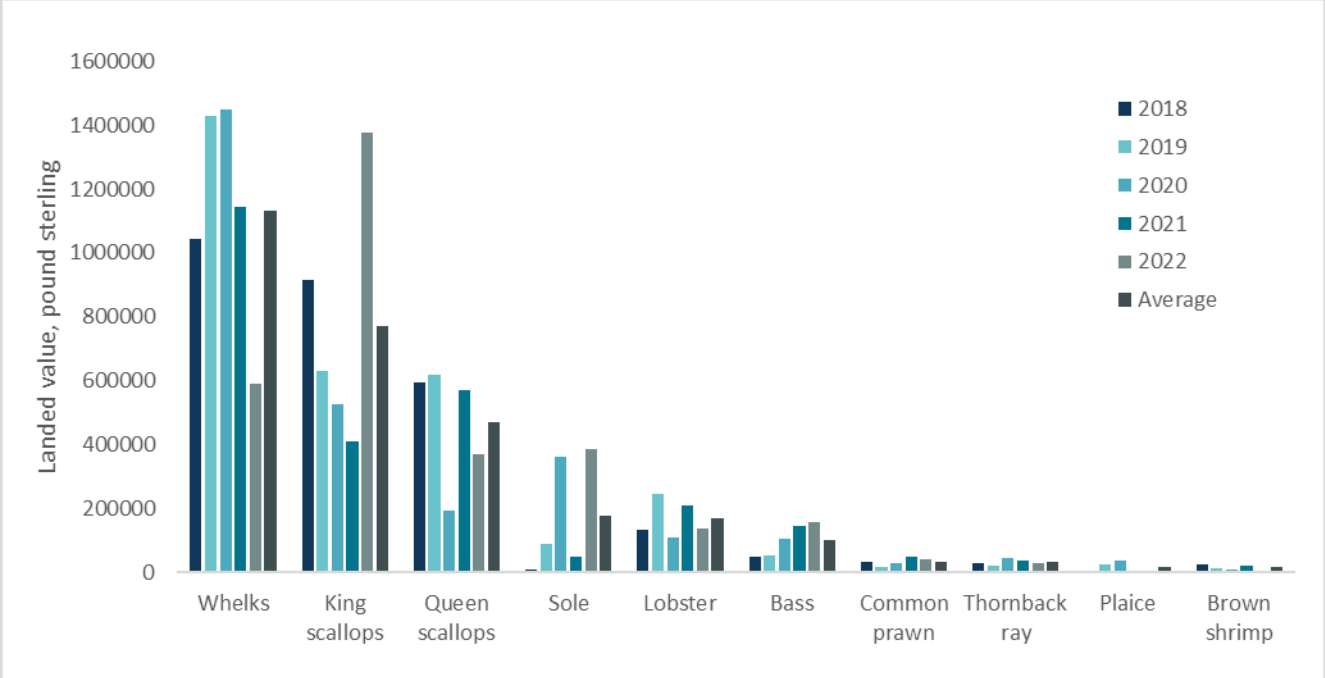

Plate 11.1: Annual landed value, by species, from ICES 35E7, 35E6 and 36E6 (MMO, 2023)

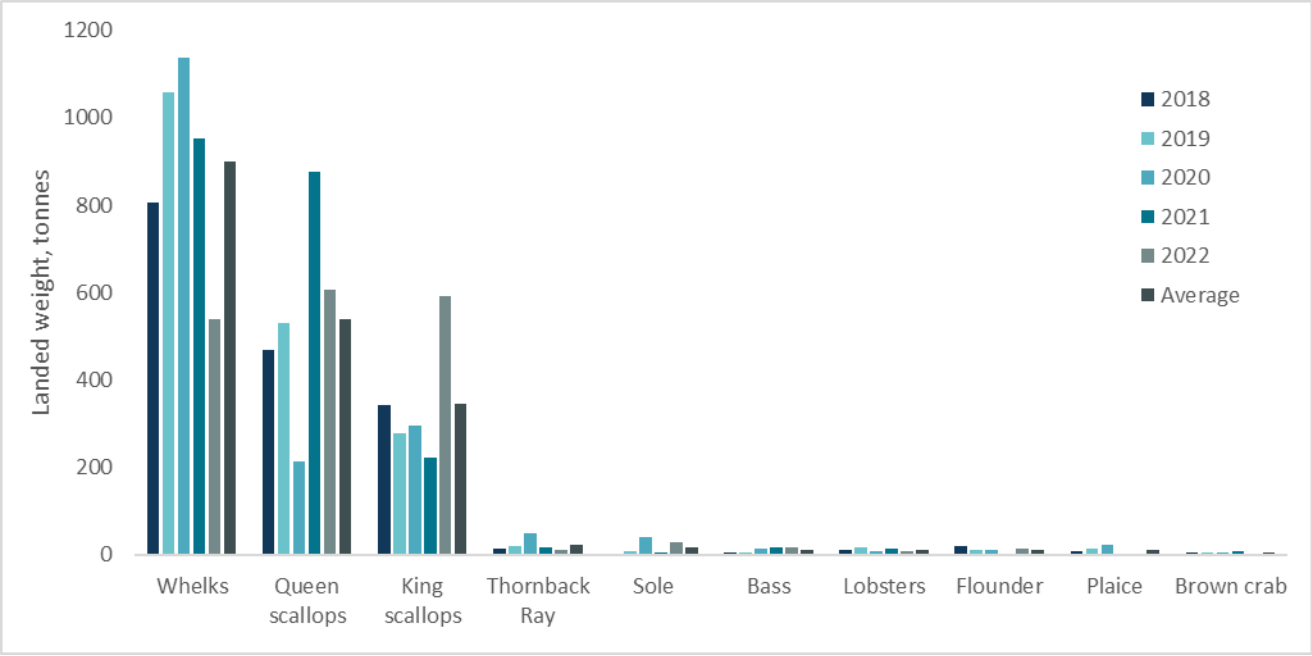

Plate 11.2: Annual landed weight, by species, from ICES 35E7, 35E6 and 36E6 (MMO, 2023)

Fishing Activity Within the Mersey Estuary

11.6.8 The national Vessel Monitoring System (VMS) for commercial fishing vessels is managed by the MMO and provides spatially explicit outputs of fishing effort. The VMS data for vessels over 15 metres (m) indicated low levels of fishing activity at

the entrance of the Mersey Estuary (0-15 hours per annum) between 2016 and 2020 (MMO, 2020). The Inshore Fishing Activity Intensity layers for 2007–2009 and 2010–2012 did not identify the presence of fishing activity within the Mersey catchment (Cefas, 2009; 2012). Consultations undertaken by Brown and May Marine during 2018 (as part of the Liverpool Cruise Terminal) identified two commercial fishermen operating multipurpose vessels, 5 and 6m in length, within the Mersey (Brown & May Marine Ltd, 2019).

11.6.9 The MMO landings statistics recorded catches within the Mersey (ICES 35E7) during 2018, 2019 and 2022, with no recorded catches in 2020 and 2021 (**Table 11-7**). The majority of these landings consisted of flounder and bass caught by drift and fixed nets (MMO, 2023). Additionally, consultation undertaken during 2018 identified cod (*Gadus morhua*) as contributing significant catches within the Mersey, with one fisherman using a combination of drift / fixed nets and rod and line, and another using a combination of nets, rod and line and pots (Brown & May Marine Ltd, 2019). From the MMO landings statistics all catches within the Mersey between 2018 and 2022 were from vessels registered to England.

Table 11-7: Annual landings value (pound sterling) by UK-registered vessels, by ICES rectangle, between 2018 and 2022 (MMO, 2023)

Year	35E6	35E7	36E6
2018	£847,747	£31.20	£2,031,621
2019	£789,394	£134.55	£2,291,604
2020	£991,261	£0	£1,681,059
2021	£974,363	£0	£1,716,970
2022	£766,403	£925	£2,372,930

Fishing Activity Outside the Mersey Estuary

11.6.10 Vessel Monitoring System (VMS) data indicated moderate to high levels of fishing activity outside of the Mersey (ICES 35E6 and 36E6) between 2016 and 2020 (MMO, 2020), with the number of hours per annum varying on a small spatial scale between 0 and 960 hours. The Inshore Fishing Activity Intensity layers for 2007–

2009 and 2010–2012 identified the presence of fishing activity within the Study Area, which included trawling, static gear, dredging and potting (Cefas, 2009; 2012).

11.6.11 Outside the Mersey (ICES rectangles 35E6 and 36E6), commercial catches are largely made up of pots and traps targeting whelks and dredgers targeting king scallops and queen scallops (MMO, 2023), with other fisheries including:

- Beam trawlers targeting mixed benthic and demersal species, with notable landings of sole and other landed species including thornback ray, brown shrimp (*Crangon crangon*), plaice and brill (*Scophthalmus rhombus*).
- Demersal trawlers targeting mixed benthic and demersal species, including Nephrops (*Nephrops norvegicus*), thornback ray and plaice.
- Drift and fixed nets targeting mixed benthic and demersal species, with notable landings of bass and other landed species including thornback ray, sole and flounder.
- Handlines targeting bass, with other landed species including flounder, sole and pollack (*Pollachius pollachius*).
- Longlines targeting mixed species, with notable landings of bass and other landed species including flatfish (flounder, sole, plaice), mackerel (*Scomber scombrus*) and cod.
- Pots and traps targeting lobsters, common prawns (*Palaemon serratus*), brown crab (*Cancer pagurus*) and velvet swimming crab (*Necora puber*).

11.6.12 From the MMO landings statistics the majority of catches outside the Mersey (35E6 and 36E6) between 2018 and 2022 were from England registered vessels, however, catches from vessels registered to Scotland and Wales also accounted for a large proportion of the landed value. Catches were also recorded from vessels registered to the Isle of Man, Belgium and Northern Ireland.

Port Landings

11.6.13 Catches landed into Liverpool port are low, when compared to close by ports (**Table 11-8**). Landings mostly consisting of bass, flounder and sole were landed by handlines and drift / fixed nets caught within ICES rectangle 35E6 (MMO, 2023). As of 1May 2024, the UK fishing vessel list listed five vessels of 10m and under registered to Liverpool as a home port and one registered to Mersey, with no vessels over 10m being registered to Liverpool or Mersey (MMO, 2024). One vessel registered to Liverpool holds a shellfish license.

Table 11-8: Annual landed value (pound sterling) between 2018 and 2022 into ports within the Study Area (MMO, 2023)

Port / Year	2018	2019	2020	2021	2022	All years
Connahs Quay	£3,531	£260	£3,982	£2,888	£525	£11,186
Mostyn	£850	£1,172	£5,981	£9,446	£8,981	£26,431
Rhyl	£9,268	£2,775	£1,086	£8,510	£6,569	£28,208
Lytham St Annes	£29,634	£26,365	£23,405	£44,695	£44,330	£168,429
Liverpool	£59,460	£102,592	£165,617	£48,461	£82,334	£458,464
Conwy	£248,263	£371,990	£457,805	£269,297	£209,999	£1,557,354
Fleetwood	£697,327	£822,478	£729,246	£729,180	£289,142	£3,267,374

11.6.14 The majority of catches within 35E6 are landed in Conwy, Fleetwood and Holyhead ports and the majority of catches within 36E6 are landed in Kirkcudbright, Fleetwood, Whitehaven, Holyhead and Silloth (MMO, 2023). The majority of catches within the Mersey (35E7) are landed in Liverpool (85% by value across 2018 to 2022).

Dee Estuary Cockle Fishery

11.6.15 The Dee Estuary cockle fishery (approximately 11km from Scoping Boundary) is an important commercial shellfish bed managed by Natural Resources Wales (NRW) and the Environment Agency (EA) with a regulating order in place (The Dee Estuary Cockle Fishery Order 2008) (NRW, 2023). The fishery is opened from July to December with TAC limits, caps on the number of license holders and gear regulations applying.

11.7 FURTHER DATA COLLECTION

11.7.1 Further data requirements and data requests that are proposed to inform the PEIR are outlined in **Table 11-9.** It is considered that existing data sources can be sought which will sufficiently characterise the commercial fisheries baseline within the Study Area. No further project-specific data collection is proposed beyond the shellfish logbook scheme identified in **Table 11-9**.

Table 11-9: Further data collection and analysis proposed for the characterisation of commercial fisheries baseline

Data Proposed	Justification
Catch statistics from the commercial cockle and mussel fishing.	Catch statistics from the commercial cockle and mussel fishing, undertaken under permit and byelaw, are to be analysed to inform the baseline for commercial fisheries.
Inshore Vessel Monitoring (I-VMS) for under-12m fishing vessels registered in England.	Information request to be made to the MMO. Current VMS data sets do not cover vessels less than 12m in length, which are those most likely to be operating within the Mersey.
Various IFCA data	Information request to be made to the IFCA for fish and shellfish species that are regulated by any permit, licence or byelaw and landings data that they hold.
Shellfish logbook scheme.	A shellfish logbook scheme, where engagement with fishermen will take place to inform shellfish landings within the Study Area, has been proposed.
MarineTraffic AIS data.	Purchase of MarineTraffic AIS data may be required to corroborate comments from consultation. It should be noted however, that whilst encouraged by the Maritime and Coastguard Agency, there is no requirement for fishing vessels under 15m to possess AIS.

11.8 FUTURE BASELINE

11.8.1 The baseline environment is not static and will exhibit some degree of change over time, with or without the tidal barrage in place. Commercial fisheries are particularly dynamic as a result of a number of factors, including but not limited to:

- Changes in market demand and price – Alters the targeted species and consequently the gear type used, as well as the grounds fished;
- Stock abundances and distribution changes – Fluctuations in stock abundances and changes in distributions (i.e. as a result of climate change, changes in fishing pressure etc.) may result in changes in landings and / or management measures and consequently changes in the targeted species (i.e. annual opening of cockle fishery is dependent on sufficient stock levels);
- Fisheries and environmental management measures – New management measures for specific species and restriction within certain areas may alter landings, targeted species, and grounds fished; and
- Advancements in gear technology – Alters landings and reduces operational costs.

11.8.2 When undertaking EIA's, it will be necessary to place any potential impacts in the context of the envelope of change that might occur naturally over the lifetime of the tidal barrage. This future baseline will be defined for the purposes of the EIA and where possible the baseline characterisation will consider at least 5 years of data to capture small scale temporal variations in activity.

11.9 BASIS FOR SCOPING ASSESSMENT

11.9.1 The Commercial Fisheries scoping assessment is based on the indicative parameters set out in **Chapter 2: Site Context and Project Description.** The source-pathway-receptor linkage between the tidal barrage and / or activities and the receptor groups for this aspect are described in **Table 11-11**.

11.10 EMBEDDED ENVIRONMENTAL MEASURES

11.10.1 Embedded mitigation measures have been identified and are proposed to be adopted as part of the evolution of the Project design (embedded into the Project design). These measures will evolve over the development process as the EIA progresses and in response to consultation. They will be fed iteratively into the assessment process. These measures typically include those that have been identified as good or standard practice and include actions that would be undertaken to meet existing legislation requirements.

11.10.2 As there is a commitment to implementing these environmental measures, and also to various standard sectoral practices and procedures, they are considered inherently part of the design of the Project and have, therefore, been considered in the scoping assessment.

11.10.3 In addition to the specific embedded mitigation measures relevant to commercial fisheries listed in **Table 11-10**, consultation will be undertaken with all relevant consultees.

11.10.4 A schedule of Commitments will be presented as part of the Environmental Statement (ES). This will inform the Construction Environmental Management Plan (CEMP) which will be prepared prior to commencement of construction works. The controls and measures within the CEMP will be implemented to mitigate against impacts during the construction phase.

Table 11-10: Relevant commercial fisheries embedded environmental measures

ID	Mitigation Measures embedded into the project design	How the measure will be secured
OM7	Vessel Management Plan (VMP).	A VMP will be developed and adhered to during the construction of the Project. The VMP will confirm the types and numbers of vessels that will be engaged on the Project and consider vessel coordination including indicative transit route planning.
OM1	Construction Environmental Management Plan (CEMP).	A CEMP will be developed and adhered to during the construction phase of the Project. A Marine Pollution Contingency Plan (MPCP) will form part of the CEMP. The MPCP provides details of procedures to protect personnel working and to safeguard the marine environment and mitigation measures in the event of an accidental pollution event arising during the construction phase.
OM14	Appointment of a Fisheries Liaison Officer (FLO).	An FLO will be appointed to the Project and will engage with commercial fishermen throughout the duration of the construction phase of the tidal barrage.
OM13	Advanced warning	Arrangement of Notice to Mariners, to include Schedule of construction activities.

ID	Mitigation Measures embedded into the project design	How the measure will be secured
OM5	Application and use of safety / exclusion zones.	Safety zones will be in place during construction activities and operation.

11.11 LIKELY SIGNIFICANT EFFECTS

11.11.1 In line with the EIA Regulations 2017, the EIA for the Project will consider those impacts where there is a risk of a likely significant effect only. The following Section draws on industry experience and expertise to identify those effect-receptor pathways that may potentially lead to a significant impact, see **Table 11-11** Where experience and available evidence indicates an effect-receptor pathway will not lead to a significant impact with regards to the EIA Regulations 2017 the pathway is scoped out from assessment.

11.11.2 The scoping assessment is based on a combination of the Project definition at the scoping stage, embedded environmental measures, understanding of current baseline conditions, the evidence base for commercial fisheries, the identification of potentially impacted receptors, and professional judgement. The approach to this assessment is set out in **Chapter 3: Approach to EIA**.

11.11.3 The early identification of likely significant effects is used here as a tool aimed at delivering a proportionate approach to the EIA. In doing so, it sets out a high-level assessment of all potential effects, significant or not. The basis for scoping out certain effects, and therefore no longer considered is presented below, supported by evidence base. Effects scoped in are presented in **Table 11-11**. This table differs slightly from other chapters given the commonality between the source, pathway, receptor model during all phases of the tidal barrage and construction phase only of the port and marine facilities.

Impacts Scoped Out of Assessment

11.11.4 Potential effects of the physical presence of infrastructure leading to gear snagging, have been scoped out from further assessment as there is likely to be no significant effect. Infrastructure will be restricted to within the Mersey whereby the main gear types used are static. Static gears are unlikely to snag on infrastructure given their

stationary nature. This has been based on the knowledge of the current baseline environment and the nature of planned works on the potential for impact from such projects more widely.

Table 11-11: Likely significant commercial fisheries effects

Source	Pathway	Receptor	Project Phase	Embedded Measures	Proposed approach to assessment (scoped in or scoped out)	Justification	Data collection & analysis to characterise the baseline
Physical presence of tidal barrage and construction / decommissioning activities (i.e. dredging, removal of cofferdams, removal of tidal barrage).	Impeding navigation	Commercial fisheries operating from Mersey.	C O&M D	11-2 11-3 11-4	Scoped In.	Construction and decommissioning activities (i.e. placement and removal of infrastructure) will result in temporary navigational impediment. The presence of the tidal barrage will result in long term navigational impediment. This may result in increased fuel costs and loss of fishing time for vessels operating from the Mersey and consequently increased cost per catch effort.	Consultation and further data collection / analysis listed in **Table 11-9** to ascertain area usage by commercial fishermen.
Construction / decommissioning activities (i.e. dredging, removal	Disruption of fishing activity.	Commercial fisheries operating	C D	11-1 11-2 11-3 11-4	Scoped In.	Construction and decommissioning activities may result in the temporary disruption	Consultation and further data collection / analysis listed in **Table 11-9**

Source	Pathway	Receptor	Project Phase	Embedded Measures	Proposed approach to assessment (scoped in or scoped out)	Justification	Data collection & analysis to characterise the baseline
of cofferdams, removal of tidal barrage).		within the Mersey.				of fishing activity within the Mersey (i.e. temporary reduction in access to fishing grounds as a result of temporary construction activities).	to ascertain area usage by commercial fishermen.
Physical presence of tidal barrage.	Long term loss of fishing grounds.	Commercial fisheries operating within the Mersey.	O&M	11-2 11-3	Scoped In.	The presence of the tidal barrage may result in the long-term loss of fishing grounds for those vessels that operate within the Mersey.	Consultation and further data collection / analysis listed in **Table 11-9** to ascertain area usage by commercial fishermen.
Tidal barrage and construction / decommissioning activities (i.e. dredging, removal of cofferdams, removal of tidal barrage).	Displacement leading to gear conflict and increased fishing pressure on adjacent grounds.	Commercial fisheries operating within the Mersey.	C O&M D	11-2 11-3 11-4	Scoped In.	Temporary or long-term displacement of fishing vessels operating within the Mersey may result in increased fishing activity and gear conflicts on adjacent fishing grounds.	Consultation and further data collection / analysis listed in **Table 11-9** to ascertain area usage by commercial fishermen.

Source	Pathway	Receptor	Project Phase	Embedded Measures	Proposed approach to assessment (scoped in or scoped out)	Justification	Data collection & analysis to characterise the baseline
Presence of tidal barrage and rock armour.	Gear snagging	Commercial fisheries operating within the Mersey.	O&M	11-2 11-3 11-5	Scoped Out.	Infrastructure will be restricted to within the Mersey whereby the main gear types used are static. Static gears are unlikely to snag on infrastructure.	N/A
Construction, operation and decommissioning activities (i.e. dredging, removal of cofferdams, removal of tidal barrage).	Displacement or disruption of commercially important fish and shellfish resources leading to displacement or disruption to fishing activity.	Commercial fisheries operating with the Mersey and adjacent waters (Commercial Fisheries Study Area).	C O&M D	11-2	Scoped In.	Commercially valuable fish and shellfish species may be affected by the Project via several impact pathways (see **Chapter 10: Fish and Shellfish**), which may result in loss of earnings for commercial fishermen operating in and around the Mersey.	Displacement or disruption of commercially important fish and shellfish will be informed by the assessment of fish and shellfish (**Chapter 10: Fish and Shellfish**).

11.12 CUMULATIVE EFFECTS

11.12.1 Cumulative effects on commercial fisheries resulting from the effects of the Project and other developments will be assessed in accordance with the guidance and methodologies set out in **Chapter 3: Approach to EIA.** Other developments will include those screened in as part of the CEA screening exercise.

11.12.2 The following impacts from the Project have the potential to act cumulatively with impacts from other developments to contribute to cumulative effects:

- Impediment of navigation;
- Disruption of fishing activity;
- Long term loss of fishing grounds;
- Displacement leading to gear conflict and increased fishing pressure on adjacent grounds; and
- Displacement or disruption of commercially important fish and shellfish resources.

11.13 TRANSBOUNDARY EFFECTS

11.13.1 International fishing fleets will be considered within the baseline and impact assessment of the EIA. There is no potential for additional transboundary impacts upon commercial fisheries.

11.14 PROPOSED APPROACH TO ENVIRONMENTAL IMPACT ASSESSMENT

11.14.1 Further data collection, desk-based studies and consultation will be undertaken to identify and assess commercial fisheries receptors. The commercial fisheries assessment will be undertaken in accordance with the methodology set out in **Chapter 3: Approach to EIA,** of the Scoping Report.

11.15 REFERENCES

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12 UNDERWATER NOISE AND VIBRATION

12.1 INTRODUCTION

12.1.1 The underwater noise and vibration assessment will consider the potential likely effects on marine receptors that may arise from the construction, operation and maintenance (O&M) and decommissioning activities of the Project. This chapter relates only to the marine working areas during construction and the tidal barrage during operation; underwater noise and vibration is not relevant to other aspects and phases of the Project.

12.1.2 This section of the Scoping Report describes the methodology to be used within the Environmental Impact Assessment (EIA), an overview of the baseline conditions within the Scoping Boundary (as defined in **Chapter 1: Introduction**), the datasets to be used to inform the EIA, the potential likely significant effects to be considered, and how these will be assessed for the purpose of the EIA.

12.1.3 The intention of this section is not to provide assessment or consideration of noise and vibration effects in order to scope in or scope out potential impacts, as this will be undertaken within the aspect chapters that consider impacts on receptors potentially sensitive to underwater noise and vibration emissions.

12.1.4 Underwater noise and vibration are impact pathways and may have potential impacts on several categories of receptor. Consequently, the underwater noise and vibration assessment will be presented as a technical appendix to the Environmental Statement (ES), to which other relevant marine disciplines will refer. Due to the interfacing between underwater noise and vibration and other marine receptor disciplines, this chapter should be considered alongside the following chapters:

- **Chapter 8: Marine Mammals:** This section describes pathways of effect from noise sources on pertinent sensitive marine mammal receptor species;
- **Chapter 9: Marine and Intertidal Ornithology:** This section describes pathways of effect from noise sources on pertinent marine and intertidal ornithological species;
- **Chapter 10: Fish and Shellfish:** This section describes pathways of effect from noise and vibration sources on pertinent sensitive fish and shellfish receptor species;
- **Chapter 11: Commercial Fisheries:** This section describes pathways of effect from noise sources on pertinent sensitive commercial fisheries receptor species;

- **Chapter 22: Onshore Noise and Vibration**: This section describes pathways of effect from vibration on pertinent sensitive historical assets in the intertidal area; and
- **Chapter 26: Infrastructure and Other Marine Users:** This section describes pathways of effect from noise and vibration sources on pertinent sensitive infrastructure and other marine users.

12.1.5 Overarching relevant legislation and policy context which has informed the scope of the assessment is outlined in **Chapter 4: Planning Policy,** with topic specific considerations outlined in **Appendix 4.1**.

12.2 TECHNICAL GUIDANCE

12.2.1 Technical guidance that has been used to define the assessment is set out in **Table 12-1**.

Table 12-1: Relevant technical guidance

Guidance reference	Relevance to the assessment
Marine Mammal Noise Exposure Criteria: Updated Scientific Recommendations for Residual Hearing Effects (Southall *et al.* 2019).	Southall *et al.* (2019) provides sound exposure criteria to predict the onset of auditory effects in marine mammals. Estimate audiograms, weighting functions ('M-weighting') and underwater noise exposure criteria for temporary and permanent auditory effects of noise are presented for six species groupings, including all marine mammal species, and will be considered within the underwater noise modelling.
Sound Exposure Guidelines for Fishes and Sea Turtles (Popper *et al.* 2014).	Popper *et al*. (2014) provides sound exposure guidelines for fish. The guidelines were developed for a broad group of animals, defined by the way they detect different sound sources and their corresponding characteristics. The resultant sound exposure guidelines will be considered within the underwater noise modelling.

12.3 STUDY AREA

12.3.1 The study area for the underwater noise and vibration assessment will be defined once the location of the tidal barrage and marine working area has been confirmed. Appropriate offset distances from each of the underwater noise emitting activities will also be considered when detailed information, such as the pile depth and diameter, is available.

12.4 CONSULTATION

12.4.1 Consultation is a key part of the application process. The assessment will be informed by engagement and discussion with various stakeholders. It is anticipated that the following stakeholders will be contacted as a minimum:

- Natural England (NE);
- Joint Nature Conservation Committee (JNCC);
- North Western Inshore Fisheries and Conservation Authority (NW-IFCA);
- Centre for Environment, Fisheries and Aquaculture Science; and
- Environment Agency (EA).

12.5 ASSESSMENT METHODOLOGY

INTRODUCTION

12.5.2 The Project-wide approach to the assessment methodology is set out in **Chapter 3: Approach to EIA**. This will be implemented to assess the likely significant effects on relevant underwater noise and vibration sensitive receptors from the construction, O&M, and decommissioning phases. The specific legislation and guidance outlined in **Appendix 4.1** will also be considered in relation to the assessment, in addition to consultation with the stakeholders outlined above.

12.5.3 As discussed in **paragraph 12.1.3**, the underwater noise and vibration assessment will be included as a technical appendix to the PEIR and ES rather than a specific aspect chapter. The technical appendix will include an assessment of the level of underwater noise and vibration generated from the proposed development.

DESK-BASED REVIEW

12.5.4 The data sources used to inform the underwater noise assessment will primarily comprise published material which is publicly available online. An initial desk-based review of existing publicly available literature and studies of the impact of underwater noise on marine mammal and fish species will be undertaken. This

will include an assessment of the sensitivity of fish and marine mammals to underwater sound, and derivation of criteria for estimating the impact to be agreed with the SNCBs. Experience from existing and consented similar developments in the marine environment will be drawn on to inform the underwater noise assessment and modelling strategy for the tidal barrage. This will include recent projects in the context of Liverpool Bay, including: Burbo Bank Offshore Windfarm; Liverpool 2 Container Terminal; Twelve Quays Ferry Terminal, Liverpool Cruise Terminal and Isle of Man Ferry Terminal. The list of recent projects will be updated as part of PEIR.

Approach

12.5.5 Marine construction activity associated with the tidal barrage will generate underwater noise and vibration that may have a potential impact on sensitive marine receptors, particularly piling activities. Drawing on experience gained through similar marine projects in the UK and international waters, an underwater noise and vibration assessment, including noise propagation modelling, will be required.

12.5.6 The detailed scope, specification and methodology of the noise propagation modelling will be discussed and agreed with the relevant stakeholders accordingly. However, it is anticipated that the noise and vibration assessment provided in the technical appendix will include the following:

- A review of publicly available literature and studies of the impact of impulsive and non-impulsive (i.e. continuous) underwater noise on marine mammal and fish species, including an assessment of the sensitivity of fish and marine mammals to underwater sound, and derivation of criteria for estimating the impact to be agreed with the relevant stakeholders.
- A review of existing underwater noise and vibration studies for consented and operational projects within the context of Liverpool Bay will be undertaken to inform the consultation process with the relevant stakeholders.
- Source noise level characterisation for piling (percussive or vibro-piling), dredging and land reclamation activities (namely the landfalls of the tidal barrage, and the Marine Navigation System), as well as noise from vessel movements during construction and operational noise from the turbines.
- If necessary, provision of a qualitative characterisation of the vibration emissions (i.e. particle motion) from the proposed construction, operational and decommissioning activities.

- Noise propagation modelling to estimate potential impact ranges to marine mammals, fish and shellfish, marine ornithology, and other marine users as a result of construction activity.
- Consideration of any operational and decommissioning underwater noise and vibration effects that may arise[13].

12.5.7 The impacts of underwater noise associated with the tidal barrage will be identified within the relevant aspect chapters of the ES. Discussion and agreement of the worst case spatial and temporal project parameters will be included (e.g. the water depth at which piling will take place, and the subsequent number of strikes per pile across a 24 hour period).

12.5.8 The impact criteria will be based on relevant published injury and behavioural sound pressure level thresholds for marine mammals and fish, which will be agreed in advance with the relevant stakeholders. These thresholds will be derived from the most recent publication of relevance, which is Southall *et al*. (2019) for marine mammal receptors and from Popper *et al*. (2014) for fish (unless further evidence is published in the interim).

12.5.9 There are no other widely used quantifiable underwater sound pressure level threshold criteria for benthic ecology receptors, any relevant marine ornithology receptors (i.e. diving birds and their subsequent underwater noise exposure), and any other marine users (i.e. human divers and swimmers). Consequently, the potential underwater noise effects on receptors without quantifiable criteria will be addressed qualitatively in conjunction with the respective aspect chapters.

12.6 BASELINE CONDITIONS

12.6.1 There are a number of anthropogenic activities along the River Mersey in the vicinity of the tidal barrage and marine working area which are likely to characterise the existing baseline underwater noise environment. These mainly include general commercial shipping and leisure boating activity. A recent study published in 2019 (Subacoustech, 2019), contains measurement data for locations near Birkenhead 12 Quays Ferry Terminal. The study reported noise levels between approximately 110 dB re 1µPa SPL_{rms} and 132 dB re 1 µPa SPL_{rms}.

12.6.2 Further detail on the baseline conditions, including future baseline conditions, and the basis for the assessment of underwater noise will be detailed within the

[13] The cavitation effects caused by the operational turbines, and the subsequent impacts on fish receptors is not considered a noise and vibration issue, but a collision risk issue. This is subsequently addressed in **Chapter 10: Fish and Shellfish**.

relevant aspect sections that consider impacts on receptors potentially sensitive to underwater noise emissions. This will relate to the following:

- **Chapter 8: Marine Mammals**;
- **Chapter 10: Fish and Shellfish**;
- **Chapter 11: Commercial Fisheries**; and
- **Chapter 26: Infrastructure and Other Marine Users**.

12.7 EMBEDDED ENVIRONMENTAL MEASURES

12.7.1 Embedded mitigation measures have been identified and are proposed to be adopted as part of the evolution of the tidal barrage design (embedded into the Project design). These measures will evolve over the development process as the EIA progresses and in response to consultation. They will be fed iteratively into the assessment process. These measures typically include those that have been identified as good or standard practice and include actions that would be undertaken to meet existing legislation requirements.

12.7.2 As there is a commitment to implementing these environmental measures, and also to various standard sectoral practices and procedures, they are considered inherently part of the design of the Project and have, therefore, been considered in the scoping assessment.

12.7.3 In addition to the specific embedded mitigation measures relevant to underwater noise listed in **Table 12-2**, consultation will be undertaken with all relevant consultees to address any concerns or issues.

Table 12-2: Relevant underwater noise embedded environmental measures

ID	Mitigation Measures embedded into the Project design	How the measure will be secured
OM9	**Marine Mammal Mitigation Protocol (MMMP).**	Development of, and adherence to, an agreed MMMP. This will mitigate potential impacts from underwater noise on marine mammals and fish through good or standard practice actions in order to meet legislative requirements. A piling MMMP will include details of soft starts to be used during piling operations, with lower hammer energies used at the beginning of the

ID	Mitigation Measures embedded into the Project design	How the measure will be secured
		piling sequence before increasing energies to higher levels.

12.8 LIKELY SIGNIFICANT EFFECTS

12.8.1 In line with the EIA Regulations 2017, the EIA for the Project will consider those impacts where there is a risk of a likely significant effect only. The following Section draws on industry experience and expertise to identify those effect-receptor pathways that may potentially lead to a significant impact. Where experience and available evidence indicates an effect-receptor pathway will not lead to a significant impact with regards to the EIA Regulations 2017, the pathway is scoped out from assessment.

12.8.2 The likely significant effects of underwater noise to each relevant receptor are summarised in the following aspect Tables:

- **Chapter 8: Marine Mammals** –**Table 8-12**;
- **Chapter 10: Fish and Shellfish**– **Table 10-14**;
- **Chapter 11: Commercial Fisheries** – **Table 11-11**; and
- **Chapter 26**: **Infrastructure and Other Marine Users** – **Table 26.6**.

12.8.3 The scoping assessments presented within these chapters is based on a combination of the Mersey Tidal Power design as defined at this stage, embedded environmental measures, understanding of the baseline conditions at this stage, the evidence base for impacts on relevant receptors, experience and evidence gained from similar marine energy projects, and professional judgement. The approach to the assessment is set out in **Chapter 3: Approach to EIA**.

IMPACTS SCOPED OUT OF ASSESSMENT

12.8.4 Any potential effects on underwater noise sensitive receptors that have been scoped out are presented in the relevant aspect chapters, as follows:

- **Section 8: Marine Mammals** – from paragraph 8.10.5;
- **Section 10: Fish and Shellfish**– from paragraph 10.11.4;
- **Section 11: Commercial Fisheries** – from paragraph 11.11.4; and

- **Section 26: Infrastructure and Other Marine Users** – from paragraph 26.10.5.

12.9 CUMULATIVE EFFECTS

12.9.1 Cumulative effects on underwater noise sensitive receptors resulting from the effects of the Project and other developments will be assessed in accordance with the guidance and methodologies set out in **Chapter 3: Approach to EIA** and considering the other developments that have been screened in as part of the CEA screening exercise in **Chapter 31: Cumulative Effects**.

12.10 TRANSBOUNDARY EFFECTS

12.10.1 Potential transboundary effects from construction, operation and decommissioning of the tidal barrage are unlikely to generate transboundary impacts given the location within the estuary. Therefore, this topic is scoped out.

12.11 PROPOSED APPROACH TO ENVIRONMENTAL IMPACT ASSESSMENT

12.11.1 Further desk-based studies and analysis will be undertaken to identify and assess underwater noise and vibration impacts on relevant underwater noise and vibration sensitive receptors. This study will be supplemented with consultation with the relevant statutory and non-statutory organisations as necessary.

12.12 REFERENCES

Popper A.N., Hawkins A.D., Fay R.R., Mann D.A., Bartol S., Carlson T.J., Coombs S., Ellison W.T., Gentry R.L., Halvorsen M.B., Løkkeborg S., Rogers P.H., Southall B.L., Zeddies D.G. and Tavolga W.N., (2014*). Sound exposure guidelines for fishes and sea turtles: a technical report prepared by ANSI-Accredited Standards Committee S3/SC1 and registered with ANSI.* ASA S3/SC1.4 TR-2014. Springer and ASA Press, Cham, Switzerland.

Southall, B.L., Finneran, J.J., Reichmuth, C., Nachtigall, P.E., Ketten, D.R., Bowles, A.E., Ellison, W.T., Nowacek, D.P. and Tyack, P.L., (2019). *Marine Mammal Noise Exposure Criteria: Updated Scientific Recommendations for Residual Hearing Effects*. Aquatic Mammals, 45(2), p.125.

13 TERRESTRIAL ECOLOGY AND BIODIVERSITY

13.1 INTRODUCTION

13.1.1 The Terrestrial Ecology and Biodiversity Chapter of the Environmental Statement will consider the potential likely significant effects on terrestrial ecological receptors that may arise from the construction, operation and maintenance (O&M) and decommissioning activities of the Project. This Chapter of the Scoping Report describes the methodology to be used within the Environmental Impact Assessment (EIA), an overview of the baseline conditions for the Scoping Boundary (as defined in **Chapter 2: Site Context and Project Description**), the datasets to be used to inform the EIA, the potential likely significant effects to be considered, and how these will be assessed for the purpose of the EIA for Terrestrial Ecology and Biodiversity.

13.1.2 There are three separate considerations for the Project as follows:

- The Tidal Barrage Development Area;
- Port and Marine Facilities; and
- The Grid Connection Development Area.

13.1.3 This Chapter considers only the terrestrial ecology aspects of the Project, namely the Grid Connection Development Area and associated enabling works, along with the Port and Marine Facilities (alongside the River Mersey).

13.1.4 The Tidal Barrage Development Area is considered as entirely marine and this is considered in the relevant Marine Chapters (**Chapters 6 to 12**) of the EIA Scoping Report. In addition, the Port and Marine Facilities have marine ecology considerations (along with terrestrial ecology) are these are also considered within the Marine Ecology Chapters (**Chapters 6 to 12**). It should be noted that there are linkages between the Tidal Barrage Development Area, Port and Marine Facilities and Grid connection such as the operational landfall for the Grid connection, connections to active travel and recreational areas. However, for this chapter these will be assessed on the basis of the Port and Marine Facilities and then associated connectivity to the Grid connection, as the Terrestrial Ecology elements start at these locations.

13.1.5 In addition, the operation of the Barrage may impact on hydrodynamics and coastal processes such that terrestrial habitats could be impacted over and above the marine habitats (considered in **Chapters 6 to 12**), which may need consideration within the Terrestrial Ecology and Biodiversity Chapter of the EIA. However, this is unknown at present and is not considered in detail here but is

acknowledged as a potential future consideration for likely significant effects (see also **Table 13-10**).

13.1.6 Terrestrial Ecology and Biodiversity interfaces with other aspects and as such, should be considered alongside these; namely:

- **Chapter 5: Coastal Processes**: There are potential pathways of effect from changes to hydrodynamic processes on terrestrial habitat, which may also be utilised by protected species. Therefore, information from the hydrodynamic modelling and coastal processes chapter will inform the terrestrial ecology and biodiversity assessment.
- **Chapter 9: Marine and Intertidal Ornithology**: The marine and intertidal ornithology assessment will interlink with terrestrial ecology and biodiversity due to the presence of bird species that use both intertidal and offshore habitats.
- **Chapter 10: Fish and Shellfish**: The terrestrial ecology and biodiversity assessment may include some receptor species that rely on fish and shellfish species as part of their diet and therefore impacts to fish and shellfish could impact terrestrial ecology receptors. The information from the fish and shellfish ecology section will be used to inform the terrestrial ecology and biodiversity assessment.
- **Chapter 12: Underwater Noise and Vibration**: The terrestrial ecology and biodiversity assessment may include some receptor species that could be affected by the use of underwater noise and vibration during the works and therefore could impact terrestrial ecology receptors. The information from the underwater noise and vibration section may be used to inform the terrestrial ecology and biodiversity assessment.
- **Chapter 19: Water Resources and Flood Risk**: There are potential pathways of effect from changes to water resources and flood risk on terrestrial habitat utilised by protected species. Therefore, information from the water resources and flood risk chapter will inform the terrestrial ecology and biodiversity assessment.
- **Chapter 21: Air Quality**: There are potential pathways of effect from changes air quality on terrestrial habitat, which may also be utilised by protected species. Therefore, information from the air quality chapter will inform the terrestrial ecology and biodiversity assessment.
- **Chapter 22: Onshore Noise and Vibration**: The terrestrial ecology and biodiversity assessment may include some receptor species that could be affected by the use of onshore noise and vibration during the works and therefore could impact terrestrial ecology receptors. The information from the

onshore noise and vibration section may be used to inform the terrestrial ecology and biodiversity assessment.

- **Chapter 23: Geology and Ground Conditions**: Changes to geology and ground conditions may create potential pathways of effect on terrestrial ecology and biodiversity receptors. Therefore, information from the geology and ground conditions chapter will inform the terrestrial ecology and biodiversity assessment.
- **Chapter 24: Terrestrial Traffic and Transport**: There are potential pathways of effect from changes to terrestrial traffic and transport on terrestrial habitat, which may also be utilised by protected species. Therefore, information from the terrestrial traffic and transport chapter will inform the terrestrial ecology and biodiversity assessment.

13.1.7 Overarching relevant legislation and policy context which has informed the scope of the assessment is outlined in **Chapter 4: Planning Policy,** with topic specific considerations outlined in **Appendix 4.1**.

13.2 TECHNICAL GUIDANCE

13.2.1 Technical guidance that has been used to define the assessment is set out in **Table 13-1**.

Table 13-1: Relevant technical guidance

Guidance Reference	Relevance to the Assessment
Chartered Institute of Ecology and Environmental Management (CIEEM) (2018, updated 2019) Guidelines for Ecological Impact Assessment in the UK and Ireland: Terrestrial, Freshwater, and Coastal. Second Edition v1.1	Provides guidance that is relevant to the assessment of potential significant effects on biodiversity.
Guidelines for Preliminary Ecological Appraisals (PEA): Second Edition (2017)	Provides best practice guidance for those undertaking Preliminary Ecological Appraisals within the UK.
UK Habitats Classification Survey (V2): UKHab Ltd (2023).	Provides guidance and methodologies for identifying and classifying UK habitat types.

Guidance Reference	Relevance to the Assessment
National Vegetation Classification: Rodwell, J.S. (2006).	
Biodiversity Net Gain: DEFRA (2024)	Provides best practice guidance on Biodiversity Net Gain, which became mandatory for large scale developments from 12 February 2024, and will do so for Nationally Significant Infrastructure Projects from November 2025.
Hedgerow Survey Handbook, 2nd Edition: Department of Food and Rural Affairs (2007); The Hedgerows Regulations 1997. Statutory Instrument 1997 No 1160 Crown Copyright (HM Government, 1997),	Provides best practice guidance for the survey of hedgerows, and to identify hedgerows which may be classified as 'important'.
Surveying Badgers: Harris, *et al*. (1989). Badger: Roper, T.J. (2010). The classification of badger *Meles meles* setts in the UK: A review and guidance for surveyors: Andrews, R. (2013).	These documents provide best practice guidance for surveying for and assessing badger activity within the UK, in order to fully assess project impacts on badger.
Collins, J. (ed) (2023) Bat Survey Guidelines for Professional Ecologists: Good Practice Guidelines (4th edn). The Bat Conservation Trust, London	Provides guidance on the recommended level of bat survey effort to fully assess project impacts on roosting and foraging / commuting bats within the UK. Also provides guidance on the assessment of the 'importance' of identified bat populations and appropriate mitigation requirements.
Chanin, P. (2003) Ecology of the European Otter. Conserving Natura 2000	Provides guidance on otter ecology and habitat requirements within the UK,

Guidance Reference	Relevance to the Assessment
Monitoring the Otter *Lutra lutra*: Chanin, P. (2003).	including within freshwater and coastal habitats, and also otter survey methodology.
The Water Vole Mitigation Handbook: Dean, *et al.* (2016).	Provides guidance on water vole ecology and habitat, and also water vole survey methodology and mitigation measures.
Wintering Bird Surveys: Gillings *et al*. (2008); and Gilbert *et al.* (1998). Breeding Bird Surveys: Biddy *et al*. (2000). Farmland Birds Surveys: Biddy *et al*. (2000). Bird Survey Guidelines for assessing ecological impacts: Bird Survey & Assessment Steering Group (2023). Wetland and Intertidal Birds Surveys: Biddy *et al*. (2000).	Provide guidance for surveying and monitoring techniques to assess breeding success and monitor population levels for UK bird species.
Barn Owl *Tyto alba* Survey Methodology and Techniques for use in Ecological Assessment: Shawyer, C.R. (2011).	Provides good practice survey guidance in relation to barn owls, including a standardised protocol for conducting and commissioning barn owl surveys in the UK.
Great crested newts *Triturus cristatus*: Habitat Suitability Index Assessment: Oldham *et al.* (2000), and Amphibian and Reptile Groups (ARG) of the United Kingdom (2010). Environmental DNA (eDNA) surveys: Biggs *et al*. (2014).	Provides a standardised methodology for the assessment of habitat suitability for great crested newts. These documents also provide information and best practice guidance on the survey of great crested newts, via eDNA and traditional presence / absence survey methodology.

Guidance Reference	Relevance to the Assessment
Presence / Absence Surveys: English Nature (2001) and Gent, A., and Gibson, S. (1998).	
Natterjack Toad *Epidalea calamita*: Survey guidelines: Martin *et al* (2021). Guidance for monitoring natterjack toad populations in the United Kingdom.	Provides guidance on planning, conducting and interpreting surveys for natterjack toad.
Reptile surveys: Froglife (1999) and JNCC (2003).	Provides guidance on planning, conducting and interpreting surveys for reptiles in the UK, in order to determine project impacts.
Sand Lizard *Lacerta agilis*: Moulton and Corbett (1999) and Gill *et a.l* (2022).	Provides guidance on habitat type, habitat management, life history and survey methodologies.
Surveying Terrestrial and Freshwater Invertebrates for conservation evaluation: Drake, et al. (2007)	Provides a framework for invertebrate surveying, in the UK, in order to determine project impacts.
Fish and eel passage assessment: Sniffer (2010) and ZSL (2018). Eel (Anguilla) survey: Environment Agency (2011).	Provides guidance on fish and eel passage assessment and the survey of eel in the UK
Predictive System for Multimetrics survey: Freshwater Habitats Trust (2024).	Provides a means of assessing the quality of ponds and small lakes in England and Wales, which is used to determine potential project impacts.
UKTAG River Assessment Method. Macrophytes and Phytobenthos: Macrophyte. Water Framework Directive –	A monitoring system for monitoring, assessing and classifying rivers in accordance with the requirements of Article

Guidance Reference	Relevance to the Assessment
United Kingdom Technical Advisory Group (2021).	8; Section 1.3 of Annex II; and Annex V of the Water Framework Directive (2000/60/EC).
The Great Britain Invasive Non-Native Species Strategy 2023 to 2030. DEFRA, Welsh Government and The Scottish Government, (2023).	Provides a framework on how to minimise the risks posed by invasive non-native species.

13.3 STUDY AREA

13.3.1 There is a separation made between marine and terrestrial ecology as to aspects covered and designated sites considered. Marine ecology chapters will cover offshore and coastal intertidal habitats up to High Astronomical Tides (HAT). The terrestrial ecology is then considered from HAT and land beyond (with the exception of functionally linked land associated with qualifying bird species of estuarine designated sites such as the Mersey Estuary SPA, which would remain as a marine based subject matter). So terrestrial ecology, in terms of coastal habitats will include habitats such as sand dune habitats.

13.3.2 The study areas for the Terrestrial Ecology and Biodiversity impact assessment are dependent on the Zones of Influence (ZoI) for the specific ecological features under assessment. In establishing the extent of the study areas for terrestrial ecology, consideration has been paid to the nature of the activities associated with the Project both at the construction and operational stages. The study areas for the EIA will be identified and agreed in consultation with stakeholders.

13.3.3 The 'Terrestrial Ecology and Biodiversity Scoping Boundary' is determined to encompass the overall Grid Connection Development Area, which encompasses the Port and Marine Facilities buffer (and the river itself) into one overall Scoping Boundary. This study area will be refined following the confirmation of a grid connection route. The study areas beyond the Scoping Boundary are defined as follows:

- For Local Nature Reserves (LNRs), Habitats of Principal Importance and Ancient Woodland the study area comprised Terrestrial Ecology and Biodiversity Scoping Boundary plus an additional 1 kilometre (km) radius. Local Wildlife Sites (LWS) datasets will be obtained for the desk study within

the Preliminary Environmental Information Report (PEIR) and Environmental Statement.

- For protected sites of national importance (National Nature Reserves, Sites of Special Scientific Interest), species and habitats not associated with statutory biodiversity conservation sites of international importance, the study area comprised the Terrestrial Ecology and Biodiversity Scoping Boundary plus an additional 2km radius.
- For statutory biodiversity conservation sites of international importance only, the study area comprised the Terrestrial Ecology and Biodiversity Scoping Boundary plus an additional 10km radius for Special Areas of Conservation (SAC) and 20km for Special Protection Areas (SPA) and Ramsar sites.

13.3.4 This is considered to be proportionate to the nature of the Project, and sufficient for consideration of biodiversity receptors that could be affected by construction and operational activities (these being precautionary distances for which it is considered that such activities could result in changes to the baseline biodiversity environment for the associated receptors).

13.3.5 It should be noted that the operational impacts of the tidal barrage itself may generate changes to hydrodynamics and associated coastal processes. This could conceivably impact protected coastal habitats and associated protected species associated with terrestrial ecology, which may then be included in the subsequent EIA, as required. For the purposes of the EIA Scoping, these are considered as marine processes associated with the marine chapters (**Chapters 6-12**) and the Coastal Processes Chapter (**Chapter 5**) but are acknowledged as having potential terrestrial ecology effects (see **Table 13-10** below). The ZoI does cover the locations these effects may occur; however, this is unknown at present and is not considered in detail within this Chapter of the EIA Scoping.

13.3.6 The study areas are shown on **Figures 13.1 – 13.5.**

13.4 CONSULTATION

13.4.1 Consultation is a key part of the application process. The assessment will be informed by engagement and discussion with various stakeholders. It is anticipated that the following stakeholders will be contacted as a minimum:

- Relevant Local Planning Authorities;
- Natural England;
- Environment Agency; and
- Local Wildlife Trusts and other Local Environmental Groups.

13.4.2 Pre-scoping discussions have been held with the relevant local Wildlife Trusts (1 July 2024), the Environment Agency (1 July 2024) and Natural England (15 July 2024), whereby no specific species issues were raised with regards to terrestrial ecology and biodiversity. Clarification over the Project's commitment to biodiversity net gain was sought by the Wildlife Trusts, which was stated as intended to meet statutory requirements as a minimum and to be confirmed as the Project design envelope is refined.

13.5 ASSESSMENT METHODOLOGY

13.5.1 The Project-wide approach to the assessment methodology is set out in **Chapter 3: Approach to EIA**. However, whilst this has informed the approach that is set out in this Terrestrial Ecology and Biodiversity Scoping chapter, it is necessary to set out how this methodology will be applied, and adapted as appropriate, to address the specific needs of the Terrestrial Ecology and Biodiversity assessment in the EIA, which will follow standard industry guidance provided by CIEEM (2019). For example, terms such as receptor (as generic terms in **Chapter 3: Approach to EIA**), is discussed below as ecological feature.

13.5.2 The specific legislation and guidance outlined in **Appendix 4.1** will also be considered in relation to the assessment, in addition to consultation with the stakeholders outlined above.

13.5.3 The assessment will be based on results of a desk study, field surveys, relevant published information (for example on the status, distribution, sensitivity to environmental changes and ecology of the features scoped into the assessment, where this information is available), and professional knowledge of ecological processes and functions. The assessment of likely significant environmental effects as a result of the Project will consider the construction, O&M and decommissioning stages.

13.5.4 The duration of the effect will be assessed as either 'short-term', 'medium-term' or 'long-term'. Short-term is considered to be up to 1 year; medium-term is considered to be between 1 and 10 years and long-term is considered to be greater than 10 years.

Determining Importance

13.5.5 In accordance with CIEEM guidelines, the ecological assessment process focuses on *'Important'* ecological features. Importance relates to the quality and extent of designated sites and habitats, habitat / species rarity and its rate of decline. 'Important' habitats and species are typically those that are not widespread, unthreatened and resilient to project / development impacts. The importance of ecological features is first determined with reference to UK

legislation and policy and then with regard to the extent of habitat or size of population that may be affected by the Project, informed by published information and professional judgement.

13.5.6 Also, in accordance with CIEEM guidelines, the importance of ecological features is categorised within a 'defined geographical context' (spatial scale), with International and European being the highest level of importance, followed by National; Regional; Metropolitan, County, vice-county or other local authority-wide area; River Basin District; estuarine system / coastal cell; and with Local importance representing the lowest level. This geographic scale is typically adapted to suit local circumstances.

Significance Evaluation Methodology

13.5.7 When considering potentially significant effects on ecological features, whether these be negative or positive, the following characteristics of environmental change are taken into account:

- Extent – the spatial or geographical area over which the environmental change may occur.
- Magnitude – the size, amount, intensity or volume of the environmental change.
- Duration – the length of time over which the environmental change may occur.
- Frequency – the number of times the environmental change may occur.
- Timing – the periods of the day / year etc. during which an environmental change may occur.
- Reversibility – whether the environmental change can be reversed through restoration actions.

13.5.8 CIEEM (2019) defines a significant effect as one *"that either supports or undermines biodiversity conservation objectives for 'important ecological features' or for biodiversity in general".* Significant effects, as defined by the CIEEM guidelines, are determined by assessing any deviation in the baseline conditions of a feature of ecological importance that may occur as a result of individual and cumulative impacts during the construction and O&M stages of the Project. These effects will be expressed in terms of geographical scale, however, the geographical scale at which an effect is significant can vary from the geographical importance of the ecological feature being assessed and in accordance with the CIEEM guidelines, this will be a function of the assessment.

13.5.9 Consideration will also be given to EIA terminology and significance will be concluded for both beneficial and adverse effects as either 'Negligible', 'Minor', 'Moderate' or 'Major', with significant effects determined through professional judgement as outlined in **Table 13-2**.

Table 13-2: Categories of significant residual effects in accordance with CIEEM and conversion for consistency with the EIA.

Geographical scale at which a residual effect is assessed as being significant in line with CIEEM EcIA Guidelines	Significance category to be used within the EIA
International, European, National or Regional.	Major
Regional, Metropolitan, County, Vice-County or other Local-Authority Wide Area, River Basin District, Estuarine system / Coastal cell.	Moderate
Local	Minor
Effects on features of Site scale importance or limited effects on features of greater importance. No significant effects on key nature conservation features.	Neutral / Negligible.

13.5.10 The following terms will be used to define the significance of the effects identified and these can be 'beneficial' or 'adverse':

- **Major effect:** where the Project is likely to cause a considerable change from the baseline conditions and the receptor has limited adaptability, tolerance or recoverability or is of the highest sensitivity. This effect is considered to be 'significant';
- **Moderate effect:** where the Project is likely to cause either a considerable change from the baseline conditions at a receptor which has a degree of adaptability, tolerance or recoverability or a less than considerable change at a receptor that has limited adaptability, tolerance or recoverability. This effect is considered more likely to be 'significant' but will be subject to professional judgement; and
- **Minor effect:** where the Project is likely to cause a small, but noticeable change from the baseline conditions on a receptor which has limited adaptability, tolerance or recoverability or is of the highest sensitivity or a considerable change from the baseline conditions at a receptor which can adapt, is tolerant of the change or / and can recover from the change. In the

context of this EIA, residual effects which are 'significant at the Local level' and converted to a 'Minor' effect, are unlikely to be assessed as 'significant' overall.

13.6 BASELINE CONDITIONS

DATA INFORMATION SOURCES

13.6.1 An initial desk-based review has been undertaken of publicly available data sources outlined in **Table 13-3** to determine the baseline character of the study area and inform the assessment process.

13.6.2 No local record data centre information was purchased for the EIA Scoping, and subsequently no species or Local Wildlife Site (LWS) data was gathered. Additional areas of Ancient Woodland contained within Local Wildlife Sites may also be revealed once the record data centre information is obtained. This information will be available and subsequently utilised within the PEIR and actual EIA and updates will be made at that point. It should therefore be noted that no County Wildlife Sites are identified in the Sites of Local Importance sections below. The only species data is based on publicly available information as detailed in **Table 13-3**.

Table 13-3: Key sources of biodiversity data

Source	Date	Summary	Coverage of Study Area
Multi Agency Geographic Information for the Countryside (MAGIC) website[14]	April 2024	Statutory designated biodiversity conservation sites of international importance.	Within the Scoping boundary and 10km (SAC) or 20km (SPA / Ramsar) from the perimeter.
Multi Agency Geographic Information for the	April 2024	Statutory designated biodiversity conservation sites of national importance and their Impact Risk Zones; records of granted	Within the Scoping boundary and

[14] Magic Map Application (defra.gov.uk)

Source	Date	Summary	Coverage of Study Area
Countryside (MAGIC) website.		European Protected Species Licences; Ancient woodland; and Priority habitats.	2km from the perimeter.
Ordnance Survey 1:10 000 scale maps and freely available satellite imagery.	April 2024	To examine the geographical context of the Scoping Boundary and identify potential habitats and key landscape features which may be important for protected and / or notable species, such as ponds and other waterbodies.	Within the Scoping boundary and 2km from the perimeter.
Liverpool City Region (LCR) Ecological Network website.	June 2024	Information on Core Biodiversity Areas and Nature Improvement Areas.	Within the Scoping boundary and 2km from the perimeter.

EXISTING BASELINE

13.6.3 This Section describes the present conditions which constitute the existing baseline environment for Terrestrial Ecology and Biodiversity within the study area. Previous data and survey (e.g. see RSK, 2023) for the Project was marine based with little or no terrestrial ecology data being available.

13.6.4 In terms of sites of international importance[15][16], the majority of the SPAs and Ramsar sites that come within 20km search area of the Scoping Boundary (e.g. Mersey Estuary Ramsar and SPA, Mersey Narrows and North Wirral Foreshore

[15] Conservation of Habitats and Species Regulations 2017 (as amended) include the creation of a national site network within the UK territory comprising the protected sites already designated under the Nature Directives, and any further sites designated under these Regulations. Under the 2017 Regulations Ramsar sites, Special Areas of Conservation (SAC) and Special Protection Areas (SPAs) in the UK no longer form part of the EU's Natura 2000 ecological network. The 2019 Regulations have created a national site network on land and at sea, including both the inshore and offshore marine areas in the UK. The national site network includes: SACs and SPAs and new SACs and SPAs designated under these Regulations

[16] It is a matter of Government policy (NPPF paragraph 187) that sites designated under the 1971 Ramsar Convention for their internationally important wetlands (commonly known as Ramsar sites), are also considered in the same way as SACs, SPAs and cSACs,

Ramsar and SPA, Liverpool Bay SPA and the Dee Estuary SPA) are only relevant to the Marine Ecology Chapters (**Chapters 7–12**) and are not relevant to the terrestrial ecology receptors. Therefore, these are not considered further in this Chapter.

13.6.5 In addition, functionally linked land considerations for the above SPAs, which may be relevant to the Grid connection and Port and Marine Facilities, will also be assessed in **Chapter 9: Marine and Intertidal Ornithology** and is not considered / repeated here.

13.6.6 All SACs are scoped in as they have terrestrial receptors. However, the marine elements of these SACs will be covered in the Marine Ecology Chapters (**Chapters 6 – 12**) and not repeated here.

13.6.7 Further, sites of national importance with marine designations are also covered in the Marine Ecology Chapters (**Chapters 6 – 12**) and not repeated here. These include Mersey Estuary Site of Special Scientific Interest (SSSI), Mersey narrows SSSI, New Ferry SSSI and North Wirral Foreshore SSSI.

PORT AND MARINE FACILITIES

13.6.8 The Port and Marine Facilities and associated infrastructure are all on the banks of the River Mersey. For the Scoping (pre-survey information), the locations look to consist of predominantly existing buildings and hardstanding, with dock features such as open water (linked to the river itself, which will be covered under the Marine Ecology Chapters (**Chapters 6 – 12**)). It is understood the areas will be used for material and equipment storage, land-based construction uses and possible use of office space as needed, linking out to the wider Grid Connection areas.

GRID CONNECTION

13.6.9 The Scoping Boundary covering the Wirral for Breck Road Substation, Birkenhead and Capenhurst lies within a largely urban landscape to the north and east, comprising both residential and industrial land uses. Parts of the Grid Connection Development Area lie along the southern coast, adjacent to the Mersey Estuary, where habitats such as mudflats are present. Further south and west the landscape is predominantly agricultural, with arable and grazed pasture fields, associated hedgerow boundaries, and small pockets of woodland. The Terrestrial Biodiversity Scoping Boundary south of the River Mersey crosses a number of watercourses and ponds are also present throughout the landscape. North of the River Mersey for Lister Drive, the landscape is largely urban, comprising both residential and industrial land uses.

STATUTORY BIODIVERSITY CONSERVATION SITES (INTERNATIONAL IMPORTANCE)

13.6.10 There were four SACs identified within 10km of the Terrestrial Ecology and Biodiversity Scoping Boundary.

13.6.11 There were four SPA and / or Ramsar sites within 20km of the Scoping Boundary relevant to the Scoping Boundary. It should be noted that Midlands Meres Ramsars are designated based on wetland habitats (rather than bird assemblages) and the likely ZoI for these sites would be based on a 10km search area from the Scoping Boundary and therefore would likely be scoped out during the EIA itself.

13.6.12 A list of the sites and their reason for designation is presented within **Table 13-4**, and the location of the sites is shown on **Figure 13.1 and Figure 13.2**.

Table 13-4: Statutory Designated Sites of International Importance within 10km (SACs) and 20km (SPA / Ramsar) of the Scoping Boundary

Designation	Approx. Size (ha)	Approximate Distance and Orientation from Terrestrial Ecology Scoping Boundary	Summary of Features for Site Designation
Sefton Coast SAC.	4591.59	Adjacent to the north.	The Sefton Coast is designated for dune habitats, primarily qualifying habitats: 2110 Embryonic shifting dunes; 2120 “Shifting dunes along the shoreline with *Ammophila arenaria* (“”white dunes””)”; 2130 “Fixed coastal dunes with herbaceous vegetation (“”grey dunes””)” * Priority feature; 2170 Dunes with *Salix repens ssp. argentea* (*Salicion arenariae*) and 2190 Humid dune slacks. In addition, Annex 2 qualifying species petalwort *Petalophyllum ralfsii* (as a primary reason for site selection) and great crested newts *Triturus cristatus* (not a primary reason for site selection).
Dee Estuary SAC.	15,805.27	Adjacent to the north.	The Dee Estuary is made up of tidal rivers, mudflats, sandflats, lagoons, salt marshes, coastal sand dunes, shingles, bogs and deciduous woodland. It is designated for its intertidal and maritime habitats and for sea lamprey *Petromyzon marinus*, river lamprey *Lampetra fluviatilis* and petalwort *Petalophyllum ralfsii*.
River Dee and Bala Lake SAC.	1149.9	Approx 7km south.	River Dee and Bala Lake / Afon Dyfrdwy a Llyn Tegid is made up of tidal rivers, estuaries, mudflats, sandflats, lagoons, salt marshes, inland waterbodies and broad-leaved deciduous woodland. It is designated for water courses of plain to montane levels with *Ranunculion fluitantis* and *Callitricho-Batrachion* vegetation, Atlantic salmon *Salmo salar*, floating water-plantain *Luronium natans.* Also present are sea lamprey, brook lamprey *Lampetra planeri,* river lamprey, bullhead *Cottus gobio* and otter *Lutra lutra*.
Deeside and Buckley Newt Sites SAC.	207.12	Approx 8.3km south-west.	Deeside and Buckley Newt sites are made up of inland waterbodies, bogs, marsh, heath, scrub, dry grassland and woodlands and is designated for GCN with old sessile oak woods also. The SAC is located along part of the north-eastern boundary.

Designation	Approx. Size (ha)	Approximate Distance and Orientation from Terrestrial Ecology Scoping Boundary	Summary of Features for Site Designation
Martin Mere SPA.	119.3	17.8km to the northeast.	A low-lying complex of open water, marsh and grassland habitats overlying deep peat and occupying part of the former site of a large freshwater lake. Qualifying species *Cygnus columbianus bewickii* Bewick's swan (non-breeding); *Cygnus cygnus* Whooper swan (non-breeding); *Anser brachyrhynchus* Pink-footed goose (non-breeding); *Anas crecca* Eurasian teal (non-breeding); and *Anas acuta* Northern pintail (non-breeding). Waterbird Assemblage is noted as a qualifying feature.
Martin Mere Ramsar.	119.3	17.8km to the northeast.	A low-lying complex of open water, marsh and grassland habitats overlying deep peat and occupying part of the former site of a large freshwater lake. Numbers of wintering waterbirds regularly exceed 20,000 individuals and include internationally important numbers of swans, ducks and geese. Wintering and passage *Philomachus pugnax* (passage flock of 50), and scarce or rare plant and invertebrate species, are also features of national importance
Midlands Meres and Mosses Ramsar Phase 1.	511	17.9km to the east.	Qualifies under Ramsar criterions 1 and 2: Ramsar criterion 1: The site comprises a diverse range of habitats from open water to raised bog. Ramsar criterion 2: Supports a number of rare species of plants associated with wetlands, including the nationally scarce cowbane *Cicuta virosa* and, elongated sedge *Carex elongata*. Also present are the nationally scarce bryophytes *Dicranum affine* and *Sphagnum pulchrum*. Also supports an assemblage of invertebrates including several rare species. There are 16 species of British Red Data Book insect listed for this site including the following endangered species: the moth *Glyphipteryx lathamella*, the caddisfly *Hagenella clathrata* and the sawfly *Trichiosoma vitellinae*.

Designation	Approx. Size (ha)	Approximate Distance and Orientation from Terrestrial Ecology Scoping Boundary	Summary of Features for Site Designation
Midlands Meres and Mosses Ramsar Phase 2.	891	19.3km to the south.	Qualifies under Ramsar Criterions 1 and 2: See Midlands Meres and Mosses Ramsar Phase 1 for detail (above).

Statutory Biodiversity Conservation Sites (National Importance)

13.6.13 Four statutory biodiversity conservation sites of national importance were identified within 2km of the Terrestrial Ecology and Biodiversity Scoping Boundary, comprising Sites of Special Scientific Importance (SSSIs). A list of the sites and their reason for designation is presented within **Table 13-5**, and the location of the sites is shown on **Figure 13.3**.

Table 13-5: Statutory Designated Sites of National Importance within 2km of the Scoping Boundary

Designation	Approx. Size (ha)	Approximate Distance and Orientation from Terrestrial Ecology Scoping Boundary	Summary of Features for Site Designation
Sefton Coast SSSI.	4605.32	Directly adjacent.	The site is of special interest for intertidal mud and sandflats, embryonic shifting dunes, mobile dunes, dunes with creeping willow Salix arenaria, humid dune slacks, fixed dunes, dune grasslands and dune heat. Small areas of saltmarsh are also present. Its assemblages of vascular and non-vascular plants, in particular the nationally rare grey hair grass *Corynephorus canescens*, nationally scarce liverwort *Petalophyllum ralfsii* and nationally rare moss *Bryum neodamense*, are also of special interest. In terms of fauna, the Sefton coast supports populations of natterjack toad *Epidalea calamita* and sand lizard *Lacerta agilis*.
Dibbinsdale SSSI.	53.2	Within Scoping Boundary.	The main habitats included are semi-natural broadleaved woodland, which covers most of the site, reed swamp, fen pasture and neutral grassland. This is the largest block of semi-natural woodland of its type in Merseyside and it contains typical examples of *ash Fraxinus excelsior* and wych elm *Ulmus glabra* and valley

Designation	Approx. Size (ha)	Approximate Distance and Orientation from Terrestrial Ecology Scoping Boundary	Summary of Features for Site Designation
			alder *Alnus glutinosa* woodland, each of which supports a rich flora and fauna.
Hallwood Farm Marl Pit SSSI.	0.1	Directly adjacent	Hallwood Farm Marl Pit has been selected because it contains black poplar Populus nigra (both male and female) which is an uncommon and declining British native tree.
Meols Meadows SSSI.	7.8	Within Scoping Boundary.	The main habitat is damp unimproved neutral grassland, the level fields being separated by ditches containing tall fen vegetation.

Statutory Biodiversity Conservation Sites (Local Importance)

13.6.14 Three statutory biodiversity conservation sites of local importance were identified within 1km of the Terrestrial Ecology and Biodiversity Scoping Boundary, comprising Local Nature Reserves (LNRs). A list of the sites and their reason for designation is presented within **Table 13-6** and the location of the sites is shown on **Figure 13.4**. As noted above no County Wildlife Sites have been identified as yet (see **section 13.7.1** above).

Table 13-6: Statutory Designated Sites of Local Importance within 1km of the Scoping Boundary

Designation	Approx. Size (ha)	Approximate Distance and Orientation from Scoping Boundary	Summary of Features for Site Designation
Bidston Moss LNR.	7.11	Within the Terrestrial Ecology Scoping Boundary.	Wetland, woodland and grassland.
Brotherton Park and Dibbinsdale LNR.	33.69	Within the Terrestrial Ecology Scoping Boundary.	The Site includes one of the Wirral's largest and finest examples of SSSI ancient woodland, with other notable habitats including wildflower meadows, reed swamps and historic parkland.

Designation	Approx. Size (ha)	Approximate Distance and Orientation from Scoping Boundary	Summary of Features for Site Designation
Rivacre Valley LNR.	41.58	Directly adjacent to Terrestrial Ecology Scoping Boundary.	Comprises woodland and meadows close to Ellesmere Port.
Brook Vale LNR.	8.2	Within 1km of the Terrestrial Ecology Scoping Boundary.	A mosaic of several habitats including Reed-bed swamp, Rimrose Brook and a man-made pond system as well as smaller peripheral areas of damp meadow, dry grassland and Willow-Carr woodland.

Table Note: LNR – Local Nature Reserve.

Nature Improvement Areas and Core Biodiversity Areas

13.6.15 A total of nine Nature Improvement Areas (NIA) were identified within 2km of the Terrestrial Ecology and Biodiversity Scoping Boundary, the details of which are provided in **Table 13-7** below.

13.6.16 Core Biodiversity Areas comprise a combination of Designated Sites and Priority Habitats and are therefore absent from this table as information relating to designated sites is provided in **Tables 13.4 to 13.6** above and information relating to Priority Habitats is provided in **Table 13-7** below.

Table 13-7: Nature Improvement areas

Nature Improvement Area	Approx. Size (ha)	Approximate Distance and Orientation from Scoping Boundary	Summary of Nature Improvement Area Focus Profiles
Dee Estuary.	3,911	Within the Terrestrial Ecology Scoping Boundary.	The Focus Area incorporates designated sites and mud and sand-flats of the outer estuary, saltmarshes of the Wirral coast and sand dunes. The Area supports several wading bird species for feeding, roosting and breeding. Ecological priorities include habitat management of the designated sites to ensure resilience to natural and climate change.
Dibbinsdale, Raby Mere	603	Within the Terrestrial Ecology Scoping Boundary.	The Focus Area is based on the River Dibbin and its catchment area, with extents of ancient woodland.

Nature Improvement Area	Approx. Size (ha)	Approximate Distance and Orientation from Scoping Boundary	Summary of Nature Improvement Area Focus Profiles
and Eastham Country Park.			Ecological priorities include habitat creation of new woodlands to buffer existing ancient woodlands and habitat management priorities include woodland management to enhance existing ancient woodlands, as well as management to eradicate both Japanese knotweed *Reynoutria japonica* and Himalayan balsam *Impatiens glandulifera*.
East Wirral Heathlands.	223	Within the Terrestrial Ecology Scoping Boundary.	The Focus Area comprises a large area of naturally isolated and highly fragmented heathland with associated and acid grasslands. Ecological priorities include habitat creation of heathland and grassland. Habitat management priorities include restoring, maintaining and enhancing heathland habitats, increasing species diversity of existing grasslands and enhancing areas of woodland in order to support the heathland.
Mersey Estuary.	6,438	Within the Terrestrial Ecology Scoping Boundary.	The Focus Area incorporates numerous designated sites and the entirety of the estuary. The Area is of major importance for ducks and waders, and grasslands and fields act as important roosting and feeding sites for birds. Ecological priorities include habitat creation of grasslands and woodlands, and habitat management priorities include management of designated sites, maintaining and enhancing ancient woodlands, semi-natural woodlands and maintaining the extent and increasing species diversity of existing grasslands.

Nature Improvement Area	Approx. Size (ha)	Approximate Distance and Orientation from Scoping Boundary	Summary of Nature Improvement Area Focus Profiles
North Wirral Foreshore and Liverpool Bay.	4,265	Directly adjacent to Terrestrial Ecology Scoping Boundary.	The area incorporates designated sites and remnant sand dunes. Ecological priorities include habitat restoration within some sand dune areas, and habitat management priorities include management of the designated sites and enhancement of remnant dune areas.
River Alt and M57 Corridor.	751	Within the Terrestrial Ecology Scoping Boundary.	The area follows the course of the River Alt and its tributaries, acting as an important 'greenway' linkage adjacent urban areas. Ecological priorities include habitat creation of wetlands, grassland, and woodland (including parkland). Habitat management objectives include enhancing watercourses, maintaining and enhancing existing woodlands, wood-pasture and parkland, and ponds, as well as maintaining the extent and increasing species diversity of existing grasslands.
River Birket Corridor.	758	Within the Terrestrial Ecology Scoping Boundary.	The Focus Area includes the river Birket and Fender with some tributaries and important wetland and grassland sites. Inland wetland areas provide habitat for important overwintering, passage and breeding birds. Ecological priorities include habitat creation of wetlands (including rivers) and new hedgerows. Habitat management priorities include enhancing watercourses, maintaining the value of supporting habitat for important bird populations, maintaining and enhancing species diversity of wetlands, grasslands, and habitat linkages.

Nature Improvement Area	Approx. Size (ha)	Approximate Distance and Orientation from Scoping Boundary	Summary of Nature Improvement Area Focus Profiles
Sefton Coast.	8,148	Within the Terrestrial Ecology Scoping Boundary.	The Focus Area is drawn around the designated sites of the Sefton Coast and includes intertidal mud and sand-flats from the Ribble Estuary to the Mersey Narrows. There are limited opportunities for habitat creation, but an ecological priority of the area is the creation of dune heathland habitat. Habitat management priorities include managing the nature conservation objectives of the designated sites which it contains, increasing management of sand dunes and improvement to visitor facilities.
West Wirral Heathlands and Arrowe Park.	1,008	Directly adjacent to Terrestrial Ecology Scoping Boundary.	The Focus Area includes a mosaic of lowland heath, acid grassland, established and regenerating woodland and scrub. Ecological priorities include habitat creation of heathland and grassland. Habitat management priorities include restoring, maintaining and enhancing heathland habitats, maintaining and improving species diversity of grasslands, and enhancing existing woodland to support the heathland.

Habitats, Protected / Notable Species and Invasive Non-native Species

13.6.17 In the absence of field survey data, the following information is provided on the basis of desk-study results and interrogation of publicly accessible databases and mapping.

13.6.18 The Terrestrial Ecology and Biodiversity Scoping Boundary lies within a largely urban landscape to the north, comprising both residential and industrial land uses. The Port and Marine Facilities and parts of the Grid Connections lie along the coast, adjacent to the Mersey Estuary, where habitats such as mudflats are present. Further south the landscape is predominantly agricultural, with arable and grazed pasture fields, associated hedgerow boundaries, and small pockets

of woodland. The Terrestrial Biodiversity Scoping Boundary crosses a number of watercourses and ponds are also present throughout the landscape.

13.6.19 There are coastal habitats associated with the estuary, where habitats such as mudflats are likely present, which will be covered in the Marine Ecology Chapters. **Table 13-8** summarises potential Priority Habitat and Ancient Woodland that may be relevant to the EIA and the location of the sites is shown on **Figure 13.5**.

Table 13-8: Priority Habitat Potentially Within the Scoping Boundary of the Scoping Boundary

Priority Habitat	Location within Terrestrial Ecology and Biodiversity Scoping Boundary
Hedgerows.	Potential for hedgerows in landscaped areas along coast, around the Port and Marine Facilities and within more formal landscaped areas. In addition, likely to be in wider landscape in relation to the Grid Connections.
Ponds	Potential for ponds in landscaped areas along coast, around the Prot and Marine Facilities and within more formal landscaped areas. In addition, likely to be in wider landscape in relation to the Grid Connections.
Good quality semi-improved grassland.	Areas of grassland noted around locations of Port Facility locations. In addition, likely to be in wider landscape in relation to the Grid Connections.
Lowland Mixed Deciduous Woodland and Ancient Woodland.	Eastham Wood Ancient Woodland, Wirral Waters, Cammell Laird, Tranmere Oil Terminal, Port Sunlight, Mersey Wharf. These woodland areas are local to potential Port and Marine Facilities locations. Ancient Woodland associated with the Dibbinsdale SSSI and a second smaller area of Ancient Woodland was identified south-east of Bebington in relation to the wider Grid Connection. In addition, there is likely to be further areas of woodlands in wider landscape in relation to the Grid Connections.
Open mosaic habitat on previously developed land.	All Port and Marine Facilities. In addition, likely to be in wider landscape in relation to the Grid Connections.

Priority Habitat	Location within Terrestrial Ecology and Biodiversity Scoping Boundary
Coastal sand dunes.	Possible location in relation to Port and Marine Facilities and likely to be in wider landscape in relation to the Grid Connections.
Coastal floodplain and grazing marsh.	Possible location in relation to Port and Marine Facilities and likely potential to be within Scoping Boundary of Grid Connection.
Reedbeds	Possible location in relation to Port and Marine Facilities and likely potential to be within Scoping Boundary of Grid Connection.
Lowland meadows.	Potential to be within Scoping Boundary of Grid Connection.
Lowland dry acid grassland.	Potential to be within Scoping Boundary of Grid Connection.
Lowland fens.	Potential to be within Scoping Boundary of Grid Connection.
Lowland heathland.	Potential to be within Scoping Boundary of Grid Connection.
Traditional orchards.	Potential to be within Scoping Boundary of Grid Connection.
Arable field margins.	Potential to be within Scoping Boundary associated with the Grid Connection.

13.6.20 There is potential for further Priority Habitats to be identified during the course of field surveys. Additional Priority Habitats identified within 2km included mudflats, coastal saltmarsh and other marine habitats such as Intertidal Substrate Foreshore. Marine habitats are covered in detail under **Chapters 6-12.**

13.6.21 The review of MAGIC identified 10 European Protected Species licences issued for bats and six issued for great crested newts within the Terrestrial Biodiversity Scoping Boundary. The licences related to bats were for the following species: common pipistrelle *Pipistrellus pipistrellus*, soprano pipistrelle *Pipistrellus pygmaeus*, Noctule *Nyctalus noctule*, whiskered bat *Myotis mystacinus*, Leisler's

bat *Nyctalus leisleri*, Natterer's bat *Myotis nattereri* and brown long-eared bat *Plecotus auritus*. The majority allowed for the destruction of a resting place, with two also allowing for the destruction of a breeding site. The most recent licences for bats were issued in 2019. The most recent great crested newt licence related to the destruction of a breeding and resting placed, issued in 2018.

13.6.22 In general, the EIA will need to consider a significant suite of terrestrial ecological receptors including ancient woodland, Priority Habitats, bats (roosts and activity), otter *Lutra lutra*, water vole *Arvicola amphibius*, barn owl *Tyto alba*, nesting birds, badgers *Meles meles*, reptiles, amphibians (including great crested newts (GCN) *Triturus cristatus*), freshwater ecology (including macrophytes, macroinvertebrates, fish, river habitat), hazel dormouse natterjack toad *Epidalea calamita* and sand lizard *Lacerta agilis*. The full requirement will be detailed once further information to inform the EIA is available.

13.7 FUTURE BASELINE

13.7.1 Determining a future baseline draws upon information about the likely future use and management of the site in the absence of development, known population trends (for species) and climate change.

13.7.2 Much of the Terrestrial Ecology and Biodiversity Scoping Boundary encompasses residential and industrial areas and is therefore unlikely to markedly change from the current baseline. The remaining areas which are under agricultural use are also unlikely to notably change as the current land management practices are likely to continue. This includes grazing livestock, cultivating crop, and the regulation of boundary features such as hedgerows. Areas which are otherwise designated, e.g. as SSSI or LNR, within the Terrestrial Ecology and Biodiversity Scoping Boundary will continue to be managed according to the specific goals of the site and may increase in biodiversity value, however the habitats present are likely to remain consistent. It is therefore considered reasonable to use the existing baseline as the basis of the assessment.

13.7.3 For intertidal habitat associated with climate change in terms of greenhouse gas emissions and the future baseline, two Representative Concentration Pathway (RCP) models for the mid-22nd Century were considered (HR Wallingford, 2024. The RCP 4.5 emissions stabilisation scenario suggested conversion of all the highest intertidal areas to saltmarsh and a small loss of total inter tidal area. For a high emissions scenario (RCP 8.5) the future baseline could see a conversion of all highest intertidal areas and saltmarsh to mud / sand flats, with a ~2km loss

of total intertidal area, constrained by flood defences. An assumption of this model is that the estuary sediment budget cannot keep pace with sea level rise.

13.7.4 An In-combination Climate Impacts (ICCI) assessment will be undertaken. The ICCI is undertaken by assessing how identified receptors in the surrounding environment (for example habitats such as saltmarsh and designated sites) are affected by future climate parameters, informed by the future climate baseline. Inclusion of an ICCI assessment has been scoped in, but this will be addressed at PEIR or ES stage and captured within the Terrestrial Ecology Chapters alongside the other relevant chapters as part of the assessments for their environmental topics. The ICCI assessment will identify if any reported effects will be exacerbated or ameliorated by the effects of climate change and identify further mitigation where required. It will also assess whether the embedded measures will continue to be effective considering changes to climate.

13.8 BASIS FOR SCOPING ASSESSMENT

13.8.1 The Terrestrial Ecology and Biodiversity scoping assessment is based on the following key assumptions which are also set out in **Chapter 2: Site Context and Project Description**:

- The Grid Connection will either be an underground cable for the entirety of the route from the tidal barrage to the point of connection, whichever route is progressed (including a subsea cable section if required) or will require reinforcement / restringing of the existing overhead connection to the existing point of connection;
- No new port facilities will be constructed. Existing Port Facilities will be utilised for temporary construction laydown and compounds as required;
- All facilitating infrastructure (such as compounds) and works required for the installation of the Grid Connections would be confined to the Scoping Boundary but is likely to be a 1km buffer from the actual grid connection locations once a route is decided; and
- Construction of the Grid Connection will be via both open cut and trenchless crossing techniques. As the locations where trenchless crossing techniques may be implemented has not been determined, for the purposes of this assessment a worst-case scenario has been assumed whereby open cut methods are implemented for the entirety of all Grid Connection routes.

13.9 EMBEDDED ENVIRONMENTAL MEASURES

13.9.1 Embedded mitigation measures have been identified and are proposed to be adopted as part of the evolution of the Project design (embedded into the Project design). These measures will evolve over the development process as the EIA progresses and in response to consultation. They will be fed iteratively into the assessment process. These measures typically include those that have been identified as good or standard practice and include actions that would be undertaken to meet existing legislation requirements.

13.9.2 As there is a commitment to implementing these environmental measures, and also to various standard sectoral practices and procedures, they are considered inherently part of the design of the Project and have, therefore, been considered in the scoping assessment.

13.9.3 As noted in **Appendix 4.1** (and reiterated here) the National Policy Statement for Energy EN-1 (NPS-EN1) (2014) states that an applicant should *"…show the project has taken advantage of opportunities to conserve and enhance biodiversity and geological conservation interests"* in respect of internationally, nationally or locally designated sites of ecological or geological interest. Further *"…species and habitats have been identified as being of principal importance for the conservation of biodiversity in England and Wales and thereby requiring conservation action."*

13.9.4 Biodiversity Net Gain (BNG) will be considered as part of the Project, with the Project needing to achieve a Net Gain of 10% as per the mandatory requirements in England for large scale projects as of 12 February 2024 and for Nationally Significant Infrastructure Projects from November 2025 under Schedule 7A of the Town and Country Planning Act (as inserted by Schedule 14 of the Environment Act 2021) (DEFRA, 2024).

13.9.5 In addition to the specific embedded mitigation measures relevant to Terrestrial Ecology and Biodiversity listed in **Table 13-9**, consultation will be undertaken with all relevant consultees to address any concerns or issues.

Table 13-9: Relevant Terrestrial Ecology and Biodiversity Embedded Environmental Measures

ID	Mitigation Measures Embedded into the Project Design	How the Measure will be Secured
13-1	Minimising land take for construction and insightful optioneering for compound / lay down areas to reduce habitat loss / avoid impacts on habitats of biodiversity value. Protection of existing established vegetation where appropriate. Mitigation measures seeks to reduce the impacts of the project on habitats of high biodiversity value which are likely to support protected and notable species.	Project Design, implemented during construction, maintenance works during operation and decommissioning.
OM5	Where possible avoid sensitive / irreplaceable habitat of ecological importance, such as ancient woodland and sites of international and national importance.	Project Design, implemented during construction, maintenance works during operation and decommissioning.
13-2	Avoid use of open cut cable line techniques across sensitive habitat such as rivers and streams. Use of Horizontal directional drilling (HDD) techniques to be employed to avoid significant impacts on sensitive ecological receptors.	Project and Construction Design, to be implemented during construction.

ID	Mitigation Measures Embedded into the Project Design	How the Measure will be Secured
OM1	An Outline Construction Environmental Management Plan (OCEMP) will be prepared and submitted as part of this EIA Scoping Report and a more detailed version of the OCEMP will be submitted as part of the Environmental Statement to record mitigation measures proposed to minimise potential effects to receptors (terrestrial ecology). Provision and implementation of the OCEMP will ensure all ecological mitigation measures are adhered to and in compliance with legislation, government and industry standards, to ensure good practice is implemented and to minimise impacts wherever possible. The CEMP will include, but will not be limited to: identification of potentially damaging construction activities, biodiversity protection zones, practical measures to reduces and or avoid impacts during construction (e.g. ecological method statements, consents, European Protected Species (EPS) licencing and mitigation); location and timing of sensitive works to avoid harm to ecological receptors, protective fencing / exclusion barrier during construction, invasive non-native species plan, roles and responsivities, ecological clerk of work and or competent person, on-going monitoring and compliance checks post-completion, submission of a verification report by the EcOW or competent person to the LPA at the end of construction. CEMP seeks to prevent damage to protected and notable habitats and species.	OCEMP will form part of the submission of the Environmental Statement with the DCO Application. The OCEMP will form the basis of a final CEMP to be agreed post-consent and prior to the discharge of conditions.

ID	Mitigation Measures Embedded into the Project Design	How the Measure will be Secured
13-4	An Outline Habitat Management Plan (OHMP) will be prepared and submitted as part of the Environmental Statement to record mitigation measures proposed to minimise potential effects to receptors (terrestrial ecology). The document will set out the applicant's proposals for habitat management for the Project which have been agreed 'in principle' with the landowners, and which would intend to implement if planning permission is granted. The OHMP will form the basis of a final Habitat Management Plan to be agreed post-consent and prior to the discharge of conditions.	The OHMP will form part of the submission of the Environmental Statement.
OM5	Following relevant legislation and engaging with stakeholders early to avoid highly sensitive biodiversity areas / implementing bespoke mitigation and compensation where impacts cannot be avoided as agreed with Natural England and other key stakeholders. Mitigation measures seek to prevent damage to protected and notable habitats and species.	Following planning consent and prior to any works submission of EPS licences to Natural England and relevant consents to other key stakeholders.
13-5	Provision and implementation of a Landscape and Ecology Management Plan (LEMP) to ensure all ecological mitigation and enhancement measures are detailed and secured in the short, medium and long term; along with necessary management and monitoring measures. This would be undertaken for protected and notable habitats and species.	Submission of LEMP as part of Discharge of DCO Requirements to the LPA.

ID	Mitigation Measures Embedded into the Project Design	How the Measure will be Secured
13-6	Provision and implementation of a Lighting Strategy to demonstrate that lighting will minimise disturbance, not cause excessive light pollution or disturb or prevent bats accessing roost sites; and bats and or other species from using key habitats as foraging and commuting corridors.	Submission of Lighting Strategy as part of DCO Requirement. The Lighting Strategy is to be included within the LEMP and CEMP.
13-7	Provision of mandatory Biodiversity Net Gain Habitat Management and Monitoring Plan (HMMP) which will outline measures set out for a period of 30 years (as per current Natural England guidance). The HMMP will be submitted separately to a CEMP and LEMP and will form part of the BNG Process. The implementation of suitable mitigation and compensation measures relating to habitat loss will be outlined in order to achieve Biodiversity Net Gain of 10%.	Submission of a Biodiversity Net Gain HMMP to LPA as part of the discharge of conditions. The specified number of biodiversity units will need to be submitted and agreed with the LPA. A certificate confirming the legal agreement of an On-Site / Off-Site Biodiversity Net Gain Provider; and or Offset Provider (the provider will need to be on the Biodiversity Gains Site register (DEFRA and Natural England, 2024)) is to be submitted to and agreed to in writing by the LPA.

13.10 LIKELY SIGNIFICANT EFFECTS

13.10.1 In line with the EIA Regulations 2017, the EIA for the Project will consider those impacts where there is a risk of a likely significant effect only. The following Section draws on industry experience and expertise to identify those effect-receptor pathways that may potentially lead to a significant impact. Where experience and available evidence indicates an effect-receptor pathway will not lead to a significant impact with regards to the EIA Regulations 2017 the pathway is scoped out from assessment.

13.10.2 The scoping assessment is based on a combination of the Project definition at the scoping stage, embedded environmental measures, understanding of the baseline conditions at this stage, the evidence base for Terrestrial Ecology and Biodiversity effects, the identification of potentially impacted receptors, and professional judgement. The approach to this assessment is set out in **Chapter 3: Approach to EIA.**

13.10.3 The early identification of likely significant effects is used here as a tool aimed at delivering a proportionate approach to the EIA. In doing so, it sets out a high-level assessment of all potential effects, significant or not. The basis for scoping out certain effects is presented after the table, supported by evidence base.

13.10.4 The likely significant effects on Terrestrial Ecology and Biodiversity are summarised in **Table 13-10**.

PORT AND MARINE FACILITIES

13.10.5 There will be no construction phase associated with the Port and Marine Facilities, as only existing facilities will be used. However, there may affects from landfall needs as per the Grid Connection. There may also be changes of use and more activity at the facilities, so at this point assessment for certain terrestrial ecology receptors are scoped in, which can be reassessed when further detail is known. Once construction is complete, any Port and Marine Facilities used may be maintained as operational and maintenance facilities for the Barrage and Grid Connection, or they will be reinstated as agreed with the site operators and function as they do at the present time. The operation and maintenance of the Port and Marine Facilities are unlikely to be significantly different to what occurs within these locations at the present time and no likely significant effects are foreseen.

13.10.6 The only impacts to be assessed for Likely Significant Effects will be during the construction phase.

GRID CONNECTION

13.10.7 Most receptors will be subject to effects during the construction stage of the Grid connections works. During the operation stage the Grid connection will be buried or on existing infrastructure and therefore, for the majority of the Project lifespan, operational effects would be limited to any associated above ground infrastructure such as substations.

13.10.8 There may be a requirement for expansion to the existing substations. Instances of maintenance may produce localised effects but are likely to be similar to those maintenance operations at the present time, with little change due to the Project. However, replacement of the Grid connection, as required, is likely to produce effects for all receptors in line with those during the construction stage.

13.10.9 Decommissioning the Project will comprise the removal of all above ground structures associated with the Grid connection, to 1m below ground level. The cable is likely to remain in-situ. Decommissioning effects will therefore be localised to certain locations along the Grid connection route.

13.10.10 Whilst it is likely the biggest impact will be at construction, given the Project Life Span is estimated to be 120 years, Construction, O&M, and Decommissioning activities are likely to have similar impacts for the Grid Connections and are not separated by receptor at this point in the summary table (**Table 13-10** below).

Table 13-10: Likely Significant Terrestrial Ecology and Biodiversity Effects

Activity and Impact	Embedded Measures	Receptor	Justification	Proposed Approach to Assessment: Scoped In or Out	Further Data Baseline Requirements
Construction: Possible direct loss of habitat, disturbance to habitat and qualifying species and degradation of habitat due to indirect impacts such as pollution events. Harm and injury to species. Impacts on habitats and species due to degradation of air quality (works and increased traffic levels) and of increased noise levels (works/traffic). Impacts on water quality due to pollution and disturbance. O&M:	Avoidance, OCEMP, OHMP, BNG (HMMP), associated mitigation measures.	Statutory Designated Sites - International (Ramsar, SPA and SAC).	The potential exists for direct physical impacts (e.g. direct loss of habitat) and indirect impacts (e.g. pollution events) on designated sites, along with their feature of interest and associated habitats during construction. Whilst it appears the Port and Marine Facilities work is unlikely to impact on the Dee Estuary SAC (locations) or the Martin Mere SPA (due to lack of terrestrial functionally linked habitat); there may be impact on the Sefton Coast SAC in terms of adjacent location and qualifying species such as GCN.	Scoped in.	Where scoped in the following is likely required: A full desk-study, including data records request from the Local Records Centre and other specialist interest ground e.g WeBs, BTO and RSPB) Habitat surveys to identify the habitats present and confirm the occurrence of priority habitats. Protected species surveys to identify
	Avoidance, OCEMP, OHMP, BNG (HMMP), associated mitigation measures.	Statutory Designated Sites - National (SSSI) and	The potential exists for direct physical impacts (e.g. direct loss of habitat) and indirect impacts (e.g. pollution events) on	Scoped in.	

Activity and Impact	Embedded Measures	Receptor	Justification	Proposed Approach to Assessment: Scoped In or Out	Further Data Baseline Requirements
Limited impacts as it is likely to be restricted to existing forms of O&M, but possible disturbance of habitat and to qualifying species if cable needs digging up. In addition, Hydrodynamics and Coastal Processes due to the Barrage will need to be considered in terms of potential change to terrestrial coastal habitat distribution and impacts on protected sites and qualifying species (e.g. GCN, natterjack toad and sand lizard (at Sefton Coast) and possibly Dee Estuary). Decommissioning: Possible direct loss of habitat, disturbance to habitat and qualifying		Locally / County Importance (Local Nature Reserve); and Non-Statutory Designated Sites of Local Importance (Local Wildlife Sites).	designated sites, along with their feature of interest and associated habitats during construction.		the presence/likely absence of relevant qualifying species associated with the designated sites.
	Avoidance, OCEMP, OHMP, BNG (HMMP), associated mitigation measures.	Habitats of Principal Importance	The Project could pass through and or be within proximity to, Habitats of Principal Importance (e.g. hedgerows, woodland and ponds). Sections of hedgerow and potentially woodland will require an open cut method of pipeline installation. The removal of sections of hedgerow and or woodland may be impacted but this is likely to be limited to the construction phase only. The potential exists for direct physical impacts (e.g. Priority	Scoped in.	

Activity and Impact	Embedded Measures	Receptor	Justification	Proposed Approach to Assessment: Scoped In or Out	Further Data Baseline Requirements
species and degradation of habitat due to indirect impacts such as pollution events. Impacts on habitats and species due to degradation of air quality and of increased noise levels. Impacts on water quality.			Habitats / Priority Areas including. arable field margins, hedgerows, ponds, mudflats, coastal floodplain and grazing marsh, good quality semi-improved grassland, lowland meadows, deciduous woodland and open mosaic habitat on previously developed land).		
	Avoidance, OCEMP, OHMP, BNG (HMMP), associated mitigation measures.	Ancient Woodland	The potential exists for direct physical impacts (e.g. direct loss of habitat) and indirect impacts (e.g. pollution events) on Ancient Woodland during construction. The Ancient Woodlands Eastham Wood, Thornton Wood, Intake Wood, Marsfords Wood, Railway Wood, Patricks Wood, Footpath Wood, Stream Wood and Plymyard Dale are all within the Scoping Boundary. Additional areas of Ancient Woodland contained within Local Wildlife Sites may also be revealed once	Scoped in.	

Activity and Impact	Embedded Measures	Receptor	Justification	Proposed Approach to Assessment: Scoped In or Out	Further Data Baseline Requirements
			the desk study data from local records centres is obtained.		
	Avoidance, use of HDD, OCEMP, OHMP, BNG (HMMP), associated mitigation measures.	Watercourses and waterbodies	The Proposed Development traverses through and in proximity to watercourses and waterbodies. The potential exists for direct physical impacts (e.g. manipulation or alteration of channels) and indirect impacts (e.g. pollution events) during construction. Note: waterbodies associated with the Port Facilities and Infrastructure are marine based and are to be considered in the Marie Ecology Chapters (**Chapters 7–12**)	Scoped in.	
	Avoidance, OCEMP, OHMP, BNG (HMMP), associated mitigation measures.	Badger	Badger: Habitats within the Scoping Boundary have the potential to support badger. The potential exists for direct physical impacts to badger and their setts	Scoped in.	

Activity and Impact	Embedded Measures	Receptor	Justification	Proposed Approach to Assessment: Scoped In or Out	Further Data Baseline Requirements
			(e.g. loss of badger setts) as well as indirect impacts (e.g. vibration or noise disturbance) to resident badger during construction. Note: Given the Port Facilities and Infrastructure areas already consist of buildings and hardstanding and are working infrastructure it is unlikely the badger would be present in these locations.		
	Avoidance, OCEMP, OHMP, BNG (HMMP), associated mitigation measures (licensing).	Bats	Habitats within the Scoping Boundary have the potential to support bats and their roosts (buildings) and foraging and commuting routes. The potential exists for direct physical impacts to bat roosts and bats (e.g. damage to, or loss of bat roosts) with impacts to foraging and commuting routes through indirect impacts (e.g. vibration, light or noise disturbance) to bats during construction.	Scoped in.	

Activity and Impact	Embedded Measures	Receptor	Justification	Proposed Approach to Assessment: Scoped In or Out	Further Data Baseline Requirements
	Avoidance, OCEMP, OHMP, BNG (HMMP), associated mitigation measures.	Hazel Dormouse	The Project has the potential to traverse through and be located in close proximity to habitat suitable to support hazel dormouse, such as ancient woodland, broadleaved woodland, hedgerows and scrub. No records exist for hazel dormouse within the Scoping Boundary and given present national distribution they are unlikely to be in the Scoping Boundary but are scoped in as per the precautionary principal. Whilst this species is rare, the potential exists for direct physical impacts (e.g. mortality of individuals or direct impacts to, or loss of, resting places) and indirect impacts (e.g. pollution events and disturbance through vibration or noise) to hazel dormouse.	Scoped in.	

Activity and Impact	Embedded Measures	Receptor	Justification	Proposed Approach to Assessment: Scoped In or Out	Further Data Baseline Requirements
	Avoidance, OCEMP, OHMP, BNG (HMMP), associated mitigation measures.	Otter	A variety of watercourses are present, within and adjacent to the Scoping Boundary, with the potential to support otter. The potential exists for direct physical impacts (e.g. impacts to, or loss of, holts) and indirect impacts (e.g. vibration, light or noise disturbance) to otter.	Scoped in.	
	Avoidance, OCEMP, OHMP, BNG (HMMP), associated mitigation measures.	Water Vole:	A variety of watercourses are present, within and adjacent to the Scoping Boundary, with the potential to support water vole. The potential therefore exists for direct physical impacts (e.g. impacts to, or loss of, burrows) and indirect impacts (e.g. vibration disturbance) to water vole.	Scoped in.	
	Avoidance, OCEMP, OHMP, BNG (HMMP), associated mitigation measures.	Other Mammals	The Project has the potential to traverse through and be located in proximity to habitat suitable to support other mammals such as hedgehog *Erinaceus europaeus*,	Scoped in.	

Activity and Impact	Embedded Measures	Receptor	Justification	Proposed Approach to Assessment: Scoped In or Out	Further Data Baseline Requirements
			brown hare *Lepus europaeus,* polecat *Mustela putorius* and harvest mouse *Micromys minutus*. The potential therefore exists for direct physical impacts (e.g. direct loss of habitat) and indirect impacts (e.g. pollution events) on other mammals.		
	Avoidance, OCEMP, OHMP, BNG (HMMP), associated mitigation measures.	Birds	Habitats within the Scoping Boundary have the potential to support nesting / roosting / overwintering bird species. The potential exists for direct physical impacts (e.g. loss of nests) and indirect impacts (e.g. disturbance to nesting birds) to birds.	Scoped in.	
	Avoidance, OCEMP, OHMP, BNG (HMMP), associated mitigation measures.	Amphibians	Habitats within the Scoping Boundary have the potential to support amphibian species including great crested newt (qualifying feature of the Sefton Coast SAC) and natterjack toads (Sefton Coast SSSI). The potential exists for direct physical impacts (e.g. mortality of	Scoped in.	

Activity and Impact	Embedded Measures	Receptor	Justification	Proposed Approach to Assessment: Scoped In or Out	Further Data Baseline Requirements
			individuals and loss of hibernacula) on amphibians.		
	Avoidance, OCEMP, OHMP, BNG (HMMP), associated mitigation measures.	Reptiles:	Habitats within the Scoping Boundary have the potential to support both the rare sand lizard (at Sefton Coast SSSI) and common reptile species including slow worm *Angui fragilis*, grass snake *Natrix natrix*, adder *Vipera berus* and common lizard *Zootoca vivipara*. The potential exists for direct physical impacts (e.g. mortality of individuals and loss of hibernacula) on reptiles.	Scoped in.	
	Avoidance, use of HDD, OCEMP, OHMP, BNG (HMMP), associated mitigation measures.	Freshwater Fish	The Project has the potential to traverse through and be located in proximity to watercourses and waterbodies. The potential exists for direct physical impacts (e.g. mortality of fish or direct impacts to, or loss of, habitat) and indirect impacts (e.g. pollution events and disturbance through vibration or noise) to fish.	Scoped in.	

Activity and Impact	Embedded Measures	Receptor	Justification	Proposed Approach to Assessment: Scoped In or Out	Further Data Baseline Requirements
	Avoidance, use of HDD, OCEMP, OHMP, BNG (HMMP), associated mitigation measures.	Freshwater: Aquatic Macroinvertebrates (incl. white-clawed crayfish *Austropotamobius pallipes*)	The Project has the potential to traverse through and be located in proximity to watercourses and waterbodies. The potential exists for direct physical impacts (e.g. direct loss of / impacts to habitat) and indirect impacts (e.g. pollution events) to aquatic macroinvertebrates including white-clawed crayfish.	Scoped in.	
	Avoidance, use of HDD, OCEMP, OHMP, BNG (HMMP), associated mitigation measures.	Freshwater: Macrophytes	The Project has the potential to traverse through and be located in proximity to watercourses and waterbodies. The potential exists for direct physical impacts (e.g. direct loss of / impacts to habitat) and indirect impacts (e.g. pollution events) to macrophytes.	Scoped in.	
	Avoidance, OCEMP, OHMP, BNG (HMMP), associated mitigation measures.	Terrestrial Invertebrates	Habitats within and adjacent to the Scoping Boundary has the potential to support terrestrial invertebrate species of conservation concern. The potential exists for direct physical	Scoped in.	

Activity and Impact	Embedded Measures	Receptor	Justification	Proposed Approach to Assessment: Scoped In or Out	Further Data Baseline Requirements
			impacts (e.g. loss of core habitat) and indirect impacts (e.g. pollution events) to terrestrial invertebrates.		
	Avoidance, OCEMP, OHMP, BNG (HMMP), associated mitigation measures.	Invasive Non-Native Species (INNS)	The Project has the potential to affect land that contain INNS. If present, there is the potential to spread INNS within or outside the Scoping Boundary.	Scoped in.	

IMPACTS SCOPED OUT OF ASSESSMENT

13.10.11 It is likely that potential effects associated with the use of the Port and Marine Facilities can be scoped out from further assessment in terms of non-statutory designated sites, freshwater watercourses and associated species (fish etc.), badger, hazel dormouse, other mammals and reptiles. This is due to those elements not being local to or likely to be found at the Port and Marine Facilities. Whilst there will be some construction activities here associated with the grid connections, in general (cable route, landfall etc.), the existing infrastructure would be utilised at these locations and no further construction activities would be necessary. The use of these sites as temporary construction laydown and compounds may generate some noise, lighting and visual disturbance, given the status of these sites as active port facilities it is unlikely that any disturbance as a result of the Project would be a notable increase from the current baseline. On this basis, no likely significant effects associated with the use of the Port and Marine Facilities are anticipated for these elements scoped out (as described above).

SURVEY REQUIREMENTS

13.10.12 As noted in **Table 13.11** there will be a significant Terrestrial Ecology and Biodiversity survey requirement associated with the Project. The actual extent and need will be further developed for the EIA, and will be based on the final grid connection corridor and any other associated features of the Project within the Grid Connection Development Area and for any associated development in the terrestrial environment. This will be carried out in consultation with the relevant authorities such as Natural England. This will include desk study data being purchased and subsequent habitat and species survey being carried out, along with reporting to support the relevant chapter of the Environmental Statement.

13.11 CUMULATIVE EFFECTS

13.11.1 A variety of impacts from the Project have the potential to act cumulatively with impacts from other developments to contribute to cumulative effects on Terrestrial Ecology and Biodiversity receptors identified. These could include air quality impacts, loss of habitats and / or ecological connectivity or fragmentation caused by the Project.

13.11.2 Cumulative effects on ecological receptors resulting from the effects of the Project and other developments will be assessed in accordance with the guidance and methodologies set out in **Chapter 3: Approach to EIA** and

considering the other developments that have been screened in as part of the CEA screening exercise.

13.12 TRANSBOUNDARY EFFECTS

13.12.1 Due to the localised nature of the potential impacts on Terrestrial Ecology and Biodiversity receptors, transboundary effects are considered unlikely to occur and therefore are not considered further.

13.13 PROPOSED APPROACH TO ENVIRONMENTAL IMPACT ASSESSMENT REPORT

13.13.1 The study area for the Terrestrial Ecology and Biodiversity assessment will be refined once the grid connection route has been confirmed. Additionally, the Applicant is committed to ongoing engagement with the relevant stakeholders in relation to the proposed technical scope and project refinement, and so further meetings and discussions will be undertaken throughout the pre-application process.

13.13.2 Further desk-based studies and analysis will be undertaken to identify and assess Terrestrial Ecology and Biodiversity receptors. This will involve ordering and analysing desk study data from the relevant Local Record Centres and wildlife recording groups in order to further investigate the presence of protected species within the terrestrial ecology zone and therefore assess likely impacts.

13.13.3 Further habitat and species surveys will be conducted to gain an up-to-date baseline and to inform the mitigation requirements of the design.

13.13.4 A full Ecological Impact Assessment (EcIA) will be included within the Terrestrial Ecology and Biodiversity chapter outlining the biodiversity receptors, the significant impacts likely to result from the development (along with rationale relating to the identification on non-significant effects), the avoidance or mitigation measures that will be incorporated within the scheme to address those impacts and identification if all impacts are sufficiently addressed or if there are any residual impacts. The EcIA will follow CIEEM Guidance (CIEEM, 2019) alongside the EIA methodology.

13.14 REFERENCES

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14 SOCIO-ECONOMICS

14.1 INTRODUCTION

14.1.1 This socio-economics chapter will consider the potential likely significant effects that may arise from the construction, operation and maintenance (O&M) and decommissioning activities of the Project on socio-economics.

14.1.2 Socio-economics considers the interrelationship between the economy and society. It relates to the National Planning Policy Framework (NPPF) [23] definition of 'sustainable development' as having an economic and social role, as well as an environmental one. The delivery of infrastructure therefore needs to consider impacts on community and the economy. In the context of the Project, this socio-economic chapter considers construction, O&M, and decommissioning employment generation, and demand for temporary accommodation from construction workers.

14.1.3 This chapter of the Scoping Report describes the methodology to be used within the Environmental Impact Assessment (EIA), an overview of the baseline conditions within the Scoping Boundary (as defined in **Chapter 1: Introduction**), the datasets to be used to inform the EIA, the potential likely significant effects to be considered, and how these will be assessed for the purposes of the PEIR and ES for socio-economics.

14.1.4 Recognising the interfaces with other topics, this socio-economics chapter should be considered alongside **Chapter 24: Terrestrial Traffic and Transport**.

14.1.5 Overarching relevant legislation and policy context which has informed the scope of the assessment is outlined in **Chapter 4: Planning Policy,** with topic specific considerations outlined in **Appendix 4.1**.

14.2 TECHNICAL GUIDANCE

14.2.1 Technical guidance that has been used to inform the socio-economic assessment is set out in **Table 14-1**. Whilst both of these guidance documents were withdrawn in 2022 (due to the Homes and Communities Agency [HCA] being replaced by Homes England) no statement on replacement guides published by the UK Government has been made, with both guidance documents still available for reference. It is considered that in the absence of any further guidance on employment density and additionality, these documents remain relevant and appropriate guidance documents.

Table 14-1: Relevant technical guidance

Guidance reference	Relevance to the assessment
HCA (now Homes England) Employment Density Guide 3rd Edition, 2015.	Provides an employment density matrix for the different use classes, as a guide for the employment assessment.
HCA (now Homes England) Additionality Guide 4th Edition, 2014.	Guidance for composite multipliers (the combined effect of indirect and induced multiplier effects) displacement and leakage rates that should be applied within the employment assessment.

14.3 STUDY AREA

14.3.1 In the absence of statutory guidance on socio-economic assessments, the study area will be defined with reference to planning policy, best practice guidance (as outlined in the relevant sections below), and professional judgement and experience. This will be identified and agreed in consultation with stakeholders.

EMPLOYMENT GENERATION

14.3.2 The study area for the assessment of employment generation follows guidance set out within the Employment Density Guide 3rd Edition (Housing and Communities Agency, 2015) and Additionality Guide 4th Edition (Housing and Communities Agency, 2014). A ‘local’ (LCRCA) and ‘regional’ (North West) study area will be used for construction employment generation, as this represents the principal labour market catchment area. All elements of the Project Site (the Tidal Barrage, Grid Connection points, and Port and Marine facilities) are likely to be highly accessible from most areas of the LCRCA and North East of England, and this labour market incorporates the population that may reasonably be expected to travel to and benefit from employment associated with construction of the Project.

INCREASED DEMAND FOR TEMPORARY ACCOMMODATION FROM CONSTRUCTION WORKERS

14.3.3 It is intended that the majority of construction workers will be sourced from the local and wider regional area (using the existing public transport network to access the Site on a daily basis).

14.3.4 Specialist construction skills will be required and if these are not able to be sourced locally, these may come from outside the local area. Given that any workers who are temporarily relocating to the local area during construction will likely reside within the locality (assumed to be predominantly situated within the six authorities that comprise the LCRCA) the temporary accommodation providers within the Project Scoping Boundary will be considered, as well as those within the wider city of Liverpool area and the surrounding settlements such as Hoylake, West Kirby, Heswall, Neston, Ellesmere Port, Runcorn, Warrington, Widnes, and Chester.

14.3.5 The extent of the study area has been determined based on professional judgement and is deemed appropriate for scoping purposes, to capture the receptors most likely to be affected by the Project.

14.3.6 At Preliminary Environmental Impact Report (PEIR) stage, following refinement of the Project design and construction methodology, this study area will be reviewed to ensure its' appropriateness, extent, and that sufficient consideration is given to the availability of accommodation provision for the leisure, tourist, and business market[17], in the context of potential construction worker numbers.

14.4 CONSULTATION

14.4.1 Consultation is a key part of the application process. The assessment will be informed by engagement and discussion with various stakeholders. There has been no specific consultation carried out in relation to socio-economics at the time of writing, however it is acknowledged that socio-economic benefits were raised as a point of interest and for further discussion by both St Helen's Borough Council and Cheshire West and Chester Council during initial project meetings (28 June 2024).

[17] The availability of temporary accommodation provision relates to providers such as hotels, B&Bs and serviced apartments which provide temporary accommodation for the leisure and tourist trade as well as business travellers. This topic is separate to the assessment of Tourist Attractions in Chapter 19: Land Use, Recreation and Tourism, which considers tourist facilities such as museums and theatres.

14.4.2 Socio-economic impacts (negative to the operation of the Port and local businesses, and benefits to tourism) were also raised by Sefton Council as a key issue of interest via email on the 18 June 2024. It is anticipated that feedback in relation to this topic and the scope of works will be gained following consultation on this Scoping Report. The methodology for this assessment will take into account feedback following scoping, and any stakeholder engagement undertaken as part of the EIA process. This Scoping Report will be issued to the following stakeholders for consultation:

- Liverpool City Council;
- Cheshire West and Chester Council;
- Sefton Council;
- Halton Borough Council;
- St Helens Borough Council;
- Wirral Council; and
- Knowsley Council.

14.5 ASSESSMENT METHODOLOGY

14.5.1 The Project-wide approach to the assessment methodology is set out in **Chapter 3: Approach to EIA**. This will be implemented to assess the likely significant effects on socio-economic receptors from the construction, O&M, and decommissioning of the Project. The guidance outlined in **Table 14-1** will also be considered in relation to the assessment, in addition to consultation with relevant stakeholders.

ASSESSMENT METHODOLOGY

14.5.2 A desk based review of publicly available demographic information has been undertaken to inform the baseline conditions in relation to the population, as well as the economy and employment at the local and regional level. There are no legislative requirements which exist in relation to socio-economics, and therefore the assessment is guided by the UK Government's planning policy and guidance, as well as past experience and professional judgement. Relevant local, regional and national socio-economic planning policies and strategies (as outlined in **Section 14.2**) have informed this Scoping Report.

Employment Generation

14.5.3 The assessment methodology for the generation of employment associated with all components of the Project construction (tidal barrage, grid connection, and port facilities) has been based on HCA (now known as Homes England) Employment Density Guide 3rd Edition (Housing and Communities Agency, 2015) and also by the Additionality Guide 4th Edition (Housing and Communities Agency, 2014). It should be noted that while both documents were withdrawn in 2022 no statement on replacement guides to be published by the UK Government has been made and both guides are still available for reference. It is considered that in the absence of any further guidance on employment density, these documents remain relevant and appropriate other guidance documents.

14.5.4 The assessment of likely significant effects relating to employment generation during the construction, O&M, and decommissioning phases will be undertaken using Excel based analysis. Gross employment projections will be provided by the Applicant (based on their past experience of developing similar facilities, due to the specialist nature of the Project and the requirement for a skilled construction labour force). Leakage, displacement, and multiplier factors will then be applied to determine the total net employment generation.

Construction Employment Generation

Leakage

14.5.5 Leakage effects are the *"proportion of outputs that benefit those outside of the intervention's target area or group"*. Leakage rates will be applied to construction employment calculations. On the basis of travel to work data, past experience and expert judgement, a medium leakage rate (as set out in the HCA Additionality Guidance) of 25% has been applied.

Displacement

14.5.6 Displacement measures the extent to which the benefits of a project are offset by reduction of output or employment elsewhere. Additional demand for labour as a result of the construction phase of the Project cannot simply be treated as a net benefit as it has the potential to remove workers from other positions, and the net benefit is therefore reduced by the extent that this occurs.

14.5.7 Overall, it is assumed that due to the flexibility of the labour market and the fact that construction workers at the Project are likely to represent a small proportion of the regional construction labour force, displacement of the direct construction employment will be low. In line with the HCA Additionality Guide, within the

context of a North West construction project, a low level of displacement of 25% is considered appropriate, where *"there are expected to be some displacement effects, although only to a limited extent".*

Multiplier Effects

14.5.8 In addition to the direct employment generated by the Project itself, there will be an increase in local employment arising from *"further economic activity (jobs, expenditure or income) associated with additional local income and local supplier purchases"*; the indirect and induced effects of the construction activity. Employment growth will arise locally through manufacturing services and suppliers to the construction process (indirect or supply linkage multipliers). Additionally, part of the income of the construction workers and suppliers will be spent in the region, generating further employment (induced or income multipliers).

14.5.9 The effects of the multiplier depend on the size of the geographical area that is being considered, the local supply linkages and income leakage from the area. The HCA Additionality Guidance provides a guide to the composite multipliers (the combined effect of indirect and induced multiplier effects) which should be applied. In line with the HCA Additionality Guide, a medium multiplier of 1.5 has been applied on the basis that there are likely to be average supply linkages associated with the Project, based on its location within the North West.

O&M Employment Generation

14.5.10 Once the tidal barrage is operational, there are not anticipated to be any employee jobs associated with the grid connection, or port and marine facilities. Any ongoing O&M activities associated with the grid element of the Project will be undertaken by National Grid and / or the end operator, as part of their existing O&M team (these activities would be infrequent, not anticipated to amount to creation of a full-time job, and undertaken as part of regular maintenance of grid connection points by the operator). Whilst it is anticipated that marine facilities will be used as part of construction of the tidal barrage, once the Project is operational, no significant on-going use is anticipated. There is the potential for the marine facilities to accommodate a supply / storage base for O&M supplies or dredging activities, however little to no continued staffing is anticipated to be required in relation to the Project.

14.5.11 Gross employment projections will be provided by and agreed with the Applicant for the O&M phase for the Tidal Barrage (based on their past experience of developing similar facilities, and the specialist nature of this structure) and these

will be refined within the PEIR. In addition, there is the potential for a visitor centre or similar facility to be delivered at the tidal barrage location which will be staffed full time. Applying HCA (now known as Homes England) Employment Densities Guidance to the employment generating floorspace within the visitor centre will provide an estimate of the total gross jobs on-site generated.

14.5.12 To determine the net operational employment generated by the Tidal Barrage and visitor centre, a leakage rate of 25%, a low level of displacement, and a 1.5 multiplier (as per English Partnerships Guidance on leakage, displacement, and multipliers outlined above) will be applied to determine the net O&M phase employment generated.

Decommissioning Employment Generation

14.5.13 Whilst it is assumed that the Project will be decommissioned at the end of its operational lifespan (either prior to or at 120 years), given the length of time which will have passed in this period, a Decommissioning Plan (including environmental management) will be prepared at the appropriate time to consider the potential risks of decommissioning the relevant elements of the Proposed Scheme (see **Chapter 2: Site Context and Project Description** for further details). It will include details of marine infrastructure available and appropriate at the time, other routes for offsite removal of materials and likely phasing of activities. For the purposes of scoping, it is assumed that all terrestrial structures and turbines will be demolished or removed within an approximately 12 month period.

14.5.14 It is not possible to produce an estimate of the likely number of employees required for these activities, due to the considerable length of time in the future decommissioning would take place and the changes to economic and societal baseline conditions. Given the short decommissioning period, and that activities will likely comprise demolition and removal, it is assumed that employees associated with this phase will be limited and not significant in the context of the construction of the regional employment market.

Increased Demand For Accommodation From Temporary Workers

14.5.15 An evaluation of the likely number of additional individuals coming to live in the study area on a temporary basis will be undertaken, based on assumptions made by the Applicant associated with travel planning, construction methodologies, and the construction programme. A percentage of the overall construction employment workforce will be determined based on these factors. Consideration will be given to any additional pressure which may arise on local

accommodation facilities, in the context of existing availability and demand within the local area from the leisure, tourist, and business market.

SIGNIFICANCE OF EFFECT CRITERIA

14.5.16 The methodology for assessing socio-economic impacts will follow standard EIA guidance as set out in **Chapter 3: Approach to EIA**, and will involve:

- Consideration of local policy, plans and development constraints;
- Assessment of the likely scale, permanence and classification of impacts; and
- An assessment of the residual and cumulative impacts of the Project.

14.5.17 The assessment will consider the likely direct, indirect and cumulative impacts associated with socio-economics. Cumulative impacts associated with the Project will be addressed in the Cumulative Effects Chapter of the Environmental Statement (ES), for further information see **Chapter 31: Cumulative Effects**.

14.5.18 For socio-economics there is no accepted definition of what constitutes a significant (or not significant) socio-economic effect. It is however recognised that classification of an effect reflects the relationship between the scale of an impact (magnitude) and the sensitivity (or value) of the affected resource or receptor. As such socio-economic effects will be assessed on the basis of:

- Consideration of sensitivity to effects: specific values in terms of sensitivity are not attributed to socio-economic resources / receptors due to their diverse nature and scale. However, the assessment takes account of the qualitative (rather than quantitative) 'sensitivity' of each receptor and, in particular, their ability to respond to change based on recent rates of change and turnover (if appropriate).
- Magnitude of the impact: this entails consideration of the size of the effect on people or businesses in the context of the area in which effects will be experienced.

14.5.19 The assessment process aims to be objective and quantify effects as far as possible. However, many socio-economics effects can only be evaluated on a qualitative basis. Effects will be defined as follows:

- **Beneficial:** classifications of significance indicate an advantageous or beneficial effect on an effected area, which may be minor, moderate, or major in effect; or

- **Adverse:** classifications of significance indicate a disadvantageous or adverse effect on an effected area, which may be minor, moderate or major in effect.

14.5.20 Based on consideration of the above, where an effect is assessed as being beneficial or adverse, the significance has been assigned using the scale below based on professional judgement. Only moderate and major effects are considered to be significant in EIA terms:

- **Negligible:** no receptors (or very few) are affected. No discernible improvement or deterioration to the existing environment because of the Project will occur;
- **Minor:** the Project would cause a small improvement or deterioration to the existing environment;
- **Moderate:** the Project would cause a noticeable improvement or deterioration to the existing environment; and
- **Major:** the Project would cause a large improvement or deterioration to the existing environment.

14.6 BASELINE CONDITIONS

14.6.1 A desk based baseline data collection exercise has been undertaken, including a review of available information to determine the baseline conditions in the relevant local and regional Study Areas to be potentially affected by the Project.

DATA INFORMATION SOURCES

14.6.2 An initial desk based review has been undertaken of publicly available data sources outlined in **Table 14-2** to determine the baseline character of the study area and inform the assessment process.

Table 14-2: Key sources of socio-economic data

Source	Date	Summary	Coverage of Study Area
Nomis Labour Market Profiles [24].	13/05/2024	This profile brings together labour market data on	Local and regional.

Source	Date	Summary	Coverage of Study Area
		population, economy, and employment.	
Index of Multiple Deprivation (Ministry of Housing, Communities & Local Government, 2019).	13/05/2024	The Index of Multiple Deprivation (IMD) identifies small area measures of relative deprivation across the UK.	Local and regional.

EXISTING BASELINE

14.6.3 This section describes the present conditions which constitute the existing baseline socio-economic environment within the relevant study areas.

Population

14.6.4 The 2021 population estimates for the six local authorities within the LCRCA were: 128,600 in Halton; 155,000 in Knowsley; 485,000 in Liverpool; 279,700 in Sefton; 183,400 in St Helens; and 320,600 in Wirral. In the North-West of England there were a total of 7,424,100 residents.

14.6.5 The estimated working age population (aged 16-64) as a percentage of the total resident population in the LCRCA authorities, the North-West, and Great Britain is shown in **Table 14-3**.

Table 14-3: Population aged 16-64 (% of the resident population)

Halton	Knowsley	Liverpool	Sefton	St Helens	Wirral	North-West	Great Britain
62.1%	63.4%	67.4%	59.9%	61.6%	59.8%	62.5%	62.9%

Economy and Employment

14.6.6 The Nomis Job Densities Report is available on a local authority-wide and sub-regional level and indicates the availability of employment and labour demand. Job densities for each local authority are outlined in **Table 14-4**.

Table 14-4: Job density rates (number of jobs per working age resident)

Halton	Knowsley	Liverpool	Sefton	St Helens	Wirral	North-West	Great Britain
0.84	0.81	0.94	0.61	0.64	0.65	0.84	0.87

14.6.7 As of 2021, the job density levels (i.e. the ratio of total jobs to the working age population) in Halton and Knowsley (0.84 and 0.81 respectively) were broadly in line with the North-West (0.84) and Great Britain levels (0.87), indicating average availability of employment opportunities. Job densities in Liverpool are somewhat higher at 0.94; typical for a large, metropolitan city area with a range and variety of jobs. Within Sefton, St Helens, and Wirral however, employment rates are somewhat lower when compared with the other authorities within the LCRCA, North-West and Great Britain as a whole, indicating fewer employment opportunities within these local authorities compared with the regional and national averages.

14.6.8 **Table 14-5** details the qualifications of the resident working age population (aged 16-64) in 2023. The proportion of working age people with degree level qualifications (Regulated Qualifications Framework level [RQF] 4 and above) in Knowsley is significantly lower than the other local authorities, as well as the North-West and Great Britian. Similarly, the proportion of residents with no qualifications is twice as high as the Great Britain average, and significantly higher than the majority of local authority areas within the LCRCA. Across other local authorities within the LCRCA, attainment levels are broadly similar, however with some slight peaks (e.g. 48.2% of residents in Wirral have a degree level qualification) or falls (the small numbers of residents in Knowsley, Sefton, and Wirral with ‘other’ qualifications, and in Wirral with no qualifications, meaning that these percentages are too small to publish whilst also maintaining anonymity of data). Overall, this suggests a mixed picture, with many local authorities in the LCRCA having an average-skilled workforce, in line with North-West and Great Britain rates.

Table 14-5: Qualifications of resident population aged 16-64 (2023)

Qualifications	Halton (%)	Knowsley (%)	Liverpool (%)	Sefton (%)	St Helens (%)	Wirral (%)	North- West (%)	Great Britain (%)
RQF4 and above	39.8	28.8	45.5	40.3	43.4	48.2	44.4	47.3
RQF3 and above	57.9	54.5	64.7	69.0	59.1	71.3	65.8	67.8
RQF2 and above	80.6	76.3	84.3	88.2	80.4	91.9	86.6	86.5
RQF1 and above	84.6	81.2	87.9	91.1	83.8	95.4	89.6	89.0
Other qual.	5.5	N/A	3.5	N/A	6.0	N/A	3.6	4.6
No qual.	9.9	15.8	8.6	5.7	10.2	N/A	6.7	6.5

Note: data for qualifications is now measured using the Registered Qualifications Framework (RQFs) which incorporates data for vocational and trade occupations, as well as NVQ levels. RQF2 is equivalent to 4-5 GCSE grades A-C, an intermediate GNVQ, or RQF2. NVQ4 and above is equivalent to a degree level qualification or Higher National Diploma.*

14.6.9 **Table 14-6** shows a breakdown of the proportion of employee jobs in the LCRCA local authorities, the North-West and Great Britain. There is a broadly similar breakdown of full time and part time jobs across all geographies, with the exception of Halton which has a slightly higher proportion of full time employees compared with the other five authorities, in line with regional and national figures.

Table 14-6: Proportion of Employee Jobs (2022)

Employee Jobs	Halton (%)	Knowsley (%)	Liverpool (%)	Sefton (%)	St Helens (%)	Wirral (%)	North-West (%)	Great Britain (%)
Full time	71.4	64.5	66.4	65.6	67.7	63.7	69.0	68.8
Part time	28.6	35.5	33.6	35.6	32.3	36.3	31.0	31.2

14.6.10 **Table 14-7** shows the proportion of total employees working in each industry sector in 2022. Broad similarities in industry concentration can be identified across the local authorities within the LCRCA, with all having a relatively low proportion (1.6%-2.9%) working in Arts, entertainment and recreation the compared to a relatively high proportion (12%-16.7%) working in the Wholesale and retail trade; repair of motor vehicles and motorcycles sector. Disparity exists in Manufacturing, where there is a 9.2% difference between the local authority with the highest proportion in this industry (Knowsley at 13.2%) and the lowest (Liverpool at 4%) as well as in Human health and social work activities, where there is a 16% difference between Halton (at 14.3%) and Knowsley (at 30.3%).

Table 14-7: Overview of jobs by industry sector 2022 (%)

Industry	Halton	Liverpool	Knowsley	St Helens	Sefton	Wirral	North West	Great Britain
B: Mining and Quarrying.	0.6	0.0	0.0	0.0	0.0	0.0	0.1	0.2
C: Manufacturing	11.1	4.0	13.2	9.2	5.0	7.8	9.0	7.6
D: Electricity, gas, steam and air conditioning supply.	0.1	0.2	0.0	0.0	0.1	0.0	0.3	0.4
E: Water supply; sewerage, waste management and remediation activities.	1.3	0.5	1.1	0.9	0.3	1.0	0.7	0.7
F: Construction	6.3	3.6	5.9	6.2	5.6	4.9	5.2	4.9
G: Wholesale and retail trade; repair of motor vehicles and motorcycles.	15.9	12.0	13.2	15.4	16.7	13.7	14.7	14.0

Industry	Halton	Liverpool	Knowsley	St Helens	Sefton	Wirral	North West	Great Britain
H: Transportation and storage.	9.5	4.7	5.3	9.2	5.0	3.4	4.7	5.0
I: Accommodation and food service activities.	4.8	9.5	3.9	6.9	8.9	7.8	7.9	8.0
J: Information and communication.	3.2	4.0	1.1	1.4	1.7	1.7	3.4	4.6
K: Financial and insurance activities.	2.0	2.6	0.3	0.7	4.4	1.2	2.4	3.3
L: Real estate activities.	0.8	2.2	0.6	1.2	1.0	1.5	1.6	1.9
M: Professional, scientific and technical activities.	9.5	7.3	7.9	6.2	5.6	7.8	9.4	9.1
N: Administrative and support service activities.	7.9	7.7	5.9	13.8	5.6	4.9	8.3	9.0

Industry	Halton	Liverpool	Knowsley	St Helens	Sefton	Wirral	North West	Great Britain
O: Public administration and defence; compulsory social security.	3.6	8.8	3.0	3.5	10.0	4.9	5.0	4.7
P: Education	6.3	9.6	5.3	9.2	10.0	9.8	8.1	8.6
Q: Human health and social work activities.	14.3	18.6	30.3	15.4	16.7	23.5	15.1	13.5
R: Arts, Entertainment and Recreation.	1.6	2.9	1.6	1.9	2.5	2.5	2.2	2.4
S: Other service activities.	2.8	1.8	1.2	1.5	2.2	2.5	1.8	2.0

Deprivation

14.6.11 The English Indices of Multiple Deprivation (IMD) uses a combination of information relating to seven 'domains': income; employment; health deprivation and disability; education, skills and training; barriers to housing and services; crime; and living environment to create an overall score of deprivation. Deprivation is scored between 1 and 317 (representing the 317 local authority districts within England), with a score of 1 being most deprived and 317 being least deprived (Ministry of Housing, Communities & Local Government, 2019).

14.6.12 The IMD 2019 identifies high levels of deprivation in the region, with all six of the local authorities in the LCRCA area in the top 25% most deprived nationally. **Table 14-8** shows the IMD overall deprivation rankings for the six authorities, with Knowsley and Liverpool ranking 3rd and 4th most deprived (the top 5%) in England. By comparison, Wirral and Sefton are ranked 77th and 89th most deprived respectively, however there is an overall high level of deprivation within the local study area as a whole, with significant pockets of deprivation in certain geographies.

Table 14-8: IMD Overall Rank

Local Authority	Halton	Knowsley	Liverpool	Sefton	St Helens	Wirral
IMD Rank	39	3	4	89	40	77

Local Accommodation Context

14.6.13 There are a considerable range of accommodation types and providers within the Scoping Boundary, many of which are located within Liverpool city centre and Liverpool docks on the eastern site of the Mersey. These include larger, national and international hotel chains, and a number of serviced apartment and Apart-hotel blocks. On the western side of the Mersey, a number of smaller hotels and bed and breakfasts (B&Bs) are situated in New Brighton to the north, with approximately ten Travelodge and Premier Inn chains located within the Scoping Boundary and surrounding settlements along the M53. In addition, there are many independent hotels and guest houses in the locality, particularly in Hoylake and West Kirby, in proximity to the beaches and coastal tourist locations to the west of the Scoping Boundary.

14.7 FUTURE BASELINE

14.7.1 The local and regional study areas for the socio-economic assessment are diverse, with mixed industrial, residential, and agricultural uses. Future development is guided by local plan documents published by each of the local authorities in the LCRCA, however the general themes of relevance to socio-economics are economic growth, diversification of industry, and the delivery of new employment and training opportunities for residents.

14.7.2 Should the Project not proceed, it is anticipated that existing commercial businesses within the local study area would remain present and operational with a similar industry composition. The LCRCA Local Industrial Strategy encourages business growth and the generation of employment opportunities for residents, and this would remain valid and relevant in the absence of the Project.

14.8 BASIS FOR SCOPING ASSESSMENT

14.8.1 This socio-economic scoping chapter is based on the following key assumptions which are also set out in **Chapter 2: Site Context and Project Description**. These are subject to refinement as the Project design evolves for PEIR and ES stages.

- It is anticipated that the maximum number of temporary construction staff required during the construction phase of the Project at its peak is anticipated to be 5,000.
- The majority of construction workers would come from within a 1 hour commute of the Project, and would therefore live within the regional study area (considered to be highly accessible from the Project location) and there would therefore not be a requirement for construction workers to reside in short term or temporary accommodation in proximity of the Project site.
- The maximum number of direct full-time equivalent (FTE) employees during the O&M phase of the Project is estimated to be 70 staff. There is potential for further employment within other ancillary buildings such as a visitor centre, however this will be refined as the design progresses.
- It is the assumption that most elements of the Project will be decommissioned at the end of their operational lifespan. Given the nature of the decommissioning works it is assumed that the length of the decommissioning period would be shorter than the construction duration of the Project.

14.8.2 Based on the preliminary construction and operational designs available at the time of writing, it is considered likely that the Project will have impacts on construction, O&M, and decommissioning employment generation.

14.9 EMBEDDED ENVIRONMENTAL MEASURES

14.9.1 Embedded mitigation measures have been identified and are proposed to be adopted as part of the evolution of the Project design. These measures will evolve as the EIA progresses, and in response to consultation. These measures typically include the adoption of Best Practicable Means, those that have been identified as good practice, and include actions that would be undertaken to meet the requirements of the permitting authority. They are considered inherently part of the design of the Project and have, therefore, been considered in this scoping assessment.

Table 14-9: Relevant Socio-economic embedded environmental measures

ID	Mitigation Measures embedded into the Project design	How the measure will be secured
14-1	The Applicant will work proactively to provide local employment opportunities and to enable access to training and up-skilling where possible. This will include recruiting locally wherever practicable to enable access to training, and career development for local and regional residents.	Development Consent Order (DCO) Requirement through the Outline Construction Environmental Management Plan (CEMP).
14-2	The processes used to recruit and manage staff working at the Project will be demonstrably fair and offer equal opportunities to all.	DCO Requirement through the Outline CEMP.
14-3	A Skills and Employment Plan will be prepared prior to the construction of the Project, by the appointed contractor, as part of the CEMP.	DCO Requirement through the Outline CEMP.
14-4	Provision of a community benefit fund – further details to be provided at PEIR	Project Commitment

14.10 LIKELY SIGNIFICANT EFFECTS

14.10.1 In line with the EIA Regulations 2017, the EIA for the Project will consider those impacts where there is the potential for likely significant effects only. The following section draws on industry experience and expertise, including of previous similar projects, to identify those effect-receptor pathways that may potentially lead to a significant impact. Where experience and available evidence indicates an effect-receptor pathway will not lead to a significant effect, this has been scoped out from further assessment. The likely significant socio-economic effects are summarised in **Table 14-10**.

14.10.2 This scoping assessment is based on a combination of the Project definition at the time of writing, embedded environmental measures, an overview of the baseline conditions, the identification of potential receptors, and professional judgement and experience. The approach to this assessment is set out in **Chapter 3: Approach to EIA**.

14.10.3 The early identification of likely significant effects is used here as a tool aimed at delivering a proportionate approach to the EIA. In doing so, it sets out a high-level assessment of all potential effects, significant or not. The basis for scoping out certain effects is presented after **Table 14-10**, supported by the evidence base presented in **Section 14.7**.

Table 14-10: Likely significant Socio-economics effects

Activity and Impact	Embedded Measures	Effect	Proposed approach to assessment (scoped in or scoped out)	Receptor	Further data baseline requirements
Construction of the Project (tidal barrage, grid connection, and port and marine facilities).	Local and regional recruitment.	Potential generation of direct, indirect, and induced employment opportunities for construction workers, as well as manufacturing services and suppliers.	Scoped in.	Working age individuals (employees) and the economy.	N/A
Construction of the Project (tidal barrage, grid connection, and port and marine facilities).	Local and regional recruitment.	Increased demand for accommodation due to an influx of temporary workers.	Scoped out.	Temporary / short term accommodation providers.	N/A – further data on construction employee numbers required.

Activity and Impact	Embedded Measures	Effect	Proposed approach to assessment (scoped in or scoped out)	Receptor	Further data baseline requirements
Operation and Maintenance of the Project (tidal barrage, grid connection, and port and marine facilities).	Local and regional recruitment.	Potential generation of direct, indirect, and induced employment opportunities.	Scoped out.	Working age individuals (employees) and the economy.	N/A
Decommissioning of the Project (tidal barrage, grid connection, and port and marine facilities).	Local and regional recruitment.	Potential generation of direct, indirect, and induced employment opportunities.	Scoped out.	Working age individuals (employees) and the economy.	N/A

Impacts Scoped out of Assessment

14.10.4 Potential effects on socio-economics have been scoped out from further assessment, resulting from a conclusion of no likely significant effect. These conclusions have been made based on the knowledge of the baseline environment and the nature of planned works. Scoped out effects are considered below.

- Potential increased demand for accommodation during the construction phase due to an influx of temporary workers. Whilst it is assumed that specialist contractors will be required for some of the construction activities, they are not likely to require temporary accommodation during construction of the grid connection and port and marine upgrades. It is assumed that the majority of construction workers would come from within a 1 hour commute of the Project, and would therefore not require temporary accommodation to reside in proximity of the Project site. As such, it is not anticipated that this would give rise to a significant increase in demand for temporary or short term accommodation local to the Project site. Whilst it is currently assumed that workers undertaking construction of the tidal barrage would not require temporary accommodation, given the scale, complexity, and likely requirement for specialist contractors to undertake elements of this construction, this will be reviewed at PEIR stage when the design refinement and employee strategy have been progressed.
- Employment generation during the O&M phase of the Project. It is the assumption that the maximum number of direct FTE employees during the O&M phase of the Project would be no more than 70 staff. Whilst this is recognised as a likely beneficial effect of the Project, this is not considered to be a significant benefit in the context of employment rates and job generation in the local and regional economy. Therefore, this has been scoped out for further assessment.
- Employment generation during the Decommissioning phase of the Project. It is the assumption that most elements of the Project will be decommissioned at the end of their operational lifespan. Given the nature of the decommissioning works and the likelihood that the length of the decommissioning period would be shorter than the construction duration of the Project, it is considered that the effects would be less than the construction of the Project. However, due to the limited information available and unknown decommissioning processes that will be available at the time the works are expected to take place, it is difficult to accurately predict the employment generation. Therefore, this has been scoped out for further

assessment. However, it should be assessed and managed in a decommissioning plan if deemed appropriate.

14.11 CUMULATIVE EFFECTS

14.11.1 Cumulative effects on socio-economics resulting from the effects of the Project and other developments will be assessed in accordance with the guidance and methodologies set out in **Chapter 31: Cumulative Effects** and considering the other developments that have been screened in as part of the CEA screening exercise.

14.12 TRANSBOUNDARY EFFECTS

14.12.1 Due to the nature of the potential impacts, transboundary effects beyond the North West region are considered unlikely to occur, and therefore have been scoped out of further consideration.

14.13 PROPOSED APPROACH TO ENVIRONMENTAL IMPACT ASSESSMENT

14.13.1 Further desk based studies and analysis will be undertaken to identify and assess socio-economic receptors in greater detail. This study will be supplemented with feedback received from stakeholders as part of the Scoping phase.

14.13.2 As the Project design is developed further as part of ongoing design and development, the assessment of construction employment generation will be refined and calculations undertaken. The baseline conditions and assessment will be undertaken as a desk-based study. The impacts of the socio-economic assessment will be appraised against professional experience and expert judgement where appropriate.

14.13.3 There is the potential for additional studies to be undertaken which consider the wider impacts of the Project (outside of an EIA framework) which could form the evidence base to support optioneering work, or consider the wider effects of the Project. These studies would be included as supporting documents as part of the DCO application, and could be referred to by topic chapters (such as Socio-economics) within the PEIR and ES. It is envisaged that these studies could provide additional information on the need for, and benefits of the Project. This will be considered by the Applicant as the Project design is refined and the DCO application is progressed.

14.13.4 The Applicant is committed to ongoing engagement with the relevant stakeholders in relation to the proposed technical scope and project refinement, and so further meetings and discussions will be undertaken throughout the pre-application process.

14.14 REFERENCES

Department for Levelling Up, Housing and Communities, (2023). *National Planning Policy Framework*. Available online at: https://www.gov.uk/government/publications/national-planning-policy-framework--2 (Accessed: June 2024).

Housing and Communities Agency, (2014). *Additionality Guide Fourth Edition*. Available online at: https://assets.publishing.service.gov.uk/media/5a7ec4b9e5274a2e87db1c92/additionality_guide_2014_full.pdf (Accessed: June 2024).

Housing and Communities Agency, (2015). *Employment Density Guide 3rd Edition*. Available online at: https://www.kirklees.gov.uk/beta/planning-policy/pdf/examination/national-evidence/NE48_employment_density_guide_3rd_edition.pdf (Accessed: June 2024).

Ministry of Housing, Communities & Local Government, (2019). *The English Indices of Multiple Deprivation.* Available online at: https://assets.publishing.service.gov.uk/media/5d8b387740f0b609909b5908/IoD2019_Technical_Report.pdf (Accessed: June 2024).

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15 MAJOR ACCIDENTS AND DISASTERS

15.1 INTRODUCTION

15.1.1 The Major Accidents and Disasters (MA&D) chapter will consider the vulnerability of the Project to MA&D during the construction, operation and maintenance (O&M) and decommissioning activities of the Project, caused by natural hazards or manmade hazards (including operational failure), and any potential significant effects as well as impacts to receptors arising from MA&D affecting the Project. For the purpose of the Environmental Impact Assessment (EIA), the vulnerability of the Project to a MA&D event during decommissioning is anticipated to be no worse than that for the construction phase following the implementation of risk management plans for decommissioning as required by UK legislative drivers. Construction and decommissioning are therefore considered together.

15.1.2 This section of the Scoping Report describes the methodology to be used within the EIA, an overview of the baseline conditions within the Scoping Boundary (as defined in **Chapter 2: Site Context and Project Description**), the datasets to be used to inform the EIA, the potential likely significant effects to be considered, and how these will be assessed for the purpose of the EIA.

15.1.3 Based on professional judgement, MA&D are events or situations that have the potential to affect the Project and to go on to cause immediate or delayed serious damage to one or more of the following receptors: human health; welfare; cultural heritage; and the environment.

15.1.4 The list of MA&D categories and types to which the Project may be vulnerable during construction and O&M phases are listed in **Table 15-1**.

Table 15-1: MA&D categories and types

Category	Type
Natural	Geophysical
	Hydrological
	Climatological and Meteorological.
	Biological
Technological or Manmade Hazards.	Societal

Category	Type
	Industrial and Urban Accidents.
	Transport Accidents.
	Pollution Accidents.
	Utility Failures.
	Malicious Attacks.
	Engineering Accidents and Failures.

15.1.5 MA&D interfaces with other aspects and as such, should be considered alongside these; namely:

- **Chapter 7: Invasive Non-Native Species**;
- **Chapter 16: Shipping and Navigation**;
- **Chapter 17: Marine Archaeology and Cultural Heritage**;
- **Chapter 19: Water Resources and Flood Risk**;
- **Chapter 21: Air Quality**;
- **Chapter 23: Geology and Ground Conditions**;
- **Chapter 24: Terrestrial Traffic and Transport**;
- **Chapter 26: Infrastructure and Other Marine Users**;
- **Chapter 27: Military and Civil Aviation**; and
- **Chapter 29: Climate Resilience**.

15.1.6 These chapters also include examples of the measures that may be used to prevent or mitigate potential significant effects and details of the preparedness for, and proposed response to, emergencies. Measures will be identified further in the EIA.

15.1.7 Overarching relevant legislation and policy context which has informed the scope of the assessment is outlined in **Chapter 4: Planning Policy,** with topic specific considerations outlined in **Appendix 4.1**. The definitions of key terms used in this chapter have been developed by reference to the definitions used in EU and UK legislation and guidance (European Parliament, 2012), (The International Federation of Red Cross and Red Crescent Societies, 2021), (Department for Environment, Food & Rural Affairs, 2011), (HM Government, 2015), (HM

Government, 2009), (Health and Safety Executive, 2015), (HM Government, 1996) relevant to MA&D as well as professional judgement in the context of the Project.

Table 15-2: Key terms and definitions

Term	Definition
(Major) Accident.	In the context of the Project, an event that threatens immediate or delayed serious damage to human health, welfare and / or the environment and requires the use of resources beyond those of the Applicant or its contractors to respond to the event. Serious damage includes the loss of life or permanent injury and / or permanent or long-lasting damage to an environmental receptor that cannot be restored through minor clean-up and restoration efforts. The significance of this effect will take into account the extent, severity and duration of harm and the sensitivity of the receptor.
ALARP	"ALARP" stands for "as low as reasonably practicable". Reasonably practicable involves weighing a risk against the trouble, time and money needed to control it. Thus, ALARP describes the level to which the Health & Safety Executive (HSE) expect to see workplace risks controlled.
Adaptive Capacity.	The capacity of receptors to adjust to potential damage, to take advantage of opportunities, or to respond to consequences.
Consultation Zone.	The HSE sets a Consultation Distance (CD) around major hazard sites and major accident hazard pipelines after assessing the risks and likely effects of major accidents at the major hazard site / pipeline. The area enclosed within the CD is referred to as the consultation zone. The Local Planning Authority is notified of this CD and has a statutory duty to consult the HSE on certain proposed developments within the zone the CD forms.
Disaster	In the context of the Project, a naturally occurring phenomenon such as an extreme weather event (for example storm, flood, temperature) or ground-related hazard events (for example subsidence, landslide, earthquake) with the potential to cause an event or situation that meets the definition of a Major Accident as defined above.

Term	Definition
External Influencing Factor.	A factor which occurs beyond the limits of the Project that may present a risk to the Project, e.g. if an external disaster occurred (e.g. earthquake, COMAH site major accident) it would increase the risk of serious damage to an environmental receptor associated with the Project.
Hazard	Anything with the potential to cause harm, including ill-health and injury, damage to property or the environment; or a combination of these.
Internal Influencing Factor.	A factor which occurs within the limits of the Project that may present a risk to the Project.
Magnitude of Impact.	The magnitude of an impact is typically defined by the following factors: ■ extent – the area over which an effect occurs; ■ duration – the time for which the effect occurs; ■ frequency – how often the effect occurs; and ■ severity – the degree of change relative to existing conditions.
MA&D Group.	A major event which can be grouped as either a Natural Hazard (Disaster) or Technological or Manmade Hazard (Major Accident).
MA&D Category.	A set of values used to categorise events within a related parent MA&D Event Group.
MA&D Type.	A set of values used to sub-categorise events within a MA&D Event Category.
Risk	The likelihood of an impact occurring combined with effect or consequence(s) of the impact on a receptor if it does occur.
Risk Event.	An identified, unplanned event, which is considered relevant to the Project and has the potential to be a Major Accident and / or Disaster subject to assessment of its potential to result in a significant adverse effect on an environmental receptor.
Sensitivity	The sensitivity of a receptor is a function of its value, and capacity to accommodate change reflecting its ability to recover if it is affected. It is typically defined by the following factors:

Term	Definition
	■ Adaptability – the degree to which a receptor can avoid, adapt to or recover from an effect; ■ Tolerance – the ability of a receptor to accommodate temporary or permanent change; and ■ Recoverability – the temporal scale over and extent to which a receptor will recover following an effect.
Vulnerability	In the context of the 2014 EU Directive [25] (European Parliament, 2014), the term refers to the 'exposure and resilience' of the Project to the risk of a major accident and / or disaster. Vulnerability is influenced by sensitivity, adaptive capacity and magnitude of impact.

15.2 TECHNICAL GUIDANCE

15.2.1 Technical guidance that has been used to define the assessment is set out in **Table 15-3**.

Table 15-3: Relevant technical guidance

Guidance reference	Relevance to the assessment
IEMA: Major Accidents and Disasters in EIA: A Primer [26](Institute of Environmental Management and Assessment, 2020).	The purpose of the primer is to increase awareness of the MA&D topic and its application within all stages of EIA. The primer outlines an assessment methodology based on known current practice within the UK and provides definitions of key terminology. The Primer is structured around a typical assessment approach and provides a proportionate method for considering major accidents and disasters through the stages of EIA.
'Green Leaves III' Guidelines for Environmental Risk Assessment and Management (Department for Environment, Food & Rural Affairs, 2011).	Providing generic guidance for the assessment and management of environmental risks. A cyclical framework for risk management is presented that

Guidance reference	Relevance to the assessment
	identifies four main components of risk assessment: ■ Formulating the problem; ■ Carrying out an assessment of the risk; ■ Identifying and appraising the management options available; and ■ Addressing the risk with a risk management strategy. A source-pathway-receptor model is suggested as a tool to assist in risk screening and an example is provided of applying the following filters to prioritise significant hazards for further investigation: ■ The plausibility of linkages between the source of a hazard and a receptor; ■ The relative potency of a hazard, availability of a pathway, or vulnerability of a receptor; ■ The likelihood of an event, based on historic occurrence or of changed circumstances; or ■ A view on the performance of current risk management measures that, if they were to fail, may increase the potential for future harm.
Guideline – Environmental Risk Tolerability for COMAH Establishments (Chemical and Downstream Oil Industries Forum, 2013).	Providing generic guidance on how to undertake environmental risk assessments required by the COMAH Regulations. It provides: ■ A definition of the types of harm that should be considered in an environmental risk assessment, and how the harm should be characterised for the assessment. In this context, the

Guidance reference	Relevance to the assessment
	level of environmental harm that would be considered serious has been defined for various different receptor types in terms of the combination of the: ■ Extent (the area / distance); ■ Severity (the degree of harm within the area of impact); and ■ Duration (the recovery period). For environmental harm to be considered serious then all parameters must exceed the receptor thresholds as defined in this guideline. The thresholds reflect expert opinion on levels of harm that would be considered serious, with consideration to various receptor specific areas of legislation (such as the Water Framework, Habitats and Environmental Liability Directives). The guideline also provides: ■ A definition of the risk criteria to be used in assessing the tolerability of the environmental risk from an establishment and, where appropriate, individual scenarios; and guidance on how the risks may be evaluated.
ISO 31000:2018 Risk Management – Guidelines (International Standards Organisation, 2018).	This guidance identifies a number of principles that need to be satisfied to make risk management effective. If the standards are adopted and applied the management of any risk should help minimise losses, improve resilience, improve controls and improve the identification of opportunities and threats.

Guidance reference	Relevance to the assessment
	The ISO standard states that when defining risk criteria, the following factors should be considered: ▪ The nature and types of causes and consequences that can occur and how they will be measured; ▪ How likelihood will be defined; ▪ The timeframe(s) of the likelihood or consequence(s); ▪ How the level of risk is to be determined; ▪ The views of stakeholders; ▪ The level at which risk becomes acceptable or tolerable; and ▪ Whether combinations of multiple risks should be considered and, if so how, and which combinations should be considered.

15.3 STUDY AREA

15.3.1 Based on professional judgement, the following factors, and associated distances from the Site, were adopted for setting the Study Area to capture internal and external influencing factors that may have high adverse consequences on the Project:

- Manmade features:
  - Airports and airfields within 13km (the general safeguarding zone defined by the Civil Aviation Authority);
  - Control of Major Accident Hazard facilities within 5km;
  - Major accident hazard pipelines within 1km;
  - Nuclear installations within 3km (distance to The Land Use Planning Outer Consultation Zone);
  - Fuel retail sites (including Liquified Natural Gas, Liquified Petroleum Gas) within 1km;

- Tunnels within 500m;
- Rail infrastructure within 500m; and
- Transmission (gas, electrical, oil / fuels) crossing the Site.

- Natural features with the potential to create risks within:
  - 3km (chiefly hydrological and geological, for example dam failure and seismic activity respectively); and
  - 1km (chiefly hydrological and geological, for example flood risk and unstable ground conditions respectively).

15.3.2 The Study Area has been based primarily on information held by the Applicant and information gathered to inform this chapter from the data sources discussed below.

15.4 CONSULTATION

15.4.1 Consultation is a key part of the application process. Specific consultation has not been undertaken to inform this chapter for MA&D. However, it is anticipated that engagement will be undertaken with the Health and Safety Executive (HSE) to understand the major accident hazard (MAH) site and pipeline consultation zones (CZ) which overlap the Project Scoping Boundary.

15.4.2 Consultation will also be undertaken with the relevant local authorities to obtain information on the safeguarding zones associated with the aerodrome (Liverpool John Lennon Airport) which has been identified in the Study Area.

15.5 ASSESSMENT METHODOLOGY

15.5.1 The Project-wide approach to the assessment methodology is set out in **Chapter 3: Approach to EIA**. This will be implemented to assess the likely significant effects on receptors from the construction, O&M, and decommissioning of the Project.

15.5.2 The specific legislation and guidance outlined in **Appendix 4.1** will also be considered in relation to the assessment, in addition to consultation with the stakeholders outlined above.

15.6 BASELINE CONDITIONS

DATA INFORMATION SOURCES

15.6.2 An initial desk based review has been undertaken of publicly available data sources outlined in **Table 15-4** to determine the baseline character of the Study Area and inform the assessment process.

Table 15-4: Key sources of MA&D data

Source	Date	Summary	Coverage of Study Area
National Risk Register 2023 Edition (HM Government, 2023).	7 May 2024	This document is the unclassified version of the National Risk Register and it identifies the main types of civil emergencies that could affect the UK in the next five years.	Full coverage.
British Geological Survey (BGS) GeoIndex Onshore (British Geological Survey, 2024).	7 May 2024	Map based data set covering, for example, earthquake risk, geology, hazard maps and mining.	Full coverage.
Tsunamis Hazard Map (Prevention Web Europe, 2005).	7 May 2024	Map based data set identifying tsunami hazard.	Full coverage.
The International Disaster Database (Centre for Research on the Epidemiology of Disasters, 2021).	7 May 2024	A global database with information on over 26,000 mass disasters from 1900 to the present day.	Full coverage.
HSE Planning Advice Web App (Health and Safety Executive, 2024).	7 May 2024	Map based visual indication of consultation zones associated with major	Full coverage.

Source	Date	Summary	Coverage of Study Area
		accident hazard sites and / or pipelines.	
HSE's COMAH 2015 Public Information Search (Health and Safety Executive, 2024).	7 May 2024	Database of major accident hazard sites.	Full coverage.
Google aerial and street view maps (Google, 2024).	7 May 2024	Mapping of the local area.	Full coverage.
Environmental aspect chapters (**Chapter 5** to **Chapter 30**).	PEIR and EIA	Information on receptors and potential mitigation measures.	Full coverage.

EXISTING BASELINE

15.6.3 This section describes the present conditions which constitute the existing baseline environment for MA&D within the Study Area.

15.6.4 The baseline relevant to MA&D comprises:

- Features external to the Project that contribute a potential source of hazard to all components of the Project;
- Sensitive environmental receptors at risk of potential significant effects; and
- Current (without the Project) MA&D risks for the existing locality.

15.7 FUTURE BASELINE

15.7.1 In the future baseline and in the absence of the Project, it is considered that the current environment within the Study Area would remain the same and as such there is no risk of a MA&D occurring. The other chapters of the Scoping Report, such as climate change, consider changes to the future baseline which, if there was a future development in this location, may increase the vulnerability to a MA&D.

15.8 BASIS FOR SCOPING ASSESSMENT

15.8.1 The MA&D scoping assessment is based on the following key assumptions which are also set out in **Chapter 2: Site Context and Project Description**:

- Maintenance activities will be undertaken for both preventive and corrective maintenance requirements;
- The operational lifetime of the Project is assumed to be a minimum of 120 years;
- The decommissioning of the barrage is anticipated to involve the removal of all offshore infrastructure. The decommissioning works are likely to be undertaken in reverse to the sequence of construction works and involve similar levels of equipment and impact;
- The marine and port facilities will only be used during the construction phase;
- Safety zones or proximal buffers will be implemented for any infrastructure required during the construction phase; and
- The risk of allision and collision will be assessed for all phases in **Chapter 16: Shipping and Navigation**.

15.9 EMBEDDED ENVIRONMENTAL MEASURES

15.9.1 Embedded mitigation measures have been identified and are proposed to be adopted as part of the evolution of the Project design (embedded into the Project design). These measures will evolve over the development process as the EIA progresses and in response to consultation. They will be fed iteratively into the assessment process. These measures typically include those that have been identified as good or standard practice and include actions that would be undertaken to meet existing legislation requirements.

15.9.2 As there is a commitment to implementing these environmental measures, and also to various standard sectoral practices and procedures, they are considered inherently part of the design of the Project and have, therefore, been considered in the scoping assessment.

15.9.3 In addition to the specific embedded mitigation measures relevant to MA&D listed in **Table 15-5**, consultation will be undertaken with all relevant consultees such as the HSE to address any concerns or issues.

Table 15-5: Relevant MA&D embedded environmental measures

ID	Mitigation Measures embedded into the Project design	How the measure will be secured
15-1	Implementation of Environmental, Health & Safety Management systems. Supplier management environmental, health and safety standards (for example, Construction Skills Certification Scheme). Adoption of good engineering practice. Risk management systems. Connection to the National Grid will be undertaken by the local operator.	Required by health and safety legislative drivers.
OM1	A CEMP will be developed and adhered to for the Project. The CEMP will detail how environmental commitments will be attained during the construction phase of the Project.	Through DCO requirement.
OM5	Safety zones will be defined during construction around specific features as outlined in **Chapter 2: Site Context and Project Description**.	Through DCO requirement.
15-2	A CDM Risk Register will be prepared for the Project to ensure that all appropriate mitigation measures are embedded into the design.	Required by health and safety legislative drivers.
OM11	A emergency preparedness and response plan will be prepared and implemented for the Project.	Required by health and safety legislative drivers.
15-3	Notification of the proposed use of cranes will be undertaken in accordance with Civil Aviation Authority guidance. In addition, aviation lighting will be provided as necessary.	Required by health and safety legislative drivers.

15.9.4 This assessment assumes that embedded mitigation measures identified in each of the technical topic chapters relevant to this assessment (as outlined in **Section 15.1**) will be implemented for the Project, in order to assess the magnitude of impact. Any additional mitigation may be identified as the

environmental assessment and regulatory engagement progresses and would be reported as required in the Environmental Statement (ES).

15.10 DESCRIPTION OF POTENTIAL VULNERABILITY TO MAJOR ACCIDENT AND DISASTER RISKS

15.10.1 There is no published guidance for the application of the legal requirements to the assessment of MA&D. However, selected relevant guidance for risk assessment methodologies is summarised in Table 12-1.

15.10.2 In addition to the information sources used to collate baseline information (detailed in Table 7-2), the following have been consulted to support the identification of potential MA&D:

- The Cabinet Office National Risk Register 2023 Edition (HM Government, 2023). This document is the unclassified version of the National Risk Register and it identifies the main types of civil emergencies that could affect the UK in the next five years. It is recognised, however, that this document does not provide an all-encompassing list of all potential accidents and disasters and its timescales are short term.
- The International Federation of Red Cross & Red Crescent Societies Early Warning, Early Action (The International Federation of Red Cross and Red Crescent Societies, 2021). This guidance looks to other countries including those in warmer climates, thereby identifying risks that the UK may encounter in the future in light of climate change and global warming.
- The International Disaster Database (Centre for Research on the Epidemiology of Disasters, 2021) contains data covering over 22,000 mass disasters in the world since 1900 to the present day and aims to *"rationalise decision making for disaster preparedness, as well as provide an objective base for vulnerability assessment and priority setting"*.

SCOPING PROCESS FOR MAJOR ACCIDENT AND DISASTER RISKS

Likelihood and Consequence Events

15.10.3 Low likelihood and low consequence events are scoped out as these are unlikely to result in significant adverse effects; because they do not fall into the definition of a MA&D (see **Table 15-2**).

15.10.4 High likelihood and low consequence events are also scoped out, as they will not lead to significant adverse effects.

15.10.5 High likelihood and high consequence events are also scoped out, as it is assumed that existing legislation and regulatory controls would not permit the Project to be progressed under these circumstances.

15.10.6 The remaining events, low likelihood and high consequence events, are the subject of the MA&D assessment. Using professional judgement, the assessment identifies relevant events and determines whether a significant environmental effect is possible.

Significance of Effect Criteria

15.10.7 By definition, a major accident and / or disaster would have a major significant effect on the environment (including human health, welfare and / or the environment). Accordingly, any risks that could result in a MA&D event without suitable mitigation, management or regulatory controls in place will be assessed as significant in the context of EIA.

Occupational Health and Safety

15.10.8 In accordance with emerging EIA practice, occupational health and safety (H&S) is scoped out of this topic.

15.10.9 Other health issues are covered in relevant environmental aspect sections of **Chapter 19: Water Resources and Flood Risk**, **Chapter 21: Air Quality** and **Chapter 22: Onshore Noise and Vibration**. As 'in combination' impacts, human health is also considered within **Chapter 31: Cumulative Effects**, not least as it is covered by detailed H&S legislation: The Management of Health and Safety at Work Regulations 1999 (HM Government, 1999), The Workplace (Health, Safety and Welfare) Regulations 1992 (HM Government, 1992) and The Electricity at Work Regulations 1989 (HM Government, 1989).

IMPACTS SCOPED IN OR OUT OF FURTHER ASSESSMENT

15.10.10 A long list of all possible MA&D groups, categories and types has been prepared in **Table 15-6** below. This is reviewed to rule out any potential MA&D that are considered highly unlikely to occur due to the location of the Project, based on baseline information and information provided for the technical topics relevant to MA&D.

15.10.11 Those MA&D types that cannot be screened out from the three-component process will require further detailed assessment in the ES.

15.10.12 The review of the MA&D groups, categories and types identified in the Study Area, has been undertaken to inform the scoping process, summarised in Table 15-6. This table shows the potential vulnerability of the Project to the risk of a MA&D at the type level. A determination on whether the MA&D type is to be scoped in or out of the MA&D assessment is provided, in accordance with either phase of the Project. The phases are indicated in the table as "C" for construction and, "O" for operation and maintenance. The ES will provide greater assessment and justification for the topic areas scoped in and for those that are scoped out no further assessment is considered necessary in the EIA.

Table 15-6: Elements scoped in or out of further assessment

MA&D group	MA&D category	MA&D type	Basis of decision to scope in / out	Scope in? phase
Natural Hazards.	Geophysical	Earthquakes	Earthquakes do not occur in Britain of a sufficient intensity owing to the motion of the Earth's tectonic plates causing regional compression. In addition, uplift from the melting of the ice sheets that covered many parts of Britain thousands of years ago can also cause movement. The BGS (British Geological Survey, 2024) acknowledges that on average, a magnitude 4 earthquake happens in Britain roughly every two years and a magnitude 5 earthquake occurs around every 10 to 20 years. As such the Cabinet Office National Risk Register (HM Government, 2023) states that "Earthquakes in the UK are moderately frequent but rarely result in large amounts of damage. An earthquake of sufficient intensity (determined on the basis of the earthquake's local effect on people and the environment) to inflict severe damage is unlikely". The Project is not in or close to an active area. It is therefore considered that this MA&D event type can be scoped out from further assessment in relation to both the construction and operational phases.	No

MA&D group	MA&D category	MA&D type	Basis of decision to scope in / out	Scope in? phase
Natural Hazards.	Geophysical	Volcanic Activity.	The Project is not located in an active area and it is highly unlikely that an ash cloud could significantly impact on any aspect of the Project. It is therefore considered that this MA&D event type can be scoped out from further assessment in relation to both the construction and operational phases.	No
Natural Hazards.	Geophysical	Landslides	There are no records of historical landslides in the Study Area. In addition, the Project is surrounded by flat or gently undulating topography, with no steep slopes or embankments expected to be constructed as part of the Project. It is therefore considered that this MA&D event type can be scoped out from further assessment in relation to both the construction and operational phases.	No
Natural Hazards.	Geophysical	Sinkholes	There are no examples of sink holes in the locality of the Project. In addition, the bedrock, Sherwood Sandstone, is not vulnerable to the formation of sink holes. The geotechnical design of the Project will take into consideration the underlying geology and any potential ground stability issues. Therefore, this MA&D event type can be scoped out from further assessment.	No

MA&D group	MA&D category	MA&D type	Basis of decision to scope in / out	Scope in? phase
Natural Hazards.	Geophysical	Tsunamis	The tidal barrage and the port and marine facilities are located in Merseyside, within and adjacent to the River Mersey. Tsunami risk in England is considered to be low, although potential meteotsunamis (caused by weather conditions rather than seismic activity) have been recorded on several occasions in the UK. Meteotsunamis commonly strike the coasts of the UK, damaging harbours, boats and very rarely, causing fatalities. There are no records of historical meteotsunamis affecting the River Mersey. The grid connection will be located below ground and therefore will not be vulnerable to tsunamis. It is therefore considered that this MA&D event type can be scoped out from further assessment in relation to both the construction and operational phases.	No
Natural Hazards.	Hydrological	Coastal Flooding.	As identified in **Chapter 19: Water Resources and Flood Risk**, the Environment Agency's Flood Map for Planning indicates that the barrage Development Area is located within Flood Zone 3, an area with high probability of flooding.	No
Natural Hazards.	Hydrological	Fluvial Flooding.		

MA&D group	MA&D category	MA&D type	Basis of decision to scope in / out	Scope in? phase
			The potential port facilities / key infrastructure areas located adjacent to the barrage Development Area are located in Flood Zones 1 (low probability), 2 (medium probability) and 3 (high probability) with the exception of Port Sunlight which is located entirely within Flood Zone 1. The Environment Agency's flood records outline that there have been two instances of flooding within the coping boundary from tidal or coastal sources: ■ Flooding at New Brighton on the 05 December 2013 from the sea overtopping defences; and ■ Mere tidal flooding along the Dell and The Esplanade on 31 January 2002 to 01 February 2002 from the River Mersey overtopping defences. The Environment Agency's Flood Map for Planning shows that the two potential grid connection routes interact with Flood Zone 3 at various locations. The Environment Agency's flood records outline that there have been 7 instances of historic flooding within the grid connection Study Area from fluvial or coastal sources:	

MA&D group	MA&D category	MA&D type	Basis of decision to scope in / out	Scope in? phase
			▪ Sea flooding along the north coast of the Wirral, bordering the grid connection route, on 5 December 2012; ▪ Three areas of main river fluvial flooding from the River Fender near where it joins the Birket, south of Leasowe on 2 September 2012; ▪ One instance of main river fluvial flooding from the River Fender on the North Cheshire Trading Estate, within the Study Area and bordering the grid connection route on the 5-6 September 2008; ▪ One instance of ordinary watercourse fluvial flooding to the east of the Sutton Bridge Substation on 26 August 2023; and ▪ One instance of local drainage / surface water flooding in Hooton on 20 January 2021. The Wirral Council Strategic Flood Risk Assessment and the Cheshire West and Chester Preliminary Flood Risk Assessment also show records of historic flooding the vicinity of the grid connection from fluvial sources.	

MA&D group	MA&D category	MA&D type	Basis of decision to scope in / out	Scope in? phase
			A detailed flood risk assessment will be prepared as part of the Water Resources and Flood Risk chapter for the ES. It is therefore considered that this MA&D event type can be scoped out from further assessment in relation to both the construction and operational phases.	
Natural Hazards.	Hydrological	Pluvial Flooding.	As identified in **Chapter 19: Water Resources and Flood Risk**, the Environment Agency's Surface Water Flood Map indicates that the barrage Development Area and potential port facilities / key infrastructure areas predominantly have a very low risk of surface water flooding. Most of the surface water flow routes and ponding within the potential port facilities / key infrastructure areas can be attributed to small watercourses, drainage ditches, surface water runoff from highways, local depressions, or flow directly into nearby watercourses. The potential grid connection Study Area also generally has a very low risk of surface water flooding. However, there are several surface water flow routes, the majority of which are either related to small watercourses, surface water runoff from highways, or flow directly into nearby watercourses.	No

MA&D group	MA&D category	MA&D type	Basis of decision to scope in / out	Scope in? phase
			There does not appear to be any large areas of surface water pooling within the Study Area. A detailed flood risk assessment will be prepared as part of the Water Resources and Flood Risk chapter for the ES. It is therefore considered that this MA&D event type can be scoped out from further assessment in relation to both the construction and operational phases.	
Natural Hazards.	Hydrological	Groundwater Flooding.	As identified in **Chapter 19: Water Resources and Flood Risk**, some of the barrage Development Area and potential port facilities / key infrastructure areas lie within an area susceptible to groundwater flooding. Generally, within this area, groundwater levels are rising due to a significant reduction in industrial abstraction with the decline of industry. The Cheshire West and Chester Council Strategic Flood Risk Assessment, indicates that all of the grid connection Study Area has a very low susceptibility to groundwater flooding. In contrast, Wirral Council's Preliminary Flood Risk Assessment shows that some of the Study Area is within an area susceptible to groundwater flooding.	No

MA&D group	MA&D category	MA&D type	Basis of decision to scope in / out	Scope in? phase
			A detailed flood risk assessment will be prepared as part of the Water Resources and Flood Risk chapter for the ES. It is therefore considered that this MA&D event type can be scoped out from further assessment in relation to both the construction and operational phases.	
Natural Hazards.	Hydrological	Avalanches	The Project topography is relatively flat and therefore an avalanche will not occur. It is therefore considered that this MA&D event type can be scoped out from further assessment in relation to both the construction and operational phases.	No
Natural Hazards.	Climatological and Meteorological.	Cyclones, hurricanes, typhoons, storms and gales.	Cyclones, hurricanes and typhoons do not occur in the UK. In January 2024, Storm Isha and Storm Jocelyn had widespread impacts across UK including North West England and Wales, causing heavy rain and disruptions in power supply. Storm Isha brought widespread strong winds (at 60 to 70Kt (69 to 81mph)), particularly across the northern half of the UK. Storm Jocelyn was less severe in	No

MA&D group	MA&D category	MA&D type	Basis of decision to scope in / out	Scope in? phase
			comparison. Storm Isha caused power outages, damaged buildings and fallen trees. There was also widespread transport disruption to road, rail and air. In December 2023, North West England and Wales were affected by Storm Gerrit with wind gusts at over 70Kt (81mph) along with heavy rains. The risks associated with adverse weather conditions will be considered and appropriate mitigation identified in the CDM Risk Register and emergency preparedness and response plan. During the operational phase, storms and gales could result in damage to the tidal barrage and the port and marine facilities however, the design takes into account environmental conditions including exposure to UK weather conditions. The risk is not significantly different to other similar infrastructure in the UK. The grid connection will be located below ground and therefore will not be vulnerable to storms and gales. It is therefore considered that this MA&D event type can be scoped out from further assessment in relation to both the construction and operational phases.	

MA&D group	MA&D category	MA&D type	Basis of decision to scope in / out	Scope in? phase
Natural Hazards.	Climatological and Meteorological.	Thunderstorms	This type of event could result in lightning strikes to temporary elevated structures during construction (e.g. tower cranes); however, the risk is no different to other construction projects in the locality. In addition, the risks associated with adverse weather conditions will be considered in the CDM Risk Register. It is therefore considered that this MA&D event type can be scoped out from further assessment.	No
Natural Hazards.	Climatological and Meteorological.	Wave surges.	The River Mersey experiences tidal bores (a strong tide that pushes up the river, against the current causing the incoming tide to form a wave, or a series of waves). Once operational, the barrage will be able to manage flood events and surges within the Mersey Estuary, both upstream and downstream by active pumping or sluicing either with or without generation through the turbines. A detailed flood risk assessment, which will consider the potential impact of wave surges, will be prepared as part of the Water Resources and Flood Risk chapter for the ES. It is therefore considered that this MA&D event type can be scoped out from further assessment in relation to both the construction and operational phases.	No

MA&D group	MA&D category	MA&D type	Basis of decision to scope in / out	Scope in? phase
Natural Hazards.	Climatological and Meteorological.	Extreme temperatures: Heatwaves Low (sub-zero) temperatures and heavy snow.	This type of event could give rise to changes in climatic conditions, with infrastructure exposed to greater heat intensity and exposure to sunlight. Heavy snow could cause workers to be trapped on the construction sites. In August 1990, the UK experienced heatwave conditions with temperatures reaching what was then a record 37.1°C in Cheltenham, England. In August 2003 a UK heatwave lasted 10 days and resulted in over 2,000 deaths. Temperatures reached what was then a record 38.5°C in Faversham. In July 2022, the UK experienced a brief but unprecedented extreme heatwave from 16 to 19 July 2022. Hawarden Airport, the Climate Station closest to the Study Area, recorded the highest national record in Wales of 37.1°C. High temperature records are now being broken with increasing frequency. The most widespread and prolonged low temperatures and heavy snow in recent years occurred from December 2009 to January 2010. Daytime temperatures were mostly sub-zero across the UK. At night, temperatures in England regularly fell to -5°C to -10°C. Snowfall across the UK lasted for some time, allowing 20cm to 30cm of snow to	No

MA&D group	MA&D category	MA&D type	Basis of decision to scope in / out	Scope in? phase
			build up, closing schools and making it very difficult to travel. Between 1981 and 2010, there were 13 occurrences where summer mean temperatures exceeded 25.2°C on five or more consecutive days. Between 1981 and 2010, there have been 1,461 days with a maximum minimum temperature below zero degrees Celsius. Between 1981 and 2010, there were 235 days with snow lying at 09:00 however, there are no records from the Met Office of the depth of snow. It should be noted that the risk of a MA&D related to extreme weather conditions is no different to other infrastructure in the locality. Specific measures and further assessment are therefore not considered to be required as part of the Project. Therefore, this MA&D event type has been scoped out during both the construction and operation phases.	
Natural Hazards.	Climatological and Meteorological.	Droughts	Over the past 40 years or so England has experienced both long and short duration droughts. Most recently in Summer 2022, a drought was declared across the most of England.	No

MA&D group	MA&D category	MA&D type	Basis of decision to scope in / out	Scope in? phase
			Merseyside was classified as an area experiencing prolonged dry weather. Prolonged periods of drought can impact infrastructure as drying out and cracking of soils may affect structural stability and prolonged dry periods can lead to cracking of surfaces and more rapid deterioration of materials. Decreased rainfall combined with an increase in the average temperature can also increase subsidence. The Project should not be vulnerable to drought as water is not an essential service during the construction or maintenance phases. During the operational phase water supply is critical for the operation of the tidal barrage however, in the event of water shortage the turbines would be safely shutdown in accordance with emergency operational procedures. The design of the Project will be resilient to ground shrinkage, and this risk should remain in the design risk register until designed out. It is therefore considered that this MA&D event type can be scoped out from further assessment during both the construction and operation phases.	

MA&D group	MA&D category	MA&D type	Basis of decision to scope in / out	Scope in? phase
Natural Hazards.	Climatological and Meteorological.	Severe Space Weather: Solar Flares.	Solar flare events are known to interrupt radio and other electronic communications. Records from solar storms in 1921 and 1960 describe widespread radio disruption and impacts on railway signalling and switching systems. During the solar storm in May 2024, reportedly there were power grid irregularities and Global Positioning System (GPS) and high-frequency radio communications were impacted. Some aerial drone users flying during the storm experienced difficulty maintaining a stable hover, disruption of GPS signals, and in some cases a sudden loss of control. There were no reported significant impacts to the population. Telemetry to allow remote operation of the tidal barrage will be installed as part of the Project. However, the Project is no more vulnerable than other similar infrastructure in the locality which relies on telemetry. It is therefore considered that this MA&D event type can be scoped out from further assessment.	No
Natural Hazards.	Climatological and Meteorological.	Severe Space Weather:	Solar energetic particles cause solar radiation storms, but only in outer space. It is therefore considered that this MA&D event type can be scoped out from further	No

MA&D group	MA&D category	MA&D type	Basis of decision to scope in / out	Scope in? phase
		Solar Energetic Particles.	assessment in relation to both the construction and operational phases.	
Natural Hazards.	Climatological and Meteorological.	Severe Space Weather: Coronal Mass Ejections.	Coronal mass ejections (CME) cause geomagnetic storms. The geomagnetic storm in 2003 caused the UK aviation sector to lose some GPS functions for a day, however there was no known significant impact on road users or infrastructure. It is therefore considered that this MA&D event type can be scoped out from further assessment in relation to both the construction and operational phases.	No
Natural Hazards.	Climatological and Meteorological.	Fog	Fog is one of the most common weather conditions in the UK, particularly throughout Autumn and Winter. Severe disruption to transport occurs when the visibility falls below 50m over a wide area. It is only during the construction phase when fog may impact the Project. There would be a risk to construction workers travelling to the Project, but this risk would not be significantly different from the baseline. Workers' health and safety is also managed by Occupational Health and Safety legislation. During the construction phase, the risks associated with poor visibility conditions. will be considered and appropriate	No

MA&D group	MA&D category	MA&D type	Basis of decision to scope in / out	Scope in? phase
			mitigation identified in the CDM Risk Register and emergency preparedness and response plan. During the operational phase there would be the potential for vessels to collide with the tidal barrage however, this risk is considered in **Chapter 16: Shipping and Navigation**. It is therefore considered that this MA&D event type can be scoped out from further assessment.	
Natural Hazards.	Climatological and Meteorological.	Wildfires: Forest fire, Bush / brush, pasture.	The Project is not located in, or surrounded by, significantly large areas of woodland that could be at risk of wildfire events during hot, dry periods and / or fires initiated by construction related activities. It is therefore considered that this MA&D event type can be scoped out from further assessment.	No
Natural Hazards.	Climatological and Meteorological.	Poor Air Quality.	In 2006 the UK experienced two periods of extended hot weather with associated elevated ozone and harmful airborne particles. In the spring of 2015, two particle pollution episodes caused widespread poor air quality throughout the UK, with multiple areas measuring 'High' on the Daily Air Quality Index and resulted in around 1,100 deaths due to exacerbation of pre-existing ill-health	No

MA&D group	MA&D category	MA&D type	Basis of decision to scope in / out	Scope in? phase
			conditions. Summer 2015 also contained two elevated ozone episodes. Construction: Construction effects would be temporary for the duration of the construction phase. These effects would relate to: ■ Increased dust deposition from construction activities resulting in loss of amenity and harm to ecological receptors; ■ Increased exposure to particulate matter (PM10 / PM2.5) in relation to human health; and ■ Increased exposure to emissions from vehicles and marine vessels (NO_2 / PM10 / PM2.5) from construction plant and construction vehicle and vessel movements. Operation: Operational traffic flows associated with maintenance are anticipated to be low. It is therefore considered that this MA&D event type can be scoped out from further assessment.	
Natural Hazards.	Biological	Disease epidemics: Viral;	The Project is located in a developed country where the population is in general good health. The most recent disease epidemic in England was COVID-19, the first cases	No

MA&D group	MA&D category	MA&D type	Basis of decision to scope in / out	Scope in? phase
		Bacterial; Parasitic; Fungal; and Prion.	of which were identified in February 2020. Although no longer considered a global health emergency by The World Health Organisation, the vulnerability of the Project to a MA&D event caused by COVID-19 during construction and operation should be mitigated by the occupational health and safety processes that are implemented by both the contractor and government rules and guidelines on the control of spread of COVID-19. The construction and use of the Project will not give rise to any disease epidemics. The UK Health Security Agency, the executive agency of the Department of Health and Social Care, is responsible for protecting the nation from public health hazards, preparing for and responding to public health emergencies. One of UK Health Security Agency's functions is to protect the public from infectious disease outbreaks and the Agency has produced documents providing operational guidance for the management of outbreaks of communicable disease, 'Communicable Disease Outbreak management: Operational Guidance'. It is therefore considered that this MA&D event type can be scoped out from further assessment.	

MA&D group	MA&D category	MA&D type	Basis of decision to scope in / out	Scope in? phase
			Risks from Weil's Disease (or leptospirosis) is considered to be of low likelihood, but not of high consequence as a low number of people contract this disease in the UK each year. It would be unlikely for any workers to contract Weil's as appropriate personal protective equipment (PPE) will be worn and any risks managed in the construction environmental management plan. It is therefore considered that this MA&D event type can be scoped out from further assessment.	
Natural Hazards.	Biological	Animal Diseases: Avian influenza; West Nile virus; Rabies; Foot and mouth; and Swine fever.	Low and highly pathogenic avian influenza has been recorded in poultry in the UK several times in the last 10 years, most recently during the period between 2021-2023. Although with no human cases reported. There was a devastating foot and mouth outbreak in 2001. There are no known foot and mouth burial pits within the Scoping Boundary. In addition, the use of the Project is not going to be the source of any disease epidemics. It is therefore considered that this MA&D event type can be scoped out from further assessment.	No

MA&D group	MA&D category	MA&D type	Basis of decision to scope in / out	Scope in? phase
Natural Hazards.	Biological	Plants	A survey of Invasive Non-Native Species will be undertaken within the Scoping Boundary as part of the ES. Standard control measures would be implemented by the appointed contractor during construction to handle and dispose of any diseased plants and / or injurious weeds and prevent their spread. It is therefore considered that this MA&D event type can be scoped out from further assessment.	No
Technological or Manmade Hazards.	Societal	Extensive public demonstrations which could lead to violence and loss of life.	The Project is located in a developed country that has steady, yet small population growth. England is politically stable with no direct border with countries experiencing conflicts. The Project is not considered highly controversial and should not lead to high profile public demonstrations. It is therefore considered that this MA&D event type can be scoped out from further assessment in relation to both the construction and operational phases.	No
Technological or Manmade Hazards.	Societal	Widespread damage to societies and economies.	The Project is located in a developed country that has steady, yet small population growth. England is politically stable with no direct border with countries experiencing conflicts. It is therefore considered that this MA&D event	No

MA&D group	MA&D category	MA&D type	Basis of decision to scope in / out	Scope in? phase
			type can be scoped out from further assessment in relation to both the construction and operational phases.	
Technological or Manmade Hazards.	Societal	The need for large-scale multi-faceted humanitarian assistance.	The Project is located in a developed country that has steady, yet small population growth. England is politically stable with no direct border with countries experiencing conflicts. It is therefore considered that this MA&D event type can be scoped out from further assessment in relation to both the construction and operational phases.	No
Technological or Manmade Hazards.	Societal	The hindrance or prevention of humanitarian assistance by political and military constraints.	The Project is located in a developed country that has steady, yet small population growth. England is politically stable with no direct border with countries experiencing conflicts. It is therefore considered that this MA&D event type can be scoped out from further assessment in relation to both the construction and operational phases.	No
Technological or Manmade Hazards.	Societal	Significant security risks for humanitarian relief workers in some areas.	The Project is located in a developed country that has steady, yet small population growth. England is politically stable with no direct border with countries experiencing conflicts. It is therefore considered that this MA&D event type can be scoped out from further assessment in relation to both the construction and operational phases.	No

MA&D group	MA&D category	MA&D type	Basis of decision to scope in / out	Scope in? phase
Technological or Manmade Hazards	Societal	Famine	The Project is located in a developed country that produces its own crops and imports food. England is politically stable and not subject to hyperinflation and therefore food is available, whether produced within the UK or imported. Famine is also not relevant to the use of the Project. It is therefore considered that this MA&D event type can be scoped out from further assessment in relation to both the construction and operational phases.	No
Technological or Manmade Hazards.	Societal	Displaced population.	There will be no displacement of populations as part of the Project. It is therefore considered that this MA&D event type can be scoped out from further assessment in relation to both the construction and operational phases.	No
Technological or Manmade Hazards.	Industrial and Urban Accidents.	Major Accident Hazard Chemical sites.	There are at least 15 Control of Major Accident Hazard (COMAH) sites within a 5km radius of the Project: ▪ Henty Oil Limited (Lower Tier) - adjacent to the east of the Scoping Boundary; ▪ L.E.C.(L'pool) Limited (Lower Tier) - approximately 3.5km east of the Scoping Boundary; ▪ Stanlow Terminals Limited (Upper Tier) - adjacent to the west of the Scoping Boundary;	Yes C, O

MA&D group	MA&D category	MA&D type	Basis of decision to scope in / out	Scope in? phase
			▪ Associated British Ports (Lower Tier) - adjacent to the east of the Scoping Boundary; ▪ Veolia ES (UK) Limited (Lower Tier) - adjacent to the south of the Scoping Boundary; ▪ Becker Industrial Coatings Limited (Lower Tier) - approximately 2.2km east of the Scoping Boundary; ▪ TRIRX Speke Limited (Upper Tier) – approximately 3.5km east of the Scoping Boundary; ▪ Blagden Specialty Chemicals Limited (Lower Tier) - approximately 1.8km east north east of the Scoping Boundary; ▪ Biodeg Chemical Company Limited (Lower Tier) - approximately 2.7km east of the Scoping Boundary; ▪ Sharpness Dock Limited (Lower Tier) - adjacent to the west of the Scoping Boundary and within one of the possible grid connection point 1km buffer zones; ▪ Unilever UK Limited (Upper Tier) - approximately 1.6km west of the Scoping Boundary; ▪ Livent Lithium UK Limited (Lower Tier) - adjacent to the west of the Scoping Boundary;	

MA&D group	MA&D category	MA&D type	Basis of decision to scope in / out	Scope in? phase
			▪ Exolum Eastham Limited (Upper Tier) - approximately 0.3km south of the Scoping Boundary and within one of the possible grid connection point 1km buffer zones; ▪ Eastham Refinery Limited (Upper Tier) - approximately 0.6km south of the Scoping Boundary and within one of the possible grid connection point 1km buffer zones; and ▪ Urenco ChemPlants Limited (Upper Tier) - within one of the possible grid connection point 1km buffer zones. The Proposed Development also lies within two Explosives Safeguarding Zones. As outlined in **Chapter 2: Site Context and Project Description**, during the construction phase there will be a safety zone / buffer around COMAH sites or industrial / hazardous facilities. The potential risks associated with the presence of these COMAH sites and Explosives Safeguarding Zones during the construction and operational phase will be considered further in the ES.	
Technological or Manmade Hazards.	Industrial and Urban Accidents.	Major Accident Hazard Pipelines.	There are no major accident hazard (MAH) pipelines within 1km of the Scoping Boundary. However, within the possible grid connection point 1km buffer zone there are MAH	Yes C

MA&D group	MA&D category	MA&D type	Basis of decision to scope in / out	Scope in? phase
			pipelines operated by: Cadent Gas Ltd and RWE nPower plc. Once the location of the grid connection point has been confirmed, further consultation will be undertaken with the HSE as part of the ES to understand which MAH pipeline Consultation Zones overlap the Project.	
Technological or Manmade Hazards.	Industrial and Urban Accidents.	Nuclear	Nuclear sites are designed, built and operated so that the chance of accidental releases of radiological material in the UK is extremely low. The last historical major accident in the UK was Windscale in 1957. There are no nuclear sites within a 5km radius of the proposed tidal barrage. However, one of the possible grid connection points is located adjacent to Capenhurst. Any works in this area will be undertaken in accordance with method statements and risk assessments developed in collaboration with Capenhurst. Therefore, this MA&D event type can be scoped out from further assessment.	No
Technological or Manmade Hazards.	Industrial and Urban Accidents.	Fuel storage	In December 2005 Europe's largest peacetime fire occurred at the Buncefield Oil Storage Terminal in Hemel Hempstead, England. The surrounding area was	No

MA&D group	MA&D category	MA&D type	Basis of decision to scope in / out	Scope in? phase
			temporarily evacuated and some local businesses experienced long-term disruption to operations. Due to the industrial nature of the location of the Proposed Scheme there are several fuel storage sites, as identified above under Major Accident Hazard Chemical Sites, within the Study Area. The potential risks associated with the presence of these bulk fuel facilities will be addressed under the MA&D event type Major Accident Hazard Chemical Sites. Therefore, it is considered that this MA&D event type can be scoped out from further assessment.	
Technological or Manmade Hazards.	Industrial and Urban Accidents.	Dam breaches.	Dam breaches in the UK are rare; the last major breach was at the Cwm Eigiau dam in 1925, which caused 17 fatalities and widespread flooding. Environment Agency Flood Risk from Reservoirs map indicates that the barrage Scoping Boundary and potential port facilities are not at risk from reservoir flooding when river levels are normal but is at risk from reservoir flooding when there is also flooding from rivers, specifically from the Torside, Woodhead and Rhodeswood reservoirs. The risk is based on a worst-case scenario for the area that could be flooded if a reservoir were to fail and release the water it holds. It is noted that reservoir flooding is unlikely to occur	No

MA&D group	MA&D category	MA&D type	Basis of decision to scope in / out	Scope in? phase
			due to the monitoring and maintenance of reservoirs and dams. Therefore, this MA&D event type can be scoped out from further assessment.	
Technological or Manmade Hazards.	Industrial and Urban Accidents.	Mines and storage caverns.	The proposed Barrage area and grid connection route is not situated within a Coal Authority Coal Mining Reporting Area. Therefore, this MA&D event type can be scoped out from further assessment.	No
Technological or Manmade Hazards.	Industrial and Urban Accidents.	Fires	Fires could be initiated by construction related activities which impact areas adjacent to the construction activities. During construction, standard control measures would be implemented by the appointed contractor to manage the risk of fire. There is a working airfield (Liverpool John Lennon Airport) with fuel storage located 2.6km south east of the closest point of the Scoping Boundary. The Project is located in an industrial location, where there are several bulk fuel storage facilities. The Project is located within a mixed industrial and residential area. Notwithstanding this, the risk of fires affecting the Project during operation is no greater than risks for existing developments in an urban environment.	No

MA&D group	MA&D category	MA&D type	Basis of decision to scope in / out	Scope in? phase
			Therefore, this MA&D event type can be scoped out from further assessment.	
Technological or Manmade Hazards.	Transport accidents.	Road	Significant transport accidents occur across the UK on a daily basis, mainly on roads, and involving private and / or commercial vehicles. During construction there will be an increase in heavy construction plant and equipment on local road network which may increase the risk of accidents. However, the majority of components and materials associated with the tidal barrage and grid connection construction will be transported by marine methods. In addition, a Construction Traffic Management Plan will be implemented. The potential risks associated with road transport accidents during the construction phase are being considered as part of the ES and do not require further assessment from a MA&D perspective. The traffic impacts associated with the operational phase are anticipated to be of low volume being limited to movements associated with maintenance activities and low numbers of staff commuting to the Site. Therefore, further	No

MA&D group	MA&D category	MA&D type	Basis of decision to scope in / out	Scope in? phase
			assessment of the traffic impacts of the Project during the operational phase is not considered necessary. It is therefore considered that this MA&D event type can be scoped out from further assessment.	
Technological or Manmade Hazards.	Transport accidents.	Rail	The Wirral Railway Line passes through the possible grid connection Scoping Boundary south of Brookhurst. The grid connection cable will be located below ground and is likely to be installed beneath the railway using horizontal directional drilling. Prior to construction the Applicant or the appointed construction contractor will engage with National Rail to develop and agree appropriate method statements and risk assessments. It is therefore considered that this MA&D event type can be scoped out from further assessment.	No
Technological or Manmade Hazards.	Transport accidents.	Waterways	The Project is located in and adjacent to the River Mersey which carries significant water traffic and will also be used by the Project during the construction and maintenance phases. **Chapter 16: Shipping and Navigation** states that a total of 21 reports are logged on the Marine Accident Investigation Branch (MAIB) between 1989 and 2024 for the Port of	No

MA&D group	MA&D category	MA&D type	Basis of decision to scope in / out	Scope in? phase
			Liverpool and surrounding River Mersey, Mersey Estuary and Liverpool Bay involving collisions, contacts, groundings and personal injuries. **Chapter 16: Shipping and Navigation** considers the potential risks associated with, for example, vessel collisions, allision, impact on search and rescue capability, Interference with navigation systems and impacts of wash. It also identifies that a Navigation Risk Assessment will be undertaken as part of the ES. It is therefore considered that this MA&D event type can be scoped out from further assessment from a MA&D perspective.	
Technological or Manmade Hazards.	Transport accidents.	Aviation	There have been no major air accidents in the UK since the Kegworth incident in 1989. There is one working airfield within the Study Area. Liverpool John Lennon Airport is located approximately 2.6km south east of the closest point of the Scoping Boundary. During construction the height of construction equipment (e.g. cranes) could potentially increase the risk to aircraft operating into / out of the airport.	Yes C

MA&D group	MA&D category	MA&D type	Basis of decision to scope in / out	Scope in? phase
			The Public Safety Zone (PSZ) associated with the airport is currently unknown. Therefore, consultation will be undertaken with Liverpool John Lennon Airport to understand the extent of the PSZ. In accordance with Civil Aviation Authority guidance, aviation lighting will be installed on cranes where necessary. Therefore, this MA&D event type has been scoped in during the construction phase for further assessment in the ES. During operation, the risks associated with the presence of the Project should be no greater than the current situation. Therefore, it is considered that the risk of aviation transport accidents can be scoped out from further assessment in the ES during the operational phase.	
Technological or Manmade Hazards.	Pollution accidents.	Air	There are no AQMAs within the Wirral Council and Knowsley Council local authority areas. Cheshire West and Chester has four AQMAs within its administrative boundaries, but none are present within the Study Area. Liverpool is covered by a city-wide AQMA declared for exceedance of the annual mean NO_2 objective. Sefton Metropolitan Borough Council has four AQMAs all of which fall within the Study Area for exceedances of: the annual mean NO_2 objective; the hourly mean NO_2; and daily mean	No

MA&D group	MA&D category	MA&D type	Basis of decision to scope in / out	Scope in? phase
			PM10 objectives. All of the local authorities undertake routine monitoring of NO_2, PM10 and PM2.5. A review of available local authority monitoring data has shown that annual mean NO_2 concentrations within both the Wirral Council and Cheshire West and Chester administrative areas were comfortably below the annual mean objective of 40µg / m^3. Annual mean NO_2 levels in Liverpool, measured by Liverpool City Council, are also below the objective. In Sefton, levels of NO_2 have breached the objective on Derby Road in Bootle, which is consistent with the declaration of an AQMA in this location. Annual mean PM10 and PM2.5 concentrations within the Study Area are also below their respective objectives of 40µg/m^3 and 20µg/m^3. **Chapter 21: Air Quality** identifies that annual mean background NO_2, PM10 and PM2.5 concentrations within the baseline air quality Study Area are below their relevant air quality objectives. NO_X concentrations exceed the critical level of 30µg/m^3 at some locations within the Study Area. Construction: Construction impacts would be temporary for the duration of the construction phase and will be managed	

MA&D group	MA&D category	MA&D type	Basis of decision to scope in / out	Scope in? phase
			through the OCEMP. Increased dust emissions from construction activities and traffic could lead to potential loss of amenity at sensitive receptors. Traffic management measures may result in both positive and adverse changes to emissions from vehicle exhausts and roadside pollution concentrations. Emissions from marine vessels, mobile plant and equipment are covered under health and safety and environmental legislation. Operation: Due to the nature of the Project, the only impacts would be associated with operational traffic flows for maintenance purposes which are anticipated to be low. It is anticipated that there are limited opportunities for pollution accidents to air during either construction or operation due to the nature of the Project. Therefore, it is considered that further assessment in the ES from a MA&D perspective is not required.	
Technological or Manmade Hazards.	Pollution accidents.	Land	During construction there may be an increase in the risk of leaks and spillages of hazardous materials associated with construction activities. During construction, standard control measures would be implemented by the appointed contractor and identified in the Outline CEMP to manage	No

MA&D group	MA&D category	MA&D type	Basis of decision to scope in / out	Scope in? phase
			the risk of spillages and leaks. It is therefore proposed not to evaluate this further in the ES for the construction phase. During operation only very small quantities of materials will be stored for maintenance purposes. These materials will be stored appropriately and provided with secondary containment. Therefore, this MA&D event type can be scoped out from further assessment.	
Technological or Manmade Hazards.	Pollution accidents.	Water	Grid Connection: **Chapter 23: Geology and Ground Conditions** identifies that where present, the superficial deposits beneath the majority of the proposed route are classified as a Secondary (undifferentiated) Aquifer. Superficial deposits beneath the northern extent are classified as a Secondary A Aquifer. The bedrock beneath the majority of the routed is classified as a Principal Aquifer, the exception being a small area in the northern section which is classified as a Secondary B Aquifer. A large proportion of central section of the route is shown to lie with a groundwater Source Protection Zone (SPZ), Zone III (total catchment), with a small area located with Zone I	No

MA&D group	MA&D category	MA&D type	Basis of decision to scope in / out	Scope in? phase
			(Inner Protection Zone) and Zone II (Outer Protection Zone). Barrage: As identified in **Chapter 23: Geology and Ground Conditions** the superficial deposits (Tidal Flat Deposits) beneath the proposed Barrage boundary are classified as a Secondary (undifferentiated) Aquifer. The bedrock (Sherwood Sandstone) beneath the proposed Barrage boundary is classified as a Principal Aquifer. No area of the proposed Barrage boundary is mapped to be within a groundwater SPZ. A Zone III (total catchment) SPZ is located approximately 300m west of the proposed Barrage boundary, associated with a Zone I (Inner Protection Zone) SPZ located approximately 2km west of the Barrage boundary in Birkenhead. During construction there may increase the risk of leaks and spillages of hazardous materials associated with the construction activities. During construction, standard control measures would be implemented by the appointed contractor to manage the risk of spillages and leaks. It is therefore proposed not to evaluate this further in the ES for the construction phase.	

MA&D group	MA&D category	MA&D type	Basis of decision to scope in / out	Scope in? phase
			During operation only very small quantities of materials will be stored for maintenance purposes. These materials will be stored appropriately and provided with secondary containment. Therefore, this MA&D event type can be scoped out from further assessment.	
Technological or Manmade Hazards.	Utilities failures.	Electricity	Instances of electricity failure (also referred to as power loss or blackout) can be caused by a number of things, such as severe weather (e.g. very strong winds, lightning and flooding) which damage the distribution network. These tend of be mainly specific place, local (e.g. metropolitan area) and less frequently regional (e.g. North East) as a result of severe winter storms and consequent damage to the distribution overhead line network. Underground and above-ground electrical transmission lines are present across the Scoping Boundary, the responsibilities of which lie with the relevant local operator or company should this infrastructure fail. The responsibility for any diversion works and the installation of new electrical infrastructure will lie with the relevant local operator or company. Information regarding diversion works will be considered in the ES, however the potential risk of construction-related incidents when	No

MA&D group	MA&D category	MA&D type	Basis of decision to scope in / out	Scope in? phase
			undertaking diversion works as part of the grid connection would be covered by existing legislation and as such does not require further consideration in the MA&D assessment.	
Technological or Manmade Hazards.	Utilities failures.	Gas	Underground gas transmission pipelines are present within the Scoping Boundary, the responsibilities of which lie with the relevant local operator or company should this infrastructure fail. If there is the requirement to undertake any diversion works, these would be undertaken by the operator and would be covered by existing legislation. There is no gas use associated with the Project. Therefore, it is considered that this MA&D event type can be scoped out from further assessment.	No
Technological or Manmade Hazards.	Utilities failures.	Water supply.	The United Utilities (UU) Strategic Water Resource Zone (WRZ) serves the area of the Project. The water stress designation for the UU Strategic WRZ is classified as "not serious". There will be minor potable water use for welfare purposes associated with the Project during its operation and relatively low use during construction which could be addressed by bringing supplies in by tanker, if required. It is	No

MA&D group	MA&D category	MA&D type	Basis of decision to scope in / out	Scope in? phase
			therefore considered that this MA&D event type can be scoped out from further assessment.	
Technological or Manmade Hazards.	Utilities failures.	Sewage system.	During the operation of the Project, there will be the requirement to connect into the existing sewage system for the disposal of foul water associated with the welfare facilities. The Applicant will engage with United Utilities to ensure that the existing sewage system has sufficient capacity During construction phase temporary portable systems will be in place covered by Health and Safety welfare requirements. It is therefore considered that this MA&D event type can be scoped out from further assessment.	No
Technological or Manmade Hazards.	Malicious Attacks.	Unexploded Ordnance.	Grid Connection: The northern extent of the proposed grid connection route is situated within an area shown to have a high Unexploded Bomb (UXB) risk, the southern extent is shown to be in an area of moderate UXB risk. Barrage: Available UXB risk maps show the areas of land to the north and south of the proposed Barrage area (i.e. Liverpool and Birkenhead) are mapped to have a high risk of UXBs. The eastern end of the southern boundary is mapped to have a moderate risk of UXBs.	No

MA&D group	MA&D category	MA&D type	Basis of decision to scope in / out	Scope in? phase
			Although no UXB risk maps are available for the majority of the Barrage area which is located within the River Mersey, it can be assumed that the area will possess a high risk of UXBs due the risk classifications on the adjacent land. Prior to the installation of any infrastructure UXO clearance would be undertaken. Measures would be undertaken during construction to brief operatives to raise awareness of this issue, and to define appropriate response strategies should UXO be discovered during the works. There would be a limited risk of UXO affecting the Project, once operational but no greater than similar schemes. Therefore, it is considered that this MA&D event type can be scoped out from further assessment.	
Technological or Manmade Hazards.	Malicious Attacks.	Attacks: Chemical; Biological; Radiological; and Nuclear.	Extremists remain interested in Chemical, Biological, Radiological and Nuclear (CBRN) materials, however alternative methods of attack such as employing firearms or conventional explosive devices remain far more likely. Historical use has been in closed densely occupied structures (underground, buildings) or targeted at specific individuals.	No

MA&D group	MA&D category	MA&D type	Basis of decision to scope in / out	Scope in? phase
			The Project is unlikely to be a target for this type of event due to the low number of exposed targets. It is therefore considered that this MA&D event type can be scoped out from further assessment in relation to both the construction and operational phases.	
Technological or Manmade Hazards.	Malicious Attacks.	Transport systems.	Potential systems would include (but are not limited to) railways, buses, passenger ferries, cargo vessels and aircraft. The Project is unlikely to be a target for this type of event due to the low number of exposed targets. It is therefore considered that this MA&D event type can be scoped out from further assessment in relation to both the construction and operational phases.	No
Technological or Manmade Hazards.	Malicious Attacks.	Crowded places.	The Project does not fall within the definition of a crowed place, i.e. pedestrian routes and other thoroughfares as well as sports arenas, retail outlets and entertainment spaces. The Project is unlikely to be a target for this type of event due to the low number of exposed targets. It is therefore considered that this MA&D event type can be scoped out	No

MA&D group	MA&D category	MA&D type	Basis of decision to scope in / out	Scope in? phase
			from further assessment in relation to both the construction and operational phases.	
Technological or Manmade Hazards.	Malicious Attacks.	Cyber	Cyber-attacks occur almost constantly on key national and commercial electronic information, control systems and digital industries. The reliance on technology to control the Project could render the Project more vulnerable to a cyber-attack. Notwithstanding this, it is not considered to be more vulnerable to attack than other similar infrastructure installed and running in the UK. It is therefore considered that this MA&D event type can be scoped out from further assessment in relation to both the construction and operational phases.	No
Technological or Manmade Hazards.	Malicious Attacks.	Infrastructure	Terrorists in the UK have previously attacked, or planned to attack, national infrastructure. Attempts were made to attack electricity substations in the 1990s. Bishopsgate, in the City of London, was attacked in 1993 and South Quay in London's Docklands in 1996. These attacks resulted in significant damage and disruption but relatively few casualties.	No

MA&D group	MA&D category	MA&D type	Basis of decision to scope in / out	Scope in? phase
			The tidal barrage could be considered a high profile attack. However, the anticipated low number of exposed targets makes the tidal barrage less attractive than other softer targets. In addition, the perceived structural soundness could act as a deterrent from attack. This risk should remain in the design risk register, which will include the requirement to undertake a terrorism risk assessment, with appropriate mitigation measures to be integrated into the design. It is therefore considered that this MA&D event type can be scoped out from further assessment.	
Technological or Manmade Hazards.	Engineering accidents and failures.	Bridge failure.	The Project involves the construction of a tidal barrage across the Mersey. This structure has been designed to meet modern safety standards, which reduces the likelihood of future failure. The risk associated with the failure of the tidal barrage is considered no greater than other similar new structures designed to comparable standards. It is therefore considered that this MA&D event type can be scoped out from further assessment in relation to both the construction and operational phases.	No

MA&D group	MA&D category	MA&D type	Basis of decision to scope in / out	Scope in? phase
Technological or Manmade Hazards.	Engineering accidents and failures.	Flood defence failure.	Environment Agency mapping indicates that the barrage Development Area and potential port facilities / key infrastructure areas benefit from fluvial and tidal flood defences consisting of engineered high ground and natural high ground. These defences stretch along the whole of the northern bank of the River Mersey within the Scoping Boundary and from the Manchester Ship Canal to the Seacombe ferry terminal on the southern bank. Areas of the potential grid connection routes also benefit from flood defences, these include: ▪ Areas defended by embankments and engineering high ground are present along both the unnamed tributary of the Birket and along the Birket; ▪ Small sections of flood wall are present along the Birket; and ▪ The River Fender is classed as defended for its entire length within the Study Area, including both crossing locations, by a combination of natural high ground and engineered high ground. However, failure or overwhelming of these flood defences in an extreme event may occur.	No

MA&D group	MA&D category	MA&D type	Basis of decision to scope in / out	Scope in? phase
			The design of the Project has been developed to include allowances for future climate change predictions that could result in flooding. Notwithstanding these factors, the potential risk of breach events will be considered in the ES as part of the Flood Risk Assessment. Therefore, it is considered that this MA&D event type can be scoped out from further assessment in relation to both the construction and operational phases from a MA&D perspective.	
Technological or Manmade Hazards.	Engineering accidents and failures.	Mast and tower collapse.	There are no towers or masts in close proximity to the Project or being built as part of the Project. It is therefore considered that this MA&D event type can be scoped out from further assessment in relation to both the construction and operational phases.	No
Technological or Manmade Hazards.	Engineering accidents and failures.	Property or bridge demolition accidents.	The Project does not involve any demolition works. It is therefore considered that this MA&D event type can be scoped out from further assessment in relation to both the construction and operational phases.	No
Technological or Manmade Hazards.	Engineering accidents and failures.	Tunnel failure / fire.	There are two tunnels within the Scoping Boundary, that cross underneath the Mersey, which carry the A59 (Kingsway Tunnel) and the A5030 (Birkenhead Tunnel). The construction of the tidal barrage does not involve the	Yes C

MA&D group	MA&D category	MA&D type	Basis of decision to scope in / out	Scope in? phase
			construction of any tunnels or construction works in close proximity to the existing road tunnels other than the transportation of pre-fabricated structure over the tunnels. As outlined in **Chapter 2: Site Context and Project Description** a safety zone upstream and downstream of the tunnels will be implemented during the construction phase. The Grid Connection Development Area includes the existing Mersey ring network which may be used for the grid connection on the northern bank of the River Mersey to Lister Drive. Until the location of the barrage and grid connection have been determined this MA&D type has been scoped in for further assessment in the ES in relation to the construction phase.	

15.10.13 To summarise the following MA&D types have been scoped in for further assessment in the ES:

- Major accident hazard chemical sites (construction and operation phase);
- Major accident hazard pipelines (construction phase);
- Transport accidents – aviation (construction phase); and
- Tunnel failure / fire.

15.11 CUMULATIVE EFFECTS

15.11.1 The MA&D assessment has, by its very nature, implicitly considered interactions with external factors such as other existing projects which may impact on the Study Area. The assessment approach for MA&D, which considers the vulnerability of the Project to MA&D events, does not assess potential cumulative effects on sensitive receptors as a MA&D event, is a rare, isolated event, which does not have on-going impacts.

15.12 TRANSBOUNDARY EFFECTS

15.12.1 By definition, a MA&D event could result in a significant environmental effect and may result in transboundary effects. The ES will consider potential transboundary effects for those MA&D types which have been scoped in for further assessment.

15.13 PROPOSED APPROACH TO ENVIRONMENTAL IMPACT ASSESSMENT REPORT

15.13.1 In line with the IEMA Primer, for those MA&D types which have been scoped in for detailed assessment in the ES, the proposed assessment process to be used in the ES will include:

- Identifying potential risk events related to the scoped in MA&D types;
- Screening these risk events, e.g. to remove unrealistic worst-case scenarios;
- Defining the likely worst-case consequences (impact);
- Assessing the likelihood; and
- Determining whether the risk event could be a MA&D and, if relevant, whether the risk is as low as reasonably practicable (ALARP) with the proposed mitigation measures.

15.14 ASSUMPTIONS AND LIMITATIONS

15.14.1 To ensure transparency within the EIA process, the following limitations and assumptions have been identified:

- The design of the Project will be subject to relevant hazard identification studies and actions identified will be integrated into the final design, to reduce risks to ALARP.
- The construction phase of the Project will be managed through the implementation of the construction phase plan required under the CDM Regulations 2015 (HM Government, 2015) and a OCEMP.
- The Project is being designed, and its implementation guided by other industry standards and codes, many of which are mandatory. These require infrastructure and systems to be designed so that risks to people and the environment are either eliminated or reduced to levels that are ALARP.
- Environmental effects associated with unplanned events that do not meet the definition of a MA&D (e.g. minor leaks and spills that may be contained within the construction sites) are addressed in other environmental aspect chapters as appropriate and not in this chapter.
- It is recognised that the management framework for the Project is not fully defined at this stage; however, a presumption of standard practice and regulatory compliance within the adopted management framework has been assumed and will be developed following the appointment of the principal contractor.
- The assessment presented in the PEIR and ES will include the latest design information available at the time of the submission. Where design information is not available, reasonable worst-case assumptions will be made.

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16 SHIPPING AND NAVIGATION

16.1 INTRODUCTION

16.1.1 The shipping and navigation chapter will consider the potential likely significant effects on shipping and navigation that may arise from the construction, operation and maintenance (O&M) and decommissioning activities of the Project, the focus of which is the tidal barrage and existing port and marine facilities.

16.1.2 These receptors include ports and harbours, shipping companies and recreational users. This section of the Scoping Report describes the methodology to be used within the Environmental Impact Assessment (EIA), an overview of the baseline conditions within the Tidal Barrage Development Area contained within the Scoping Boundary (as defined in **Chapter 1: Introduction**), the datasets to be used to inform the EIA, the potential likely significant effects to be considered, and how these will be assessed for the purpose of the EIA.

16.1.3 Shipping and navigation interfaces with other aspects and as such, should be considered alongside these; namely:

- **Chapter 11: Commercial fisheries:** There are potential pathways of effects from fishing activities in proximity to the Project. Information in the commercial fisheries chapter will therefore, inform the shipping and navigation assessment.
- **Chapter 26: Infrastructure and marine users:** There are potential pathways of effects from infrastructure and marine users in proximity to the Project. Information in the infrastructure and marine users chapter will therefore, inform the shipping and navigation assessment.

16.2 LEGISLATIVE AND POLICY CONTEXT

16.2.1 Overarching relevant legislation and policy context which has informed the scope of the assessment is outlined in **Chapter 4: Planning Policy,** with topic specific considerations outlined in **Appendix 4.1**. The Peel Ports Group Limited Port of Liverpool Port Marine Safety Code (PMSC) – Marine Safety Plan 2024 – 2026 is of particular relevance to this chapter as it sets the policies and objectives applicable for the conduct of marine operations within the Port of Liverpool.

16.3 TECHNICAL GUIDANCE

16.3.1 Technical guidance that has been used to define the assessment is set out in **Table 16-1**.

Table 16-1: Relevant Technical Guidance

Guidance reference	Relevance to the assessment
The PMSC's Guide to Good Practice	The Project is located within the Port of Liverpool SHA
Marine Guidance Note (MGN) 654	Policy relevant for renewable energy infrastructure within UK waters
MGN 372	Policy relevant for renewable energy infrastructure within UK waters
International Association of Marine Aids to Navigation and Lighthouse Authorities (IALA) G1162	Guidance applies to all fixed structures above or below the surface of the sea
World Association for Waterborne Transport Infrastructure (PIANC) (2009) Report 106	Innovations on navigation lock design
PIANC (2014a) Report 121	Harbour Approach Channels Design Guidelines
PIANC (2019) Report 141	Design Guidelines for Inland Waterway Dimensions
PIANC (2014b) Report 151	Design of Lock Gates for Ship Collision
PIANC (2015) Report 155	Ship Behaviour in Locks and Lock Approaches

16.4 STUDY AREA

16.4.1 The study area for the shipping and navigation assessment will be defined in relation to impacts with shipping and navigation receptors. It is proposed that it will consistent of the waters seaward of Mean High Water Springs (MHWS) with

the northern boundary a line due west of Liverpool Coastguard on Crosby Beach to Crosby Channel Lateral Buoys C14/C17, and due south to Leasowe Beach. The southern boundary is marked between Eastham Locks and Stalbridge Dock. This study area has been defined to ensure key approach channels and navigational features are included within the shipping and navigation assessment. This will be identified and agreed in consultation with stakeholders. The proposed shipping and navigation study area is presented in **Figure 16.1.**

16.5 CONSULTATION

16.5.1 Consultation is a key part of the application process. The assessment will be informed by engagement and discussion with various stakeholders as identified in **Section 16.15**.

16.5.2 An initial workshop was undertaken with Peel Ports on 14th May 2024, with follow up workshops on the 3rd July 2024 and the 15th August 2024.

16.5.3 An initial meeting was held with Cammell Laird on 16th March 2023 to discuss the project development and further engagement is anticipated as the project develops

16.6 ASSESSMENT METHODOLOGY

16.6.1 The Project-wide approach to the assessment methodology is set out in **Chapter 3: Approach to EIA**. This will be implemented to assess the likely significant effects on shipping and navigation receptors from the construction, O&M, and decommissioning of the tidal barrage.

16.6.2 Relevant legislation and guidance will also be considered in relation to the assessment, in addition to consultation with the stakeholders outlined above.

16.6.3 The assessment approach will be based on the conceptual 'source-pathway-receptor' model. This model identifies likely environmental effects resulting from the construction, O&M and decommissioning of the Project. This process provides an easy to follow assessment route between effect sources and potentially sensitive receptors ensuring a transparent impact assessment.

16.6.4 Iterative steps involved in the assessment approach will include:

- Determination of potential interactions between the Project and receptors (for construction and operation and maintenance phases);
- Definition of the shipping and navigation receiving environment within the influence of the Project;
- Assessment of the sensitivity of the receptors;

- Assessment of the magnitude of impact;
- Assessment of the significance of effects;
- Proposal of mitigation measures to reduce, prevent or where these are not possible, to offset, any adverse significant effects;
- Assessment of the residual effects after any mitigation measures have been considered; and
- Assessment of cumulative effects.

RECEPTOR SENSITIVITY

16.6.5 The criteria for defining the sensitivity of shipping and navigation receptors within the Shipping and Navigation EIA chapter are outlined in **Table 16-2**. The definitions have been informed by the International Maritime Organization (IMO) Formal Safety Assessment (FSA) (IMO, 2018).

16.6.6 It should be noted that the value of the receptor and sensitivity are not necessarily linked for a particular effect. For example, a receptor could be of international or national importance (e.g. a traffic routeing measure) but have a low or negligible sensitivity to an impact and vice versa. Consequently, when determining the sensitivity level taken forward to assessment this will be taken into account, with receptor-specific considerations and professional judgement being used.

Table 16-2: Sensitivity criteria for shipping and navigation receptors.

Sensitivity	Definition
High	Serious consequence - fatality/serious injuries, serious damage to vessel (>£1 million), serious pollution (Tier 2) and prolonged disruption to operators/marine users.
Medium	Moderate consequence - Serious injuries, damage to vessel (<£1 million), moderate pollution (Tier 2) and temporary disruption to operators/marine users.
Low	Minor consequence - Multiple minor injuries, minor damage (<£100 thousand) to vessel, minor pollution (Tier 1) and short-term disruption to operators/marine users.

Sensitivity	Definition
Very Low	Negligible consequence - Minor injury, minor damage (<£10 thousand), minor spill and minimal disruption to operators/marine users.

MAGNITUDE OF IMPACT

16.6.7 The criteria for defining the magnitude within the Shipping and Navigation EIA chapter are outlined in **Table 16-3.** Where an impact could reasonably be assigned to more than one level of magnitude, professional judgement will be used to determine which level is applicable.

Table 16-3: Magnitude of impact criteria for shipping and navigation.

Magnitude	Definition
High	Frequent hazard occurrence, likely to occur approximately annually. Impact continuous throughout the project lifecycle.
Medium	Reasonably probable that hazard may occur, approximately every decade. Impact would occur periodically under certain conditions (multiple times per year).
Low	Unlikely that hazard occurs during project lifecycle. Impact would occur infrequently (once per year).
Very Low	Extremely unlikely that hazard occurs during project lifecycle. Impact could occur during rare conditions less than once per year.

SIGNIFICANCE OF EFFECT

16.6.8 The significance of the effect upon shipping and navigation receptors will be determined by taking into account the sensitivity of the receptor and the magnitude of the impact. Effects are defined initially without mitigation. Where the resulting effect comprises a range of significance levels, the final assessment for each effect will be based upon expert judgement.

16.6.9 Residual effects that are classified as moderate or above are considered to be ‘significant’ in EIA terms; however, professional judgement is applied for

moderate effects. Residual effects classified as slight or below are considered to be 'not significant'.

16.6.10 The following terms have been used to define the significance of the effects identified:

- **Major Effect:** Project could be expected to have a considerable effect on shipping and navigation receptors;
- **Moderate Effect:** Project could be expected to have a noticeable effect on shipping and navigation receptors;
- **Minor Effect:** Project could be expected to result in a small, barely noticeable effect on shipping and navigation receptors; and
- **Negligible:** where no discernible effect is expected as a result of the Project on shipping and navigation receptors.

Table 16-4: Significance of effect criteria for the shipping and navigation assessment.

Magnitude of Change	Receptor Sensitivity			
	High	Medium	Low	Very Low
High	Major	Major	Major or Moderate	Moderate or Minor
Medium	Major or Moderate	Major or Moderate	Major or Moderate	Minor
Low	Moderate or Minor	Moderate or Minor	Minor	Minor
Very Low	Minor or Negligible	Minor or Negligible	Negligible	Negligible

16.7 BASELINE CONDITIONS

DATA INFORMATION SOURCES

16.7.2 An initial desk-based review has been undertaken of publicly available data sources outlined in **Table 7-2** to determine the baseline character of the shipping and navigation study area and inform the assessment process. In addition, previous studies commissioned by the Project have been referenced (AqualisBraemar LOC, 2021a; 2021b, 2021c).

Table 16-5: Key sources of shipping and navigation data

Source	Date	Summary	Coverage of Study Area
Nautical Charts	2024	1121 – Irish Sea with St George's Channel and North Channel 3490-1 – Tranmere to Garston and Eastham 3940-2 – Seaforth to Tranmere	Full coverage
Automatic Identification System (AIS) Data	January 2015-June 2021	AIS dataset used in previous Marine Traffic Studies undertaken (AqualisBraemar LOC (2021a) and AqualisBraemar LOC (2021b))	Full coverage
AIS Data	2019	12 months of anonymised AIS data obtained from the Maritime Management Organisation (MMO)	Full coverage
Sailing Directions	2022	Admiralty Sailing Directions West Coast of England and Wales Pilot, 21st Edition 2022	Full coverage
Marine Accident Investigation Branch (MAIB)	1989-2024	Historical incident data published by the MAIB	Full coverage

Source	Date	Summary	Coverage of Study Area
Royal National Lifeboat Institution (RNLI)	2008-2023	Historical incident data published by the RNLI	Full coverage

EXISTING BASELINE

16.7.3 This section describes the present conditions which constitute the existing baseline environment for shipping and navigation within the study area.

Navigational Features

16.7.4 The dredged depth of the Queens and Crosby Channel on the approach to the mouth of Mersey River is 10-12 metres (m) Chart Datum (CD). Dredged depth in the river fluctuates between 10-18m CD until Tranmere Oil Terminal. Liverpool docks end at the Brunswick dock to Liverpool marina, accessible at high tide only. Beyond the Port of Liverpool, two narrow channels border the east and west side. Eastham Channel (west) leads to the Manchester Canal and Garston Channel (east) towards the Port of Garston which maintains 6m CD, bordered by the intertidal Devils Bank.

16.7.5 The River Mersey is subject to significant tidal fluxes with a maximum tidal range of 10.8m at Gladstone Docks on a spring tide and 4m on a neap tide with a maximum tidal flow rate of 5.1knots according to Admiralty chart 3490.

16.7.6 On the approach to Mersey Estuary the dredged channel is delimited by lateral markers both floating and fixed on the east and west banks. Shallow obstacles and wrecks are marked with cardinal buoys, and Gladstone and Langton dock entrances are marked by Sector lights to ensure safe passage through the channels. Designated anchorages are situated in Liverpool Bay west of Burbo Bank Wind Farm and north of the no-anchor zone at the entrance to Queens Channel.

Local Ports and Harbours

16.7.7 The Port of Liverpool is a dock system stretching 7.5 miles (12.1 kilometres (km)) from Brunswick Dock to Seaforth Dock on the east side (Liverpool) of the River Mersey and includes the adjacent Birkenhead Docks on the west side (Wirral) totalling 29 commercial docks.

16.7.8 The port is a global hub of commercial trade and operates two container terminals Royal Seaforth Container Terminal (RSCT) and Quayside Liverpool2

Terminal at depths of 15m and 16.5m respectively. The majority of trade is between North America, China, Europe, and Canada and spans a wide diversity of products including coal, automobiles, foods, grains, fresh produce, minerals, aggregates, liquid bulk and liquified gas. The Port of Liverpool also houses a major global cruise terminal outside of the enclosed docks.

16.7.9 Vessels over 82m in length or with certain classifications require pilotage. Five Pilot boarding stations are situated around the mouth of the River Mersey (Peelports 2022). Vessel Traffic Services (VTS), enacted by the Port of Liverpool's Marine Department, requires vessels to report their movements at upon arrival or departure at the port entrance, enclosed docks and other points dependent on a vessels route and purpose (Peelports 2024).

Vessel Traffic

16.7.10 Liverpool is the 3rd busiest UK port for commercial freight. A Department for Transport (DfT) publication indicates an average of 32 million tonnes of freight is processed through the Port of Liverpool per year. In 2022, 33,422 freight vessels moved through the port (DfT 2024). In addition, there is abundant recreational activity facilitated by Liverpool Marina as well as approximately 100 cruise ship calls per year.

16.7.11 Passenger and ferry vessels frequent the Port of Liverpool daily (**Figure 16.2)** Ferry terminals are located at Birkenhead, Seacombe and Woodside on the west side and Bootle and Pier Head on the east side. Mersey Ferries operates services between both sides and local cruises (Cruise Liverpool). Services operate between eight locations including to Dublin, Belfast and the Isle of Man (IoM) operated by P&O (The Peninsular and Oriental Steam Navigation Company), Stena Line, and IoM Steam Packet Company (IoMSPC) respectively.

16.7.12 Cargo and tanker vessel movements are depicted in **Figure 16.3**. The majority of which travel to and from the Liverpool docks, with some Tankers docking at Queen Elizabeth Dock further up-river on the west side or up the Manchester Canal. Alternative destinations for cargo vessels include Mersey Wharf at Bromborough, the Port of Garston on the east side or the Manchester Canal.

16.7.13 Tug and service or recreational vessel movements are depicted in **Figure 16.4.** Unlike passenger, cargo and tanker vessels, they also enter the Mersey estuary from a shallower route south of the Burbo Bank wind farm. Tug and service vessels are abundant in all industrial regions of the river whilst recreational vessels stay more central or berth at the Liverpool Marina.

16.7.14 Nearby recreational boat clubs in proximity to the Project include Wallasey Yacht Club, Tranmere Sailing Club, Royal Mersey Yacht Club, Liverpool Yacht Club and West Cheshire Sailing Club.

16.7.15 Vessels by length are depicted in **Figure 16.5**. Smaller vessels can be seen to take the shallow route south of the Burbo Bank wind farm whereas the larger vessels are more concentrated in Queens and Crosby channels avoiding the shallow Burbo Bank to the west (ADS, 2006). Vessels >250m travel no further upriver than Tranmere oil terminal where beyond depth are restricted to <10m.

Historical Incidents and Search and Rescue

16.7.16 Search and Rescue (SAR) in the Mersey Estuary area is covered by Bristow SAR for His Majesty's Coastguard (HMCG). The closest helicopter base is the Caernarfon base in Wales, with two Sikorsky S-92 helicopters, approximately 127km away (25 minutes flight time). RNLI lifeboat stations are situated at Hoylake, New Brighton and West Kirby. The nearest HMCG Marine Rescue Coordination Centre (MRCC) is situated in Holyhead.

16.7.17 There were 190 RNLI reported incidents, primarily categorised as 'Person in the Water', within the shipping and navigation study area between 2008 and 2023, amounting to approximately 12.7 each year. A total of 21 reports are logged on the MAIB between 1989 and 2024 for the Port of Liverpool and surrounding River Mersey, Mersey Estuary and Liverpool Bay involving collisions, contacts, groundings and personal injuries (MAIB 2024).

16.8 FURTHER DATA COLLECTION

16.8.1 Further data to be collected and utilised for the EIA is outlined in **Table 16-6**. The proposed data will provide further characterisation of the shipping and navigation characteristics within the Study Area.

Table 16-6: Surveys proposed for the characterisation of shipping and navigation baseline.

Data	Justification
Vessel traffic data collection	Vessel traffic dataset to inform shipping movements within the Study Area and identify regular operators.

Data	Justification
Consultation	Early and ongoing engagement with relevant authorities to ensure all concerns are addressed within the EIA.
Collection of incidents data	Review of incident datasets provided by Peel Ports and published by the RNLI and MAIB.

16.9 FUTURE BASELINE

16.9.1 A future baseline will be developed as part of the NRA which in the shipping and navigation study area might result in an increase or change in the numbers or types of vessels navigating the Mersey. This will include future developments, such as port developments, or macro-economic changes in vessel traffic supply and demand.

16.9.2 A previous study was also undertaken for the Project which predicted vessel visits for Manchester Ship Canal, Mersey Wharf and Garston (AqualisBraemar LOC, 2021c). This will be updated as part of the NRA.

16.10 BASIS FOR SCOPING ASSESSMENT

16.10.1 The shipping and navigation scoping assessment is based on the indicative parameters given in **Section 2.4.2: Tidal Barrage** of **Chapter 2: Site Context and Project Description**. This section includes specifics on the parameters for the tidal barrage, as well as associated cofferdams and/or caissons.

Table 16-7: Indicative parameters for the tidal barrage.

Description	Parameter
Maximum extent of the scoping boundary	See are presented in **Figure 16.1**.
Maximum width of working area within channel	Between 1.5-2.0 km
Greatest amount of dredging required	Up to 20,000,000 m^3
Greatest duration of construction activities	Up to 10 years
Greatest extent of safety zones	500m

Description	Parameter
Number and dimensions of locks	The size and number of locks are subject to discussions with port operators.

16.11 EMBEDDED ENVIRONMENTAL MEASURES

16.11.1 Embedded mitigation measures have been identified and are proposed to be adopted as part of the evolution of the Project design (embedded into the Project design). These measures will evolve over the development process as the EIA progresses and in response to consultation. They will be fed iteratively into the assessment process. These measures typically include those that have been identified as good or standard practice and include actions that would be undertaken to meet existing legislation requirements.

16.11.2 As there is a commitment to implementing these environmental measures, and also to various standard sectoral practices and procedures, they are considered inherently part of the design of the Project and have, therefore, been considered in the scoping assessment.

16.11.3 In addition to the specific embedded mitigation measures relevant to shipping and navigation listed in **Table 16-8,** consultation will be undertaken with all relevant consultees such as Peel Ports to address any concerns or issues.

Table 16-8: Relevant shipping and navigation embedded environmental measures

ID	Mitigation Measures embedded into the Project design	Phase	How the measure will be secured
OM1	Development and adherence to outline Construction Environmental Management Plan (OCEMP) Method Statement.	C	Secured Development Consent Order (DCO) Requirement.
16-1	Schedule deconfliction of construction activities with vessel operations (e.g. ferry timetables).	C	Secured through DCO Requirement.
16-2	Marking and charting on Admiralty charts including an appropriate chart note.	C/O/D	Secured through DCO Requirement.
OM5	Application and use of safety zones during construction/major maintenance.	C/O/D	Secured through DCO Requirement.

ID	Mitigation Measures embedded into the Project design	Phase	How the measure will be secured
16-3	Development and adherence to an Aid to Navigation (AtoN) Management Plan determining suitable marking and lighting arrangements.	C/O/D	Secured through DCO Requirement.
OM13	Notification of activities through the use of Notice to Mariners.	C/O/D	Secured through DCO Requirement.
OM11	Development and adherence to Emergency Response and Cooperation Plan (ERCoP) and update/input into Port of Liverpool's emergency plans.	C/O/D	Secured through DCO Requirement.
OM7	Development and adherence to Vessel Traffic Management Plan for Project vessels to minimise impacts on other operators and ensure compliance with appropriate standards and equipment carriage requirements.	C/O/D	Secured through DCO Requirement.
OM1	Training and Personal Protective Equipment (PPE) carriage of Project personnel.	C/O/D	Secured through DCO Requirement.
16-4	Update and input of Liverpool Port's Safety Management System (SMS). Input into review of pilotage and VTS procedures for Port of Liverpool.	C/O/D	Secured through DCO Requirement.
16-5	Development of safe limits of operation of locks (e.g. wind limits).	C/O/D	Secured through DCO Requirement.
16-6	Appropriate temporary/permanent fendering/impact protection installed on tidal barrage.	C/O/D	Secured through DCO Requirement.
16-7	Maintenance dredging and routine monitoring of areas impacted by the project to maintain deep draught vessel access. Inspection and maintenance programme of relevant navigational infrastructure, such as locks.	O	Secured through DCO Requirement.

ID	Mitigation Measures embedded into the Project design	Phase	How the measure will be secured
OM10	Decommissioning plan	D	Secured through DCO Requirement.

16.12 LIKELY SIGNIFICANT EFFECTS

16.12.1 In line with the EIA Regulations 2017, the EIA for the Project will consider those impacts where there is a risk of a likely significant effect only. The following Section draws on industry experience and expertise to identify those effect-receptor pathways that may potentially lead to a significant impact. Where experience and available evidence indicates an effect-receptor pathway will not lead to a significant impact with regards to the EIA Regulations 2017 the pathway is scoped out from assessment.

16.12.2 The likely significant effects on shipping and navigation are summarised in **Table 16-9.** The scoping assessment is based on a combination of the Project definition at the scoping stage, embedded environmental measures, understanding of the baseline conditions at this stage, the evidence base for shipping and navigation effects, the identification of potentially impacted receptors, and professional judgement.

16.12.3 The early identification of likely significant effects is used here as a tool aimed at delivering a proportionate approach to the EIA. In doing so, it sets out a high-level assessment of all potential effects, significant or not. The basis for scoping out certain effects, and therefore no longer considered is presented after the table, supported by evidence base.

Table 16-9: Likely significant shipping and navigation effects

Source	Pathway	Receptor	Project Phase	Embedded Measures	Scoped in or scoped out	Justification	Data collection & analysis to characterise the baseline
Vessel activities, Tidal Barrage	Increased collision risk.	Third-party vessels	C O&M D	OM1, 16-1, 16-2, OM5, OM13, OM7, 16-4, 16-6	Scoped in	Project has potential to minimise navigable searoom increasing the likelihood of a vessel-to-vessel collision. Increased vessel movements associated with the Project could increase interactions with other vessels. Collisions could result in vessel damage, pollution or fatalities.	AIS data. Consultation. Collision risk modelling. Hazard workshop.
Tidal Barrage	Increased contact / allision risk.	Third-party vessels	C O&M D	16-2, OM5, 16-3, OM13, 16-4, 16-5, 16-6	Scoped in	The presence of the Project infrastructure introduces new hazards to vessels increasing the likelihood of an allision (contact) occurring. Allisions could result in vessel damage, pollution or fatalities.	AIS data. Consultation. Allision risk modelling. Hazard workshop.

Source	Pathway	Receptor	Project Phase	Embedded Measures	Scoped in or scoped out	Justification	Data collection & analysis to characterise the baseline
Vessel activities, Tidal Barrage	Increased grounding risk.	Third-party vessels	C O&M D	16-2, OM5, 16-4, 16-7	Scoped in	Displacement of traffic associated with the Project has potential to increase the likelihood of a grounding incident occurring where vessels are navigating close to shore. Groundings could result in vessel damage, pollution or fatalities.	AIS data. Consultation. Hazard workshop.
Vessel activities, Tidal Barrage	Disruption of commercial vessel movements.	Third-party commercial vessels	C O&M D	OM1,16-2, OM13, OM7, 16-6, OM10, 16-7,	Scoped in	Commercial vessels (including ferries) have potential to be displaced by activities associated with the Project. The presence of infrastructure or construction activities could cause delays to timetabled services or result in cancelled sailings.	AIS data. Consultation.
Vessel activities, Tidal Barrage	Disruption of recreational/small craft movements.	Third-party small craft	C O&M D	OM1, 16-2, OM13, OM7	Scoped in	Small vessels have potential to be displaced by activities associated with the Project. This could lead to an	AIS data. Consultation.

Source	Pathway	Receptor	Project Phase	Embedded Measures	Scoped in or scoped out	Justification	Data collection & analysis to characterise the baseline
						increased risk or reduce access.	
Vessel activities, Tidal Barrage	Impact to search and rescue capability.	Third-party vessels, SAR responders	C O&M D	OM1, 16-2, 16-3, OM13, OM11, OM7,	Scoped in	The Project has potential to inhibit search and rescue activities due to reduced access to SAR craft such as lifeboats, contributing to a greater potential for loss of life were an incident to occur.	AIS data. Consultation. Hazard workshop.
Tidal Barrage	Interference with marine radar, communication and positioning systems.	Third-party vessels	C O&M D	16-2, 16-3	Scoped in	Project infrastructure has the potential to interfere with marine systems essential to navigation leading to a greater likelihood of navigational accidents.	Desk based study. AIS data. Consultation.
Vessel activities, Tidal Barrage	Interference with shore-based VTS.	Third-party vessels	C O&M D	16-4, 16-6	Scoped in	Project infrastructure has the potential to interfere with VTS systems essential to navigation reducing the capacity/capability of port management or lead to a	Desk based study. Consultation.

Source	Pathway	Receptor	Project Phase	Embedded Measures	Scoped in or scoped out	Justification	Data collection & analysis to characterise the baseline
						greater likelihood of navigational accidents.	
Tidal Barrage	Reduction in Under Keel Clearance.	Third-party vessels	C O&M D	OM7, OM13	Scoped in	Subsea infrastructure associated with the Project has potential to decrease navigable water depths increasing the likelihood of a grounding incident occurring.	Desk based study. Hazard workshop. AIS data. Consultation.
Vessel activities	Wash/ swamping of small craft by Project vessel movements.	Third-party small craft	C O&M D	OM1, 16-1, OM7, 16-4	Scoped in	Project vessel movements have potential to cause wash which could swamp and sink small craft with the potential to result in loss of life.	Desk based study. Hazard workshop. AIS data. Consultation.
Tidal Barrage	Wash/ swamping of small craft by Project infrastructure.	Third-party small craft	C O&M D	OM5, 16-3, OM13, 16-4	Scoped in	Project infrastructure has potential to disrupt water flow and cause a hazard to small craft with the potential to result in loss of life.	Desk based study. Hazard workshop. AIS data.

Source	Pathway	Receptor	Project Phase	Embedded Measures	Scoped in or scoped out	Justification	Data collection & analysis to characterise the baseline
							Consultation.
Vessel activities	Breakout of towed materials/equipment during construction.	Third-party vessels	C	OM1, 16-1, OM5, 16-3, OM13, OM7, 16-4	Scoped in	Objects in tow associated with the Project have the potential to break loose from the tow lines and pose a navigational hazard to other marine users.	Desk based study. AIS data. Consultation.
Vessel activities	Breakout of Project vessels alongside jetties/quays.	Third-party vessels	C O&M D	16-4, 16-6	Scoped in	Project vessels have the potential to break away from their moorings at the jetties/quays and pose a navigational hazard to other marine users.	Desk based study. AIS data. Consultation.
Tidal Barrage	Impedance of existing AtoNs.	Third-party vessels	C O&M D	16-3	Scoped in	The Project infrastructure has the potential to obscure existing AtoNs in proximity and pose a navigational hazard to other marine users.	Desk based study. AIS data. Consultation.

Source	Pathway	Receptor	Project Phase	Embedded Measures	Scoped in or scoped out	Justification	Data collection & analysis to characterise the baseline
Tidal Barrage	Loss of anchorages/ moorings.	Third-party vessels	C O&M D	OM1, 16-1, OM13, OM7	Scoped in	The Project infrastructure has the potential to affect access to anchorages and moorings, rendering them unviable.	Desk based study. AIS data. Consultation.
Vessel activities, Tidal Barrage	Impact on port/harbour access.	Third-party vessels, ports and harbours	C O&M D	OM1, 16-1, OM13, OM7		The Project infrastructure has the potential to reduce access into the Port of Liverpool and associated berths/terminals, decreasing the competitiveness of the port.	Desk based study. AIS data. Consultation. Port arrival statistics.

Impacts Scoped out of Assessment

16.12.4 No impacts have been scoped out of the shipping and navigation assessment.

16.13 CUMULATIVE EFFECTS

16.13.1 Cumulative effects on shipping and navigation resulting from the effects of the Project and other developments will be assessed in accordance with the guidance and methodologies set out in **Chapter 3: Approach to Scoping and EIA** and considering the other developments that have been screened in as part of the Cumulative Effects Assessment (CEA) screening exercise. All effects scoped into the assessment have the potential to act cumulatively with other developments.

16.14 TRANSBOUNDARY EFFECTS

16.14.1 Due to the localised nature of the potential impacts, transboundary effects are considered unlikely to occur and therefore no further transboundary effects are identified. Whilst it is recognised that ships may be internationally owned or operating between different ports in different states, these impacts have been captured and assessed within the shipping and navigation chapter.

16.15 PROPOSED APPROACH TO ENVIRONMENTAL IMPACT ASSESSMENT

16.15.1 Further studies and analysis will be undertaken to identify and assess shipping and navigation receptors. A Navigation Risk Assessment (NRA) will be undertaken to inform the EIA.

16.15.2 This study will be supplemented with consultation with the relevant statutory and non-statutory organisations as necessary. In particular, engagement will be undertaken with Peel Ports at the outset to ensure alignment between the proposed NRA methodology and the established NRA processes implemented across their ports. This includes alignment of definitions used within the risk assessment matrices where appropriate.

16.15.3 The principal guidance for assessing impacts to shipping and navigation for renewable energy installations is described in MGN 654 (MCA, 2021). Annex 1 of MGN 654 describes the methodology by which an NRA should be undertaken, including data collection and consultation requirements.

16.15.4 To provide the data required to inform the NRA and Offshore EIA Report, vessel traffic data covering the shipping and navigation study area will be acquired and considered with other datasets where appropriate. The data will be analysed to determine the types, numbers and activities of all marine users within the shipping and navigation study area. The data will be seasonally representative and include all marine users.

16.15.5 Consultation with key shipping and navigation stakeholders is ongoing and will be continued and used to inform the NRA and EIA ensuring a representative cross section of maritime users are considered. The list of consultees is anticipated to include:

- Peel Ports: Port of Liverpool;
- Maritime and Coastguard Agency (MCA);
- Trinity House;
- Chamber of Shipping;
- Other ports, harbours and residential moorings in proximity;
- Ferry operators, including Mersey Ferries, Stena Line, P&O Ferries, and IoMSPC;
- Commercial operators;
- RNLI;
- Royal Yachting Association (RYA);
- Local yacht clubs;
- Local fishing organisations;
- Tranmere Terminal;
- Manchester Ship Canal Co.;
- Cammell Laird Shipyards; and
- ABP Garston.

16.15.6 A future baseline and future case scenario will be developed to predict how vessels will navigate with the Project in place, accounting for any other developments with the shipping and navigation study area.

16.15.7 Collision, allision and grounding risk modelling will be undertaken to analyse the proportion of the vessel traffic which may interact with the Project based on the disposition of the baseline (and future baseline) traffic.

16.15.8 As per MGN 654, the NRA will follow the IMO FSA methodology, an internationally recognised approach for conducting maritime risk assessments. The FSA is a structured and systematic methodology, aimed at enhancing maritime safety, including protection of life, health, the marine environment and property, by using risk analysis and, if appropriate, cost-benefit assessment. There are five steps within the FSA process:

1. Identification of hazards;
2. Risk analysis;
3. Risk control options;
4. Cost-benefit assessment (if applicable); and
5. Recommendations for decision making.

16.15.9 A hazard workshop will be held with key shipping and navigation consultees to facilitate the risk assessment.

16.15.10 Hazards will be identified, and their likelihood and consequence scored to produce a risk score. This assessment will bring together the quantitative risk modelling, consultation feedback, analysis results, lessons learnt from previous developments and expert judgement. Where necessary, risk controls will be identified to mitigate any unacceptable risks and reduce the risks to As Low as Reasonably Practicable (ALARP). This will be presented in the form of a hazard log and used to inform the EIA Report. The hazard log will also be used to identify standard and additional mitigation measures required to demonstrate that the hazards are broadly acceptable or tolerable on the basis of ALARP declarations, in line with regulatory requirements.

16.15.11 Other impacts will be assessed following a desk based study, consultation with the relevant stakeholders and a review of the academic and industry literature as well as lessons learnt from previous projects.

16.15.12 The outputs of the NRA will be used to inform the judgements on significance within the shipping and navigation chapter of the EIA.

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17 MARINE ARCHAEOLOGY AND CULTURAL HERITAGE

17.1 INTRODUCTION

17.1.1 The Marine Cultural Heritage and Archaeology chapter will consider the potential likely significant effects on marine cultural heritage assets that may arise from the construction, operation and maintenance (O&M) and decommissioning activities of the Project. These receptors include palaeoenvironmental deposits, palaeolandscape remains, wreck remains (watercraft and aircraft), and riverside structural remains. This section of the Scoping Report describes the methodology to be used within the Environmental Impact Assessment (EIA), an overview of the baseline conditions within the Scoping Boundary (as defined in **Chapter 1: Introduction**), the datasets to be used to inform the EIA, the potential likely significant effects to be considered, and how these will be assessed for the purpose of the EIA.

17.1.2 Marine Cultural Heritage and Archaeology interfaces with other aspects and as such, should be considered alongside these; namely:

- **Chapter 6: Coastal Processes**: Due to the potential for altered marine processes to affect marine archaeological remains, the marine geology, oceanography and physical processes section will be used to inform the marine cultural heritage and archaeology assessment;
- **Chapter 18: Terrestrial Cultural Heritage and Archaeology**; and
- **Chapter 25: Seascape, Landscape and Visual Impact Assessment**: This chapter has informed the marine cultural heritage and archaeology section regarding visual effects on marine heritage features.

17.1.3 This chapter concerns marine cultural heritage assets, which are defined as being assets located below Mean High Water Level. Potential impacts on marine cultural heritage assets that may result from elements of the Project that are above Mean High Water Level (e.g. the barrage) are addressed in this chapter. Cultural heritage above below Mean High Water Level are addressed in **Chapter 18: Terrestrial Cultural Heritage and Archaeology**.

17.1.4 Overarching relevant legislation and policy context which has informed the scope of the assessment is outlined in **Chapter 4: Planning Policy,** with topic specific considerations outlined in **Appendix 4.1**.

17.2 TECHNICAL GUIDANCE

17.2.1 Technical guidance that has been used to define the assessment is set out in **Table 17-1**.

Table 17-1: Relevant technical guidance

Guidance reference	Relevance to the assessment
Historic Environment Guidance for the Offshore Renewable Energy Sector (Wessex Archaeology / Collaborative Offshore Wind Research into the Environment (COWRIE), 2007).	A generic guidance note on the survey, appraisal and monitoring of the historic environment during the development of offshore renewable energy projects in the UK. The guidance is applicable to the marine environment and the coastal environment adjacent to any development, encompassing the inter-tidal area, coastal margin and those areas further inland likely to be affected by offshore renewable energy developments.
Guidance for Assessment of Cumulative Impacts on the Historic Environment from Offshore Renewable Energy (COWRIE, 2008).	A guidance note on the assessment of the cumulative effects on the historic environment during the development of offshore renewable energy projects in the UK. The guidance is applicable to the marine environment and the coastal environment adjacent to any development, encompassing the inter-tidal area, coastal margin and those areas further inland likely to be affected by offshore renewable energy developments.
Code of Practice for Seabed Development (Joint Nautical Archaeology Policy Committee, 2006).	The code provides guidance to developers on risk management and legislative implications of developing within the marine environment in the UK. It also outlines the responsibility of developers in protecting the UK's marine heritage.
Guidance for Offshore Geotechnical Investigations and Historic Environment	A guidance note on the aims of offshore geotechnical investigations and the

Guidance reference	Relevance to the assessment
Analysis: guidance for the renewable energy sector (COWRIE, 2011).	resulting analysis undertaken during the development of offshore renewable energy projects in the UK. The guidance is applicable to the marine environment and the coastal environment adjacent to any development, encompassing the inter-tidal area, coastal margin and those areas further inland likely to be affected by offshore renewable energy developments.
Chartered Institute for Archaeologists' Standard and Guidance for Historic Environment Desk-Based Assessments, consultancy advice and Code of Conduct.	A generic guidance note on the assessment of the historic environment during the development projects in the UK. The Code of Conduct guides the practices and standards for archaeological assessment both onshore and offshore.
Archaeological Written Schemes of Investigation for Offshore Wind Farm Projects Offshore Renewables Projects (The Crown Estate, 2021).	Guidance on the range of archaeological methodologies that may be required as part of the initial investigation stages or the mitigation phase of offshore projects.
Management Guidelines for military aviation sites (Historic England, 2016).	Guidance regarding the management and understanding of sites that include military aviation remains.
People and the Sea: a maritime archaeological research agenda for England (Ransley *et al.*, 2013).	Guidance regarding the current research priorities for the marine cultural heritage and archaeology discipline providing context for consideration of significance.
The Assessment and Management of Marine Archaeology in Port and Harbour Development (Historic England, 2016).	Guidance for developments within ports and harbours that may impact cultural heritage and archaeology. The document focuses specifically on the environmental assessments required for new development projects.

17.3 STUDY AREA

17.3.1 The study area for the Marine Cultural Heritage and Archaeology assessment will be 5km buffered from the Barrage Scoping Boundary and covers all receptors within the tidal Mersey estuary and seawards of mean high water spring (MHWS). This is considered on the basis of professional judgement and to ensure potential marine heritage assets of which do not have a confirmed or accurate location are appropriately captured. This will be identified and agreed in consultation with stakeholders. The study area is presented in **Figure 17.1**.

17.4 CONSULTATION

17.4.1 Pre-scoping consultation was undertaken on 26 June 2024 with representatives from Historic England. An overview of the Project was presented along with a summary of the heritage assets potentially impacted. Concerns regarding the viability of offshore survey methods (side scan sonar, multi-beam echo sounder, sub-bottom profiling and magnetometer) within the shallow areas of the Tidal Barrage Development Area were discussed. This has been considered in **Table 17-2**. Consultation will be held with the relevant statutory and non-statutory organisations as necessary and stakeholder feedback will inform the EIA. Consultees are expected to comprise:

- Historic England;
- Sefton Council;
- Liverpool City Council; and
- Wirral Council.

17.4.2 Consultation will be held with Sefton Council, Liverpool City Council, and Wirral Council in respect of:

- Potential effects on archaeological remains within the intertidal zone; and
- Potential effects on geoarchaeological receptors which represent survival of sequences also observed in the terrestrial zone.

17.5 ASSESSMENT METHODOLOGY

17.5.1 The Project-wide approach to the assessment methodology is set out in **Chapter 3: Approach to EIA**. This will be implemented to assess the likely significant effects on cultural heritage and archaeology receptors from the construction, operation and maintenance, and decommissioning of the Project.

17.5.2 The specific legislation and guidance outlined in **Appendix 4.1** will also be considered in relation to the assessment, in addition to consultation with the stakeholders outlined above.

17.6 BASELINE CONDITIONS

DATA INFORMATION SOURCES

17.6.1 The EIAR will set out the planning framework in respect of buried historic assets (archaeological remains), built historic assets and historic landscapes within the marine environment and the interface between the terrestrial and marine environments. It will include the methodology for assessing the environmental effects predicted during the construction, operation and decommissioning phases. It will provide a summary overview of the baseline conditions. The guidance used during the preparation of the Chapter is outlined in **Table 17-1**.

17.6.2 An initial desk-based review has been undertaken of publicly available data sources outlined in **Table 17-2** to determine the baseline character of the study area and inform the assessment process.

Table 17-2: Key sources of marine cultural heritage and archaeology data

Source	Date	Summary	Coverage of Study Area
United Kingdom Hydrographic Office (UKHO) Wrecks and Obstructions data.	April 2024	An extensive data set containing over 94,000 charted, uncharted, live and dead wrecks and obstructions from around the world.	100%
National Heritage List of England (NHLE).	April 2024	Data sets identifying designated assets within England (World Heritage Sites, Scheduled Monuments, Listed Buildings, Battlefields, Parks and Gardens, Conservation	100%

Source	Date	Summary	Coverage of Study Area
		Areas, Protected Wrecks)	
National Marine Heritage Record.	May 2024	Data set identifying known maritime heritage assets within English territorial waters (up to 12NM from Mean High Water Springs)	100%
Merseyside Historic Environment Record.	TBA	Data set identifying known terrestrial heritage assets and previous archaeological investigations	100%
Geophysical Survey	August 2023	Results of geophysical survey using multi-beam echo sounder (MBES), backscatter data (psuedo-sidescan) and sub-bottom profiler (SBP).	100%
LiDAR	August 2023	Data set integrated into the geophysical survey data where necessary to supplement in areas where vessel based geophysical survey techniques are restricted or limited.	Limited to some intertidal areas on Birkenhead side of river.

EXISTING BASELINE

17.6.3 This section describes the present conditions that constitute the existing baseline environment for marine cultural heritage and archaeology within the study area.

17.6.4 A high-level appraisal of historic assets has been undertaken to inform the scoping assessment using publicly available information. This is intended to provide an initial indication of the potential issues that will be considered in the EIA. Designated and non-designated historic assets within the Tidal Barrage Development Area and the 5km study area have been identified through information collated from Historic England and the United Kingdom Hydrographic Office. The identified assets provide an overview of the quantity and character of built and buried heritage within the Tidal Barrage Development Area (**Figure 17.1**).

17.6.5 Marine cultural heritage and archaeology receptors can be attributed to four main categories of sites or features:

- Submerged prehistoric landscapes resulting from changes to sea-level and eventual stabilisation of sea-level at or near present levels. Such landscapes may contain highly significant evidence of prehistoric human occupation and / or environmental change.
- Archaeological remains of watercraft deposited when such vessels sank while at sea or became abandoned in an intertidal context which subsequently became inundated.
- Remains of aircraft crash sites, either coherent assemblages or scattered material usually the result of Second World War (WWII) military conflict, but also numerous passenger casualties, particularly during the peak of seaplane activity during the interwar period. Also includes aircraft, airships and other dirigibles dating to the First World War (WWI) though these rarely survive in the archaeological record.
- Structural remains other than watercraft, including such elements as fish traps, abandoned quays, hards, defensive structures or sites lost to coastal erosion may be found within the intertidal zone (between MHWS and MLWS) within the Mersey riverbed. Marine cultural heritage and archaeology receptors located seaward of MHWS only will be assessed to determine the extent of potential impact. Intertidal heritage assets located up to MHWS have been reviewed for this Scoping Report.

Designated Assets

17.6.6 There are no Protected Wrecks or scheduled monuments within the study area. Seven Listed Buildings are located within the Barrage Scoping Boundary comprising the lengths of four sea walls (NHLE 1068411, NHLE 1073438, NHLE 1073439, and NHLE 1361706), the entrance to Princes Half Tide Dock (NHLE

1208892), and the Merchant Navy War Memorial (NHLE 1393706). The Barrage Development Area extends into three Conservation Areas: the Stanley Dock Conservation Area and Castle Street Conservation Area delineated by Liverpool Council and Rock Park Conservation Area delineated by Wirral Council.

Non-designated Assets

17.6.7 There are 173 United Kingdom Hydrographic Office (UKHO) recorded wrecks or obstructions within the Barrage Scoping Boundary area. One of the 173 UKHO recorded wrecks or obstructions is recorded as a non-dangerous wreck that was lifted, 112 are noted as dangerous wrecks of which 52 are noted as either 'dead' or 'lifted' and five are noted as 'not fully surveyed', 14 are noted as a 'wreck showing any portion of hull or superstructure' of which nine are noted as either 'dead' or 'lifted'. The notation 'dead' is used to denote that the wreck could not be relocated following its initial recording. Twenty-nine of the remaining 61 recorded wrecks or obstructions are noted as foul ground and one is noted as a diffuser. The remaining 16 records are of unspecified type; however, the descriptions suggest that one is the remains of a collapsed crane, one is the remains of jack-up legs and container, and a third is two mounds of masonry or debris. The rest of the unspecified types do not include a description.

17.6.8 There are an additional 92 UKHO wrecks and obstructions within the study area, eight of which are noted as foul ground, 18 as undefined, 34 as dangerous wrecks, and 29 as a 'wreck showing any portion of hull or superstructure'.

17.6.9 The Tidal Barrage Development Area has been the subject of considerable dredging activity both historically and recently, as it is located within part of a tidal river adjacent to active port infrastructure. This activity would have damaged, removed and / or disturbed potential watercraft remains; however, the extent of this impact has not been determined and it cannot be concluded at this time that dredging has entirely removed archaeological remains within the Tidal Barrage Development Area.

17.6.10 The River Mersey acted as the boundary between the historic counties of Lancashire (to the north) and Cheshire (to the south). The proposed Tidal Barrage Development Area is located within the Mersey riverbed while three of the proposed cable routes would be constructed on the Wirral Peninsula connecting into existing electrical infrastructure at Capenhurst and / or Birkenhead and one would extend from the Huskisson Dock area of the Liverpool docks to Stanley. Nineteenth century historic maps show that land reclamation activities undertaken along the banks of the Wirral Peninsula in the early to mid-19th century allowed the area along the proposed cable routes and

the Tidal Barrage Development Area to become increasingly developed within the latter half of the 1800s. Huskisson Dock area to the Stanley area of Liverpool (near to Newsham Park and Garden) has been fully developed since at least the mid-19th century.

17.6.11 The potential for the presence of archaeological and palaeoenvironmental remains will be considered within a marine cultural heritage and archaeology desk-based assessment and through the archaeological assessment of any marine geophysical survey data and geotechnical survey data.

17.7 FUTURE BASELINE

17.7.1 The existing environment for marine archaeology and cultural heritage as set out above has been shaped by a combination of factors, with the most prevalent being changes in global sea levels and associated climatic and environmental conditions. These conditions have and will continue to affect the burial and preservation of remains.

17.7.2 Dredging operations will continue within the Tidal Barrage Scoping Boundary as it is located within part of a tidal river adjacent to active port infrastructure. This activity will damage, remove and / or disturb potential watercraft remains to varying degrees depending upon the type of removal activity utilised.

17.7.3 Marine physical processes, including the cycle of burial and exposure due to storm events, have an ongoing effect on the preservation of archaeological material. Sediment cover provides protection from physical marine processes, reducing the risk of erosion and degradation. It is not possible to assess the effect of this impact upon individual heritage assets as this will depend on the nature of the exposed heritage asset and site-specific conditions. The potential increase and violence of storm activity as a result of climate instability may exacerbate the effects of the burial and exposure cycle on affected assets.

17.7.4 Underwater cultural heritage is also under threat from warming waters caused by climate change. As the sea levels rise, the impact of the tidal activity on heritage assets within and adjacent to the intertidal will increase through mechanical wave action, entrained sediment abrasion and bioturbation. In addition, warming waters result in the northward migration of invasive species, which may include the blacktip shipworm (Lyrodus pedicellatus) and great shipworm (Teredo navalis), and which are considered to be a major threat to wooden wrecks and other wooden structures within the marine environment.

17.7.5 Further marine infrastructure projects within the region will all have the potential to cause adverse direct impacts on heritage assets or contribute to beneficial impacts. This requires enhanced understanding of the archaeological resource through geophysical / geotechnical survey data released to the public domain or the enhanced knowledge of an asset's characteristics, features or elements derived from site-specific survey and investigations. There is the potential for loss or disturbance through threat of deleterious effect, theft or salvage of possible significant historic wreck sites arising from discovery and other marine infrastructure projects.

17.8 BASIS FOR SCOPING ASSESSMENT

17.8.1 The marine cultural heritage and archaeology scoping assessment is based on the indicative parameters set out in **Chapter 2: Site Context and Project Description.**

17.9 EMBEDDED ENVIRONMENTAL MEASURES

17.9.1 Embedded mitigation measures have been identified and are proposed to be adopted as part of the evolution of the Project design (embedded into the Project design). These measures will evolve over the development process as the EIA progresses and in response to consultation. They will be fed iteratively into the assessment process. These measures typically include those that have been identified as good or standard practice and include actions that would be undertaken to meet existing legislation requirements.

17.9.2 As there is a commitment to implementing these environmental measures, and also to various standard sectoral practices and procedures, they are considered inherently part of the design of the Project and have, therefore, been considered in the scoping assessment.

17.9.3 In addition to the specific embedded mitigation measures relevant to marine cultural heritage and archaeology listed in **Table 17-3** consultation will be undertaken with all relevant consultees such as Historic England will be required to address any concerns or issues.

Table 17-3: Relevant marine cultural heritage and archaeology embedded environmental measures

ID	Mitigation Measures embedded into the project design	How the measure will be secured
OM5	Where practical, sensitive sites will be avoided by the temporary and permanent marine footprint.	Mitigation leading to preservation *in situ* will be advocated and Archaeological Exclusion Zones will be implemented around cultural heritage assets.
OM1	Loss or disturbance of possible submerged historic landscape elements arising from altered seabed conditions (for example, scour) will be mitigated, as far as possible, through sensitive design.	Construction Environmental Management Plan (CEMP).
17-1	Loss or disturbance of possible submerged historic landscape elements arising from works will be mitigated, as far as possible, through the selection of appropriate working methods. The working methods would include but would not be limited to the avoidance of identified marine heritage assets and anthropogenic geophysical anomalies by a minimum of 30 m during riverbed preparation and installation activities.	Construction Environmental Management Plan (CEMP); Protocol for Archaeological Discoveries (PAD).
OM10	A Decommissioning Programme will be developed for the Project in line with industry good practice, guidance and legislation.	Project design; use of Protocol for Archaeological Discoveries (PAD) during decommissioning works.
17-2	The barrage and O&M buildings will be subject of careful design, regarding form, massing, materiality, colour, etc., to create an appearance that minimises harmful	Design change.

ID	Mitigation Measures embedded into the project design	How the measure will be secured
	intrusion into the settings of heritage assets.	

17.10 LIKELY SIGNIFICANT EFFECTS

17.10.1 In line with the EIA Regulations 2017, the EIA for the Project will consider those impacts where there is a risk of a likely significant effect only. The following Section draws on industry experience and expertise to identify those effect-receptor pathways that may potentially lead to a significant impact. Where experience and available evidence indicate an effect-receptor pathway will not lead to a significant impact with regards to the EIA Regulations 2017 the pathway is scoped out from assessment.

17.10.2 The likely significant effects on marine cultural heritage and archaeology are summarised in **Table 17-4**. The scoping assessment is based on a combination of the Project definition at the scoping stage, embedded environmental measures, understanding of the baseline conditions at this stage, the evidence base for significant effects, the identification of potentially impacted receptors, and professional judgement. The approach to this assessment is set out in **Chapter 3: Approach to EIA**.

17.10.3 The early identification of likely significant effects is used here as a tool aimed at delivering a proportionate approach to the EIA. In doing so, it sets out a high-level assessment of all potential effects, significant or not. The basis for scoping out certain effects, and therefore no longer considered is presented after the table, supported by evidence base.

Table 17-4: Likely significant effects

Activity and Impact	Effect	Proposed approach to assessment (scoped in or scoped out)	Receptor
Direct impact of sediment removal during riverbed preparation.	Removal, truncation, or disturbance of marine archaeology and	Scoped In	Palaeo-environmental remains

Activity and Impact	Effect	Proposed approach to assessment (scoped in or scoped out)	Receptor
	cultural heritage assets and deposits.		Palaeo-landscape features Wreck remains Riverside structural remains
Direct impact by penetration, compression and disturbance during riverbed preparation, and construction of foundations. Prop-wash during construction activities	Removal, truncation, or disturbance of marine archaeology and cultural heritage assets and deposits.	Scoped In	Palaeo-environmental remains Palaeo-landscape features Wreck remains Riverside structural remains
Indirect impact of altered riverbed conditions, for example, scour or differential deposition of sediments.	Removal, truncation, or disturbance of marine archaeology and cultural heritage assets and deposits.	Scoped In	Palaeo-environmental remains Palaeo-landscape features Wreck remains Riverside structural remains
Direct impact by penetration, compression and disturbance effects during repair and maintenance activities.	Removal, truncation, or disturbance of marine archaeology and cultural heritage assets and deposits.	Scoped In	Palaeo-environmental remains Palaeo-landscape features Wreck remains Riverside structural remains

Activity and Impact	Effect	Proposed approach to assessment (scoped in or scoped out)	Receptor
Direct impact by penetration, compression and disturbance effects of jack-up barges and anchoring of maintenance vessels during the operational phase.	Removal, truncation, or disturbance of marine archaeology and cultural heritage assets and deposits.	Scoped In	Palaeo-environmental remains Palaeo-landscape features Wreck remains Riverside structural remains
Indirect impact from discovery.	Potential disturbance of wrecks through the recovery of cultural material by members of the public as a result of discovery.	Scoped In	Wreck remains
Direct impact to terrestrial cultural heritage assets	Changes within the setting of terrestrial cultural heritage assets.	Scoped Out	Designated terrestrial heritage assets (eg listed buildings, scheduled monuments)
Direct impact during decommissioning activities.	Further removal, truncation, or disturbance of marine archaeology and cultural heritage assets and deposits adjacent to or within the footprint of the construction and operation phase works.	Scoped Out	Palaeo-environmental remains Palaeo-landscape features Wreck remains Riverside structural remains

Impacts Scoped out of Assessment

17.10.4 These conclusions have been made based on the knowledge of the baseline environment and the nature of planned works on the potential for impact from

such projects more widely. The conclusions follow (in a site-based context) existing best practice. Each scoped out effect is considered in turn below.

17.10.5 Potential effects arising from the direct impact to marine cultural heritage and archaeology receptors during the decommissioning of the Project have been scoped out from further assessment. In effect, any disturbance arising during this phase of the Project will present only minor effects (not significant) on archaeological remains and / or geoarchaeological deposits that have previously been disturbed and mitigated during the construction or operational phases. It is possible that best practice mitigation measures, such as a PAD or Written Scheme of Investigation (WSI), will be required to ensure that any additional disturbance is mitigated through preservation by record.

17.10.6 Direct impacts to terrestrial cultural heritage assets through changes within their setting is scoped out as it will be assessed within the terrestrial cultural heritage chapter (**Chapter 18: Terrestrial Archaeology and Cultural Heritage**).

17.11 CUMULATIVE EFFECTS

17.11.1 Cumulative effects on marine cultural heritage and archaeology receptors resulting from the effects of the Project and other developments will be assessed in accordance with the guidance and methodologies set out in **Chapter 3: Approach to EIA** and considering the other developments that have been screened in as part of the CEA screening exercise.

17.11.2 The following impacts from the Project have the potential to act cumulatively with impacts from other developments to contribute to cumulative effects:

- Direct impact of sediment removal during riverbed preparation;
- Direct impact by penetration, compression and disturbance during riverbed preparation, construction of foundations, maintenance, and the anchoring of jack-up barges during construction and maintenance; and
- Indirect impact of altered riverbed conditions, for example, scour or differential deposition of sediments.

17.12 TRANSBOUNDARY EFFECTS

17.12.1 Due to the localised nature of the potential impacts, transboundary effects are considered unlikely to occur and therefore have been scoped out of the assessment.

17.13 PROPOSED APPROACH TO ENVIRONMENTAL IMPACT ASSESSMENT REPORT

17.13.1 An offshore archaeological desk-based assessment will be undertaken to establish the baseline for both known and potential heritage assets within the defined areas based on the desk-based sources listed in **Table 17-5** in addition to the key data sources in **Table 17-2**.

Table 17-5: Desk-based baseline data sources – Marine Archaeology and Cultural Heritage

Source	Summary
Merseyside Historic Environment Record (MHER).	Primary repository of archaeological information. Includes information from past investigations, local knowledge, find spots, and documentary and cartographic sources.
British Geological Survey (BGS).	Historic borehole logs and the wider geological background for the region.
National Historic Seascape Characterisation (NHSC).	GIS data and character texts for the HSC of coastal and marine areas around England, mapped through a series of projects funded by Historic England and consolidated into a single national database.
Coastal and Intertidal Zone Archaeological Network (CITiZAN).	Interactive mapping of intertidal heritage in England.
Existing archaeological studies and published sources.	Background information on the archaeology of the Irish Sea and the Mersey Estuary. Background information relating to submerged landscapes within the Celtic Sea and Mersey Estuary.

17.13.2 The assessment will also consider geophysical survey results to identify potential wreck remains, and will identify the location and extent of modern dredging activities.

17.13.3 The NPPF defines significance as "*The value of a heritage asset to this and future generations because of its heritage interest. That interest may be historic, archaeological, architectural or artistic*." The determination of the significance is based on statutory designation and / or professional judgement against these interests (they are also identified in Historic England Statements of Heritage Significance (2019)).

17.13.4 Each asset is evaluated against the range of criteria listed above on a case-by-case basis. Unless the nature and exact extent of buried archaeological remains within any given area have been determined through prior investigation, significance is often uncertain.

17.13.5 In relation to significant heritage assets, the assessment considers the contribution that the historic character and setting make to the overall significance of the asset.

Determining Receptor Sensitivity and Value

17.13.6 Each historic asset is evaluated against the range of criteria listed above on a case-by-case basis, in accordance with the criteria listed in **Table 17-6**. This also considers regional variations and individual qualities, where applicable.

17.13.7 Unless the nature and exact extent of marine archaeological remains within any given area has been determined through prior investigation, their significance can be uncertain, and a judgement will be made on the basis of existing knowledge.

17.13.8 In relation to designated historic assets, the assessment considers the contribution that historic character and setting make to the overall significance of the asset.

Table 17-6: Definition of sensitivity levels for Marine Cultural Heritage and Archaeology

Value or Sensitivity	Guidelines
Very High	This category contains heritage assets that will be considered to be of international importance either for historic associations or their informative potential. This category includes World Heritage Sites (including nominated sites) and assets of acknowledged international importance.

Value or Sensitivity	Guidelines
High	This category contains heritage assets that will be considered to be of national importance either for historic associations or their informative potential. This category includes heritage assets designated as scheduled monuments, Grade I and II* listed buildings, protected military remains or Protected Wrecks and those of equivalent value, or palaeoenvironment remains that are either very well-preserved or particularly important for understanding specific periods.
Medium	Heritage assets of regional importance for historic associations or their informative potential. This category includes Grade II listed buildings, well-preserved live wrecks that are not suitable for designation, palaeoenvironmental remains that are typical of a region or non-designated heritage assets of regional importance.
Low	Non-designated heritage assets of local importance for historic associations or their informative potential may include marine debris or less well-preserved marine material, or generally representative archaeological material or feature types.
Negligible	These include those features that are recorded but no longer extant, which are suggestive of further activity but not of intrinsic value (for example, records of losses without identified wreck sites, some 'dead' wrecks, isolated finds of debris).

Determining Magnitude of Change

17.13.9 Determination of magnitude of change upon the significance of known or potential historic assets is based on the severity of likely impact (for example, physical effects on built historic assets or the permanent presence of new structures etc. that result in changes to the contribution of setting to the heritage significance of a built historic asset). **Table 17-7** describes the criteria used in this assessment to determine the magnitude of change.

Table 17-7: Definition of magnitude of change levels for Marine Cultural Heritage and Archaeology

Magnitude of Change	Criteria (adverse)	Criteria (beneficial)
Major	Total or substantial change to an asset. Loss or disturbance of defining features of the asset. Comprehensive changes to setting such as extreme visual effects, gross change of noise or change to sound quality, or fundamental changes to use or access.	Preservation of a heritage asset *in situ* where it would otherwise be completely or almost lost. Changes that appreciably enhance the cultural significance of a heritage asset and how it is understood, appreciated, and experienced.
Moderate	Changes to many key archaeological materials or elements, such that the significance of the heritage asset is clearly modified. Considerable changes to setting that affect the character of the heritage asset such as visual change to many key aspects or views, noticeable differences in noise or sound quality, or considerable changes to use or access.	Changes to important elements of a heritage asset's fabric or setting, resulting in its cultural significance being preserved (where this would otherwise be lost) or restored. Changes that improve the way in which the heritage asset is understood, appreciated, and experienced.
Minor	Changes to key archaeological materials or key historic building elements, such that the significance of the heritage asset is slightly altered. Slight changes to setting such as slight visual changes to a few key aspects or views, limited changes to noise levels or sound	Changes that result in elements of a heritage asset's fabric or setting detracting from its cultural significance being removed. Changes that result in a slight improvement in the way a heritage asset is

Magnitude of Change	Criteria (adverse)	Criteria (beneficial)
	quality, or slight changes to use or access.	understood, appreciated, and experienced.
Negligible	Changes to archaeological materials or historic buildings elements such that alterations to the significance of the heritage asset are very minor. Very minor changes to setting such as virtually unchanged visual effects, very slight changes in noise levels or sound quality, or very slight changes to use or access.	Very minor changes that result in elements of a heritage asset's fabric or setting detracting from its cultural significance being removed. Very minor changes that result in a slight improvement in the way a heritage asset is understood, appreciated, and experienced.
No change	Changes to fabric or setting that leave significance unchanged.	

Evaluation of Significance of Effects

17.13.10 The assessment of potential significant effects considers all stages of the Project. The significance level attributed to each effect will be assessed based on the heritage significance of the affected historic asset and the magnitude of change (impact) to the heritage significance of the asset.

17.13.11 Effects may be either negative (adverse) or positive (beneficial) and are defined initially without mitigation. Where the resulting effect comprises two separate levels (for instance, ‘moderate or minor’ or ‘minor or negligible’), professional judgement will be applied to select the most appropriate significance of effect. Where information is insufficient to be able to quantify either the asset significance or magnitude of change with any degree of certainty, the effect is given as 'uncertain'. This might be the case for possible buried historic assets, the presence, nature, date, extent and significance of which is uncertain due to the absence of any site-based investigation.

17.13.12 Residual effects that are classified as moderate or above are considered to be ‘significant’ in EIA terms; however, professional judgement is applied for moderate effects. Residual effects classified as slight or below are considered to be ‘not significant’.

Table 17-8: Significance of Cultural Heritage and Archaeology Effect

		Heritage Asset (Receptor) Heritage Significance			
		Very High	High	Medium	Low
Magnitude of Change (Impact)	High	Major	Major	Major or Moderate	Moderate or Minor
	Medium	Major or Moderate	Major or Moderate	Major or Moderate	Minor
	Low	Moderate or Minor	Moderate or Minor	Minor	Minor
	Negligible	Minor or Negligible	Minor or Negligible	Negligible	Negligible

17.13.13 The following terms have been used to define the significance of the effects identified:

- **Major Effect**: where the Project could be expected to have a considerable effect (either positive or negative) on heritage assets (receptors);
- **Moderate Effect**: where the Project could be expected to have a noticeable effect (either positive or negative) on heritage assets (receptors);
- **Minor Effect**: where the Project could be expected to result in a small, barely noticeable effect (either positive or negative) on heritage assets (receptors); and
- **Negligible**: where no discernible effect is expected as a result of the Project on heritage assets (receptors).

17.13.14 Residual effects that are classified as moderate or above are considered to be 'significant' in EIA terms; however, professional judgement is applied for moderate effects. Residual effects classified as slight or below are considered to be 'not significant'.

17.13.15 Rather than apply the test of the NPS when considering the impact of the DCO Project on heritage assets, the language used in the NPS (i.e., harmful impact or substantial harm) has been correlated with the standard EIA methodology.

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18 TERRESTRIAL ARCHAEOLOGY AND CULTURAL HERITAGE

18.1 INTRODUCTION

18.1.1 The Terrestrial Cultural Heritage and Archaeology chapter will consider the potential likely significant effects on terrestrial cultural heritage and archaeology that may arise from the construction, operation and maintenance (O&M) and decommissioning activities of the Project. These receptors include designated heritage assets (i.e. scheduled monuments, listed buildings, registered parks and gardens, etc.) and non-designated heritage assets. This section of the Scoping Report describes the methodology to be used within the Environmental Impact Assessment (EIA), an overview of the baseline conditions within the Scoping Boundary (as defined in **Chapter 1: Introduction**), the datasets to be used to inform the EIA, the potential likely significant effects to be considered, and how these will be assessed for the purpose of the EIA.

18.1.2 Terrestrial Cultural Heritage and Archaeology interfaces with other aspects and as such, should be considered alongside these; namely:

- **Chapter 17: Marine Cultural Heritage and Archaeology**: This chapter will be used to allow for an integrated approach to analysing the historic environment and the interplay between terrestrial and maritime activities;
- **Chapter 22: Onshore Noise and Vibration:** Due to the potential for changes in the noise and vibration to affect archaeological remains, this chapter will be used to inform the terrestrial cultural heritage and archaeology assessment;
- **Chapter 23: Geology and Ground Conditions:** This chapter will be used to inform the terrestrial cultural heritage and archaeology assessment as the geology and ground conditions affects what type of historic environmental remains are likely to survive and how the landscape was utilised in the past; and
- **Chapter 25: Seascape, Landscape and Visual Impact:** This chapter will be used to inform the terrestrial cultural heritage and archaeology assessment regarding visual effects on terrestrial heritage features.

18.1.3 This chapter concerns terrestrial cultural heritage assets, which are defined as being assets located landwards of the Mean Low Water Level. Potential impacts on terrestrial cultural heritage assets that may result from elements of the proposed development that are below Mean High Water level (e.g. the barrage) from changes in the setting are addressed in this chapter. Impacts to the cultural

heritage assets below Mean High Water Level are addressed in **Chapter 17: Marine Cultural Heritage and Archaeology**.

18.1.4 Overarching relevant legislation and policy context which has informed the scope of the assessment is outlined in **Chapter 4: Planning Policy,** with topic specific considerations outlined in **Appendix 4.1**.

18.2 TECHNICAL GUIDANCE

18.2.1 Technical guidance that has been used to define the assessment is set out in **Table 18-1**.

Table 18-1: Relevant technical guidance

Guidance reference	Relevance to the assessment
Chartered Institute for Archaeologists' Standard and Guidance for Historic Environment Desk-Based Assessments, consultancy advice and Code of Conduct.	Defines good practice for the execution and reporting of historic environment desk-based assessments. The Code of Conduct guides the practices and standards for archaeological assessment both onshore and offshore.
Historic England GPA2 - Managing Significance in Decision-taking.	Emphasises the requirement to having a knowledge and understanding of the significance of heritage assets likely to be affected by the development.
Historic England GPA3 - The Setting of Heritage Assets.	Provides advice on the setting of heritage assets. Setting is as defined in the National Planning Policy Framework (NPPF) and forms the surroundings in which a heritage asset is experienced. Components of a setting can make positive or negative contribution to the significance of an asset and affect the ways in which it is experienced.
Historic England Advice Note 12: Statements of Heritage Significance: Analysing Significance in Heritage Assets.	Provides advice on assessing the significance of heritage assets likely to be affected by the development.

18.3 STUDY AREA

18.3.1 In order to determine the full historic environment potential within the Scoping Boundary and the proposed cable routes, a broad range of standard documentary and cartographic sources, including results from any archaeological investigations within 500m, will be examined to determine the likely nature, extent, preservation and significance of any known or possible heritage assets that may be present within, or adjacent to, the Site. This will cover all possible receptors landwards of Mean Low Water Springs (MLWS). Where appropriate, reference will be made to key heritage assets beyond the Study Area.

18.3.2 Cross reference with the Marine Archaeology and Cultural Heritage Chapter (REF) will ensure that no duplication of assessment is undertaken between the chapters.

18.3.3 Based on the nature of the current proposals, which do not entail substantial new built form, together with the nature of the existing fabric, significant effects due to changes to historic setting are considered unlikely. The initial setting Study Area will be formed of a 500m buffer around the Scoping Boundary in order to identify any cultural heritage assets that could be impacted by the Project through a change in setting. Professional judgement will be applied when scoping designated heritage assets potentially affected through changes to setting and, where relevant, assets beyond the Study Area may be considered. This is to ensure that any changes within the setting of affected designated heritage assets is taken into consideration. The Study Area is presented in **Figure 18.1**.

18.4 CONSULTATION

18.4.1 Pre-scoping consultation was undertaken on 26 June 2024 with representatives from Historic England. An overview of the proposed development was presented along with a summary of the heritage assets potentially impacted. The scoping of different impacts was discussed as well as any concerns from the consultees; in particular, the consideration of the Grade I listed Birkenhead Park for inscription by United Nations Educational, Scientific and Cultural Organisation (UNESCO) and the proposed scoping out of impacts to built heritage assets as a result of changes within their setting during the construction phase. These have been considered in paragraphs 18.7.3 and 18.10.4 respectively. Comments on this scoping report will be considered in the preparation of the EIA.

18.4.2 Consultation will be held with the relevant statutory and non-statutory organisations and stakeholder feedback will inform the EIA. Discussions would

focus on study areas, methodology, key constraints, and any other information which may not be available through the Historic Environment Record (HER). Consultees are expected to comprise:

- Historic England;
- Sefton Council;
- Liverpool City Council; and
- Wirral Council.

18.5 ASSESSMENT METHODOLOGY

18.5.1 The Project-wide approach to the assessment methodology is set out in **Chapter 3: Approach to EIA**. This will be implemented to assess the likely significant effects on terrestrial cultural heritage and archaeology receptors from the construction, O&M, and decommissioning of the Project.

18.5.2 The specific legislation and guidance outlined in **Table 18-1** will also be considered in relation to the assessment, in addition to consultation with the stakeholders outlined above.

18.5.3 The Environmental Impact Assessment Report (EIAR) will set out the planning framework in respect of buried heritage assets (archaeological remains), above ground heritage assets and historic landscapes within the terrestrial environment and the interface between the terrestrial and marine environments. It will include the methodology for assessing the environmental effects predicted during the construction, operation and decommissioning phases. It will provide a summary overview of the baseline conditions. The guidance used during the preparation of the Chapter is outlined in **Table 18-2**.

18.5.4 Further desk-based studies and analysis will be undertaken to identify and assess terrestrial cultural heritage and archaeology receptors. This study will be supplemented with consultation with the relevant statutory and non-statutory organisations as necessary.

18.6 BASELINE CONDITIONS

DATA INFORMATION SOURCES

18.6.2 An initial desk based review has been undertaken of publicly available data sources outlined in **Table 18-2** to determine the baseline character of the Study Area and inform the assessment process.

Table 18-2: Key sources of terrestrial cultural heritage and archaeology data

Source	Date	Summary	Coverage of Study Area
National Heritage List of England (NHLE).	April 2024	Statutory designations (scheduled monuments; statutorily listed buildings; registered parks and gardens; historic battlefields) can provide a significant constraint to development.	100%
Merseyside Historic Environment Record.	TBA	Primary repository of archaeological information. Includes information from past investigations, local knowledge, find spots, and documentary and cartographic sources.	100%
Local Planning Authorities (Liverpool, Sefton, and Wirral) – Conservation Areas.	May 2024	An area of special architectural or historic interest the character or appearance of which it is desirable to preserve or enhance.	100%
British Geological Survey (BGS).	May 2024	Solid and drift geology digital map; online BGS geological borehole record data. Subsurface deposition, including buried geology and topography, can provide an indication of potential for early human settlement, and potential depth of archaeological remains.	100%
Ordnance Survey Historic maps (National Library of Scotland).	May 2024	Provides a good indication of past land use and impacts which may have compromised archaeological survival. Provides an indication of the possible date of any buildings on the site.	100%

Source	Date	Summary	Coverage of Study Area
Cheshire pre-1860 maps (Cheshire Local History Association).	May 2024	Provides a good indication of past settlement patterns which provides an indication of potential areas of concentration for medieval and early post-medieval activity.	90%

EXISTING BASELINE

18.6.3 This section describes the present conditions which constitute the existing baseline environment for terrestrial cultural heritage and archaeology within the Study Area.

18.6.4 A high-level appraisal of terrestrial heritage assets has been undertaken to inform the scoping assessment using publicly available information. This is intended to provide an initial indication of the potential issues that will be considered in the EIA. Designated heritage assets within the 500m Study Area have been identified through information collated from Historic England. The Study Area is limited to the MLWS and does not extend into the sub-tidal. The identified assets provide an overview of the quantity and character of built and buried heritage within the Study Area to the MLWS (**Figure 18.1**).

Designated Assets

18.6.5 There are no Registered Battlefields or World Heritage Sites within the Study Area.

18.6.6 One thousand eight hundred and seventy nine listed buildings are located within the Study Area, 1678 of which are located within the Scoping Boundary. The majority of the listed buildings lie within or in close proximity to the 46 conservation areas within the Study Area. There are six scheduled monuments within the Study Area: Birkenhead Priory, Bromborough Court House, the standing cross at the Church of the Holy Cross at Woodchurch, the church and churchyard at Overchurch, Edge Hill Engine Station, and Storeton Hall, Bebington. Four of the scheduled monuments are located within the Scoping Boundary.

Non-designated Assets

18.6.7 The Merseyside Historic Environment Record (HER) data was not obtained for the scoping stage. It would be obtained to inform the baseline for EIA. The Historic Environment Record data was reviewed on Heritage Gateway; however, that site is not updated regularly and the data is not a complete record of the Merseyside HER holdings. The exact number of non-designated assets is not known given the limitations of access on Heritage Gateway but it is clear from the review that a considerable number of non-designated heritage assets are noted within the area around the site. These assets include prehistoric findspots, evidence of Roman activity, evidence of medieval occupation and industrial activity, and post-medieval development along the river and estuary.

18.6.8 The River Mersey acted as the boundary between the historic counties of Lancashire (to the north) and Cheshire (to the south). The proposed Tidal Barrage Development Area is located within the Mersey riverbed, and the proposed Grid Connection Development Area would be constructed on the eastern side of the Wirral Peninsula, connecting into existing electrical infrastructure at Capenhurst and / or Birkenhead and one on the north-eastern side of the River Mersey, which would extend from the Huskisson Dock area of the Liverpool docks to Stanley. Nineteenth century historic maps show that land reclamation activities undertaken along the banks of the Wirral Peninsula in the early to mid-19th century allowed the area along the Grid Connection Development Area and the Tidal Barrage Development Area to become increasingly developed within the latter half of the 1800s. Prior to this development, the Wirral was populated with small settlements surrounded by open fields, most notably Wallasey, Eastham Ferry, and Eastham.

18.6.9 The geology of the site is comprised of outcrops of two sandstone formations, the Wilmslow and Chester formations which cover the majority of the Study Area, plus an outcrop of Sidmouth mudstone formation extending into the north west of the Study Area. These bedrock formations are overlaid by tidal mudflat and blown sand deposits around the coastal areas of the peninsula and till deposits in the interior of the peninsula (BGS, 2024). The floodplain deposits have potential to contain buried archaeological remains dated from before the introduction of land reclamation and significant water management infrastructure. The extent of disturbance from modern development within the site and Study Area is currently unclear, but it is likely that there is potential for remains of currently unknown archaeological remains to survive within the alluvial and aeolian deposits.

18.7 FUTURE BASELINE

18.7.1 Buried heritage assets are a static resource, which have reached equilibrium with their environment and do not change (i.e. decay or grow) unless their environment changes as a result of human or natural intervention. In any areas that are impacted through sea level rise or human intervention, buried heritage assets may potentially experience degradation through physical and chemical change within the burial environment. In terms of the historic setting of buried heritage assets, the significance of specific assets may change due to the presence of, currently unknown, future developments.

18.7.2 For built heritage assets, there may be some decay over time in the absence of the Project. The setting of heritage assets may change due to the presence of, currently unknown, future developments. These could have a detrimental or positive effect on setting and could result in the intervening presence of buildings and/or vegetation.

18.7.3 Changes to the designations of heritage assets within the Study Area anticipated for two of the identified designated assets: Birkenhead Park (NHLE 1000994) and Shoreton Hall, Bebington (NHLE 1004918 and 1075385). The Grade I registered Birkenhead Park is currently included on the UK Tentative List for potential inclusion within the UNESCO World Heritage Site list which may change the potential significance of the heritage asset and its associated features. Shoreton Hall, Bebington scheduled monument and Grade II* listed building is expected to be removed from the Register following the building's repair and conversion. The date of the completion of these works and the asset's removal from the Register is not currently known.

18.8 BASIS FOR SCOPING ASSESSMENT

18.8.1 The Terrestrial Cultural Heritage scoping assessment is based on the indicative parameters set out in **Chapter 2: Site Context and Project Description.**

18.9 EMBEDDED ENVIRONMENTAL MEASURES

18.9.1 Embedded mitigation measures have been identified and are proposed to be adopted as part of the evolution of the Project design (embedded into the Project design). These measures will evolve over the development process as the EIA progresses and in response to consultation. They will be fed iteratively into the assessment process. These measures typically include those that have been identified as good or standard practice and include actions that would be undertaken to meet existing legislation requirements.

18.9.2 As there is a commitment to implementing these environmental measures, and also to various standard sectoral practices and procedures, they are considered inherently part of the design of the Project and have, therefore, been considered in the scoping assessment.

18.9.3 In addition to the specific embedded mitigation measures listed in **Table 18-3**, consultation will be undertaken with all relevant consultees such as Historic England and the archaeological advisor to the Local Planning Authority will be required to address any concerns or issues.

Table 18-3: Relevant embedded environmental measures

ID	Mitigation Measures embedded into the project design	How the measure will be secured
OM5	Where practical, sensitive sites will be avoided by the temporary and permanent footprint.	Design change
OM1	Loss of historic important hedgerows will be avoided by careful design of site management, access, haul roads, etc.	Outline Construction Environmental Management Plan (OCEMP).
18-1	Hazards to known heritage assets, e.g. designated or undesignated significant historic buildings and areas of archaeological remains, will be eliminated where possible though safe systems of work, physical avoidance, physical barriers, etc., as appropriate to the risk.	Outline Construction Environmental Management Plan (OCEMP).
18–2	The barrage and O&M buildings will be subject of careful design, regarding form, massing, materiality, colour, etc., to create an appearance that minimises harmful intrusion into the settings of heritage assets.	Heritage input during the design stage.

18.10 LIKELY SIGNIFICANT EFFECTS

18.10.1 In line with the EIA Regulations 2017, the EIA for the Project will consider those impacts where there is a risk of a likely significant effect only. The following Section draws on industry experience and expertise to identify those effect-receptor pathways that may potentially lead to a significant impact. Where experience and available evidence indicates an effect-receptor pathway will not

lead to a significant impact with regards to the EIA Regulations 2017 the pathway is scoped out from assessment.

18.10.2 The likely significant effects on Cultural Heritage and Archaeology are summarised in **Table 18-4**. The scoping assessment is based on a combination of the Project definition at the scoping stage, embedded environmental measures, understanding of the baseline conditions at this stage, the evidence base for significant effects, the identification of potentially impacted receptors, and professional judgement.

18.10.3 The early identification of likely significant effects is used here as a tool aimed at delivering a proportionate approach to the EIA. In doing so, it sets out a high-level assessment of all potential effects, significant or not. The basis for scoping out certain effects, and therefore no longer considered is presented after the table, supported by evidence base.

Table 18-4: Potential significant effects and effects scoped out of assessment

Activity and impacts	Effect	Proposed approach to assessment (scoped in or scoped out)	Receptor
Construction stage activities (e.g. excavation of the cable trench / ground preparation and construction compounds/temporary access roads).	Removal, truncation, or disturbance of terrestrial archaeology and heritage assets and deposits.	Scoped In	Previously unrecorded archaeological remains (buried cultural heritage assets) Hedgerows considered important under the Hedgerow Regulations (1997).
Operation stage impact to above ground heritage assets through the introduction of new built	Permanent changes within the setting of terrestrial heritage assets within 150m of	Scoped In	Designated heritage assets (listed buildings, scheduled

Activity and impacts	Effect	Proposed approach to assessment (scoped in or scoped out)	Receptor
form of the barrage, the gantry crane, and buildings (i.e. changes to setting).	the proposed Barrage, impacting heritage significance (how assets are understood and appreciated).		monuments, conservation areas) and non-designated above ground heritage assets.
Construction stage impact on above ground heritage assets due to temporary changes to setting (i.e. visual and auditory changes from construction equipment and activities) related to construction of the barrage and O&M buildings, excavation of the cable trench / ground preparation, and construction compounds.	Temporary changes within the setting of heritage assets outside of the scheme footprint due to construction activities.	Scoped out	Designated assets (listed buildings, scheduled monuments, conservation areas) and non-designated above ground heritage assets.
Operation stage impacts to buried heritage assets related to the O&M buildings and cable trench.	Effects on the setting of buried heritage assets, impacting heritage significance (how assets are understood and appreciated).	Scoped Out	Previously unrecorded archaeological remains (buried cultural heritage assets).
Operation stage impact on built heritage assets through the introduction of new built form (i.e. changes to setting) within the vicinity of the proposed cable route.	Changes within the setting of terrestrial heritage assets around the proposed buried cables, impacting heritage significance	Scoped Out	Designated assets (listed buildings, scheduled monuments,

Activity and impacts	Effect	Proposed approach to assessment (scoped in or scoped out)	Receptor
	(how assets are understood and appreciated).		conservation areas).
Decommissioning stage effects on both above and below ground heritage assets related to O&M buildings, the cable trench, and compounds.	Physical impact during decommissioning activities on below ground heritage assets. Changes within the setting of above ground heritage assets around the proposed buried cables, impacting heritage significance (how assets are understood and appreciated).	Scoped Out	Previously unrecorded archaeological remains (buried cultural heritage assets) Designated assets (listed buildings, scheduled monuments, conservation areas) and non-designated above ground heritage assets.

Justification for Those Impacts Scoped Out of Assessment

18.10.4 As set out in **Table 18-5** above, the following effects are considered insignificant and are proposed to be scoped out of the assessment:

- **All construction stage effects on above ground heritage assets due to temporary changes to setting through visual and auditory changes from construction equipment and activities** (affecting how assets are understood and experienced). This is considered on the basis such impacts would be short-term and of lesser significance than any permanent operation stage effects.
- **Operation stage impacts on above ground heritage assets through the introduction of new built form (i.e. changes to setting) within the vicinity**

of the proposed cable route. The possible impact on the setting of above ground designated heritage assets will not be considered along the proposed cable route on the basis that the works comprise only below ground disturbance. Consequently, there would be no effects on heritage assets through a change in setting. Should substantial above ground infrastructure be proposed (i.e. substations or overhead power lines) then the scoping will be reviewed during the EIA and where necessary potential effects on nearby assets will be considered.

- **All operation stage impacts to buried archaeological remains** will not be considered on the basis that there would be no further ground disturbance following completion of the construction phase and no additional archaeological impact.
- **All decommissioning stage effects on both above and below ground heritage assets.** For buried heritage assets, the main impact would occur during construction stage (excavation of the cable trench and working width). Additional further impact through decommissioning is unlikely and therefore the effects are considered insignificant. In terms of the setting of built heritage assets, decommissioning stage effects will be short term and likely of lesser significance that any preceding Construction or Operation stage effects and therefore are considered insignificant.

18.11 CUMULATIVE EFFECTS

18.11.1 Cumulative effects on terrestrial cultural heritage and archaeology resulting from the effects of the Project and other developments will be assessed in accordance with the guidance and methodologies set out in **Chapter 3: Approach to EIA** and considering the other developments that have been screened in as part of the CEA screening exercise.

18.11.2 The following impacts from Project have the potential to act cumulatively with impacts from other developments to contribute to cumulative effects:

- Direct physical impact during the excavation of the cable corridor; and
- Changes within the setting of designated heritage assets around the Tidal Barrage Development Area.

18.12 TRANSBOUNDARY EFFECTS

18.12.1 Due to the localised nature of the potential impacts, transboundary effects are considered unlikely to occur and therefore scoped out of further assessment.

18.13 PROPOSED APPROACH TO ENVIRONMENTAL IMPACT ASSESSMENT REPORT

18.13.1 An onshore archaeological desk-based assessment will be undertaken to establish the baseline for both known and potential heritage assets within the defined areas based on the desk-based sources listed in **Table 18-5** in addition to the key data sources in **Table 18-2**.

Table 18-5: Desk-based baseline data sources – Terrestrial Cultural Heritage and Archaeology

Source	Summary
Merseyside Historic Environment Record (MHER).	Primary repository of archaeological information. Includes information from past investigations, local knowledge, find spots, and documentary and cartographic sources.
British Geological Survey (BGS).	Historic borehole logs and the wider geological background for the region.
Coastal and Intertidal Zone Archaeological Network (CITiZAN).	Interactive mapping of intertidal heritage in England.
Existing archaeological studies and published sources.	Background information on the archaeology of the Wirral Peninsula and the Mersey Estuary.
National Record of the Historic Environment (NRHE).	National database maintained by Historic England. Not as comprehensive as the HER but can occasionally contain additional information. Accessible via Pastscape website.
Soilscapes	Subsurface deposition, including soil type, can provide an indication of potential for early human settlement, and potential depth of archaeological remains, as well as influence the suitability of other techniques, such as aerial photographic analysis and geophysical survey.
Wirral Archives	Historic maps (e.g. Tithe, enclosure, estate), published journals and local history which provide baseline information on the historic environment.

Source	Summary
The Historic Environment of North West England: A Resource Assessment and Research Framework.	An overview of the state of current knowledge and the research priorities and questions that inform archaeological investigation within North West England.

18.13.2 The NPPF defines significance as *"The value of a heritage asset to this and future generations because of its heritage interest. That interest may be historic, archaeological, architectural or artistic."* The determination of the significance is based on statutory designation and / or professional judgement against these interests (they are also identified in Historic England Statements of Heritage Significance (2019)).

18.13.3 The significance of each asset is evaluated against the range of criteria listed above and will be described on a case-by-case basis. Unless the nature and exact extent of buried archaeological remains within any given area have been determined through prior investigation, significance is often uncertain.

18.13.4 In relation to significant heritage assets, the assessment considers the contribution that the historic character and setting make to the overall significance of the asset.

DETERMINING RECEPTOR SENSITIVITY AND VALUE

18.13.5 Each heritage asset is evaluated against the range of criteria listed above on a case-by-case basis, in accordance with the criteria listed in **Table 18-6**. This also considers regional variations and individual qualities, where applicable.

18.13.6 Unless the nature and exact extent of terrestrial archaeological remains within any given area has been determined through prior investigation, their significance can be uncertain, and a judgement will be made on the basis of existing knowledge.

18.13.7 In relation to designated heritage assets, the assessment considers the contribution that historic character and setting make to the overall significance of the asset.

Table 18-6: Definition of sensitivity levels for Terrestrial Cultural Heritage and Archaeology

Value or Sensitivity	Guidelines
Very High	This category contains heritage assets that will be considered to be of international importance either for historic associations or their informative potential. This category includes World Heritage Sites (including nominated sites) and assets of acknowledged international importance.
High	This category contains heritage assets that will be considered to be of national importance either for historic associations or their informative potential. This category includes heritage assets designated as scheduled monuments, Grade I and II* listed buildings, protected military remains or Protected Wrecks and non-designated assets of equivalent value, or palaeoenvironment remains that are either very well-preserved or particularly important for understanding specific periods.
Medium	Heritage assets of regional importance for historic associations or their informative potential. This category includes Grade II listed buildings, conservation areas containing buildings that contribute significantly to its historic character; and non-designated heritage assets (both archaeological and built heritage) of regional importance.
Low	Heritage assets of local importance for historic associations or their informative potential. This category also includes assets compromised by poor preservation and/or poor survival of contextual associations and buildings of modest quality in their fabric or historical association.
Negligible	These include those features that are recorded but no longer extant, which are suggestive of further activity but not of intrinsic value (for example, records of findspots).

DETERMINING MAGNITUDE OF CHANGE

18.13.8 Determination of magnitude of change upon the significance of known or potential heritage assets is based on the severity of likely impact (for example, physical effects on built heritage assets or the permanent presence of new

structures etc. that result in changes to the contribution of setting to the heritage significance of a built heritage asset). **Table 18-7** describes the criteria used in this assessment to determine the magnitude of change.

Table 18-7: Definition of magnitude of change levels for Terrestrial Cultural Heritage and Archaeology

Magnitude of Change	Criteria (adverse)	Criteria (beneficial)
Major	Total or substantial change to an asset. Loss or disturbance of defining features of the asset. Comprehensive changes to setting such as extreme visual effects, gross change of noise or change to sound quality, or fundamental changes to use or access.	Preservation of a heritage asset *in situ* where it would otherwise be completely or almost lost. Changes that appreciably enhance the cultural significance of a heritage asset and how it is understood, appreciated, and experienced.
Moderate	Changes to many key archaeological materials (e.g. artefacts, soil contexts, palaeoenvironmental deposits, peats) or elements, such that the significance of the heritage asset is clearly modified. Considerable changes to setting that affect the character of the heritage asset such as visual change to many key aspects or views, noticeable differences in noise or sound quality, or considerable changes to use or access.	Changes to important elements of a heritage asset's fabric or setting, resulting in its cultural significance being preserved (where this would otherwise be lost) or restored. Changes that improve the way in which the heritage asset is understood, appreciated, and experienced.
Minor	Changes to key archaeological materials or key historic building	Changes that result in elements of a heritage asset's fabric or setting

Magnitude of Change	Criteria (adverse)	Criteria (beneficial)
	elements, such that the significance of the heritage asset is slightly altered. Slight changes to setting such as slight visual changes to a few key aspects or views, limited changes to noise levels or sound quality, or slight changes to use or access.	detracting from its cultural significance being removed. Changes that result in a slight improvement in the way a heritage asset is understood, appreciated, and experienced.
Negligible	Changes to archaeological materials or historic buildings elements such that alterations to the significance of the heritage asset are very minor. Very minor changes to setting such as virtually unchanged visual effects, very slight changes in noise levels or sound quality, or very slight changes to use or access.	Very minor changes that result in elements of a heritage asset's fabric or setting detracting from its cultural significance being removed. Very minor changes that result in a slight improvement in the way a heritage asset is understood, appreciated, and experienced.
No change	Changes to fabric or setting that leave significance unchanged.	

EVALUATION OF SIGNIFICANCE OF EFFECTS

18.13.9 The assessment of potential significant effects considers all stages of the Project. The significance level attributed to each effect will be assessed based on the heritage value or sensitivity of the affected heritage asset and the magnitude of change (impact) to the heritage value or sensitivity of the asset.

18.13.10 Effects may be either negative (adverse) or positive (beneficial) and are defined initially without mitigation. Where the resulting effect comprises two separate levels (for instance, 'moderate or minor' or 'minor or negligible'), professional judgement will be applied to select the most appropriate significance of effect. Where information is insufficient to be able to quantify either the asset significance or magnitude of change with any degree of certainty, the effect is

given as 'uncertain'. This might be the case for possible buried heritage assets, the presence, nature, date, extent and significance of which is uncertain due to the absence of any site-based investigation.

18.13.11 Residual effects that are classified as moderate or above are considered to be 'significant' in EIA terms; however, professional judgement is applied for moderate effects. Residual effects classified as slight or below are considered to be 'not significant'.

Table 18-8: Significance of Cultural Heritage and Archaeology Effect

		Heritage Asset (Receptor) Heritage Value			
		Very High	High	Medium	Low
Magnitude of Change (Impact)	High	Major	Major	Major or Moderate	Moderate or Minor
	Medium	Major or Moderate	Major or Moderate	Major or Moderate	Minor
	Low	Moderate or Minor	Moderate or Minor	Minor	Minor
	Negligible	Minor or Negligible	Minor or Negligible	Negligible	Negligible

18.13.12 The following terms have been used to define the significance of the effects identified:

- **Major Effect:** where the Project could be expected to have a considerable effect (either positive or negative) on heritage assets (receptors)
- **Moderate Effect:** where the Project could be expected to have a noticeable effect (either positive or negative) on heritage assets (receptors);
- **Minor Effect:** where the Project could be expected to result in a small, barely noticeable effect (either positive or negative) on heritage assets (receptors); and
- **Negligible:** where no discernible effect is expected as a result of the Project on heritage assets (receptors).

18.13.13 Residual effects that are classified as moderate or above are considered to be 'significant' in EIA terms; however, professional judgement is applied for

moderate effects. Residual effects classified as slight or below are considered to be ‘not significant’.

18.13.14 Rather than apply the test of the NPS when considering the impact of the DCO Project on heritage assets, the language used in the NPS (i.e. harmful impact or substantial harm) has been correlated with the standard EIA methodology.

18.14 REFERENCES

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19 WATER RESOURCES AND FLOOD RISK

19.1 INTRODUCTION

19.1.1 This chapter considers the potential likely significant effects on water resources and flood risk that may arise from the construction, operation and maintenance (O&M) and decommissioning activities of the Project. Potential receptors include the River Mersey, main rivers, ordinary watercourses, other surface waterbodies, groundwater bodies, Source Protection Zones (SPZs), groundwater and surface water discharges and abstractions, protected sites, the floodplain and people and properties at risk of flooding now and / or in the future.

19.1.2 This section of the Scoping Report describes the methodology to be used within the Environmental Impact Assessment (EIA), an overview of the baseline conditions within the Scoping Boundary (as defined in **Chapter 2: Site Context and Project Description**), the datasets to be used to inform the EIA, the potential likely significant effects to be considered, and how these will be assessed for the purpose of the EIA.

19.1.3 This chapter interfaces with many other chapters of the EIA, including:

- **Chapter 2: Site Context and Project Description** provides an overview of the Site, its environmental and social context and characteristics in addition to describing the main components of the Project. It also describes the key activities to be undertaken during the Project including the parameters, timescales and assumptions to be used as the basis of assessment.
- **Chapter 3: Approach to EIA** describes the principles and approach being taken throughout the scoping process.
- **Chapter 5: Coastal Processes** considers the potential likely significant effects on coastal processes (including changes in bathymetry, water levels, waves, currents, seabed geology and sediment transport) and on water and sediment quality that may arise from the construction, O&M and decommissioning activities of the Project.
- **Chapter 6: Benthic Ecology and Plankton** considers likely significant effects on biology of the estuary and how these effects will be influenced by the water quality and locations of riverine inputs.
- **Chapter 23: Geology and Ground Conditions** considers the potential likely significant effects on geology and ground conditions that may arise from the construction, O&M and decommissioning activities of the Project. The receptors

considered include human health, controlled waters and the environment and built environment, as well as the geological environment itself.

19.1.4 Overarching relevant legislation and policy context which has informed the scope of the assessment is outlined in **Chapter 4: Planning Policy,** with topic specific considerations outlined in **Appendix 4.1**.

19.1.5 The Environmental Statement will be supported by a Flood Risk Assessment (FRA). The scope of this is not discussed in detail herein but will be agreed with the relevant stakeholders during the process of the EIA and as the Project is refined.

19.1.6 A Water Framework Directive (WFD) Screening and Scoping Report which considers the offshore and estuarine elements of the proposed barrage has been undertaken and is included at **Appendix 3.4** to this EIA Scoping Report.

19.2 TECHNICAL GUIDANCE

19.2.1 Relevant technical guidance that has been used to define the assessment is set out in **Table 19-1**.

Table 19-1: Relevant technical guidance

Guidance reference	Relevance to the assessment
Planning Practice Guidance (PPG) Flood Risk and Coastal Change, 2022 (Department for Levelling Up, Housing and Communities, 2022).	Advises how to take account of and address the risks associated with flooding and coastal change in the planning process.
Planning Practice Guidance (PPG) Water Supply, Wastewater and Water Quality, 2019 (Department for Levelling Up, Housing and Communities, 2019).	Advises on how planning can ensure water quality and the delivery of adequate water and wastewater infrastructure.
Non-Statutory Technical Standards for Sustainable Drainage Systems, 2015 (Department for Environment, Food and Rural Affairs, 2015).	Non-statutory technical standards for the design, maintenance and operation of SuDS to drain surface water.

Guidance reference	Relevance to the assessment
Design Manual for Roads and Bridges (LA 113), 2020 (Highways England, Transport Scotland, Welsh Government and Department for Infrastructure, 2020).	Describes the requirements for assessment and management of the impacts projects can have on the water environment.
Construction Industry Research and Information Association (CIRIA) C532 Control of Water Pollution from Construction Sites, 2001 (CIRIA, 2001).	CIRIA C532 provides guidance on environmental good practice for the control of water pollution arising from construction activities and the effective methods of preventing its occurrence.

19.3 STUDY AREA

19.3.1 The Study Area for the Water Resources and Flood Risk chapter is defined as the likely reach of potential effects as a result of the Project and is based on professional judgement.

19.3.2 As the design and consultation processes progress and the Project is refined, the Study Area will also continue to evolve to accommodate any changes that are generated. As the Study Areas change, data collection will also be reviewed and updated.

19.3.3 The assessment of direct effects on surface water resources will include surface water features within and up to 0.5km from the Scoping Boundary (including the Mersey estuary). This distance is considered appropriate and proportionate for the assessment of direct effects (i.e. associated with overland migration of pollutants directly to surface features, pollutants conveyed in drainage systems, and works within a river channel) due to the relatively flat topography and upper soil filtration.

19.3.4 The assessment of indirect effects will include surface water features that have hydraulic connectivity with features within 1km from the Scoping Boundary. This includes watercourses and other water environment receptors that could be affected by pollutants conveyed by watercourses. The Study Area may need to be increased to 5km depending on the likely magnitude of the effect and sensitivity of receptors.

19.3.5 The Study Area encompasses groundwater features and groundwater abstractions up to 1km from the Scoping Boundary. This distance is appropriate and proportionate for the assessment of direct impacts from surface-borne pollutants migrating to groundwater features and groundwater flow and level changes. Groundwater receptors up to 3km distance from the Scoping Boundary are considered where hydraulic connectivity with the Project exists.

19.3.6 The Study Area for the assessment of flood risk and drainage will include all potential receptors (land and property) that could be at risk of increased flood risk as a result of the Project, typically up to 1km from the Scoping Boundary.

19.4 CONSULTATION

19.4.1 Statutory stakeholder consultation will be undertaken throughout the EIA and is anticipated to include, but is not limited to:

- Liverpool City Council;
- Sefton Council;
- Wirral Council;
- Cheshire West and Chester Council;
- Marine Management Organisation;
- The Environment Agency;
- Natural Resources Wales; and
- Natural England.

19.4.2 In addition, non-statutory stakeholder consultation will be undertaken with relevant bodies, for example, the Mersey Rivers Trust and the Mersey Estuary Conservation Group.

19.4.3 Initial meetings have been held (or are due to be held) with the majority of organisations listed above.

19.4.4 No meeting was requested from Sefton Council but key issues of interest to them include impact on coastal nature sites and designated species and the effect on coastal defence and erosion.

19.5 ASSESSMENT METHODOLOGY

19.5.1 The Project-wide approach to the assessment methodology is set out in **Chapter 3: Approach to EIA**. This will be implemented to assess the likely significant

effects on surface water and groundwater receptors from the construction, O&M, and decommissioning of the Project.

19.5.2 The approach to the assessment of the Project will be discussed and agreed through stakeholder consultation and with regard to relevant legislation and guidance.

Surface Water Features

19.5.3 Impacts on surface water features will be assessed qualitatively (and quantitively if deemed necessary, to be agreed during consultation) for the construction, O&M and decommissioning phases of the barrage and grid connection and the construction phase for the potential port facilities / key infrastructure areas. It will be informed by a desk-based study, consultation with the wider EIA team and with the relevant authorities.

Hydrogeology

19.5.4 The assessment of potential effects on groundwater will be undertaken qualitatively (and quantitively if deemed necessary, to be agreed during consultation) through reviewing publicly available information along with obtaining information on licenced and private (unlicensed) water abstractions within the Study Area. No site-specific ground investigation or groundwater monitoring will be undertaken to inform the groundwater assessment.

Flood Risk

19.5.5 Changes in flood risk during the construction, O&M and decommissioning phases of the barrage and grid connection and the construction phase for the potential port facilities / key infrastructure areas will be assessed qualitatively (and quantitively if deemed necessary, to be agreed during consultation) based on professional judgement and any necessary mitigation proposed. The assessment will also consider, from a strategic perspective, any anticipated temporary drainage solutions which will be implemented during the construction phase of the Project.

19.5.6 A standalone FRA will be prepared to support the ES in accordance with NPPF (Ministry of Housing Communities & Local Government, 2023). The FRA will investigate all potential sources of flooding considering the expected effect of climate change and assess the potential implications of the Project on flood risk to people and property, as well as assess the potential risk of flooding to the Project. The assessment will also consider, from a strategic perspective, any

anticipated temporary drainage solutions which will be implemented during the construction phase of the Project.

Water Framework Directive

19.5.7 Consultation with the Environment Agency will be undertaken to support the Preliminary Environmental Information Report (PEIR) and to confirm the need and methodology for a WFD Compliance Assessment, based on the WFD Screening and Scoping Report at **Appendix 3.4** of this report.

19.6 ASSESSMENT OF EFFECTS

19.6.1 The assessment will be undertaken following the principles set out within the Design Manual for Roads and Bridges (DMRB) LA 113 – Road Drainage and the Water Environment (Highways England, Transport Scotland, Welsh Government and Department for Infrastructure, 2020). Although DMRB LA 113 was developed for assessing potential impacts that road projects may have on the water environment, it does provide a suitable framework and basis to develop a consistent classification of sensitivity of potential water receptors, magnitude of impact and significance of effect and is generally considered as industry best practice.

Determining Sensitivity of Receptors

19.6.2 The criteria used to determine the sensitivity of each receptor is presented in **Table 19-2.** The method set out in the DMRB LA 113 provides guidance on assigning value (sensitivity) to receptors (for example watercourses and floodplains).

Table 19-2: Criteria for assigning value (sensitivity) to water environment receptors

Sensitivity of Receptor	Typical Criteria	Typical Examples
Very High	Nationally significant receptor of high sensitivity.	▪ Watercourse having a WFD classification shown in a River Basin Management Plan (RBMP) with Q95 >1m3/s; ▪ Site protected / designated under EU or UK habitat legislation (Special Area of Conservation (SAC), Special Protection Area (SPA), Site of Special Scientific Interest (SSSI), Ramsar site, salmonid water), or species protected by EC Legislation Ecology and Nature Conservation; ▪ Groundwater SPZ 1; ▪ Groundwater locally supports a Groundwater Dependent Terrestrial Ecosystem (GWDTE) or any other very significant feature; ▪ Principal aquifer providing a regionally important resource or protected site; and ▪ Essential infrastructure or highly vulnerable development.
High	Locally significant receptor of high sensitivity.	▪ Watercourse having a WFD classification shown in a RBMP with Q95 <1m3/s; ▪ Species protected under EC or UK Legislation Ecology and Nature Conservation; ▪ Groundwater SPZ 2; ▪ Groundwater supports a GWDTE or any other significant feature; ▪ Principal aquifer providing locally important resource or supporting a river ecosystem; and ▪ More vulnerable development.

Sensitivity of Receptor	Typical Criteria	Typical Examples
Medium	Moderate quality and rarity.	▪ Watercourse not having a WFD classification shown in a RBMP with Q95 >0.001m3/s; ▪ Aquifer providing water for agriculture or industrial use with limited connection to surface water; ▪ Groundwater SPZ 3; and ▪ Less vulnerable development.
Low	Lower quality.	▪ Watercourse not having a WFD classification shown in a RBMP with Q95 <0.001m3/s; ▪ Unproductive strata; and ▪ Water-compatible development.

Determining Magnitude of Impacts

19.6.3 The magnitude of an impact is estimated based on the potential size or scale of change compared to the baseline and is independent to the sensitivity of the receptor. The criteria used to determine the magnitude of impacts is taken from DMRB LA 113 and is presented in **Table 19-3**.

Table 19-3: Criteria for assigning impact magnitude

Level of Magnitude	Definition of Magnitude	Typical Examples
Major Adverse	Results in loss of receptor and / or quality and integrity of the receptor.	▪ Loss or extensive change to a fishery; ▪ Loss or extensive change to a designated nature conservation site; ▪ Loss of regionally important public water supply; ▪ Reduction in WFD classification; ▪ Loss of, or extensive change to an aquifer;

Level of Magnitude	Definition of Magnitude	Typical Examples
		▪ Potential high risk of pollution to groundwater from routine runoff; ▪ Loss of, or extensive change to GWDTE or baseflow contribution to protected surface water bodies; ▪ Loss or significant damage to major structures through subsidence or similar effects; ▪ A major increase in the likelihood, depth or extent of flooding as a consequence of the development (existing receptors) sufficient to put life at risk; and ▪ Increase in peak flood level (>100mm).
Moderate Adverse	Results in effect on integrity of receptor, or loss of part of receptor.	▪ Partial loss in productivity of a fishery; ▪ Degradation of regionally important public water supply or loss of major commercial / industrial / agricultural supplies; ▪ Contribution to reduction in WFD classification; ▪ Partial loss or change to an aquifer; ▪ Potential moderate risk of pollution to groundwater from routine runoff; ▪ Partial loss of the integrity of GWDTE; ▪ Damage to major structures through subsidence or similar effects or loss of minor structures; and ▪ Increase in peak flood level (>50mm).
Minor Adverse	Results in some measurable change in receptor's quality or vulnerability.	▪ Minor effects on water supplies; ▪ Potential low risk of pollution to groundwater from routine runoff; ▪ Minor effects on an aquifer, GWDTEs, abstractions and structures;

Level of Magnitude	Definition of Magnitude	Typical Examples
		▪ Measurable but limited in size or magnitude increase in the probability, depth or extension of flooding; and ▪ Increase in peak flood level (>10mm).
Negligible	Results in effect on receptor, but of insufficient magnitude to affect the use or integrity.	▪ The proposed project is unlikely to affect the integrity of the water environment; ▪ No measurable impact upon an aquifer and / or groundwater receptors; ▪ Negligible change in flood risk because of the Project (existing receptors) or negligible flood risk affecting receptors introduced as part of the Project; and ▪ Negligible change to peak flood level (≤ ±10mm).
Minor Beneficial	Results in some beneficial effect on receptor or a reduced risk of negative effect occurring.	▪ Reduction of groundwater hazards to existing structures; ▪ Reductions in waterlogging and groundwater flooding; and ▪ Measurable but limited in size or magnitude increase in the probability, depth or extension of flooding (existing receptors).
Moderate Beneficial	Results in moderate improvement of receptor quality.	▪ Contribution to improvement in WFD classification; ▪ Improvement in water body catchment abstraction management strategy classification; ▪ Support to significant improvements in damaged GWDTE; ▪ Some reduction in the likelihood, depth or extent of flooding because of the Project (existing receptors) which can reduce potential damage caused by flooding; and

Level of Magnitude	Definition of Magnitude	Typical Examples
		▪ Moderate reduction in discharge in sewerage network providing some improvement in capacity.
Major Beneficial	Results in major improvement of receptor quality.	▪ Improvement in WFD classification; ▪ Recharge of an aquifer; ▪ A major reduction in the likelihood, depth or extent of flooding because of the Project (existing receptors) sufficient to reduce risk to life; and ▪ Large reduction in discharge into the sewerage network freeing up significant capacity.
No Change		▪ No loss or alteration of characteristics, features or elements; no observable impact in either direction.

Determining Significance of Effects

19.6.4 The overall significance of the effect is based on the sensitivity of the receptor and the magnitude of the impact as shown in

19.6.5 **Table** 19-4.

19.6.6 Effects which are moderate or above will be considered to be significant.

Table 19-4: Determining significance of effect

Magnitude of Impact	Sensitivity of Receptor				
	Very High	High	Medium	Low	No Change
Very High	Major	Major	Major or Moderate	Moderate or Minor	Neutral
High	Major or Moderate	Major or Moderate	Major or Moderate	Minor	Neutral
Medium	Moderate or Minor	Moderate or Minor	Minor	Minor	Neutral
Low	Minor or Negligible	Minor or Negligible	Negligible	Negligible	Neutral

19.7 BASELINE CONDITIONS

DATA INFORMATION SOURCES

19.7.1 An initial desk-based review of publicly available data sources has been undertaken to determine the baseline characteristics and to inform the assessment process. Baseline information has been collated from the following sources:

- Environment Agency's online Catchment Data Explorer (Environment Agency, 2024a);
- Environment Agency's Flood Map for Planning (Environment Agency, 2024b);
- Environment Agency's Long Term Flood Risk Mapping (Environment Agency, 2024c);
- Environment Agency's Recorded Flood Outlines Map (Environment Agency, 2024d);
- Environment Agency's online AIMS Spatial Flood Defences Database (Environment Agency, 2024e);
- Environment Agency's Northwest River Basin Management Plan (Environment Agency, 2022);
- Ordnance Survey Mapping (Microsoft, 2024);
- DEFRA 'Magic Map' online (DEFRA Magic Maps, 2024);

- British Geological Survey (BGS) GeoIndex online database (British Geological Survey, 2024);
- Google maps, Aerial Imagery (Google Maps, 2024);
- National Library of Scotland, Historical Mapping (National Library of Scotland, 2024);
- Flood Estimation Handbook Web Service (UK Centre for Ecology and Hydrology Flood Estimation Handbook Web Service, No Date);
- Cheshire West and Chester Council Strategic Flood Risk Assessment (JBA Consulting, 2016);
- Cheshire West and Chester Council Preliminary Flood Risk Assessment (Cheshire West and Chester Council, 2011);
- Cheshire West and Chester Council Local Flood Risk Management Strategy (Cheshire West and Chester Council, 2016);
- Liverpool City Region Combined Authority Strategic Flood Risk Assessment Part A (Liverpool City Region Combined Authority, November 2023);
- Liverpool City Council Preliminary Flood Risk Assessment (Liverpool City Council, 2011);
- Liverpool City Council Local Flood Risk Management Strategy (Liverpool City Council Local Flood Risk Management Strategy, No Date);
- Liverpool City Council Parks and Greenspaces (Liverpool City Council, 2024);
- Wirral Council Strategic Flood Risk Assessment (Wirral Council, 2019);
- Wirral Council Preliminary Flood Risk Assessment (Wirral Council, 2017);
- Wirral Council Local Flood Risk Management Strategy (Wirral Council, 2016);
- Wirral Council Sites of Biological Importance (Wirral Council, 2017);
- Sefton Council Strategic Flood Risk Assessment (Sefton Council, 2013);
- Sefton Council Preliminary Flood Risk Assessment (Sefton Council, 2011);
- Sefton Council Local Flood and Coastal Erosion Risk Management Strategy (Sefton Council, 2022);
- Mersey Estuary Catchment Flood Management Plan (CMFP) (Environment Agency, 2009); and
- Towards a Spatial Development Strategy for the Liverpool City Region up to 2040 (Liverpool City Region Combined Authority, 2023).

EXISTING BASELINE - TIDAL BARRAGE DEVELOPMENT AREA AND POTENTIAL PORT FACILITIES AND KEY INFRASTRUCTURE AREAS

19.7.2 This section describes the present conditions which constitute the existing baseline environment for flood risk and water resources within the Tidal Barrage Development Area and potential port facilities / key infrastructure areas which could be utilised during the construction phase. To avoid duplication of information, features located outside of the Tidal Barrage Development Area and potential port facilities / key infrastructure areas but within the Study Areas described in Section 19.4 are included in Existing Baseline – Grid Connection.

19.7.3 The riverine and canal systems feeding into the Mersey Estuary are also described as these provide sources of nutrients which support biological growth in the Mersey Estuary and assessment of effects of the proposed Barrage in **Chapter 6: Benthic Ecology and Plankton** will require baseline data on flows and water quality in these rivers and canals.

19.7.4 The urban nature of several of these catchments results in some rivers carrying significant nutrient loads and the presence or artificial waterways such as the Manchester Ship Canal results in multiple potential points of entry of these nutrients to the Mersey Estuary. For example, parts of the River Irwell and the River Mersey flow along the Manchester Ship Canal between Manchester and Rixton Junction, from where river flows can enter the estuary via the River Mersey and Howley Weir or via the Canal and Weaver Sluices or Eastham Locks. The River Irwell section of the Canal receives treated sewage discharges from Davyhulme Waste Water Treatment Works, which serves over one million people in the Manchester area.

Surface Water Features

19.7.5 The Tidal Barrage Development Area encompasses a 15km stretch of the Mersey Estuary from immediately inland of Eastham Locks (south bank) and Garston Docks (north bank) to its mouth. The River Mersey starts in Stockport at the confluence of the River Goyt, which flows from the Peak District in the North West of England, and the River Tame, which flows from the Pennines to the east of Manchester. It flows westwards through south Manchester and at Irlam flows into the Manchester Ship Canal which is the canalised section of the River Irwell. The River Irwell flows from its source in the Pennines through the centre of Manchester to enter the Mersey at Irlam. From Irlam to Rixton the River Mersey flows along the Manchester Ship Canal and at Rixton Junction the River Bollin enters the canal from the south, while the Mersey leaves the canal to the north and flows on through Warrington to the head of the estuary at Howley Weir. The

Manchester Ship Canal continues separately along the south bank of the estuary and enters the estuary at Eastham Locks. The River Weaver joins the Manchester Ship Canal downstream of Runcorn but upstream of Eastham, with surplus water entering the Mersey via the Weaver Sluices.

19.7.6 The Mersey Estuary stretches from the upper tidal limit of Howley Weir in Warrington to the sea. West of Warrington the estuary widens, and then narrows as it passes through the Runcorn Gap between the towns of Runcorn and Widnes, in Halton. Seaward of the Runcorn Gap, the estuary widens to a maximum of approximately 5km before its exit to the Irish Sea via the narrows between Liverpool and Birkenhead. The Mersey is a tidal riverine estuary with the second highest tidal range in the UK of up to 10.37m.

19.7.7 From Rixton Junction, a small (ungauged) flow of water from the Rivers Mersey and Bollin passes down the Manchester Ship Canal via Latchford Locks. At Weaver Sluices this flow merges with flow from the River Weaver and the combined flow is mostly discharged to the Mersey Estuary via the Weaver Sluices. A small (ungauged) flow continues down the Manchester Ship Canal and is discharged to the estuary at Eastham Locks, both through lock operation and operation of a small hydropower plant.

19.7.8 Other main rivers (as defined by the Water Resources Act ,1991) discharging to the Mersey Estuary include Ditton Brook and Sankey Brook on the north bank and The Birket, Dibbinsdale Brook, Rivacre Brook, River Gowy and Hoolpool Gutter on the south bank (the last three passing beneath the Manchester Ship Canal via culverts).

19.7.9 The locations of the watercourses described above and their links with the Mersey Estuary are shown in **Figure 5.3**.

19.7.10 Main rivers that discharge into the Mersey Estuary within the Tidal Barrage Development Area and potential port facilities / key infrastructure areas include the Dibbinsdale Brook and the Birket. These rivers have several attributes that could be affected by the Project, including water quality and flow conveyance. They also support several services, including water supply, receipt and dilution of wastewater discharge, navigation and amenity.

19.7.11 In addition, many smaller watercourses and drainage ditches that function at a local scale drain to the Mersey Estuary. In some areas, these features are managed to facilitate land drainage and reduce flood risk.

19.7.12 Water quality in the River Mersey has been severely affected by industrialisation in the region. The Environment Agency's online Catchment Data Explorer (Environment Agency, 2024a) shows that the Tidal Barrage Development Area sits within the North West TrAC Management Catchment and the Mersey Estuary Operational Catchment. The Mersey Water Body (Water Body IDGB531206908100) has a water body type of transitional water and a hydromorphological designation of heavily modified. It currently has a 'moderate' ecological potential and 'fail' chemical status.

19.7.13 The Tidal Barrage Development Area is adjacent to the Mersey Mouth WFD coastal water body (Water Body ID: GB641211630001) which has a hydromorphological designation of heavily modified. It currently has a 'moderate' ecological potential and 'fail' chemical status. Further details on the WFD are available in the WFD Screening and Scoping Report at **Appendix 3.4**.

19.7.14 While the Tidal Barrage Development Area itself does not include any surface freshwater water bodies, there are tributary freshwater water bodies which flow into the Mersey Estuary within the Ditton, Glaze, Gowy, Sankey, Weaver Lower and Wirral Operational Catchments.

19.7.15 The potential port facilities / key infrastructure area at Wirral Waters sits within the Mersey Lower Management Catchment, the Wirral Operational Catchment and the Birket including Arrow Brook and Fender Water Body (Water Body IDGB531206908100). It is classed as a river and has a hydromorphological designation of heavily modified. It has a 'moderate' ecological potential and 'fail' chemical status.

19.7.16 The following protected areas are located within the Tidal Barrage Development Area and potential port facilities / key infrastructure areas:

- The Mersey Narrows and North Wirral Foreshore is of national and international importance as a designated SSSI, SPA, SAC and RAMSAR site;
- The Mersey Estuary is a designated RAMSAR, SSSI and SPA site;
- New Ferry SSSI; and
- Liverpool Bay SPA.

19.7.17 There is currently limited information available on permitted discharges or licensed abstractions to / from controlled surface waters within the Project Area. Further details of permitted discharges to surface waters and licenced and private surface water abstractions will be collected to inform the PEIR and ES assessments.

19.7.18 The Tidal Barrage Development Area and potential port facilities / key infrastructure areas are not located within a Drinking Water Safeguard Zone (surface water or groundwater).

Flood Risk

19.7.19 The Environment Agency's Flood Map for Planning (Environment Agency, 2024b) and Long-Term Flood Risk mapping (Environment Agency, 2024c) were viewed to assess the flood risk to the Tidal Barrage Development Area and potential port facilities / key infrastructure areas which could be utilised during the construction phase.

19.7.20 The NPPF (Ministry of Housing Communities and Local Government, 2023) categorises fluvial and tidal flood risk as follows:

- Zone 1 (low probability) is assessed as having less than a 1 in 1,000 annual probability of river or sea flooding (<0.1%);
- Zone 2 (medium probability) is assessed as having between a 1 in 100 and 1 in 1,000 annual probability of river flooding (1% to 0.1%), or between a 1 in 200 and 1 in 1,000 annual probability of sea flooding (0.5% to 0.1%) in any year; and
- Zone 3 (high probability) is assessed as having a 1 in 100 or greater annual probability of river flooding (>1%), or a 1 in 200 or greater annual probability of flooding from the sea (>0.5%) in any year.

19.7.21 The Environment Agency's Flood Map for Planning (Environment Agency, 2024b) shows that the Tidal Barrage Development Area is located within Flood Zone 3.

19.7.22 The potential port facilities / key infrastructure areas located adjacent to the Tidal Barrage Development Area are located in Flood Zones 1, 2 and 3 with the exception of Port Sunlight which is located entirely within Flood Zone 1.

19.7.23 The EA's AIMS dataset (Environment Agency, 2024e) indicates that the Tidal Barrage Development Area and potential port facilities / key infrastructure areas benefit from fluvial and tidal flood defences consisting of engineered high ground and natural high ground. These defences stretch along the whole of the right bank of the River Mersey (when facing downstream) within the Scoping Boundary and from the Manchester Ship Canal to the Seacombe ferry terminal on the left bank.

19.7.24 The Environment Agency's Surface Water Flood Map (Environment Agency, 2024c) describes the surface water flood risk levels as follows:

- Very Low Risk – area having less than 0.1% chance of flooding each year;
- Low Risk – area having between 0.1% and 1% chance of flooding each year;
- Medium – area having between 1% and 3.3% chance of flooding each year; and
- High – area having more than 3.3% chance of flooding each year.

19.7.25 It indicates that the Tidal Barrage Development Area and potential port facilities / key infrastructure areas predominantly have a very low risk of surface water flooding. Most of the surface water flow routes and ponding within the potential port facilities / key infrastructure areas can be attributed to small watercourses, drainage ditches, surface water runoff from highways, local depressions, or flow directly into nearby watercourses.

19.7.26 The Environment Agency's Flood Risk from Reservoirs Map (Environment Agency, 2024c) shows that the River Mersey is not at risk from reservoir flooding when river levels are normal but is at risk from reservoir flooding when there is also flooding from rivers, specifically from the Torside, Woodhead and Rhodeswood reservoirs. The risk is based on a worst-case scenario for the area that could be flooded if a reservoir were to fail and release the water it holds. It is noted that reservoir flooding is unlikely to occur due to the monitoring and maintenance of reservoirs and dams.

19.7.27 Information on flood risk from groundwater has been sourced from a review of Liverpool City Council's PFRA (Liverpool City Council, 2011) and Wirral Council's PFRA (Wirral Council, 2017). They show that some of the Tidal Barrage Development Area and potential port facilities / key infrastructure areas lie within an area susceptible to groundwater flooding. Generally, within the area, groundwater levels are rising due to a significant reduction in industrial abstraction with the decline of industry, and as a result of increased rainfall events associated with climate change.

19.7.28 The EA's recorded flood outlines from previous flood events (Environment Agency, 2024d) shows that there have been two instances of flooding within the Scoping Boundary from tidal or coastal sources:

- Flooding at New Brighton on the 05 December 2013 from the sea overtopping defences; and

- Mere tidal flooding along the Dell and the Esplanade on 31 January 2002 to 01 February 2002 from the River Mersey overtopping defences.

Hydrogeology

19.7.29 The main characteristics of the geology (superficial and bedrock) that underlies the Project are described in **Chapter 23: Geology and Ground Conditions**, which considers published information where no site-specific ground investigation (GI) data are available.

19.7.30 The Tidal Barrage Development Area and potential port facilities / key infrastructure areas are underlain by superficial Tidal Flat Deposits which have been classified as a 'Secondary Undifferentiated' aquifer to the southeast, and 'Unproductive' within most of the Tidal Barrage Development Area. Changes in aquifer classifications are due to different periods / years of mapping by the BGS. Below the superficial deposits is the Sherwood Sandstone Group (SSG) bedrock aquifer, classified as a 'Principal' aquifer. Borehole logs from the BGS GeoIndex (British Geological Survey, 2024) indicate that the Tidal Flat Deposits are likely to be 6 to 14m in thickness within the Study Area.

19.7.31 The Groundwater Vulnerability Map (DEFRA Magic Maps, 2024) shows that the Tidal Barrage Development Area and potential port facilities / key infrastructure areas have been classified overall as having a range of medium to high groundwater vulnerabilities. There are some small areas designated as low groundwater vulnerability, slightly to the north of Birkenhead in the area of the Wirral Waters facility. A small area of the Tidal Barrage Development Area, Wirral Waters and the Cammell Laird facilities are situated within a groundwater Source protection Zone (SPZ) Zone 3 – Total Catchment. This zone is defined as the total area needed to support the abstraction or discharge from the protected groundwater source and is not defined by any particular travel time to the abstraction.

19.7.32 Groundwater levels in the superficial deposits were identified in several borehole records (British Geological Survey, 2024), at approximately 3 to 9 metres below ground level (mBGL) or -2.3 to 3.5 metres Above Ordnance Datum (mAOD). The prevailing groundwater flow direction is assumed to be towards the Mersey Estuary.

19.7.33 Information regarding private groundwater abstractions were not available for this scoping study, however will be requested from local authorities for the purposes of the PEIR and ES. Further information regarding licenced abstractions will also be requested from the Environment Agency.

19.7.34 Two GWDTE are located in the vicinity of the Tidal Barrage Development Area and potential port facilities / key infrastructure areas. These are the Brothern Park and Dibbinsdale Local Nature Reserve (SSSI located 1.4km south east) and the Crosby Foreshore (SSSI located 2km north). The presence of GWDTE will be established by ecological surveys.

19.7.35 No springs have been identified on Ordnance Survey map records (Microsoft, 2024).

19.7.36 The Environment Agency's Catchment Data Explorer (Environment Agency, 2024a) shows that the Tidal Barrage Development Area and potential port facilities / key infrastructure areas are located within two WFD groundwater bodies:

- Areas to the west, on the Wirral side of the Mersey Estuary are located within the Wirral and West Cheshire Permo-Triassic Sandstone Aquifers Groundwater Body (Water Body ID GB41101G202600). It has an overall water body status of 'poor' with 'good' quantitative status and 'poor' chemical status.
- Areas to the east, on the Liverpool side of the Mersey Estuary are located within the Lower Mersey Basin and North Merseyside Permo-Triassic Sandstone Aquifers Water Body (Water Body ID GB41201G101700). It has an overall water body status of 'poor' with 'poor quantitative status and 'poor' chemical status.

EXISTING BASELINE - GRID CONNECTION

19.7.37 There are four potential grid connection points located at Birkenhead, Capenhurst, Lister Drive and Breck Road Substation.

19.7.38 To the west of the Tidal Barrage Development Area, potential grid connections include Breck Road Substation, Birkenhead or Capenhurst substations, crossing over the borough of the Wirral and possibly into the borough of Cheshire West and Chester (in the case of Capenhurst).

19.7.39 Should the grid connection be made to the east of the Tidal Barrage Development Area into Lister Drive, the route and location of the grid connection will be predominantly urbanised.

Surface Water Features

19.7.40 The proposed grid connection to Birkenhead is adjacent to the Mersey Estuary in the north. Details of the Mersey Estuary are described above in the existing baseline for the Tidal Barrage Development Area.

19.7.41 In addition to the Mersey Estuary, the proposed grid connection to Birkenhead crosses the following Environment Agency designated main rivers (in order from north to south):

- An unnamed tributary of the Birket (north of the M53 near Bidston Golf Club);
- The Birket;
- The River Fender;
- Prenton Brook;
- Dibbinsdale Brook; and
- An unnamed drain ultimately flowing into Dibbinsdale Brook.

19.7.42 The proposed grid connection to Capenhurst is also located adjacent to the Mersey Estuary and crosses the Dibbinsdale Brook (also known as the River Dibbin).

19.7.43 The Rivacre Brook and Clatter Brook are designated as main rivers by the Environment Agency and sit within the 1km buffer zone of the potential grid connections to the west of the Mersey Estuary.

19.7.44 There are six named ordinary watercourses within the Grid Connection Development Area to the west of the Mersey Estuary:

- Hargrave Brook;
- Stanney Brook;
- Raby Brook;
- Thornton Brook;
- Brimstage Brook; and
- Storeton Brook.

19.7.45 The proposed grid connection Breck Road Substation is also located adjacent to the Mersey Estuary. There are no main rivers within the Development Area for the Breck Road Substation.

19.7.46 The proposed grid connection Lister Drive is also located adjacent to the Mersey Estuary, although on the eastern side.

19.7.47 There are no main rivers within the Development Area for the Lister Drive connection, as this is predominantly within Liverpool City Centre. There are also very few ordinary watercourses located within the city centre, or within the Study Area. There is, however, the Leeds and Liverpool Canal, managed by the Canal and River Trust.

19.7.48 Within the potential Grid Connection Development Area, there are many small drain systems or unnamed watercourses, that flow for a short distance before acting as tributaries to the main rivers and ordinary watercourses listed above.

19.7.49 There are also many small ponds located within the Grid Connection Development Area.

19.7.50 The following ponds / lakes are named and / or appear within Wirral Council's Sites of Biological Importance (Wirral Council Sites of Biological Importance, 2017), although this is not an exhaustive list of all ponds / lakes within the site boundary:

- Marine Lake;
- Ponds within Bidston Moss Park;
- Ponds within Birkenhead Park;
- Raby Mere;
- Benty Heath Lane Ponds;
- Willaston Copse;
- Thornton Hough Ponds;
- Thornton Common;
- Bromborough Golf Course Ponds; and
- Ponds within 'David's Rough'.

19.7.51 Within Liverpool City Centre, there are further small ponds / lakes. Liverpool City council lists the following parks in Liverpool as having angling lakes:

- Calderstones Park;
- Greenbank Park;
- Larkhill Gardens;

- Newsham Park;
- Princes Park;
- Sefton Park;
- Stanley Park; and
- Walton Hall Park.

19.7.52 The Environment Agency's online Catchment Data Explorer (Environment Agency, 2024a) shows that the Breck Road Substation, Birkenhead and Capenhurst Grid Connection Development Areas sit within the WFD Wirral Operational Catchment, and is covered by three water bodies:

- The Birket including Arrowe Brook and Fender Water Body (Water Body ID GB112068060530) is classed as a river and has a hydromorphological designation of heavily modified. It has a 'moderate' ecological status and 'fail' chemical status;
- The Dibbinsdale Brook and Clatter Brook Water Body (Water Body ID GB112068060270) is classed as a river and is not designated artificial or heavily modified. It has a 'poor' ecological status and 'fail' chemical status; and
- Rivacre Brook Water Body (Water Body IDGB112068060350) is classed as a river and has a hydromorphological designation of heavily modified. It has a 'moderate' ecological status and 'fail' chemical status.

19.7.53 The Environment Agency's online Catchment Data Explorer (Environment Agency, 2024a) shows that the Lister Drive Grid Connection Development Area sits within the WFD Ditton Operational Catchment. It do not sit within any specific water body catchments.

19.7.54 The following statutory protected areas are located within the Grid Connection Development Area:

- The Mersey Estuary is a Ramsar Site, SPA and SSSI, as noted within the Tidal Barrage Development Area and potential port facilities / key infrastructure areas baseline section above;
- The Mersey Narrows and North Wirral Foreshore is a SSSI, SPA, SAC and RAMSAR site;
- Dee Estuary SAC;
- Hallwood Farm Marl Pit SSSI;

- Dibbinsdale SSSI;
- North Wirral Foreshore SSSI; and
- New Ferry SSSI.

19.7.55 There is currently limited information available on licensed discharges or abstractions to / from controlled surface waters within the Grid Connection Development Area. Further details of consented discharges to surface waters and licenced and private surface water abstractions will be collected to inform the PEIR and ES assessments.

Flood Risk

19.7.56 The Environment Agency's Flood Map for Planning (Environment Agency, 2024b) shows that the Breck Road Substation, Birkenhead and Capenhurst potential grid connection routes interact with Flood Zone 3 at various locations:

- Along the Mersey Estuary and adjacent to Liverpool Bay;
- At the north of the Birkenhead grid connection alignment, associated with the unnamed tributary of the Birket, the Birket itself and the River Fender between Wallasey and Leasowe;
- Where the Project crosses the River Fender as it is culverted beneath the M53;
- Where the Project crosses Brimstage Brook along Brimstage Road;
- Where the Project crosses Thornton Brook;
- Where the Project crosses Raby Brook;
- Where the Project crosses the Dibbinsdale Brook; and
- Where the Project crosses the River Dibbin.

19.7.57 The Flood Map for Planning (Environment Agency, 2024b) shows that the Lister Drive potential grid connection route does not interact with Flood Zone 3 at any location, with the exception of the Mersey and the flood risk associated with the docks along the Mersey.

19.7.58 The EA's AIMS dataset (Environment Agency, 2024e) shows the location of flood defences within the Project and includes:

- Areas defended by embankments and engineering high ground are present along both the unnamed tributary of the Birket and along the Birket;
- Small sections of flood wall are present along the Birket; and

- The River Fender is classed as defended for its entire length within the Study Area, including both crossing locations, by a combination of natural high ground and engineered high ground.

19.7.59 As noted within the tidal barrage section above, there are also flood defences stretching along the whole of the right bank of the River Mersey within the Scoping Boundary and from the Manchester Ship Canal to the Seacombe ferry terminal on the left bank. These defences consist of engineered and natural high ground.

19.7.60 The Environment Agency's Surface Water Flood Map (Environment Agency, 2024c) shows that the potential Birkenhead and Capenhurst Grid Connection Development Areas generally have a very low risk of surface water flooding. However, there are several surface water flow routes, the majority of which are either related to small watercourses, surface water runoff from highways, or flow directly into nearby watercourses. There does not appear to be any large areas of surface water pooling within the Study Area.

19.7.61 The Lister Drive Grid Connection Development Area contains significantly more areas at risk of surface water flooding, as a result of the urban nature of Liverpool City Centre. The majority of streets within the city have some form of surface water flooding, with water generally flowing southwest towards the Mersey. There are also several areas where flow paths converge and indicate the potential for pooling, particularly at parks or recreational areas and especially where pools are also present.

19.7.62 The Environment Agency's Flood Risk from Reservoirs Map (Environment Agency, 2024c) shows that the Mersey Estuary is not at risk from reservoir flooding when river levels are normal but is at risk from reservoir flooding when there is also flooding from rivers, as detailed in the Tidal Barrage Development Area baseline section above.

19.7.63 Both the River Fender and the Birket are shown to be at risk from reservoir flooding when river levels are normal from the Crosshill No.1 reservoir. There is an area of reservoir flood risk when river levels are normal at Sutton Bridge from the Sutton Hall reservoir. Despite this risk, both Cheshire West and Chester and Wirral Councils note that reservoirs in the UK have an extremely good safety record with no incidents resulting in the loss of life since 1925.

19.7.64 Liverpool City Centre is shown to be at risk from Kensington No.3 reservoir when river levels are normal. Again, Liverpool City Region Combined Authority note that there have been no incidents resulting in the loss of life since 1925.

19.7.65 The Cheshire West and Chester Council Strategic Flood Risk Assessment (SFRA) (Cheshire West and Chester, 2016) indicates that the Grid Connection Development Area has a very low susceptible to groundwater flooding. In contrast, Wirral Council's PFRA (Wirral Council, 2017) shows that some of the Study Area is within an area susceptible to groundwater flooding.

19.7.66 The Liverpool City Region Combined Authority SFRA (2023) notes that due to the relatively low-lying topography of the Liverpool City Region, large areas of land are at risk of groundwater emerging at the ground surface and flooding surface assets. The majority of the Study Area to the west of the Mersey is classified as Gridcode 3. Within this zone there is a risk of groundwater flooding to surface and subsurface assets. There is the possibility of groundwater emerging at the surface locally. There are also small areas classified as Gridcode 2, where there is a risk of flooding to subsurface assets but surface manifestation of groundwater is unlikely.

19.7.67 Environment Agency mapping (Environment Agency, 2024d) shows recorded flood outlines from previous flood events. There are seven instances of historic flooding within the Grid Connection Development Area from fluvial or coastal sources:

- Sea flooding along the north coast of the Wirral, bordering the grid connection route, on 5 December 2012;
- Three areas of main river fluvial flooding from the River Fender near where it joins the Birket, south of Leasowe on 23 September 2012;
- One instance of main river fluvial flooding from the River Fender on the North Cheshire Trading Estate, within the Study Area and bordering the grid connection route on the 5 / 6 September 2008;
- One instance of ordinary watercourse fluvial flooding to the east of the Sutton Bridge Substation on 26 August 2023; and
- One instance of local drainage / surface water flooding in Hooton on 20 January 2021.

19.7.68 There are no recorded flood events in Liverpool City Centre on the Environment Agency mapping.

19.7.69 Wirral Council's SFRA (Wirral Council, 2019) includes recorded flood incidents from United Utilities and Welsh Water. The northern end of the Gird Connection Development Area generally has more recorded incidents, with between 300 - 361 incidents. The southern end of the Grid Connection Development Area has

fewer recorded incidents (between 131 - 200 incidents). The exact locations or details of these flooding incidents are not recorded.

19.7.70 Wirral Council's PFRA (Wirral Council, 2017) and Cheshire West and Chester Council PFRA (Cheshire West and Chester Council, 2011) also show records of historic flooding across the Council's area, and includes several sewer, surface water and fluvial flooding records within the vicinity of the of the Grid Connection Development Area. Exact details of each event are not available.

19.7.71 The Liverpool City Region Combined Authority SFRA (2023) adds that surface water flooding has been recorded to have previously occurred across the City Region, including in heavily urbanised areas such as Liverpool City Centre. Exact details and dates are not provided.

Hydrogeology

19.7.72 The main characteristics of the geology (superficial and bedrock) that underlies the Project are described in **Chapter 23: Geology and Ground Conditions** which considers published information where no site-specific GI data are available.

19.7.73 The proposed Grid Connection Development Area is underlain by superficial Tidal Flat and Devensian Till Deposits of Devensian age which have both been classified as 'Secondary Undifferentiated' aquifers. Also, within the Grid Connection Development Area just south of the centre of Liverpool, Shirdley Hill Sands Formation of Devensian age are present, which have been classified as a 'Secondary A' aquifer. To the northwest of the Grid Connection Development Area at Wallasey, Tidal Flat Deposits of Quaternary age are present, and have been classified as a 'Secondary A' aquifer. To the very north of the Scoping Boundary at Litherland, Blown Sand deposits of Quaternary age are present and have also been classified as a 'Secondary A' aquifer. Below the superficial deposits are the Sherwood Sandstone Group (SSG) and Mercia Mudstone Group (MMG) bedrock aquifers, classified as 'Principal' and 'Secondary B' aquifers respectively. Borehole logs from the BGS GeoIndex (British Geological Survey, 2024) indicate that the superficial deposits are likely to be 4 to 25m in thickness within the Study Area.

19.7.74 The Groundwater Vulnerability Map (DEFRA Magic Maps, 2024) shows that the proposed Grid Connection Development Area has been classified as having a range of low to high groundwater vulnerabilities, depending on the presence of overlying superficial deposit, i.e. till characterised as having medium-low vulnerability, tidal flat deposits are generally medium vulnerability. Notable areas

which indicate high groundwater vulnerability (Central Liverpool, south-east of Bidston, east of Bebington, New Brighton and Raby) relates to the SSG outcropping with no Superficial deposit coverage. A small area to the west of the Scoping Boundary at Upton indicates a low groundwater vulnerability relating to the MMG outcropping with no superficial coverage. There are four groundwater SPZ Zone 1, and also Zones 2 and 3 to the western side of the Mersey Estuary, and a SPZ Zone 3 to the east, within the Grid Connection Development Area.

19.7.75 Groundwater levels in the superficial deposits were identified in several borehole records (British Geological Survey, 2024), at approximately 10 to 28 mBGL or 12.27 to 75.25 mAOD. Groundwater flow direction is assumed to be towards the Mersey Estuary.

19.7.76 Information regarding private groundwater abstractions were not available for this scoping study, however it will be requested from local authorities for the purposes of the ES. Further information regarding licenced abstractions will also be requested from the Environment Agency.

19.7.77 The Brothern Park and Dibbinsdale Local Nature Reserve (SSSI and GWDTE) are located within the Project Area. The Crosby Foreshore (SSSI) sits adjacent to the north of the Grid Connection Development Area. The presence of GWDTE will be established by ecological surveys.

19.7.78 No springs have been identified on Ordnance Survey map records (Microsoft, 2024).

19.7.79 Areas to the west, on the Wirral side of the Mersey Estuary are located within the Wirral and West Cheshire Permo-Triassic Sandstone Aquifers Groundwater Body (Water Body ID GB41101G202600). It has an overall water body status of ‘poor’ with ‘good’ quantitative status and ‘poor’ chemical status.

19.7.80 Within this groundwater body, the proposed Birkenhead Grid Connection passes through a Groundwater Drinking Water Safeguard Zone (Zone ID: GWSGZ0059, Prenton). The Drinking Water Safeguard Zone is within the Greater Manchester, Merseyside and Cheshire Environment Agency Water Management Area.

19.7.81 Areas to the east, on the Liverpool side of the Mersey Estuary are located within the Lower Mersey Basin and North Merseyside Permo-Triassic Sandstone Aquifers Water Body (Water Body ID GB41201G101700). It has an overall water body status of ‘poor’ with ‘poor quantitative status and ‘poor’ chemical status.

19.7.82 There are no other groundwater Drinking Water Safeguard Zones, nor are there any Surface Water Drinking Water Protected Areas or Surface Water Drinking Water Safeguard Zones.

19.8 FUTURE BASELINE

19.8.1 The most likely change in the future baseline condition is associated with the potential effects of climate change.

19.8.2 The Environment Agency provide guidance on a range of potential climate change allowances (Environment Agency, 2022) to be considered when assessing flood risk, including sea level allowances, peak river flows and peak rainfall intensity. The allowances that apply are dependent on the relevant river basin district / management catchment, the lifetime of the development and the receptor being assessed.

19.8.3 The Environment Agency provides a range of allowances for each river basin district and epoch for sea level rise which are based on percentiles with the higher central allowance based on the 70th percentile and the upper end allowance based on the 95th percentile. The Project is located within the North West river basin district which is anticipated to have a cumulative rise in sea level between 2000 and 2125 of 1.01m for the higher central allowance and 1.41m for the upper end allowance.

19.8.4 With respect to peak river flows, the Project is located within the Lower Mersey Management Catchment. In this region it is predicted that by the 2080s peak river flows could increase by 44% (central allowance), 57% (higher allowance) and 90% (upper allowance). This may increase the frequency of flood risk to identified receptors and increase the extent of Flood Zones 2 and 3, resulting in a greater area being at risk of fluvial flooding.

19.8.5 Peak rainfall intensity is also increasing as a result of climate change, which could potentially further increase the risk of surface water flooding to the Project. The Environment Agency provides guidance on the central and upper end allowances dependant on the management catchment. The Project is located within the Lower Mersey Management Catchment. The total potential change anticipated up to the 2070s for the 1% annual exceedance rainfall event is 30% (central allowance) and 45% (upper end allowance).

19.8.6 Climate change is also expected to affect groundwater levels of the aquifers in particular in the proximity to the surface water features which could result in an increased seasonal range of water levels and has the potential to increase the

groundwater flood risk. Qualitative consideration will be given to this within the assessment.

19.8.7 The barrage will be designed to account for climate change and include flood resilience measures. During the O&M phase, the barrage will be able to manage flood events and surges within the Mersey Estuary, both upstream and downstream by active pumping or sluicing either with or without generation through the turbines. This will be assessed in the FRA. In addition, climate change will be considered in the design of any proposed surface water drainage system.

19.8.8 The WFD is also likely to affect the future baseline of surface water and groundwater receptors. The WFD requires all waterbodies (including surface water and groundwater) to achieve 'good' overall status, or to experience no deterioration in status or potential status. It is expected that the WFD legislation will drive future improvements in the ecological and chemical quality of water bodies. The effects of the implementation of future cycles of RBMPs would therefore also be considered when assigning value to hydrology and land drainage resources.

19.8.9 The effects of known future development that share the same hydrological catchments as the Project would also be considered, in terms of the potential for these developments to impact on the status of water receptors.

19.9 BASIS FOR SCOPING ASSESSMENT

19.9.1 The Water Resources and Flood Risk environment scoping assessment is based on the following key assumptions which are also set out in **Chapter 2: Site Context and Project Description**:

- The tidal barrage will be a permanent structure across the channel of the Mersey Estuary, extending between the right and left banks, and will still allow the natural flow of the Estuary during any tidal cycle;
- The barrage will be a partially submerged structure, with the vast majority of the structure beneath the water level and into the estuary bed;
- No new port facilities will be constructed. Existing port facilities will be utilised for temporary construction laydown and compounds as required;
- The grid connection will be an underground cable for the entirety of the route from the tidal barrage to the point of connection, whichever route is progressed or require reinforcement / restringing upon the existing overhead routes to the existing point of connection; and

- All facilitating infrastructure (such as compounds) and works required for the installation of the grid connections would be confined within the 1km buffer.

19.10 EMBEDDED ENVIRONMENTAL MEASURES

19.10.1 Embedded mitigation measures have been identified and are proposed to be adopted as part of the evolution of the Project design (embedded into the Project design). These measures will evolve over the development process as the EIA progresses and in response to consultation. They will be fed iteratively into the assessment process. These measures typically include those that have been identified as good or standard practice and include actions that would be undertaken to meet existing legislation requirements.

19.10.2 As there is a commitment to implementing these environmental measures, and also to various standard sectoral practices and procedures, they are considered inherently part of the design of the Project and have, therefore, been considered in the scoping assessment.

19.10.3 In addition to the specific embedded mitigation measures relevant to the water environment listed in **Table 19-5** consultation will be undertaken with all relevant consultees such as the Environment Agency and LLFAs to address any concerns or issues.

19.10.4 A Schedule of Commitments will be presented as part of the ES. This will inform the Construction Environmental Management Plan (CEMP) which will be prepared prior to commencement of construction works. The controls and measures within the CEMP will be implemented to mitigate against impacts during the construction phase.

Table 19-5: Relevant Flood Risk and Surface Water embedded environmental measures

ID	Mitigation Measures embedded into the project design	How the measure will be secured
OM11	An emergency response plan will be developed for the Project to cover the construction, O&M and decommissioning phases of the Project.	CEMP, operating and maintenance procedures of the barrage.
19-1	Flood risk will be minimised as much as possible during the construction phase of the Project. Wherever possible, storage of materials or site	CEMP

ID	Mitigation Measures embedded into the project design	How the measure will be secured
	compounds will not be located within the active fluvial and tidal floodplains. Construction materials will be controlled near watercourses.	
19-2	Where applicable, temporary drainage solutions will be utilised to control runoff from the Project and protect surface water drainage patterns from any temporary hardstanding areas to prevent pollution risk and any possible increase in flood risk elsewhere.	CEMP
19-3	The design of the Project will make all efforts to avoid any loss of floodplain storage capacity in active fluvial floodplains where applicable.	Flood Risk Assessment and CEMP.
19-4	Potential groundwater flooding in excavations will be controlled.	CEMP
19-5	Should it be deemed necessary (i.e. if dewatering is required), a Groundwater Management Plan will be developed as part of the CEMP to ensure all groundwater abstracted during the construction stage is appropriately managed. Given the potential shallow depths to groundwater, groundwater interceptions are considered likely.	CEMP
19-6	In areas of shallow groundwater, sheet or secant piles will be used in the trenchless crossing entry / exit pits. This will provide hydraulic control measures to limit the ingress of water into excavations and prevent collapse.	CEMP
19-7	Where appropriate, trench breakers (clay plugs) will be placed within the open trench sections which intercept groundwater to avoid preferential groundwater (and therefore pollutant transport) pathways being created.	CEMP
19-8	A sediment management plan, the provision of adequate buffer zones (where possible) and silt	CEMP

ID	Mitigation Measures embedded into the project design	How the measure will be secured
	fencing between construction activities and the watercourses will control sediments and pollutants reaching watercourses.	
19-9	Erosion control, rock armour and scour protection measures will be required across the tidal barrage during the construction and O&M phases in order to protect against damage and high energy wave action. The requirement for, and exact nature and location of erosion will be confirmed following technical assessments undertaken as part of the EIA process.	Design of barrage.
19-10	The barrage will be designed to account for climate change and include flood resilience measures. During the O&M phase, the barrage will be able to manage flood events and surges within the Mersey Estuary, both upstream and downstream by active pumping or sluicing either with or without generation through the turbines.	Design of barrage and operational mode.
19-11	Major surface water crossings for the grid connection will be designed to minimise disruption to hydrological processes and riparian and aquatic habitats.	Suitable design of watercourse crossing following industry standards.
19-12	Direct grid connection works within 10m of a watercourse will be avoided where possible, and the grid design will attempt to avoid unnecessary works within close proximity of watercourses.	Minimise number of watercourse crossings required during route selection.
19-13	Where works are within 10m of a watercourse for the grid connection, clearance of vegetation on channel banks, valley side and riparian zone will be limited. A minimum of 8m vegetated buffer strip between the construction zone and the watercourse will be retained. In addition, sediment barriers will be provided between earthworks, construction zone and the watercourse to prevent	CEMP

ID	Mitigation Measures embedded into the project design	How the measure will be secured
	entrainment of sediment and materials into the river.	

19.11 LIKELY SIGNIFICANT EFFECTS

19.11.1 In line with the EIA Regulations 2017, the EIA for the Project will consider those impacts where there is a risk of a likely significant effect only. The following Section draws on industry experience and expertise to identify those effect-receptor pathways that may potentially lead to a significant impact. Where experience and available evidence indicates an effect-receptor pathway will not lead to a significant impact with regards to the EIA Regulations 2017 the pathway is scoped out from the assessment.

19.11.2 The likely significant effects are summarised in **Table 19-6**. The scoping assessment is based on a combination of the Project definition at the scoping stage, embedded environmental measures, understanding of the baseline conditions at this stage, the evidence base for the water environment, the identification of potentially impacted receptors, and professional judgement. The approach to this assessment is set out in **Chapter 3: Approach to EIA**.

19.11.3 The early identification of likely significant effects is used here as a tool aimed at delivering a proportionate approach to the EIA. In doing so, it sets out a high-level assessment of all potential effects, significant or not. The basis for scoping out certain effects, and therefore no longer considered is presented after the table, supported by the evidence base.

Table 19-6: Likely significant water environment effects

Activity and Impact	Embedded Measures	Effect	Proposed approach to assessment (scoped in or scoped out)	Receptor	Further data baseline requirements
Construction, O&M and decommissioning phases could mobilise sediments and pollute water.	Fit for purpose design. Implementation of a CEMP. Direct construction of grid connection within 10m of a watercourse is to be avoided where possible.	Construction, O&M and decommissioning phases of the tidal barrage could change the water quality (including biological, physico-chemical and hydromorphological quality elements) of the Mersey Estuary (downstream and upstream of the proposed tidal barrage) and other surface water receptors in the vicinity leading to adverse ecological impacts and physical modifications to the water environment. There is also a risk of accidental spillages from vessels of oil and other hazardous substances during the construction phase. The use of the potential port facilities / key infrastructure areas during the construction phase could change the water quality of	Scoped In.	River Mersey and other surface water receptors. Main rivers, ordinary watercourses and other surface water features within the Study Area. Designated sites.	Location, type and construction methodology of tidal barrage structure to be confirmed. Locations and methods of watercourse crossings associated with the grid connection to be confirmed

Activity and Impact	Embedded Measures	Effect	Proposed approach to assessment (scoped in or scoped out)	Receptor	Further data baseline requirements
		these water features and ultimately the River Mersey to which they connect. The construction phase of the grid connection could change the water quality of main rivers, ordinary watercourses and other surface water features within the Study Area. Effects of the grid connection during the O&M phase could include impacts to hydromorphological form and processes.			pending route selection.
Construction, O&M and decommissioning phases could change the quantity of flows within the Mersey Estuary and other surface water receptors.	Suitable design. Implementation of a CEMP. Direct construction of grid connection within 10m of a	Construction, O&M and decommissioning phases of the barrage could reduce and / or increase flows in the Mersey Estuary which may impact features upstream and downstream of the proposed barrage leading to adverse ecological impacts and physical modifications to the water environment. Impacts could also result	Scoped In.	River Mersey and other surface water receptors. Main rivers, ordinary watercourses and other surface water	Location, type and construction methodology of tidal barrage structure to be confirmed.

Activity and Impact	Embedded Measures	Effect	Proposed approach to assessment (scoped in or scoped out)	Receptor	Further data baseline requirements
	watercourse is to be avoided where possible.	from changes to flow dynamics and tide locking effects. The construction stage of the grid connection could change the quantity of flows of main rivers, ordinary watercourses and other surface water features within the Study Area and physically impact the hydrology and hydraulic connectivity of watercourses through the construction of watercourse crossings.		features within the Study Area. Designated sites.	Locations and methods of watercourse crossings associated with the grid connection to be confirmed pending route selection.
Construction, O&M and decommissioning stages of proposed tidal barrage could change the hydromorphology of the water body and induce bank and bed scour.	Suitable design. Implementation of a CEMP.	Construction of the tidal barrage has the potential for direct effects on the hydromorphology within the water body during both the construction and O&M phases. Construction, O&M and decommissioning stages of the barrage could induce bed and	Scoped In.	River Mersey.	Location, type and construction methodology of tidal barrage structure to be confirmed.

Activity and Impact	Embedded Measures	Effect	Proposed approach to assessment (scoped in or scoped out)	Receptor	Further data baseline requirements
		bank scour if not effectively managed by erosion control measures.			
Construction, O&M and decommissioning stages could alter flood risk from different sources.	Suitable design. Implementation of a CEMP including emergency planning procedures for construction workers. Direct construction of grid connection within 10m of a watercourse is to be avoided	Construction, O&M and decommissioning phases of the barrage could alter tidal / fluvial flood risk in the Mersey Estuary (including tide locking) and any tributaries downstream / upstream of the tidal barrage. Once operational, the barrage will be able to manage flood events and surges within the Mersey Estuary, both upstream and downstream by active pumping or sluicing either with or without generation through the turbines. The construction O&M and decommissioning phases of the grid connection could change flood risk associated with main rivers and ordinary	Scoped In.	River Mersey and other surface water receptors. Main rivers, ordinary watercourses and other surface water features within the Study Area Construction workers. Land / properties at	Location, type and construction methodology of tidal barrage structure to be confirmed. Locations and methods of watercourse crossings associated with the grid connection to be confirmed

Activity and Impact	Embedded Measures	Effect	Proposed approach to assessment (scoped in or scoped out)	Receptor	Further data baseline requirements
	where possible.	watercourses due to watercourse crossings. Construction compounds / associated development for the Project could increase flood risk from other sources of flooding including surface water and sewer flooding. Changes in flood risk arising from the Project require further assessment to understand potential flood risk impacts. The effects will be described in the FRA and summarised in the Water Resources and Flood Risk chapter.		increased risk of flooding due to the Project.	pending route selection.
Construction, O&M and decommissioning stages could impact groundwater associated users, i.e. abstractions (including as a result of changes to groundwater flows and	Implementation of a CEMP. Environmental permit.	Any dewatering which may be required may have the potential to impact on nearby groundwater abstractions if present. Private abstractions are still be identified within the Study Area.	Scoped In.	Areas designated as Source Protection Zones 1, 2 and 3.	Private abstractions within the Study Area will need to be identified.

Activity and Impact	Embedded Measures	Effect	Proposed approach to assessment (scoped in or scoped out)	Receptor	Further data baseline requirements
levels), SPZ and Drinking Water Safeguard Zones.		SPZ III and the Drinking Water Safeguard Zone will be considered as they may potentially be affected due to the proposed Grid Connection route.		Drinking Water safeguarded zones.	
Construction, O&M and decommissioning stages could impact groundwater quality.	Implementation of a CEMP.	Potential pollution risk from spillages, material storage and increase turbidity. Excavating and / or dewatering near polluted sources (such as scrap yards, service stations, landfills etc.) may mobilise already polluted sub-surface materials and / or groundwater; potentially to enter watercourses through dewatering discharge.	Scoped In.	Principal and Secondary Undifferentiated Aquifers.	
Construction, O&M and decommissioning stages could impact groundwater levels and flows	Implementation of a CEMP.	Temporary dewatering during construction and long-term underground structures and reinstated ground has the potential to affect groundwater levels and flows in Principal and Secondary Undifferentiated Aquifers.	Scoped In.	Principal and Secondary Undifferentiated Aquifers. GWDTE.	Habitat survey to validate presence of GWDTE.

Activity and Impact	Embedded Measures	Effect	Proposed approach to assessment (scoped in or scoped out)	Receptor	Further data baseline requirements
		Changes in flows and levels near GWDTE have the potential to reduce or cut off groundwater supply to an ecosystem. Changes in flows and levels near springs could reduce or cut off groundwater supply. Trenching and piling may create impermeable barriers which could have an impact on groundwater flooding where this has been designated a high or medium risk.		Springs.	Walkover survey to identify the presence / absence of Springs.

Impacts Scoped Out of Assessment

19.11.4 Potential port facilities / key infrastructure areas will only be used during construction and so will only be considered during the construction phase of the Project. They will not be used and so will have no impact on flood risk or water environment receptors during the O&M and decommissioning phases. The potential port facilities / key infrastructure areas already exist.

19.11.5 It is expected that during the ES other impacts will be scoped out of the chapter as further details on the Project becomes available and the information is refined. Impacts scoped out of the assessment will be listed in the PEIR and ES.

19.12 CUMULATIVE EFFECTS

19.12.1 A variety of impacts from the Project have the potential to act cumulatively with impacts from other developments to contribute to cumulative effects on water resource receptors identified. These could include impacts on human health, shipping and navigational receptors, land use and ecological sites and species.

19.12.2 Cumulative effects on the water environment resulting from the effects of the Project and other developments will be assessed in accordance with the guidance and methodologies set out in **Chapter 3: Approach to EIA** and are detailed within **Chapter 31: Cumulative Effects**. These are most likely to include cumulative risks to the quality of surface water and groundwater features, and flood risks to identified receptors, and therefore potential cumulative impacts on human health, land use and ecological receptors.

19.13 TRANSBOUNDARY EFFECTS

19.13.1 Due to the localised nature of the potential impacts, transboundary effects are considered unlikely to occur.

19.14 PROPOSED APPROACH TO ENVIRONMENTAL IMPACT ASSESSMENT REPORT

19.14.1 Further desk-based studies and analysis will be undertaken to identify and assess potential water environment receptors. This study will be supplemented with consultation with the relevant statutory and non-statutory organisations as necessary.

19.14.2 A standalone FRA will be prepared to support the ES in accordance with the NPPF (Ministry of Housing Communities and Local Government, 2023), Planning Practice Guidance (Department for Levelling Up, Housing and Communities, 2022), regional and local guidance. The FRA will further investigate all potential sources of flooding, taking into account the expected effect of climate change and assess the potential implications of the Project on flood risk to people and property, as well as assess the potential risk of flooding to the Project.

19.14.3 Consultation with the Environment Agency will be undertaken to support the PEIR and to confirm the need and methodology for a WFD Compliance Assessment, based on the WFD Screening and Scoping Report at **Appendix 3.4** of this report.

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20 LAND USE, TOURISM AND RECREATION

20.1 INTRODUCTION

20.1.1 This land use, recreation and tourism chapter will consider the potential likely significant effects on land use that may arise from the construction, operation and maintenance (O&M) and decommissioning activities of the Project. These receptors relate to the importance of land use on recreational users, tourists and other land users. This section of the Scoping Report describes the methodology to be used within the Environmental Impact Assessment (EIA), an overview of the baseline conditions within the Scoping Boundary (as defined in **Chapter 1: Introduction**), the datasets to be used to inform the EIA, the potential likely significant effects to be considered, and how these will be assessed for the purpose of the EIA.

20.1.2 The assessment of land use, recreation and tourism interfaces with other aspects of the Scoping Report and as such, should be considered alongside these, namely:

- **Chapter 5: Coastal Processes**: Components of coastal processes including water levels, waves, and water quality will all have an effect on the quality of tourism in the area.
- **Chapter 13: Terrestrial Ecology and Biodiversity**: The preservation of key ecological designations is important in retaining the recreational value of particular areas. Touristic features that rely on biodiversity assets will benefit from their protection.
- **Chapter 14: Socio-economics**: Employment generation as a result of the Proposed Scheme will increase the demand for accommodation due to an influx of temporary workers, potentially creating competition for space for workers in the tourism industry to reside in the city.
- **Chapter 16: Shipping and Navigation**: Existing marine and port facilities that interact with and support touristic assets may be temporarily inhibited during construction. This could have adverse effects on the touristic potential of these receptors.
- **Chapter 17: Marine Archaeology and Cultural Heritage**: The preservation of important heritage assets and marine archaeology will be beneficial to the city's touristic value.

- **Chapter 18: Terrestrial Archaeology and Cultural Heritage**: The preservation of important heritage assets and terrestrial archaeology will be beneficial to the city's touristic value.
- **Chapter 21: Air Quality**: Changes in local pollutant concentrations may affect various land uses and the recreational value of particular areas. Exhausts from construction traffic may reduce the attractiveness of parks and gardens for use by residents and tourists.
- **Chapter 22: Onshore Noise and Vibration**: Changes in local noise levels may affect various land uses and the recreational value of particular areas. Increased noise pollution from construction activities may reduce the attractiveness of parks and gardens for use by residents and tourists.
- **Chapter 23: Geology and Ground Conditions**: Any instances of ground contamination will likely reduce the quality of recreational areas for all users.
- **Chapter 24: Terrestrial Traffic and Transport:** Increased traffic as a result of additional construction vehicles on the roads will complicate access to tourist attractions and assets for all users. Increased traffic will also likely reduce the attractiveness of parks and gardens for use by residents and tourists through increased air and noise pollution.
- **Chapter 25: Seascape, Landscape and Visual Impacts**: Visual receptors are a key component of the tourist sector. Should these be compromised, the touristic value of the city will likely experience adverse effects.
- **Chapter 26: Infrastructure and Other Marine Users**: Disruption to other marine users as a result of the Proposed Scheme could affect tourist activities in the marine area.
- The Health Impact Assessment: In understanding the baseline population and prevalence of vulnerable groups in the area, access to and use of tourist attractions and recreational facilities by residents can be better assessed. Potential adverse health effects as a result of community severance will increase the demand for high quality recreational spaces.

20.1.3 Overarching relevant legislation and policy context which has informed the scope of the assessment is outlined in **Chapter 4: Planning Policy,** with topic specific considerations outlined in **Appendix 4.1**.

20.2 TECHNICAL GUIDANCE

20.2.1 A summary of technical guidance relevant to the assessment of land use, recreation and tourism is set out in **Table 20-1**.

Table 20-1: Relevant Technical Guidance

Guidance reference	Relevance to the assessment
Design Manual for Roads and Bridges (DMRB) LA 112 Population and Human Health (Highways England, 2019).	Whilst it is acknowledged that the DMRB is the standard for assessment of road schemes in Great Britain and Northern Ireland, this guidance provides a useful reference point for assessing land use, recreational, and community impacts of infrastructure, in the context of non-residential schemes.
Planning Practice Guidance - Open Space, Sports and Recreation Facilities, Public Rights of Way and Local Green Space (Department for Levelling Up Housing and Communities and Ministry of Housing, Communities and Local Government, 2014).	This sets out guidance on considering open spaces, sports and recreational facilities and Public Rights of Way (PRoW) throughout the planning process.

20.3 STUDY AREA

20.3.1 The study area for land use, recreation and tourism is dependent on the likely spatial extent of the effect under consideration. As outlined in **Table 20-2,** DMRB guidance provides the best methodology for assessing many of land use related receptors in the context of the Project. The DMRB LA 112 advises a study area of 500m around a development boundary to be used to report the likely effects on land-use and accessibility, private property and housing, community land and assets, development land and businesses, and walkers, cyclists and horse-riders.

20.3.2 The Project is currently at an early design stage, with Development Areas identified within which the Tidal Barrage, Grid Connections and associated Marine and Port Facilities may be developed. For the purposes of Scoping, the Scoping Boundary includes a 1km buffer around the potential Grid Connection routes, to allow for flexibility of routing. This Scoping Boundary has therefore been used for the basis of the land use and recreation elements of the assessment, as it will allow for a buffer around the potential Project infrastructure

locations, ensuring those resources or receptors most likely to experience effects as a result of the Project are captured. As the Project design is refined, the identified land use and recreation receptors will be revised as part of the PEIR and ES, and a buffer of 500m applied to ensure a proportionate approach to assessment, in line with DMRB LA 112 guidance.

20.3.3 For tourism, in the absence of statutory guidance, reference has been made to best practice guidance, and professional judgement and experience. To align with the approach taken for the land use and recreational receptors in this assessment, the area within the Scoping Boundary will be used in order to capture those attractions or tourist facilities most likely to be affected by the Project.

20.3.4 Given that these study areas do not conform to jurisdiction boundaries, where appropriate, datasets for geographical boundaries will be presented for some elements of the baseline for the purposes of Scoping. At the ES stage, lower level data (such as ward or Lower Super Output Area [LSOA] data) will be used for analysis where appropriate and available, whereas this Scoping chapter presents a broader overview of baseline data as a means of comparison between areas. Datasets for larger jurisdiction boundaries have therefore been used for the purposes of this Scoping chapter as follows:

- **National:** England;
- **Regional:** North West; and
- **Local:** Halton Borough; Knowsley Borough, Liverpool City, Sefton Borough, St Helens Borough, and Wirral Borough (these six authorities make up the LCRCA area).

Table 20-2: Land use, recreation and tourism study areas

Resource or Receptor	Study Area
Private property and residential areas.	▪ The area within the Scoping Boundary (encompassing the Tidal Barrage Development Area, Port Facilities and Key Infrastructure Area, and Grid Connection Development Area).
Local businesses.	▪ The area within the Scoping Boundary (encompassing the Tidal Barrage Development Area, Port Facilities and Key

Resource or Receptor	Study Area
	Infrastructure Area, and four potential Grid Connection Development Area).
Agricultural Land Holdings.	▪ No Study Area is applied when considering agricultural land holdings, as the impacts to agricultural land would only occur on that which is directly impacted (either temporarily or permanently) by the Project (e.g. from potential grid connections crossing agricultural land).
Community facilities, open space and recreational facilities.	▪ The area within the Scoping Boundary (encompassing the Tidal Barrage Development Area, Port Facilities and Key Infrastructure Area and Grid Connection Development Area).
Recreational routes for Walkers, Cyclists, and Horse Riders (WCH).	▪ The area within the Scoping Boundary (encompassing the Tidal Barrage Development Area, Port Facilities and Key Infrastructure Area, and four potential Grid Connection Development Area or those PRoW which have a direct means of access within the Scoping Boundary. Additionally, routes with the potential to benefit from connecting to new active travel routes across the tidal barrage.
Tourist attractions.	▪ The area within the Scoping Boundary (encompassing the Tidal Barrage Development Area, Port Facilities and Key Infrastructure Area, and the Grid Connection Development Area).

20.4 CONSULTATION

20.4.1 Consultation is a key part of the application process. The assessment will be informed by engagement and discussion with various stakeholders. There has been no specific consultation carried out for land use, recreation, and tourism at the time of writing however it is acknowledged that Sefton Borough Council raised impacts on local businesses, and tourism as points of interest and further discussion (via email received 18 June 2024). It is anticipated that feedback in relation to this topic and the scope of works will be gained following consultation on this Scoping Report. The methodology for this assessment will take into account feedback following scoping, and any stakeholder engagement

undertaken as part of the EIA process. This Scoping Report will be issued to the following stakeholders for consultation:

- Liverpool City Council;
- Sefton Council;
- Halton Borough Council;
- St Helens Borough Council;
- Wirral Council; and
- Knowsley Council.

20.5 ASSESSMENT METHODOLOGY

20.5.1 The Project-wide approach to the assessment methodology is set out in **Chapter 3: Approach to EIA**. This will be implemented to assess the likely significant effects on land use, recreation and tourism receptors from the construction, O&M, and decommissioning of the relevant components of the Project.

20.5.2 For the assessment of land use, recreation and tourism, the approach to assessment for each element is outlined below, including determining the sensitivity criteria and magnitude of impact for each receptor, and concluding the overall significance. The specific guidance outlined in **Table 20-1** will also be considered in relation to the assessment, in addition to scoping responses received from stakeholders.

LAND USE AND RECREATION

20.5.3 The approach to assessment of the following topics is outlined below:

- Private property and residential areas:
- Local businesses;
- Agricultural land holdings;
- Community facilities, open space, and recreational facilities; and
- Recreational routes for WCH.

20.5.4 Land Use and recreational receptors which are subject to disruption (or diversion in the case of recreational routes) through land take, where access would be affected, or amenity effects may arise (on a temporary or permanent basis) will be identified. An assessment of sensitivity and magnitude will be undertaken, applying professional judgement and past experience on similar developments.

20.5.5 The assessment will be qualitative and informed by desk based study. The following methodology for the assessment of likely significant effects is informed by DMRB LA 104 and DMRB LA 112, as this guidance provides an appropriate methodological basis for assessing the effects on land use and recreation related receptors in the context of the Project.

Sensitivity, Magnitude, and Significance Criteria

20.5.6 The sensitivity criteria and magnitude of change will be assigned based on the criteria outlined in **Table 20-3** and **Table 20-4** below. The criteria have drawn on DMRB LA 112 and adapted for this assessment. Each receptor's value will be assigned taking account of professional judgement and past experience of similar schemes, including the nature of the specific receptor in question and its ability to adapt to change.

20.5.7 For the assessment of agricultural land holdings, guidance by Natural England (2021) also outlines the need to protect Best and Most Versatile (BMV) agricultural land (Grades 1-3a), hence other agricultural land would be regarded as lower sensitivity.

Table 20-3: Land Use and Recreation – Sensitivity Criteria

Sensitivity	Description
Very high	**Private property and residential areas** ■ Existing private property or land allocated for housing located in a local authority area where the number of households are expected to increase by >25% by 2041 (ONS data); and / or ■ Existing housing and land allocated for housing (e.g., strategic housing sites) covering >5ha and / or >150 houses. **Local businesses** ■ Existing employment sites (excluding agriculture) and land allocated for employment (e.g. strategic employment sites) covering >5ha. **Community facilities, open space, and recreational facilities (where there is a combination of the following)** ■ Complete severance between communities and their land / assets, with little / no accessibility provision;

Sensitivity	Description
	■ Alternatives are only available outside the local planning authority area; ■ The level of use is very frequent (daily); and ■ The land and assets are used by the majority (>=50%) of the community. **Agricultural land holdings** ■ Areas of land in which the enterprise is wholly reliant on the spatial relationship of land to key agricultural infrastructure; and ■ Access between land and key agricultural infrastructure is required on a frequent basis (daily). ■ Land holdings classed as BMV. **Recreation routes for WCH** ■ National trails and routes likely to be used for both commuting and recreation that record frequent (daily) use. Such routes connect communities with employment land uses and other services with a direct and convenient WCH route. Little / no potential for substitution. ■ Routes regularly used by vulnerable travellers such as the elderly, school children and people with disabilities, who could be disproportionately affected by small changes in the baseline due to potentially different needs. ■ Rights of way for WCH crossing roads at grade with >16,000 vehicles per day.
High	**Private property and residential areas** ■ Private property or land allocated for housing located in a local planning authority area where the number of households are expected to increase by 16-25% by 2041 (ONS data); and / or ■ Existing housing and land allocated for housing (e.g. strategic housing sites) covering >1-5ha and / or >30-150 houses. **Local businesses** ■ Existing employment sites (excluding agriculture) and land allocated for employment (e.g. strategic employment sites) covering >1 - 5ha.

Sensitivity	Description
	Community facilities, open space, and recreational facilities (where there is a combination of the following) ■ There is substantial severance between community and assets, with limited accessibility provision; ■ Alternative facilities are only available in the wider local planning authority area; ■ The level of use is frequent (weekly); and ■ The land and assets are used by the majority (>=50%) of the community. **Agricultural land holdings** ■ Areas of land in which the enterprise is dependant on the spatial relationship of land to key agricultural infrastructure; and ■ Access between land and key agricultural infrastructure is required on a frequent basis (weekly). ■ Land holdings classed as BMV. **Recreation routes for WCH** ■ Regional trails and routes (e.g. promoted circular walks) likely to be used for recreation and to a lesser extent commuting, that record frequent (daily) use. Limited potential for substitution; and / or ■ Rights of way for WCH crossing roads at grade with >8,000 - 16,000 vehicles per day.
Medium	**Private property and residential areas** ■ Houses or land allocated for housing located in a local authority area where the number of households are expected to increase by >6-15% by 2041 (ONS data); and / or ■ Existing housing and land allocated for housing (e.g. strategic housing sites) covering <1ha and / or <30 houses. **Local businesses** ■ Existing employment sites (excluding agriculture) and land allocated for employment (e.g. strategic employment sites) covering <1ha.

Sensitivity	Description
	Community facilities, open space, and recreational facilities (where there is a combination of the following) ■ There is severance between communities and their land / assets but with existing accessibility provision; ■ Limited alternative facilities are available at a local level within adjacent communities; ■ The level of use is reasonably frequent (monthly); and ■ The land and assets are used by the majority (>=50%) of the community. **Agricultural land holdings** ■ Areas of land in which the enterprise is partially dependent on the spatial relationship of land to key agricultural infrastructure; and ■ Access between land and key agricultural infrastructure is required on a reasonably frequent basis (monthly). **Recreation routes for WCH** ■ Public rights of way and other routes close to communities which are used for recreational purposes (e.g. dog walking), but for which alternative routes can be taken. These routes are likely to link to a wider network of routes to provide options for longer, recreational journeys, and / or ■ Rights of way for WCH crossing roads at grade with >4000 – 8000 vehicles per day.
Low	**Private property and residential areas** ■ Proposed development on unallocated sites providing housing with planning permission / in the planning process. **Local businesses** ■ Proposed development on unallocated sites providing employment with planning permission / in the planning process. **Community facilities, open space, and recreational facilities (where there is a combination of the following)**

Sensitivity	Description
	■ Limited existing severance between community and assets, with existing full Disability Discrimination Act compliant accessibility provision; ■ Alternative facilities are available at a local level within the wider community; ■ The level of use is infrequent (monthly or less frequent); and ■ The land and assets are used by the minority (>=50%) of the community. **Agricultural land holdings** ■ Areas of land which the enterprise is not dependent on the spatial relationship of land to key agricultural infrastructure; and ■ Access between land and key agricultural infrastructure is required on an infrequent basis (monthly or less frequent). **Recreation routes for WCH** ■ Routes which have fallen into disuse through past severance or which are scarcely used because they do not currently offer a meaningful route for either utility or recreational purposes, and / or ■ Rights of way for WCH crossing roads at grade with <4000 vehicles per day.
Negligible	**Private property and residential areas** ■ N/A **Local businesses** ■ N/A **Community facilities, open space, and recreational facilities (where there is a combination of the following)** ■ No or limited severance or accessibility issues; ■ Alternative facilities are available within the same community; ■ The level of use is very infrequent (a few occasions yearly); and ■ The land and assets are used by few in the community.

Sensitivity	Description
	Agricultural land holdings ■ Areas of land which are infrequently used on a non-commercial basis. **Recreation routes for WCH** ■ N/A

Table 20-4: Land Use and Recreation – Magnitude of Impact

Magnitude of Impact (change)	Typical criteria
Major	**Private property and residential areas; local businesses; community facilities, open space, and recreational facilities; and agricultural land holdings** ■ Loss of resource and / or quality and integrity of resource; severe damage to key characteristics, features or elements. e.g. direct acquisition and demolition of buildings and direct development of land to accommodate highway assets; and / or ■ Introduction (adverse) or removal (beneficial) of complete severance with no / full accessibility provision. **Recreation routes for WCH** ■ Approximately 500m increase (adverse) / decrease (beneficial) in WCH journey length.
Moderate	**Private property and residential areas; local businesses; community facilities, open space, and recreational facilities; and agricultural land holdings** ■ Partial loss of / damage to key characteristics, features or elements, e.g. partial removal or substantial amendment to access or acquisition of land compromising viability of property, businesses, community assets or agricultural holdings; and / or ■ Introduction (adverse) or removal (beneficial) of severe severance with limited / moderate accessibility provision.

Magnitude of Impact (change)	Typical criteria
	Recreation routes for WCH ■ Approximately 250m - 500m increase (adverse) or decrease (beneficial) in WCH journey length.
Minor	**Private property and residential areas; local businesses; community facilities, open space, and recreational facilities; and agricultural land holdings** ■ A discernible change in attributes, quality or vulnerability; minor loss of, or alteration to, one (maybe more) key characteristics, features or elements, e.g. amendment to access or acquisition of land resulting in changes to operating conditions that do not compromise overall viability of property, businesses, community assets or agricultural holdings; and / or ■ Introduction (adverse) or removal (beneficial) of severance with adequate accessibility provision. **Recreation routes for WCH** ■ Approximately 50m - 250m increase (adverse) or decrease (beneficial) in WCH journey length.
Negligible	**Private property and residential areas; local businesses; community facilities, open space, and recreational facilities; and agricultural land holdings** ■ Very minor loss or detrimental alteration to one or more characteristics, features or elements. e.g. acquisition of non-operational land or buildings not directly affecting the viability of property, businesses, community assets or agricultural holdings; and / or ■ Very minor introduction (adverse) or removal (beneficial) of severance with ample accessibility provision. **Recreation routes for WCH** ■ Approximately 50m increase (adverse) or decrease (beneficial) in WCH journey length.

Magnitude of Impact (change)	Typical criteria
No change	**Private property and residential areas; local businesses; community facilities, open space, and recreational facilities; agricultural land holdings; and recreation routes for WCH** ■ No loss or alteration of characteristics, features, elements or accessibility; no observable impact in either direction.

20.5.8 The level of significance will be assigned in line with Table 3.8.1 in DMRB LA 104, and is outlined in **Table 20-5** below. Significant effects for the assessment of land use and recreation receptors comprise those which are assigned as moderate, large or very large. The remaining effects will be categorised as non-significant, as outlined below:

- Very Large: Very high importance and rarity, international scale and very limited potential for substitution;
- Large: High importance and rarity, national scale, and limited potential for substitution;
- Moderate: Medium importance and rarity, regional scale, and some potential for substitution;
- Slight: Low or medium importance and rarity, local scale; and
- Neutral: Very low importance and rarity, local scale.

Table 20-5: Significance of Effect

Magnitude	Sensitivity					
		Very High	High	Medium	Low	Negligible
	Major	Very Large	Very Large or large	Large or moderate	Moderate	Slight or neutral
	Moderate	Very Large or large	Large or moderate	Moderate	Moderate or slight	Slight or neutral
	Minor	Large or moderate	Moderate	Moderate or slight	Slight or neutral	Slight or neutral
	Negligible	Moderate or slight	Moderate or slight	Slight	Slight or neutral	Slight or neutral
	No Change	Neutral	Neutral	Neutral	Neutral	Neutral

TOURIST ATTRACTIONS

20.5.9 A qualitative impact assessment of tourism will be undertaken, with the assessment utilising available tourism data and published studies and applying professional judgement to reach conclusions. The assessment will focus on those tourist assets and attractions that could be affected by the Project during construction and operation. It will also consider the likely construction of a visitor centre as part of the Project, which would create a new tourist facility within Liverpool, potentially boosting tourism to the Mersey area during the operation of the Project.

20.6 BASELINE CONDITIONS

DATA INFORMATION SOURCES

20.6.2 The following data sources have been used to inform the baseline for land use, recreation and tourism. An initial desk based review has been undertaken of publicly available data sources outlined in **Table 20-6** to determine the baseline character of the study area and inform the land use assessment process.

Table 20-6: Key Sources of Data

Source	Date	Summary	Coverage of Study Area
Official Census and Labour Market Statistics (NOMIS).	Various	National statistics for England and Wales relating to population, economy, and deprivation.	Full coverage of the study area.
Defra MAGIC interactive map.	Various	Statutory and non-statutory land designations, information on geology and soils, ALC, designated sites (available at: https://magic.defra.gov.uk/MagicMap.aspx).	Full coverage of the study area.
Google Maps.	Various	Recent and historical aerial photography (available at: https://www.google.co.uk/maps).	Full coverage of the study area.
LandIS Soilscape map.	Various	Map of soils, including information on soil types at the regional level (available at: https://www.landis.org.uk/soilscapes/).	Full coverage of the study area.
Sustrans.	Various	Web based data from the sustainable transport charity which provides cycling and walking routes (available at:	Full coverage of the study area.

Source	Date	Summary	Coverage of Study Area
		https://www.sustrans.org.uk/national-cycle-network/).	
LCRCA local authorities.	Various	Local plans and other resources with information on active travel routes from Halton Borough; Knowsley Borough, Liverpool City, Sefton Borough, St Helens Borough, and Wirral Borough.	Full coverage of the study area.

EXISTING BASELINE

20.6.3 This section describes the conditions which constitute the existing baseline environment for land use, recreation and tourism for the study areas identified in **Table 20-2**. The area within the Scoping Boundary extends across the north eastern and south western sides of the River Mersey, the river channel, and follows a broadly north-south alignment on both sides of the river. It comprises several components: the Tidal Barrage Development Area; the Port Facilities and Key Infrastructure Area; and the Grid Connection Development Area (Breck Road Substation, Birkenhead, Capenhurst or Lister Drive).

20.6.4 The southernmost point of the Scoping Boundary is on the western side of the River Mersey, where the potential grid connection route extends south to Capenhurst, west of Ellesmere Port. The most northerly point of the Scoping Boundary is on the eastern side of the River Mersey, and encompasses an area of dock and port facilities at Port of Liverpool, which could be used to facilitate construction of the Tidal Barrage.

20.6.5 In order to reflect the differing construction durations and locations for the different key components of the Project (e.g. the construction duration for the Tidal Barrage using a cofferdam construction could be up to 10 years, compared with the construction duration for the Grid Connection which has yet to be determined, but will be less), the baseline and assessment for land use, recreation and tourism is broadly separated into two sections:

- Tidal Barrage Scoping Boundary study area (which comprises the Tidal Barrage Development Area within the river channel, the Port Facilities and

Key Infrastructure Area, and an approximate buffer of 1km surrounding this area).

- Grid Connection Development Area study area (which comprises the area within the Project Scoping Boundary, including the four potential Grid Connection points with a 1km buffer). It excludes the Tidal Barrage Scoping Boundary study area described above; however given the overlapping nature of these two study areas there may be some reference to the same geographical locations for the purpose of identifying the baseline and relevant receptors.

Tidal Barrage Scoping Boundary Study Area

Private Property and Residential Areas

20.6.6 Private property is residential land and allocated residential development land that does not accommodate public space or other community facility or assets. Commercial property is considered under the 'Local businesses' section below.

20.6.7 Whilst much of the area within and in close proximity to the Tidal Barrage Development Area is industrial, a number of residential areas are located beyond the dock and port areas to the east, extending into the city centre of Liverpool. This area encompasses parts of Vauxhall and Everton and comprises a densely populated area of predominantly semi-detached and terraced properties (an estimated 3-4,000 dwellings in this location), interspersed with some flat accommodation closer to the main city centre. South of the city centre in Brunswick and St Michaels, there are numerous densely populated terraces, with areas of larger, detached dwellings along Riverside Drive to Aigburth (an estimated 5,000 dwellings in these locations).

20.6.8 To the south and west of the Tidal Barrage Development Area sit the seafront towns of New Brighton, Egremont, Seacombe, Tranmere, New Ferry, and Port Sunlight. Dwellings here are predominantly terraced and semi-detached, with residential streets adjoining Magazine Promenade, Egremont Promenade, Secombe Promenade, and Rockferry Promenade, which front onto the River Mersey. There are estimated to be 4-5,000 dwellings in these locations.

Local Businesses

20.6.9 The Scoping Boundary encompasses the Mersey Estuary, an area dominated with maritime and industrial uses. Port and dock facilities proximate to the barrage location within the Scoping Boundary are listed below and include (but are not limited to):

- Port of Liverpool;
- Gladstone Lock;
- Langton Lock;
- Garston Dock;
- Liverpool Waters;
- Pier Head;
- Wirral Waters;
- Cammell Laird;
- Tranmere Oil Terminal;
- Port Sunlight; and
- Mersey Wharf.

20.6.10 Beyond these uses, additional businesses are present in the vicinity of the barrage location on both sides of the River Mersey. These include multiple sea front restaurants and bars, the Baltic Food Market south of Liverpool city centre, as well as numerous hotels and temporary accommodation providers. These include the Titanic Hotel and Pullman Hotel, chains such as Travelodge and Holiday Inn.

20.6.11 It is also acknowledged that there are several designated brownfield sites for employment development within the Tidal Barrage Scoping Boundary study area, particularly focused around the industrial and ports locations along the River Mersey. Consultation will be undertaken with the Liverpool City Council and Wirral Borough Council as part of the Scoping and stakeholder engagement process during the PEIR stage, in order to identify those designated employment sites of relevance to the Project.

Agricultural Land Holdings

20.6.12 The assessment of soils and agricultural ground conditions is included in **Chapter 23: Geology and Ground Conditions**. Agricultural land holdings considers farm businesses and their viability in the context of temporary or permanent disruption to agricultural land as a result of the Project. In England, agricultural land is classified according to the Agricultural Land Classification (ALC) system, graded 1 to 5. Grades 1 to 3a are classed as ‘best and most versatile’ whilst Grade 5 land is noted to be the poorest quality of agricultural land (Natural England, 2019).

20.6.13 The entirety of the area within the Scoping Boundary proximate to the River Mersey is categorised as non-agricultural land, predominantly in urban use.

Community Facilities, Open Space, and Recreational Facilities

20.6.14 There are a large number of community facilities located within the vicinity of the Tidal Barrage location and wider Tidal Barrage Scoping Boundary and Grid Connection Scoping Boundary including schools, nurseries, places of worship, libraries, community centres, and other community facilities

20.6.15 Open space is defined as “any land laid out as a public garden, or used for the purposes of public recreation or land which is a disused burial ground” (HM Government, 1990). There are a number of open spaces within and adjacent to the Barrage RLB. These include but are not limited to:

- Vale Park, New Brighton;
- Festival Garden;
- Port Sunlight River Park;
- Eastham Country Park;
- Otterspool Promenade;
- Chavasse Park;
- Shorefields Nature Park;
- Princes Park; and
- Sefton Park.

20.6.16 Notably, Leighton View Millenium Green, located to the northwest of Dingle, has been identified as a new area of public open space (Natural England, 2023). Non-developed land in the area surrounding the Tidal Barrage location predominantly comprises residential gardens, waterfront promenades and beaches, including New Brighton Beach. Further recreational facilities in the Tidal Barrage Scoping Boundary study area include the Floral Pavillion Theatre north of New Brighton; and Everton Stadium, south of Bootle (currently under construction but due to be completed in 2025); and M&S Bank Arena and ACC Liverpool.

Recreational Routes for WCH

20.6.17 There are numerous Public Rights of Way (PRoW) and cycling routes within, immediately adjacent to, (or passing through) the Tidal Barrage Scoping

Boundary study area. Notably, the Tarleton to Pier Head section of the King Charles III England Coast Path route follows the section of promenade and footpath adjacent to the Tidal Barrage Development Area and forms a section of this nationally important long distance route. The Wirral Circular Trail also routes along the western side of the Tidal Barrage Development Area and adjoins several other PRoW in the wider Tidal Barrage Scoping Boundary .

20.6.18 The Sustrans National Cycle Network (NCN) map identifies two NCN routes in the Tidal Barrage Scoping Boundary study area:

- Route 810 connects Liverpool and Ainsdale, passing close to Everton Football Club before joining the Leeds and Liverpool Canal towpath (Sustrans, No Date, b);
- Route 56 linking Chester to Liverpool, passing through the Tidal Barrage Scoping Boundary study area, past Royal Albert Docks (a UNESCO World Heritage Site) to Sefton Park (Sustrans, Do Date, a).

Tourist Attractions

20.6.19 Those tourist attractions which use, or access the River Mersey are detailed in **Chapter 26: Infrastructure and Other Marine Users**. Terrestrial based tourist attractions are outlined below.

20.6.20 Although visitor numbers are still below the pre-pandemic figures of 66.27 million in 2019, in 2023 Liverpool City recorded annual visitor numbers of 55.94 million (Growth Platform, 2023).

North Bank of the River Mersey

20.6.21 Many of the tourist attractions within the vicinity of the Tidal Barrage Development Area are centred around the historical features showcasing Liverpool's maritime history, including the Maritime Museum, , Museum of Liverpool, Royal Albert Docks, the 'Memorial to the Marine Engine Room Heroes', and Mersey Tunnel Tours. Other attractions proximate to the Tidal Barrage Development Area include the Tate Liverpool, Liver Building, Wheel of Liverpool, Liverpool Water Sports Centre, Liverpool Marina and Yacht Club, and the Liverpool Exhibition Centre. The city also showcases its musical history through the British Music Experience museum and Beatles Statue (both adjacent to the Tidal Barrage Development Area), and Beatles Story Museum.

20.6.22 The Liverpool half marathon and Liverpool 'ten miler' are annual events which attract visitors and participants from across the country. The start and end point

for both races is at Pier Head, routing through Princes Park, Sefton Park, and the sea front (BTR, No Date).

South Bank of the River Mersey

20.6.23 Due to its industrial nature, the south western length of the Tidal Barrage Development Area offers fewer tourist attractions than its eastern counterpart. The Ureka Science Museum in Wallasey, and Rockferry beach, and Port Sunlight Riverside Heritage Centre are all, adjacent to the Tidal Barrage Development Area. Birkenhead Priory is also located on the western bank of the River Mersey in the wider Tidal Barrage Scoping Boundary study area.

Grid Connection Scoping Boundary Study Area

Private Property and Residential Areas

20.6.24 The potential Grid Connection Development Area extends from Capenhurst in the north, to the A5089 and Anfield to the east, and south to the outskirts of Ellesmere Port, passing through numerous residential settlements. On the eastern bank of the River Mersey this includes the southern extent of Bootle, Walton, Anfield, Tuebrook, Toxteth, St Michael's, and Aigburth. Dwellings are predominantly terraced or semi-detached, and higher density than on the other side of the river. An estimated 8-10,000 dwellings lie in these locations within the Scoping Boundary.

20.6.25 On the western bank of the River Mersey this area includes Wallasey, New Brighton, Noctorum, Prenton, Birkenhead, Bebington, Bromborough, Eastham, and the northern and western extents of Ellesmere Port. Dwellings are diverse in character, predominantly terraced or semi-detached closer to the river, with lower density areas of detached dwellings and housing estates further west.

20.6.26 The Birkenhead and Capenhurst Grid Connections closely follow the alignment of the M53 south, from Junction 1, where there are fewer residential properties. This area encompasses approximately 10-15,000 dwellings falling within the Scoping Boundary in these settlements.

20.6.27 It is also acknowledged that there are a number of residential land allocations within and proximate to the Grid Connection Scoping Boundary study area which are identified in the Local Plan documents and allocations maps of the six local authorities which comprise the LCRCA. Consultation on these allocations and the residential developments most likely to come forward will be undertaken with the local authorities as part of the Scoping and stakeholder engagement process

during the PEIR stage, in order to identify those residential allocations of relevance to the Project.

Local Businesses

20.6.28 There are numerous businesses located within the Grid Connection Scoping Boundary study area. Notable premises include several large offices - HM Passport Office (Liverpool), HM Land Registry Office (Birkenhead), and Birkenhead ferry terminal, in addition to numerous national chain stores providing convenience and comparison goods within shopping areas in Liverpool city centre, Birkenhead, and other centres.

20.6.29 The land within the western portion of the Grid Connection Scoping Boundary study area is less industrialised and densely occupied with businesses than the area proximate to the centres of Liverpool and Birkenhead. There remains a diverse range of businesses however, with many small premises (e.g. dog grooming, insurance, and hairdressing) as well as vehicle showrooms, supermarkets, and retail parks. There are also numerous small industrial and trading estates throughout the study area.

20.6.30 It is also acknowledged that there are a number of employment land allocations within and proximate to the Grid Connection Scoping Boundary study area which are identified in the Local Plan documents and allocations maps of the six local authorities which comprise the LCRCA. Consultation on these allocations and the future development most likely to come forward will be undertaken with the local authorities as part of the Scoping and stakeholder engagement process during the PEIR stage, in order to identify those employment land allocations of relevance to the Project.

Agricultural Land Holdings

20.6.31 Small areas of agricultural land are present within the Grid Connection Scoping Boundary study area, south of Junction 3 of the M53. Agricultural land surrounding the M53 and to the west of Ellesmere Port is predominantly classified as ‘Good to Moderate’ according to the ALC grading. Land holdings and land ownership is unknown at this stage, however there are approximately 15-20 farm businesses within this area of the Scoping Boundary which are assumed to own or lease the land holdings in the surrounding area.

Community Facilities, Open Space, and Recreational Facilities

20.6.32 There are a large number of community facilities located in the Grid Connection Scoping Boundary study area including schools and education providers (including University of Liverpool), healthcare facilities including GP and dental practices and Royal Liverpool University Hospital, libraries, community centres, allotment facilities (including a significant number of plots at Earlston Allotments), and places of worship (including Liverpool Metropolitan Cathedral and Kailash Buddhist Centre).

20.6.33 There are a number of open spaces within the Grid Connection Scoping Boundary study area. These include but are not limited to:

- Marine Park;
- Central Park;
- Stanley Park and Gardens;
- New Brighton Promenade;
- Birkenhead Park (currently on the UNESCO tentative list);
- Vale Park New Brighton;
- Harrison Park;
- Bidston Moss;
- Duck Pond Lake Park;
- Thornton Common; and
- Allport Common.

20.6.34 Located to the west of the River Mersey, two Woodland Trust sites provide areas of recreational open space; Storeton Woods is a popular location for local residents and is located close to the potential Capenhurst Grid Connection. Uptown Meadow Millenium Wood is 15.05 hectares (NGR: SJ265876) close to the urban area at Birkenhead and the potential Capenhurst and Birkenhead Grid Connections (Woodlands Trust, No Date, a; b).

20.6.35 There are also several country parks located within the Grid Connection Scoping Boundary study area including at Bidston Hill; Arrowe; Eastham Woods; and the regionally important North Wirral Coastal Park.

Recreational Routes for WCH

20.6.36 There are numerous designated PRoW and cycling routes within the Grid Connection Scoping Boundary study area, particularly connecting the centre of Liverpool to the wider city. On the south and western side of the River Mersey, a network of designated footpaths is present near west Birkenhead at Bidston Moss (FP5) and across Bidston Hill (FP1, FP3, FP23, FP24, FP25, FP26), and to the south of Birkenhead at Storeton (FP5, FP6), Brimstage (FP24, FP25), and Willaston. A small number of permissive routes and shared user pathways are also located within the Grid Connection Scoping Boundary study area (predominantly on the south and western side of the River Mersey) however these are less numerous than footpaths.

20.6.37 Leasowe Common is also a Countryside Rights of Way (CRoW) Section 15 land site within Wirral, situated in close proximity to the Birkenhead Grid Connection. There are three further CRoW sections close to the M53 and the Capenhurst and Birkenhead Grid Connections.

20.6.38 Three National Cycle Networks (NCNs) are located within the Grid Connection Scoping Boundary study area:

- Route 810 connects Liverpool and Ainsdale, passing close to the Everton football grounds before joining the Leeds and Liverpool Canal towpath (Sustrans, No Date, b);
- Route 89 along the northern coastline of the Wirral peninsula (OS Maps, No Date); and
- Route 56 linking Chester to Liverpool, traversing the Scoping Boundary, taking users past the Royal Albert Docks and onto Sefton Park (Sustrans, No Date, a).

Tourist Attractions

20.6.39 There are fewer tourist attractions in the southern and western areas of the Scoping Boundary, however the Ureka Science Museum is located on the western bank of the River Mersey, as well as the Wirral Transport Museum and Heritage centre, and The Port Sunlight Museum, north of Bromborough. Port Sunlight Village, Lady Lever Art Gallery, and the Williamson Art Gallery and Museum are also popular visitor attractions.

20.7 FUTURE BASELINE

20.7.1 The future baseline for residential properties, businesses, agricultural land holdings, community facilities, open spaces, and tourist attractions is uncertain, however it is assumed that steady economic and population growth would continue. Associated with this growth, existing housing, community, and recreational infrastructure is likely to be required.

20.7.2 Due to this uncertainty, for the purposes of this assessment, it is assumed the future baseline relating to land use, recreation and tourism would be broadly similar in the period of construction, O&M, and decommissioning of the Project. It is acknowledged however, that there are a number of residential and employment land allocations identified within the LCRCA area which are likely to proceed during this time, irrespective of the Project.

20.8 BASIS FOR SCOPING ASSESSMENT

20.8.1 The land use, recreation and tourism scoping assessment is based on the following key assumptions which are also set out in **Chapter 2: Site Context and Project Description**:

- The construction phase may be preceded with some site preparation works such as exclusion of public areas for safety purposes, road and public access diversions in addition to removal of street furniture and utilities.
- Terrestrial works such as construction routes, compounds and access will be required in the immediate vicinity of the tidal barrage landfalls.
- Construction vehicles will be required onsite and these are likely to include excavators, transportation vehicles such as Moxy earth moving equipment, piling rigs and cranes. Once in position these will remain until the end of the construction phase.
- The grid connection will be an underground cable for the entirety of the route from the tidal barrage to the point of connection, whichever route is progressed or require reinforcement / restringing upon the existing overhead routes to the existing point of connection;
- Any localised ancillary structures which are required to support the construction phase will be decommissioned and removed when the construction phase is complete.
- At the time of writing, no Project specific worker accommodation (i.e. a worker village) is proposed as it is assumed that a sufficient construction

workforce is available within commuting distance, and that sufficient temporary accommodation would be available for any workforce travelling for the Project construction phase. This will be considered further within **Chapter 14: Socio-economics**, and at the PEIR and ES stages as the Project design is refined.

- It is assumed that all workers and traffic will travel to the Project utilising existing public transport options and individual means.
- The decommissioning of the Tidal Barrage is anticipated to involve demolishing and removing terrestrial ground structures at ground level. Any below ground level structures, including the grid cable, will be left in-situ to minimise the environmental impacts associated with removal.

20.8.2 Based on the preliminary construction designs available at the time of writing, it is considered likely that the Project will have impacts on the accessibility of select recreational routes and community facilities, with potential for temporary restrictions in access / diversions to these receptors. Nearby residential receptors identified are also likely to experience temporary localised effects of onsite construction vehicles, plant, and equipment. During the operational phase, benefits will be brought about through the connection of the two banks for non-motorised users, enhancing opportunities for active travel, boosting connectivity in the area, and generating public realm improvements. There is also the potential for benefits relating to tourism, with a possible visitor centre associated with the Tidal Barrage creating a new tourist attraction, with viewpoints and a new crossing bridging the River Mersey.

20.8.3 Likely significant effects identified at this stage are set out below in **Table 20-7**.

20.9 EMBEDDED ENVIRONMENTAL MEASURES

20.9.1 Embedded mitigation measures have been identified and are proposed to be adopted as part of the evolution of the Project design (embedded into the Project design). These measures will evolve over the development process as the EIA progresses and in response to consultation. They will be fed iteratively into the assessment process. These measures typically include those that have been identified as good or standard practice and include actions that would be undertaken to meet existing legislation requirements.

20.9.2 As there is a commitment to implementing these environmental measures, and also to various standard sectoral practices and procedures, they are considered

inherently part of the design of the Project and have, therefore, been considered in the scoping assessment.

Table 20-7: Relevant Land Use Embedded Environmental Measures

ID	Mitigation Measures embedded into the project design	How the measure will be secured
OM1	The design will ensure that routes used by walkers and cyclists, including PRoW, long distance walking routes and NCN routes will remain open where practicable and accessible to users during construction. Where this is not practicable, suitable diversions will be identified. Where appropriate diversions are not available and temporary closures required, these would be for as short a duration as possible.	DCO Requirement through the Outline Construction Environmental Management Plan (CEMP). The need for an Access Management Plan will be considered at PEIR and ES stage as the Project design is refined further.
20-1	Any permanent diversion of PRoW routes and other recreational routes should be clearly signposted and local groups should be notified and engaged. The design of routes would consider vulnerable user groups and ensure accessibility is maintained for users with limited mobility wherever possible i.e. resting places.	DCO Requirement through the Outline Construction Environmental Management Plan (CEMP) and Powers of the Draft DCO.
20-2	Accesses to residential properties, community facilities, and local businesses would be maintained throughout the construction period.	DCO Requirement through the Outline Construction Environmental Management Plan (CEMP).

ID	Mitigation Measures embedded into the project design	How the measure will be secured
20-3	Timings of works will be so that organised events including the Liverpool Half Marathon in March 2025 is not disrupted during construction.	DCO Requirement through the Outline Construction Environmental Management Plan (CEMP).
20-4	A Communication Strategy will be prepared to ensure that local residents and other stakeholders are made aware of the commencement of construction works.	DCO Requirement through the Outline Construction Environmental Management Plan (CEMP).
OM1	It is assumed (subject to the design development and refinement of the Project) that connection points and cabling will be delivered through tunnelling and existing utilities connections and will not use open cut trenching unless this is unavoidable.	DCO Requirement through the Outline Construction Environmental Management Plan (CEMP).
20-5	The Project will aim to avoid permanent development on prime agricultural land (ALC grades 1-3a) with the aim of preserving the best quality agricultural land. An Agricultural Reinstatement Plan will be in place to commit to like for like replacement of any agricultural land lost during construction.	DCO Requirement through the Outline Construction Environmental Management Plan (CEMP), Agricultural Reinstatement Plan.

20.10 LIKELY SIGNIFICANT EFFECTS

20.10.1 In line with the EIA Regulations 2017, the EIA for the Project will consider those impacts where there is a risk of a likely significant effect only. The following Section draws on industry experience and expertise to identify those effect-receptor pathways that may potentially lead to a significant impact. Where

experience and available evidence indicates an effect-receptor pathway will not lead to a significant impact with regards to the EIA Regulations 2017 the pathway is scoped out from assessment.

20.10.2 The likely significant effects on land use are summarised in **Table 20-8**. The scoping assessment is based on a combination of the Project definition at the scoping stage, embedded environmental measures, understanding of the baseline conditions at this stage, the evidence base for land use effects, the identification of potentially impacted receptors, and professional judgement. The approach to this assessment is set out in **Chapter 3: Approach to EIA**.

20.10.3 The early identification of likely significant effects is used here as a tool aimed at delivering a proportionate approach to the EIA. In doing so, it sets out a high-level assessment of all potential effects, significant or not. The basis for scoping out certain effects, and therefore no longer considered is presented after the table, supported by evidence base.

Table 20-8: Likely Significant Land Use Effects

Activity and Impact	Embedded Measures	Effect	Proposed approach to assessment (scoped in or scoped out)	Receptor(s)	Further data baseline requirements
Construction of the Project (tidal barrage, grid connections, and port and marine facilities) leading to disruption to private properties and housing, due to the potential for proximate location of construction works areas, and movement of construction vehicle traffic.	ID 20-2, 20-3 and 20-4.	Whilst there is the potential for slight disruption to residents as a result of delays due to construction traffic or changes to property access, the embedded design measures will ensure that access to residential properties will be maintained throughout the construction period. Whilst the Project design is at its early stages, due to its predominantly marine based logistics, no loss of residential properties or associated land is anticipated. Any potential amenity effects will be assessed as part of the Health Impact Assessment (HIA) for the Project, and in **Chapter 21: Air Quality, Chapter 22: Onshore Noise and Vibration, and Chapter 25: Seascape, Landscape and Visual**.	Scoped out.	Residents of private property and housing (including allocated residential development land).	N/A

Activity and Impact	Embedded Measures	Effect	Proposed approach to assessment (scoped in or scoped out)	Receptor(s)	Further data baseline requirements
		During the O&M phase, there is not anticipated to be any Project interaction with private property and housing. For decommissioning, works are anticipated to be less that those required for the construction of the Project and are therefore not anticipated to be significant.			
Construction of the Project (tidal barrage, grid connections, and port and marine facilities) leading to disruption to businesses or development, due to the potential for proximate location of construction works areas, and movement of construction vehicle traffic.	ID 20-2, 20-3 and 20-4.	Whilst there is the potential for slight disruption to businesses as a result of delays due to construction traffic or changes to business access, the embedded design measures will ensure that access to business premises for employees and customers will be maintained throughout the construction period. Whilst the Project design is at its early stages, due to its predominantly marine based logistics, no loss of	Scoped out.	Businesses and development land.	N/A

Activity and Impact	Embedded Measures	Effect	Proposed approach to assessment (scoped in or scoped out)	Receptor(s)	Further data baseline requirements
		businesses or development land is anticipated. Assuming the embedded measures identified are in place, there are not anticipated to be any activities during the construction of the Project which will prevent businesses from undertaking operations. Any potential amenity effects will be assessed as part of the Health Impact Assessment (HIA) for the Project, and in **Chapter 21: Air Quality, Chapter 22: Onshore Noise and Vibration, and Chapter 25: Seascape, Landscape and Visual**. During the O&M phase, there is not anticipated to be any Project interaction with businesses and development land. For decommissioning, works are anticipated to be less that			

Activity and Impact	Embedded Measures	Effect	Proposed approach to assessment (scoped in or scoped out)	Receptor(s)	Further data baseline requirements
		those required for the construction of the Project and are therefore not anticipated to be significant.			
Construction of the Project (tidal barrage, grid connections, and port and marine facilities) leading to disruption to agricultural land holdings during construction, O&M, and decommissioning, due to the potential for temporary or permanent land take for construction works areas.	ID 20-3, 20-4, and OM1.	It is envisaged that access to agricultural land holdings will be maintained, due to the contained nature of the construction works and connection points being within existing National Grid substations. Whilst the Project design is at its early stages, no loss of agricultural land is anticipated that would give rise to significant adverse effects for farm businesses and their viability. Where there are Grid Connection cables crossing agricultural land, where possible these will be buried. As such, whilst there is potential for adverse effects on agricultural land holdings, these are likely to be minimal and have therefore been	Scoped out.	Agricultural Land Holdings.	N/A

Activity and Impact	Embedded Measures	Effect	Proposed approach to assessment (scoped in or scoped out)	Receptor(s)	Further data baseline requirements
		scoped out for further assessment. During the O&M phase, there is not anticipated to be any Project interaction with agricultural land holdings. For decommissioning, works are anticipated to be less that those required for the construction of the Project and are therefore not anticipated to be significant.			
Construction of the Project (tidal barrage, grid connections, and port and marine facilities) leading to disruption to community facilities, open space and recreational facilities land during construction, due to the potential for proximate location of construction works areas, and movement of construction vehicle traffic.	ID OM1, 20-1, 20-2 and 20-4	Whilst there is the potential for slight disruption to community facilities, open space and recreational facilities as a result of changes to access, the embedded design measures will ensure that access for people using these resources will be maintained throughout the construction period. Whilst the Project design is at its early stages, due to its	Scoped out.	Community facilities, open space and recreational facilities.	N/A

Activity and Impact	Embedded Measures	Effect	Proposed approach to assessment (scoped in or scoped out)	Receptor(s)	Further data baseline requirements
		predominantly marine based logistics, no loss of community or recreational facilities or open space is anticipated. Any potential amenity effects will be assessed as part of the Health Impact Assessment (HIA) for the Project, and in **Chapter 21: Air Quality, Chapter 22: Onshore Noise and Vibration, and Chapter 25: Seascape, Landscape and Visual**. It is also noted that due many of these facilities being located in urban areas the construction of the Project would not significantly decrease the enjoyment or experience of using these resources. During the O&M phase, there is not anticipated to be any Project interaction with			

Activity and Impact	Embedded Measures	Effect	Proposed approach to assessment (scoped in or scoped out)	Receptor(s)	Further data baseline requirements
		community and recreational facilities and open spaces. For decommissioning, works are anticipated to be less that those required for the construction of the Project and are therefore not anticipated to be significant.			
Construction of the Project (tidal barrage, grid connections, and port and marine facilities) leading to disruption for WCH using PRoW, due to the potential for proximate location of construction works areas, and movement of construction vehicle traffic.	ID OM1 and 20-1.	Whilst there is the potential for slight disruption to WCH routes, the embedded design measures will ensure that access for users will be maintained throughout the construction period where possible, or a suitable diversionary route implemented. It is envisaged that due to the construction of the tidal barrage, there is potential for users of the King Charles III England Coast Path to	King Charles III England Coast Path scoped in, in relation to Tidal Barrage Scoping Boundary study area. New pedestrian route across the Tidal Barrage scoped in during O&M phase. Other WCH routes scoped out.	WCH using the Coast Path.	N/A

Activity and Impact	Embedded Measures	Effect	Proposed approach to assessment (scoped in or scoped out)	Receptor(s)	Further data baseline requirements
		experience disruption and possible temporary loss of access. Given that this is a section of a long distance route of national importance, which is likely to attract users from beyond the local area, there is the potential for barrage construction works to give rise to significant effects for users. During the O&M phase, there is not anticipated to be any Project interaction with WCH routes, aside from the new pedestrian route across the Tidal Barrage. During operation of the Project, there is the potential for significant beneficial impacts associated with this, delivering a new crossing over the River Mersey and increasing options for active travel, connecting both local and			

Activity and Impact	Embedded Measures	Effect	Proposed approach to assessment (scoped in or scoped out)	Receptor(s)	Further data baseline requirements
		wider regional and national pedestrian routes. For decommissioning, works are anticipated to be less that those required for the construction of the Project and are therefore not anticipated to be significant.			
Construction of the Project (tidal barrage, grid connections, and port and marine facilities) leading to disruption to users of tourist facilities, due to the potential for proximate location of construction works areas, and movement of construction vehicle traffic.	ID 20-2 and 20-4	It is envisaged that due to the construction of the tidal barrage, there is potential for tourist attractions in close proximity to the River Mersey to experience disruption and possible temporary loss of access. Tourist visitors frequent Liverpool from the UK and abroad, and there is the potential for barrage construction works to give rise to significant effects on tourist attractions and their users. For decommissioning, works are anticipated to be less that	Tourist attractions in proximity to the tidal barrage scoped in during construction (for Tidal Barrage Scoping Boundary study area). Tidal barrage visitor centre and associated facilities scoped in during O&M phase. Other tourist attractions scoped out during construction, O&M, and decommissioning.	Tourist attractions and their users.	N/A

Activity and Impact	Embedded Measures	Effect	Proposed approach to assessment (scoped in or scoped out)	Receptor(s)	Further data baseline requirements
		those required for the construction of the Project and are therefore not anticipated to be significant. During operation of the Project, there is the potential for significant beneficial impacts associated with the Tidal Barrage visitor centre, delivering a new tourist attraction and viewpoint which could attract visitors from the wider region and across the UK.			

IMPACTS SCOPED OUT OF ASSESSMENT

20.10.4 Potential effects on land use, recreation and tourism have been scoped out from further assessment, aside from for certain recreational routes for WCH and tourist facilities in the Tidal Barrage Scoping Boundary study area where there is the potential for significant effects. There is a conclusion of no likely significant effects for all other land use receptors. These conclusions have been made based on the knowledge of the baseline environment and the nature of planned works.

20.10.5 The Project design will seek to minimise impacts and disruption to all receptors. Where construction vehicle routes and construction compounds are located close to dwellings, businesses, and community facilities, access will be maintained throughout the construction period. As such, this will reduce the potential for disruption to residents, businesses, and users, and avoid significant disruption. Should specific receptors be identified which may experience disruption to access, or their ability to operate due to construction activities, this will be reviewed as the design of the Project is progressed. Similarly, as the Grid Connection cabling routes are further refined, should specific agricultural land holdings be identified which may experience disruption due to cabling activities or loss of land, this would be reviewed further and where possible and appropriate, cables undergrounded so the functionality of agricultural land is not impeded.

20.10.6 Whilst there is the potential for amenity effects on land use, recreation, and tourist receptors as a result of other environmental impacts (e.g. air quality, noise and vibration, landscape and visual) this is assessed by other topics chapters in **Chapter 21: Air Quality, Chapter 22: Onshore Noise and Vibration, and Chapter 25: Seascape, Landscape and Visual**.

20.11 CUMULATIVE EFFECTS

20.11.1 Cumulative effects on land use, recreation and tourism receptors resulting from the effects of the Project and other developments will be assessed in accordance with the guidance and methodologies set out in **Chapter 30: Cumulative Effects** and considering the other developments that have been screened in as part of the CEA screening exercise.

20.12 TRANSBOUNDARY EFFECTS

20.12.1 Due to the localised nature of the potential impacts, transboundary effects are considered unlikely to occur for land use, recreation and tourism receptors.

20.13 PROPOSED APPROACH TO ENVIRONMENTAL IMPACT ASSESSMENT REPORT

20.13.1 Further desk-based studies and analysis will be undertaken to identify and assess land use, recreation and tourism receptors. This study will be supplemented with feedback received from stakeholders as part of the Scoping phase.

20.13.2 As the Project design is developed further as part of ongoing design and development, the assessment of WCH and tourism receptors will be refined. The baseline conditions and assessment will be undertaken as a desk-based study. Impacts will be appraised against professional experience and expert judgement where appropriate.

20.14 REFERENCES

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21 AIR QUALITY

21.1 INTRODUCTION

21.1.1 The Air Quality chapter will consider the potential likely significant effects on air quality that may arise from the construction, operation and maintenance (O&M) and decommissioning activities of the Project. This section of the Scoping Report describes the methodology to be used within the Environmental Impact Assessment (EIA), an overview of the baseline conditions within the Scoping Boundary (as defined in **Chapter 1: Introduction**), the datasets to be used to inform the EIA, the potential likely significant effects to be considered, and how these will be assessed for the purpose of the EIA.

21.1.2 The potential impacts considered in this chapter are those associated with the construction phase of the Project; namely:

IMPACTS ON HUMAN HEALTH

- Impacts on sensitive human[18] receptors due to changes in local pollutant concentrations, e.g. nitrogen dioxide (NO_2) and particulate matter (PM_{10} and $PM_{2.5}$), leading to poor air quality. These will be due to:
  - Exhaust emissions from construction traffic, plant and generators associated with the construction of the tidal barrage, marine and port facilities and grid connectors; and
  - Emissions from marine vessels associated with the construction of the tidal barrage, marine and port facilities.
- Impacts on sensitive receptors due to exhaust emissions of NO_X, PM_{10} and $PM_{2.5}$ from road traffic delayed due to construction works and road closures, together with the use of diversion routes which have the potential to introduce 'new' exposure. These impacts will be associated with the construction of the tidal barrier, marine and port facilities and grid connectors.

[18] Human sensitive receptors include residential properties, schools, hospitals and care homes as defined in Box 1.1 of LAQM.TG22.

IMPACTS ON DESIGNATED ECOLOGICAL SITES

- Impacts on sensitive ecological receptors within designated sites[19] due to changes in local pollutant concentrations, e.g. nitrogen dioxide (NO_2) and particulate matter (PM_{10} and $PM_{2.5}$), due to increased levels of nitrogen and acid deposition resulting from exhaust emissions from construction traffic, plant and generators, and marine vessels, associated with construction of the tidal barrier, marine and port facilities and grid connectors; ; and
- Dust deposition due to construction activities that affects sensitive habitats and plant communities.

NUISANCE IMPACTS

- Dust soiling effects on people and property generated by on-site activities, vehicle movements on roads and construction routes, particular at site entrances(s), and emissions from construction compounds associated with construction of the tidal barrier, marine and port facilities and grid connectors; and
- Odour emissions associated with dredging activities leading to annoyance associated with construction of the tidal barrier and the marine and port facilities.

21.1.3 Due to the nature of the Project, no operational phase impacts are anticipated; however, if during the course of the assessment the likelihood of significant effects associated with the operational phase is identified, these will also be considered, as appropriate.

21.1.4 Impacts due to decommissioning activities are likely to be broadly similar to those considered as part of the construction phase.

21.1.5 This chapter interfaces with other aspects and as such, should be considered alongside these, namely:

- **Chapter 13: Terrestrial Ecology and Biodiversity** which summarises the likelihood of significant effects on sensitive ecological receptors due to dust soiling and impacts on local air quality due to construction of the Project;

[19] The Institute of Air Quality Management (IAQM) guidance on the assessment of air quality impacts on designated nature conservation sites defines these as Special Areas of Conservation (SACs), Special Protection Areas (SPAs) (known as European sites) and Ramsar sites which are covered by the Habitats Regulations. It also applies to Sites of Special Scientific Interest (SSSIs), National Nature Reserves (NNRs), local nature reserves (LNRs), local wildlife sites (LWSs) and areas of ancient woodland (AW).

- **Chapter 24: Terrestrial Traffic and Transport** which informs the assessment of construction vehicle movements and traffic routing considered in this assessment;
- **Chapter 28: Greenhouse Gases** whose emission sources are similar to those considered in the air quality assessment, e.g. road traffic; and
- The Heath Impact Assessment which will accompany the environmental impact assessment which summarises human health impacts due to the Project including those due to dust soiling and changes in local air quality.

21.1.6 Overarching relevant legislation and policy context which has informed the scope of the assessment is outlined in **Chapter 4: Planning Policy,** with topic specific considerations outlined in **Appendix 4.1**.

21.2 TECHNICAL GUIDANCE

21.2.1 Technical guidance that has been used to define the assessment is set out in **Table 21-1**.

Table 21-1: Relevant technical guidance

Guidance reference	Relevance to the assessment
Local Air Quality Management Technical Guidance (LAQM.TG22), 2022	This guidance, published by Department for Environment Food & Rural Affairs (Defra), provides appropriate guidance for handling air quality monitoring data, the conversion of NO_X to NO_2 (and vice versa), estimating background pollutant concentrations, determining compliance with short-term air quality objectives, i.e. deriving 1-hour mean NO_2 and 24-hour mean PM_{10} concentrations from annual mean concentrations, as well as the verification and adjustment of air quality models. It also provides guidance on estimating emissions from construction plant (including Non-Road Mobile Machinery).
National Planning Practice Guidance – Air Quality, 2019	This provides guidance on how planning can take account of the impact of new development on air quality. It explains how much detail air quality assessments need to include for Projects, and how impacts on air quality can be mitigated. It also provides information on how air quality is taken into account by

Guidance reference	Relevance to the assessment
	Local Authorities in both the wider planning context of Local Plans and neighbourhood planning, and in individual cases where air quality is a consideration in a planning decision.
Institute of Air Quality Management (IAQM): Guidance on the Assessment of Dust from Demolition and Construction (version 2.2), 2024	This outlines how to assess the impacts arising from construction activities. The emphasis of the methodology is on classifying sites according to the risk of impacts (in terms of dust nuisance, PM_{10} impacts on public exposure and impact upon sensitive ecological receptors) and to identify mitigation measures appropriate to the level of risk identified.
Environmental Protection UK (EPUK)/IAQM: Land Use Planning and Development Control - Planning for Air Quality (version 1.2), 2017	This provides comprehensive advice on when an air quality assessment may be required; what should be included in an assessment; how to determine the significance of any air quality impacts associated with a development; and, the possible mitigation measures that may be implemented to minimise these impacts.
IAQM: A guide to the assessment of air quality impacts on designated nature conservation sites (version 1.1), 2020	This provides guidance on the assessment of the air quality impacts of developments on designated nature conservation sites.
JNCC Report No. 665: Nitrogen Futures, 2020	This provides guidance on future baseline NH_3 concentrations and nitrogen deposition rates based on potential future emissions scenarios.
IAQM: Guidance on the assessment of odour for planning (version 1.1), 2018	This includes guidance on using odour assessment tools, odour benchmark / assessment criteria, how to draw conclusions from assessment results, an where the need for mitigation measures is identified, the development of odour management plans
Environment Agency: H4 Odour Management, 2011	This includes guidance on assessing odour, mitigation measures and monitoring. It also includes guidance on developing odour management plans.

21.3 STUDY AREA

21.3.1 **Figure 21.1** shows the baseline air quality Study Area which extends 2km from the Barrage Scoping Boundary. It includes the grid connections as well as the 1km grid connection buffer, the port facilities and key infrastructure area, and the proposed barrage. The Study Area has been determined through the identification of key constraints (as outlined in Baseline Conditions below) and professional judgement on the basis of where impacts may occur due to construction activities and traffic, marine emissions and odour; it may need to be revised following the provision of more detailed design information.

21.3.2 The Study Area covers the administrative areas of Wirral Council (WC) and LCC either side of the River Mersey, extending northwards up the coast into the southern extent of Sefton Council (SC) and extending southwards into the north-western extent of Cheshire West and Chester (CWC). A small portion of the Study Area extends into the western region of Knowsley Council (KC) covering the suburb of Swanside.

CONSTRUCTION PHASE

21.3.3 IAQM guidance has been followed in defining the Study Area for construction stage impacts. This requires consideration of human sensitive receptors within 250 metres of the Project or within 50m of the route(s) used by construction vehicles on the public highway, up to 250m from the site entrance(s). For ecological receptors, the guidance recommends the consideration of sensitive receptors within 50m of Project and up to 50m from roads, located up to 250m of the site entrance(s) used by construction traffic. There are both sensitive human and ecological sites in the Study Area that would be affected.

21.3.4 While the routes to be used by construction phase traffic are not known at the current time, if following screening of the change in traffic flows due to the Project against the indicative criteria for requiring a detailed assessment given in the joint EPUK / IQAM guidance is exceeded, this will be generally limited to within 200m of the roads which will make up the ‘affected road network’.

21.3.5 The impact of emissions from marine vessels on sensitive receptors within 200m of vessel routes and port facilities would also be considered.

21.3.6 With reference to the IAQM odour guidance, professional judgement would be applied to determine the sensitivity of people to odour which will in-turn determine the Study Area. A Study Area for odour will therefore be defined once

further information is available on the source odour potential, exposure pathway effectiveness and sensitivity of the receptors on the surrounding land.

21.4 CONSULTATION

21.4.1 Consultation is a key part of the application process. The assessment has been and will be informed by engagement and discussion with various stakeholders such as relevant local authorities.

21.4.2 A summary of the consultation undertaken to date, including issues specific to air quality, is outlined in **Table 21-2**, together with how these issues will be considered in the production of the EIA.

21.4.3 The meeting with KC did not place when originally scheduled (on 28 June 2024), consequently this will need to be rearranged; a consultation meeting with WC is yet to be scheduled.

Table 21-2: Consultation

Date	Consultee	Consultation and key comments	How this is accounted for
26 June 2024	CWC	No specific comments were provided by CWC and LCC relating to the assessment of air quality impacts.	No further action required at this time.
08 July 2024	LCC		
18 June 2024	SBC	Impacts on sensitive (human and ecological) receptors due to construction traffic, dust and longer-term changes to the road / rail network, including significant increases in traffic on major (or local) roads in South Sefton, will need to be considered taking into account the location of Sefton's AQMAs on	The potential impact of construction dust and traffic due to the Project on sensitive receptors, existing AQMAs and areas covered by SBC's emerging Clean Air Plan are acknowledged in this Scoping Report and will be considered further

Date	Consultee	Consultation and key comments	How this is accounted for
		Princess Way (A5036) and the A565. Consideration of cumulative impacts associated with other committed developments.	in the assessment, including consideration of cumulative impacts associated with other committed developments.

21.5 ASSESSMENT METHODOLOGY

21.5.1 The Project-wide approach to the assessment methodology is set out in **Chapter 3: Approach to EIA**. This will be implemented to assess the likely significant effects on sensitive receptors from the construction, O&M, and decommissioning of the Project. The specific legislation and guidance outlined in **Appendix 4.1** will also be considered in relation to the assessment, in addition to consultation with the stakeholders outlined above.

21.5.2 A desktop study will be undertaken to determine air quality conditions in the baseline Study Area using key data sources given in **Table 21-3** This will include a review of the latest annual status reports published by LCC, SC, WC, CWC and KC including available local monitoring data, Defra's Local Air Quality Management support pages[20], predicted background air pollutant concentrations taken from Defra's PCM model, roadside concentrations for PCM modelled road links, the Environmental Agency's Pollution Register, and information held by the relevant local authorities on permitted Part A2 and B[21] installations.

21.5.3 Geospatial data available from Ordnance Survey, Google Earth and Air Pollution Information System (APIS) will be used to identify any existing sensitive receptors that may be sensitive to changes in air quality together with a review of the Project drawings.

21.5.4 Construction traffic shall be screened against the indicative criteria for requiring a detailed assessment given in the joint EPUK / IQAM guidance to determine the need for a quantitative air quality assessment. If necessary, this will be

[20] https://laqm.defra.gov.uk/

[21] This relates to smaller industrial processes regulated by the Local Authority under the Pollution Prevention and Control guidance, including Part A2 processes (which may release to land, air and water) or Part B processes (which only release to air).

undertaken to quantify the impacts, i.e. changes, in ambient NO_2, PM_{10} and $PM_{2.5}$ concentrations at relevant human sensitive receptors within 200m of affected roads for both the 'without' and 'with' development scenarios. The scoping criteria given in the IAQM's 'A guide to the assessment of air quality impacts on designated nature conservation sites' will be used to determine the need to assess the impact of NO_X emissions and nutrient nitrogen on sensitive ecological receptors. Pollutant levels will be predicted using the ADMS-Roads dispersion model with reference to current guidance. The modelling will be completed in accordance with Defra's Technical Guidance document LAQM.TG(22).

21.5.5 The results of the modelling will be compared to relevant statutory air quality objectives. Impact descriptors and the significance of identified impacts on human sensitive receptors will be determined using the joint EPUK / IAQM guidance and professional judgement. The likelihood of significant effects on sensitive ecological receptors would be determined by the project Ecologist, as required.

21.5.6 All assumptions and limitations will be given in the assessment presented within the ES and are likely to include:

- The number and type of plant used on site during the construction phase, as well as estimates of the volume of materials handled.
- The odour source strength and emission rates associated with dredging activities.
- Uncertainties will exist in marine vessel data in particular around exhaust emission rates. The number of vessels and their movements will also need to be estimated.
- If modelling of odour and / or marine vessel movements were to be qualitatively assessed, the model used, ADMS 6, would rely on input data with inherent uncertainties. The model will also simplify complex physical systems into a range of algorithms.
- Uncertainties in the traffic data provided by the project traffic consultant. Predictions of future year traffic flows will be based on published growth factors and additional trips generated by nearby cumulative schemes, as well as estimates of construction vehicle movements based on predicted volumes of materials to be handled.
- If a detailed air quality assessment is undertaken, there would be uncertainties associated with both measured and predicted concentrations.

The model (ADMS-Roads) would rely on input data, including predicted traffic flows, with inherent uncertainties. The model itself simplifies complex physical systems into a range of algorithms. ADMS-Roads would not consider local micro-climatic conditions that may also affect pollutant concentrations.

- To reduce the uncertainty associated with predicted concentrations, roads model verification would be carried out following the guidance in LAQM.TG(22).

21.6 BASELINE CONDITIONS

DATA INFORMATION SOURCES

21.6.1 An initial desk-based review has been undertaken of publicly available data sources outlined in **Table 21-3** has been used to determine the baseline character of the Study Area and inform the assessment process.

Table 21-3: Key sources of data

Source	Date	Summary	Coverage of Study Area
Environment Agency (EA) website.	May 2024	Public register of Part A1[22] permitted installations that have emissions to air.	Full coverage of the baseline air quality Study Area.
Multi-Agency Geographic Information for the Countryside (MAGIC) website.	May 2024	Locations of sensitive ecological receptors.	Full coverage of the baseline air quality Study Area, specifically the location of designated ecological sites up to 50m from Scoping Boundary of the Project and up to 50m from roads, located up to 250m of the site entrance(s) used by construction traffic.
Defra	May 2024	National background maps of forecast air quality concentrations on a 1km x	Full coverage of the baseline air quality Study Area.

[22] Large-scale industrial processes emitting to land, air and/or water and regulated by the Environment Agency

Source	Date	Summary	Coverage of Study Area
		1km basis from 2018 up to 2030.	
WC	September 2023	Local air quality monitoring data. Data on Part A2 and B permitted processes[23].	Full coverage of the baseline air quality Study Area within the WC administrative area.
LCC	November 2022	Local air quality monitoring data and the location of AQMAs. Data on Part A2 and B permitted processes.	Full coverage of the baseline air quality Study Area within the LCC administrative area.
SC	September 2023	Local air quality monitoring data and the location of AQMAs. Data on Part A2 and B permitted processes.	Full coverage of the baseline air quality Study Area within the SC administrative area.
CWC	October 2023	Local air quality monitoring data and the location of AQMAs. Data on Part A2 and B permitted processes.	Full coverage of the baseline air quality Study Area within the CWC administrative area.
KC	June 2023	Local air quality monitoring data. Data on Part A2 and B permitted processes.	Full coverage of the baseline air quality Study Area within the KC administrative area.
Ordnance Survey and Google Earth data products.	May 2024	Locations of sensitive human sensitive receptors.	Full coverage of the baseline air quality Study Area, specifically the location of human sensitive receptors up to 250m from the Scoping Boundary of the Project and up to 50m from roads, located within 250m from the site entrance(s), used by construction traffic.

[23] This would relate to smaller industrial processes regulated by the Local Authority under the Pollution Prevention and Control guidance, including Part A2 processes (which may release to land, air and water) or Part B processes (which only release to air).

Source	Date	Summary	Coverage of Study Area
APIS	May 2024	Current NO_X and NH_3 levels, critical loads, together with nitrogen and acid deposition rates for designated ecological sites.	Full coverage of the baseline air quality Study Area, specifically data for designated ecological sites up to 200m of the affected road network as well as sites within 200m of routes used by marine vessels and port facilities

EXISTING BASELINE

21.6.2 This section describes the present conditions which constitute the existing environment within the baseline air quality Study Area.

Sensitive Receptors

21.6.3 There are human and ecological receptors that would be sensitive to changes in air quality within the Study Area. Human receptors include residential properties immediately adjacent to the Scoping Boundary and throughout the baseline air quality Study Area, together with schools, hospitals and care homes.

21.6.4 Designated ecological sites within the baseline Study Area containing nitrogen sensitive species include the Sefton Coast Special Area of Conservation (SAC) and Site of Special Scientific Interest (SSSI) in Sefton, the Dee Estuary SAC and Dibbinsdale SSSI in the Wirral.

21.6.5 A number of Ancient Woodland sites (AWs) consisting of Thronton Wood, Foxes Wood, Eastham Wood, Stream Wood, Railway Wood, Patricks Wood, Marsfords Wood, Footpath Wood and Plymyard Dale located in the Wirral, and Fulwood Wood and Dipford Wood located in Liverpool. Bidston Moss Local Nature Reserve (LNR) is located along the M53 in North Birkenhead and Brotherton Park and Dibbinsdale LNR is located in Bromborough. The locations of these designated ecological sites are shown in **Figure 21.1**. A summary of the APIS data for these designated ecological sites is given in **Table 21-4**.

Air Quality Management Areas and Clean Air Plans

21.6.6 The locations of the AQMAs in the baseline study are shown in **Figure 21.1**.

21.6.7 There are no AQMAs within the WC and KC local authority area. CWC has four AQMAs within its administrative boundaries, but none are present within the Study Area. Liverpool is covered by a city-wide AQMA declared for exceedance of the annual mean NO_2 objective. SC has four AQMAs all of which fall within the Study Area. These include:

- SC AQMA 2: an area covering A5036 Princess Way from the Ewart Road flyover up to and including the Roundabout and flyover at the junction with Crosby Road South A565. This AQMA is adjacent to the site with partial areas covering the A5036 and A565 roundabout falling within the Scoping Boundary. The AQMA is declared for exceedances of the annual mean NO2 objective.
- SC AQMA 3: an area around the A5058 Millers Bridge and A565 Derby Road junction. This AQMA is adjacent to the northeastern region of the Scoping Boundary in Bootle and is declared for exceedances of the hourly mean NO2 and daily mean PM10 objectives.
- SC AQMA 4: an area around the junction of Crosby Road North A565 and South Road, Waterloo located 0.7km north of the Scoping Boundary and declared for exceedances of the annual mean NO2 objective.
- SC AQMA 5: an area around the junction of Hawthorne Road B5422 and Church Road A5036, Litherland situated towards approximately 1.3km east of the Scoping Boundary. It was declared for exceedances of the annual mean NO_2 objective.

21.6.8 SC are currently in the process of developing a Clean Air Plan which it is anticipated will lead to the implementation of a class B Heavy Goods Vehicle Clean Air Charging Zone and will include the roads within SC AQMA No. 3 and AQMA No. 5.

21.6.9 LCC's Clean Air Plan identifies nine areas where efforts are being focussed to reduce roadside NO_2 concentrations.

Table 21-4: Site relevant critical loads, nitrogen deposition rates, NO_x and NH_3 concentrations

Designated site	Relevant nitrogen critical load class*	Critical load range for nitrogen (kg N/ha/yr)	Nitrogen deposition rate (kg N/ha/yr)	Critical load for NO_x ($\mu g/m^3$)	Critical load for NH_3 ($\mu g/m^3$)**	NO_x concentration ($\mu g/m^3$)***	NH_3 concentration ($\mu g/m^3$)***
Sefton Coast SAC.	Moist and wet dune slacks.	5-10	13.89	30	1 or 3	17.67	1.62
Dee Estuary SAC.	Coastal dune grasslands (grey dunes) - acid type. Moist and wet dune slacks - acid type.	5-10	17.60	30	1 or 3	17.53	2.83
Dibbinsdale SSSI and AW.	Broadleaved deciduous woodland.	10-15	29.53	30	1 or 3	14.73	2.51
Sefton Coast SSSI.	Coastal dune grasslands (grey dunes).	5-15	13.89	30	1 or 3	17.67	1.62
Thornton Wood AW.	Broadleaved deciduous woodland.	10-15	29.32	30	1 or 3	12.79	2.47

Designated site	Relevant nitrogen critical load class*	Critical load range for nitrogen (kg N/ha/yr)	Nitrogen deposition rate (kg N/ha/yr)	Critical load for NO_x ($\mu g/m^3$)	Critical load for NH_3 ($\mu g/m^3$)**	NO_x concentration ($\mu g/m^3$)***	NH_3 concentration ($\mu g/m^3$)***
Foxes Wood AW.	Broadleaved deciduous woodland.	10-15	29.24	30	1 or 3	12.79	2.47
Eastham Wood AW.	Broadleaved deciduous woodland.	10-15	29.93	30	1 or 3	20.01	2.42
Stream Wood AW.	Broadleaved deciduous woodland.	10-15	29.32	30	1 or 3	11.78	2.47
Railway Wood AW.	Broadleaved deciduous woodland.	10-15	29.16	30	1 or 3	12.93	2.42
Patricks Wood AW.	Broadleaved deciduous woodland.	10-15	29.32	30	1 or 3	14.73	2.45

Designated site	Relevant nitrogen critical load class*	Critical load range for nitrogen (kg N/ha/yr)	Nitrogen deposition rate (kg N/ha/yr)	Critical load for NO_x ($\mu g/m^3$)	Critical load for NH_3 ($\mu g/m^3$)**	NO_x concentration ($\mu g/m^3$)***	NH_3 concentration ($\mu g/m^3$)***
Marsfords Wood AW.	Broadleaved deciduous woodland.	10-15	29.52	30	1 or 3	13.37	2.49
Footpath Wood AW.	Broadleaved deciduous woodland.	10-15	29.32	30	1 or 3	11.78	2.47
Plymyard Dale AW.	Broadleaved deciduous woodland.	10-15	29.94	30	1 or 3	13.7	2.56
Fulwood Wood AW.	Broadleaved deciduous woodland.	10-15	28.12	30	1 or 3	16.54	2.09
Dipford Wood AW.	Broadleaved deciduous woodland.	10-15	28.12	30	1 or 3	16.54	2.09

Designated site	Relevant nitrogen critical load class*	Critical load range for nitrogen (kg N/ha/yr)	Nitrogen deposition rate (kg N/ha/yr)	Critical load for NO_x ($\mu g/m^3$)	Critical load for NH_3 ($\mu g/m^3$)**	NO_x concentration ($\mu g/m^3$)***	NH_3 concentration ($\mu g/m^3$)***
Bidston Moss LNR.	Broadleaved deciduous woodland.	10-15	24.53	30	1 or 3	14.74	1.85
Brotherton Park and Dibbinsdale LNR.	Broadleaved deciduous woodland.	10-15	29.32	30	1 or 3	14.73	2.45

Notes:

Data have been taken from the Air Pollution Information System website (http://www.apis.ac.uk/) and represent a three-year average for the period 2020-22 (2021 mean).

* Where multiple features occur within a designated site, data has been presented for the feature with the lowest critical load for nitrogen.

** The lower critical level for NH_3 applies for bryophytes.

*** Where sites span multiple grid squares, the highest value is presented.

Local Emission Sources

21.6.10 Air quality within the Study Area is mainly influenced by transport emissions from vehicles using the road network within the SC, LCC, WC, CWC and KC administrative areas.

21.6.11 There are a total of 39 Part A1 industrial processes located within the Study Area. Of these, seven are in Sefton, 13 each in both Liverpool and the Wirral, and six in CWC. None of the permitted industrial installations are likely to substantially affect air quality at the Site and, where relevant, will have limits on emissions to air imposed by the regulator.

21.6.12 Air quality is also influenced by emissions from the Port of Liverpool including both direct emissions from shipping and from the movement of heavy-goods vehicles (HGVs) to and from the port.

21.6.13 Liverpool John Lennon Airport, located in the south of Liverpool, lies just outside the Study Area; however, road traffic emissions from vehicle movements associated with the day-to-day operation of the airport along-with aviation emissions (including aeroplanes and ground support vehicles) are expected to influence the local air quality within the Study Area.

Defra Background Maps

21.6.14 Defra provides modelled estimates of background concentrations of NO_2, PM_{10} and $PM_{2.5}$ for the whole of the UK, mapped at a grid resolution of 1km x 1km. Estimates are available based on a reference year of 2018 and for all years between 2018 to 2030. The range of 2022 background concentrations of air pollutants across the Study Area are given in Table 21-5: Defra predicted annual mean background air pollutant concentrations across the baseline air quality Study Area (µg/m3).

Table 21-5: Defra predicted annual mean background air pollutant concentrations across the baseline air quality Study Area (µg/m^3)

Year	NO_x*	NO_2	PM_{10}	$PM_{2.5}$
2024	7.2-46.1	5.7-27.9	8.5-15.7	5.7-11.4
Applicable air quality objective/critical level*	30	40	40	20
Grid square where maximum	333500, 394500	333500, 394500	335500, 394500	335500, 394500

concentration predicted (2024).				

21.6.15 Annual mean background NO_2, PM_{10} and $PM_{2.5}$ concentrations within the baseline air quality Study Area are below their relevant air quality objectives. NO_X concentrations exceed the critical level of 30µg/m^3 at some locations within the Study Area.

Local Authority Monitoring Data

21.6.16 WC, LCC, SC, CWC and KC undertake routine monitoring of NO_2, PM_{10} and $PM_{2.5}$ using continuous automatic analysers as well as passive diffusion tubes at background and roadside locations.

21.6.17 A review of available local authority monitoring data has shown that annual mean NO_2 concentrations within both the WC, CWC and KC administrative areas were comfortably below the annual mean objective of 40µg/m^3. Annual mean NO_2 levels in Liverpool, measured by LCC, are also below the objective. In Sefton, levels of NO_2 have breached the objective on Derby Road in Bootle, which is consistent with the declaration of an AQMA in this location.

21.6.18 Annual mean PM_{10} and $PM_{2.5}$ concentrations within the Study Area are also below their respective objectives of 40µg/m^3 and 20µg/m^3.

21.7 FUTURE BASELINE

21.7.1 In the absence of the Project, it is anticipated that baseline conditions would be no worse than current levels (assuming no further improvement over time); however, and generally speaking, air quality is improving in the UK. Background concentrations of key pollutants, including NO_2, PM_{10} and $PM_{2.5}$, are expected to decline steadily over the coming years in response to measures to reduce emissions from a range of key sources, including domestic, industrial and transport sources.

21.7.2 At roadside locations, concentrations of NO_2 have fallen following the introduction of Euro 6 engine controls in 2016. Continued improvement is also expected due to the introduction of low and zero emission vehicles into the national fleet and the progressive phasing out of internal combustion engine vehicles by 2035. These technological improvements are expected to outweigh the projected increase in vehicle numbers.

21.7.3 For particulate matter, future changes at roadside locations are more balanced, as there has been less focus on reducing emissions of this family of pollutants in recent years. However, emissions are still expected to improve, i.e. fall, by around two percent per year over the next few years, which will outweigh the likely increase in vehicle numbers.

21.7.4 The future baseline for background concentrations of NH_3 and rates of nutrient nitrogen deposition will be based upon the 2019-21 data from APIS with the application of factors from the JNCC Nitrogen Futures report to provide the values for the expected Project opening year of 2038.

21.8 BASIS FOR SCOPING ASSESSMENT

21.8.1 The air quality scoping assessment is based on the following key assumptions which are also set out in **Chapter 2: Site Context and Project Description**:

- The extent of the Scoping Boundary of the Project (see **Figure 21.1**).

21.9 EMBEDDED ENVIRONMENTAL MEASURES

21.9.1 Embedded mitigation measures have been identified and are proposed to be adopted as part of the evolution of the Project design (embedded into the Project design). These measures will evolve over the development process as the EIA progresses and in response to consultation. They will be fed iteratively into the assessment process. These measures typically include those that have been identified as good or standard practice and include actions that would be undertaken to meet existing legislation requirements.

21.9.2 As there is a commitment to implementing these environmental measures, and also to various standard sectoral practices and procedures, they are considered inherently part of the design of the Project and have, therefore, been considered in the scoping assessment.

21.9.3 In addition to the specific embedded mitigation measures relevant to air quality listed in **Table 21-7,** consultation with relevant consultees will be required to address any concerns or issues.

21.9.4 It is anticipated that mitigation measures identified in **Table 21-6** will be secured through a suitably worded planning condition.

Table 21-6: Relevant air quality embedded environmental measures

ID	Mitigation Measures embedded into the project design	How the measure will be secured
21-1	Construction phase dust and particulate matter will be controlled through the application of best practice mitigation measures as outlined in current IAQM guidance.	A site-specific Dust Management Plan (DMP) will be included in the Construction Environmental Management Plan (CEMP).
21-2	Exhaust emissions from plant and construction equipment on site will be mitigated through the application of suitable controls and Site management measures.	Specific engine emission standards for plant and construction equipment will be given in the Outline and Full CEMP.
21-3	Exhaust emissions from marine vessels will be mitigated through the application of suitable controls and Site management measures.	Specific engine emission standards for marine vessels will be given in the Outline and Full CEMP.
21-4	Vehicle engine exhaust emissions from construction traffic will be mitigated through the application of suitable controls and Site management measures. For example, deliveries will be consolidated, where possible, to limit the number of vehicle movements and timed to avoid peak hours. Vehicle routing will be planned to minimise disruption on the local road network and to avoid local pollution 'hotspots' including AQMAs and areas covered by Clean Air Plans.	Specific engine emission standards for construction vehicles will be given in the Outline and Full CEMP. A Construction Logistics Plan (CLP) will be developed which will include transport management and delivery consolidation measures.

ID	Mitigation Measures embedded into the project design	How the measure will be secured
21-5	Emissions from temporary traffic management measures will be mitigated through the application of suitable controls and Site management measures. For example, temporary traffic management measures will be implemented, where possible, to avoid peak hours or undertaken as part of planned overnight works.	A Construction Logistics Plan (CLP) will be developed which will include transport management measures.
21-6	Odour emissions from dredging activities will be mitigated through the application of best practice mitigation measures as outlined in current IAQM and Environment Agency guidance.	A site-specific CEMP and Odour Management Plan (OMP) will be developed.

21.9.5 Mitigation measures will be developed as part of the DCO process following consultation with statutory and non-statutory consultees. These could include construction and consolidation management plans as well as the use of marine vessels for materials transportation to displace vehicle movements from the local road network.

21.9.6 The mitigation measures developed will contain commitments that complement the aims and objectives of the local air quality actions plans, including the Clean Air Plans developed by LCC and SC. A ‘compliance checklist’ will be developed as part of the Preliminary Environmental Impact Report and the final Environmental Statement.

21.10 LIKELY SIGNIFICANT EFFECTS

21.10.1 In line with the EIA Regulations 2017, the EIA for the Project will consider those impacts where there is a risk of a likely significant effect only. The following Section draws on industry experience and expertise to identify those effect-receptor pathways that may potentially lead to a significant impact. Where experience and available evidence indicates an effect-receptor pathway will not

lead to a significant impact with regards to the EIA Regulations 2017 the pathway is scoped out from assessment.

21.10.2 The likely significant effects on air quality are summarised in **Table 21-7**. The scoping assessment is based on a combination of the Project definition at the scoping stage, embedded environmental measures, understanding of the baseline conditions at this stage, the evidence base for air quality effects, the identification of potentially impacted receptors, and professional judgement. The approach to this assessment is set out in **Chapter 3: Approach to EIA**.

21.10.3 The early identification of likely significant effects is used here as a tool aimed at delivering a proportionate approach to the EIA. In doing so, it sets out a high-level assessment of all potential effects, significant or not. The basis for scoping out certain effects, and therefore no longer considered is presented after the table, supported by evidence base.

IMPACTS SCOPED OUT OF ASSESSMENT

21.10.4 Due to the nature of the Project, no operational phase impacts are anticipated; however, if during the course of the assessment the likelihood of significant effects associated with the operational phase is identified, these will also be considered, as appropriate.

21.11 CUMULATIVE EFFECTS

21.11.1 Cumulative effects on air quality resulting from the effects of the Project and other developments will be assessed in accordance with the guidance and methodologies set out in **Chapter 3: Approach to EIA** and considering the other developments that have been screened in as part of the CEA screening exercise.

Table 21-7: Like significant effects on air quality

Activity and Impact	Embedded Measures	Effect	Proposed approach to assessment (scoped in or scoped out)	Receptor	Further data baseline requirements
Emissions of dust and particulate matter from site activities leading to temporary increases in levels of deposited dust and surface soiling which cease at the end of the construction phase.	21-1	Loss of amenity, annoyance and complaints. Dust soiling of plants and trees.	Scoped in.	Human sensitive receptors within 250m of the Site and / or 50m of the route(s) used by construction vehicles on the public highway, up to 250m from the Site entrance(s). Ecological sensitive receptors within 50m of the Site and / or 50m of the route(s) used by construction vehicles on the public highway, up to 250m from the Site entrance(s).	None

Activity and Impact	Embedded Measures	Effect	Proposed approach to assessment (scoped in or scoped out)	Receptor	Further data baseline requirements
Emissions of NO_X, PM_{10} and $PM_{2.5}$ from plant and construction equipment on site which cease at the end of the construction phase.	21-2	Temporary changes in NO_2, PM_{10} and $PM_{2.5}$ levels leading to harm to human and ecological sensitive receptors.	Scoped in.	Human sensitive receptors and Designated ecological sites with features sensitive to changes in NO_X and nutrient nitrogen input within 200m of the Site.	None
Emissions of NO_X, PM_{10} and $PM_{2.5}$ from marine vessels which cease at the end of the construction phase.	21-3	Temporary changes in NO_2, PM_{10} and $PM_{2.5}$ levels leading to harm to human and ecological sensitive receptors.	Scoped in.	Human sensitive receptors and designated ecological sites with features sensitive to changes in NO_X and nutrient nitrogen input within 200m of marine vessel routes and docking points.	None

Activity and Impact	Embedded Measures	Effect	Proposed approach to assessment (scoped in or scoped out)	Receptor	Further data baseline requirements
Emissions of NO_X, PM_{10} and $PM_{2.5}$ from construction traffic on local roads and temporary traffic management measures which cease at the end of the construction phase.	21-4 and 21-5	Temporary changes in NO_2, PM_{10} and $PM_{2.5}$ levels leading to harm to human and ecological sensitive receptors.	Scoped in.	Human sensitive receptors and designated ecological sites with features sensitive to changes in NO_X and nutrient nitrogen input within 200m of affected roads.	Scheme specific baseline NO_2 surveys to determine current roadside concentrations along potential routes to be used by construction vehicles
Odour emissions associated with dredging activities which cease at the end of the construction phase.	21-6	Loss of amenity, annoyance and complaints.	Scoped in.	Human sensitive receptors	None

21.12 TRANSBOUNDARY EFFECTS

21.12.1 Due to the localised nature of the potential impacts, transboundary effects are considered unlikely to occur and are therefore not discussed further.

21.13 PROPOSED APPROACH TO ENVIRONMENTAL IMPACT ASSESSMENT REPORT

21.13.1 Further desk-based studies and analysis will be undertaken to identify and assess the potential impacts associated with the construction phase on sensitive receptors. This study will be supplemented with consultation with the relevant statutory and non-statutory organisations as necessary.

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22 ONSHORE NOISE AND VIBRATION

22.1 INTRODUCTION

22.1.1 The Onshore Noise and Vibration chapter will consider the potential likely significant effects on onshore noise and vibration that may arise from the construction, operation and maintenance (O&M) and decommissioning activities of the Project. This section of the Scoping Report describes the methodology to be used within the Environmental Impact Assessment (EIA), an overview of the baseline conditions within the Scoping Boundary (as defined in **Chapter 1: Introduction**), the datasets to be used to inform the EIA, the potential likely significant effects to be considered, and how these will be assessed for the purpose of the EIA.

22.1.2 Onshore noise and vibration interfaces with other aspects and as such, should be considered alongside these; namely:

- **Chapter 9: Marine and Intertidal Ornithology**;
- **Chapter 12: Underwater Noise and Vibration**;
- **Chapter 13: Terrestrial Ecology and Biodiversity**;
- **Chapter 18: Terrestrial Archaeology and Cultural Heritage**; and
- **Chapter 24: Terrestrial Traffic and Transport**.

22.1.3 Overarching relevant legislation and policy context which has informed the scope of the assessment is outlined in **Chapter 4: Planning Policy,** with topic specific considerations outlined in **Appendix 4.1**.

22.2 TECHNICAL GUIDANCE

22.2.1 Technical guidance that has been used to define the assessment is set out in **Table 22-1**.

Table 22-1: Relevant technical guidance

Guidance reference	Relevance to the assessment
BS 5228-1:2009+A1:2014 Code of practice for noise and vibration control on construction and open sites - Part 1: Noise	This document provides a prediction and assessment methodology for construction noise and basic methods for noise control, amongst other things.
BS 5228-2:2009+A1:2014 Code of practice for noise and vibration control on construction and open sites - Part 2: Vibration.	This document provides a vibration prediction methodology for some construction activities. It also provides an assessment methodology and basic methods to control vibration from construction works.
Design Manual for Roads and Bridges (DMRB) LA 111 - Noise and vibration. Revision 2.	This document determines the approach taken to evaluate noise and vibration levels during both the construction, operation and maintenance of highways projects. Although this is not a highways project, the methodology used to appraise the effects of development traffic is deemed appropriate.
Calculation of Road Traffic Noise 1988 (CRTN).	Details the prediction methodology for noise from road traffic.
BS 4142:2014+A1:2019 Methods for rating and assessing industrial and commercial sound.	This document is used for measuring, predicting and assessing the impact of noise from industrial processes and plant items.
Planning Practice Guidance: Noise.	Advises on how planning can manage potential noise impacts in new development.

22.3 STUDY AREA

22.3.1 The study areas for the onshore noise and vibration assessment will be defined in relation to published standards and, where these are not definitive, it will be based on professional judgement. These will be identified and agreed in consultation with stakeholders so that the Preliminary Environmental Impact Report (PEIR) and (Environmental Statement) ES are suitably informed.

22.3.2 The study areas for sensitive human receptors and, in the case of construction vibration, listed buildings are presented below:

- For construction and decommissioning noise: a Study Area of 150m from any area of construction will be adopted. This falls within the distance for which the BS 5228 prediction methodology is valid and is considered sufficient to ensure that all potentially significant noise effects will be identified.
- For construction and decommissioning vibration: a Study Area of 100 m from the closest construction activity with the potential to generate vibration will be adopted. This falls within the distance for which the BS 5228 prediction methodology is valid. Furthermore, DMRB LA111 states; "*A study area of 100m from the closest construction activity with the potential to generate vibration is normally sufficient to encompass vibration sensitive receptors*."
- For construction and decommissioning traffic noise: a Study Area of 50m from public roads with an expected increase of 1dB(A) or more due to construction traffic will be adopted. This is in line with the guidance in DMRB LA111 does not require the assessment of effects at receptors more than 50m from works.
- For operational noise from fixed plant and equipment: a Study Area of 200m from the sites of fixed plant and equipment will be adopted. This is considered sufficient to ensure that all potentially significant noise effects will be identified and addressed.
- For operational noise from dredging vessels: a Study Area of 200m from the banks of the river will be adopted. This is based on experience of working on other developments which involve dredging.
- For operational road traffic noise; a Study Area of 300m from the closest road traffic noise source is considered sufficient to ensure that all potentially significant noise effects will be considered. This is informed by the validity of the CRTN calculation methodology.

22.4 CONSULTATION

22.4.1 Consultation is a key part of the application process Introductory meetings have been held in advance of the submission of the EIA Scoping Report with Cheshire West and Chester Council (26 June 2024), Liverpool City Council (8 July 2024) and Natural England (15 July 2024) to help inform the assessment approach, although there were no specific noise issues raised within these sessions. In addition to these meetings, Sefton Council expressed within an email on the 18 June 2024 that noise impacts and disturbance to Sefton residents, businesses and the wider community, and any associated health impacts would be key issues of interest for them. It is anticipated that the following stakeholders will continue to be consulted, as a minimum:

- Natural England;
- Liverpool City Council;
- Wirral Council;
- Sefton Council; and
- Cheshire West and Chester Council.

22.5 ASSESSMENT METHODOLOGY

22.5.1 The Project-wide approach to the assessment methodology is set out in **Chapter 3: Approach to EIA**. This will be implemented to assess the likely significant effects on onshore noise and vibration receptors from the construction, O&M, and decommissioning of the Project. The specific legislation and guidance outlined in **Table 22-1** will also be considered in relation to the assessment, in addition to consultation with the stakeholders outlined above.

22.5.2 The assessment methodology focuses on human receptors and, in the case of construction vibration, is also relevant to listed buildings. However, noise predictions will also be undertaken for terrestrial ecological receptors and information on the proposed assessment methodology and significance of effect criteria is detailed in **Chapter 13: Terrestrial Ecology and Biodiversity** and **Chapter 9: Marine and Intertidal Ornithology**.

BASELINE NOISE LEVELS

22.5.3 A detailed baseline noise survey will be undertaken to establish the prevailing conditions at sensitive human and terrestrial ecological receptors in the vicinity of all three components of the Project. The measurement locations and the survey

methodology will be discussed and agreed with the relevant local authorities prior to the survey being undertaken. However, the survey locations are likely to include the closest residential and education uses, any noise-sensitive commercial premises and ecologically sensitive areas. The surveys would be mostly unattended and conducted over a period of approximately one week such that representative noise levels are obtained.

22.5.4 All measurements will be carried out using sound level meters compliant with Class 1 specification, as set out in BS EN 61672-1: 2013. All measurement equipment will be installed by a consultant competent in environmental noise monitoring, and in general accordance with the principles of BS 7445-2: 1991.

22.5.5 No baseline vibration survey is considered necessary as sensitive areas are some distance from the site and vibration levels significantly reduce with distance. However, this will be kept under review as the Project progresses.

CONSTRUCTION AND DECOMMISSIONING PHASE

22.5.6 Whilst the extent and detail of the construction and decommissioning phases is under development, it is expected that they will include similar noise sources and have, therefore, at this stage been considered using the same assessment methodology. However, the decommissioning phase relates to the barrage only as most other aspects of the Project will remain in-situ. This will be reviewed as the Project progresses.

Construction and Decommissioning Noise

22.5.7 Construction noise will be assessed using the guidance in BS 5228:2009+A1:2014 Part 1. The results of the baseline noise survey will be used to determine appropriate construction noise level thresholds during the daytime and, for the construction of the barrage, during the night-time. Predictions of noise from the construction of the tidal barrage (including any associated marine movements and dredging of the channel bed), cable laying for the grid connection, and use of the existing port facilities, will be assessed against those thresholds. Predictions will be undertaken for a sample of the closest sensitive human receptors within the Study Area for each relevant construction phase activity for all components of the Project.

22.5.8 Appropriate mitigation measures will be presented, including best practicable means (BPM) and the good practice recommendations presented in BS 5228-1.

Construction Vibration

22.5.9 Construction vibration would be assessed using the guidance in BS 5228:2009+A1:2014 Part 2. For a sample of construction activities that have the potential to produce vibration (e.g. piling associated with the tidal barrage), vibration impact will be determined at a series of set-back distances within the Study Areas for the sensitive human receptors and the sensitive cultural heritage receptors. Appropriate mitigation measures will be presented, including BPM and the good practice recommendations presented in BS 5228-2.

22.5.10 Construction of the grid connection and use of the port and marine facilities during construction phase are unlikely to require the prediction and assessment of construction vibration as they will not require vibration-generating plant / activities. This will be kept under review as the Project progresses.

Construction Traffic Noise

22.5.11 The assessment of temporary construction traffic noise on the public highway will be carried out using the guidance in DMRB LA111. This will involve a desktop study informed by the logistics strategy noting that the construction of the tidal barrage will be a predominantly marine based activity. Construction traffic associated with the tidal barrage will, therefore, most likely be associated with workforce and terrestrial logistics to port and marine facilities. Noise level calculations will be undertaken in accordance with the methodology contained within CRTN and the associated noise changes due to the construction traffic arising from the Project would be assessed using the guidance set out in DMRB LA111.

22.5.12 When the construction traffic data are released, professional judgement will be used to determine whether the Study Area needs to be redefined. This will include consideration of distance between routes and sensitive receptors, times of day for the vehicle movements and the existing noise environment at the receptors.

22.5.13 Given the length of the construction phase, the proposed assessment years for the construction traffic assessment will be considered in detail as the Project progresses as there is likely to be the need for rerouting of traffic due to temporary road closures during the construction phase.

OPERATION AND MAINTENANCE PHASE

Noise from Fixed Plant and Equipment

22.5.14 The proposals include various items of fixed plant and equipment such as a substation and ventilation systems. The locations of these plant will be finalised as the engineering design matures and are likely to relate to the tidal barrage itself and any substation, services plant such as for ventilation.

22.5.15 The results of the baseline noise survey will be used to determine appropriate target design criteria for the plant items which will be set in accordance with BS 4142:2014+A1:2019. If sufficient manufacturers' data are available, predictions of the plant noise will be undertaken and assessed against the target design criteria. Predictions will be undertaken for a sample of the closest sensitive human receptors within the Study Area.

22.5.16 Where necessary, appropriate outline mitigation measures will be presented.

Noise from Dredging the Channel Bed

22.5.17 Dredging will be required to maintain continuous operation of the tidal barrage and the frequency of dredging will be confirmed once the tidal barrage location is finalised.

22.5.18 Dredging vessels are known to produce low frequency noise and predictions will be undertaken at a sample of receptors within the Study Area and assessed in accordance with criteria agreed in advance with the local authorities.

Noise from Operational Road Traffic

22.5.19 The assessment of operational road traffic noise on the public highway will be carried out using the guidance in DMRB LA111. This will involve a desktop study and noise level calculations will be undertaken in accordance with the methodology contained within CRTN and the associated noise changes due to the development traffic arising from the tidal barrage would be assessed using the guidance set out in DMRB LA111.

22.5.20 Whilst routes for operational traffic are yet to be finalised and anticipated levels of traffic unknown, professional judgement will be used to determine whether the Study Area needs to be redefined. This will include consideration of distance between routes and sensitive receptors, times of day for the vehicle movements and the existing noise environment at the receptors.

22.6 BASELINE CONDITIONS

DATA INFORMATION SOURCES

22.6.2 An initial desk based review has been undertaken of publicly available data to determine the baseline character of the Study Area and inform the assessment process.

EXISTING BASELINE

22.6.3 This section describes the present conditions which constitute the existing baseline environment for onshore noise and vibration within the Study Area. This is based on a desktop assessment and will be supplemented with a detailed on-site baseline noise survey.

22.6.4 The desktop study identifies Noise Important Areas (NIAs) based on the third round noise mapping for the Environmental Noise Directive (END), legally in force in England through the Environmental Noise (England) Regulations.

22.6.5 There are several NIAs which are likely to be in the Study Areas with **Figure 22.1** showing the extent of those nearby. As the engineering design evolves, the list of NIAs will be finalised.

22.6.6 A desktop review of the site and surrounding area has also been conducted using online aerial photography and preliminary drawings. The potential Study Areas comprise a mix of uses including industrial / commercial, retail, residential, leisure and education which have varying sensitivity to noise and vibration. There may also listed buildings in the 100m construction Study Area and these buildings may be more sensitive to vibration, should they be deemed structurally unsound (see **Figure 18.1** which shows the location of listed buildings). The area on the western bank of the River Mersey includes sensitive residential and education uses and also less sensitive leisure, commercial / industrial and retail uses. The area on the eastern bank of the River Mersey includes more uses which are less sensitive to noise and vibration such as industrial / commercial and retail. However, there are also leisure uses and hotels which are considered sensitive to noise.

22.6.7 It is anticipated that the existing noise environment at the nearest sensitive human receptors on the western bank of the River Mersey will be dominated by road traffic on the local road network and more localised sources such as industrial uses. From the online England Noise and Air Quality Viewer Extrium, the noise levels at the sensitive residential receptors to the to the west of the

river are between 55dB and 60dB LAeq,16hr during daytime and between 50dB and 55dB Lnight during night time with respect to road traffic noise only. These levels provide an indication of the baseline road traffic noise climate in the area, and are presented in **Figure 22.1**. The detailed baseline survey will provide a greater level of understanding with respect to the noise climate in the Study Areas and the results will be reported in the PEIR.

22.6.8 Information on the baseline environment in relation to ecological receptors is provided in **Chapter 13: Terrestrial Ecology and Biodiversity**.

22.7 FUTURE BASELINE

22.7.1 It is not anticipated that any major proposed developments are in the planning process which would substantially change the future baseline noise levels.

22.7.2 The future baseline noise environment at sensitive human receptors would be determined by any changes in road and rail traffic movements and other noise sources associated with nearby developments. This will remain under review and reported, as needed, in the PEIR and ES.

22.8 BASIS FOR SCOPING ASSESSMENT

22.8.1 The onshore noise and vibration scoping assessment is based on the indicative parameters set out in **Chapter 2: Site Context and Project Description** and **Figure 2.1.**

22.9 EMBEDDED ENVIRONMENTAL MEASURES

22.9.1 Embedded mitigation measures have been identified and are proposed to be adopted as part of the evolution of the Project design (embedded into the Project design). These measures will evolve over the development process as the EIA progresses and in response to consultation. They will be fed iteratively into the assessment process. These measures typically include those that have been identified as good or standard practice and include actions that would be undertaken to meet existing legislation requirements.

22.9.2 As there is a commitment to implementing these environmental measures, and also to various standard sectoral practices and procedures, they are considered inherently part of the design of the Project and have, therefore, been considered in the scoping assessment.

22.9.3 In addition to the specific embedded mitigation measures relevant to onshore noise and vibration listed in **Table 22-2** consultation will be undertaken with all

relevant consultees such that any concerns or issues can be proactively discussed and assessment methodologies agreed.

Table 22-2: Relevant onshore noise and vibration embedded environmental measures

ID	Mitigation Measures embedded into the project design	How the measure will be secured
22-1	Best practicable means and best practice to be employed during construction.	To be included within the Outline CEMP which will form part of the submission of the Environmental Statement with the DCO Application.
22-2	Target design criteria for operational fixed plant and equipment.	Operational noise management plan.

22.10 LIKELY SIGNIFICANT EFFECTS

22.10.1 In line with the EIA Regulations 2017, the EIA for the Project will consider those impacts where there is a risk of a likely significant effect only. The following Section draws on industry experience and expertise to identify effects that may potentially lead to a significant impact. Where experience and available evidence indicates an effect-will not lead to a significant impact with regards to the EIA Regulations 2017 it is scoped out from assessment.

22.10.2 The likely significant effects of onshore noise and vibration are summarised in **Table 22-3**. The scoping assessment is based on a combination of the Project definition at the scoping stage, embedded environmental measures, understanding of the baseline conditions at this stage, the evidence base for onshore noise and vibration effects, the identification of potentially impacted receptors, and professional judgement.

22.10.3 The early identification of likely significant effects is used here as a tool aimed at delivering a proportionate approach to the EIA. In doing so, it sets out a high-level assessment of all potential effects, significant or not. The basis for scoping out certain effects, and therefore no longer considered, is presented after the table, supported by evidence base.

Table 22-3: Likely significant onshore noise and vibration effects

Activity and Impact	Embedded Measures	Effect	Proposed approach to assessment (scoped in or scoped out)	Receptor	Further data baseline requirements
Construction noise effects at sensitive human receptors.	Best practicable means and best practice measures.	Potential significant effect due to high noise levels from construction activity.	Scoped In.	Noise sensitive receptors within the Study Area for construction noise (see **Section 21.4**).	Baseline noise survey to be undertaken.
Construction vibration effects at sensitive human receptors.	Best practicable means and best practice measures.	Potential significant effect due to vibration levels from construction activity.	Scoped In.	Vibration sensitive receptors within the Study Area for construction vibration (see **Section 21.4**).	None
Construction vibration effects at sensitive listed buildings.	Best practicable means and best practice measures.	Potential significant effect due to vibration levels from construction activity.	Scoped In.	Vibration sensitive receptors within the Study Area for construction vibration (see **Section 21.4**).	None
Construction traffic noise effects at sensitive human receptors.	None	Potential significant effects depending on construction traffic routing and the extent to which roads are used to transport construction material.	Scoped In.	Noise sensitive receptors within the Study Area of the construction traffic routes.	Baseline traffic flow data for the construction routes.

Activity and Impact	Embedded Measures	Effect	Proposed approach to assessment (scoped in or scoped out)	Receptor	Further data baseline requirements
Construction traffic vibration effects at sensitive human receptors.	None	The vibration generated by construction traffic vehicles would be similar to the vibration caused by any other similar vehicles that could legally use the route. It is, therefore, anticipated that significant effects are unlikely to occur.	Scoped out.	N/A	None
Operational noise from fixed plant and equipment.	Setting target design noise criteria.	Potentially significant noise effects.	Scoped in.	Noise sensitive receptors within the Study Area for fixed plant and equipment.	Baseline noise survey to be undertaken.
Operational noise from routine dredging of the channel bed.	None	Potentially significant noise effects.	Scoped in.	Noise sensitive receptors within the Study Area for fixed plant and equipment.	None
Operational road traffic noise.	None	Unlikely to be significant. However, this can only be determined when traffic flow data are confirmed.	Scoped in (to be reviewed as the Project progresses).	Noise sensitive receptors within the Study Area.	Baseline traffic flow data.
Operational vibration.	None	The vibration generated by operational aspects of the	Scoped out.	N/A	None

Activity and Impact	Embedded Measures	Effect	Proposed approach to assessment (scoped in or scoped out)	Receptor	Further data baseline requirements
		Project are unlikely as there are no proposed sources of vibration.			

IMPACTS SCOPED OUT OF ASSESSMENT

22.10.4 Potential effects of onshore operational vibration have been scoped out from further assessment, resulting from a conclusion of no likely significant effect. These conclusions have been made based on the knowledge of the baseline environment and the nature of planned works on the potential for impact from such projects more widely. The conclusions follow existing best practice and professional judgement.

IMPACTS SCOPED INTO THE ASSESSMENT

22.10.5 Below is a summary of the Project components scoped in:

- Construction noise: including the tidal barrage, dredging of the channel bed, cable laying for the grid connection and the intensified use of any existing port and marine facilities;
- Construction vibration: including the tidal barrage and any onshore elements of piling;
- Construction traffic noise;
- Operational noise from fixed plant and equipment associated with the tidal barrage and including any substation noise;
- Operational noise from routine dredging of the channel bed; and
- Operational road traffic noise.

22.11 CUMULATIVE EFFECTS

22.11.1 Cumulative effects on onshore noise and vibration resulting from the effects of the Project and other developments will be assessed in accordance with the guidance and methodologies set out in **Chapter 3: Approach to EIA** and considering the other developments that have been screened in as part of the Cumulative Effects Assessment (CEA) screening exercise.

22.11.2 Construction phase effects, where there is an overlap in noise generating phases of the construction programmes have the potential to act cumulatively with impacts from other developments to contribute to cumulative effects.

22.11.3 Cumulative effects on industrial and commercial receptors are scoped out due to their low sensitivity to noise and vibration.

22.12 TRANSBOUNDARY EFFECTS

22.12.1 Due to the localised nature of the potential impacts, transboundary effects are considered unlikely to occur and, therefore, are not considered further.

22.13 PROPOSED APPROACH TO ENVIRONMENTAL IMPACT ASSESSMENT

22.13.1 A baseline noise survey and further desk-based studies and analysis will be undertaken to identify and assess onshore noise and vibration effects. This study will be supplemented with consultation with the relevant statutory and non-statutory organisations as necessary.

22.14 REFERENCES

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23 GEOLOGY AND GROUND CONDITIONS

23.1 INTRODUCTION

23.1.1 The Geology and Ground Conditions chapter will consider the potential likely significant effects related to Geology and Ground Conditions that may arise from the construction, operation and maintenance (O&M) and decommissioning activities of the Project. The receptors considered include human health, controlled waters and the built environment, as well as the geological environment itself. This section of the Scoping Report describes the methodology to be used within the Environmental Impact Assessment (EIA), an overview of the baseline conditions within the Scoping Boundary (as defined in **Chapter 2: Project Description**), the datasets to be used to inform the EIA, the potential likely significant effects to be considered, and how these will be assessed for the purpose of the EIA.

23.1.2 Geology and Ground Conditions interfaces with other aspects and as such, should be considered alongside these; namely:

- **Chapter 5: Coastal Processes**: there are potential pathways of effects between soil and geological deposits and construction works, with water bodies and water quality;
- **Chapter 19: Water Resources and Flood Risk**: there are potential pathways of effects between soil and geological deposits and construction works, with groundwater and surface water resources and water quality;
- **Chapter 20: Land Use, Recreation and Tourism**: there will be common receptors such as agricultural land holdings considered under both of these chapters; and
- **Chapter 30: Waste and Materials**: there will be deposits generated during construction works that will be considered by the materials and waste assessment.

23.1.3 Overarching relevant legislation and policy context which has informed the scope of the assessment is outlined in **Chapter 4: Planning Policy,** with topic specific considerations outlined in **Appendix 4.1**.

23.2 TECHNICAL GUIDANCE

23.2.1 Technical guidance that has been used to define the assessment is set out in **Table 23-1**.

Table 23-1: Relevant technical guidance

Guidance reference	Relevance to the assessment
Environment Agency 'Land Contamination Risk Management' (LCRM) (as updated 20 July 2023).	Guidance on the assessment and management of potential risks from land contamination.
CIRIA C552 'Contaminated Land Risk Assessment. A guide to good practice' (2001).	Guidance on assessment of contaminated land and explanation of the key elements of risk assessment practices and procedures.
CIRIA C532 (2001) Control of Water Pollution from Construction Sites.	Provides guidance on environmental good practice for the control of water pollution arising from construction activities. The document t focuses on the potential sources of water pollution from within construction sites and the effective methods of preventing its occurrence.
British Standards Institute (BSI) BS 5930 (2015 +A1:2020) The Code of Practice for Site Investigations.	Provides guidance on conducting ground investigation.
BS 10175 (2011 +A2:2017) Investigation of Potentially Contaminated Sites – Code of Practice.	Provides recommendations for investigation of potentially contaminated land or land with naturally elevated concentrations of potentially harmful materials.
Department for Environment, Food and Rural Affairs (DEFRA), Contaminated Land Statutory Guidance April 2012.	This guidance includes guidance on the process of the assessment of contaminated land in the legal sense of the term.
BS 8485 (2015+A1 2019) Code of practice for the design of protective measures for methane and carbon dioxide ground gases for new buildings.	Provides guidance for use by designers of ground gas protection measures and regulators who are involved in the assessment of gas protection design solutions.

Guidance reference	Relevance to the assessment
CIRIA C665, 2007. Assessing risks posed by hazardous ground gases to buildings.	Provides guidance on good practice in investigation and assessment of risks posed by hazardous ground gases.
Environment Agency and National House Building Council (NHBC) (2008) Guidance for the safe development of housing on land affected by contamination, Environment Agency R&D Publication 66.	Guidance on the assessment of land potentially affected by contamination. Although published by the NHBC guidance provided is relevant to many types of development.
Design Manuals for Roads and Bridges (DMRB) LA 109 (Geology and Soils). (Design Manuals for Roads and Bridges, 2019).	A document that covers the requirements that shall be applied to the assessment, reporting and management of environmental effects on geology and soils from the delivery of highways projects. Although the Proposed Scheme is not a highways project, this guidance is used as a guide when considering the significance of potential effects.
DMRB LA 113 (Road Drainage and the Water Environment) (Highways England, Transport Scotland, Welsh Government and Department for Infrastructure, 2020).	DMRB LA 113 is referenced alongside DMRB LA 109.
DMRB LA 104 (Environmental Assessment and Monitoring) (Highways England, Transport Scotland, Welsh Government and Department for Infrastructure, 2020).	DMRB LA 104 is referenced alongside DMRB LA 109.
Institute of Environmental Management and Assessment. (2022). Guide: A New	The primary focus is on outlining the approach to the assessment of the effects on land and soil. Guidance is also provided on the

Guidance reference	Relevance to the assessment
Perspective on Land and Soil in Environmental Impact Assessment.	assessment of contaminated land and materials management and reuse.
ICE (2019). Environmental Impact Assessment Handbook, Third Edition.	Provides an overarching guide to Environmental Impact Assessment including outline guidance on the assessment of soils and agricultural land.
Environment Agency (2017) Groundwater Protection.	Contains position statements which provide information about the EA's approach to managing and protecting groundwater.
Society of Brownfield Risk Assessment (SoBRA), August 2022. Guidance on Assessing Risk to Controlled Waters from UK Land Contamination Under Conditions of Future Climate Change.	Provides guidance on how to include for the potential effects of climate change in the assessed stages of controlled waters risk assessment for land contamination.
Planning Practice Guidance – Land affected by Contamination. 22 July 2019.	Provides guidance as to when land contamination may be potentially present, the role of the planning authority in consideration contamination and the requirements and different stages of risk assessment.
Yorkshire and Lincolnshire Pollution Advisory Group, Version 12.2 July 2023. Development on Land Affected by Contamination – Technical Guidance for Developers, Landowners and Consultants.	Provides guidance on good practice for the development of land affected by contamination. This document has also been adopted by Local Authorities outside the Yorkshire and Lincolnshire region such as St Helens Council.

23.3 STUDY AREA

23.3.1 For scoping, the study area for the Geology and Ground Conditions assessment will be defined as the Scoping Boundary plus a buffer of 250 metres (m) when

considering controlled waters receptors and 50m for all other receptors. The study area for Geology and Ground Conditions is presented in **Figure 23.1**.

23.4 CONSULTATION

23.4.1 At this stage, no consultation has been undertaken for Geology and Ground Conditions. When appropriate (following refinement of the Project extents), the assessment will be informed by engagement and discussion with various stakeholders such as the Environment Agency (EA) and relevant Local Authorities (LAs).

23.5 ASSESSMENT METHODOLOGY

23.5.1 The Project-wide approach to the assessment methodology is set out in **Chapter 3: Approach to EIA**. This will be implemented to assess the likely significant effects related to Geology and Ground Conditions receptors from the construction, O&M, and decommissioning of the Project.

23.5.2 The specific legislation, policies and guidance outlined in **Chapter 4: Planning Policy and Appendix 4.1** will also be considered in relation to the assessment, in addition to consultation with the stakeholders outlined above.

INITIAL BASELINE DATA GATHERING

23.5.3 At this stage of the Project an initial assessment of baseline conditions has been informed by a high level review of publicly available data sources alongside existing reports. The baseline data collated as part of the scoping exercise is provided in **Section 23.7**.

23.5.4 It is anticipated that as the Project progresses further, more detailed assessment of the baseline conditions will be made in the form of detailed desk based assessments and intrusive ground investigation. The additional information sourced by these additional sources will enable refinement of the overall assessment.

ASSESSMENT METHODOLOGY

23.5.5 A detailed assessment of Geology and Ground Conditions would be completed in accordance with DMRB document LA 109 Geology and Soils (2019) which provides guidance on the assessment of effects associated with geology and soils including effects associated with land contamination.

23.5.6 In the context of the assessment of the likely effects in relation to land contamination the Environment Agency's LCRM Guidance will be followed, as is required by all parties engaged in and responsible for land contamination. The LCRM Guidance provides a technical framework in the understanding of how contamination issues that may arise could be managed.

23.5.7 The detailed elements of the assessment would include:

- Review baseline soil, geological and environmental information for the Project, including historical mapping, to enable an assessment of potential impacts associated with Geology and Ground Conditions;
- Undertake a site reconnaissance;
- Scoping of an intrusive ground investigation to target key identified sources of contamination, alongside obtaining baseline information and data to support further assessment of the initial Conceptual Site Model (CSM);
- Review ground investigation chemical data and logs to confirm attribute importance and facilitate further assessment;
- Agricultural Land Classification (ALC) soils survey;
- Assessment of potential contaminant linkages, as required;
- List and assess potential impacts;
- Assess the sensitivity of the attributes; and
- List and assess the likely significance of effects.

CONCEPTUAL SITE MODEL

23.5.8 In consideration of land contamination the LCRM Guidance recommends the use of a CSM to understand risk, comprising three elements: a source, a pathway, and a receptor. Each element is described below:

- Source – presence of potential contaminants that may cause harm;
- Pathway – a physical linkage between the source and receptor; and
- Receptor – those that are identified as being sensitive to the potential contamination (including human health, controlled waters, buildings, services, and ecological systems).

23.5.9 Without a source, pathway or receptor being present, there can be no contamination risk. For example, the presence of measurable concentrations of contaminants within the ground / subsurface / soils does not delineate a

contamination risk unless pollutant linkages have been defined and there is a risk of harm to receptors.

23.5.10 An initial CSM, based on the high level baseline review is presented in **Section 23.8**. The initial CSM identifies source, pathway and receptor linkages by considering the proposed elements of the Project during construction, O&M and decommissioning alongside the environmental setting.

23.5.11 The level of risk has been broadly evaluated in accordance with the methodology set out in CIRIA C552. This methodology involves classification of the consequence and probability associated with each potential contaminant linkage and thereby the corresponding level of risk (risk category).

23.5.12 The CIRIA C552 framework for classifying consequence is summarised in **Table 23-2**.

Table 23-2: Classification of Consequence (Table 6.3 of CIRIA C552)

Classification	Potential Contaminants of Concern
Severe	▪ Severe short term (acute) risks to human health, likely to result in significant harm; ▪ Short term risk of pollution of sensitive water resource; and ▪ A short term risk to a particular ecosystem, or an organism forming part of such an ecosystem.
Medium	▪ Chronic damage to human health (significant harm); ▪ Pollution of sensitive water resource; and ▪ A significant change in a particular ecosystem, or an organism forming part of such an ecosystem.
Mild	▪ Pollution of non-sensitive water resource; ▪ Significant damage to crops, buildings, structures and service; and ▪ Damage to sensitive buildings / structures / services or to the environment.
Minor	▪ Harm, not necessarily significant, which may result in a financial loss, or expenditure to resolve; ▪ Non-permanent health effects to human health; and ▪ Easily repairable effects of damage to buildings, structures and services.

23.5.13 The ‘severe’ consequence classification describes acute risk (arising from short term exposure). The ‘medium’ classification describes chronic harm (and may constitute ‘significant harm’ under Part 2A of the Environmental Protection Act).

23.5.14 The CIRIA 552 framework for classifying probability is summarised in **Table 23-3**.

Table 23-3: Classification of Probability (Table 6.4 of CIRIA C552)

Classification	Potential Contaminants of Concern
High Likelihood	There is a contaminant linkage and an event that appears very likely in the short term and almost inevitable over the long term, or there is evidence at the receptor of harm or pollution.
Likely	It is probable that an event will occur. Whilst not inevitable, it is possible in the short term and likely over the long term.
Low Likelihood	Circumstances are possible under which an event could occur, but it is not certain that (even over the long term) such an event would occur.
Unlikely	It is improbable that an event would occur, even in the very long term.

23.5.15 The level of risk (risk category), ranging from ‘very high risk' to 'very low risk', is determined by the consequence and probability classifications using the matrix presented in **Table 23-4**.

Table 23-4: Risk Category (Table 6.5 of CIRIA C552)

Probability	Consequence			
	Severe	Medium	Mild	Minor
High Likelihood	Very High	High	Moderate	Moderate / Low
Likely	High	Moderate	Moderate / Low	Low
Low Likelihood	Moderate	Moderate / Low	Low	Very Low
Unlikely	Moderate / Low	Low	Very Low	Very Low

Assessment of Effects

23.5.16 The significance of effects in relation to Geology and Ground Conditions, will be assessed by considering the risks identified in the initial CSM (or updated CSM when additional site specific information / data becomes available) in relation to the sensitivity and magnitude criteria and subsequently the significance matrix as outlined in **Table 23-7**, **Table 23-8** and **Table 23-9**.

23.5.17 The assessment will be based on DMRB LA 109, LA 113 and LA 104 which present guidance on the methodology for assessing the value / sensitivity of the receptor and the magnitude of the impact.

Receptor Value / Sensitivity

23.5.18 Assessment of receptor value (sensitivity) in relation to geology and soils will follow the framework described in **Table 23-5**. Each receptor will be assigned a value (sensitivity) of Very High, High, Medium or Low based on guidance provided within DMRB LA 109: Geology and soils, DMRB LA 113: Road drainage and the water environment along with professional judgement.

23.5.19 Factors that may affect the sensitivity of the likely receptor include:

- Geology and soils – the national or regional importance of a geological feature or agricultural land classification;
- Human Health – age, weight, sex, duration onsite and distance from the Site Boundary;
- Controlled Waters – distance from the Site and resource potential; and
- Below ground services and building structures – building design including factors such as gas protection measures and depth (below ground level) of services installation.

Table 23-5: Sensitivity Criteria

Sensitivity	Description
Very High	Geology: very rare and of international importance with no potential for replacement (e.g. UNESCO World Heritage Sites, UNESCO Global Geoparks, SSSI's and Geological Conservation Review (GCR) where citations indicate features of international importance). Geology meeting international designation citation criteria which is not designated as such. Soils: 1) Soils directly supporting an EU designated site (e.g. SAC, SPA, Ramsar); and / or 2) ALC grade 1 & 2 or LCA grade 1 & 2 Contamination: 1) Human health - very high sensitivity land e.g. residential or allotments. 2) Surface water: watercourse having Good WFD classification or designation under EC or UK legislation; and

Sensitivity	Description
	3) Groundwater: Principal Aquifer located within SPZ1.
High	Geology: rare and of national importance with little potential for replacement (e.g. geological SSSI, areas of special scientific interest (ASSI), National Nature Reserves (NNR)). Geology meeting national designation citation criteria which is not designated as such. Soils: 1) Soils directly supporting a UK designated site (e.g. SSSI); and / or 2) ALC grade 3a, or LCA grade 3.1. Contamination: 1) High sensitivity land use such as public open space. 2) Surface water: Watercourse having Moderate WFD classification; and, 3) Groundwater: Principal Aquifer located within SPZ2.
Medium	Geology: of regional importance with limited potential for replacement (e.g. RIGS). Geology meeting regional designation citation criteria which is not designated as such Soils: 1) Soils supporting non-statutory designated sites (e.g. Local Nature Reserves (LNR), LGS's, Sites of Nature Conservation Importance (SNCIs)); and / or 2) ALC grade 3b or LCA grade 3.2. Contamination: – 1) Medium sensitivity land use such as commercial or industrial. 2) Surface waters: watercourse not having WFD classification linking to a WFD watercourse within 100m; and, 3) Principal Aquifer located within SPZ3.
Low	Geology: of local importance / interest with potential for replacement (e.g. non-designated geological exposures, former quarry's / mining sites). Soils: 1) ALC grade 4 & 5 or LCA grade 4.1 to 7; and / or 2) Soils supporting non-designated notable or priority habitats. Contamination: – 1) Low sensitivity land use such as highways and rail.

Sensitivity	Description
	2) Surface waters - watercourse not having WFD classification linking to a WFD watercourse within 250m; and, 3) Unproductive stratum.
Negligible	Geology: no geological exposures, little / no local interest. Soils: Previously developed land formerly in 'hard uses' with little potential to return to agriculture. Contamination: 1) Undeveloped surplus land / no sensitive land use proposed. 2) Surface water: no surface water courses located within 250m; and, 3) Ground water: no pathway to underling aquifer.

Magnitude

23.5.20 The expected magnitude of impact to each identified receptor will be assigned in accordance with the principles established in **Table 23-6** based on DMRB LA 109: Geology and soils and DMRB LA 113: Road drainage and the water environment along with professional judgement.

Table 23-6: Magnitude Criteria

Magnitude	Criteria
Major	Geology: loss of geological feature / designation and / or quality and integrity, severe damage to key characteristics, features or elements. Soil: physical removal or permanent sealing of soil resource or agricultural land. Contamination: Contamination adverse: Significant contamination identified, and contamination level significantly exceeds human health and environmental assessment criteria with the potential for significant harm to be caused. Contamination heavily restricts future use of land. Surface water: Loss of regionally important public water supply; loss or extensive change to a designated conservation site, reduction in water body WFD classification.

Magnitude	Criteria
	Groundwater: Loss of, or extensive changes to an aquifer, loss of regionally important water supply; loss of significant damage to major structures through subsidence of similar effects. Contamination benefit: Substantial betterment of ground or groundwater quality / contamination conditions through remediation and / or mitigation.
Moderate	Geology: partial loss of geological feature / designation, potentially adversely affecting the integrity; partial loss of / damage to key characteristics, features or elements. Soils: permanent loss / reduction of one or more soil function(s) and restriction to current or approved future use (e.g. through degradation, compaction, erosion of soil resource.) Contamination: Contamination adverse: Contaminant concentrations exceed background levels and are in line with relevant screening criteria. Significant contamination can be present, control / remediation measures are required to reduce risk to human health / make land suitable for intended use. Surface water: Degradation of regionally important public water supply or loss of significant commercial / industrial / agricultural supplies; contribution to reduction in water body WFD classification. Groundwater: Partial loss or change to an aquifer; degradation of regionally important public water supply or loss of significant commercial / industrial / agricultural supplies; contribution to reduction in water body WFD classification; damage to major structures through subsidence of similar effects or loss of minor structures. Contamination benefit: Substantial betterment of ground or groundwater quality / contamination conditions through remediation and / or mitigation
Minor	Geology: minor measurable change in geological feature / designation attributes, quality or vulnerability; minor loss of, or alteration to, one (maybe more) key characteristics, features or elements. Soils: temporary loss / reduction of one or more soil function(s) and restriction to current or approved future use (e.g. through degradation, compaction, erosion of soil resource.) Contamination: Contamination adverse: Contamination levels are below or marginally exceed human health and environment assessment criteria. Significant

Magnitude	Criteria
	contamination is unlikely. Best practice control measures or remediation measures may be required to reduce risks to human health / make land suitable for intended use. Surface water: Minor effects on water supplies. Groundwater: Minor effects on an aquifer, GWDTEs, abstractions and structures. Contamination benefit: Moderate Betterment of ground or groundwater quality / contamination conditions through remediation and / or mitigation.
Negligible	Geology: very minor loss or detrimental alteration to one or more characteristics, features or elements of geological feature / designation. Overall integrity of resource not affected. Soils: no discernible loss / reduction of soil function(s) that restrict current or approved future use. Contamination: Contamination levels substantially below human health and environment assessment criteria and remediation is not required. No requirement for control measures to reduce risks to human health / make land suitable for intended use. Surface water: No risk identified Groundwater: No measurable impact on aquifer or groundwater receptors.
No Change	Geology: no temporary or permanent loss / disturbance of characteristics features or elements. Soils: no loss / reduction of soil function(s) that restrict current or approved future use. Contamination: Human health: reported contaminant concentrations below background levels; Surface water: No risk identified Groundwater: No measurable impact on aquifer or groundwater receptors.

Significance

23.5.21 Once the sensitivity of the affected receptor and potential magnitude of change have been established, the matrix presented in **Table 23-7** will be used to determine the significance of effect, ranging from 'neutral' to 'very large'. The

likely duration of the effect and likelihood of the effect occurring is also considered when assessing each effect.

23.5.22 Where a range has been provided within the matrix, e.g. 'moderate or large', professional judgement will be used to define the significance. The effects are described as adverse and beneficial.

Table 23-7: Significance of Effects Matrix

Magnitude of Impact	Receptor Value				
	Very High	High	Medium	Low	Negligible
Major	Very Large	Very Large or large	Large or moderate	Moderate or slight	Slight or neutral
Moderate	Very Large or large	Large or moderate	Moderate	Moderate or slight	Slight or neutral
Minor	Large or moderate	Moderate	Moderate or slight	Slight or neutral	Slight or neutral
Negligible	Moderate or slight	Moderate or slight	Slight	Slight or neutral	Slight or neutral

23.5.23 DMRB LA 104 provides the following typical descriptions of the significance criteria:

- **Very Large**: Effects at this level are material in the decision-making process (considered Significant);
- **Large**: Effects at this level are likely to be material in the decision-making process (considered Significant);
- **Moderate**: Effects at this level can be considered to be material decision-making factors (considered Significant);
- **Slight**: Effects at this level are not material in the decision-making process (not considered Significant); and
- **Neutral**: No effects or those that are beneath levels of perception, within normal bounds of variation or within the margin of forecasting error (not considered Significant).

23.5.24 Based on the above an effect would be considered significant if assessed as moderate or above.

23.6 BASELINE CONDITIONS

DATA INFORMATION SOURCES

23.6.1 An initial high level desk-based review has been undertaken of existing reports and publicly available data sources outlined in **Table 23-8** and **Table 23-9** to determine the baseline character of the study area and inform the assessment process.

23.6.2 When completing the desk-based review the Project has been split into two distinctly different areas; the Tidal Barrage Development Area and the Grid Connection Development Area. In completing the Geology and Soils chapter for ease of reference the Tidal Barrage Development Area also includes the adjacent onshore areas which will be subject to development with e.g. ancillary buildings (both temporary and permanent), laydown areas and also the marine and port facilities.

Table 23-8: Existing Reports

Report Title, Author & Date	Summary	Coverage of Study Area
Pre-FEED Geotechnical Baseline Desk Study Report. Mott McDonald, February 2024.	The scope of the report was to collate geotechnical baseline desk study data and develop geotechnical cross-sections through the LEAPFROG models for crossing three indicative locations. A detailed ground model has been produced based on the available information, and an initial assessment made of the options based on design and constructability factors. The initial assessment concludes that the northern option is the favourable option in consideration of a number of factors however additional complications are posed by the	Tidal barrage crossing options. Indicative southern option. Indicative northern option.

Report Title, Author & Date	Summary	Coverage of Study Area
	shallower bedrock in comparison to the other indicative.	
Phase 1 Geophysical Survey. SEP Hydrographic, December 2023.	The geophysical survey was to assess the thickness sediment cover and depth to bedrock in the two proposed tidal barrage locations. The report details the geophysical survey completed and provides an interpretation of the results.	The survey was completed across the two northern and southern indicative locations.
Preliminary Ground Condition Assessment. Mott MacDonald, March 2021.	A geotechnical report prepared to provide a summary of the ground conditions for three tidal power options; coastal lagoon, offshore lagoon and tidal barrage. The purpose of the report was to aid in high level concept design of the proposed scheme. Information provided within the report was based on previous feasibility studies, site investigation information and publicly available information.	Information relating to the tidal barrage relates to the southern indicative option. Information relating to the coastal and offshore lagoons lies outside the current Scoping Boundary.

Table 23-9: Publicly available information sources

Source	Review Date	Summary	Coverage of Study Area
The British Geological Survey	13 May 2024	Digitised mapped geological deposits and data within study area.	Ca. 80% Study Area in the central and northern Tidal Barrage

Source	Review Date	Summary	Coverage of Study Area
(BGS) Onshore GeoIndex.		Available at: GeoIndex - British Geological Survey (bgs.ac.uk)	Development Area (River Mersey) not covered.
BGS 1:50,000 Scale Geological Map Sheet 96 Liverpool Bedrock and Superficial.	13 May 2024	Mapped 1:50,000 scale geology within study area.	Majority of the Study Area (Grid Connection and Tidal Barrage Development Area). The north eastern corner is covered by Map Sheet 83.
BGS 1:50,000 Scale Geological Map Sheet 83 Formby Bedrock and Superficial.	13 May 2024	Mapped 1:50,000 scale geology within study area.	Extremely small area of the north eastern corner of the current Scoping Boundary.
BGS Memoir “Geology of the Liverpool district — a brief explanation of the geological map Sheet 96 Liverpool”.	13 May 2024	Available at: Liverpool district, sheet 96, brief explanation (bgs.ac.uk)	Majority of the Study Area (Grid Connection and Tidal Barrage).
The Coal Authority (CA) Interactive Map Viewer.	13 May 2024	Digitised coal mining areas and other coal mining data. Available at: Interactive Map Viewer | Coal Authority (bgs.ac.uk)	Whole Study Area (Grid Connection and Tidal Barrage).

Source	Review Date	Summary	Coverage of Study Area
Groundsure.io	13 May 2024	Digitised environmental data viewer. Data viewed includes, geology, BGS borehole records, hydrogeology, authorised and historical landfills, and environmental designations. Available at: Groundsure.io	Whole Study Area (Grid Connection and Tidal Barrage) – data source / layer dependent.
DEFRA MAGIC Map.	13 May 2024	Provides authoritative geographic information about the natural environment. Available at: Magic Map Application (defra.gov.uk)	Whole Study Area (Grid Connection and Tidal Barrage Development Areas).
Unexploded Ordnance / Bomb (UXO / UXB) Data.	13 May 2024	High-level assessment of UXO / UXB risk. Available at: Risk Maps | Zetica UXO.	Ca. 60%. Whole Grid Connection Development Area, ca. 5% Tidal Barrage Development Area where intersecting the shore.
Cranfield Soil and Agrifood Institute Soilscapes.	15 May 2024	Provides a spatial display of soil	100% Grid Connection Development Area

Source	Review Date	Summary	Coverage of Study Area
		types and soil descriptions.	5% Tidal Barrage Development Area (onshore element)
National Library of Scotland.	13 May 2024	Reference in relation to historical mapping.	Entire Study Area.

EXISTING BASELINE – TIDAL BARRAGE DEVELOPMENT AREA

23.6.3 This section describes the present conditions which constitute the existing baseline environment for Geology and Ground Conditions within the extent of the current Tidal Barrage Development Area (to include onshore ancillary development and the port and marine facilities).

Current Site Setting

23.6.4 The Tidal Barrage Development Area is predominantly situated on the River Mersey (tidal estuary), which flows in an approximate south-east to north-west direction (with tidal reversal) toward the Irish Sea.

23.6.5 The proposed Tidal Barrage Development Area is situated between the urban areas of Liverpool and Birkenhead, which together form the conurbation of Merseyside. The proposed Tidal Barrage Development Area extends north to the mouth of the Mersey Estuary and south towards the extensive estuarine mudflats. The area is a busy maritime shipping hub, with numerous docks, ports and terminals populating the shoreline both on the northern and southern shores of the Mersey.

23.6.6 There are two road tunnel crossings under the River Mersey (Kingsway Tunnel (north) and Queensway Tunnel (south) and one rail tunnel crossing (Mersey Railway).

Site History

23.6.7 The River Mersey and adjacent shoreline possess a significant industrial legacy. The shorelines of Merseyside within the proposed Tidal Barrage Development Area developed significantly over the industrial revolution in the 18th and 19th Centuries with numerous docklands constructed along both the eastern and

western banks of the Mersey. Available historical mapping confirms the presence of goods yards, warehouses, terminals, railway infrastructure and other industrial land uses during the 19th and 20th Centuries. Shipbuilding was a major industry along the Mersey, and Merseyside operated as a maritime hub for northern England.

Geology

Artificial Ground

23.6.8 BGS mapping confirms the presence of Artificial Ground (Made Ground, undivided) along a large proportion of both the eastern and western shorelines of the River Mersey, and is generally present within the boundary of the proposed Tidal Barrage Development Area where intersecting the shoreline.

23.6.9 The mapped Artificial Ground is likely to be associated with land reclamation and / or later infilling of historical docklands.

23.6.10 Recent geological modelling completed by Mott McDonald, for indicative locations within the Tidal Barrage Development Area, indicates a significant thickness of Made Ground on both the southern and northern banks of the Mersey at the southern cross-section. Although still indicated to be present the extent of Made Ground is indicated to be less at the northern cross-section.

Superficial

23.6.11 Tidal Flat Deposits (clay, silt and sand) are mapped by the BGS across the entire proposed Tidal Barrage Development Area. The BGS describe Tidal Flat Deposits as unconsolidated sediment, mainly mud and / or sand that form in the intertidal zone.

23.6.12 Although not mapped at surface level, Glacial Till (heterogenous mixture of clay, sand, gravel, and boulders), is understood to underlie the Tidal Flat Deposits across the River Mersey (Ref: BGS Geology of the Liverpool district) and was confirmed during the excavation of the Mersey Railway tunnel.

23.6.13 Mott McDonald cross-section of the southern indicative location indicates a significant thickness of superficial deposits comprising Alluvium underlain by Glacial Till. This cross-section indicates the presence of a glacial channel, the base of which lies at approximately -70m Above Ordnance Datum (mAOD). The base of the superficial deposits towards the western banks of the River Mersey are shown to be much shallower, lying at approximately -30mAOD.

23.6.14 Mott McDonald cross-section of the northern indicative location indicates the superficial deposits to be much thinner than at towards the south of the Tidal Barrage Development Area with the absence of the defined glacial channel. The superficial deposits, Alluvium over Glacial Till, are shown to extend to a depth of approximately -20mAOD.

Bedrock

23.6.15 Bedrock of the Sherwood Sandstone Group (sandstone, part pebbly) is mapped by the BGS to underlie the entire Tidal Barrage Development Area, underlying the superficial deposits. The Sherwood Sandstone Group is the parent unit of the Chester Formation, Wilmslow Formation and Helsby Formation, which are mapped locally.

23.6.16 The geological cross-section provided on BGS Sheet 96, taken from a line drawn approximately north east / south west to the south of the Mersey Tunnel shows a number of geological fault lines resulting in the displacement of both shallow and deeper bedrock.

23.6.17 The Mott McDonald geological cross-sections indicate bedrock to be at a significantly greater depth on cross-section of the southern indicative location than the northern indicative location as a result of the presence of a glacial channel.

Hydrogeology

23.6.18 The superficial deposits (Tidal Flat Deposits) beneath the proposed Tidal Barrage Development Area are classified as a Secondary (undifferentiated) Aquifer.

23.6.19 The bedrock (Sherwood Sandstone) beneath the proposed Tidal Barrage Development Area is classified as a Principal Aquifer.

23.6.20 No area of the Tidal Barrage Development Area is shown to be within a groundwater Source Protection Zone (SPZ). A Zone III (total catchment) SPZ is located approximately 300m west of the proposed Tidal Barrage boundary, associated with a Zone I (Inner Protection Zone) SPZ located approximately 2km west of the Tidal Barrage Development Area in Birkenhead.

23.6.21 At this stage of the assessment there is no information available relating to licensed groundwater abstractions.

Hydrology

23.6.22 The River Mersey (tidal estuary) is located within the Tidal Barrage Development Area.

23.6.23 Numerous unnamed surface watercourses flow into the River Mersey along the Tidal Barrage Development Area. A number of docklands (manmade water structures) are present along the shorelines of the River Mersey.

23.6.24 There is currently no information available on licensed surface water abstractions or licensed discharges. Further details relating to surface water abstractions and licensed discharges will be sought to inform the PEIR and ES assessments.

Landfills

23.6.25 The Tidal Barrage Development Area is adjacent to or in close proximity to numerous historical landfills located along the shoreline of the River Mersey. Of note is the Old Dingle Oil Terminal landfill in the east of the proposed Tidal Barrage Development Area, along the northern boundary. Mapped historical landfills are predominantly associated with the infilling of former docks.

23.6.26 An authorised landfill (Bromborough Dock) is present adjacent to the southern boundary of the Tidal Barrage Development Area, operated by Biffa Waste Services Limited.

23.6.27 The locations of authorised and historical landfills are shown on **Figure 23.7**.

Mining and Mineral Resources

23.6.28 The Tidal Barrage Development Area is not situated within a Coal Authority Coal Mining Reporting Area.

23.6.29 There are no Minerals Safeguarding Areas (MSAs) identified within the Tidal Barrage Development Area within the Wirral Local Plan or Liverpool Local Plan (Ref. Wirral Local Plan Minerals Report and Liverpool Local Plan).

Environmental Designations

23.6.30 The following Sites of Special Scientific Interest (SSSI) are located within the Tidal Barrage Development Area:

- Mersey Estuary SSSI – southeastern Tidal Barrage Development Area;
- New Ferry SSSI – central southern Tidal Barrage Development Area; and

- Mersey Narrows SSSI – northwestern and northeastern Tidal Barrage Development Area.

23.6.31 The above SSSIs are designated as such on the basis of biological interest. There are no geological SSSIs within the Tidal Barrage Development Area.

23.6.32 The following designations are also located within the Tidal Barrage Development Area:

- The Mersey Estuary is also a designated RAMSAR site and Special Protection Area (SPA);
- The Mersey Narrows and North Wirral Foreshore are of national and international importance as a designated SPA, Special Area of Conservation (SAC) and RAMSAR site; and
- Liverpool Bay SPA.

Geological Designations

23.6.33 There are no Local Geological Sites (LGS) within the Tidal Barrage Development Area.

Agricultural Land

23.6.34 Where intersecting the shoreline, Provisional ALC shows the Tidal Barrage Development Area to be classified as urban land.

23.6.35 The Agricultural Land Classifications are illustrated on **Figure 23.5** (Provisional) and **Figure 23.6** (Post 1988).

Soil Types

23.6.36 The eastern bank of the River Mersey is shown to comprise Soilscape 20: Loamy and clayey floodplain soils with naturally high groundwater.

23.6.37 The western bank of the River Mersey is shown to comprise the following four soil types:

- Soilscape 4: Sand dune soils;
- Soilscape 6: Freely draining slightly acid loamy soils;
- Soilscape 18: slowly permeable seasonally wet slightly acid but base rich loamy and clayey soils; and

- Soilscape 20: Loamy and clayey floodplain soils with naturally high groundwater.

Unexploded Ordnance

23.6.38 Available Unexploded Bomb (UXB) risk maps show the areas of land to the north and south of the Tidal Barrage Development Area (i.e. Liverpool and Birkenhead) indicate a high risk of UXBs. The eastern end of the southern boundary is mapped to have a moderate risk of UXBs.

23.6.39 Although no UXB risk maps are available for the majority of the Tidal Barrage Development Area which is located within the River Mersey, it can be assumed that the area will possess a high risk of UXBs due the risk classifications on the adjacent land.

EXISTING BASELINE – GRID CONNECTION DEVELOPMENT AREA: WIRRAL

23.6.40 This section describes the present conditions which constitute the existing baseline environment for Geology and Ground Conditions within the proposed grid connection options in the Wirral, to the west and south of the River Mersey.

Current Site Setting

23.6.41 The proposed grid connection options to the west and south of the Mersey lie within the Wirral peninsula, with the longest of the three options running south from Wallasey in the north to Capenhurst just north of Ellesmere Port in the south.

23.6.42 The northern extent of the proposed Grid Connection Development Area is situated within the urbanised areas of Wallasey and Birkenhead. The area south of Birkenhead is generally likely to be routed on land free from urban structures or infrastructure (agricultural land, public open space, etc.).

Site History

23.6.43 The northern and south eastern sections of the Grid Connection Development Area are located within the urban developments of Wallasey and Birkenhead to the north and Bebington to the south east, these areas have been subject to a variety of historical land uses associated with urban development including areas of heavy industry alongside residential and commercial areas. A large extent of the southern section has predominantly remained undeveloped. Localised changes have occurred due to the urban development of the surrounding areas

and construction of highways, urban infrastructure and other land uses such as allotments and golf courses.

Geology

Artificial Ground

23.6.44 Localised Artificial Ground (Made Ground – Undivided) is mapped to be present in localised areas within the Grid Connection Development Area, predominantly along the southern bank of the River Mersey (adjacent to the Narrows), along with localised pockets across the Wirral. A section of Artificial Ground is mapped traversing west from the River Mersey in the north of the Wirral, extending to the M53. Artificial ground is generally mapped to be absent in the central and south western areas of the Wirral.

Superficial

23.6.45 Glacial Till (heterogenous mixture of clay, sand, gravel, and boulders) is mapped across the majority of the proposed Grid Connection Development Area.

23.6.46 Head deposits (clay, silt, sand and gravel) are mapped locally in the centre of the proposed Grid Connection Development Area.

23.6.47 Tidal Flat Deposits (clay, silt and sand) are mapped beneath the north and southeast sections of the proposed Grid Connection Development Area (i.e. adjacent to the River Mersey).

23.6.48 Blown Sand (sand) is mapped to be present in the far north of the proposed Grid Connection Development Area.

Bedrock

23.6.49 Bedrock of the Sherwood Sandstone Group (sandstone, part pebbly) is mapped beneath the majority of the proposed Grid Connection Development Area. The Sherwood Sandstone Group is the parent unit of the Chester Formation, Wilmslow Formation and Helsby Formation, which are mapped locally.

23.6.50 Bedrock of the Sidmouth Mudstone Formation (red-brown mudstone and siltstone) is mapped beneath the western part of the north of the Grid Connection Development Area. The Sidmouth Mudstone Formation is a subdivision of the Mercia Mudstone Group.

Hydrogeology

23.6.51 Where present, the superficial deposits beneath the majority of the proposed Grid Connection Development Area are classified as a Secondary (undifferentiated) Aquifer. Superficial deposits beneath the northern extent are classified as a Secondary A Aquifer.

23.6.52 The bedrock beneath the majority of the Grid Connection Development Area is classified as a Principal Aquifer, the exception being a small area in the northern section which is classified as a Secondary B Aquifer (corresponding with the area of Mercia Mudstone deposits).

23.6.53 A large proportion of central section of the Grid Connection Development Area is shown to lie with a groundwater SPZ, Zone III (total catchment), with small areas located with Zone I (Inner Protection Zone) and Zone II (Outer Protection Zone).

23.6.54 At this stage of the assessment there is no information available relating to licensed groundwater abstractions. Further information will be sought as the assessment progresses to PEIR and ES stage.

Hydrology

23.6.55 The River Mersey is located to the immediate east of the north eastern and south eastern extent of the proposed Grid Connection Development Area (Wirral).

23.6.56 Numerous unnamed surface watercourses are shown to be present along the Grid Connection Development Area. Named surface watercourses include the River Fender, The Birket (tributary of the River Mersey), Prenton Brook and Dibbinsdale Brook.

23.6.57 There is currently no information available on licensed surface water abstractions or licensed discharges. Further details relating to surface water abstractions and licensed discharges will be sought to inform the PEIR and ES assessments.

Landfills

23.6.58 The Grid Connection Development Area passes through or adjacent to a number of historical landfills. Of note is Bidston Moss Landfill site in the northern extent adjacent to Junction 1 of the M53 and Eastham Rake in the southern extent, to the south of the M53.

23.6.59 An authorised landfill, operated by Biffa Waste Services Limited, is situated at the eastern extent of the Grid Connection Development Area.

23.6.60 Locations of authorised and historical landfills are shown on **Figure 23.7**.

Mining and Mineral Resources

23.6.61 The Grid Connection Development Area is not situated within a Coal Authority Coal Mining Reporting Area.

23.6.62 There are no significant mineral reserves within the Wirral (RPS, March 2022. Wirral Local Plan Minerals Report). The Grid Connection Development Area does not pass through any MSAs.

Environmental Designations

23.6.63 The following SSSIs are located to the immediate north and east of the northern extent of the proposed Grid Connection Development Area .

- North Wirral Foreshore SSSI; and
- Mersey Narrows SSSI.

23.6.64 The central section (to the south of J4 of the M3) crosses Dibbinsdale SSSI.

23.6.65 The above SSSIs are designated as such on the basis of biological interest.

23.6.66 The Mersey Narrows and North Wirral Foreshore, which are of national and international importance as a designated SPA, SAC and RAMSAR site is also located within the proposed Grid Connection Development Area.

Geological Designations

23.6.67 The northern section of the proposed Grid Connection Development Area is shown to encompass an LGS; ‘The Red and Yellow Noses, New Brighton’.

Agricultural Land

23.6.68 Provisional ALC - The majority of the northern and eastern section of the proposed Grid Connection Development Area is classified as urban or non-agricultural. The southern section of the Development Area, beyond the Junction 3 of the M53 is predominantly classified as Grade 3 (undifferentiated) with some small areas of Grade 2.

23.6.69 Post 1988 ALC – Post 1988 ALC is available for limited areas of the proposed Grid Connection Development Area. Where available, predominantly in the southern section, a classification of predominantly Grade 3a (best and most versatile (BMV)) is shown.

23.6.70 The Agricultural Land Classifications are illustrated on **Figure 23.5** (Provisional) and **Figure 23.6** (Post 1988).

Soil Types

23.6.71 The majority of the proposed Grid Connection Development Area passes through Soilscape 18: slowly permeable seasonally wet slightly acid but base rich loamy and clayey soils.

23.6.72 The following soil types are also present along the northern extent of the Development Area:

- Soilscape 4: Sand dune soils;
- Soilscape 10: Freely draining slightly acid sandy soils;
- Soilscape 15: Naturally wet very acid sandy and loamy soils; and
- Soilscape 20: Loamy and clayey floodplain soils with naturally high groundwater.

23.6.73 Stretches of the southern and eastern extent of the Development Area comprise the following soil types:

- Soilscape 6: Freely draining slightly acid loamy soils; and
- Soilscape 10: Freely draining slightly acid sandy soils.

Unexploded Ordnance

23.6.74 The north western extent of the proposed Grid Connection Development Area is situated within an area shown to have a high UXB risk, the south western extent is shown to be in an area of moderate UXB risk.

EXISTING BASELINE – GRID CONNECTION DEVELOPMENT AREA: LIVERPOOL

23.6.75 This section describes the present conditions which constitute the existing baseline environment for Geology and Ground Conditions within the proposed Grid Connection Development Area within Liverpool. The section considers data for the grid connection options to the east and north of the River Mersey as shown in **Figure 23.1**.

Current Site Setting

23.6.76 The proposed grid connection options to the east and north of the Mersey lie within the city of Liverpool. One of the two options will likely run southeast from landfall to Lister Drive the other will likely run approximately south to St Georges.

23.6.77 The Grid Connection Development Area to the east and north of the Mersey are situated within the predominantly urbanised area of Liverpool.

Site History

23.6.78 The Grid Connection Development Area located within Liverpool has been subject to a variety of historical land uses associated with urban development including areas of heavy industry alongside residential and commercial areas. Many localised changes have occurred due to the ongoing urban development. Changes include the construction of highways, changes in urban infrastructure, construction of shopping centres, commercial / industrial areas and university buildings as well as general changes land use from historical areas of heavy industry, docklands etc to residential / commercial areas.

Geology

Artificial Ground

23.6.79 Artificial Ground (Made Ground – Undivided) are mapped to be present in localised areas within the Scoping Boundary, predominantly along the southern boundary of the River Mersey, likely associated with infilled docks and reclaimed land, along with localised pockets across Liverpool.

Superficial

23.6.80 Superficial deposits are shown to be absent form a large area within the central section of the proposed Grid Connection Development Area. A summary of the superficial deposits, where shown to be present, is provided below.

23.6.81 Where superficial deposits are shown to be present, Glacial Till (heterogenous mixture of clay, sand, gravel, and boulders) is mapped across the majority of the Grid Connection Development Area.

23.6.82 Tidal Flat Deposits (clay, silt and sand) are mapped beneath the western extent of the Grid Connection Development Area from Vauxhall to Liverpool city centre.

23.6.83 Blown Sand (sand) is mapped to be present in the far north of the Scoping Boundary but does not coincide with the proposed grid connection routes.

23.6.84 Shirdley Hill Sandstone Formation (sand) is mapped to be present in the far south of the Scoping Boundary.

Bedrock

23.6.85 Bedrock of the Sherwood Sandstone Group (sandstone, part pebbly) is mapped beneath the majority of the proposed Grid Connection Development Area in Liverpool. The Sherwood Sandstone Group is the parent unit of the Chester Formation, Wilmslow Formation and Helsby Formation, which are mapped locally.

23.6.86 A number of geological fault lines are shown to cross the Liverpool area, generally trending north south.

Hydrogeology

23.6.87 Where present, the superficial deposits beneath the majority of the proposed routes are classified as a Secondary (undifferentiated) Aquifer.

23.6.88 The bedrock beneath Liverpool is classified as a Principal Aquifer.

23.6.89 Neither of the proposed routes are within a Groundwater SPZ.

23.6.90 At this stage of the assessment there is no information available relating to licensed groundwater abstractions.

Hydrology

23.6.91 The River Mersey is located to the immediate west of the proposed Grid Connection Development Area across the Liverpool area.

23.6.92 Aside from the Leeds Liverpool Canal there are no significant surface water bodies within the proposed Grid Connection Development Area which crosses Liverpool.

Landfills

23.6.93 The proposed routes do not pass through any authorised or historical landfills. Several historical landfills are located along the northern shore of the River Mersey.

23.6.94 The locations of authorised and historical landfills are shown on **Figure 23.7**.

Mining and Mineral Resources

23.6.95 The proposed Grid Connection Development Area is not situated within a Coal Authority Coal Mining Reporting Area.

23.6.96 There are no MSA within the proposed Grid Connection Development Area.

Environmental Designations

23.6.97 No SSSIs are located within either of the proposed Grid Connection Development Area. The Mersey Estuary SSSI and Mersey Narrows SSSI lie to the north and south of the Grid Connection Development Area.

23.6.98 The Mersey Estuary and Mersey Narrows are both also designated RAMSAR sites and SPA.

Geological Designations

23.6.99 There are a total of 27 Regionally Important Geological / Geomorphological sites listed within the local plan, comprising a variety of disused quarries, outcrops, railway cuttings, cliffs and erratics. The precise location of these sites is not currently known however will be identified to inform further assessment within the PEIR and ES.

Agricultural Land

23.6.100 Provisional ALC – Liverpool is classified as urban or non-agricultural.

Soil Types

23.6.101 The majority of the proposed Grid Connection Development Area passes through Soilscape 10: Freely draining slightly acid sandy soils and Soilscape 18: Slowly permeable seasonally wet slightly acid but base-rich loamy and clayey soils.

23.6.102 The following soil types are also present along the northern extent of the Grid Connection Development Area from Vauxhaull:

- Soilscape 4: Sand dune soils; and
- Soilscape 20: Loamy and clayey floodplain soils with naturally high groundwater.

Unexploded Ordnance

23.6.103 The Grid Connection Development Area is situated within an area shown to have a high UXB risk.

23.7 INITIAL CONCEPTUAL SITE MODEL

23.7.1 The initial CSM presented below is based upon the environmental conditions of the Study Area as described in the previous sections.

23.7.2 The methods used in this assessment followed a risk-based approach with the potential environmental risk assessed qualitatively using the 'source-pathway-receptor' contaminant linkages concept introduced in the guidance documents (principally the EA's LCRM guidance) on the practical implementation of the Environmental Protection Act 1990.

23.7.3 Given the baseline information is limited and data sources ordinarily accessed as part of a desk-based Preliminary Environmental Risk Assessment (Phase 1) have not been available at this stage the resulting CSM is preliminary and will be subject to further review as the Project progresses.

Sources (Tidal Barrage Development Area)

- Potential contamination associated with historical and current industrial activities such as docklands, goods yards, warehouses, terminals (namely Tranmere Oil Terminal) and railway infrastructure and other historical and current industrial land uses.
- Artificial Ground mapped along both shores of the River Mersey (reclaimed land and infilled docklands), which are often mapped as historical landfills.
- Sediments and saltmarshes as potential secondary sources of contamination.
- Contaminants of potential concern include but are not limited to asbestos, heavy metals, petroleum hydrocarbons, polycyclic aromatic hydrocarbons (PAHs), cyanide, phenols, volatile organic compounds (VOCs), semi-volatile organic compounds (SVOCs), pesticides and herbicides, biocides, polychlorinated biphenyls (PCBs), per- and polyfluoroalkyl substances (PFAS) and radionuclides.
- Hazardous ground gases (carbon dioxide and methane).

Sources (proposed Grid Connection Development Area (Wirral and Liverpool))

- Potential contamination associated with historical and current industrial and general localised urban development within the Grid Connection Development Area both to the north and south of the River Mersey.
- Authorised and historical landfills along the northern and southern banks of the River Mersey, plus other nearby landfills across the Wirral and Liverpool.
- Contaminants of potential concern include but are not limited to asbestos, heavy metals, petroleum hydrocarbons, polycyclic aromatic hydrocarbons (PAHs), cyanide, phenols, VOCs, SVOCs, pesticides and herbicides, biocides, PCBs, PFAS and radionuclides
- Hazardous ground gases (carbon dioxide and methane).

Receptors (both Tidal Barrage Development Area and Grid Connection Development Area)

23.7.4 Identified potential receptors include the following:

- Site workers during construction;
- Neighbouring site users adjacent to the proposed Tidal Barrage and Grid Connection during construction;
- Future workers during operation;
- Future groundworkers (maintenance workers) during operation;
- Third parties during operation of the Tidal Barrage (e.g. visitors and users of the Barrage);
- Groundwater in superficial deposits (Secondary Undifferentiated Aquifer) and bedrock (Principal Aquifer) (construction);
- Nearby SPZs (construction);
- Surface waters - River Mersey and numerous surface watercourses (construction);
- Infrastructure and built environment including foundations, potable water supply pipes (operation); and
- Ecological receptors associated with SSSIs, SPAs, RAMSAR sites and SACs (construction and operation).

Pathways (both the Tidal Barrage Development Area and Grid Connection Development Area)

- Human Health – Dermal contact with soils and groundwater, ingestion of dusts / soil particles, inhalation of dusts and fibres (on and off-Site receptors), and inhalation of hazardous ground gases / vapours (on and off-Site receptors).
- Controlled Waters – Leaching of contaminants through the unsaturated zone and subsequent impact to groundwater within the underlying aquifers, and lateral migration, including surface run-off, of contaminants to groundwater and surface water.
- Infrastructure / Built Environment – Direct contact with contaminants (e.g. sulphates and hydrocarbons) in the soil and groundwater with below ground structures (underground potable water pipes and buried concrete), and accumulation of hazardous gases within below ground structures in the future development (explosive risk).
- Ecological Receptors – direct contact with contaminants within soils, shallow groundwater and surface water.

Initial Conceptual Site Model (both the Tidal Barrage Development Area and Grid Connection Development Area)

23.7.5 Using risk classification guidance as provided in CIRIA C552 (refer to Assessment Methodology outlined in **Section 23.6**) , the following risks to broad receptor groups are provided below on a preliminary basis. Note that in the absence of detailed design to confirm the exact location of the scheme, and the absence of site-specific information (e.g. detailed desk based assessment, ground investigation data and subsequent geo-environmental assessment), these classifications are preliminary and will be updated as the scheme progresses.

- Risks to Human Health (Future Site Users) – Low / Moderate Risk;
- Risks to Human Health (Construction and Maintenance) – Low / Moderate Risk;
- Risks to Controlled Waters (Groundwater aquifers and surface water) – Moderate Risk;
- Risks to Infrastructure/Built Environment – Low / Moderate Risk; and
- Risks to Environment (ecological receptors) – Moderate Risk.

23.8 FUTURE BASELINE

23.8.1 In consideration of Geology and Ground Conditions should the Project not go ahead the future baseline is likely to broadly remain in its current condition, the exception being the areas of the Study Area such as the areas of salt marsh which will be subject to sea level rise. The sea level rise projections are provided in both **Chapter 5: Coastal Processes** and **Chapter 29: Climate Resilience** and indicate that there will be an estimated potential rise of 1.27m by 2158. The projected rise in sea levels may cause accelerated erosion and mobilisation of potentially contaminated sediments.

23.8.2 Parts of the Study Area may undergo development of a different nature in which case the near surface ground conditions are likely to alter.

23.9 BASIS FOR SCOPING ASSESSMENT

23.9.1 The Geology and Ground Conditions scoping assessment is based on the following key assumptions which are also set out in **Chapter 2: Site Context Project Description**:

- In preparing this chapter the focus has been on the onshore components of the Project. It is however noted that construction of the Tidal Barrage has the potential to require stabilisation of the estuary bed via soil treatment methods. The requirements for soil treatment will be assessed and defined further as the Project progresses and the effects of the construction methodology in relation to Geology and Soils will be considered in future assessment.
- Onshore land take associated with construction of the Tidal Barrage landfalls will predominantly comprise temporary occupation associated with construction compounds and lay down areas. Where possible existing onshore facilities will be utilised, however temporary accommodation (construction compounds containing, welfare, offices, storage etc) with associated infrastructure are also likely required.
- The Tidal Barrage will require the construction of permanent onshore O&M buildings which will be occupied for the duration of the lifespan of the Tidal Barrage.
- The construction of any new O&M buildings will require appropriate ground investigation for both geotechnical design and geo-environmental assessment. This fundamental assessment is integral to progression of the Project. Should permanent O&M buildings be sited on brownfield land and assessment identifies potential contaminant linkages, an appropriate

remediation strategy will be designed and implemented in accordance with standard environmental good practice.

- An underground grid connection may be constructed by open cut trenching technique, with trenchless techniques implemented as required in areas of higher sensitivity and key crossing points where open cut is not feasible.
- Land loss along the grid connection will predominantly be on a temporary basis and once installed the connection route will be returned to its pre-construction land use (or otherwise agreed).
- There will be temporary land take along the grid connection route during construction to accommodate temporary construction compounds and laydown areas. All areas of temporary land take will be returned to its pre-construction land use following completion of the construction phase (or otherwise agreed).
- During operation of the grid connection, groundworkers are likely to require access for routine maintenance and potential replacement of the cable. Land take required for the establishment of temporary compounds and laydown areas during significant periods of maintenance / cable replacement will be temporary and the areas of land take returned to pre-construction land use (or otherwise agreed).
- Land instability will be considered as part of the geotechnical design of the scheme and is therefore considered as embedded mitigation. Land stability is not considered as part this assessment.
- The embedded environmental measures as identified in **Section 23.11** will be implemented throughout all phases of the Project.

23.9.2 The likely significant effects associated with receptors identified in relation to Geology and Ground Conditions are summarised in **Table 23-11.**

23.10 EMBEDDED ENVIRONMENTAL MEASURES

23.10.1 Embedded mitigation measures have been identified and are proposed to be adopted as part of the evolution of the Project design (embedded into the Project design). These measures will evolve over the development process as the EIA progresses and in response to consultation. They will be fed iteratively into the assessment process. These measures typically include those that have been identified as good or standard practice and include actions that would be undertaken to meet existing legislation requirements.

23.10.2 As there is a commitment to implementing these environmental measures, and also to various standard sectoral practices and procedures, they are considered inherently part of the design of the Project and have, therefore, been considered in the scoping assessment.

23.10.3 In addition to the specific embedded mitigation measures relevant to Geology and Ground Conditions listed in **Table 23-10**, consultation will be undertaken with relevant consultees such as the EA to address any concerns or issues.

Table 23-10: Relevant Geology and Ground Conditions embedded environmental measures

ID	Mitigation Measures embedded into the project design	How the measure will be secured
23-1	The design of the project will be completed in accordance with standard design codes relevant to a project of this nature. Of relevance specifically to Geology and Ground Conditions is Eurocode 7 - BS EN 1997 Geotechnical design & UK National Annex. The preparation of geotechnical risk register at the earliest stages of the Project is fundamental to ensuring that potential effects such as ground instability are considered and appropriate mitigation measures are included within the Project design.	DCO Requirement.
23-2	The siting and design of the Project will be completed in consideration of the relevant legislation and local policies. Of relevance specifically to Geology and Ground Conditions are the policies relating to development on brownfield sites, requirement for biodiversity and geological conservation, requirement to minimise impact on agricultural land and the safeguarding of mineral reserves.	DCO Requirement.
23-3	Detailed ground investigation will be completed. Ground investigation will be required to inform	DCO Requirement.

ID	Mitigation Measures embedded into the project design	How the measure will be secured
	both geotechnical design parameters and geo-environmental assessment. Geo-environmental risk assessment will assess potential risks to both human health and controlled waters and will be completed in accordance with relevant guidance documents to include but not be limited to EA guidance LCRM. Geo-environmental assessment will also include consideration of the suitability of materials for reuse as part of the Project (if site won materials can be accommodated) and also provisional waste classification for offsite disposal of surplus materials.	
23-4	Should geo-environmental assessment identify plausible contaminant linkages and the requirement for remediation a remediation strategy will be designed and implemented in accordance with standard environmental best practices.	To be included within the Outline CEMP which will form part of the submission of the Environmental Statement with the DCO Application. DCO Requirement - CEMP.
23-5	Standard environmental practices will be implemented during construction to limit the potential for release of potential contaminants. This will include the potential requirements for further assessment such as a piling risk assessment, ahead of construction to ensure that the most appropriate construction methods are implemented.	To be included within the Outline CEMP which will form part of the submission of the Environmental Statement with the DCO Application. DCO Requirement - CEMP.
23-6	Material reuse will be carried out in accordance with CL:AIRE The Definition of Waste:	To be included within the Outline CEMP which will form

ID	Mitigation Measures embedded into the project design	How the measure will be secured
	Development Industry Code of Practice (or other suitable regulations or exemptions).	part of the submission of the Environmental Statement with the DCO Application. DCO Requirement - CEMP.
23-7	ALC surveys will be completed as required along the grid connection route – to provide an ALC assessment and ensure that the soils are managed appropriately during construction.	To be included within the Outline CEMP which will form part of the submission of the Environmental Statement with the DCO Application. DCO Requirement - CEMP.
23-8	Soils management will be completed in accordance with best practice as outlined in the guidance document 'Construction Code of Practice for the Sustainable Use of Soils on Construction Sites (Defra, 2009)'.	To be included within the Outline CEMP which will form part of the submission of the Environmental Statement with the DCO Application. DCO Requirement - CEMP.
23-9	Construction works will be completed in accordance with standard construction practices and relevant Risk Assessments and Method Statements (RAMS). RAMS will take into consideration the potential risks highlighted with respect to the topic of Geology and Ground Conditions to include the potential for encountering UXB.	To be included within the Outline CEMP which will form part of the submission of the Environmental Statement with the DCO Application. DCO Requirement - CEMP.
23-10	Construction phase RAMS will include potential risks associated with potential unstable ground	To be included within the Outline CEMP which will form part of the submission of the

ID	Mitigation Measures embedded into the project design	How the measure will be secured
	as a result of excavation and appropriate control measures will be designed and implemented.	Environmental Statement with the DCO Application. DCO Requirement - CEMP.
23-11	Management measures will be inherent in the design of the future facility and the future operations will be undertaken in line with the appropriate environmental permitting requirements with particular reference to the Environmental Permitting (England and Wales) Regulations 2016 as appropriate.	DCO Requirement.

23.11 LIKELY SIGNIFICANT EFFECTS

23.11.1 In line with the EIA Regulations 2017, the EIA for the Project will consider those impacts where there is a risk of a likely significant effect only. The following Section draws on industry experience and expertise to identify those effect-receptor pathways that may potentially lead to a significant impact. Where experience and available evidence indicates an effect-receptor pathway will not lead to a significant impact with regards to the EIA Regulations 2017 the pathway is scoped out from assessment.

23.11.2 The likely significant effects related to Geology and Ground Conditions are summarised in **Table 23-11**. The scoping assessment is based on a combination of the Project definition at the scoping stage, embedded environmental measures, understanding of the baseline conditions at this stage, the evidence base for potential effects, the identification of potentially impacted receptors, and professional judgement. The approach to this assessment is set out in **Chapter 3: Approach to EIA**.

23.11.3 The early identification of likely significant effects is used here as a tool aimed at delivering a proportionate approach to the EIA. In doing so, it sets out a high-level assessment of all potential effects, significant or not. The basis for scoping out (and therefore no longer considering) certain effects is presented after the table, supported by evidence base.

Table 23-11: Likely significant Geology and Ground Conditions effects

Activity and Impact	Embedded Measures	Effect	Proposed approach to assessment (scoped in or scoped out)	Receptor	Further data baseline requirements
Construction & Operation – Development on brownfield sites, potential to encounter contaminated materials. Potential risk to future site users.	23-3, 23-4, 23-5, 23-6, 23-8	Moderate	Scoped In.	Human Health.	Phase 1 Preliminary Environmental Assessment & Intrusive Ground Investigation.
Construction – Development on brownfield sites, potential to encounter contaminated material, and potential to mobilise and create preferential contaminant pathways.	23-5, 23-6, 23-8	Moderate	Scoped In.	Controlled Waters and ecological receptors.	Phase 1 Preliminary Environmental Assessment & Intrusive Ground Investigation.
Operation – Development on brownfield sites, potential for aggressive ground conditions.	23-1, 23-3	Moderate	Scoped In.	Buildings and Infrastructure.	Phase 1 Preliminary Environmental Assessment & Intrusive Ground Investigation.
Construction – development in an area of	23-9	Moderate	Scoped In.	UXB	Desk based assessment.

Activity and Impact	Embedded Measures	Effect	Proposed approach to assessment (scoped in or scoped out)	Receptor	Further data baseline requirements
moderate to high UXB risk.					
Construction – development in close proximity to an LGS.	23-2	Minor	Scoped In.	LGS (Grid connection).	Phase 1 Preliminary Environmental Assessment.
Construction & Operation – sterilisation of mineral resources.	23-2	Neutral	Scoped Out.	Mineral Resources.	None.
Construction & Operation – temporary loss and to a lesser extent potential permanent loss of BMV agricultural land.	23-7	Moderate	Scoped In.	Agricultural Land.	ALC survey (Areas of permanent land take).

23.11.4 It should be noted that **Table 23-11** provides a summary of the key receptors identified and does not list individual source-pathway-receptor linkages. Future assessment will include a further breakdown of source-pathway-receptor linkages relevant to each receptor.

Impacts Scoped Out of Assessment

23.11.5 Potential effects on Mineral Resources are scoped out due to there being limited mineral resources within the Wirral and Liverpool LA boundaries and no MSA within the Study Area.

23.11.6 Potential effects to the remaining receptors are scoped in. It is noted that the effects LGS is shown to be slight in **Table 23-11** however this effect is proposed to be scoped in. The scoping in of LGS is based on the recognition that there is a sensitive receptor and that the grid connection route has not be finalised.

23.12 CUMULATIVE EFFECTS

23.12.1 Cumulative effects related to Geology and Ground Conditions resulting from the effects of the Project and other developments will be assessed in accordance with the guidance and methodologies set out in **Chapter 3: Approach to EIA** and considering the other developments that have been screened in as part of the CEA screening exercise.

23.12.2 The following impacts from the Project have the potential to act cumulatively with impacts from other developments to contribute to cumulative effects:

- Mobilisation of potential contaminants and potential creation of preferential contaminant pathways in relation to human health during construction (e.g. mobilisation of potential contaminants via the creation of dust during construction).
- Mobilisation of potential contaminants and potential creation of preferential contaminant pathways in relation to controlled waters during construction.
- Loss of BMV agricultural land.

23.12.3 Cumulative effects on human health and buildings and infrastructure during operation from potential contaminative sources are proposed to be scoped out of cumulative effect assessment as the potential effects are considered to be specific and restricted to the Project.

23.12.4 LGS receptors are proposed to be scoped out of cumulative effect assessments as based on the existing information available the potential effects of the Project itself are considered slight.

23.12.5 Mineral resource receptors are proposed to be scoped out of cumulative effect assessments as there are no MSAs within the Study Area.

23.13 TRANSBOUNDARY EFFECTS

23.13.1 Due to the localised nature of the potential impacts, transboundary effects on all but neighbouring site users and controlled waters receptors are considered unlikely to occur and therefore scoped out of further assessment.

23.13.2 The transboundary effects to controlled waters receptors will be considered further within the ES.

23.14 PROPOSED APPROACH TO ENVIRONMENTAL IMPACT ASSESSMENT REPORT

23.14.1 Further desk-based studies, intrusive ground investigation and where required ALC surveys will be undertaken to identify and assess Geology and Ground Conditions receptors. Further assessment will be supplemented with consultation with the relevant statutory and non-statutory organisations as necessary.

A detailed assessment of Geology and Ground Conditions will be completed in broad accordance with guidance referenced in **Section 23.3** and will include an assessment of the effects outlined in **Table 23-11** As additional baseline information becomes available via further desk-based research, consultation with relevant stakeholders and intrusive ground investigation the effects in **Table 23-11** will be separated further to enable specific source-pathway-receptor linkages to be assessed in detail.

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24 TERRESTRIAL TRAFFIC AND TRANSPORT

24.1 INTRODUCTION

24.1.1 The Terrestrial Traffic and Transport chapter will consider the potential likely significant effects on the transport network and sensitive receptors that may arise from the construction, operation and maintenance (O&M) and decommissioning activities of the Project. This section of the Scoping Report describes the methodology to be used within the Environmental Impact Assessment (EIA), an overview of the baseline conditions within the Scoping Boundary (as defined in **Chapter 1: Introduction**), the datasets to be used to inform the EIA, the potential likely significant effects to be considered, and how these will be assessed for the purpose of the EIA.

24.1.2 It is considered that the Project's construction will have the greatest environmental impact, with the operational likely to generate a significantly reduced level of impact. Impacts due to decommissioning activities are likely to be broadly similar to those considered as part of the construction phase and this assessment will therefore focus on the construction phase.

24.1.3 This chapter interfaces with other aspects and as such, should be considered alongside these; namely:

- **Chapter 16: Shipping and Navigation:** There is the potential for traffic generated by onshore construction activities to have an impact on those accessing local ports used to support ferry operations and the scheduling of activities will require to take cognisance of this to minimise disruption as far, as possible.
- **Chapter 21: Air Quality:** Construction traffic will generate a temporary worsening of air quality, with this being of greater importance in existing air quality management areas and where the construction traffic access route passes through residential areas. The level of construction traffic will be quantified within the Traffic and Transport Chapter, with this data used to inform the air quality assessment presented in **Chapter 21**.
- **Chapter 22: Onshore Noise and Vibration:** While all construction traffic is likely to result in a temporary increase in noise levels, heavy goods vehicles (HGVs) could also have an impact in terms of vibration, with both impacts being of greater importance where construction vehicles pass close to sensitive receptors. The level of construction traffic will be quantified within

the Traffic and Transport Chapter, with this data used to inform the noise impact assessment presented in **Chapter 22.**

24.1.4 Overarching relevant legislation and policy context which has informed the scope of the assessment is outlined in **Chapter 4: Planning Policy,** with topic specific considerations outlined in **Appendix 4.1**.

24.2 TECHNICAL GUIDANCE

24.2.1 Technical guidance that has been used to define the assessment is set out in **Table 24-1**.

Table 24-1: Relevant technical guidance

Guidance reference	Relevance to the assessment
Environmental Assessment Traffic and Movement July 2023 [27]	Provides the framework for assessment of road traffic on the environment.

24.3 STUDY AREA

24.3.1 The Applicant is committed to minimising the impact of the Project's construction as far as possible and has therefore committed to transport the majority of components and materials associated with the tidal barrage to the marine working area by marine methods. There will, however, be a requirement for an element of works to be undertaken onshore, along with a need for construction workers to travel to the marine working area and to the grid connection route. This will be reflected in the assessment undertaken as part of the EIA.

24.3.2 A number of existing marine and port facilities are currently being considered to provide temporary laydowns and compounds to support construction activities associated with the Project's delivery. The locations of these are shown in **Figure 2.1**, and as outlined within section 2.5.6 of **Chapter 2: Site Context and Project Description**. As the potential off-site locations are spread over a relatively large area, it is not possible to fully define the Study Area or baseline conditions at this time.

24.3.3 The Study Area for the traffic and transport assessment will be identified and agreed in consultation with stakeholders following refinement of site options.

24.4 CONSULTATION

24.4.1 Consultation is a key part of the application process. The assessment has been and will be informed by engagement and discussion with various stakeholders such as Liverpool City Council (LCC), Wirral Council (WC) and National Highways (NH).

24.5 ASSESSMENT METHODOLOGY

24.5.1 The Project-wide approach to the assessment methodology is set out in **Chapter 3: Approach to EIA**. This will be implemented to assess the likely significant effects on sensitive receptors from the construction, O&M, and decommissioning of the Project.

24.5.2 The specific legislation and guidance outlined in **Chapter 4: Planning Policy and Appendix 4.1** will also be considered in relation to the assessment, in addition to consultation with the stakeholders outlined above.

24.5.3 It is intended that potential effects of the Project will be reviewed in accordance with the Institute of Environmental Management and Assessment (IEMA) Guidelines for the Environmental Assessment of Traffic and Movement which confirms that an assessment should be undertaken in accordance with the following two rules:

- Rule 1: On road links where traffic flows are predicted to increase by more than 30% (or where the number of HGVs is predicted to increase by more than 30%); and
- Rule 2: On road links of high sensitivity where traffic flows have increased by 10% or more.

24.5.4 Where the predicted growth in traffic flow is below the thresholds, the IEMA guidelines suggest the significance of the effects can be stated to be negligible and further detailed assessment is not warranted.

24.5.5 The following groups and special interests will also be considered for each link on the agreed study network in line with the IEMA guidance, to determine the sensitivity of receptors:

- People at home;
- People at work;
- Sensitive locations including hospitals, schools, places of worship and historical buildings;

- People walking;
- People cycling;
- Recreational and shopping areas;
- Ecological / nature conservation sites; and
- Tourist / visitor attractions.

24.5.6 Where either of the two IEMA thresholds are exceeded, the impact of construction traffic will be assessed in terms of the following effects:

- Severance;
- Driver delay;
- Pedestrian delay;
- Pedestrian amenity;
- Fear and intimidation; and
- Accidents and safety.

24.5.7 The significance of the effects on receptors will be evaluated against the IEMA guidance and, where possible, in line with the criteria used for the other environmental topic areas covered in the Environmental Statement (ES). These criteria are subjective but consider the number of receptors affected, their sensitivity and the length of the period for which they will be impacted.

24.5.8 A number of the traffic-related effects set out in the IEMA guidance such as noise, vibration and ecological effects, are outwith the scope of this assessment and will be assessed in the respective Chapters of the EIA.

24.5.9 With regard to general construction traffic, in order to assess traffic impacts during the construction phase, estimated vehicle movements for all major construction vehicle trip generators will be calculated. Daily vehicle movements during the peak period of the construction phase will be assessed against the baseline traffic conditions. Any changes in traffic levels on each of the study network links during the construction phase will be assessed in terms of percentage change and compared against the maximum vehicle capacity of each link.

24.5.10 The perception of change in traffic is dependent on a wide range of factors including volume, speed and composition of traffic (i.e. percentage of HGVs). The assessment of environmental effects of traffic requires a number of stages, namely:

- Determination of existing and forecast traffic levels and characteristics;
- Determining the time period suitable for assessment;
- Determining the year of assessment; and
- Identifying the geographical boundaries of assessment.

24.5.11 Once the environmental effects and the road links to be included within the analysis have been identified, the next stage of the assessment is to quantify the magnitude of the environmental impact and identify the level of significance that such changes will make. This requires the definition of both baseline conditions and estimation of conditions for the appropriate year of assessment. Each receptor will have a different value and level of sensitivity to change and the quantification of environmental effects is easier for some receptors than others. Traffic noise has been extensively researched and methods of measurement developed. Other effects such as severance are more subjective as there are no current proven or reliable techniques for study.

24.5.12 The IEMA guidelines identify general thresholds for traffic flow increases of 10% and 30%. The guidelines also suggest that 30%, 60% and 90% changes in traffic levels should be considered as slight, moderate and substantial impacts respectively. It is generally considered that traffic flow increases of less than 10% are not significant given that daily background traffic flow may vary by this amount. Based on these rules and perceptions, the magnitude of the impact can be classified using the criteria in **Table 24-2**.

Table 24-2: Criteria for Determining the Magnitude of Impact

Major	Moderate	Minor	Negligible	Major
>90% increase in traffic.	60%-90% increase in traffic.	30%-60% increase in traffic.	0%-30% increase in traffic.	>90% increase in traffic.

24.5.13 A combination of the sensitivity of the receptor and the magnitude of effect will then be used to inform the significance of the effect. For many effects there are no simple rules or formulae which define thresholds of significance and there is, therefore, a need for interpretation and judgement on the part of the assessor, backed up by data or quantified information where possible.

24.6 BASELINE CONDITIONS

DATA INFORMATION SOURCES

24.6.2 An initial desk based review has been undertaken of publicly available data sources outlined in **Table 24-3** to determine the baseline character of the Study Area and inform the assessment process.

Table 24-3: Key sources of traffic and transport data

Source	Date	Summary	Coverage of Study Area
Department for Transport (DfT) Traffic Counts website.	Accessed May 2024.	Traffic counter sites installed on the strategic road network which provide traffic flow data.	A number of sites located in the vicinity of the Project.
Crashmap database.	Accessed May 2024.	Personal injury accident data available for the five year period between January 2018 and 2022.	Full coverage of the anticipated Study Area.

EXISTING BASELINE

24.6.3 This section describes the present conditions which constitute the existing baseline environment for traffic and transport within the area in the vicinity of the Project (namely the Tidal Barrage Development Area and Grid Connection Development Area).

24.6.4 An initial review of the existing transport network has been undertaken to inform this Scoping Report, with a more detailed review to be undertaken as part of the traffic and transport chapter of the Preliminary Environmental Information Report (PEIR) and ES.

24.6.5 The area within which the Project is located is well served by public transport services and it is intended that the majority of construction workers will use the existing network to access the Site on a daily basis.

24.6.6 The area is also supported by a well-connected highway network which will support convenient access by construction traffic from the strategic highway network.

24.6.7 The Applicant is seeking to prioritise the use of shipping to bring in materials and there may also be potential to transport materials to the area via the Garston Docks Freightliner Terminal. However in this assessment, the strategic highway network, including the M53, A41 and A59 have been identified to be a potential haul route for HGVs where required. This is considered to be of a standard able to accommodate construction traffic, and where necessary, it is proposed to utilise this as far as possible to minimise the impact on the local road network. It is, however, anticipated that there will be a requirement for construction traffic to utilise the local highway network when accessing the Project.

24.6.8 As previously highlighted, the Study Area will be defined following confirmation of the locations of the associated development required to support construction activities.

24.7 FUTURE BASELINE

24.7.1 The tidal barrage may take up to 10 years to construct and there is the potential for the transport network in the vicinity of the Project to be improved in that time. This includes enhancements to public transport services, in addition to local or more strategic improvements to the highway network.

24.7.2 Any planned improvements will be identified in consultation with LCC, WC and NH, with the future baseline developed taking cognisance of these.

24.7.3 The impact of construction traffic will be assessed for the anticipated peak period of construction activities, with traffic flows extracted from the DfT counters, growthed to the future year baseline using appropriate rates extracted from the Tempro database.

24.8 BASIS FOR SCOPING ASSESSMENT

24.8.1 The traffic and transport scoping assessment is based on the following key assumptions which are also set out in **Chapter 2: Site Context and Project Description**:

- The majority of components and materials associated with the tidal barrage, will be transported to the marine working area by marine methods.

- It is assumed that there will be no requirement to provide onsite worker accommodation, with all employees associated with the tidal barrage's construction assumed to access the Project on a daily basis.
- It is assumed that the assessment will focus on road network between the strategic road network and the construction sites supporting installation of the tidal barrage and grid connection.

24.9 EMBEDDED ENVIRONMENTAL MEASURES

24.9.1 Embedded mitigation measures have been identified and are proposed to be adopted as part of the evolution of the Project design (embedded into the Project design). These measures will evolve over the development process as the EIA progresses and in response to consultation. They will be fed iteratively into the assessment process. These measures typically include those that have been identified as good or standard practice and include actions that would be undertaken to meet existing legislation requirements.

24.9.2 As there is a commitment to implementing these environmental measures, and also to various standard sectoral practices and procedures, they are considered inherently part of the design of the Project and have, therefore, been considered in the scoping assessment.

24.9.3 In addition to the specific embedded mitigation measures relevant to traffic and transport listed in **Table 24-4**, consultation will be undertaken with all relevant consultees such as LCC, WC and NH to address any concerns or issues.

Table 24-4: Relevant traffic and transport embedded environmental measures

ID	Mitigation Measures embedded into the project design	How the measure will be secured
24-1	Transportation of the majority of components and materials associated with the tidal barrage to the marine working area by marine methods.	Commitment provided to this as part of the Project's means of delivery.
24-2	Implementation of a Construction Traffic Management Plan (CTMP) to minimise the impact of construction traffic associated with the tidal barrage and grid connection on sensitive receptors as far as possible,	Contained within the ES and secured via DCO Requirement.

ID	Mitigation Measures embedded into the project design	How the measure will be secured
	with movements scheduled to avoid peak periods of port activity where possible.	
24-3	Avoid the use of heavy haul roads through the residential areas on the left bank.	Commitment provided to this as part of the Project's means of delivery.
24-4	Provision of limited parking for workers within the construction sites to encourage the use of public transport, with this approach supported through the promotion of a comprehensive Travel Plan identifying the services available when accessing the construction sites.	Commitment provided to this as part of the Project's means of delivery.
24-5	Consideration of the provision of park and ride facilities with associated shuttle bus services, to support workers accessing the area from further afield to do so sustainably.	Commitment provided to this as part of the Project's means of delivery.
24-6	Consideration of the provision of water based shuttle services to support worker access from key collection areas to the marine working areas.	Commitment provided to this as part of the Project's means of delivery.

24.10 LIKELY SIGNIFICANT EFFECTS

24.10.1 In line with the EIA Regulations 2017, the EIA for the Project will consider those impacts where there is a risk of a likely significant effect only. The following Section draws on industry experience and expertise to identify those effect-receptor pathways that may potentially lead to a significant impact. Where experience and available evidence indicates an effect-receptor pathway will not lead to a significant impact with regards to the EIA Regulations 2017 the pathway is scoped out from assessment.

24.10.2 The likely significant effects on traffic and transport are summarised in **Table 24.5**. The scoping assessment is based on a combination of the Project definition at the scoping stage, embedded environmental measures, understanding of the baseline conditions at this stage, the evidence base for traffic and transport effects, the identification of potentially impacted receptors, and professional judgement. The approach to this assessment is set out in **Chapter 3: Approach to EIA**.

24.10.3 The early identification of likely significant effects is used here as a tool aimed at delivering a proportionate approach to the EIA. In doing so, it sets out a high-level assessment of all potential effects, significant or not. The basis for scoping out certain effects, with these no longer considered for the purpose of this EIA, is presented in **Table 24-5**.

Table 24-5: Likely significant traffic and transport effects

Activity and Impact	Embedded Measures	Effect	Proposed approach to assessment (scoped in or scoped out)	Receptor	Further data baseline requirements
Increase in HGV traffic on the local highway network in the vicinity of the temporary laydowns and compounds supporting construction of the tidal barrage.	Transport of the majority of components and materials associated with the tidal barrage's construction by marine methods, avoiding travelling through the residential areas on the west bank and implementation of a CTMP.	Impact on Severance; Driver delay; Pedestrian delay; Pedestrian amenity; Fear and intimidation; and Accidents and safety.	Scoped in.	Sensitive receptors adjacent to the construction access routes including: People at home; People at work; Sensitive locations; People walking; People cycling; Recreational and shopping areas; Ecological / nature conservation sites; and Tourist / visitor attractions.	None
Increase in HGV traffic on the local highway network on the access routes supporting the grid connection's installation.	Transport of the majority of components and materials associated with the tidal barrage's construction by marine methods and implementation of a CTMP.	Impact on Severance; Driver delay; Pedestrian delay; Pedestrian amenity; Fear and intimidation; and Accidents and safety.	Scoped in.	Sensitive receptors adjacent to the construction access routes including: People at home; People at work; Sensitive locations; People walking; People cycling;	None

Activity and Impact	Embedded Measures	Effect	Proposed approach to assessment (scoped in or scoped out)	Receptor	Further data baseline requirements
				Recreational and shopping areas; Ecological / nature conservation sites; and Tourist / visitor attractions.	
Significant number of workers accessing the Project on a daily basis and potential impact of this on the local highway network.	Provision of limited parking within the construction sites, with park and rides and water based shuttle services to support worker access, with an associated Travel Plan developed to support this approach.	Impact on Severance; Driver delay; Pedestrian delay; Pedestrian amenity; and Accidents and safety.	Scoped in.	Sensitive receptors adjacent to the construction access routes including: People at home; People at work; Sensitive locations; People walking; People cycling; Recreational and shopping areas; Ecological / nature conservation sites; and Tourist / visitor attractions.	None

IMPACTS SCOPED OUT OF ASSESSMENT

24.10.4 As vehicles travel away from the Project, they will disperse across the wider highway network, thus diluting any potential effects. It is therefore expected that the effects relating to traffic and transport are unlikely to be significant beyond the Study Area which will be defined as part of the EIA, and as such it is not proposed to assess the impact of construction traffic outwith this area.

24.10.5 The traffic impacts associated with the operational phase of both the tidal barrage and grid connection are anticipated to be of low volume being limited to movements associated with maintenance activities and low numbers of staff commuting to the Site. Therefore, further assessment of the traffic impacts of these components during the operational phase is not considered necessary.

24.10.6 Traffic associated with the grid connection's decommissioning is anticipated to be significantly less than that generated during construction. Due to the timescales involved and the likelihood for changes to the baseline situation during this period, it is not proposed to assess the traffic and transport effects associated with the decommissioning phase as part of the EIA.

24.11 CUMULATIVE EFFECTS

24.11.1 Cumulative effects on traffic and transport resulting from the effects of the Project and other developments will be assessed in accordance with the guidance and methodologies set out in **Chapter 3: Approach to EIA** and considering the other developments that have been screened in as part of the CEA screening exercise.

24.12 TRANSBOUNDARY EFFECTS

24.12.1 Due to the localised nature of the potential impacts, transboundary effects are considered unlikely to occur and it is therefore not proposed to consider these further as part of the traffic and transport chapter.

24.13 REFERENCES

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25 SEASCAPE, LANDSCAPE & VISUAL EFFECTS

25.1 INTRODUCTION

25.1.1 The seascape, landscape and visual chapter will consider the potential likely significant effects on seascape, landscape and visual receptors that may arise from the construction, operation and maintenance (O&M) and decommissioning activities of the Project.

25.1.2 The seascape, landscape and visual chapter will focus on the areas that are likely to be affected by the Project both directly through physical changes to the seascape resource and indirectly through visibility of these changes which may affect the character of the seascape and landscape resource and the visual amenity of the surrounding area. Receptors will include the areas of seascape and landscape resources within 5 kilometres (km) of the Scoping Boundary in relation to the tidal barrage, local residents that reside on or adjacent to the banks of the River Mersey, tourists that visit local attractions affiliated with the immediate setting of the Project, and workers of nearby commercial premises. A study area of a 2km buffer in relation to the route and grid connection is considered appropriate based on the context of an urban fringe.

25.1.3 This section of the Scoping Report describes the methodology to be used within the Environmental Impact Assessment (EIA), an overview of the baseline conditions within the Scoping Boundary (as defined in **Chapter 1: Introduction**), the datasets to be used to inform the EIA, the potential likely significant effects to be considered, and how these will be assessed for the purpose of the EIA.

25.1.4 Seascape, landscape and visual assessments are separate although linked processes describing closely related but distinct sets of effects. Seascape Character Assessment principally applies to coastal and marine areas seaward of the low water mark. Landscape Character Assessment principally applies to areas lying to the landward side of the high water mark. In the context of this project, the context beyond the Seascape is one that is substantially urban in nature.

25.1.5 Landscape effects are changes to landscape character resulting from how the landscape is perceived following the development. As noted in para 2.6 of the third edition of the Guidelines for Landscape and Visual Impact Assessment (GLVIA3) 'Landscape' includes consideration of 'townscape' matters where relevant (Landscape Institute and Institute of Environment Management and

Assessment, 2013). Para 2.7 of GLVIA3 states that "*Townscape refers to areas where the built environment is dominant…"* and that it comprises *"…the landscape within the built-up area, including the buildings, the relationship between them, the different types of urban open spaces, including green spaces and the relationship between buildings and open spaces."*. For the purposes of this report the term 'landscape' is used to refer to both landscape and townscape matters.

25.1.6 An Approach to Seascape Character Assessment (Natural England, 2012) refers to a definition of Seascape as: "*An area of sea, coastline and land, as perceived by people, whose character results from the actions and interactions of land with sea, by natural and/or human factors"*.

25.1.7 It should be noted that published guidance from various sources may use either or both of the terms Seascape Character and Coastal Character for the above definition. For the purposes of this Scoping Report, they should be considered interchangeable.

25.1.8 Seascape and Landscape impact assessment consider these effects both in terms of the individual components of the seascape and landscape and on the structure, coherence and character of the seascape and landscape as a whole.

25.1.9 Visual effects are changes in the composition and character of views available in the area affected by the Project. Visual impact assessment considers the response of the people who experience these effects, who may be living or working in the area, enjoying recreational activities or simply passing through. The assessment considers the overall consequence of the effects on the visual amenity - the pleasantness of the view or outlook – that the people affected enjoy.

25.1.10 Seascape, Landscape and Visual effects interface with other environmental topics and as such, should be considered alongside these, namely:

- **Chapter 13: Terrestrial Ecology and Biodiversity**, in relation to habitats such as mudflats, watercourses, fields, hedgerows, woodland etc; and
- **Chapter 18: Terrestrial Archaeology and Cultural Heritage**, in relation to heritage assets which contribute to the landscape (for example listed buildings, conservation areas, registered parks and gardens etc).

25.1.11 Overarching relevant legislation and policy context which has informed the scope of the assessment is outlined in **Chapter 4: Planning Policy,** with topic specific considerations outlined in **Appendix 4.1**.

25.2 TECHNICAL GUIDANCE

25.2.1 Technical guidance which will be used to define the assessment is set out in **Table 25-1**.

Table 25-1: Relevant technical guidance

Guidance reference	Relevance to the assessment
GLVIA3 and associated clarifications.	The SLVIA methodology should follow the principles and approaches set out in the GLVIA3 and associated clarifications published by the GLVIA Panel. The methodology may however be adapted to relate to the specific characteristics and nature of the Project.
Landscape Institute, Visual Representation of Development Proposals (Landscape Institute, 2019).	Visual Representations of the Project would be prepared in line with the advice set out in this guidance.
Landscape Institute, Technical Guidance Note 02-21 “Assessing The Value of Landscapes Outside National Designations (Landscape Institute, 2021).	The assessment of landscape value will follow the advice set out in this guidance.
Natural England, An Approach to Seascape Character Assessment (Natural England, 2014).	The assessment of effects on the seascape will follow the advice set out in this guidance.
Natural England, An Approach to Landscape Character Assessment.	The description and assessment of landscape character will follow the advice set out in this guidance.
Natural England, An Approach to landscape sensitivity assessment to inform spatial planning and land management (Natural England, 2019).	The assessment of effects on the seascape, landscape and visual amenity will consider landscape sensitivity (as defined in this guidance).

Guidance reference	Relevance to the assessment
Marine Management Organisation – An Approach to seascape sensitivity assessment (Marine Management Organisation, 2019).	The assessment of effects on the seascape will consider seascape sensitivity (as defined in this guidance).
Landscape Institute, Technical Information Note, Townscape Character Assessment (Landscape Institute, 2017).	Provides best practice guidance on carrying out townscape character assessment.
National Infrastructure Commission Design Group, Project Level Design Principles (National Infrastructure Commission Design Group, 2024).	Provides guidance on, amongst other things, achieving design quality via the use of defined project level design principles. An architect would be used to incorporate these principles into the design of the Project.

25.3 STUDY AREA

25.3.1 The study area for the SLVIA will be defined in relation to potential for significant effects to arise as a result of the construction, operation and decommissioning of the barrage and the construction and decommissioning of the grid connection separately. It is anticipated that the potential for significant effects be refined through the design process and final project envelope to ensure a focus on potential significant effects only.

25.3.1 The Guidelines for Landscape and Visual Impact Assessment (GLVIA 3) [28, 28] clarify how study areas should be determined on a project-specific basis. Paragraph 5.2 of GLVIA 3 states that the Study Area extent should be *"… based on the extent of Landscape Character Areas likely to be significantly affected either directly or indirectly"* or *"on the extent of the area from which the development is potentially visible, defined as the Zone of Theoretical Visibility, or a combination of the two."*

25.3.2 For the assessment of visual effects in relation to the construction, operation and decommissioning of the barrage and the construction and decommissioning of the grid connection, viewpoints from key locations to represent visual receptors will be identified through the site / option selection process and production of zones of theoretical visibility (ZTV) plans with the final viewpoints for assessment

to be agreed with consultees. The visual assessment will consider only the area covered by the ZTV (by definition, visual effects can only occur where a development is visible) which will be produced once the final location of the marine and onshore elements are determined. However, seascape and landscape assessment will consider the effect on the whole of those parts of the defined units of seascape or landscape character potentially affected, not simply on those parts covered by the ZTV.

25.4 CONSULTATION

25.4.1 Consultation is a key part of the application process. The assessment will be informed by engagement and discussion with various stakeholders including relevant Local Planning Authorities (LPA's).

25.4.2 A summary of the key issues raised during consultation to date, specific to seascape, landscape and visual matters, is outlined in **Table 25-2**, together with how these issues will be considered in the EIA.

Table 25-2: Consultation

Date	Consultee	Consultation and Key Comments	How this is accounted for
18 June 2024	Sefton Borough Council.	Email correspondence received from SBC outlining key issues to be considered in the Scoping Report, including *"Disturbance and visual impacts for Sefton residents, businesses and wider communities (also any mitigation/ benefits, e.g. that could support regeneration of The Strand?)".*	Visual receptors in Sefton which could potentially be affected by the Project (and therefore scoped in to the ES) are identified in **Section 25.7** of this Scoping Report.

25.5 ASSESSMENT METHODOLOGY

25.5.1 The Project-wide approach to the assessment methodology is set out in **Chapter 3: Approach to EIA**. This will be implemented to assess the likely significant

effects on seascape, landscape and visual receptors from the construction, O&M, and decommissioning of the Project.

25.5.2 The specific legislation and policy guidance outlined in **Appendix 4.1** and **Table 25-1** will also be considered in relation to the assessment, in addition to consultation with the stakeholders outlined above.

25.5.3 The methodology for carrying out the SLVIA will be in accordance with best practice guidance, as outlined below.

25.5.4 The assessment approach and process are summarised in the flow diagram below, taken from GLVIA3:

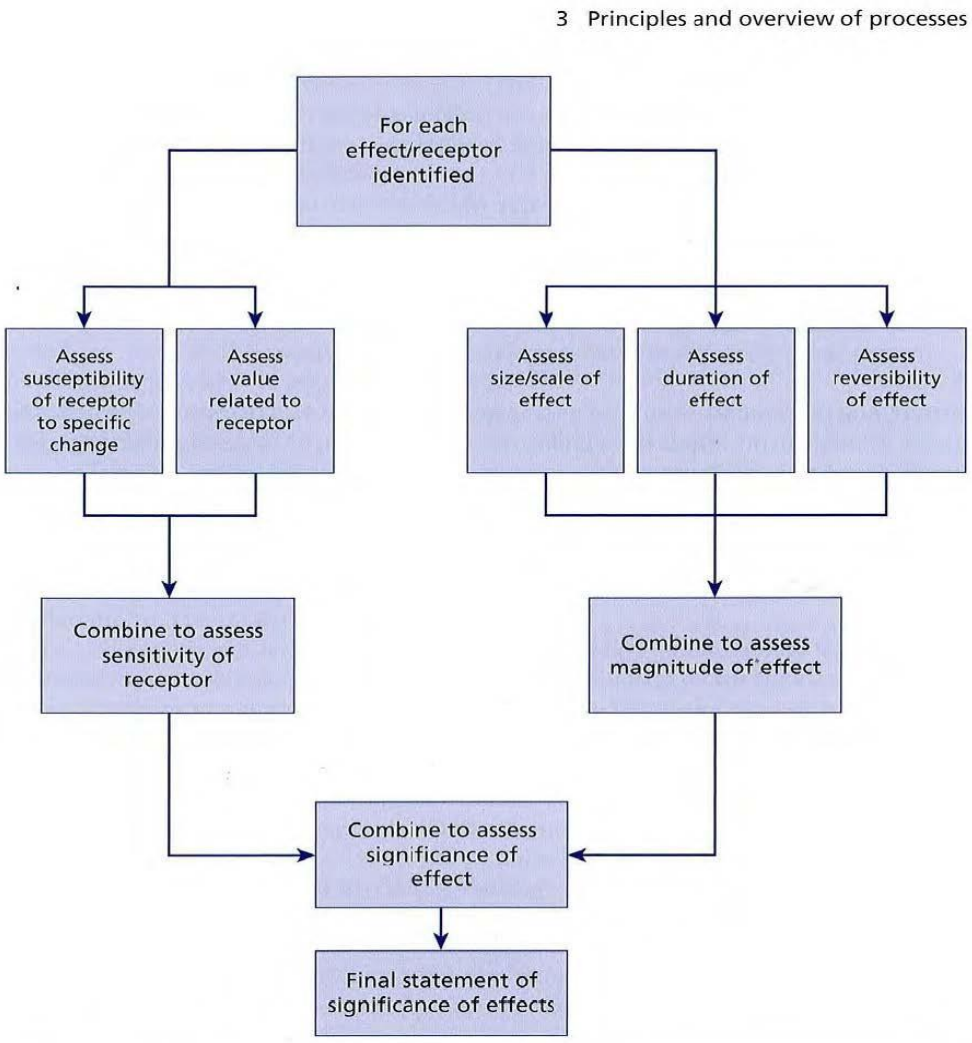

Plate 25.1: Flow Diagram from GLVIA3

SIGNIFICANCE OF LANDSCAPE, SEASCAPE AND VISUAL EFFECTS

25.5.5 The significance of a landscape, seascape or visual effect will be assessed through professional judgement, combining the sensitivity of the receptor with the magnitude of impact.

25.5.6 Combining the stated measures of magnitude and sensitivity indicates the relative importance of different effects. This, combined with an oversight of professional judgement, allows us to evaluate effects and to determine significance their significance.

25.5.7 In line with guidance set out at Paragraph 5.53 of GLVIA3, the rationale for the overall judgements will be clear and will demonstrate how the assessments of sensitivity and magnitude have been linked in determining the overall significance of each effect.

25.5.8 **Chapter 3: Approach to EIA** of this Scoping Report explains that major and moderate effects are generally considered to be 'significant', whilst minor and negligible effects are generally considered to be 'not significant'. The classification of significance of landscape and visual effects will align with this approach.

25.6 BASELINE CONDITIONS

25.6.1 The following section sets out the baseline conditions for the area potentially affected by the Project, briefly describing the landscape / seascape and related designations, the landscape / seascape character and key visual receptors present.

25.6.2 Study Areas in relation to the barrage and the grid connection have been defined for the purposes of this Scoping Report through a survey of the pattern of existing land use, landform and land cover within the landscape surrounding the Scoping Boundary. It is important to note that the boundary of the Study Area does not define the area beyond which there will be no effect, rather it contains the area within which the likely significant landscape and visual effects are predicted to occur. For the purpose of Scoping, a study area of 5km has been identified in relation to the barrage, and is presented in **Figure 25.1,** which may be subsequently reduced through further studies and discussion with stakeholders**.** A study area of a 2km buffer in relation to the route and grid connection is considered appropriate based on the context of an urban fringe.

DATA INFORMATION SOURCES

25.6.3 An initial desk based review has been undertaken of publicly available data sources outlined in **Table 25-3** to determine the baseline character of the study area and inform the assessment process.

Table 25-3: Key sources of landscape and seascape data

Source	Date	Summary	Coverage of Study Area
National Character Area (NCA) Profiles 58 (Merseyside Conurbation) and 59 (Wirral).	2024	NCAs represent areas of distinct and recognisable character at the national scale.	NCA's 58 and 59 together provide full coverage of Study Area.
Seascape Character Assessment for the North West Inshore and Offshore marine plan areas.	2018	Several Marine Character Areas (MCA) are defined in this Assessment.	MCA 36 (Dee and Mersey Estuaries and Coastal Waters) is within the Study Area.
Landscape Character Assessment (LCA) of Sefton.	2003	Defines and describes several landscape character types within Sefton.	'Sandy Foreshore' is a landscape character type identified in the LCA which falls within the Study Area.
Wirral LCA.	2019	Defines and describes several LCAs within Wirral.	Several LCAs are located within the Study Area.

The site and immediate surroundings

25.6.4 The Site is located close to the mouth of the River Mersey, between the Wirral on the west and the city of Liverpool to the east. The Mersey Estuary stretches for a distance of approximately 48km from the upper tidal limit of Howley Weir in Warrington to the sea. At its widest point, between Oglet on the north shore and Ince Bank on the south, it is approximately 4.5km across.

25.6.5 To the east of the site is the City of Liverpool, including its imposing Pier Head buildings (a former World Heritage site), which includes:

- The Pier Head, an area characterised by a formal arrangement of early 20th-century monumental buildings (the Three Graces);
- Albert Dock – historic docks surrounded by large historic dockside warehouses;
- Stanley Dock: the area includes the Leeds and Liverpool Canal and canal locks, the Victoria Clock Tower and the large water-filled Stanley, Collingwood, Bramley-Moore, Nelson and Salisbury docks; and
- Commercial District: Georgian and Victorian architectural form the city's historic commercial and civic centre around Castle Street, Dale Street and Old Hall Street built on medieval streets.

25.6.6 Beyond the Pier Head buildings the commercial and increasingly residential areas of the city rise with the distinctive St Johns Beacon visible above the skyline. South of the city centre the historic docks give way to the former Festival Gardens which create a vegetated riverbank as far south as the large Victorian villas of Cressington Park.

25.6.7 Beyond the riverside frontage development lie the predominantly residential areas of Seaforth, Kirkdale and Vauxhall to the north of the city of Liverpool, with Toxteth, Dingle and Aigburth to the south.

25.6.8 Wallasey is located north of the Kingsway Tunnel towards the mouth of the estuary, of which the suburbs New Brighton and Egremont are located closest to the River Mersey. South of the Kingsway Tunnel and on the eastern side of Wirral, are the towns of Birkenhead, Bebington and Bromborough, which includes the residential suburbs of Tranmere, New Ferry and the villages of Port Sunlight and Eastham.

25.6.9 Port facilities are present to the east and west of the river, extending along the banks and interspersed with areas of housing and commercial development. As

noted in **Chapter 2: Site Context and Project Description** of this Scoping report a Grid Connection Development area within Wirral, which is being explored for a suitable grid connection and will be routed from the tidal barrage over the Wirral to either Birkenhead or Capenhurst. Additionally the Grid Connection Development Area extends into Liverpool on the northern bank of the River Mersey, with the potential for a grid connection to Lister Drive.

Published Landscape and Seascape Character Assessments

25.6.10 Natural England has developed a series of NCA profiles. These NCA profiles provide a broad range of information including key characteristics of a given area, description of the natural and cultural features that shape the landscapes, change over time, the current key drivers for ongoing change, a broad analysis of each area's characteristics and ecosystem services, and an array of opportunities for positive environmental change.

25.6.11 National Landscape Character Areas (NCA) that are relevant to the study area are listed below:

- NCA 58: Merseyside Conurbation; and
- NCA 59: Wirral.

25.6.12 A Marine Character Area (MCA) is an area of marine space which has its own individual character and identity. MCAs that are relevant to the study include MCA 36: Dee and Mersey Estuaries and Coastal Waters. This MCA is defined within the North West inshore Marine Plan Area, identified in the Marine Management Organisation (2018) *Seascape Character Assessment for the North West Inshore and Offshore marine plan areas* (Marine Management Organisation, 2018).

25.6.13 The Landscape Character Assessment of Sefton (Sefton Council, 2003) identifies the Sandy Foreshore Landscape Character Type which is relevant to the study area. This is described as "*A dynamic intertidal landscape featuring a gently sloping sandy beach, offering distant sea views, and attracting feeding birds during low tide, while shrinking to a narrow strip at high tide*."

25.6.14 The Wirral Landscape Character Assessment (Wirral Metropolitan Borough Council, 2019) identifies several Landscape Character Areas (LCAs). Those that are relevant to the study area are listed below:

- LCA 1a: North Wirral Coastal Edge;
- LCA 1c: Eastham Estuarine Edge;

- LCA 2b: The Fender River Floodplain;
- LCA 3a: Bidston Sandstone Hills;
- LCA 4a: Landican and Thingwall Lowland Farmland;
- LCA 4b: Thornton Hough Lowland Farmland and Estates;
- LCA 4c: Clatterbrook and Dibben Valley Lowland;
- LCA 4d: Raby Lowland Farmland and Estates;
- LCA 5a: North Wirral Foreshore and Coastal Waters; and
- LCA 6b: Mersey Estuary.

25.6.15 The landscape / seascape character areas defined above are proposed to be scoped into the SLVIA. Should it become apparent that any of these landscape receptors are unlikely to experience significant effects, the Applicant would seek to scope these receptors out of the SLVIA via agreement with the relevant stakeholders.

Visual Receptors

25.6.16 Based on the current details of the Project, visual receptors to be scoped into the SLVIA include:

- Visitors to various heritage and recreational facilities within the Study Area including:
  - Park land at Festival Gardens;
  - Royal Liver Building;
  - British Music Experience;
  - Maritime Museum;
  - Tate Liverpool;
  - The Beatles Story Museum;
  - Royal Albert Dock;
  - Everton Stadium;
  - M&S Bank Arena;
- Guests staying in hotels on the waterfront;
- Users of the mixed-use frontage to the River, including residents of riverside property and marina;

- Users of the open space and playing fields at Otterspool;
- Users of the Transpennine trail;
- Users of various formal and informal routes close to the bank of the river south of Princes Parade;
- Users of Seacombe, Egremont and Magazines Promenades;
- Users of Ferry terminals located at Birkenhead, Seacombe and Woodside on the west (Wirral) and Bootle and Pier Head on the east (Liverpool);
- Users of the Mersey Ferry;
- Visitors to Liverpool using the Liverpool Cruise Terminal;
- Recreational users of the River Mersey on leisure craft;
- Users of the A59 (linking to Kingsway Tunnel) and the A5030 (linking to Birkenhead Tunnel);
- Users of port facilities to the east of the site;
- Residents of Wallasey;
- Residents in the areas of Seaforth, Crosby, Bootle, Kirkdale and Vauxhall;
- Residents of Birkenhead; and
- Residents of Tranmere and New Ferry.

25.6.17 To assist in illustrating the potential level of impact magnitude to visual receptors as a result of the barrage during construction and operation, visualisations will be prepared for a set of representative viewpoints. An initial set of representative viewpoints will be identified through desk-based review and site visits but will be verified through further site visits and the production of a digital Zone of Theoretical Visibility (ZTV). An initial ZTV showing areas with theoretical visibility is indicated in **Figure 25.1**. Representative viewpoints 'typical' or 'representative' views experienced visual receptors will be identified and agreed with the relevant decision-making authorities.

25.7 FUTURE BASELINE

25.7.1 Change is an ongoing and inevitable process and will continue across the Study Area irrespective of whether the Project proceeds. In the absence of the Project there is likely to be a change to the future baseline conditions as a result of other factors and developments in proximity to the Site. These are the conditions that are anticipated to prevail 'Without the Project' in place.

25.7.2 The future baseline will influence the assessments of landscape and visual effects undertaken in relation to the Construction and Operational Phases of the Project. Change can arise through natural processes (e.g. the maturity of woodlands) and natural systems (e.g. river erosion) or, as is often the case, due to human activity, land use, management, or neglect. due to human activity, land use, management, or neglect.

25.7.3 Climate change in the region is predicted to result in warmer drier summers, warmer wetter winters, and higher sea levels. This in turn may result in the following land use changes which are of relevance to landscape and visual issues:

- Drier summers could lead to drought-stress for semi-natural habitats and urban trees. This could lead to degradation and loss of certain habitats and individual trees that contribute to landscape;
- Hotter and drier summers, milder winters and changes in seasonal rainfall patterns could lead to changes in species composition of some habitats with changes to tree productivity; and
- Increased prevalence of pests and diseases, such as oak decline, may result in changes to the composition and the visual role of mature trees.

25.8 BASIS FOR SCOPING ASSESSMENT

25.8.1 The SLVIA scoping assessment is based on the following key assumptions:

- The Grid Connection will be an underground cable for the entirety of the route from the tidal barrage to the existing point of connection, whichever route is progressed or require the reinforcement / restringing of the existing overhead infrastructure to the existing point of connection;
- No new port facilities will be constructed. Existing Port Facilities will be utilised for temporary construction laydown and compounds as required;
- All facilitating infrastructure (such as compounds) and works required for the installation of the Grid Connections would be confined to the Scoping Boundary but is likely to be a 1km buffer from the actual grid connection locations once a route is decided;
- Construction of an underground cable will be via both open cut and trenchless crossing techniques. As the locations where trenchless crossing techniques may be implemented has not been determined, for the purposes of this assessment a worst-case scenario has been assumed whereby open

cut methods are implemented for the entirety of all Grid Connection routes (with the exception of Lister Drive); and

- It is assumed that the underground cable will be replaced at least once during the operational stage of the Grid Connections, with maintenance occurring every 3 years.

25.8.2 The SLVIA a parameter-based “design envelope” approach, as set out in **Chapter 2: Site Context and Project Description**. The maximum parameters for the Tidal Barrage (and on which the SLVIA will be based) are as follows:

- Maximum width (in River Channel): Between 1.5-2km depending on location within the Tidal Development Area; and
- Maximum Height of Tidal Barrage (to AOD or CD): +7.2 AOD (level with onshore roads and 2040 Highest Astronomical Tide (HAT) at 6.9m AOD, with a gantry crane of +40 AOD.

25.8.3 Based on the maximum height parameters of the associated infrastructure of the Project, it is considered unlikely at this stage that the barrage element will have significant impacts on the landscape, seascape or on views beyond 2km during operation. However, the permanent presence of the gantry crane is potentially visible over a larger area, as such, a study area of 5km will be used initially to test / confirm this assumption and the study area may be reduced for the assessment of operation of the barrage with agreement from stakeholders. A smaller study area of a 2km buffer in relation to the construction and decommissioning of the route and grid connection is considered appropriate based on the context of an urban fringe.

25.8.4 A further ZTV may be prepared dependent on the final routeing of the grid connection and chosen method of installation.

25.9 EMBEDDED ENVIRONMENTAL MEASURES

25.9.1 Embedded mitigation measures will be identified and are proposed to be adopted as part of the evolution of the Project design (embedded into the Project design). These measures will evolve over the development process as the EIA progresses and in response to consultation. They will be fed iteratively into the assessment process. These measures typically include those that have been identified as good or standard practice and include actions that would be undertaken to meet existing legislation requirements.

25.9.2 As there is a commitment to implementing these environmental measures, and to various standard sectoral practices and procedures, they are considered inherently part of the design of the Project and have, therefore, been considered in the scoping assessment.

25.9.3 In addition to the specific embedded mitigation measures listed in **Table 25-4**, consultation will be undertaken with all relevant consultees to address any concerns or issues.

Table 25-4: Relevant embedded environmental measures

ID	Mitigation Measures embedded into the project design	How the measure will be secured
25-1	National Infrastructure Commission Design Principles should be referred to in developing the design for the barrage and supporting infrastructure.	Design and Access Statement and Planning Statement, Design principles documents and works plans.
25-2	The principles of 'good design' to be incorporated into buildings (operation and maintenance / power hub and visitor buildings) and public realm.	Design and Access Statement and Planning Statement, Design principles documents and works plans.
25-3	Public realm design and access to the barrage.	Design and Access Statement, Planning Statement, Design principles document and works plans.
25-4	Minimising land take for construction and insightful optioneering for compound / lay down areas to reduce impacts on trees and other vegetation. Protection of existing established vegetation where appropriate.	Project Design, implemented during construction, maintenance works during operation and decommissioning.
25-5	Where possible avoid sensitive/irreplaceable landscape / townscape features (e.g. ancient woodland, listed buildings).	Project Design, implemented during construction, maintenance works during operation and decommissioning.
25-6	Avoid use of open cut cable line techniques across sensitive habitat such as rivers and streams. Use of Horizontal directional drilling	Project and Construction Design, to be implemented during construction.

ID	Mitigation Measures embedded into the project design	How the measure will be secured
	(HDD) techniques to be employed to avoid significant impacts on sensitive landscape receptors.	
25-7	Provision and implementation of an Outline Construction Environmental Management Plan (OCEMP) to ensure all landscape and visual mitigation measures are adhered to and in compliance with legislation, government and industry standards, to ensure good practice is implemented and to minimise impacts wherever possible. The OCEMP will include, but will not be limited to: identification of potentially damaging construction activities, root protection areas, practical measures to reduces and or avoid impacts during construction; location and timing of sensitive works to avoid harm to landscape and visual receptors, fencing / hoarding during construction.	A preliminary OCEMP will be submitted as part of this EIA Scoping Report. An updated OCEMP will form part of the submission of the Environmental Statement. The OCEMP will form the basis of a final CEMP to be agreed post-consent and prior to the discharge of DCO Requirements.
25-8	Provision and implementation of a Landscape and Ecology Management Plan (LEMP) to ensure all landscape (and ecological) reinstatement, mitigation and enhancement measures are detailed and secured in the short, medium and long term, along with necessary management and monitoring measures.	Submission of LEMP as part of discharge of DCO Requirements.

ID	Mitigation Measures embedded into the project design	How the measure will be secured
25-9	Provision and implementation of a Lighting Strategy to demonstrate that lighting will not cause excessive light pollution / visual impact.	Submission of Lighting Strategy as part of DCO Requirement. The Lighting Strategy is to be included within the LEMP and CEMP.
25-10	Temporary screening for construction activity adjacent to sensitive visual receptors.	Preliminary OCEMP, Environmental Statement, and Works Plans.

25.10 LIKELY SIGNIFICANT EFFECTS

25.10.1 In line with the EIA Regulations 2017, the EIA for the Project will consider those impacts where there is a risk of a likely significant effect only. The following Section draws on industry experience and expertise to identify those effect-receptor pathways that may potentially lead to a significant impact. Where experience and available evidence indicates an effect-receptor pathway will not lead to a significant impact with regards to the EIA Regulations 2017 the pathway is scoped out from assessment.

25.10.2 The potential likely significant effects are summarised in **Table 25-5**. The scoping assessment is based on a combination of the Project definition at the scoping stage, embedded environmental measures, understanding of the baseline conditions at this stage, the evidence base for landscape, seascape and visual effects, the identification of potentially impacted receptors, and professional judgement. The approach to this assessment is set out in **Chapter 3: Approach to EIA** and **Section 25.6** of this Scoping report.

25.10.3 The early identification of likely significant effects is used here as a tool aimed at delivering a proportionate approach to the EIA. In doing so, it sets out a high-level assessment of all potential effects, significant or not. The basis for scoping out certain effects, and therefore no longer considered is presented after the table, supported by evidence base.

25.10.4 The SLVIA will focus on the areas that are likely to be affected by the Project both directly through physical changes to the seascape resource and indirectly through visibility of these changes which may affect the character of the seascape resource and the visual amenity of the surrounding area. The SLVIA will therefore focus on areas with theoretical visibility as indicated in **Figure 25.1**.

25.10.5 The SLVIA will consider effects on landscape, seascape and visual receptors within the study area during construction and operation. Operational effects will be considered at Year 1 and Year 15 to identify effects of maturing mitigation planting.

25.10.6 The ZTV shown in **Figure 25.1**, indicates that the Project would be discernible within views from areas of higher ground beyond the 5 km study area extents. Whilst views of the Project may be discernible from these locations, the appreciable distance in separation is unlikely to result in significant effects on visual receptors in these locations. Viewpoints will therefore be selected from

locations within 5 km of the Site as representative of the visual receptors in the study area.

25.10.7 The elements of the barrage and grid connection that comprise the Project, during construction, operation and subsequent decommissioning, is expected to affect landscape, seascape and visual amenity in the following ways:

Table 25-5: Likely significant effects

Activity and Impact	Embedded Measures	Effect	Proposed approach to assessment (scoped in or scoped out)	Receptor	Further data baseline requirements
Temporary impacts of construction activity (including lifting equipment) in relation to the barrage and grid connection.	Avoidance, OCEMP.	Effects on physical, aesthetic and perceptual qualities of the landscape / seascape; effects on views and visual amenity.	Scoped In.	Landscape elements within Project site; Landscape / Seascape Character Areas and residents / visitors within 5km of Project site.	Baseline surveys for seascape / landscape, and visual receptors.
Temporary loss of existing vegetation to facilitate construction compounds / access in relation to the grid connection.	Avoidance, OCEMP.	Temporary effects on physical, aesthetic and perceptual qualities of the landscape / seascape.	Scoped In.	Landscape elements within Project site.	Baseline surveys for seascape / landscape, and visual receptors.
Permanent presence of new sub-station buildings in	Use of appropriate form, detailed	Permanent effects on physical, aesthetic and perceptual qualities of the	Scoped In.	Landscape elements within Project site;	Baseline surveys for seascape /

Activity and Impact	Embedded Measures	Effect	Proposed approach to assessment (scoped in or scoped out)	Receptor	Further data baseline requirements
the context of the river margins.	design, materials or finishes.	landscape / seascape; effects on views and visual amenity		Landscape / Seascape Character Areas and residents / visitors within 5km of Project site.	landscape, and visual receptors.
Permanent presence of Mersey Tidal Barrage and gantry crane as new features of seascape and of views, particularly at low water.	Use of appropriate form, detailed design, materials or finishes.	Permanent effects on physical, aesthetic and perceptual qualities of the landscape / seascape; effects on views and visual amenity.	Scoped In.	Landscape / Seascape Character Areas and residents / visitors within 5km of Project site.	Baseline surveys for seascape / landscape, and visual receptors.
Permanent presence of underground grid connection.	Avoidance, OCEMP.	No significant permanent effects on physical, aesthetic and perceptual qualities of the landscape / seascape; or effects on views and visual amenity.	Scoped Out.	Visual receptors within 2km of Grid Connection.	None

Impacts Scoped Out of Assessment

25.10.8 Potential effects as a result of the barrage on landscape, seascape and visual receptors beyond 5km have been scoped out from further assessment, resulting from a conclusion of no likely significant effect. These conclusions have been made based on the work to date in relation to the ZTV as indicated on **Figure 25.1**, combined with knowledge of the baseline environment which comprises the heavily developed river frontages including the Liverpool and Birkenhead docks and associated cranes and infrastructure. In this baseline context, the nature and impact of planned works which would be of a comparable height and scale with the surrounding development are therefore unlikely to give rise to a significant effect. The conclusions follow (in a site based context) existing best practice.

25.10.9 Potential effects as a result of the grid connection are scoped out in relation to the operation and decommissioning of the grid connection as these will be underground and therefore not visible within the landscape.

25.10.10 Potential effects on a number of landscape / seascape and visual receptors are proposed to be scoped out of the SLVIA as summarised below:

- A summary of the key NCA characteristics will be included in the SLVIA for context but the NCAs are not proposed to be carried forward for assessment as they are considered too spatially extensive in scale for the purpose of the SLVIA;
- With the exception of users of routes close to and approaching the Project site, visual receptors along main roads and other transport networks generally are proposed to be scoped out of the SLVIA. These are receptors of typically low sensitivity, and which are less susceptible to change due to speed of travel, and are scoped out on the basis that significant effects are highly unlikely; and
- Visual receptors from business parks and places of work (e.g. workers associated with the docks) are proposed to be scoped out of the SLVIA For the purposes of proportionality and to make sure the effects that are significant are the key focus of this assessment, these receptors of typically lower sensitivity and which are less susceptible to change due to the focus of views being on the activity as opposed to the views.

25.11 CUMULATIVE EFFECTS

25.11.1 Cumulative effects on landscape, seascape and visual receptors resulting from the effects of the Project and other developments will be assessed in accordance

with the guidance and methodologies set out in **Chapter 3: Approach to EIA** and considering the other developments that have been screened in as part of the screening exercise.

25.11.2 The following impacts from Project have the potential to act cumulatively with impacts from other developments to contribute to cumulative effects:

- Construction phase effects associated with the barrage and grid connection, as a result of overlap with other developments under construction within the Study Area; and
- Operational phase effects associated with the presence of the barrage only, as a result of other proposed developments within the Study Area.

25.12 TRANSBOUNDARY EFFECTS

25.12.1 Due to the relatively localised nature of the potential impacts, transboundary effects are considered unlikely to occur and therefore are scoped out.

25.13 PROPOSED APPROACH TO ENVIRONMENTAL IMPACT ASSESSMENT

25.13.1 Further desk-based studies and analysis will be undertaken to identify and assess seascape, landscape and visual receptors. This study will be supplemented with consultation with the relevant statutory and non-statutory organisations as necessary.

25.14 REFERENCES

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26 INFRASTRUCTURE AND OTHER MARINE USERS

26.1 INTRODUCTION

26.1.1 The infrastructure and other marine users chapter will consider the potential likely significant effects on third party assets and human users of the marine environment that may arise from the construction, operation and maintenance (O&M) and decommissioning of the Project. This Section of the Scoping Report describes the methodology to be used within the EIA, an overview of the baseline conditions (as defined in **Chapter 1: Introduction**), the datasets to be used to inform the Environmental Impact Assessment (EIA), the potential likely significant effects to be considered, and how these will be assessed for the purpose of the EIA.

26.1.2 This topic interfaces with other aspects and as such, should be considered alongside these; namely:

- **Chapter 11: Commercial Fisheries**: This outlines commercial fishing activity along the River Mersey and port landings. Impacts on commercial fishing activities may be common to those on recreational fishing activities;
- **Chapter 16: Shipping and Navigation:** Potential shipping and navigation impacts may cause interference or risk to infrastructure and other marine users, for example, oil and gas infrastructure, dredging and waste disposal activities and existing or future vessel access. Therefore, the shipping and navigation assessment will inform the infrastructure and other marine users assessment, navigation impacts to infrastructure is considered only within the shipping and navigation chapter;
- **Chapter 19: Water Resources and Flood Risk:** Details information on licensed discharges or abstractions to / from controlled surface waters, which will inform the Infrastructure and Marine Users assessment;
- **Chapter 20: Land Use, Recreation and Tourism:** This considers terrestrial users and recreational facilities, and will likely have common receptors with the Infrastructure and Marine Users assessment; and
- **Chapter 30: Waste and Materials**: Explores dredging and disposal of materials, which may impact on receptors covered by the Infrastructure and Marine Users assessment.

26.1.3 This infrastructure and other marine users assessment will consider all other infrastructure, users and utilities which have not been included in other aspects

sections such as offshore and onshore renewable energy projects, subsea cables, utilities, military and defence activities, oil and gas infrastructure, disposal sites, and other infrastructure, as well as recreational activities.

26.1.4 Overarching relevant legislation and policy context which has informed the scope of the assessment is outlined in **Chapter 4: Planning Policy,** with topic specific considerations outlined in **Appendix 4.1**.

26.2 TECHNICAL GUIDANCE

26.2.1 No technical guidance has been identified that has not already been identified in other aspects sections where an interface with infrastructure and other marine users exists. This will be informed by consultee liaison and engagement and updated for the Environmental Statement (ES) where relevant.

26.3 STUDY AREA

26.3.1 The Scoping Boundary includes the likely areas where the Project will require permanent structures (such as tidal barrage and potentially grid connection) and temporary areas which facilitate the construction phase including port and industrial facilities. At present two Development Areas have been proposed (shown in **Figure 2.1**) within which the tidal barrage can be located and also where the grid connection points and associated routes may be installed.

26.3.2 For the purposes of the EIA, the Study Area will be the marine working area associated with the confirmed location of the barrage (i.e. 1 kilometre (km) upstream and downstream of the barrage location). In addition, an additional buffer within the channel will also be incorporated to consider the wider area and movement of other mobile marine users.

26.3.3 The Study Area specific to the grid connection encompasses users within 1km of the cable route and substation, once the substation and grid connection route have been identified.

26.3.4 The Study Areas will be reviewed and potentially amended in response to such matters as refinement of the Project components, the identification of specific impact pathways and in response, where appropriate, to feedback from consultation.

26.4 CONSULTATION

26.4.1 No specific consultation is anticipated with external stakeholders at this stage. The production of this chapter has been based on publicly available data and follows good practice guidance. It is recognised that engagement is essential to informing this assessment and so the Applicant intends to undertake consultation with the relevant bodies in conjunction with other topics as outlined in **Section 26.1**.

26.5 ASSESSMENT METHODOLOGY

26.5.1 The Project-wide approach to the assessment methodology is set out in **Chapter 3: Approach to EIA**. Whilst this has informed the approach that will be used in this infrastructure and other marine users' chapter, it is necessary to set out how this methodology will be applied and adapted as appropriate, to address the specific needs of the other marine users assessment.

26.5.2 This will be implemented to assess the likely significant effects on infrastructure and other marine users receptors from the construction, O&M and decommissioning of the Project.

26.6 BASELINE CONDITIONS

DATA INFORMATION SOURCES

26.6.2 An initial desk based review has been undertaken of publicly available data sources outlined in Table 7-2 to determine the baseline character of the Scoping Boundary and wider area to inform the assessment process. The baseline data sources identified in this EIA Scoping Report will remain under review and may be updated in response to feedback from relevant statutory and non-statutory consultees during the EIA process or in response to new sources of information becoming available.

Table 26-1: Key sources of infrastructure and other marine users data

Source	Date	Summary	Coverage of Study Area
Online Geographical Information Systems (GIS) data sets Available online at: https://www.arcgis.com/apps/webappviewer/index.html?id=cb3474a78df24139b1651908ff8c8975	Accessed April 2024.	Seabed obstructions including oil and gas wells, pipelines, platforms, and other oil and gas infrastructure. Location of other marine energy projects in the public domain. Location of cables and utilities.	Full coverage of the Study Area.
Kingfisher Information Service Cable Awareness (KIS-ORCA) Available online at: https://kis-orca.org/	Accessed April 2024.	Displays used and abandoned cables and pipeline routes.	Full coverage of the Study Area.
SeaSearch Available online at: https://www.seasearch.org.uk/mapping_dashboard	Accessed April 2024.	Provides a heat map with the number of forms submitted by divers.	Full coverage of the Study Area.
North Sea Transition Authority Oil and Gas Authority interactive map Available online at: https://nstauthority.maps.arcgis.com/apps/webappviewer/index.html?id=29c31fa4b00248418e545d222e57ddaa	Accessed April 2024.	Provides all onshore oil and gas activity.	Full coverage of the Study Area.

Source	Date	Summary	Coverage of Study Area
North Sea Transition Authority Oil and Gas Authority interactive map Available online at: https://www.arcgis.com/apps/webappviewer/index.html?id=f4b1ea5802944a55aa4a9df0184205a5	Accessed April 2024.	Provides all offshore oil and gas activity.	Full coverage of the Study Area.
Centre for Environment, Fisheries and Aquaculture Science (Cefas) GIS interactive map of Disposal Sites. Available online at: https://data.cefas.co.uk/view/407	Accessed June 2024.	Provides Disposal Sites regulated under the London Convention / London Protocol of the International Maritime Organisation (IMO).	Full coverage of the Study Area.
Barbour ABI on behalf of the Department for Energy Security and Net Zero (DESNZ) interactive map of renewable energy projects. Available online at: https://data.barbour-abi.com/smart-map/repd/desnz/?type=repd	Accessed June 2024.	Shows the geographical spread of renewable energy projects.	Full coverage of the Study Area.
Southwest Environmental Limited United Utilities	Accessed June 2024.	Shows the location of sewage works that are	Full coverage of the Study Area.

Source	Date	Summary	Coverage of Study Area
Sewage Treatment Works Maps Available online at: https://www.southwest-environmental.co.uk/further%20info/in%20depth/sewage_works_maps/united_utilities_water_sewage_treatment_works_location_maps.html		owned and operated by United Utilities.	
Marine Management Organisation interactive map to explore Marine Plans Available online at: https://explore-marine-plans.marineservices.org.uk/marine-plans-explorer	Accessed June 2024.	Data layers include dredging and disposal sites, subsea cables, energy projects and recreational activities.	Full coverage of the Study Area.
The Crown Estate Open Data Portal. Available online at: https://opendata-thecrownestate.opendata.arcgis.com/	Accessed June 2024.	An interactive map which shows assets such as offshore wind farms.	Full coverage of the Study Area.

EXISTING BASELINE

26.6.3 This section describes the present conditions which constitute the existing baseline environment for infrastructure and other marine users (not already identified in commercial fisheries, shipping and navigation and socioeconomics). The area considered includes within the Scoping Boundary (consisting of Tidal Barrage Development Area, Grid Connection Development Area and Port and

Harbour Facilities) and wider area where appropriate. The following topics are explored:

- Offshore renewable energy projects;
- Carbon storage licences;
- Onshore renewable energy projects;
- Subsea cables;
- Utilities (gas, electricity, water, power distribution transmission and telecommunications);
- Military and defence activities; oil and gas infrastructure (decommissioned and in operation);
- Dredging and Disposal Sites;
- Other infrastructure (Mersey Tunnels); and
- Recreational activities (ferry crossings, boating, diving, fishing and water sports).

Offshore Renewable Energy Projects

26.6.4 Operational offshore windfarm developments within the wider area (15 nautical miles (NM)) of the Project are shown in **Table 26-2**. The nearest operational offshore windfarms are Burbo Bank and Burbo Bank 2. **Table 26-2** shows the approximate distances to other offshore windfarm developments within the Irish Sea. There are no operational offshore windfarm projects within the Scoping Boundary.

Table 26-2: Offshore windfarm projects and distance to the Project Scoping Boundary within the Irish Sea

Offshore Windfarm	Status	Distance from the Project Scoping Boundary (NM)
Burbo Bank	In operation.	Approximately 3.9NM northwest.
Burbo Bank 2	In operation.	Approximately 4.2NM northwest.

North Hoyle	In operation.	Approximately 11.3NM west.

26.6.5 There are no planned offshore windfarms within 15NM of the Project.

26.6.6 No other types of offshore energy (tidal and wave) planned or operational are present within 15NM of the Project.

Carbon Storage Licences

26.6.7 The utilisation of carbon dioxide appraisal and storage licences ("CS Licences") to achieve the UK Net Zero ambition for 2050 are approved and issued by the NSTA (Northern Sea Transition Authority, 2023). To the northwest of the Project, lies a CS Licence (reference CS004), noted to be 'out of round' (**Figure 26.1**). The HyNet Carbon Dioxide Pipeline project aims to transport captured carbon dioxide emitted from major industry across the North West of England and North Wales, into almost-empty gas fields under the sea in Liverpool Bay, the proposed HyNet pipeline crosses through the Scoping Boundary. No CS licenses exist within the Scoping Boundary.

Onshore Renewable Energy Projects

26.6.8 The Renewable Energy Planning Database demonstrates the geographical spread of renewable energy projects. Within the Project Scoping Boundary (specifically the Grid Connection Development Area and Port and Harbour Facilities) there are various types of renewable energy projects, including landfill gas (three sites), solar photovoltaics (21 sites), battery (six sites), onshore wind (three sites) (see **Figure 26.2**). These projects are either awaiting construction or are already operational. **Table 26-3** lists the operational renewable energy projects within the Scoping Boundary.

26.6.9 As there are several onshore renewable energy projects in various stages of development, they will be assessed in detail in the cumulative assessment.

26.6.10 There are no onshore renewable energy projects within the Tidal Barrage Development Area.

Table 26-3: Operational onshore energy projects within the Scoping Boundary

Project Name	Planning Authority	Energy Type	Capacity	Status
Bidston Moss Landfill Scheme.	Wirral Council.	Landfill Gas.	2.3MW	Operational.
Burbo Bank Energy Storage.	Wirral Council.	Battery.	2MW	Operational.
Bromborough Dock Landfill Scheme.	Wirral Council.	Landfill Gas.	3MW	Operational.
Bromborough Dock.	Wirral Council.	Landfill Gas.	3.7MW	Operational.
Royal Seaforth Dock Wind Farm.	Sefton Council.	Wind Onshore.	3MW	Operational.
Port of Liverpool – wind.	Sefton Council.	Wind Onshore.	10MW	Operational.
Liverpool Energy Management Facility.	Liverpool City Council.	Battery.	49.9MW	Operational.

Subsea Cables

26.6.11 There are several existing subsea cables within the wider area of the Project. The Western Link Ardneill to Wirral 2 by National Grid and Scottish Power is situated within 1.81km (0.98NM) of the Project (Kingfisher Information Service Cable Awareness, No Date) and has a capacity of 2200MW and makes landfall at two locations; Ardneil Bay and Leasowe. Off the coastline of North Wirral, there are also several cable routes from the Burbo Bank Wind Farm, including Orsted-owned Burbo Bank Ex Cables 1, 2 and 3.

26.6.12 The Burbo Bank Ex Cables 1, 2 and 3, connecting at an onshore substation (Orsted, No Date) (**Figure 26.1**) are within the Grid Connection Development

Area and Wallasey onshore substation has been identified as a potential grid connection point for the Project.

26.6.13 There is also the Eirgrid East West Interconnector (EWIC), which is located approximately 7.4km west to the Project Scoping Boundary (**Figure 26.1**), connecting to a convertor station in Shotton, Wales.

26.6.14 As shown in **Figure 26.1**, there are three telecommunication cables to the north of the Tidal Barrage Development Area which land at Southport:

- Greater Technology Together (GTT);
- Esat BT (now called BT Ireland); and
- GTT.

26.6.15 There are no subsea cables within the Tidal Barrage Development Area or Port and Harbour Facilities.

Utilities

26.6.16 The following section on utilities in the area is based on publicly available data. Further desk based assessment will be undertaken to identify utilities once the Project study area has been refined and locations chosen for the Tidal Barrage and Grid Connection Corridor.

Gas

26.6.17 There are several gas pipes located within the wider study area. The nearest Gas pipe is Mickle Trafford to Deeside Gas pipe located 1.4km south of the Scoping Boundary.

Electricity

26.6.18 As shown in **Figure 26.3** there are several electricity and telecommunications cables within the Scoping Boundary including:

Tidal Barrage Development Area

- National Grid Electricity cable (crossing the Mersey);

Grid Connection Development Area and Port and Harbour Facilities

- National Grid Electricity cables;
- SP Manweb plc (SPM) extra high voltage (EHV) overhead line (OHL); and
- SPM 132kV OHL cables.

Tidal Barrage and Grid Connection Areas and Port and Harbour Facilities

26.6.19 As outlined in **Chapter 19: Water Resources and Flood Risk**, currently, a list of licensed discharges or abstractions from controlled surface waters within the Scoping Boundary has not been requested from the Environment Agency / Council at this stage. This will form part of the PEIR.

26.6.20 As shown in **Figure 26.4**, there are two Waste Water Treatment Works (WwTW) operated by United Utilities Limited located along the west bank of the River Mersey within the Tidal Barrage Development Area. Birkenhead WwTW is situated on Shore Road whilst Bromborough Waste Water Treatment Works is located close to the nature reserve Port Sunlight River Park and the residential area of New Ferry. On the east of the River Mersey, Liverpool WwTW is situated on the sites of the former Sandon and Wellington Docks and is linked to The Mersey Estuary Pollution Alleviation Scheme (MEPAS) pipeline a 14 mile-long interceptor sewer that runs from Crosby to Speke, along the coast of Sefton and Liverpool. Treated sewage from Liverpool WwTW is discharged via a submerged outfall into the Mersey Estuary located within the Tidal Barrage Development Area at NGR SJ329926.

26.6.21 Depending on the final location of the Tidal Barrage, the development could present an opportunity to move the United Utilities outfalls and the associated infrastructure.

26.6.22 It is important to note large permitted discharges that operate outside of the Scoping Boundary as effluent can enter the River Mersey through the Manchester Ship Canal or the Weston Canal / River Weaver. Also operated by United Utilities is Davyhulme WwTW which is the main plant for the city of Manchester, discharging into the River Irwell, with the treated sewage effluent flowing down into the River Mersey.

Military and Defence Activities

26.6.23 There is a Ministry of Defence firing range in the North West of England, located in Holcombe Moor near Ramsbottom in Lancashire (Ministry of Defence, 2024), approximately 51km north east of the Project Scoping Boundary. The Sealand Rifle Ranges cover 486 hectares (ha) in the Dee Estuary near Chester comprising of an operational range area and a Raneg Danger Area (Ministry of Defence, 2022). Altcar small arms firing range is also 6.5km from the Scoping Boundary.

26.6.24 There are no munition disposal areas within the Scoping Boundary.

26.6.25 The effects of the Project on civil and military aviation are covered in the civil and military assessment in **Chapter 27: Military and Civil Aviation**. No further assessment is undertaken in this infrastructure and other marine users chapter of any other aspects of defence related to use of airspace, including radar.

Oil and Gas Infrastructure: Offshore

26.6.26 The closest operational oil and gas infrastructure within the wider area is DD-POA Gas Export Pipeline located 9.4NM southwest to the Project. The Lennox to Douglas Oil Line is situated approximately 9.8NM northwest of the Scoping Boundary, but is noted to be not in use. There are two offshore oil and gas extraction facilities within the wider area; the Hamilton Gas Field and the Lennox Oil and Gas Field.

26.6.27 Lennox (gas) field is currently in production and is located approximately 11.4NM northwest of the most northern point of the Project's scoping boundary. Situated in the same location is Lennox (oil) field with the status currently unknown. This oil and gas well began production oil and gas in 1996 and are connected by a number of buried oil and gas pipelines.

26.6.28 Approximately 14.2NM northwest of the Scoping Boundary lies Hamiliton Gas Field, produces oil and gas of economic importance to the region (Wessex Archaeology, 2006).

26.6.29 There is an offshore North Sea Transition Authority (NSTA) well (Registration number 110/14-5) constructed with the intention of exploration, which was decommissioned in 1996, located approximately 9NM northwest of the Scoping Boundary.

26.6.30 There is no oil and gas infrastructure within the Scoping Boundary.

Oil and Gas Infrastructure: Onshore

26.6.31 Within the Grid Connection Development Area lies a petroleum exploration and development license (Island Gas Limited and Nexen Exploration U.K Limited), with a license expiry date of 1 July 2039 (Northern Sea Transition Authority, 2024). This licence provides the right to search and bore for and get petroleum.

26.6.32 Situated on the south side of the River Mersey is the Tranmere Oil Terminal which enables the important of crude oil and diesel. The crude oil is then

supplied to the Stanlow refinery at Ellesmere Port in Cheshire, via a 15 mile pipeline (Essar Energy Transmission, 2024).

Disposal Sites

26.6.33 Since the end of 1998, most forms of disposal at sea including industrial waste and sewage sludge have been prohibited. There are, however, exceptions which include the disposal of dredged materials (mainly sand, silt and clays) of port and harbour origin for the purposes of maintaining navigable shipping channels.

26.6.34 As outlined in **Chapter 30: Waste and Materials**, it is anticipated that dredging materials from the Project will be disposed at licensed offshore marine disposal facilities or reused for local ecological enhancement opportunities. There is the potential for dredged material to be used as part of the construction of the tidal barrage structure if caissons are used.

26.6.35 There are eight Disposal Sites within the Scoping Boundary, presented in **Table 26-4** and shown in **Figure 26.5**. No Disposal Sites are situated in the Grid Connection Area or Port and Harbour Facilities.

Table 26-4: Disposal sites within the Scoping Boundary

Site ID	Disposal Site	Status
IS115	Bramley Moore Dock.	Closed.
IS116	Nelson Dock.	Closed.
IS125	Mersey (Mid-River 2).	Closed.
IS126	Canning Half Tide.	Open.
IS127	Mersey of Bromborough.	Closed.
IS128	Mersey Bromborough2.	Disused.

Site ID	Disposal Site	Status
IS129	Mersey (Liverpool Marina).	Open.
IS130	Wallasey.	Closed.

Other Infrastructure

Mersey Tunnels

26.6.36 Three tunnels are present under the River Mersey within the Scoping Boundary: the Mersey Railway Tunnel and two road tunnels, the Queensway and the Kingsway. These tunnels play an important role in connecting the Wirral and Liverpool and became assets of the Liverpool City Region Combined Authority in April 2014 (LCRCA, No Date).

Recreational Activities

Tidal Barrage Development Area and Port and Harbour Facilities Areas

26.6.37 Recreation in the region tends to be highly seasonal with kayaking, water skiing, sailboarding, canoeing and personal watercraft occurring within the inshore waters and River Mersey. As outlined in **Figure 26.6** here are a number of inshore sailing clubs and organisations in the vicinity of the Tidal Barrage Development Area including Liverpool Yacht Club, SeaClan, Royal Mersey Yacht Club, Tranmere Sailing Club, Harbourside Sea School and Safewater Training Ltd. Further inland, small boat moorings are present on the Sankey Canal at Widnes and at the Fidlers Ferry Club and Fidlers Ferry Boatyard.

26.6.38 Liverpool South Docks on the east bank of the Tidal Barrage Development Area had the greatest concentration of Grade I listed architecture in the UK. Managed by the Canal and River Trust, the South Docks provide moorings for long term berths and for visitors in Liverpool Marina, with associated facilities (Canal and River Trust, No Date).

26.6.39 Also situated on the east bank is Salthouse Dock, which provides an important link between the Leeds and Liverpool Canal and the South Docks and provides moorings for visiting canal craft. Salthouse Dock is linked, via the historic Royal Albert Dock, to Canning Dock from which vessels can access the estuary via Brunswick Lock to the south or via Canning Dock Tidal Gate and Swing Bridge to

the north. From the Mersey Estuary, recreational vessels can enter the Manchester Ship Canal at Eastham (subject to compliance with seaworthiness rules) and access the rest of the canal system via the Shropshire Union Canal at Ellesmere Port, the River Weaver at Weston Marsh Lock or the Bridgewater Canal at Pomona Lock.

26.6.40 The Liverpool Watersports Centre, located within Queens Dock also offers a variety of water activities, including swan pedalos, kayaks and canoes, powerboating, paddleboarding, open water swimming and accessible wheelyboats, alongside an inflatable aqua park (Liverpool Watersports Centre, No Date).

26.6.41 As discussed in baseline environment in **Chapter 16: Shipping and Navigation**, there are a number of ferry cruising routes within the Scoping Boundary, which travel both across and along the River Mersey. Commuter cruises link Seacombe and Woodside in Wirral and Liverpool Gerry Marsden (Pier Head). Additional ferry routes include connections from Douglas, Isle of Man to Liverpool, alongside ferry trips between Belfast and Birkenhead and Dublin and Bootle.

26.6.42 As detailed in **Chapter 11: Commercial Fisheries**, the Mersey Estuary also presents opportunities for commercial sea fishing. Other users include recreational receptors, where the purpose of fishing is recreation and not for sale or trade. Along the coastline of North West England there are significant areas for recreational sea angling, due to the highly dynamic and ecologically productive marine environments. The area is covered by the North West Inshore Marine Plan (Marine Management Organisation, 2024). The estuarine and intertidal environments within the Mersey estuary present areas for recreational sea angling, thus there are a number of angling charter boats, with charter vessels based in Birkenhead and the Wirral (Fisheries, No Date). In addition to this, there are both boat and shore-based angling clubs, angling shops, as well as thousands of individuals not affiliated with a club located in the North West district (North Western Inshore Fisheries and Conservation Authority, No Date).

26.6.43 It is understood from the SeaSearch interactive map that diving occurs along the River Mersey within the Port of Liverpool Dock, Salthouse Dock and Dukes Dock (Seasearch, No Date). The Mersey Divers scuba club based on the Wirral Peninsula is one of the largest scuba clubs in the North West. The club house is situated to the north of the Mersey tunnels, on the left bank of the River Mersey.

Grid Connection Areas

26.6.44 The potential Grid Connection Areas are located along the coast to the north and traverse agricultural areas further south and west. There are plenty of local angling clubs which fish on local waters including the Liverpool and District Angling Association and Port Sunlight Angling Club (Fisheries, No Date; Liverpool and District Angling Association, No Date).

26.6.45 Additional recreational activities within the Grid Connection Development Area include allotments or community growing spaces, bowling greens, golf courses, other sports facility, play spaces, playing fields and public parks or gardens (**Figure 26.7**). **Chapter 20: Land Use, Tourism and Recreation** discusses further the recreational facilities.

26.7 FUTURE BASELINE

26.7.1 The EIA process will consider the existing baseline conditions within the study area, and future baseline conditions (as far as reasonably practicable), in accordance with the methodology set out in **Chapter 3: Approach to EIA** of this Scoping Report.

26.7.2 The future baseline for other marine users will be subject to economic, social and environmental pressures. It is therefore difficult to predict the fluctuations that may be experienced on other marine users activity surrounding the Project.

26.7.3 On the basis of the evidence available, it is assumed that the future baseline for infrastructure and other marine users over the lifetime of the Project is unlikely to be markedly different from the current baseline.

26.8 BASIS FOR SCOPING ASSESSMENT

26.8.1 The scoping assessment for infrastructure and other marine users is based on the following key assumptions which are also set out in **Chapter 2: Site Context and Project Description**:

- The construction phase presents the potential for disturbance to terrestrial and marine receptors;
- The operational lifetime of the Project is assumed to be 120 years; and
- Extent of the Scoping Boundary is as shown in **Figure 1.1**.

26.8.2 The source-pathway-receptor linkage between Project infrastructure and / or activities and the receptor groups for this aspect are described in **Table 26-5.**

26.9 EMBEDDED ENVIRONMENTAL MEASURES

26.9.1 Embedded mitigation measures have been identified and are proposed to be adopted as part of the evolution of the Project design (embedded into the Project design). These measures will evolve over the development process as the EIA progresses and in response to consultation. They will be fed iteratively into the assessment process. These measures typically include those that have been identified as good or standard practice and include actions that would be undertaken to meet existing legislation requirements.

26.9.2 As there is a commitment to implementing these environmental measures, and also to various standard sectoral practices and procedures, they are considered inherently part of the design of the Project and have, therefore, been considered in the scoping assessment.

Table 26-5: Relevant Infrastructure and Other Marine Users embedded environmental measures

ID	Mitigation Measures embedded into the project design	How the measure will be secured
OM11	Development of Emergency Response and Cooperation Plan (ERCOP) to outline the measures the Project has put in place to support an emergency response, the resources available to support that response and provide emergency contact details.	Draft DCO requirement.
OM13	Implementation of Kingfisher notifications and other navigational warnings to warn of the nature of the works associated with the Project.	Draft DCO requirement.
OM13	Accurate warnings provided in a timely manner to detail the construction, maintenance and decommissioning operations to marine users given via Kingfisher Bulletins.	Draft DCO requirement.
OM2	Any objects dropped on the seabed during works associated with the Project will be reported and objects will be recovered	Draft DCO requirement.

ID	Mitigation Measures embedded into the project design	How the measure will be secured
	where they pose a hazard to other marine users and where recovery is possible.	
OM1	A Construction Environmental Management Plan (CEMP) to be implemented by the contractor support any emergency response and implement the relevant health and safety procedures.	Draft DCO requirement.
OM10	A Decommissioning Programme will be developed for the Project in line with industry good practice, guidance and legislation.	Draft DCO requirement.

26.10 LIKELY SIGNIFICANT EFFECTS

26.10.1 In line with the EIA Regulations 2017, the EIA for the Project will consider those impacts where there is a risk of a likely significant effect only. The following Section draws on industry experience and expertise to identify those effect-receptor pathways that may potentially lead to a significant impact. Where experience and available evidence indicates an effect-receptor pathway will not lead to a significant impact with regards to the EIA Regulations 2017 the pathway is scoped out from assessment.

26.10.2 The likely significant effects on infrastructure and other marine users are summarised in **Table 26-6.** The scoping assessment is based on a combination of the Project definition at the scoping stage, embedded environmental measures, understanding of the baseline conditions at this stage, the evidence base for infrastructure and other marine users effects and professional judgement. The approach to this assessment is set out in **Chapter 3: Approach to EIA**.

26.10.3 The early identification of likely significant effects is used here as a tool aimed at delivering a proportionate approach to the EIA. In doing so, it sets out a high-level assessment of all potential effects, significant or not. The basis for scoping out certain effects, and therefore no longer considered is presented after the table, supported by evidence base.

26.10.4 As the Project is refined and the Tidal Barrage location and Grid Connection Route is identified the potential likely significant effects may be revised.

Table 26-6: Likely significant Infrastructure and Other Marine Users effects

Activity and Impact	Embedded Measures	Effect	Proposed approach to assessment (scoped in or scoped out)	Receptor(s)	Further data baseline requirements
Temporary obstruction to offshore renewable energy projects (Construction and decommissioning).	OM11 OM13 OM2 OM1 OM10	No significant effect as the offshore renewable energy projects identified are not close enough to have a potential impact. Based on the distance to the Project, the effects are not expected to be significant.	Scoped out.	Burbo Bank, Burbo Bank 2 and North Hoyle.	N/A
Obstruction to offshore renewable energy projects (O&M).	OM11 OM13 OM2 OM1 OM10	No significant effect as the offshore renewable energy projects identified are not close enough to have a potential impact, maintenance activities associated with the offshore wind projects are expected to be able to continue as planned without impedance.	Scoped out.	Burbo Bank, Burbo Bank 2 and North Hoyle.	N/A
Temporary obstruction to offshore CCS Projects (Construction and decommissioning).	OM11 OM13 OM2 OM1 OM10	No CS Licences currently exist within the Project Scoping Boundary. The proposed HyNet pipeline crosses through the Scoping Boundary. One CS licence area exists outside of the Scoping Boundary. Based on the	Scoped in.	HyNet	Further Desk Based Studies and consultation with relevant parties.

Activity and Impact	Embedded Measures	Effect	Proposed approach to assessment (scoped in or scoped out)	Receptor(s)	Further data baseline requirements
		distance to the Project, the effects are not expected to be significant.			
Obstruction to CCS projects (O&M).	OM11 OM13 OM2 OM1 OM10	No CS Licences currently exist within the Project Scoping Boundary. The proposed HyNet pipeline crosses through the Scoping Boundary. One CS licence area exists outside of the Scoping Boundary. Based on the distance to the Project, the effects are not expected to be significant. O & M activities associated with the tidal barrage project are not expected to cause any significant impacts to the HyNet CCS project.	Scoped out.	CS Liscence (reference CS004) HyNet.	N/A
Impacts to onshore renewable energy projects (Construction, O&M and decommissioning).	OM1	▪ No significant effect, the grid connection route will be chosen to avoid existing onshore renewable infrastructure. ▪	▪ Scoped out. ▪ ▪ ▪ ▪	▪ Receptor is dependent on grid connection route. ▪ ▪ Onshore Oil and gas infrastructure	▪ N/A ▪ ▪ ▪ ▪

Activity and Impact	Embedded Measures	Effect	Proposed approach to assessment (scoped in or scoped out)	Receptor(s)	Further data baseline requirements
		▪ The presence of the licence for petroleum exploration within the Grid Connection Development Area may cause obstruction of any future licensed activities.	▪ ▪ Scoped in.	(Petrol exploration and Development License (Island Gas Limited and Nexen Exploration UK Limited). ▪	▪ ▪ Design Refinement. Further Desk Based Studies and consultation with relevant parties.
Temporary obstruction to subsea cables (Construction and decommissioning).	OM11 OM13 OM2 OM1 OM10	There are subsea cables within 2 km of the Scoping Boundary and the Grid Connection Development Area. The Project is not expected to cross any subsea cables therefore the Project is expected to have no significant effects on subsea cables. However, the Project may utilise the same substation and connection area so further consultation may be required.	Scoped in.	Burbo Bank Ex Cables 1, 2 and 3, and the Western Link Ardneill to Wirral 2.	Consultation with the asset owner and further desk based studies.

Activity and Impact	Embedded Measures	Effect	Proposed approach to assessment (scoped in or scoped out)	Receptor(s)	Further data baseline requirements
Obstruction to subsea cables (O&M).	OM11 OM13 OM2 OM1 OM10	There are subsea cables within 2 km of the Scoping Boundary and the Grid Connection Development Area. The Project once operational is not expected to have any further significant effects on existing subsea cables.	Scoped out.	Burbo Bank Ex Cables 1, 2 and 3, and the Western Link Ardneill to Wirral 2.	N/A
Temporary obstruction to utilities (Construction).	OM2 OM1	Various utilities infrastructure (water, electricity, gas and telecommunications) are present within the Scoping Boundary. There may be temporary disturbance to the utilities if the infrastructure is required to be moved once the grid connection route and barrage location is identified. Protective provisions maybe in place for some infrastructure preventing impacts and overhead lines will have a protective proximity distance to ensure safety and remove the risk of impact.	Scoped in (gas electricity, water, telecommunications) (Overhead lines scoped out).	Various.	Design Refinement. Consultation with any utility owners and further desk-based studies.

Activity and Impact	Embedded Measures	Effect	Proposed approach to assessment (scoped in or scoped out)	Receptor(s)	Further data baseline requirements
Obstruction to utilities (O&M and decommissioning).	OM1 OM10	Various utilities infrastructure (water, electricity, gas and telecommunications) are present within the Scoping Boundary. The finalised layout of the Project infrastructure and grid connection route will avoid existing infrastructure where possible, utilities will be moved where required with the permission of the utility owner. This will be carried out in the construction phase so no further impacts will be predicted for the operation, maintenance and decommissioning phase.	Scoped out.	Various.	N/A
Temporary obstruction of military and defence activities (Construction, O&M and decommissioning).	OM1 OM10	The nearest military of Defence firing range is approximately 51km northeast of the Project Scoping Boundary. Altcar small arms range is 6.5 km from the Scoping Boundary. This is considered sufficiently distant to lead to no significant effect.	Scoped out.	Sealand Rifle Range. Altcar Small Arms range.	N/A

Activity and Impact	Embedded Measures	Effect	Proposed approach to assessment (scoped in or scoped out)	Receptor(s)	Further data baseline requirements
Temporary obstruction of oil and gas infrastructure - offshore (Construction and decommissioning).	OM11 OM13 OM2 OM1 OM10	No offshore oil and gas infrastructure is present within Scoping Boundary or wider area, therefore no significant impacts are expected.	Scoped out.	Hamilton Gas Field and Lennox Oil and Gas Field, DD-POA Gas Export Pipeline and NSTA well.	N/A
Obstruction of oil and gas infrastructure - offshore (O&M).	OM11 OM13 OM2 OM1 OM10	No offshore oil and gas infrastructure is present within Scoping Boundary. Therefore no likely significant effects are anticipated.	Scoped out.	Hamilton Gas Field and Lennox Oil and Gas Field, DD-POA Gas Export Pipeline and NSTA well.	N/A
Temporary obstruction of oil and gas infrastructure - onshore (Construction and decommissioning).	OM1 OM10	The presence of the licence for petroleum exploration within the Grid Connection Development Area may cause temporary obstruction of licensed activities.	Scoped in (until grid connection route is confirmed).	Petrol exploration and Development License (Island Gas Limited and Nexen Exploration UK Limited.	Consultation and engagement with the licence holders should the grid connection corridor pass through the licence area.
Obstruction of oil and gas infrastructure - onshore (O&M).	OM1	The presence of the licence for petroleum exploration within the Grid Connection Development Area may cause obstruction of any future licensed activities.	Scoped in (until grid connection route is confirmed).	Petrol exploration and Development License (Island Gas Limited and Nexen Exploration U.K Limited).	Consultation and engagement with the licence holders should the grid connection corridor

Activity and Impact	Embedded Measures	Effect	Proposed approach to assessment (scoped in or scoped out)	Receptor(s)	Further data baseline requirements
					pass through the licence area.
Impact on Disposal Sites (O&M).	OM11 OM13 OM2 OM1 OM10	Dredging materials from the Project may continue to be disposed at licensed offshore marine disposal facilities during the operation and maintenance phase.	Scoped in.	Sites as listed in **Table** 26-4	Consultation with the Marine Management Organisation and further desk based studies.
Temporary impact on Disposal Sites (Construction and decommissioning)	OM11 OM13 OM2 OM1 OM10	Dredging materials from the Project may be disposed at licensed offshore marine disposal facilities.	Scoped in.	Sites as listed in **Table** 26-4	Consultation with the Marine Management Organisation and further desk based studies.
Effects on Other Infrastructure (Mersey Tunnels) (Construction, O&M and decommissioning).	OM11 OM13 OM2 OM1 OM10	Impacts to Mersey Tunnels will be avoided through site selection. The Tunnels are also below ground level and in conjunction with proximity distances from any weight bearing loads (i.e. the barrage) for geotechnical safety, it is unlikely that this infrastructure asset will be impacted by the construction, operation /	Scoped out.	Mersey Tunnels.	N/A

Activity and Impact	Embedded Measures	Effect	Proposed approach to assessment (scoped in or scoped out)	Receptor(s)	Further data baseline requirements
		maintenance or decommissioning of the tidal barrage.			
Potential effects on recreational receptors including fishing, diving and water sports (Construction, O&M and decommissioning).	OM11 OM13 OM2 OM1 OM10	Disturbance / disruption to the users and businesses operating within the vicinity of the Tidal Barrage Development Area.	Scoped in.	Various.	Further desk based studies will be required to determine the businesses / users affected by the development as the Project is refined. Consultation will be required with those users identified.
Temporary potential effects on ferry routes (Construction, O&M and decommissioning).	OM11 OM13 OM2 OM1 OM10	As there are known ferry routes which pass through, or close to, the Scoping Boundary, it is recognised as a marine user and the Project has the potential to have a likely to have a significant effect.	Scoped in.	Services that operate include: Woodside to Pier Head, Woodside to Seacombe, Birkenhead to Belfast, Pier Head to Isle of Man, Pier Head to Seacombe, Bootle to Dublin and Bootle to Belfast.	Further desk based studies will be required to determine the businesses / users affected by the development as the Project Description and Area is refined. Consultation will be required with those users identified.

Impacts Scoped Out of Assessment

26.10.5 A number of potential effects have been scoped out from further assessment, resulting from a conclusion of no likely significant effect. These conclusions have been made based on the knowledge of the baseline environment and the nature of planned works on the potential for impact from such projects more widely. The conclusions follow (in a site based context) existing best practice. Each scoped out effect is considered in turn below.

26.10.6 Potential effects in relation to the obstruction of offshore renewable energy projects (Burbo Bank, Burbo Bank 2 and North Hoyle) are scoped out due to the distance from the Project, namely the Tidal Barrage Development Area. It is highly unlikely that the marine working areas would interact.

26.10.7 Potential impacts to onshore renewable energy projects have been scoped out as the grid connection route will be chosen to avoid existing onshore renewable infrastructure.

26.10.8 Obstruction to subsea cables during the O&M phase are scoped out at once the Project is operational, it is not expected to have any significant effects on existing subsea cables.

26.10.9 Present within the Scoping Boundary are various utilities infrastructure which have been scoped out for O&M and decommissioning, as utilities will be moved where required with the permission of the utility owner during construction, so no further impacts will be predicted.

26.10.10 No potential effects are predicted to occur in relation to temporary obstruction of military and defence activities due to the distance from the Project, Altcar small arms range is 6.5km away from the Project Scoping Boundary which is too distant for any significant impacts.

26.10.11 Potential effects on the obstruction of offshore oil and gas infrastructure are scoped out due to the proximity of the infrastructure to the Project.

26.10.12 Although the Mersey Tunnels are situated within the Scoping Boundary, the tunnels are below ground level and no intrusive works or presence of permanent physical structures will occur within the vicinity, so will not be impacted by the lifecycle of the Project.

26.11 CUMULATIVE EFFECTS

26.11.1 Cumulative effects on infrastructure and other marine users resulting from the effects of the Project and other developments will be assessed in accordance with the guidance and methodologies set out in **Chapter 3: Approach to EIA** and considering the other developments that have been screened in as part of the Cumulative Effects Assessment (CEA) screening exercise.

26.11.2 The following impacts from Project have the potential to act cumulatively with impacts from other developments to contribute to cumulative effects:

- Increased vessel movements from cumulative projects in all phases to other marine users; and
- Potential for increased obstruction and / or disruption to proposed infrastructure and other marine users.

26.12 TRANSBOUNDARY EFFECTS

26.12.1 Due to the localised nature of the potential impacts, transboundary effects are considered unlikely to occur due to all likely interactions with infrastructure and other marine users to be within UK territorial waters. Therefore it is proposed that this impact will be scoped out from further consideration within the EIA.

26.13 PROPOSED APPROACH TO ENVIRONMENTAL IMPACT ASSESSMENT

26.13.1 Further desk-based studies and analysis will be undertaken to identify and assess infrastructure and other marine user receptors. This study will be supplemented with consultation with the relevant statutory and non-statutory organisations as part of the consultation process which as set out in **Chapter 3: Approach to EIA**.

26.13.2 Likely significant effects will be described and the assessment will include consideration of potential significant cumulative effects as appropriate, as set out in **Chapter 3: Approach to EIA.**

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27 MILITARY AND CIVIL AVIATION

27.1 INTRODUCTION

27.1.1 The military and civil aviation chapter will consider the potential likely significant effects on local communities and the economy that may arise from the construction, operation and maintenance (O&M) and decommissioning activities of the Project. These receptors include civil aviation interests, military aviation interests, Ministry of Defence (MoD) operations, radar (aviation and meteorological), helicopter operators and other local aerodrome activities.

27.1.2 This section of the Scoping Report describes the methodology to be used within the Environmental Impact Assessment (EIA), an overview of the baseline conditions within the Scoping Boundary (as defined in **Chapter 1: Introduction**), the datasets to be used to inform the EIA, the potential likely significant effects to be considered, and how these will be assessed for the purpose of the EIA.

27.1.3 Military and civil aviation interfaces with other aspects and as such, should be considered alongside these; namely:

- **Chapter 26: Infrastructure and Other Marine Users**. Information from this chapter will inform military and civil aviation; and
- **Chapter 16: Shipping and Navigation**. There are potential pathways of effects from shipping and navigation users in proximity to the Project.

27.2 TECHNICAL GUIDANCE

27.2.1 Technical guidance that has been used to define the assessment is set out in **Table 27-1**.

Table 27-1: Relevant Technical Guidance

Guidance reference	Relevance to the assessment
CAP 168 Licensing of Aerodromes (Pager Power, 2018).	Dictates that the relevant aerodrome should request the lighting and operational requirements of cranes.
CAP 393 Air Navigation: The Order and the	States the Rules of the Air regarding civil aviation in the UK (HM Government, 1982) and includes for completeness

Guidance reference	Relevance to the assessment
Regulations (Civil Aviation Authority, 2021a).	terms of Air Navigation Order 2016 (HM Government, 2016) and the Rules of the Air Regulations 2015 (HM Government, 2015).
CAP 670 Air Traffic Safety Requirements (Civil Aviation Authority, 2019).	Outlines the regulatory framework and requirements for the safety of air traffic services.
CAP 774 The UK Flight Information Services (Civil Aviation Authority, 2021b).	The UK Flight Information Services are a suite of air traffic services that are provided in Class G airspace within the UK Flight Information Region. When notified, elements of these services can also be provided in other airspace classifications. The document is applicable to both civil and military pilots and providers of air traffic services in Class G airspace.
CAP 1096 Guidance to crane users on aviation lighting and notification (Civil Aviation Authority, 2021c).	Provides guidance to crane users on the crane notification process and obstacle lighting and marking requirements. This allows for safe crane operation. All cranes which are expected to operate for over 90 days and have a maximum altitude of 300ft are classified as a temporary structure and will require a Notice to Airmen.
3000 Series: Air Traffic Management Regulations (Military Aviation Authority, 2024a).	Regulatory framework for military personnel and military air traffic control.
Manual of Military Air Traffic Management (Military Aviation Authority, 2024b).	Outlines the regulations for military air traffic control and emergency procedures for military designated airspace.
UK Aeronautical Information Publication (AIP) (UK	Provides information on civilian aerodromes and aviation procedures within UK airspace.

Guidance reference	Relevance to the assessment
Aeronautical Information Publication, 2024).	
UK Military AIP (UK Military Aeronautical Information Publication, 2024).	Provides information on military aerodromes in the UK and guidance to military aircrew on in-flight navigation procedures.

27.3 STUDY AREA

27.3.1 The study area for the military and civil aviation assessment is defined in relation to the maximum operating ranges of any applicable radar systems relevant in the area including civil, military and national air traffic services. For the purposes of showing radar within the wider study area, a 10km buffer over the Tidal Barrage Development Area has been incorporated.

27.3.2 The EIA study area will consider the airspace above the confirmed location of the Tidal Barrage and associated port and marine facilities. This is due to the use of tall, static structures (cranes) throughout the construction phase of the Project as outlined in **Chapter 2: Site Context and Project Description**. As with any tall structure, cranes can present a risk to aviation activity by not being clearly marked or being classed as an obstruction by penetrating the Obstacle Limitation Surface (OLS). The purpose of the OLS is to define the airspace around aerodromes to be maintained free from obstacles (trees, buildings, cranes etc.) so aircraft operations can be completed safely (Civil Aviation Authority, 2024b).

27.3.3 The Grid Connection will be an underground cable located within the Grid Connection Development Area or contained on existing infrastructure once reinforced / restrung and therefore has not been considered further in this assessment.

27.4 CONSULTATION

27.4.1 No specific consultation has been undertaken with external stakeholders at this stage to inform the baseline. This has been based on publicly available data and follows good practice guidance. Where necessary, consultation will be undertaken following receipt of the Scoping Opinion and on the implementation of embedded measures within the DCO process.

27.5 ASSESSMENT METHODOLOGY

27.5.1 The Project-wide approach to the assessment methodology is set out in **Chapter 3: Approach to EIA**. This will be implemented to assess the likely significant effects on military and civil aviation receptors from the construction, O&M, and decommissioning of the Project.

27.5.2 The specific legislation and guidance outlined in **Appendix 4.1** will also be considered in relation to the assessment, in addition to consultation with the stakeholders outlined above.

27.6 BASELINE CONDITIONS

DATA INFORMATION SOURCES

27.6.2 An initial desk based review has been undertaken of publicly available data sources outlined in **Table 27-2** to determine the baseline character of the study area and inform the assessment process.

Table 27-2: Key Sources of Aviation Data

Source	Date	Summary	Coverage of Study Area
National Air Traffic Service (NATS Unmanned Aircraft Systems (UAS) Restrictions Map.	Various.	An interactive map of the UK showing all of the UAS airspace restrictions. Available online at: https://nats-uk.ead-it.com/cms-nats/opencms/en/uas-restriction-zones/#Dronesafe_Map	Full coverage of the Study Area.

EXISTING BASELINE

27.6.3 This section describes the present conditions which constitute the existing baseline environment for military and civil aviation within the study area. This assessment considers all radar systems within 10km of the Project, as well as military aviation areas of operation.

Civil Aviation

27.6.4 The airspace above the Tidal Barrage Development Area is used by civil aircraft and lies within the London Flight Information Region (FIR) for air traffic control, regulated by the UK CAA. Specifically, the Project falls under the Lakes Sector. Airspace is classified as either controlled or uncontrolled and is divided into a number of classes depending on what kind of Air Traffic Service (ATS) is provided and under what conditions. In the UK there are five classes of airspace, A, C, D, E and G. The first four are controlled airspace classes while Class G is uncontrolled.

27.6.5 Aircraft operate under one of two flight rules; Visual Flight Rules (VFR) or Instrument Flight Rules (IFR). VFR flight is conducted with visual reference to the natural horizon while IFR flight requires reference solely to aircraft instrumentation. The airspace above the Project is classified as a Class D airspace which is for IFR and VFR flying (National Air Traffic Services, No Date, d).

27.6.6 There are no licensed UK airports within the Scoping Boundary. The nearest airport is Liverpool John Lennon Airport situated within the Liverpool City Council's administrative boundary and is approximately 6km south east at its nearest point to the Scoping Boundary. A portion of the Airport falls under Halton Borough Council's westernmost boundary where the Airport has proposed a runway expansion and public safety zone. This plan aligns with Halton Borough Council's Local Plan which demonstrates how the Airport Public Safety Zone would extend along the bank of the River Mersey, towards the residential area of Hale (Halton Borough Council, 2022).

27.6.7 According to the CAA who regulate all non-military flying in the UK, a drone should not be flown higher than 400ft, must be kept in line of sight at all times, not flown within 150ft (50 metres (m)) of people, property and transport or within 500ft (150m) of crowds and built up areas (Civil Aviation Authority, No Date, d). NATS sets out the permanent airspaces which are prohibited, restricted and classified as danger areas within the UK. An interactive map National Air Traffic Services map outlines that EGR311 CAPENHURST (A circle, 2NM radius, centred at 531550N 0025708W) lies within the southern aspect of the Grid Connection Development Area. The following restriction areas are nearby to the Project:

- EGRU307A LIVERPOOL: A circle, 2.5 NM radius, centred at 532001N 0025059W where unmanned aircraft flight not permitted unless permission has been granted by the relevant Air Traffic Service unit or aerodrome

operator. This airspace includes Liverpool John Lennon Airport and the airspace above Garston Dock on the bank of the River Mersey;

- EGRU307B LIVERPOOL: Located adjacent to EGRU307A, this restriction area ensures unmanned aircraft flight not permitted unless permission has been granted by the relevant Air Traffic Service unit or aerodrome operator;
- EGRU339 HMP LIVERPOOL: Unmanned aircraft flight not permitted unless permission has been granted by His Majesty's Prison and Probation Service (HMPPS). This is situated immediately east of the northern point of the Grid Connection Development Area; and
- EGRU325 HMP ALTCOURSE: Unmanned aircraft flight not permitted unless permission has been granted by HMPPS, also situated immediately east of the northern point of the Grid Connection Development Area.

27.6.8 There are no Radio Mandatory Zones (RMZ) within the Tidal Barrage Development Area. The closest RMZ is at Hawarden Airport, located to the south of the Scoping Boundary (National Air Traffic Services, 2021).

27.6.9 There are no Transponder Mandatory Zones (TMZ) within the Tidal Barrage Development Area. The Burbo Bank TMZ's are located off the coast of the Wirral Peninsula (National Air Traffic Services, 2021).

Military Aviation

Military Low Flying Operations

27.6.10 The UK Low Flying System (UKLFS), used for Military Low Flying activity, covers the open airspace over the entire UK land mass and surrounding sea areas laterally to the UK Flight Information Region boundaries, from the surface to 2,000 ft above ground level (agl) or above mean sea level (amsl) (Ministry of Defence, 2023c). There are no set flight paths however major cities are usually avoided by low flying operations. The UK is divided into 20 low flying areas, with the Project situated within Low Flying Area 8 (Ministry of Defence, 2023b). The Tidal Barrage Development Area is located within an avoidance area where military low flying does not usually take place unless the flights are in connection with an airfield located within the area (National Air Traffic Services, 2024). Tactical training areas also form part of the low flying training; however none are present above the Tidal Barrage Development Area or within the wider study area (Ministry of Defence, 2023a).

Ministry of Defence Operations

27.6.11 There are no designated MoD air-to-air refuelling areas within the Tidal Barrage Development Area or within the wider study area. The nearest MoD air-to-air refuelling area is Area 13, located approximately 34NM north of the Project within the Irish Sea (National Air Traffic Services, 2021).

27.6.12 There are no Military Training Areas (MTA's) within the Tidal Barrage Development Area or within the wider study area. The closest MTA is North Wales which is located approximately 30km to the south west of the Project.

27.6.13 A potential military aviation receptor includes Royal Air Force Woodvale near Formby in Merseyside, located approximately 11km north of the Scoping Boundary, with operations weekdays between 9am and sunset (Royal Air Force, No Date).

Military Small Arms Ranges

27.6.14 Small arms ranges may present a hazard to aircraft which operate at or below 500ft agl. There are no small arms ranges within the Tidal Barrage Development Area or wider Scoping Boundary. The closest is Altcar small arms range located at the estuary mouth of the River Alt in the village of Hightown, approximately 6.5km to the north of the Scoping Boundary. There is a MoD firing range in the North West of England, located in Holcombe Moor near Ramsbottom in Lancashire (Ministry of Defence, 2024), approximately 51km north east of the Project Scoping Boundary. The Sealand Rifle Ranges cover 486 ha in the Dee Estuary near Chester comprising of an operational range area and a Raneg Danger Area (Ministry of Defence, 2022).

Ministry of Defence Danger Areas

27.6.15 Danger areas are an airspace of defined dimensions within which activities dangerous to the flight of aircraft may exist at specified times. There are no danger areas within the Tidal Barrage Development Area or the wider study area (National Air Traffic Services, No Date, a). The nearest danger area is located approximately 66km south east of the Tidal Barrage Development Area at Upper Hulme, with a 1.5 NM radius and designated as a 'closed impact area' (National Air Traffic Services, No Date, a).

27.6.16 The Project partially lies within R311 Capenhurst restricted area. The restricted area located in the wider study area include R312 Springfields restricted area located approximately 32km northwest and R319 Manchester restricted area located approximately 45km east of the Scoping Boundary.

Radars

Civil Aviation

27.6.17 NATS (En Route) plc (NERL) provides en-route civil air traffic services within the London FIR. There are two NERL secondary surveillance radars within the wider study area i.e. Manchester radar located approximately 15km to the east and Blackpool radar located approximately 6km to the north of the Scoping Boundary.

27.6.18 Liverpool John Lennon Airport also provides 24/7 full radar and have partnered with Air Navigation Solutions to implement Radar in The Tower operations at the airport (Air Navigation Solutions, 2021; Southport and Mersey Aero Club, 2023).

Ministry of Defence Air Defence Radars

27.6.19 The MoD safeguard a network of long range high powered air defence radars used to provide the UK with airspace surveillance and security and to fulfil national and international obligations. No military radars have been identified as being potentially impacted by the Project.

Ministry of Defence Air Traffic Control Radars

27.6.20 Other than the northern points of the Tidal Barrage Development Area and Grid Connection Development Area, the majority of the Project is situated within Liverpool Air Traffic Control (ATC) zone, with the entire Project falling under the Liverpool ATC area (**Figure 27.1**).

Ministry of Defence Protected Radars

27.6.21 No MoD Protected Radars are active or in use within the Scoping Boundary (**Figure 27.2**). The Protected radars located within the wider study area include Shawbury located approximately 64km to the southeast, Cosford located approximately 89km to the southeast and Valley located 105km to the west of the Scoping Boundary.

UK Met Office Meteorological Radars

27.6.22 No Met Office Meteorological Radars are active or in use within the study area. The Protected radars located within the wider Study area include Hameldon Hill located approximately 59km to the northwest (**Figure 27.2**).

Helicopter Operations

27.6.23 There are no helicopter main routes (HMRs) located in the immediate vicinity of the Scoping Boundary. However, a number of helicopter support flight routes are located to the north of the Project (National Air Traffic Services, No Date, c).

27.6.24 There are a few Air Ambulance helipads along the eastern side of the River Mersey, although they fall outside of the Tidal Barrage Development Area and Scoping Boundary. This includes Broadgreen Hospital, Alder Hey Children's Hospital and Aintree Hospital.

Search and Rescue Operations

27.6.25 As outlined in **Chapter 16: Shipping and Navigation**, the Tidal Barrage Development area is covered by Bristow Search and Rescue (SAR) for His Majesty's Coastguard. There are ten strategically located helicopter SAR bases across the UK, with the nearest SAR base located at Caernarfon, approximately 88.5km south-west of the tidal barrage location (Maritime and Coastguard Agency, 2024).

Other Aerodrome Activities

27.6.26 The definition of an aerodrome is "*a defined area (including any buildings, installations and equipment) on land or water or on a fixed, fixed offshore or floating structure intended to be used either wholly or in part for the arrival, departure and surface movement of aircraft*" (Civil Aviation Authority, 2024a). The following aerodrome activities have been considered in relation to the Project.

27.6.27 There are no outdoor skydiving facilities within the Tidal Barrage Development Area or wider study area.

27.6.28 The closest microlight aircraft training facility is West Lancashire Microlight School operating from a private airfield at Ince Blundell, 2 miles from the west coast (West Lancashire Microlight School, no date). This is situated approximately 6.5km to the north of the northernmost point of the Scoping Boundary.

27.6.29 Southport and Merseyside Aero Club operates out of Liverpool John Lennon Airport which falls outside of the Tidal Barrage Development Area (Southport and Merseyside Aero Club, 2023).

27.6.30 Also operating out of Liverpool John Lennon Airport is Helicentre UK providing personal and corporate helicopter charters throughout the UK (Helicentre UK, 2024).

27.6.31 Non-Secondary Surveillance Radar (SSR) glider operations areas have been established to allow gliders to fly at and above 10,000ft above mean sea level, up to 19,500ft (National Air Traffic Services, no date, b). As shown in Figure 26.1, there are no non-SSR glider operations within the Tidal Barrage Development Area or wider study area.

27.7 FUTURE BASELINE

27.7.1 The future baseline is determined by drawing upon information about the likely future use and management of the areas within the Scoping Boundary in the absence of Project and any other proposed developments (consented or otherwise) that may act cumulatively with the Project components to affect military and civil aviation features.

27.7.2 The military and civil aviation baseline is likely to remain primarily unchanged.

27.8 BASIS FOR SCOPING ASSESSMENT

27.8.1 The military and civil aviation scoping assessment is based on the following key assumptions which are also set out in **Chapter 2: Site Context and Project Description**:

- Maximum Height of Tidal Barrage structure is up to +7.2m AOD with a +8.5m AOD parapet on either side, with its permanent operational gantry crane up to 40m AOD;
- The maximum height of cranes utilised during the construction phase may be above 145m. ; and
- The grid connection will use underground cables or use existing infrastructure if reinforcement / restringing is required.

27.8.2 The source-pathway-receptor linkage between Project infrastructure and / or activities and the receptor groups for this aspect are described in **Table 27-4.**

27.9 EMBEDDED ENVIRONMENTAL MEASURES

27.9.1 Embedded mitigation measures have been identified and are proposed to be adopted as part of the evolution of the Project design (embedded into the Project design). These measures will evolve over the development process as the EIA

progresses and in response to consultation. They will be fed iteratively into the assessment process. These measures typically include those that have been identified as good or standard practice and include actions that would be undertaken to meet existing legislation requirements.

27.9.2 As there is a commitment to implementing these environmental measures, and also to various standard sectoral practices and procedures, they are considered inherently part of the design of the Project and have, therefore, been considered in the scoping assessment.

27.9.3 In addition to the specific embedded mitigation measures relevant to Military and Civil Aviation listed in

27.9.4 **Table 27-3**, consultation will be undertaken with all relevant consultees such as the MoD, CAA, NERL and any aerodrome (licensed or otherwise) may be required to address any concerns or issues.

Table 27-3: Relevant Aviation Embedded Environmental Measures

ID	Mitigation Measures embedded into the project design	How the measure will be secured
OM11	Development of Emergency Response and Cooperation Plan (ERCOP) to outline the measures the Project has put in place to support an emergency response, the resources available to support that response and provide emergency contact details.	Draft DCO requirement.
27-1	A suitable lighting scheme for the lighting of structures (cranes) will be agreed with the relevant authorities in order to comply with CAP 1096 Guidance.	Draft DCO requirement.
27-2	The aviation community will be notified of crane activity through the means of a Notice to Airmen.	Draft DCO requirement.
OM10	A Decommissioning Programme will be developed for the Project in line with industry good practice, guidance and legislation.	Draft DCO requirement.

ID	Mitigation Measures embedded into the project design	How the measure will be secured
27-3	A Construction Environmental Management Plan (CEMP) to be implemented by the contractor. The contractor will ensure that the relevant environmental measures within the CEMP and health and safety procedures are implemented. A CEMP will identify the project management structure roles and responsibilities with regard to managing and reporting on the environmental impact of the construction phase. This will include any notifications required regarding cranes and taller structures to be utilised during construction.	Draft DCO requirement and CEMP.

27.10 LIKELY SIGNIFICANT EFFECTS

27.10.1 In line with the EIA Regulations 2017, the EIA for the Project will consider those impacts where there is a risk of a likely significant effect only. The following Section draws on industry experience and expertise to identify those effect-receptor pathways that may potentially lead to a significant impact. Where experience and available evidence indicates an effect-receptor pathway will not lead to a significant impact with regards to the EIA Regulations 2017 the pathway is scoped out from assessment.

27.10.2 The likely significant effects on civil and military aviation are summarised in **Table 27-4**. The scoping assessment is based on a combination of the Project definition at the scoping stage, embedded environmental measures, understanding of the baseline conditions at this stage, the evidence base for civil and military aviation effects, the identification of potentially impacted receptors, and professional judgement. The approach to this assessment is set out in **Chapter 3: Approach to EIA**.

27.10.3 The early identification of likely significant effects is used here as a tool aimed at delivering a proportionate approach to the EIA. In doing so, it sets out a high-level assessment of all potential effects, significant or not. The basis for scoping out certain effects, and therefore no longer considered is presented after the table, supported by evidence base.

27.10.4 All impacts to O&M have been scoped out as the crest level of the tidal barrage will be 7.2m AOD with a 8.5m parapet on either side, thus it is not anticipated to have any significant effects on civil and military aviation receptors. In addition to this, it is anticipated that a gantry crane will be used throughout O&M activities, with the maximum height of the Main Gantry Crane being approximately 40m AOD.

27.10.5 Reflective and metallic structures can potentially cause a glint and glare effect to aircraft in certain conditions such as the angle of the sun against the extent of the reflection. The Tidal Barrage structure is likely to be predominantly made of concrete and mainly submerged. Whilst there may be reflective and metallic surfaces contained within the Tidal Barrage structure (fencing and sluice gates for example), these are unlikely to be sufficient to cause glint and glare to civil and military aviation.

Table 27-4: Likely Significant Military and Civil Aviation Effects

Activity and Impact	Embedded Measures	Effect	Proposed approach to assessment (scoped in or scoped out)	Receptor	Further data baseline requirements
Creation of an obstacle for civil aviation activities through the installation of infrastructure above sea level (construction and decommissioning).	OM11, 27-1, 27-2, OM10	As the maximum height of the crane utilised during the construction phase is anticipated to be 145m, this will not have a significant effect on the airspace above the Tidal Barrage Development Area.	Scoped out.	Liverpool John Lennon Airport.	N/A
Obstruction to Military Low Flying Operations (construction and decommissioning).	27-1, 27-2, OM10	As the airspace above the Tidal Barrage Development Area is situated within an avoidance area where military low flying does not usually take place, it is unlikely that the crane structures will interact with the low flying operations.	Scoped out.	Military Low Flying Operations.	N/A
Interaction with MoD Danger Areas and firing ranges (construction and decommissioning).	27-1, 27-2, OM10	There are no danger areas within the Tidal Barrage Development Area or the wider study area.	Scoped out.	Danger Areas.	N/A
Obstruction to MoD Operations and air-to-air refuelling areas (construction and decommissioning).	27-2, OM10	Potential effects on MoD operations are scoped out due to the distance of the operations from the Tidal Barrage Development Area.	Scoped out.	MoD operations.	N/A

Activity and Impact	Embedded Measures	Effect	Proposed approach to assessment (scoped in or scoped out)	Receptor	Further data baseline requirements
Interference on radars (construction and decommissioning).	27-2, 27-3	Tall construction equipment such as cranes have the potential to interfere with radar. However, as there are no MoD Protected Radars or MET Office radars active or in use within the Scoping Boundary, it is unlikely there will be any interference with the radars caused by the static cranes used within the Project.	Scoped out.	Civil, military and meteorological radars.	N/A
Creation of an obstacle for helicopter operations (construction and decommissioning).	OM11, 27-1, 27-2, OM10	There are no HMRs located in the Tidal Barrage Development Area or within the wider study area.	Scoped out.	HMRs, Air Ambulance operations and helicopter trips for recreational use.	N/A
Creation of an obstacle which interferes with SAR operations (construction and decommissioning).	OM11, 27-1, 27-2, OM10	The Project does not have the potential to impact on airborne SAR operations through the creation of an obstruction as the crest level of the tidal barrage will be 7.2m AOD with a 8.5m parapet on either side.	Scoped out.	SAR operations.	N/A
Impacts on aerodrome activity (construction and decommissioning).	27-1, 27-2, OM10	There are no skydiving facilities or microlight gliding training schools within the Tidal Barrage Development Area or within the wider study area.	Scoped out.	Various.	N/A

Activity and Impact	Embedded Measures	Effect	Proposed approach to assessment (scoped in or scoped out)	Receptor	Further data baseline requirements
		Southport and Merseyside Aero Club and Helicentre UK both operate out of Liverpool John Lennon Airport, which is in close proximity to the Scoping Boundary, but it is not anticipated any significant effects will occur.			
Creation of an aviation obstacle through the installation of cranes (construction and decommissioning).	27-1, 27-2, OM10, 27-3	There are statutory requirements concerning lighting tall structures. In compliance with CAP 1096 Guidance (with respect to lighting and notification to make aircraft users aware of the addition of crane infrastructure to the Tidal Barrage Development Area), the impact to the aviation sector during the Project lifespan is assessed to be not significant.	Scoped out.	Civil and military aviation activities.	N/A

Impacts Scoped Out of Assessment

27.10.6 All potential impacts have been scoped out from further assessment, resulting from a conclusion of no likely significant effect. These conclusions have been made based on the baseline environment, proximity of the receptor, the proposed embedded measures and the nature of planned works on the potential for impact from such projects more widely.

27.11 CUMULATIVE EFFECTS

27.11.1 Cumulative effects on military and civil aviation resulting from the effects of the Project and other developments will be assessed in accordance with the guidance and methodologies set out in **Chapter 3: Approach to EIA** and considering the other developments that have been screened in as part of the CEA screening exercise.

27.11.2 At present it is unlikely that the Project has the potential to act cumulatively and cause the creation of an aviation obstacle to military and civil aviation.

27.12 TRANSBOUNDARY EFFECTS

27.12.1 Due to the localised nature of the potential impacts, transboundary effects are considered unlikely to occur and therefore there is no potential for the Project to have significant effects on military and civil aviation elements.

27.13 PROPOSED APPROACH TO ENVIRONMENTAL IMPACT ASSESSMENT

27.13.1 Further desk-based studies and analysis will be undertaken to identify and assess military and civil aviation receptors. This study will be supplemented with consultation with the relevant statutory and non-statutory organisations as necessary.

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28 GREENHOUSE GASES

28.1 INTRODUCTION

28.1.1 The Greenhouse Gases (GHG) chapter will consider the potential likely significant effects from GHG emissions that may arise from the construction, operation and maintenance (O&M) and decommissioning activities of the Project. The receptor for GHG emissions is the global atmosphere. This section of the Scoping Report describes the methodology to be used within the Environmental Impact Assessment (EIA), an overview of the baseline conditions within the Scoping Boundary (as defined in **Chapter 2: Site Context and Project Description**), the datasets to be used to inform the EIA, the potential likely significant effects to be considered, and how these will be assessed for the purpose of the EIA.

28.1.2 Impacts from GHG interfaces with other aspects and as such, should be considered alongside these; namely:

- **Chapter 21: Air Quality:** Sources of emissions impacting air quality may be similar to those that generate GHG emissions, particularly those that involve use of fuels in a combustion process, so would be reviewed as part of the GHG assessment to check the relevance of emissions included for assessment.
- **Chapter 24: Terrestrial Traffic and Transport:** GHG emissions are generated by vehicles using fossil fuels and grid electricity supplies. Transport modelling conducted for Terrestrial Traffic and Transport assessment would be used to inform the evaluation of transport related GHG emissions.
- **Chapter 30: Waste and Materials:** Materials used during the construction and operation of the Project will have embodied GHG emissions associated with their manufacture and transportation, as will the disposal of waste materials for the Project. The related GHG emissions will be evaluated as part of the GHG assessment.

28.1.3 Overarching relevant legislation and policy context which has informed the scope of the assessment is outlined in **Chapter 4: Planning Policy,** with topic specific considerations outlined in **Appendix 4.1**.

28.2 TECHNICAL GUIDANCE

28.2.1 Technical guidance that has been used to inform the assessment is set out in **Table 28-1**.

Table 28-1: Relevant technical guidance

Guidance reference	Relevance to the assessment
National Planning Practice Guidance 2021 (Department for Levelling Up Housing and Communities and Ministry of Housing, Communities and Local Government, 2024).	The guidance highlights the importance of and advises how to identify suitable climate change mitigation and adaptation measures in the planning process. This would require the implementation of appropriate measures by the local planning authorities.
Environmental Impact Assessment Guide to Assessing Greenhouse Gas Emissions and Evaluating their Significance (IEMA, 2022).	The requirement to consider this topic has resulted from the 2014 amendment to the EIA Directive. The aim of this Guidance is to assist practitioners with addressing GHG emissions assessment and mitigation in statutory and non-statutory EIA.
The GHG Protocol (Greenhouse Gas Protocol, No Date).	The GHG Protocol establishes comprehensive global standardised frameworks to measure and manage GHG emissions from private and public sector operations, value chains and mitigation actions.
PAS 2080: 2023 (The British Standards Institute, 2023).	PAS 2080:2023 is a standard for managing carbon in building and infrastructure. It looks at the whole value chain and aims to reduce carbon and cost through intelligent design, construction and use.

Guidance reference	Relevance to the assessment
Royal Institution of Chartered Surveyors (RICS) Whole Life Carbon Assessment for the Built Environment 2017 (RICS, 2017).	This RICS professional statement addresses the need for technical details of numerous aspects influencing whole life carbon calculations for built projects. It is intended to standardise whole life carbon assessment for built projects.

28.3 STUDY AREA

28.3.1 The assessment of GHG emissions is not restricted by geographical area, instead focussing on any increase or decrease in emissions as a result of the Project, wherever that may be. In line with GHG Protocol guidance this considers sources of scope 1 and 2 emissions associated with the use of fuel and electricity during construction, operation and decommissioning, along with sources of indirect scope 3 emissions associated with these phases (e.g. embodied carbon within materials, emissions associated with transport of materials and waste). Although specific reference is not made to scope 1, 2 and 3 emissions, these categories are addressed within the life-cycle stages defined in the guidance for the PAS 2080:2023 standard (see **Table 28-6**). This includes:

- Construction emissions from the Project footprint but also relating to the transport of materials to and from the construction locations (including the marine working area and grid connection route) and their manufacture. This may be distant from the Project location, for example, GHG emissions associated with the manufacture of concrete in terms of embodied carbon and energy in the production process for prefabricated units within the tidal barrage.
- Operation emissions (increase or reduction) which result from the operation of the Project and any shifts in energy usage that may occur. In this case, GHG emissions include those for embodied emissions arising from the maintenance, repair and replacement of materials and waste for the operation of the Proposed Scheme, operational energy and potable water supplies used for support services and ancillary buildings, as well as avoided emissions attributable to the use of the renewable electricity generated by the Project.

- Decommissioning emissions which result from the dismantling of the Project, including the potential management and transportation of waste materials for onward treatment or disposal (noting the assumption in **Chapter 2: Site Context and Project Description** that all terrestrial ground structures will be demolished and removed at ground level or just below and any below ground structures will be left in-situ, including piles, pipework, and grid connection cables).

28.4 CONSULTATION

28.4.1 No consultation has been conducted to date with respect to GHG emissions for the Project. Stakeholder consultation is not typically required to carry out the GHG assessment as data is generally available from public sources or the project design team. The assessment will take into account any issues relating to the assessment GHG emissions identified in a Scoping Opinion response from the relevant Planning Authority.

28.5 ASSESSMENT METHODOLOGY

28.5.1 The Project-wide approach to the assessment methodology is set out in **Chapter 3: Approach to EIA**. This will be implemented to assess the likely significant effects from GHG emissions on climate from the construction, O&M, and decommissioning of the Project.

28.5.2 The specific legislation and guidance outlined in **Chapter 4: Planning Policy and Appendix 4.1** will also be considered in relation to the assessment.

28.5.3 The approach to GHG assessment approach considers the likely magnitude of GHG emissions (or avoided emissions) in comparison to the baseline without the Project. Subject to the agreement of scoped in elements, the assessment of likely significant effects would follow IEMA guidance (IEMA, 2022) in line with the assessment scope identified in **Section 28.10**. It considers emissions throughout the lifecycle of the Project addressing:

- Construction phase - e.g. embodied emissions associated with materials, transportation of materials to site and waste / arisings from the Site, and the construction process;
- Operation phase - e.g. operation of lighting and controls, utility supplies used in support facilities and ancillary buildings, maintenance and replacement of components, as well as avoided emissions from the Project; and

- Decommissioning phase - e.g. demolition and dismantling processes and equipment, and the transport and the onward management or disposal of materials.

28.5.4 For all in scope lifecycle stages of the Project, the assessment will include the following:

- Collection of available data / information on the scale of GHG emitting activities (e.g. tonnes of concrete, litres of fuel, kWh electricity) and GHG avoidance activities for the baseline and for the Project. In each case this will cover the whole study period (design life of 120 years); and
- Calculation of the GHG emissions by applying a suitable emissions factor (per unit of emissions generating or avoidance activity).

28.5.5 Emissions calculations will focus on emissions annually and throughout the Project lifecycle. Values will be reported as tonnes of CO_2equivalents (tCO_2e).

28.5.6 Given the operating lifetime of the Project there needs to be a number of working assumptions used, for example in the scale of decarbonisation of grid electricity. These working assumptions will be informed by relevant national policy and regulation and associated analysis and clearly highlighted.

SIGNIFICANCE OF EFFECT CRITERIA

28.5.7 The methodology adopted will attribute a significance of effect level based on the sensitivity / value of the affected receptor(s) and the magnitude of change arising from the Project. Any magnitude of emitted or avoided GHG emissions makes a cumulative contribution to climate change. As there is only one receptor 'the climate', it has a consistent sensitivity (**high**) no matter the location of the emissions source.

28.5.8 Significance of GHG impacts is assessed in line with IEMA guidance (IEMA, 2022): "*a development's emissions should be based on its net impact over its lifetime, which may be adverse, beneficial or negligible*". The evaluation of significance is not solely based on the magnitude of GHG emissions but whether the Project contributes to reducing GHG emissions relative to a comparable baseline consistent with achieving net zero by 2050.

28.5.9 With regards to assigning significance, IEMA guidance provides five distinct levels of significance as outlined below. Major or moderate adverse effects and beneficial effects are considered significant; minor adverse and negligible effects are considered to be not significant.

- ***Major adverse (Significant):*** the project's GHG impacts are not mitigated or are only compliant with do-minimum standards set through regulation, and do not provide further reductions required by existing local and national policy for projects of this type. A project with major adverse effects is locking in emissions and does not make a meaningful contribution to the UK's trajectory towards net zero.
- ***Moderate adverse (Significant):*** the project's GHG impacts are partially mitigated and may partially meet the applicable existing and emerging policy requirements but would not fully contribute to decarbonisation in line with local and national policy goals for projects of this type. A project with moderate adverse effects falls short of fully contributing to the UK's trajectory towards net zero.
- ***Minor adverse (Not Significant):*** the project's GHG impacts would be fully consistent with applicable existing and emerging policy requirements and good practice design standards for projects of this type. A project with minor adverse effects is fully in line with measures necessary to achieve the UK's trajectory towards net zero.
- ***Negligible (Not Significant):*** the project's GHG impacts would be reduced through measures that go well beyond existing and emerging policy and design standards for projects of this type, such that radical decarbonisation or net zero is achieved well before 2050. A project with negligible effects provides GHG performance that is well 'ahead of the curve' for the trajectory towards net zero and has minimal residual emissions.
- ***Beneficial (Significant):*** the project's net GHG impacts are below zero and it causes a reduction in atmospheric GHG concentration, whether directly or indirectly, compared to the without-project baseline. A project with beneficial effects substantially exceeds net zero requirements with a positive climate impact.

28.5.10 As noted above, consideration of the net emissions impact is intentional within the IEMA guidance to ensure that the overall impact of a Project on the global climate is taken into account (without assigning significance to specific sources of emissions). However, quantification of direct and indirect sources of GHG emissions for the PEIR and Environmental Statement (in line with the PAS 2080 lifecycle stages), will enable identification of 'carbon hotspots' to inform measures for potential mitigation.

28.5.11 In order to provide context to the GHG emissions, and as set out in the IEMA guidance, the estimated GHG emissions arising from the Project will be

compared with the respective UK carbon budgets (HM Government, 2023), shown in **Table 28-2**, which have been set by the UK Government covering 2023 to 2037. Further contextualisation on more local or sector carbon budgets will also be considered as well as any cumulative impacts on GHG emissions.

Table 28-2: UK Carbon Budgets

Carbon Budget Period	UK Carbon Budget ($MtCO_2e$)
Fourth: 2023-2027	1,950
Fifth: 2028-2032	1,725
Sixth: 2033-2037	965

28.6 BASELINE CONDITIONS

DATA INFORMATION SOURCES

28.6.2 An initial desk based review has been undertaken of publicly available data sources outlined in **Table 28-3** to determine the baseline character of the Study Area and inform the assessment process.

Table 28-3: Key sources of GHG emissions data

Source	Date	Summary	Coverage of Study Area
Department for Energy Security & Net Zero (DESNZ).	July 2023	Key GHG emissions sources included in the latest available annual reporting for UK local authorities.	Six local authorities covered by the Liverpool City Region Combined Authority (LCRCA): Halton Borough Council Knowsley Council Liverpool City Council

Source	Date	Summary	Coverage of Study Area
			Sefton Council St Helens Borough Council Wirral Council

EXISTING BASELINE

28.6.3 This section describes the present conditions which constitute the existing baseline environment for GHGs for the Project.

28.6.4 In the 'Do minimum' baseline scenario, GHG emissions occur constantly and widely as a result of natural and human activity, including land use and land use change, energy consumption (e.g. fossil fuels, purchased energy from the grid and / or other sources) and industrial processes. In accordance with the process set down in IEMA guidance for Assessing Greenhouse Gas Emissions and Evaluating their Significance (IEMA, 2022) the GHG assessment would only consider the scenario in which the Project results in additional or avoided emissions in comparison to the baseline. The baseline conditions therefore focus on those sources of emissions subject to change between the baseline and the Project.

28.6.5 The baseline involves no construction activities, although the construction phase may need to consider existing GHG emissions for road transport and marine vessels to provide a comparison with construction related traffic and travel by the construction workforces. Given the marine nature of the Project baseline GHG emissions for on-shore elements during the operational phase, such as road transport, are considered to be minimal. The main source of existing GHG emissions for the Project relates to marine vessel movements through the section of the River Mersey located within Site, which are described in more detail within the 'Vessel Traffic' section in **Chapter 16: Shipping and Navigation**. Additional information for road and marine transport, where available, will be used to determine the baseline relevant to GHGs within the Environmental Statement (ES).

28.6.6 The latest summary of GHG emissions for 2021 for the six local authorities within the jurisdiction of the LCRCA and for UK local authorities as a whole, are presented in **Table 28-4**. The emissions sources are a subset of the total

emissions for each local authority, chosen for their relevance to the Project, with the summary total for all emissions sources provided. These emissions have only been provided for context and are not the baseline emissions for this assessment.

Table 28-4: GHG Emissions Sources (2021) for LCRCA local authorities and the UK (Department for Energy Security & Net Zero, 2023)

Emissions Sources	Halton Borough Council ($ktCO_2e$)	Knowsley Council ($ktCO_2e$)	Liverpool City Council ($ktCO_2e$)	Sefton Council ($ktCO_2e$)	St Helens Borough Council ($ktCO_2e$)	Wirral Council ($ktCO_2e$)	LCRCA six local authorities combined ($ktCO_2e$)*	UK ($ktCO_2e$)
Industry Electricity	75	67	59	25	55	36	317	17,109
Industry Gas	86	125	174	68	184	133	769	20,037
Large Industrial Installations	52	4	0.4	176	204	0.1	437	29,268
Industry 'Other'	40	65	51	24	24	36	239	17,927

Emissions Sources	Halton Borough Council ($ktCO_2e$)	Knowsley Council ($ktCO_2e$)	Liverpool City Council ($ktCO_2e$)	Sefton Council ($ktCO_2e$)	St Helens Borough Council ($ktCO_2e$)	Wirral Council ($ktCO_2e$)	LCRCA six local authorities combined ($ktCO_2e$)*	UK ($ktCO_2e$)
Industry Total	**253**	**260**	**284**	**293**	**467**	**205**	**1,762**	**84,341**
Commercial Electricity	18	11	100	36	29	43	236	10,964
Commercial Gas	28	3	39	73	22	11	176	6,239
Commercial 'Other'	0.4	0.6	1.1	0.4	0.4	0.5	3	223
Commercial Total	**46**	**15**	**141**	**109**	**51**	**54**	**416**	**17,426**

Emissions Sources	Halton Borough Council ($ktCO_2e$)	Knowsley Council ($ktCO_2e$)	Liverpool City Council ($ktCO_2e$)	Sefton Council ($ktCO_2e$)	St Helens Borough Council ($ktCO_2e$)	Wirral Council ($ktCO_2e$)	LCRCA six local authorities combined ($ktCO_2e$)*	UK ($ktCO_2e$)
Public Sector Electricity	5	9	57	14	11	17	114	5,380
Public Sector Gas	7	14	135	117	49	42	365	10,580
Public Sector 'Other'	0.01	0.1	0.01	0.1	0.03	0.01	0.2	63
Public Sector Total	**13**	**23**	**192**	**131**	**60**	**60**	**479**	**16,024**
Domestic Electricity	38	44	142	87	54	101	466	22,245

Emissions Sources	Halton Borough Council ($ktCO_2e$)	Knowsley Council ($ktCO_2e$)	Liverpool City Council ($ktCO_2e$)	Sefton Council ($ktCO_2e$)	St Helens Borough Council ($ktCO_2e$)	Wirral Council ($ktCO_2e$)	LCRCA six local authorities combined ($ktCO_2e$)*	UK ($ktCO_2e$)
Domestic Gas	127	150	471	316	194	366	1,624	63,613
Domestic 'Other'	5	9	10	24	7	9	65	11,064
Domestic Total	**170**	**203**	**624**	**427**	**256**	**476**	**2,156**	**96,921**
Road Transport (A Roads)	112	76	205	115	99	115	721	48,450

Emissions Sources	Halton Borough Council ($ktCO_2e$)	Knowsley Council ($ktCO_2e$)	Liverpool City Council ($ktCO_2e$)	Sefton Council ($ktCO_2e$)	St Helens Borough Council ($ktCO_2e$)	Wirral Council ($ktCO_2e$)	LCRCA six local authorities combined ($ktCO_2e$)*	UK ($ktCO_2e$)
Road Transport (Motorways)	49	126	4	29	123	93	423	25,397
Road Transport (Minor Roads)	58	111	245	87	60	133	693	36,254
Diesel Railways	4	2	3	0.3	2	0.2	11	1,680
Transport 'Other'	2	2	6	3	2	3	19	1,943

Emissions Sources	Halton Borough Council ($ktCO_2e$)	Knowsley Council ($ktCO_2e$)	Liverpool City Council ($ktCO_2e$)	Sefton Council ($ktCO_2e$)	St Helens Borough Council ($ktCO_2e$)	Wirral Council ($ktCO_2e$)	LCRCA six local authorities combined ($ktCO_2e$)*	UK ($ktCO_2e$)
Transport Total	**224**	**316**	**463**	**235**	**285**	**343**	**1,866**	**113,725**
Landfill	11	20	114	32.4	141	29	347	13,618
Waste Management 'Other'	9	15	16	16	10	12	79	5,196
Waste Management Total	**20**	**35**	**130**	**48**	**151**	**41**	**426**	**18,814**
Other Total	13	10	7	40	36	19	125	51,795

Emissions Sources	Halton Borough Council ($ktCO_2e$)	Knowsley Council ($ktCO_2e$)	Liverpool City Council ($ktCO_2e$)	Sefton Council ($ktCO_2e$)	St Helens Borough Council ($ktCO_2e$)	Wirral Council ($ktCO_2e$)	LCRCA six local authorities combined ($ktCO_2e$)*	UK ($ktCO_2e$)
(LULUCF and agriculture)								
Grand Total*	**738**	**862**	**1,841**	**1,284**	**1,306**	**1,198**	**7,229**	**399,046**

*Note: individual emission entries have been rounded, so rounding errors may occur in combined totals

28.7 FUTURE BASELINE

28.7.1 The future baseline considers GHG emissions in the future based on the existing baseline, i.e. without any further development of the Site. As with other transport sectors there is likely to be decarbonisation of the shipping sector that would lead to an associated reduction of GHG emissions for the future baseline, although given the international make-up of marine vessels there is uncertainty regarding the rate that this would occur. Based on the current understanding, given the location of the Project no other future operations are reasonably foreseen that would lead to a significant change in the existing baseline GHG emissions.

28.8 BASIS FOR SCOPING ASSESSMENT

28.8.1 The GHG scoping assessment is based on the following key assumptions which are also set out in **Chapter 2: Site Context and Project Description**:

- The construction phase will be predominantly contained within the marine environment, including delivery of large equipment and materials to the marine working area, with additional terrestrial works for installation of the grid connection. There is no construction phase anticipated for the port and marine facilities as these are existing and established areas.
- Electricity generated by the Project will be used to supply the national grid network and will reduce GHG emissions to atmosphere from unspecified sources contributing to UK grid average generation of electricity.
- The design of the Project provides for continued use of the River Mersey by marine vessels. It is assumed there will be no change in the number of vessel movements identified for the baseline.
- The Project will allow for active travel (e.g. pedestrian, cycling) along the barrage structure connecting to local access and open public realm areas. Currently, it is expected that road access will be limited to maintenance vehicles only; it is not anticipated that access will be provided for public vehicles or public transport across the barrage.
- The Project will be decommissioned at the end of its operational lifespan, either prior to or at 120 years. It is recognised that wholesale decommissioning is not appropriate for the Project given the proposed length of operational life and it expected that any below ground structures will be left in-situ, including piles, pipework, and grid connection cables.

28.9 EMBEDDED ENVIRONMENTAL MEASURES

28.9.1 Embedded mitigation measures have been identified and are proposed to be adopted as part of the evolution of the Project design. These measures will evolve over the development process as the EIA progresses and in response to consultation. They will be fed iteratively into the assessment process. These measures typically include those that have been identified as good or standard practice and include actions that would be undertaken to meet existing legislation requirements.

28.9.2 As there is a commitment to implementing these environmental measures, and also to various standard sectoral practices and procedures, they are considered inherently part of the design of the Project and have, therefore, been considered in the scoping assessment.

28.9.3 In addition to the specific embedded mitigation measures relevant to GHGs listed in **Table 28-5** mitigation measures will be developed as part of the Development Consent Order (DCO) process following consultation with relevant stakeholders.

Table 28-5: Relevant GHG embedded environmental measures

ID	Mitigation Measures embedded into the Project Design	How the measure will be secured
OM1	The Applicant intends for the Proposed Scheme to be predominantly marine based logistics for the delivery of materials and equipment, thereby minimising the requirement for terrestrial logistics as far as possible.	To be included within the Outline CEMP which will form part of the submission of the Environmental Statement with the DCO Application. DCO Requirement – CEMP.
28-1	The Applicant is reviewing sustainability proposals during the construction phase, including consideration of design options for material types and quantities, and will confirm a target as part of the Preliminary Environmental Impact Report (PEIR).	Project Design will identify sustainability targets for the construction phase.

ID	Mitigation Measures embedded into the Project Design	How the measure will be secured
28-2	Where appropriate, construction materials will be sourced by marine activities such as re-use of construction phase dredging materials.	Project Design will optimise opportunities for reuse of dredging materials in construction elements.
30-4	A Waste Management Plan (WMP) will be prepared and included with the ES, which will also include the outline of a Materials Management Plan (MMP).	WMP and Outline MMP will form part of the submission of the ES.

28.10 LIKELY SIGNIFICANT EFFECTS

28.10.1 In line with the EIA Regulations 2017, the EIA for the Project will consider those impacts where there is a risk of a likely significant effect only. The following Section draws on industry experience and expertise to identify those effect-receptor pathways that may potentially lead to a significant impact. Where experience and available evidence indicates an effect-receptor pathway will not lead to a significant impact with regards to the EIA Regulations 2017 the pathway is scoped out from assessment.

28.10.2 The likely significant effects from GHG emissions on climate are summarised in **Table 28-6** in line with PAS 2080 lifecycle stages for built infrastructure (The British Standards Institute, 2023). The scoping assessment is based on a combination of the Project definition at the scoping stage, embedded environmental measures, understanding of the baseline conditions at this stage, the evidence base for effects from GHG emissions, the identification of the global climate as the impacted receptor, and professional judgement. The approach to this assessment is set out in **Section 28.5**.

28.10.3 The early identification of likely significant effects is used here as a tool aimed at delivering a proportionate approach to the EIA. In doing so, it sets out a high-level assessment of all potential effects, significant or not. The basis for scoping out certain effects is presented after the table, supported by the evidence base.

Table 28-6: Likely significant GHG effects

Activity and Impact	Embedded Measures	Effect	Proposed approach to assessment (scoped in or scoped out)	Receptor	Further data baseline requirements
Construction – Lifecycle Stage					
Product Stage (manufacture and transport of raw materials to suppliers) (A1-3): Adverse impact from embodied carbon emissions associated with extraction, transport and manufacture of the required raw materials for all components of the Project.	Reuse material from dredging activities for construction where possible.	Material increase in GHG emissions entering the atmosphere.	Scoped in.	Global Climate.	None.
Transport of Materials to Site (A4): Adverse impact from fuel related GHG emissions from vehicles transporting materials to the Project construction locations.	Optimise use of marine vessels for transport, and reuse dredged material from locality where possible.	Material increase in GHG emissions entering the atmosphere.	Scoped in.	Global Climate.	None.
Plant and Equipment Use during Construction (A5): Adverse impact from GHG emissions associated with	None confirmed.	Material increase in GHG emissions entering the atmosphere.	Scoped in.	Global Climate.	None.

Activity and Impact	Embedded Measures	Effect	Proposed approach to assessment (scoped in or scoped out)	Receptor	Further data baseline requirements
use of fuel and electricity in plant and equipment during construction of all components of the Project.					
Transport of Waste during Construction (A5): Adverse impact from fuel / energy related GHG emissions from vehicles transporting construction waste arising from all components of the Project.	Optimise use of marine vessels for transport and minimise quantities of dredged material requiring transport for disposal.	Material increase in GHG emissions entering the atmosphere.	Scoped in.	Global Climate.	None.
Disposal of Construction Waste (A5): Adverse impact from GHG emissions released during treatment and disposal of construction waste arising from all components of the Project.	Avoid disposal of dredged material by reusing in construction where possible.	Minimal GHG emissions associated with disposal of mainly inert material.	Scoped out.	Global Climate.	None.
Land use, Land Use Change and Forestry (A5): Potential for adverse impact from release of CO_2 or beneficial impact from	None confirmed.	Minimal change to existing habitats and related GHG emissions.	Scoped out.	Global Climate.	None.

Activity and Impact	Embedded Measures	Effect	Proposed approach to assessment (scoped in or scoped out)	Receptor	Further data baseline requirements
sequestration of CO_2 associated with a change in land use during construction.					
Operation – Lifecycle Stage					
Installed Products and Materials (B1): Adverse impacts from emissions attributable to products and materials used in the Project (including refrigerants where applicable).	None confirmed.	Minimal GHG emissions expected for the Project.	Scoped out.	Global Climate.	None.
Maintenance, Repair, Replacement, Refurbishment (B2-5): Adverse impact from emissions associated with ongoing maintenance, repair and replacement of the tidal barrage infrastructure and grid connection cables, including transport of waste and dredging materials.	None confirmed.	Material increase in GHG emissions entering the atmosphere.	Scoped in.	Global Climate.	Additional detail on type and scale of existing marine vessel movements to estimate associated baseline GHG emissions.

Activity and Impact	Embedded Measures	Effect	Proposed approach to assessment (scoped in or scoped out)	Receptor	Further data baseline requirements
Operational Energy Use (B6): Adverse impacts from emissions attributable to electricity and gas supplies expected to be sourced from national distribution networks for support facilities, external lighting and ancillary buildings for the tidal barrage, along with use of back-up power supplies in event of power failure.	None confirmed.	Material increase in GHG emissions entering the atmosphere.	Scoped in.	Global Climate.	None.
Operational Water Use (B7): Adverse impact from emissions associated with use of water supplies for support facilities and ancillary buildings for the tidal barrage during operation.	None confirmed.	Minimal operational water consumption and related GHG emissions.	Scoped out.	Global Climate.	None.
Land use, Land Use Change and Forestry (B8): Potential for adverse impact from release of CO_2 or	None confirmed.	Minimal change to existing habitats and related GHG emissions.	Scoped out.	Global Climate.	None.

Activity and Impact	Embedded Measures	Effect	Proposed approach to assessment (scoped in or scoped out)	Receptor	Further data baseline requirements
beneficial impact from sequestration of CO_2 associated with a change in land use during operation.					
Other Operational Processes (B8): Adverse impact from operational processes or embodied carbon in products used in operations for the tidal barrage (other than for maintenance, e.g. process chemicals).	None confirmed.	Minimal GHG emissions related to operation or use of consumables.	Scoped out.	Global Climate.	None.
Avoided Emissions (D): Beneficial impacts attributable to avoided emissions from generation of renewable electricity.	Efficient generation of renewable electricity is a fundamental aspect of the Project.	Material decrease in GHG emissions entering the atmosphere.	Scoped in.	Global Climate.	None.
Decommissioning – Lifecycle Stage					
Decommissioning Process (C1): Adverse impact from GHG emissions associated with	None confirmed.	Minimal GHG emissions given the expected decarbonisation of	Scoped out.	Global Climate.	None.

Activity and Impact	Embedded Measures	Effect	Proposed approach to assessment (scoped in or scoped out)	Receptor	Further data baseline requirements
use of plant and equipment during decommissioning of the Project (noting that any below ground structures are expected to be left in-situ, including piles, pipework, and grid connection cables).		energy supplies over the lifetime of the Project.			
Transport and Disposal of Materials (C2-4): Adverse impact from GHG emissions released during transport of waste materials arising from decommissioning and their onward management or disposal.	None confirmed.	Minimal GHG emissions associated with disposal of mainly inert or recyclable material.	Scoped out.	Global Climate.	None.

Impacts Scoped Out of Assessment

28.10.4 Potential effects from GHG emissions attributable to specific infrastructure lifecycle stages for the Project have been scoped out from further assessment, resulting from a conclusion of no likely significant effect. These conclusions have been made based on the knowledge of the baseline environment and the nature of planned works on the potential for impact from such projects more widely. The conclusions follow (in a site based context) existing best practice. Each scoped out effect is considered in turn below.

- Potential effects from ***Disposal of Construction Waste (A5)*** for the Project are scoped out, as GHG emissions from the disposal and degradation of waste materials are expected to be minimal as they will predominantly comprise inert waste from excavation and dredging activities or surplus concrete and recyclable materials.
- Potential effects from ***Land use, Land Use Change and Forestry (A5)*** during construction and ***Land use, Land Use Change and Forestry (B8)*** during operation of the Project, are scoped out as the potential change in habitats are expected to be minor in terms of any increase or decrease in carbon sequestration from the atmosphere.
- Potential effects from ***Installed Products and Materials (B1)*** are scoped out for the Project, as products and materials used in the Project are not expected to release GHG emissions.
- Potential effects from ***Operational Water Use (B7)*** for the Project are scoped out, as operation of the Project is not expected to require significant use of water from public supplies.
- Potential effects from ***Other Operational Processes (B8)*** for the Project are scoped out, as operation of the Project is not expected to require significant use of additional products and consumables, beyond those that would be accounted for under maintenance, repair, replacement and refurbishment activities (which are scoped in for assessment for all components of the Project).
- Potential effects from ***Decommissioning Activities (C1-4)*** are scoped out for the Project, as given the 120 year lifetime of the Project it is not possible to proportionally assess impacts and effects from decommissioning activities. Noting the Government's target to achieve net zero carbon for the UK by 2050 it is also expected that measures will be implemented to decarbonise energy, transport and waste management sectors, with minimal GHG emissions attributable to the use of plant and equipment at the time of

decommissioning, or for the onward transport and management of any waste materials.

28.11 CUMULATIVE EFFECTS

28.11.1 Cumulative effects for GHGs resulting from the effects of the Project and other developments will be assessed in accordance with the guidance and methodologies set out in **Chapter 3: Approach to EIA and Chapter 31: Cumulative Effects**, considering the other developments that have been screened in as part of the Cumulative Effects Assessment (CEA) screening exercise.

28.11.2 IEMA guidance (IEMA, 2022) identifies that GHG emissions are not geographically limited, so impacts from emissions are not restricted to a specific location or physical boundary (as may be the case for other environmental impacts, such as noise, air quality or flooding) but impact the atmosphere at a global level. Avoided or emitted GHG emissions make a cumulative contribution to the global atmosphere and impact on climate change (beneficial or adverse). Therefore, in accordance with the IEMA guidance, consideration of cumulative GHG emissions is inherent in the assessment and the cumulative impact of GHG emissions for the Project have been assessed against the contextual scale of relevant UK carbon budgets.

28.12 TRANSBOUNDARY EFFECTS

28.12.1 As noted in **Section 28.11** impacts from GHG emissions are not restricted to a specific location or physical boundary, therefore there is potential for transboundary effects. However, as the receptor for GHG emissions is the global climate the associated effects cannot be ascribed to a specific location and EIA effects are considered in terms of the contribution to global GHG levels attributable to the Project.

28.13 REFERENCES

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29 CLIMATE CHANGE RESILIENCE

29.1 INTRODUCTION

29.1.1 The Climate Change Resilience (CCR) chapter will consider the potential impacts of climate change on the Project, which may result in likely significant effects. The chapter will consider the construction, Operation and Maintenance (O&M) and decommissioning phases of the Project. The CCR chapter is different from other environmental topics, as the receptor is the Project components and therefore considers the impact of climate change on the Project. These receptors include the temporary and permanent project assets and the workforce. This section of the Scoping Report describes the methodology to be used within the Environmental Impact Assessment (EIA), an overview of the baseline conditions within the Scoping Boundary (as defined in **Chapter 1: Introduction**), the datasets to be used to inform the EIA, the potential likely significant effects to be considered, and how these will be assessed for the purpose of the EIA.

29.1.2 The assessment of CCR interfaces with flood risk and coastal processes, and as such, should be considered alongside:

- **Chapter 5: Coastal Processes** - Sea level rise associated with climate change has the potential to impact coastal processes; and
- **Chapter 19: Water Resources and Flood Risk**- Climate change can cause increased frequency and intensity of rainfall and therefore the risk of flooding to the Project.

29.1.3 CCR interfaces with all other topic chapters through the In-combination Climate Impacts (ICCI) assessment. The ICCI is undertaken by assessing how identified receptors in the surrounding environment are affected by future climate parameters, informed by the future climate baseline. Inclusion of an ICCI assessment has been scoped in, but this will be addressed at Preliminary Environmental Information Report (PEIR) or Environmental Statement (ES) stage and captured within the relevant chapters as part of the assessments for their environmental topics. The ICCI assessment will identify if any reported effects will be exacerbated or ameliorated by the effects of climate change and identify further mitigation where required. It will also assess whether the embedded measures will continue to be effective considering changes to climate.

29.1.4 A potential benefit of the Project, based on preliminary hydro-environmental modelling outputs, is to respond to the flood risks posed by sea level rise. This will be assessed as part of the ICCI assessment.

29.1.5 Overarching relevant legislation and policy context which has informed the scope of the assessment is outlined in **Chapter 4: Planning Policy**, with topic specific considerations outlined in **Appendix 4.1**.

29.2 TECHNICAL GUIDANCE

29.2.1 Technical guidance that has been used to define the assessment is set out in **Table 29-1**.

Table 29-1: Relevant technical guidance

Guidance reference	Guidance relevance to the assessment
Institute of Environmental Management and Assessment (IEMA) EIA Guide to: Climate Change Resilience and Adaptation 2020 (IEMA, 2020).	Hereafter referred to as 'the IEMA Guidance'. This guide provides a framework for the effective consideration of Climate Change Resilience and adaptation in the EIA process. This guide has been used within the assessment approach. This includes the recommended approach of using a high emission scenario of RCP8.5 at the 50th percentile for the 2080s providing a suitable conservative approach to the climate assessment; identifying climate change vulnerability and sensitivity of receptors at scoping stage; undertaking a significance assessment at EIA Report stage; and developing additional adaptation / mitigation measures.
ISO 14091:2021 Adaptation to climate change - Guidelines on vulnerability, impacts and risk assessment (International Standards Organisation, 2021).	This international standard provides guidelines on approaches to assess climate change-related risks. It highlights the role of risk assessments in improving climate change adaptation planning and informing climate change adaptation activities from their implementation through to monitoring.

29.2.2 Technical guidance used as part of the assessments in **Chapter 5: Coastal Processes** - Sea level rise and **Chapter 19: Water Resources and Flood Risk** are detailed in the relevant chapters.

29.3 STUDY AREA

29.3.1 The study area for the assessment of Climate Change Resilience relates to the impact of climate on the Project (rather than the impact of the Project on climate). As such, the Study Area for the Project is defined as the Scoping Boundary and includes all temporary and permanent assets and working areas.

29.4 CONSULTATION

29.4.1 No specific consultation is anticipated with external stakeholders at this stage nor has been undertaken to inform the production of this chapter and in determining the baseline information, which has been based on publicly available data and follows good practice guidance.

29.5 ASSESSMENT METHODOLOGY

29.5.1 The approach to assessing Climate Change Resilience is different to other environmental topics, whereby the significance of effects will be determined by considering the consequence and the likelihood of potential impacts associated with changes in climate variables on Project receptors. The assessment of significant effects will be assessed using an approach adapted from the IEMA guidance (IEMA, 2020) and professional judgement.

29.5.2 At this scoping stage, a vulnerability assessment is undertaken (refer to **Section 29.11**) to determine the climate variables and associated impacts to the Project which may result in likely significant effects.

29.5.3 To determine the significance of effects at ES stage, the likelihood and consequence assessment will be qualitatively assessed using the descriptions in **Table 29-2** and **Table 29-3.** These descriptions have been developed using professional judgement, informed by relevant guidance. It is noted that **Chapter 5: Coastal Processes** and **Chapter 19: Water Resources and Flood Risk** have prescriptive methodologies which are distinct to the CCR assessment.

29.5.4 The assessment of likelihood and consequence (and therefore significance) will take embedded mitigation into account as an assumed part of the design. Embedded mitigation will be identified through engagement with the Applicant and design team.

Table 29-2: Likelihood definitions

Measure of likelihood	Description
Very High	The event occurs multiple times during the lifetime of the Project e.g. approximately annually.
High	The event occurs several times during the lifetime of the Project e.g. approximately once every five years.
Medium	The event occurs limited times during the lifetime of Project e.g. approximately once every 15 years.
Low	The event occurs occasionally during the lifetime of the Project e.g. once in 60 years.
Very Low	The event may occur once during the lifetime of the Project.

Table 29-3: Consequence definitions

Measure of consequence	Description
Very large adverse.	Permanent and extensive damage. Disruption lasting substantially more than ten days as this will include unplanned and early renewal of large portions of the facility / infrastructure due to damage. Severe health effects and / or fatalities.
Large adverse.	Facility / infrastructure damage. Disruption lasting more than three but less than ten

Measure of consequence	Description
	days. Unplanned maintenance and early renewal of some portions of infrastructure or sub-assets. Severe health effects. Significant effect on the environment, requiring remediation.
Moderate adverse.	Limited facility / infrastructure damage with damage recoverable by maintenance or minor repair on a small portion of the infrastructure / assets. Disruption lasting more than one but less than three days. Adverse effects on health and / or the environment.
Minor adverse.	Localised facility / infrastructure disruption. No permanent damage, minor restoration work required which may require facility closure lasting less than one day. Slight adverse health or environmental effects.
Negligible	No facility / infrastructure damage, minimal adverse effects on health, safety and the environment. Facility doesn't shut down.

29.5.5 The likelihood and consequence are combined to assess the significance of effects on project assets (receptors), as shown in **Table 29-4**. The assessment is qualitative and based on professional judgment, engagement with the design team and a review of relevant literature.

Table 29-4: Significance of effect criteria

Likelihood	Consequence				
	Negligible	Minor adverse	Moderate adverse	Large adverse	Very large adverse
Very Low	Not significant	Not significant	Not significant	Not significant	Not significant
Low	Not significant	Not significant	Not significant	Significant	Significant
Medium	Not significant	Not significant	Significant	Significant	Significant
High	Not significant	Significant	Significant	Significant	Significant
Very High	Not significant	Significant	Significant	Significant	Significant

29.6 BASELINE CONDITIONS

29.6.1 The IEMA Guidance (IEMA, 2020) identifies the need for the baseline to consider:

- The current climate baseline (defined by historic climate conditions) to provide an indication of past vulnerability; and
- The future climate baseline (short term extremes and long-term variation) to assess a project's vulnerability to climate change.

29.6.2 This section provides an overview of the current baseline conditions for the Project using climate station data, and the projected future changes in the climate for the Study Area.

DATA INFORMATION SOURCES

29.6.3 An initial desk based review has been undertaken of publicly available data sources outlined in **Table 29-5,** to determine the baseline character of the study area and inform the assessment process.

Table 29-5: Key sources of data for current and future baseline data

Source	Date	Summary	Coverage of Study Area
Met Office records for UK Climate averages (Met Office, No Date).	No date	Provides historical observed climate data.	Data captured from the Hawarden climate station located approximately 18km from the Project at the closest point.
State of the UK Climate Report 2022 (2023) (Kendon, *et al.,* 2023).	2022	Provides a summary of the UK climate trends.	Applicable to the UK.
UKCP18 climate projections (Met Office, 2018).	2018	Provides climate change projection data.	The Climate Risk Indicators were used to extract UKCP18 data for Merseyside, as the area where the scheme resides. This is representative of the Study Area.
UK Climate Risk Indicators (Nigel Arnell *et. al*., 2021).	2021	Provides climate change projection data.	
UKCP18 Marine Report (2018) (Palmer, 2018).	2018	Provides a summary of the climate change trends in the marine environment.	Applicable to the UK.
UKCP18 Fact sheet: Sea Level Rise and Storm	2018	Provides a summary of climate change trends	Applicable to the UK.

Source	Date	Summary	Coverage of Study Area
Surges (2018) (Met Office, 2018).		with respect to tidal impacts.	
UKCP18 Fact sheet: Soil Moisture and the Water Balance (2020) [29]	2020	Provides a summer of key information available for soil moisture and other water balance metrics.	Applicable to the UK.
National Tidal and Sea Level Facility (National Tidal and Sea Level Facility, 2024).	2024	Historic sea level trends.	Used to infer the current baseline sea level data from Liverpool Gladstone Dock as the closest location providing current data.

EXISTING BASELINE

29.6.4 This section provides a summary of the climate trends over the past three decades (1991-2020) for temperature, precipitation (rain and snow), wind, humidity, solar radiation and sea level. This provides an understanding of how recent climate trends have impacted the Study Area. This is presented for both the UK context as well as the local climate, as represented by the UK Met Office Observing Study Area closest to the Study Area, at Hawarden.

UK Context

29.6.5 According to the latest State of the UK Climate Report 2022 (Kendon, *et al.,* 2023) the UK's climate is changing, with recent decades warmer, wetter, and sunnier than the 20th century on a national and local scale. This report highlights that the UK has warmed at a broadly consistent (but slightly higher) rate than the observed change in global mean temperature. The key findings from the latest 2022 report are:

- All the top ten warmest years for the UK in the series from 1884 have occurred this century.
- The most recent decade (2013-2022) has been on average 0.3 Celsius (°C) warmer than the 1991-2020 average and 1.1°C warmer than 1961-1990.

- The most recent decade (2013-2022) had 4% and 7% fewer days of both air and ground frost, respectively, compared to the 1991-2020 average, and 15% and 18% fewer compared to 1961-1990.
- The most recent decade (2013-2022) had 3% fewer heating degree days per year on average compared to 1991-2020, and 12% fewer compared to 1961-1990.
- Five of the ten wettest years for the UK since 1836 have occurred this century.
- For the most recent decade (2013-2022), UK winters have been on average 10% wetter than 1991-2020 and 25% wetter than 1961-1990.
- Widespread and substantial snow events have occurred in 2021, 2018, 2013, 2010 and 2009, but their number and severity have generally declined since the 1960s.
- For the most recent decade (2013-2022) UK winters have been 3% sunnier than 1991-2020 and 14% sunnier than 1961-1990. UK springs have been 6%-16% sunnier.
- The UK annual mean wind speed from 1969-2022 shows a downward trend, consistent with that observed globally. However, this series must be interpreted with some caution. Changes in instrument type, station network size, station exposure, and choice of metric used mean that interpreting trends in storminess from UK wind speed data is not straightforward due to the limitations of available data.

Local Climate

Precipitation - Rainfall

29.6.6 Average seasonal rainfall recorded at Hawarden climate station (the closest climate station to the Study Area), North West England and north Wales, and the UK for the period 1991-2020 is presented in **Table 29-6**. It demonstrates that the local weather is drier than both the region and the UK average year-round, particularly during winter in comparison to average rainfall across UK.

Table 29-6: Long term average seasonal rainfall (mm) (1991-2020) for Hawarden climate station, north west England and north Wales, and the rest of the UK

Season	Long Term Average Season Rainfall (1991-2020) (mm)		
	Hawarden Climate station	England NW and Wales N	UK
Summer (June, July, August).	61.1mm	98.9mm	84.5mm
Winter (December, January, February).	61.7mm	132.9mm	115.0mm

Precipitation - Snow

29.6.7 Snowfall is closely linked with temperature, with falls rarely occurring if the temperature is higher than 4°C. In the local area, snowfall is normally confined to the months including and between November to April.

Temperature

29.6.8 **Table 29-7** shows the long-term average seasonal mean temperature for Hawarden climate station, North West England and north Wales, and the UK between 1991-2020. It shows that the Study Area is warmer than both the region and the UK average.

Table 29-7: Long term average mean seasonal temperature (°C) (1991-2020) for Hawarden climate station, North West England and north Wales, and the UK

Season	Long Term Average Season Temperature (1991-2020) (°C)		
	Hawarden Climate Station	England NW and Wales N	UK
Summer (June, July, August).	15.9°C	14.6°C	14.6°C
Winter (December, January, February).	5.2°C	4.2°C	4.1°C

Humidity

29.6.9 The annual average relative humidity for the Study Area is 78-80%, with a slightly higher humidity of 80-82% in the surrounding area.

Wind

29.6.10 The local area is one of the more sheltered parts of the UK. In general, the strongest winds are associated with the passage of deep depressions across or close to the UK. The frequency and strength of these depressions is greatest in the winter half of the year, especially from December to February, and this is when mean speeds and gusts (short duration peak values) are strongest. Further detail around current wind data local to the Study Area will be provided within the PEIR.

Sea Level Rise

29.6.11 The National Tidal and Sea Level Facility at the nearest tide gauge station at Liverpool Gladstone Dock has been recording sea level data since 1991, with the last update in February 2024 (National Tidal and Sea Level Facility, 2024). The annual average data shows that sea level has risen from 7017mm in 1992 to 7202mm in 2015, the last year of complete data. Annual average data can be inferred from the monthly data points in 2023 which concludes that sea level was approximately 7213mm on average in 2023. See further detail of standard tidal elevations at Gladstone Dock in Chart Datum and Ordnance Datum in **Chapter 5: Coastal Processes.**

29.6.12 The Tidal Barrage Development Area is located within Flood Zone 3. The potential port facilities / key infrastructure areas located adjacent to the Tidal Barrage Development Area are located in Flood Zones 1, 2 and 3 with the exception of Port Sunlight which is located entirely within Flood Zone 1. Additionally, the two potential grid connection routes interact with Flood Zone 3 at various locations. Further information around the baseline conditions for flood risk can be found in **Chapter 19: Water Resources and Flood Risk.**

Wave heights

29.6.13 The baseline conditions of annual and seasonal mean significant wave heights have been explored in **Chapter 5: Coastal Processes.** The Mersey Estuary has limited inshore waves into the estuary. Offshore waves have been measured to have a significant wave height of up to 3m, and a maximum recorded wave height of 5.8m. The location also experiences significant tidal currents which lead to scour, reduce sediment accumulation and may lead to locally increased wave heights under certain wind conditions e.g. wind over tide.

Past Major Events

29.6.14 The local area has experienced major weather events across the baseline period considered, including storms causing heavy rains, high winds, flooding and disruption to power supply, and heatwave events. These events will be analysed during the PEIR and ES to understand how extreme weather has historically affected the region, which will inform the impacts assessed throughout the operational life of the Project and the design measures proposed.

29.7 FUTURE BASELINE

29.7.1 The UK Climate Projections 2018 (UKCP18) (UK Met Office, 2018) probabilistic projections for Representative Concentration Pathways (RCP) 8.5 (high emission scenarios) have been used to infer future changes in a range of climate variables that may affect the vulnerability of the Project to climate change. The Climate Risk Indicators (CRI) (Arnell, *et al.,* 2021), developed as part of the UK Climate Resilience Programme has been used to inform this assessment. The CRI utilises the UKCP18 projections and allows for a range of climate related indicators (including but not limited to, Met Office Heatwaves and heat stress). The CRI data for County area of Merseyside, as defined by CRI, has been used to inform this assessment, as it is considered to represent the majority of the study area.

29.7.2 The future climate has been presented for the 2030s (2020-2049), the 2050s (2040-2069) and 2080s (2070-2099) to identify the anticipated climate conditions. These projections are provided against the baseline period of 1981-2010 (based on model data), and 1991-2020 (current climate) as an indication of change from the baseline period.

29.7.3 Currently, UKCP18 Projections provide data to the year 2100 in most cases. The Project design life is anticipated to be a minimum of 120 years, where there may be sub-assets with a shorter design life which are replaced at intervals throughout the overall life cycle. The CCR assessment will consider RCP8.5, and sensitivity test to the 10th or 90th percentile. Due to the data shortage of the 22nd century, the assessment will look at measures that should be taken now for those assets with a longer design-life which may have less opportunity for maintenance and replacement over the overall Project design life to adapt to climate change as impacts may become more frequent or severe. Adaptive capacity can be built into the development now for those sub-assets which will be replaced throughout the lifecycle, at which point the latest climate change projections will be reviewed.

29.7.4 Although the assessment has been undertaken for the 50th percentile (i.e. the median, or central estimate) the 10th and the 90th percentiles are presented here to illustrate the full range of projected outcomes.

29.7.5 Climate change is projected to lead to warmer, wetter winters and hotter, drier summers, with an increase in the intensity and frequency of extreme events such as heatwaves, drought, extreme rainfall leading to flash flooding, storms, and wind events. The information presented below illustrates how the climate may evolve at the Study Area of the Project by the end of the century.

Rainfall and Temperature

29.7.6 **Table 29-8** provides an overview of current and projected summer and winter temperature and rainfall for the location of the Project.

Table 29-8: Temperature and rainfall data for the Model Reference (1981-2010), current (1991-2020) and future climate (2030s, 2050s and 2080s) for RCP8.5 (anomalies), the table shows the 50th percentile (10th percentile to 90th percentile) values.

Climate variable	Model Reference (1981-2010)	Current Baseline (1991-2020)	RCP8.5 50th percentile (10^{th}-90^{th} percentile)		
			2030s	2050s	2080s
Average summer temperature (°C change).	15.7°C	15.9°C	1.2°C (0.4-1.9°C)	2.1°C (0.9-3.4°C)	4.3°C (2.1-6.6°C)
Average winter temperature (°C change).	4.8°C	5.2°C	0.9°C (0.2-1.6°C)	1.5°C (0.6-2.6°C)	2.8°C (1.2-4.6°C)
Min winter temperature (°C change).	1.5°C	2.0°C	0.9°C (0.1-1.7°C)	1.6°C (0.5-2.8°C)	2.9°C (1.1-5.0°C)
Max summer temperature (°C change).	20.2°C	20.4°C	1.3°C (0.3- 2.2°C)	2.3°C (0.8-3.9°C)	4.7°C (2.1-7.5°C)
Average summer rainfall (% change)	57.6mm	61.1mm	-6.4% (-21.8-7.9%)	-15.2% (-34.8-2.7%)	-31.0% (-54.7- -6.8%)
Average winter rainfall (% change).	59.8mm	61.7mm	1.6% (-5.4-9.4%)	5.0% (-4.4-15.9%)	11.6% (-2.0-28.2%)

29.7.7 Indicators of climate risk are shown in **Table 29-9**. These provide an indication of sector specific thresholds which are projected to change in the future. The indicators presented in **Table 29-9** are provided against the model reference period of 1981-2010. These indicators are unavailable for the current baseline period (1991-2020).

Table 29-9: Future projections (absolute) of climate risk indicators for the 2030s, 2050s and 2080s for RCP8.5, the table shows the 50th percentile (10th percentile to 90th percentile) values.

Climate variable	Model Reference (1981-2010)	RCP8.5 50th percentile (10th-90th percentile)		
		2030s	2050s	2080s
Met office heatwave[24] (events per year).	0.9	1.6 (1.1-2.4)	2.6 (1.4-4.3)	4.4 (2.6-5.7)
Road accident risk[25] (days per year).	32.4	23.6 (17.3-30.2)	17.9 (10.9-26.9)	10.7 (4.3-21.4)
Road melt risk (days per year)[26].	8.4	14.7 (10.1-20.6)	22.8 (12.8-40.0)	51.5 (22.8-83.0)
Heat stress[27] (days per year).	0.1	0.2 (0.1-0.5)	0.8 (0.2-2.3)	4.9 (1.1-14.1)
Wildfire Fire Danger Index[28] (days per year).	11.4	17.3 (10.2-29.4)	25.8 (12.1-49.1)	51.3 (19.1-90.2)

[24] A UK heatwave threshold is met when a location records a period of at least three consecutive days with daily maximum temperatures meeting or exceeding the heatwave temperature threshold. The threshold for the local area is 25°C.

[25] Days with minimum temperature below 0°C.

[26] Days with maximum temperature above 25 °C.

[27] Days with shade Wet Bulb Globe Temperature (WBGT) above 25°C.

[28] Days with Met Office Fire Danger Index at the Very High Fire Severity level or above.

Precipitation - Snow

29.7.8 With regards to future changes, rising winter temperatures are likely to reduce the amount of precipitation that falls as snow in winter. Snowfall data is unavailable for the probabilistic projections (25km) of UKCP18, however both the regional (12km) and the local (2.2km) of UKCP18 show a decrease in both falling and lying snow across the UK for the period of 2061-2080 relative to the 1981-2000 baseline.

Humidity

29.7.9 Projections for humidity anticipate an average decrease of approximately 0.6% in the 2030s (-1.0-0.9%), and a decrease of 1.7% in the 2050s (-2.3- -1.3%).

Soil Moisture

29.7.10 **Table 29-10** indicates the projected changes in soil moisture for the North West of England region, for both the summer and winter months. Soil moisture is the amount of moisture held in a given amount of soil which is important for plant growth (Met Office, 2020). Changes in soil moisture are anticipated to be at the greatest in summer and autumn, with little change during winter and spring [29]. These dry periods are anticipated to be longer and deeper with climate change, as it is a function of increased evaporation due to higher temperatures and a decrease in precipitation,

Table 29-10: Future projections of soil moisture for NW England (as % change) for the 2030s, 2050s and 2080s for RCP8.5, the table shows the 50th percentile (10th percentile to 90th percentile) values.

	2030s	2050s	2080s
Soil Moisture[29] (% change - winter)	-0.12 (-1.47-0.58)	0.10 (-1.63-1.07)	0.07 (-1.65-1.53)
Soil Moisture (% change – summer)	-10.33 (-25.34 – -3.02)	-17.84 (-35.07 – -10.02)	-34.8 (-45.72 – -21.96)

Wind

29.7.11 UKCP18 depicts a wide spread of future changes in mean surface wind speed; however, there is large uncertainty in projected changes in circulation over the

[29] Potential soil moisture deficit measured by the maximum difference between accumulated rainfall and potential evaporation.

UK and natural climate variability contributes to much of this uncertainty. It is therefore difficult to represent regional extreme winds and gusts within regional climate models.

29.7.12 Central estimates of change in mean wind speed for the 2050s are small in all ensembles runs (<0.2m/s). A wind speed of 0.2m/s (approximately 0.4 knots) is small compared with the typical magnitude of summer mean wind speed of about 3.6-5.1m/s (7-10 knots) over much of England. Seasonal changes at individual locations across the UK lie within the range of -15% to +10%.

29.7.13 In terms of storms, the analysis presented here is a summary of expected changes in storm patterns under a changing climate. A storm is defined by the Met Office as a wind event measuring 10 or higher on the Beaufort scale (equivalent to a wind speed of 27m/s or 60mph) (Met Office, No Date).

29.7.14 Studies (Slingo, 2014) relating to future projections of storms suggest that climate driven storm changes are less distinct in the northern than southern hemisphere. However, such is the wide range of inter-model variation, robust projections of changes in storm track are not yet possible and there is low confidence in the direction of future changes in the frequency, duration or intensity of storms affecting the UK.

Sea Level Rise and Flood Risk

29.7.15 The Study Area is located along the River Mersey, flowing into the nearby Liverpool Bay. Therefore, it is exposed to future sea level rise and coastal change. **Table 29-11** below depicts the projected sea level rise using UKCP18 marine projections data taken as the central data within the climate periods used in the assessment for the 2030s and the 2080s. Marine projections data is available up to 2100, therefore the results have been extrapolated for the year 2158 to be in line with the asset design life and **Chapter 5: Coastal Processes**. UKCP18 projection data is available for sea level rise up to 2300 using an exploratory methodology and therefore the extrapolation of the 2100 dataset reduces issues with confidence in the data.

Table 29-11: Sea level rise projections (m) presented as 50th percentile (10th percentile to 90th percentile) for the study area.

	2035	2085	2158
Sea level rise (m)	0.15m (0.12-0.20m)	0.54m (0.39-0.73m)	1.27m (0.88-1.80m)

Wave heights

29.7.16 Changes in wind speeds and the intensity and frequency of storm events due to climate change will likely result in extreme wave heights at the Project location.

29.7.17 Further information regarding sea level rise, tidal water levels, offshore winds and extreme wave heights can be found in **Chapter 5: Coastal Processes**.

Physiochemical Properties of Waterbodies

29.7.18 UKCP18 does not provide information on changes to coastal water properties, such as sea surface temperature and acidification (Palmer, 2018). Increases in CO_2 emissions in the atmosphere results in more CO_2 absorbed by the ocean. When it dissolves in the sea water, the pH of the water decreases. Recent studies suggest that the North Atlantic Ocean contains more CO_2 than any other ocean basin, and surface waters are experiencing a decline in pH, resulting in increasing acidity of the waters (Findlay *et al*., 2022).

29.8 BASIS FOR SCOPING ASSESSMENT

29.8.1 The Climate Change Resilience scoping assessment is based on the indicative parameters set out in **Chapter 2: Site Context and Project Description** plus

- The development of an outline Construction Environmental Management Plan (CEMP) will incorporate construction phase measures to manage the risks from weather related hazards.

29.8.2 In order to determine the climate variables which have the potential to result in likely significant effects, a vulnerability assessment has been undertaken (refer to **Section 29.11**).

29.9 EMBEDDED ENVIRONMENTAL MEASURES

29.9.1 Embedded mitigation measures have been identified and are proposed to be adopted as part of the evolution of the Project design (embedded into the Project design). These measures will evolve over the development process as the EIA progresses and in response to consultation. They will be fed iteratively into the assessment process. These measures typically include those that have been identified as good or standard practice and include actions that would be undertaken to meet existing legislation requirements.

29.9.2 As there is a commitment to implementing these control measures, and also to various standard sectoral practices and procedures, they are considered

inherently part of the design of the Project and have, therefore, been considered in the scoping assessment.

29.9.3 Specific embedded mitigation measures relevant to Climate Change Resilience, known as control measures, are listed in **Table 29-12** Embedded mitigation measures related to flood risk and surface water can be found in **Chapter 19: Water Resources and Flood Risk** and the hydro-dynamic modelling are detailed in **Chapter 5: Coastal Processes** and will not be reproduced here

Table 29-12: Relevant Climate Change Resilience embedded control measures

ID	Mitigation Measures embedded into the Project design	How the measure will be secured
29-1	The CEMP (and subsequent iterations) will include measures to manage and mitigate weather related hazards during the construction phase. It is already noted that the construction durations take into account weather and marine conditions and restrictions around pilotage of certain vessels when wave heights exceed 1m (**Chapter 2: Site Context and Project Description**).	To be included within the Outline CEMP which will form part of the submission of the Environmental Statement with the DCO Application. DCO Requirement - CEMP.
29-2	An indicative maintenance schedule for key components of the barrage is reported in section 2.7 of **Chapter 2: Site Context and Project Description**. The scheduled replacement regime will, to an extent, mitigate adverse impacts from climate change which may result in damage to components.	Inherent to the component design and operational maintenance.
29-3	Rainwater falling on the barrage structure will be directed into surface water drainage and discharged to the Mersey (refer to Section 2.7 of **Chapter 2: Site Context and Project Description.**	Inherent to the Barrage design.

ID	Mitigation Measures embedded into the Project design	How the measure will be secured
29-4	The design of the Project has been informed by design codes (refer to Section 2.7 of **Chapter 2: Site Context and Project Description** for the design codes). Whilst many of the design codes do not specifically consider climate change, it is noted that climate change effects have been estimated, based on UKCP18 Guidance RCP8.5.	Inherent to the Barrage design.
OM10	As detailed in **Chapter 2: Site Context and Project Description**, a Decommissioning Plan (including environmental management) will be prepared at the appropriate time to consider the potential risks of decommissioning the relevant elements of the Project.	DCO Conditions.
29-5	The basis of the design is for the network connection is for cables to be buried and therefore removes exposure of these assets to climate change hazards such as wind and storms.	Inherent to the Barrage design.

29.9.4 It is noted that a potential benefit of the Project, based on preliminary hydro-environmental modelling outputs, is to respond to the flood risks posed by sea level rise. However, the Climate Change Resilience assessment focuses on how the Project will be resilient to climate change, rather than how it alters impacts in the surrounding environment.

29.9.5 As part of the EIA process, the Applicant will investigate and confirm which operational modes could be implemented to respond to climate change projections in intertidal areas, to ensure the continued operation of the Project and benefit environmental receptors. These embedded measures will be confirmed throughout the PEIR and ES.

29.10 LIKELY SIGNIFICANT EFFECTS

Identifying Vulnerable Project Elements

29.10.2 The IEMA Guidance (IEMA, 2020) outlines that the scoping stage should identify the key climatic variables relevant to the Project and likely effects; however, it is not prescriptive in how this is undertaken.

29.10.3 The future baseline presented in **Section 29.8** has therefore been analysed to provide an understanding of the climate trends that have the potential to affect the Project. The climate variables have been assessed for the time periods across the Project lifetime.

29.10.4 The vulnerability assessment is the outcome of an assessment of sensitivity and exposure of the receptors to the climate trends presented in **Section 29.8**. The vulnerability assessment has been undertaken for all phases of the Project in order to identify the impacts with a likely significant effect.

29.10.5 The exposure and sensitivity of the receptor to climate impacts is assigned a level of vulnerability as shown in the matrix in **Table 29-13**.

Table 29-13: Vulnerability matrix

Sensitivity	Exposure		
	Low	Medium	High
Low	Low vulnerability.	Low vulnerability.	Low vulnerability.
Moderate	Low vulnerability.	Medium vulnerability.	Medium vulnerability.
High	Low vulnerability.	Medium vulnerability.	High vulnerability.

29.10.6 Sensitivity refers to the degree of response of the receptor to a change and its capacity to accommodate and recover from a change should it be affected. The typical ‘sensitivity’ of receptors to climate variables considers the impact of the climate on the specific receptors, considering any preliminary design measures (as detailed in **Section 29.10**). The assessment is based on a literature review

and professional judgement and sensitivity is rated as high, moderate, or low. ‘High sensitivity’ implies that the receptor will lose much of its original form and function; ‘moderate sensitivity’ implies that the receptor is able to tolerate some climatic conditions without being fully altered though remains susceptible to be altered to some extent and ‘low sensitivity’ implies that projected changes in the climatic factors have little influence on the receptor.

29.10.7 Exposure is the nature and degree to which climate variations may pose a risk to the Project. The ‘exposure’ of receptors to projected change in climate variables based on the current climate and the future projections identified in the baseline information presented above is rated as high, medium or low. The construction phase is assessed as exposure to the climate trends of the ‘2030s’ (2020-2049), the operational phase considers the climate trends for the 2050s (2040-2069) and 2080s (2070-2099) and the decommissioning phase considers the climate trends for the 2080s (2070-2099). To align with EIA practice assessing a worst-case scenario the operation and decommissioning phases will be assessed against the climate projections available. The UKCP18 dataset provides data to 2100. **Chapter 5: Coastal Processes** has extrapolated sea level rise data across the design life of the asset to 2158. In the case of other climate change trends beyond 2100, such as temperatures, the CCR assessment will undergo qualitative sensitivity testing, and will investigate the ability of adaptive capacity measures throughout the Project design life. Adaptive capacity is the means of the project to reassess over the course of the design life and change the design of sub-assets in response to a changing climate. This would only be applicable to sub-assets which have a lesser design life to the overall barrage.

29.10.8 On completion of the vulnerability assessment, climate variables in the construction, operation, and decommissioning phase to which the Project is likely to have a low vulnerability to are scoped out of further assessment as no potential for likely significant effects is identified. Climate variables in the construction, operation, and decommissioning phase to which the Project is likely to have a medium or high vulnerability to are taken forward for further assessment at the next stage as these variables are identified as having the potential for likely significant effects, using the methodology outlined in **Section 12.5.** This is a qualitative assessment informed by expert opinion and supporting literature.

Construction

29.10.9 The construction period may be up to 10 years. The sensitive receptors during the construction phase include:

- Construction site (for the tidal barrage, the grid connection and associated development) and materials including those located within marine and port facilities;
- Plant and equipment (such as vehicles and dredging vessels, cranes and ancillary features such as fencing, drainage and lighting); and
- Construction workers.

29.10.10 The Study Area would be sensitive to extreme weather such as heavy rainfall events and heatwaves during the construction period. Heavy precipitation may lead to flash floods and waterlogging on the construction site, potentially compromising stored / stockpiled materials.

29.10.11 Heatwave conditions may pose health risks to site workers and could disrupt the operation of plant and machinery. Such weather events may lead to delays in the construction process.

29.10.12 Marine works may be impacted by high wind and storm events disrupting or delaying the construction programme.

29.10.13 **Table 29-14** presents the assessment of vulnerability of the Project during the construction phase. This takes into account the exposure (based on current and future baseline conditions, as defined in **Section 29.8**) and sensitivity taking into account any design, mitigation and enhancement measures addressed in **Section 29.10**.

Table 29-14: Vulnerability assessment for the construction phase

Receptor	Climate variable	Associated hazard	Exposure	Sensitivity	Vulnerability
Construction site and materials.	Precipitation	Change in annual average.	Low	Low	Low
		Drought	Low	Low	Low
		Extreme precipitation events (flooding).	Medium	Low	Low
	Temperature	Change in annual average.	Low	Low	Low
		Extreme temperature events.	Medium	Low	Low
	Relative humidity.	Changes in annual average.	Low	Low	Low

Receptor	Climate variable	Associated hazard	Exposure	Sensitivity	Vulnerability
	Soil moisture.	Changes in annual average.	Medium	Low	Low
	Wind	Gales and high winds.	High	Low	Low
		Storms and lightning.	High	Low	Low
		Extreme wave heights and storm surges.	High	Low	Low
	Sea level rise.	Higher sea level.	Low	High	Low
Plant and equipment.	Precipitation	Change in annual average.	Low	Low	Low
		Drought	Low	Low	Low

Receptor	Climate variable	Associated hazard	Exposure	Sensitivity	Vulnerability
		Extreme precipitation events (flooding).	Medium	Low	Low
	Temperature	Change in annual average.	Low	Low	Low
		Extreme temperature events.	Medium	Low	Low
	Relative humidity.	Changes in annual average.	Low	Low	Low
	Soil moisture.	Changes in annual average.	Medium	Low	Low
	Wind	Gales and high winds.	High	Low	Low
		Storms and lightning.	High	Low	Low

Receptor	Climate variable	Associated hazard	Exposure	Sensitivity	Vulnerability
		Extreme wave heights and storm surges.	High	Low	Low
	Sea level rise.	Higher sea level.	Low	Low	Low
Construction workers.	Precipitation	Change in annual average.	Low	Low	Low
		Drought	Low	Low	Low
		Extreme precipitation events (flooding).	Medium	Low	Low
	Temperature	Change in annual average.	Low	Low	Low
		Extreme temperature events.	Medium	Low	Low

Receptor	Climate variable	Associated hazard	Exposure	Sensitivity	Vulnerability
	Relative humidity.	Changes in annual average.	Medium	Low	Low
	Soil moisture.	Changes in annual average.	Low	Low	Low
	Wind	Gales and high winds.	High	Low	Low
		Storms and lightning.	High	Low	Low
		Extreme wave heights and storm surges.	High	Low	Low
	Sea level rise.	Higher sea level.	Low	Low	Low

29.10.14 The results of the vulnerability assessment for construction phase show that 'low' vulnerability has been identified for all climate variables. This is on the basis that the CEMP will include measures to manage the risks from weather-related events and reduce the sensitivity of the receptors to the climate variables, and exposure during the construction phase is lower for chronic trends such as temperature. As stated above, variables with a 'low' vulnerability are not anticipated to result in any likely significant effects. Therefore, no likely significant effects are identified in the construction phase.

Operation and Maintenance

29.10.15 The design life of the Project is estimated to be up to 120 years.

29.10.16 The sensitive receptors for the operation phase are listed below. A full description of the Project components is provided in **Chapter 2: Site Context and Project Description**. These include:

- Tidal Barrage. A structure spanning the Mersey Estuary which comprises the fully submerged Power Generation System (turbines which produce electricity) the hydro-control system which comprises sluice gates to control water levels and flows when the barrage is in operation and the marine navigation systems which are locks allowing continued use of the estuary by vessels. This also includes connections to either banks and the active travel infrastructure.
- Ancillary operational buildings including operations, maintenance and administrative buildings, control room and substation;
- Ancillary equipment. This includes elements such as lighting, CCTV, gantry cranes, firefighting equipment, pumps for dewatering and cooling water system;
- Grid connection. This consists of an underground cable route from the tidal barrage site to the point of connection or is contained on existing infrastructure subject to reinforcement or restringing works; and
- End users: The employees, maintenance contractors, users of the active travel network and visitors to the Project.

29.10.17 The aquatic protection measures will be developed as part of the EIA process to protect the barrage against sea level rise and high energy wave action. They are therefore considered a design measure and not a separate Project asset; their design will take into account climate change projections across the lifecycle of the assets. This will be developed through the PEIR / ES.

Precipitation

29.10.18 Components of the Project have the potential be sensitive to high and low rainfall (and associated flooding and drought, respectively) such as mechanical and electrical equipment which could be impacted through rainfall infiltration and flooding. Changes in precipitation rates and frequency can result in the drying out and cracking of materials which may affect structural stability and composition of the ground conditions. Prolonged dry periods can lead to cracking and more rapid deterioration of materials. Increased precipitation is likely to cause increased frequency and intensity of pluvial and fluvial flooding. Rain infiltration into electrical components can cause corrosion, degradation and potentially failure. Snow and ice also have the potential to cause damage to all above-ground infrastructure.

Temperature

29.10.19 Project assets listed in **29.10.16** which are located above ground and externally may be sensitive to high and / or low temperature extremes through:

- Overheating of infrastructure, leading to greater demand for cooling;
- Overheating of electronic equipment;
- Deterioration of material structure and fabric;
- Damage to paved surfaces, including potential melting and deformation of surface asphalt; and
- Uncomfortable working conditions and increased risk of heat stress on personnel during O&M activities.

Relative Humidity

29.10.20 An increase in humidity has the potential to increase condensation within electrical equipment housing, corrosion and decay of metal surfaces as well as mould growth, mildew and staining.

Soil Moisture

29.10.21 Changes in precipitation (either increased or decreased) can alter the soil moisture content. This in turn can lead to movement of the ground through, for example, subsidence or shrinkage. Ancillary structures used for operation (separate to the tidal barrage) with shallow foundations can be susceptible to damage or destabilisation from ground movement. Buried electrical cables (installed for the grid connection) are considered sufficiently flexible to

accommodate movements due to shrink / swell and are typically located at depths where little movement takes place (UK Climate Risk, 2023).

Wind and Storms

29.10.22 High winds and storms could affect the integrity of the tidal barrage, buildings and ancillary equipment. High winds can also cause wind-driven rain infiltration into plant, building materials and surfaces affecting all aspects of the Project's above-ground infrastructure, which can increase maintenance costs and operational disruption. High winds can also cause extreme wave heights and storm surges affecting all aspects of the Project assets. Seawater from waves and spray has a high salt content and therefore corrosive to some materials used in the Project assets, particularly metal elements.

Sea Level Rise and Flood Risk

29.10.23 The Project will be impacted by sea level risk and flood risk. The most significant change in the future baseline condition is therefore likely to be associated with an increase in sea level associated with the potential effects of climate change.

29.10.24 **Table 29-15** presents the assessment of vulnerability of the Project during the O&M phase. This takes into account the exposure (based on current and future baseline conditions, as defined in **Section 29.8**) and sensitivity taking into account any design, mitigation and enhancement measures addressed in **Section 29.10**. Variables identified as having a medium or high vulnerability are identified as having potential to result in likely significant effects. **Table 29-16** presents the list of potential impacts related to the climate variables scoped into the assessment. These impacts will be assessed within the PEIR / ES.

Table 29-15: Vulnerability assessment for the operation and maintenance phase

Receptor	Climate variable	Associated hazard	Exposure	Sensitivity	Vulnerability
Tidal barrage.	Precipitation	Change in annual average.	Medium	Low	Low
		Drought	Medium	Low	Low
		Extreme precipitation events (flooding).	Medium	Low	Low
	Temperature	Change in annual average.	Medium	Low	Low
		Extreme temperature events.	Medium	Moderate	Medium
	Humidity	Changes in annual average.	Medium	Moderate	Medium

Receptor	Climate variable	Associated hazard	Exposure	Sensitivity	Vulnerability
	Soil moisture.	Changes in annual average leading to shrink swell in some soils.	Low	Low	Low
	Wind	Gales and high winds.	High	High	High
		Storms and lightning.	High	High	High
		Extreme wave heights and storm surges.	High	High	High
	Sea level rise.	Higher sea level.	High	High	High
Ancillary Buildings.	Precipitation	Change in annual average.	Medium	Low	Low
		Drought	Medium	Low	Low

Receptor	Climate variable	Associated hazard	Exposure	Sensitivity	Vulnerability
		Extreme precipitation events (flooding).	Medium	High	Medium
	Temperature	Change in annual average.	Medium	Low	Low
		Extreme temperature events.	Medium	High	High
	Humidity	Changes in annual average.	Medium	Low	Low
	Soil moisture.	Changes in annual average leading to shrink swell in some soils.	Medium	Moderate	Medium
	Wind	Gales and high winds.	High	Moderate	Medium

Receptor	Climate variable	Associated hazard	Exposure	Sensitivity	Vulnerability
		Storms and lightning.	High	Moderate	Medium
		Extreme wave heights and storm surges.	Medium	High	Medium
	Sea level rise	Higher sea level.	Medium	High	Medium
Ancillary equipment.	Precipitation	Change in annual average.	Medium	Low	Low
		Drought	Medium	Low	Low
		Extreme precipitation events (flooding).	Medium	Low	Low
	Temperature	Change in annual average.	Medium	Low	Low

Receptor	Climate variable	Associated hazard	Exposure	Sensitivity	Vulnerability
		Extreme temperature events.	Medium	Moderate	Medium
	Humidity	Changes in annual average.	Low	Moderate	Medium
	Soil moisture.	Changes in annual average leading to shrink swell in some soils.	Low	Low	Low
	Wind	Gales and high winds.	High	High	High
		Storms and lightning.	High	High	High
		Extreme wave heights and storm surges.	Medium	Moderate	Medium
	Sea level rise.	Higher sea level.	Medium	Moderate	Medium

Receptor	Climate variable	Associated hazard	Exposure	Sensitivity	Vulnerability
Grid connection.	Precipitation	Change in annual average.	Low	Low	Low
		Drought	Medium	Low	Low
		Extreme precipitation events (flooding).	Medium	Moderate	Medium
	Temperature	Change in annual average.	Low	Low	Low
		Extreme temperature events.	Low	Medium	Low
	Humidity	Changes in annual average.	Low	Low	Low
	Soil moisture.	Changes in annual average leading to	Medium	Moderate	Medium

Receptor	Climate variable	Associated hazard	Exposure	Sensitivity	Vulnerability
		shrink swell in some soils.			
	Wind	Gales and high winds.	Low	Low	Low
		Storms and lightning.	Low	Low	Low
		Extreme wave heights and storm surges.	Low	Low	Low
	Sea level rise.	Higher sea level.	Low	Low	Low
End users	Precipitation	Change in annual average.	Low	Low	Low
		Drought	Medium	Low	Low
		Extreme precipitation events (flooding).	Medium	Moderate	Medium

Receptor	Climate variable	Associated hazard	Exposure	Sensitivity	Vulnerability
	Temperature	Change in annual average.	Medium	Low	Low
		Extreme temperature events.	High	High	High
	Humidity	Changes in annual average.	Low	Moderate	Low
	Soil moisture.	Changes in annual average leading to shrink swell in some soils.	Low	Low	Low
	Wind	Gales and high winds.	High	High	High
		Storms and lightning.	High	High	High

Receptor	Climate variable	Associated hazard	Exposure	Sensitivity	Vulnerability
		Extreme wave heights and storm surges.	High	High	High
	Sea level rise.	Higher sea level.	Low	Moderate	Low

29.10.25 The results of the vulnerability assessment for operation phase show that 'medium' and 'high' vulnerabilities have been identified for the following receptors and climate variables:

- Tidal barrage: Extreme temperature events; changes in humidity; wind (gales, high winds, extreme wave height, storms and lightning); and sea level rise;
- Ancillary buildings: Extreme precipitation (flooding); changes in soil moisture; extreme temperature events; wind (gales, high winds, extreme wave height, storms and lightning); and sea level rise;
- Ancillary equipment: Extreme temperature events; wind (gales, high winds, extreme wave height, storms and lightning); changes in humidity and sea level rise;
- Grid connection: Extreme precipitation (flooding and subsequent erosion) and changes in soil moisture; and
- End users: Extreme precipitation; extreme temperature events and wind (gales, high winds, extreme wave height, storms and lightning).

29.10.26 As stated previously, variables with a 'low' vulnerability are not anticipated to result in any likely significant effects and are not carried forward for further assessment.

Decommissioning

29.10.27 As detailed in **Chapter 2: Site Context and Project Description**, a Decommissioning Plan (including environmental management) will be prepared at the appropriate time to consider the potential risks of decommissioning the relevant elements of the Project.

29.10.28 Potential significant impacts associated with decommissioning would likely be similar to those listed for construction above. However, given the 120 year design life of the Project, climate projections currently do not extend beyond the end of this century. As such, the decommissioning phase has been scoped out of the EIA as further assessment would be required to identify impact of climate change on the decommissioning phase at that time.

Potential Impacts from Scoped in Climate Variables

29.10.29 The potential impacts associated with the O&M phase are shown in **Table 29-16**. Receptors associated with the associated hazards are identified and potential impacts detailed in accordance with professional judgement and experience on past projects of similar magnitude and purpose.

Table 29-16: Potential impacts associated with scoped in climate variables

Receptor	Climate hazard	Potential impacts
Tidal barrage.	Extreme temperature events.	Degradation of surfaces due to melting or deformation, such as the active travel links. Overheating of mechanical components resulting in loss of function or services.
	Gales, high winds, extreme wave height, storms and lightning.	Increased volumes of debris within the Mersey Estuary with the potential to cause damage to turbines. Power outages causing disruption to services. Damage to mechanical components which become submerged through increased wave height, storm surge or sea level rise. Corrosion of materials through impacts of ocean acidification.
	Humidity.	Increase condensation, corrosion and decay of metal surfaces as well as mould growth, mildew and staining.
	Sea level rise.	Overtopping of the barrage bank connections and breakwaters resulting in flooding and damage. Drainage infrastructure becomes overwhelmed and ineffective resulting in flooding and damage.
Ancillary buildings.	Extreme precipitation.	Water ingress causing structural damage to the buildings.

Receptor	Climate hazard	Potential impacts
		Water ingress casing damage to critical items within the buildings (e.g. control panels, emergency communication networks). Flooding of buildings from surface water or overwhelmed drainage, resulting in damage.
	Extreme temperature events.	Melting and deformation of building materials. Colder temperature could result in frozen pipework, or increased brittleness of materials.
	Changes in annual average leading to shrink swell in some soils.	Shrink swell processes leading to structural instability of building foundations.
	Gales, high winds, extreme wave height, storms and lightning.	Damage to building structure (such as cladding, façade or roofing). Power outages causing disruption to services.
	Sea level rise.	Drainage infrastructure becomes overwhelmed and ineffective resulting in flooding and damage.
Ancillary equipment.	Extreme temperature events.	Overheating of electronic components resulting in loss of function or services.
	Gales, high winds, extreme wave height, storms and lightning.	Damage to ancillary equipment.

Receptor	Climate hazard	Potential impacts
		Power outages causing disruption to services. Damage to electrical components which become submerged through increased wave height, storm surge
	Humidity.	Increased condensation, corrosion and decay of metal surfaces as well as mould growth, mildew and staining.
	Sea level rise.	Damage to electrical components which become submerged through sea level rise.
Grid connection.	Extreme precipitation.	Flooding and subsequent erosion of soils exposing underground cables.
	Changes in soil moisture.	Shrink swell in soils causing instability if cabling is not of a sufficient depth.
End users.	Extreme precipitation.	Surface water flooding prevent access / egress to the Project.
	Extreme temperature events.	Increased occurrence of heat stress.
	Gales, high winds, extreme wave height, storms and lightning.	Unsafe conditions for users of active travel or maintenance staff.

29.10.30 In addition to the impacts identified in **Table 29-16**, the assessment of In-combination Climate Impacts (ICCI) will be scoped in for the operational phase.

29.10.31 The ICCI assessment is informed by the future climate baseline and considers the receptors within the surrounding environment that would be impacted by the

Project in combination with future climatic conditions. The ICCI will be captured within the relevant topic as part of the ES assessment.

Impacts scoped Out of assessment

29.10.32 Based on the outputs of the vulnerability assessment, the following climate variable and receptors have been scoped out from further assessment, on the basis that they will not result in likely significant effect.

29.10.33 The construction phase has been scoped out for all climate variables due to low exposure from baseline and the presence of embedded measures comprised in the CEMP.

29.10.34 During operation, the potential for significant effects to arise from the following were considered low vulnerability and therefore are scoped out:

- Precipitation, changes in annual temperature and soil moisture for the Tidal Barrage and the Ancillary equipment;
- Change in annual precipitation, drought, change in annual temperature and humidity for the ancillary buildings;
- Changes in annual and extreme temperature, drought, humidity, wind events and sea level rise for the grid connection; and
- Change in annual precipitation, drought, change in annual temperature, humidity, soil moisture and sea level rise for end users.

29.10.35 The decommissioning phase has been scoped out on the basis that a Decommissioning Plan will be developed at the time of decommissioning and will consider the impacts of climate change within that plan.

29.11 CUMULATIVE EFFECTS

29.11.1 For Climate Change Resilience, the receptor is the Project which has no commonality with other topics. As such, no assessment of cumulative effects will be undertaken.

29.11.2 To reiterate, the ICCI assessment is undertaken by assessing how identified receptors in the surrounding environment are affected by future climate parameters, informed by the future climate baseline. Inclusion of an ICCI assessment has been scoped in, but this will be addressed at PEIR or ES stage and captured within the relevant chapters as part of the assessments for their environmental topics. The ICCI assessment will identify if any reported effects will be exacerbated or ameliorated by the effects of climate change and identify

further mitigation where required. It will also assess whether the embedded measures will continue to be effective considering changes to climate.

29.12 TRANSBOUNDARY EFFECTS

29.12.1 No effects on climate change resilience receptors are likely to be transboundary. Due to the localised nature of the potential impacts, transboundary effects are considered unlikely to occur and therefore are not considered further.

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30 MATERIALS AND WASTE

30.1 INTRODUCTION

30.1.1 The Materials and Waste Chapter will consider the potential likely significant effects on the consumption of material resources, and generation and disposal of waste that may arise from the construction, operation and maintenance (O&M) and decommissioning activities of the Project. These receptors include material resources and landfill void capacity. This section of the Scoping Report describes the methodology to be used within the Environmental Impact Assessment (EIA), an overview of the baseline conditions within the Scoping Boundary (as defined in **Chapter 1: Introduction**), the datasets to be used to inform the EIA, the potential likely significant effects to be considered, and how these will be assessed for the purposes of the EIA.

30.1.2 Impacts from Material and Waste interfaces with other aspects and as such, should be considered alongside these, namely:

- **Chapter 5: Coastal Processes**: Dredging will be required to facilitate the installation of the main structures, while regular maintenance dredging will be required during the operation of the tidal barrage. The impacts of dredging and disposal and the suitability of sediment for reuse and disposal in ecological areas will be evaluated as part of the Hydro Dynamic Modelling and Coastal Processes assessment.
- **Chapter 16: Shipping and Navigation**: Given the intention to predominantly use marine based logistics for the delivery of construction materials and equipment required during the construction phase of the Project, this will have impacts associated with marine transportation and navigation. The reuse of marine dredging materials during the construction phase will also have impacts associated with marine transportation and navigation. These will be evaluated as part of the Shipping and Navigation assessment.
- **Chapter 19: Water Resources and Flood Risk**: During construction of the Project, there is the potential to encounter contaminated site arisings which may have impacts and effects on controlled waters. These will be evaluated as part of the Water Resources and Flood Risk assessment.
- **Chapter 21: Air Quality**: The types and quantities of construction materials and waste generated required during the construction phase of the Project will have impacts associated with emissions to air and transportation. These will be evaluated as part of the Air Quality assessment.

- **Chapter 22: Onshore Noise and Vibration**: The types and quantities of construction materials required during the construction phase of the Project will have onshore noise and vibration impacts associated with their transportation. The waste generated and disposed will also have onshore noise and vibration impacts associated with waste transportation. These will be evaluated as part of the Onshore Noise and Vibration assessment.
- **Chapter 23: Geology and Ground Conditions**: During construction of the Project, there are likely to be contaminated site arisings which will have impacts and effects on human health. These will be evaluated as part of the Geology and Ground Conditions assessment.
- **Chapter 24: Terrestrial Traffic and Transport**: The types and quantities of construction materials required during the construction phase of the Project will have impacts associated with their terrestrial transportation. The waste generated and disposed during the construction phase of the Project will also have impacts associated with waste transportation from the site. These will be evaluated as part of the Terrestrial Traffic and Transport assessment.
- **Chapter 28: Greenhouse Gases**: Materials consumed during the construction phase of the Project will have embodied carbon emissions associated with their manufacture and transportation. The waste generated and disposed during the construction will also have embodied carbon emissions associated with their transportation. The GHG emissions will be evaluated as part of the GHG assessment.

30.1.3 Overarching relevant legislation and policy context which has informed the scope of the assessment is outlined in **Chapter 4: Planning Policy,** with topic specific considerations outlined in **Appendix 4.1**.

30.2 STUDY AREA

30.2.1 The Study Areas that are applicable to the Project (as defined in the IEMA Guide) are:

- The development study area (the Scoping Boundary comprising the Tidal Barrage Development Area, Grid Connection Development Area, and Marine and Port Facilities). This comprises the extent of works within the application site, including areas required for temporary access, site compounds, working platforms and other enabling activities.
- The Project falls within the jurisdiction of six local authorities collectively known as the Liverpool City Combined Authority: Halton Borough Council;

Knowsley Council; Liverpool City Council; Sefton Council; St Helens Borough Council; and Wirral Council; as well as Cheshire West and Chester.

- Where data are available, the expansive study area extends to the availability of construction materials and the capacity of waste management facilities within the region where the Project is located. The expansive study area is North West England, which comprises the local authority areas of Cheshire, Cumbria, Greater Manchester, Lancashire, Merseyside, Warrington, and Halton[30]. For context, data for the UK is also provided.

30.3 CONSULTATION

30.3.1 No consultation has been undertaken for the development of the materials and waste scoping chapter. Stakeholder consultation is not typically required to carry out the materials and waste assessment as the data to inform the baseline is publicly available, and the methodology follows best practice guidance. The assessment will take into account any issues relating to the assessment of materials and waste identified in a Scoping Opinion response from the relevant Planning Authority.

30.4 ASSESSMENT METHODOLOGY

30.4.1 The Project-wide approach to the assessment methodology is set out in **Chapter 3: Approach to EIA**. This will be implemented to assess the likely significant effects on the consumption of material resources, and generation and disposal of waste from the construction, O&M, and decommissioning of the Project.

30.4.2 For the materials and waste assessment, the IEMA Guide [30] will be used to assess the potential impacts and effects from the Project, using the process and significance criteria it sets out. It is anticipated that Method W1 (Void Capacity, as detailed in the IEMA Guide) will be used to best reflect the scale and nature of the Project.

30.4.3 In accordance with the IEMA Guide, the assessment will be a quantitative exercise that aims to identify the following:

- The type and volume of materials to be consumed by the Project during construction, including details of any recycled materials content;

[30] The Local Authority areas align with the Environment Agency Waste Data Interrogator tool used to inform the baseline of this chapter.

- The type and volume of waste to be generated by the Project during construction, with details of planned recovery and / or disposal method (for example on-site reuse, off-site recycling, disposal to landfill);
- The cut and fill balance; and
- Details of any construction materials to be specified, where sustainability credentials (particularly those that improve resource efficiency) afford performance beyond expected industry standards.

30.4.4 The sensitive receptors that will be incorporated into the assessment are:

- Material resources – consumption impacts on their immediate and long term availability, resulting in depletion of natural resources; and
- Landfill void capacity – reductions in regional and national infrastructure, resulting in unsustainable use or loss of resources and temporary or permanent degradation of the natural environment.

30.4.5 The impacts from the Project during the construction phase that would be considered in the assessment include:

- Anticipated reductions in availability (stocks, production and / or sales) of materials regionally and nationally; and
- Anticipated reductions in the landfill void capacity of regional and national infrastructure.

30.4.6 The likely types and estimated quantities of construction material resources required (including site arisings generated) for the Project will be assessed. Impacts and effects will be evaluated against data for the regional and national materials markets, where information is available.

30.4.7 The likely types and estimated quantities of construction waste to be generated by the Project will be assessed. Impacts will be evaluated against the capacity of regional (or where justified, national) waste management infrastructure.

SENSITIVITY

30.4.8 The criteria for assessing sensitivity of materials and waste is set out in **Table 30.1**.

Table 30-1: Materials and Waste Sensitivity Criteria

Sensitivity	Materials criteria On balance, the key materials required for the construction of the Project…	Inert and non-hazardous waste criteria Landfill void capacity is expected to…	Hazardous waste criteria Landfill void capacity is expected to…
Negligible	Are forecast (through trend analysis and other information) to be free from known issues regarding supply and stock; **and /or** are available comprising a very high proportion of sustainable features and benefits compared to industry-standard materials*	...remain unchanged, or is expected to increase through a committed change in capacity.	...remain unchanged, or is expected to increase through a committed change in capacity.
Low	Are forecast (through trend analysis and other information) to be generally free from known issues regarding supply and stock; **and / or** are available comprising a high proportion of sustainable features and benefits compared to industry-standard materials.	...reduce minimally: by <1% as a result of wastes forecast.	...reduce minimally: by <0.1% as a result of wastes forecast.
Medium	Are forecast (through trend analysis and other information) to suffer from some potential issues regarding supply and stock; **and / or** are available comprising some sustainable	...reduce noticeably: by 1-5% as a result of wastes forecast.	...reduce noticeably: by 0.1-0.5% as a result of wastes forecast.

Sensitivity	Materials criteria On balance, the key materials required for the construction of the Project…	Inert and non-hazardous waste criteria Landfill void capacity is expected to…	Hazardous waste criteria Landfill void capacity is expected to…
	features and benefits compared to industry-standard materials.		
High	Are forecast (through trend analysis and other information) to suffer from known issues regarding supply and stock; **and / or** comprise little or no sustainable features and benefits compared to industry-standard materials.	...reduce considerably: by 6-10% as a result of wastes forecast.	...reduce considerably: by 0.5-1% as a result of wastes forecast.
Very High	Are known to be insufficient in terms of production, supply and/or stock; **and / or** comprise no sustainable features and benefits compared to industry-standard materials.	... reduce very considerably (by>10%); end during construction or operation; is already known to be unavailable; or, would require new capacity or infrastructure to be put in place to meet forecast demand.	... reduce very considerably (by >1%); end during construction or operation; is already known to be unavailable; or, would require new capacity or infrastructure to be put in place to meet forecast demand.
Notes	* Subject to supporting evidence, sustainable features and benefits could include, for example, materials or products that: ■ Comprise reused, secondary or recycled content (including excavated and other arisings); ■ Support the drive to a circular economy; or ■ In some other way reduce lifetime environmental impacts.		

MAGNITUDE

30.4.9 **Table 30.2** sets out the criteria for assessing magnitude of materials and waste. For the purposes of the assessment, Method W1 (void capacity) as set out in the IEMA Guide, will be used.

Table 30-2: Materials and Waste Magnitude Criteria

Magnitude	Materials Criteria The assessment of the Project is made by determining whether the consumption of…	Inert and non-hazardous waste criteria The percentage depletion of remaining landfill void capacity	Hazardous waste criteria The percentage depletion of remaining landfill void capacity
No change	...no materials are required.	Zero waste generation and disposal from the development.	Zero waste generation and disposal from development.
Negligible	...no individual material type is equal to or greater than 1% by volume of the regional* baseline availability.	Waste generated by the development will reduce regional* landfill void capacity baseline[$] by <1%.	Waste generated by the development will reduce national landfill void capacity baseline[$] by <0.1%
Minor	...one or more materials is between 1-5% by volume of the regional* baseline availability; **and / or** the development has the potential to adversely and substantially[#] impact access to one or more allocated mineral site (in their entirety), placing their future use at risk.	Waste generated by the development will reduce regional* landfill void capacity baseline[$] by 1-5%.	Waste generated by the development will reduce national landfill void capacity baseline[$] by <0.1-0.5%

Magnitude	Materials Criteria The assessment of the Project is made by determining whether the consumption of…	Inert and non-hazardous waste criteria The percentage depletion of remaining landfill void capacity	Hazardous waste criteria The percentage depletion of remaining landfill void capacity
Moderate	...one or more materials is between 6-10% by volume of the regional* baseline availability; **and / or** one allocated mineral site is substantially# sterilised by the development rendering it inaccessible for future use.	Waste generated by the development will reduce regional* landfill void capacity baseline$ by 6-10%.	Waste generated by the development will reduce national landfill void capacity baseline$ by <0.5-1%
Major	...one or more materials is >10% by volume of the regional* baseline availability; **and / or** more than one allocated mineral site is substantially# sterilised by the development rendering it inaccessible for future use.	Waste generated by the development will reduce regional* landfill void capacity baseline$ by >10%.	Waste generated by the development will reduce national landfill void capacity baseline$ by >1%
Notes	* or where justified, national. # justified using professional judgement, based on the scale and nature of the allocated mineral site being assessed. $ forecast as the worst-case scenario, during a defined construction phase.		

SIGNIFICANCE CRITERIA

30.4.10 The outputs of comparing sensitivity against magnitude will be assessed against the significance of effects matrix provided within Section 10 of the IEMA Guide, replicated in **Table 30.3**.

Table 30-3: Matrix to assign Significance of Effect Category

		Sensitivity of receptor				
		Negligible	**Low**	**Medium**	**High**	**Very high**
Magnitude of impact	No change.	Neutral	Neutral	Neutral	Neutral	Neutral
	Negligible	Neutral	Neutral or slight.	Neutral or slight.	Slight	Slight
	Minor	Neutral or slight.	Neutral or slight.	Slight	Slight or moderate.	Slight or moderate.
	Moderate	Neutral or slight.	Slight	Moderate	Moderate or Large.	Large or Very Large.
	Major	Slight	Slight or moderate.	Moderate or Large.	Large or Very Large.	Very Large.

Effect threshold

30.4.11 Effects that are classified as moderate, large or very large are considered to be significant, for both materials and waste.

30.4.12 Effects classified as slight or neutral are considered to be not significant in either case.

30.5 BASELINE CONDITIONS

DATA INFORMATION SOURCES

30.5.2 An initial desk based review has been undertaken of publicly available data sources outlined in **Table 30.4** to determine the baseline character of the study area and inform the assessment process.

Table 30-4: Key sources of data for material resource availability, landfill capacity and waste recovery

Source	Date	Summary	Coverage of Study Area
Department for Business and Trade, Building Materials and Components statistics (DBEIS, 2024).	May 2024.	Provides information on selected building materials and contains monthly data on price indices, bricks, cement and concrete blocks; and quarterly data on sand and gravel, slate, concrete roofing tiles and ready-mixed concrete.	UK
Mineral Products Association, Profile of the UK Mineral Products Industry (Mineral Production Association, 2023).	2023	The report explores the individual profile of the materials produced by the industry, and which are part of the MPA family. It sheds light on the national and regional distribution of production, and the key drivers of demand and supply.	UK
StatsWales, Iron and Steel Production by Year, Measure and Area [31].	April 2024.	This dataset gives information on iron production, steel production and manpower in the iron and steel industry for Wales and the UK since 1975.	UK
North West Aggregates Working Party Annual Monitoring Report 2021	May 2022.	The Annual Monitoring Report provides information on	Cheshire East; Cheshire West and Chester; Cumbria;

Source	Date	Summary	Coverage of Study Area
(North West Aggregates Working Party, 2022).		aggregates in the North West of England so that the North West Aggregate Working Party can contribute to the monitoring of the Managed Aggregate Supply System and assess whether the North West of England is making a full contribution towards meeting both national and local aggregate needs.	Greater Manchester, Merseyside and Halton and Warrington; Lancashire.
Minerals Safeguarding Guidance note (Cheshire West and Chester Council, No Date).	No Date.	The document provides guidance on the safeguarding of minerals and identifies the minerals policies that may be applicable to non-mineral development.	Cheshire West and Chester.
Liverpool Local Plan 2013 -2033 (Liverpool City Council, 2022)..	January 2022.	The Local Plan provides a long-term spatial vision, strategic priorities and policies for future development in the city over the next 15 to 20 years, specifically with regard to the quantity and location of new homes, employment provision, shops, facilities and other services, transport and other infrastructure	Liverpool City

Source	Date	Summary	Coverage of Study Area
		provision, climate change mitigation and adaption and the conservation and enhancement of the natural and historic environment.	
Wirral Local Plan 2021-2037 (Wirral Council, 2022).	2022	Provides a strategy for the supply of minerals and waste sites in the borough as well as more detailed policies focused on restoration and minerals safeguarding processes	Wirral Council
2022 Waste Data Interrogator (Environment Agency, 2024a).	May 2024.	Provides data of waste received at permitted sites; waste removed from permitted sites and summary tables for England.	UK
Remaining Landfill Capacity (Environment Agency, 2024b).	March 2024.	Provides information of remaining landfill capacity by site in England at the end of the calendar year.	UK

EXISTING BASELINE

30.5.3 This section of the Materials and Waste chapter describes baseline material consumption and waste disposal for the current land use. It also provides regional and national information and data in the context of which environmental assessment can be undertaken.

MATERIALS

Materials Currently Required

30.5.4 The existing land use within the Scoping Boundary comprises urban areas (including port facilities, recreational and cultural facilities, industrial establishments, residential areas, and active travel routes and stations) and rural areas (mainly agricultural). The types of material that are expected to be required for these assets currently present within the Scoping Boundary comprise (mainly) aggregate, concrete, steel – their use would be associated with routine maintenance and repair works, particularly within the urban environment.

30.5.5 Although no data is currently available, professional judgement can be used to assert that by comparison with regional and national availability of resources, consumption of construction and other materials for routine activities currently required within the current land uses, is minimal.

Material Resource Availability

30.5.6 **Table 30.5** provides a summary of the availability of the main construction materials in North West England and the UK. The materials listed are considered to be appropriate to the bulk construction materials required for the Project. The overview excludes technological products but provides a proportionate context in which the assessment of impacts and significant effects from material consumption can be undertaken.

Table 30-5: Construction materials availability in the North West of England and the UK

Material Type	North West England	UK
Production of sand and gravel (Mineral Production Association, 2023).	1.9 million tonnes (Mt) (2022)	52.1Mt (GB) (2022)
Production of crushed rock (Mineral Production Association, 2023).	7.2Mt (2022)	116.1Mt (GB) (2022)
Production of primary aggregate (Mineral Production Association, 2023).*	9.1Mt (2022)	191.1Mt (UK) (2022)
Recycled and secondary aggregate.	0.09Mt (2020) (sales of)[5]	69.6Mt (GB) (2021) (production of)[3]

Material Type	North West England	UK
Production of Concrete blocks (DBEIS, 2024)	25.0Mm^2 (North) (2023)	60.7Mm^2 (GB) (2023)
Ready-mix concrete (Mineral Production Association, 2023).	0.7Mm^3 (2022) (sales of)	21.1Mm^3 (UK) (2022) (production of)
Production of Steel (StatsWales, 2024).	(No data).	6.0Mt (UK) (2022)
Asphalt (Mineral Production Association, 2023).	2.1Mt (2022) (sales of).	26.8Mt (UK) (2022) (production of).
* The data for Primary Aggregates comprises crushed rock and sand and gravel. The UK figure for primary aggregates includes Northern Ireland, whereas the data for crushed rock and sand and gravel excludes Northern Ireland. Where the data format (production or sales) differs between regional and country wide data, this has been stated in brackets. Data availability: as stated in brackets GB: Great Britain (England, Wales and Scotland) figures used where UK figures (including Northern Ireland) are unavailable.		

30.5.7 Across the North West of England and the UK, the availability of construction materials typically required for construction schemes, indicates that stocks / production / sales remain buoyant.

30.5.8 The Wirral Local Plan, the Liverpool Local Plan, the Chester West and Cheshire Council Mineral Safeguarding Note, the Halton Local Plan, the Knowsley Local Plan, the Sefton Local Plan and the St Helens Local plan all detail the location of existing mineral activity and safeguarded areas for future minerals extraction. The area within the Scoping Boundary does not overlay any of these defined mineral safeguarding areas for the extraction of minerals. Moreover, the Liverpool Local Plan notes that there are no remaining workable deposits of minerals for commercial extraction in Liverpool. Should any reserves be present, these are already sterilised by the existing infrastructure.

WASTE

Waste Generation and Disposal

30.5.9 The existing land use within the Scoping Boundary is expected to generate minimal volumes of site arisings and waste for disposal to landfill, given the

nature of the predominantly urban environment (port facilities, recreational / cultural facilities, residential and industrial establishments, and active travel route / stations). Some minimal quantities of waste may be generated (such as packaging and general litter) which may require disposal to landfill. Regular maintenance dredging within the Tidal Barrage Development Area is currently managed and disposed at licensed offshore marine disposal facilities.

Waste Recovery Infrastructure and Remaining Landfill Capacity

30.5.10 Data from the latest Environment Agency Wast Data Interrogator (Environment Agency, 2024a) demonstrates that in 2022, the North West of England had 1,036 waste recovery sites which diverted 81% (6,448,966 tonnes) of waste from landfill. Data include the total waste received from both within the subject region and from other regions in the UK. The recovery rates demonstrate that there is infrastructure available to aid in the diversion of waste from landfill.

30.5.11 The latest data from the Environment Agency (Environment Agency, 2024b) for the North West of England confirms that in 2022 there was 31.2 Mm^3 (million cubic metres) of remaining landfill capacity. Data in **Table 30.6** summarise this information by landfill type.

Table 30-6: Remaining landfill capacity in the North West of England

Landfill Type	Remaining capacity (2022, Mm^3)
Non-inert (includes hazardous and non-hazards waste).	25.5
Inert	5.7
Total	31.2

30.5.12 In the absence of future provision, landfill capacity will become an increasingly sensitive receptor throughout the duration of the construction phase and into operation. As such, diverting waste from landfill through waste avoidance, re-use, recycling and recovery will be an important measure to implement for the Project. As it is known that there is no non-landfill capacity within the Liverpool City Region area – and only limited inert landfill capacity, the importance of diverting waste from landfill becomes even more significant. This is because it will limit waste materials being transported potentially significant distances across the North West region, for final management / disposal.

30.6 FUTURE BASELINE

30.6.1 In the future baseline and in the absence of the Project, it is considered that the current land use within the Scoping boundary will remain the same. As such, the consumption of materials resources and disposal of waste to landfill will remain minimal in the context of regional and national availability.

30.7 BASIS FOR SCOPING ASSESSMENT

30.7.1 The materials and waste scoping assessment is based on the following key assumptions which are also set out in **Chapter 2: Site Context and Project Description**:

- The construction phase for the tidal barrage will be contained mainly within the marine environment, with additional terrestrial works associated with installation of an onward connection to the grid. It is understood that the Lister Drive connection cables will be installed within existing cable routes and tunnels located beneath the ground. However, either new cable routes will be required to connect to existing substations or reinforcement / restringing on existing infrastructure.
- Dredging materials will primarily be reused in the caissons and for ecological enhancement, or disposed at licensed offshore marine disposal facilities, in accordance with existing practice. It is not anticipated that any dredged arisings will be disposed to landfill during construction or operation.
- The tidal barrage will be decommissioned at the end of its operational lifespan (either prior to or at 120 years). It is recognised that wholesale decommissioning is not appropriate for the Project given the proposed length of operational life and it is expected that any below ground structures will be left in-situ, including piles, pipework, and grid connections cables.
- The assessment of materials and waste is based upon the validity of the collated information, regarding the resources that are expected to be consumed and the waste generated and disposed of during the ‘in scope’ lifecycle phases of the Project.
- A lifecycle assessment (including embodied carbon and water) of materials has not been included, as the effort and resources required to complete such an exercise are deemed disproportionate to the benefit they would offer the assessment of significance of effects. Furthermore, many of the elements assessed within a lifecycle assessment are not directly relevant to the goals of this chapter. Embodied carbon (as part of a whole life carbon assessment) is assessed in **Chapter 28: Greenhouse Gases** of this report.

- Impacts and effects associated with the extraction of raw resources and the manufacture of products for the Project have not been included, as these cannot be assured with any accuracy and are subject to separate environmental consent and permitting processes.
- Impacts and effects from the transportation of material resources and waste to and from the Project are not included, as these are considered as part of **Chapter 16: Shipping and Navigation, Chapter 21: Air Quality, Chapter 22: Onshore Noise and Vibration, Chapter 24: Terrestrial Traffic and Transport and Chapter 28: Greenhouse Gases** – as appropriate to these specialist topics.
- Potential effects from marine disposal of dredged sediment are not included, as it is assumed that, unless otherwise specified, sediment of appropriate quality will be disposed at existing licensed offshore disposal sites or used in an ecological enhancement project which have already undergone rigorous environmental assessments (with contaminated sediment to be treated in accordance with regulatory requirements). These are considered as part of **Chapter 5: Coastal Processes**.
- Impacts and effects on human health and controlled waters as a result of contaminated site arisings from the Project are not included, as these are considered in **Chapter 23: Geology and Ground Conditions and Chapter 19: Water Resources and Flood Risk** as appropriate to that specialist topic, and within the **Health Impact Assessment (Appendix 3.5)**.

30.8 EMBEDDED ENVIRONMENTAL MEASURES

30.8.1 Embedded mitigation measures have been identified and are proposed to be adopted as part of the evolution of the Project design (embedded into the Project design). These measures will evolve over the development process as the EIA progresses and in response to consultation. They will be fed iteratively into the assessment process. These measures typically include those that have been identified as good or standard practice and include actions that would be undertaken to meet existing legislation requirements.

30.8.2 As there is a commitment to implementing these environmental measures, and also to various standard sectoral practices and procedures, they are considered inherently part of the design of the Project and have, therefore, been considered in the scoping assessment.

30.8.3 In addition to the specific embedded mitigation measures relevant to Materials and Waste listed in **Table 30.7**, mitigation measures will be developed as part of

the DCO process following consultation and in discussion with the Project design team.

Table 30-7: Relevant embedded environmental measures

ID	Mitigation Measures embedded into the project design	How the measure will be secured
OM1	The Applicant intends to use predominantly marine based logistics for the delivery of materials and equipment, thereby minimising the requirement for terrestrial logistics as far as possible.	To be included within the Outline CEMP which will form part of the submission of the Environmental Statement with the DCO Application.
30-2	The Applicant is reviewing sustainability proposals during the construction phase, including consideration of design options for material types and quantities, and will confirm a target as part of the PEIR or ES.	Project Design will identify sustainability targets for the construction phase.
30-3	Where appropriate, construction materials will be sourced by marine activities such as existing port dredging activities or the reuse of construction phase dredging materials.	Project Design will optimise opportunities for reuse of dredging materials in construction elements.
30-4	A Waste Management Plan (WMP) will be prepared and included with the ES, which will also include the outline of a Materials Management Plan (MMP).	WMP and Outline MMP will form part of the submission of the ES.
30-5	Disposal of operational dredging materials will be within a marine disposal facility or may contribute to a marine enhancement project within the locality.	Disposal location will either be under control by the Applicant or under agreement with a third party.
OM10	A Decommissioning Plan (including environmental management) will be prepared to consider potential risks, details of marine infrastructure available and other routes for offsite removal of materials, and likely phasing of activities.	This will be prepared at the appropriate time at the end of the operational lifespan of the Project either prior to or at 120 years.

30.8.4 It is anticipated that the principles of circular practice and sustainable resource management (including designing out waste) - in the context of the Waste Hierarchy, relevant design, mitigation and enhancement measures will be identified in the ES. These are likely to include the adoption of Best Practicable means, such as those listed in **Table 30 8**.

30.8.5 In addition, lessons learnt, and opportunities identified on other similar nationally significant infrastructure projects will be researched and applied, where relevant.

Table 30-8: Potential design, mitigation and enhancement measures

Element	Description	Stage
Materials	Identification and specification of material resources that can be acquired responsibly, in accordance with BES 6001 Responsible Sourcing of Construction Products (BRE Group, 2022).	Design and construction.
	Design for resource optimisation: simplifying layout and form, using standard sizes, balancing cut and fill, maximising the use of renewable materials, and materials with recycled or secondary content, and setting net importation as a scheme goal.	Design
	Design for off-site construction: Maximising the use of pre-fabricated structures and components, encouraging a process of assembly rather than construction.	Design
	Design for the future: Considering how materials can be designed to be more easily adapted over an asset lifetime, and how deconstructability and demountability of elements can be maximised at end-of-first-life.	Design
	Design to incorporate products that can be leased or hired (Products as a Service), or digitalise elements of the works (in place of physical structures and assets).	Design
	Identify opportunities to minimise the export and import of material resources.	Design and construction.
	Manage engineering plan configurations and layouts to ensure the most effective use of materials and arisings can be achieved.	Design and construction.

Element	Description	Stage
	Implement a Materials Management Plan in accordance with the CL:AIRE Definition of Waste: Code of Practice (CL:AIRE, 2011).	Construction
Waste	Engage early with contractors to identify possible enhancement and mitigation measures, and to identify opportunities to reduce waste through collaboration and regional synergies.	Design and Procurement.
	Design for recovery and reuse: identifying, securing and using material resources at their highest value, whether they already exist on site, or are sourced from other schemes.	Design
	Ensure arisings are properly characterised before or during design, to maximise the potential for highest value reuse.	Design
	Forecast and identify the volume and type of woodland and other vegetative arisings that will be generated, and establish opportunities for high-value reuse and recycling, both on and off-site.	Design and construction.
	Working to a proximity principle, ensuring arisings generated are handled, stored, managed and reused or recycled as close as possible to the point of origin.	Design and construction.
	Identify areas for stockpiling and storing wastes that will minimise quality degradation and leachate, and will minimise damage and loss.	Design and construction.
	As part of a CEMP, specify management requirements for waste and arisings and capture information and data on site arisings recovered and diverted from landfill, by developing a Site Waste Management Plan once a preferred option has been selected.	Design

30.9 LIKELY SIGNIFICANT EFFECTS

30.9.1 In line with the EIA Regulations 2017, the EIA for the Project will consider those impacts where there is a risk of a likely significant effect only. The following Section draws on industry experience and expertise to identify those effect-receptor pathways that may potentially lead to a significant impact. Where

experience and available evidence indicates an effect-receptor pathway will not lead to a significant impact with regards to the EIA Regulations 2017 the pathway is scoped out from assessment.

30.9.2 The likely significant effects on materials and waste are summarised in **Table 30.9**. The scoping assessment is based on a combination of the Project definition at the scoping stage, embedded environmental measures, understanding of the baseline conditions at this stage, the evidence base for materials and waste effects, the identification of potentially impacted receptors, and professional judgement. The approach to this assessment is set out in **Section 30.6**.

30.9.3 The early identification of likely significant effects is used here as a tool aimed at delivering a proportionate approach to the EIA. In doing so, it sets out a high-level assessment of all potential effects, significant or not. The basis for scoping out certain effects, and therefore no longer considered is presented after the table, supported by evidence base.

Table 30-9: Likely significant materials and waste effects

Activity and Impact	Embedded Measures	Effect	Proposed approach to assessment (scoped in or scoped out)	Receptor	Further data baseline requirements
Construction Phase					
Adverse impact from consumption of material resources associated with the construction of the Project (e.g. concrete, bricks, steel).	Reuse material from dredging activities for construction within the Tidal Barrage Development Area, where possible.	Potentially significant adverse effect on the environment through the depletion of natural and non-renewable resources.	Scoped in.	Availability of key construction materials.	None
Adverse impact from disposal of waste generated during construction phase.	Management of waste to reduce disposal to landfill. Further detail is provided in Section 30.8.	Potential for significance adverse effects on remaining landfill capacity - considered a sensitive receptor in the UK. The potential for waste to be diverted from landfill through reuse of site arisings and recovery, recycling or treatment of waste will reduce the adverse effects on landfill capacity.	Scoped in.	Remaining landfill void capacity.	None

Activity and Impact	Embedded Measures	Effect	Proposed approach to assessment (scoped in or scoped out)	Receptor	Further data baseline requirements
Adverse impacts from dredging during construction phase.	Avoid disposal to landfill: Dredged arisings to be reused for construction within the Tidal Barrage Development Area, where possible. Surplus arisings to be disposed offshore.	No likely significant effects on remaining landfill capacity from dredging activities.	Scoped out.	Remaining landfill void capacity.	None
Operational Phase					
Adverse impacts from consumption of construction materials required for maintenance or repair works.	None confirmed.	No likely significant effects. It is considered that the quantities of materials likely to be required for these activities would be negligible.	Scoped out.	Availability of key construction materials.	None
Adverse impacts from the generation and disposal of waste during O&M.	None confirmed.	No likely significant effects. In line with current waste management regulations, it is expected that on-site welfare waste will be segregated and	Scoped out.	Remaining landfill void capacity.	None

Activity and Impact	Embedded Measures	Effect	Proposed approach to assessment (scoped in or scoped out)	Receptor	Further data baseline requirements
		managed for recycling where possible, with minimal quantities anticipated to require disposal to landfill.			
Dredging will be required in order to maintain continuous operation and navigation of the tidal barrage.	Disposal of operational dredging materials will be within a licensed marine disposal facility.	No likely significant effects.	Scoped out.	Remaining landfill void capacity.	No further action.
Decommissioning					
Adverse impacts from disposal of dismantled structures, plant and decommissioned equipment located above ground.	Decommissioning Plan. Further detail is provided in Section 30.8.	No likely significant effects.	Scoped out.	Remaining landfill void capacity.	N/A

IMPACTS SCOPED OUT OF ASSESSMENT

30.9.4 The following potential effects on materials and waste have been scoped out from further assessment, resulting from a conclusion of no likely significant effect. These conclusions have been made based on the knowledge of the baseline environment and the nature of planned works on the potential for impact from such projects more widely, using professional judgement or specific guidance criteria (where applicable). The conclusions follow (in a site based context) existing best practice. Each scoped out effect is considered in turn below:

- Potential effects from dredging activities for the Project during construction are scoped out, as these arisings are to be reused for construction within the Tidal Barrage Development Area, where possible. Surplus arisings are expected to be reused for ecological enhancement or disposed offshore at a licensed marine disposal facility. It is not intended to dispose of dredged material to landfill.
- Potential effects from consumption of material resources for the Project during operation are scoped out, as Operation phase activities of the Project are not anticipated to require consumption of material resources beyond those necessary for routine repair and maintenance. As such, the impacts associated with material resource consumption are considered to be minimal and not significant. This is therefore scoped out and does not require further assessment in the ES.
- Potential effects from disposal and recovery of waste associated with the Project during operation are scoped out, as operation of the Project is anticipated to generate negligible quantities of welfare and construction waste from staff and maintenance activities to landfill. It is expected that routine marine dredging will be managed by marine licensed disposal facility. This is therefore scoped out and does not require further assessment in the ES.
- Potential effects from consumption of material resources associated with decommissioning the Project are scoped out, as material resources are not anticipated to be required for decommissioning works. As such, the effects associated with material resource consumption are considered to be minimal and not significant. This is therefore scoped out and does not require further assessment in the ES.
- Potential effects from disposal and recovery of waste associated with the Project decommissioning are scoped out, as the design life of the Project is anticipated to be 120 years, after which the terrestrial ground structures will

be demolished and removed. It is expected concrete material will be crushed and other material such as metal will be sorted and recycled where possible; the turbines will be removed and sold or recycled. Below ground structures will be left in-situ, including piles, pipework, and cables. It is anticipated that the breakwaters will remain in-situ and erode over time through natural processes. A Decommissioning Plan is expected to be developed at the time of decommissioning and will consider the impacts of waste generated within that plan. This is therefore scoped out and does not require further assessment in the ES.

30.10 CUMULATIVE EFFECTS

30.10.1 Cumulative effects on material consumption and landfill capacity resulting from the effects of the Project and other developments will be assessed in accordance with the guidance and methodologies set out in **Chapter 3: Approach to EIA** and considering the other developments that have been screened in as part of the CEA screening exercise.

30.10.2 The following impacts from Project have the potential to act cumulatively with impacts from other developments to contribute to cumulative effects:

- Depletion of natural and non-renewable resources; and
- Reduction of available landfill void capacity.

30.11 TRANSBOUNDARY EFFECTS

30.11.1 Due to the localised nature of the potential impacts, transboundary effects are considered unlikely to occur and therefore are not considered further.

30.12 PROPOSED APPROACH TO ENVIRONMENTAL IMPACT ASSESSMENT

30.12.1 Further desk-based studies and analysis will be undertaken to review and update baseline information, identify and assess materials and waste receptors, in accordance with the prescribed assessment methodology.

30.13 REFERENCES

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31 CUMULATIVE EFFECTS

31.1 INTRODUCTION

31.1.1 The Environmental Impact Assessment (EIA) Regulations (HM Government, 2017) require that, in assessing the effects of a particular development, consideration should also be given to the Cumulative Effects that may arise from the Project in conjunction with other existing and / or approved developments within the same zone of influence (ZOI).

31.1.2 The Environmental Statement (ES) will assess the potential for significant cumulative environmental effects as a result of the Project in accordance with Schedule 4, paragraph 5(e) of the Infrastructure Planning (Environmental Impact Assessment) Regulations 2017 (HM Government, 2017) and PINS Advice Note 17 (Planning Inspectorate, 2019). The purpose of the Cumulative Effects Assessment (CEA) is to assess whether the combination of multiple effects upon a common receptor would result in an effect of greater significance than the individual effects alone.

31.1.3 Cumulative Effects may arise because of several different factors and combined changes. According to the Institute of Environmental Management and Assessment (IEMA) (IEMA, 2020) cumulative impacts can be defined as *"the additional changes caused by a Proposed Development in conjunction with other similar developments as the combined effect of a set of developments, taken together, in practice 'effects' and 'impacts' are used interchangeably"*.

31.2 PROPOSED ASSESSMENT METHODOLOGY

31.2.1 Given there is no widely accepted methodology or best practice for the assessment of Cumulative Effects, the Planning Inspectorate's Advice Note 17 (Planning Inspectorate, 2019), has informed the approach taken to the Intra-project Effects and Inter-project Effects assessments. In addition, the proposed approach is also based on professional experience, the types of receptors being assessed and the nature and scale of the Project.

31.2.2 The assessment will consider the following two types of cumulative effects:

- Intra-project combined effects – the interaction and combination of different residual (post-mitigation) environmental effects of the Project affecting the same Receptor. For example, visual and noise effects during construction affecting the same residential dwelling, or multiple developments along the

River Mersey affecting flood risk and surface water flows, with potential for impacts on water quality; and

- Inter-project cumulative effects – the residual (post-mitigation) environmental effects of the Project combining and interacting with the residual environmental effects of committed development(s), including consideration of other parts of the Project, affecting the same Receptor. For example, cumulative construction traffic effects upon a residential dwelling from the Project and a nearby industrial development. Or, the impact of underwater noise disturbance on marine mammals, from construction activities such as piling within the water environment.

31.2.3 The assessment will be qualitative and based on environmental information available at the time of the assessment. However, partial quantitative assessments may be undertaken where reliable and accurate environmental data allows (dependent on the information available from reasonably foreseeable projects on traffic and noise for example at the time of scoping).

31.2.4 Where information is not available, assumptions will be made based on professional judgement and clearly stated alongside any uncertainty as part of the Intra-project Effects and Inter-project Effects assessments.

31.2.5 Cumulative effects relevant to other regulatory assessments, such as the Water Framework Directive assessment and the Habitats Regulation Assessment will be considered separately to the cumulative impact assessment, within these reports themselves.

INTRA-PROJECT COMBINED EFFECTS

31.2.6 The approach to the assessment of intra-project combined effects for the Project only will consider the changes in baseline conditions at common sensitive receptors. It will be based on the information and Study Areas within the technical chapters. This assessment considers any residual effects that are reported as non-negligible (or equivalent) within the technical chapters. Minor effects, while not significant, are considered in the assessment on the basis that multiple minor effects may interact to result in a significant effect. Negligible residual effects reported in the technical chapters are considered unlikely to accumulate to the extent that a significant Intra-project effect would occur.

31.2.7 The assessment will initially review the ES chapters to identify the receptors which are predicted to be subject to residual effects from more than one environmental topic. A qualitative assessment will then be undertaken upon these receptors, using professional judgement and the information provided

within the technical chapters, to determine the overall intra-project combined effect significance.

31.2.8 The assessment of intra-project combined effects will be presented in the ES.

INTER-PROJECT CUMULATIVE EFFECTS

31.2.9 The assessment methodology for inter-project Cumulative Effects will involve the following key steps. A summary of the steps is outlined in **Plate 31.1**. The deadline for which will be once the statutory consultations have been completed.

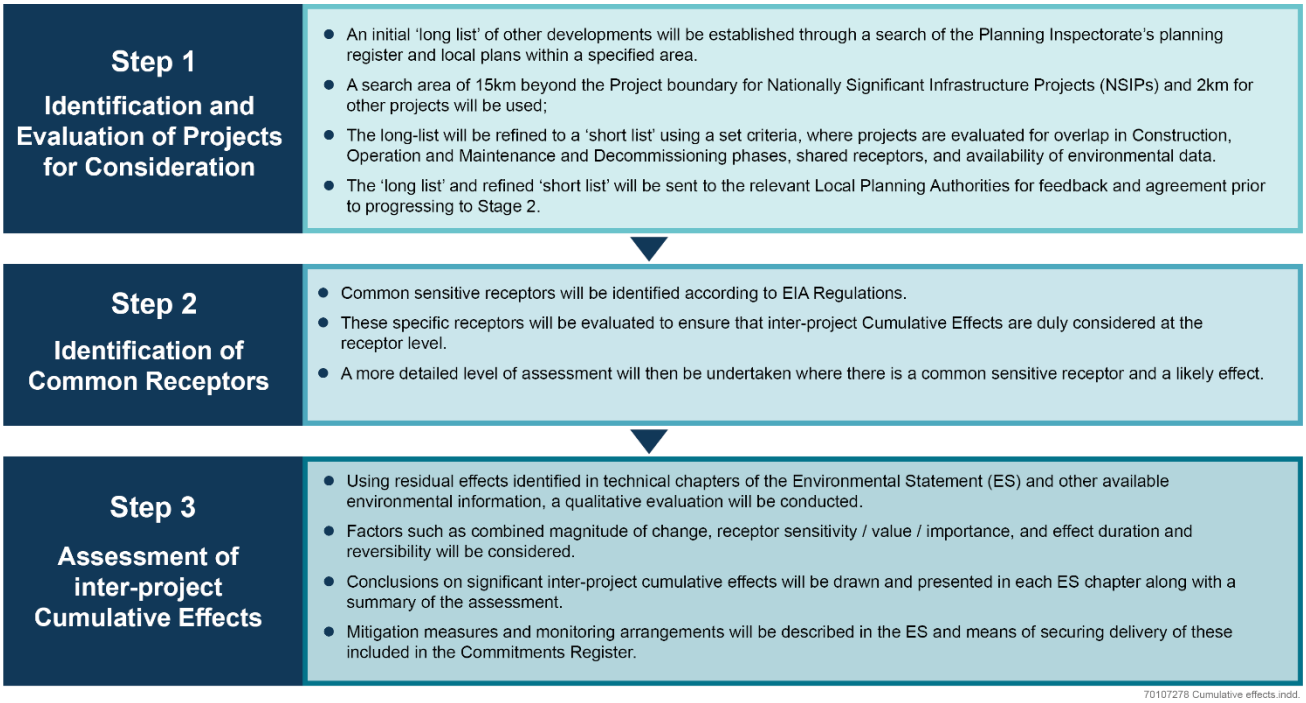

Plate 31.1: Inter-project cumulative effects methodology

Step 1 – Identification and Evaluation of Projects for Consideration

31.2.10 As presented in the PINS Advice Note 17 (Planning Inspectorate, 2019), an initial 'long list' of other developments will be identified through a search of the local planning authorities' planning registers, the Planning Inspectorate's planning register and local plans. This will determine the ZOI for each aspect within the ES.

31.2.11 Other reasonably foreseeable projects will also be identified, including those that form part of the Project. Based on professional judgement, the initial search will be based on a search area of 15km beyond the Project boundary for Nationally Significant Infrastructure Projects (NSIPs) and 2km for other projects.

31.2.12 The following selection criteria will be applied:

- Major development (HM Government, 2015) or NSIP projects that are under construction;
- Major development or NSIP projects which have been permitted within the last five years that are not yet implemented;
- Major development or NSIP submitted applications(s) but not yet determined;
- Projects on the Planning Inspectorate for England (referred to as PINS) Programme of Projects;
- Major development or NSIP projects which have been refused but are subject to appeal procedures not yet determined;
- Projects identified in relevant development plans (and emerging development plans) (such as the Strategic Development Strategy) which would have the characteristics of a Major development;
- Development of a relevant type or scale to be undertaken via other permitted methods, for example under permitted development or marine licence, for example within the Port of Liverpool; and
- Other plans and programmes (as appropriate) which set out the framework for future development consents / approvals, where such development is reasonably likely to come forward and would likely be a Major development or NSIP.

31.2.13 Given the location of the Project, projects within the marine environment which are not an NSIP or require consent under the Town & Country Planning Act 1990 (as amended) but require a Marine Licence will also be considered. These could include proposed coastal / estuarine proposals and proposed port activities undertaken by operators. A criteria for scale will be determined based on a review of the marine based activities likely to be undertaken within the construction, operation and decommissioning timescales of the tidal barrage. This will be considered in the long list.

31.2.14 Following this data collection, the long-list will be refined to a short-list by reviewing each of the other developments identified against the following criteria:

- Would the Construction, Operation and Maintenance and Decommissioning phases overlap with the Project?
- Is there potential that the Project shares common sensitive Receptors with the Project?

- The Project has environmental assessment information that is publicly available and is sufficient to allow the identified receptors and residual effects of the other development to be understood. Projects that have no, or insufficient environmental assessment information, will typically not be considered as it will not be possible to accurately identify common receptors or cumulative effects.

31.2.15 Professional judgement has been applied to develop the above criteria. It is not anticipated that projects outside of the criteria set out above would give rise to greater or different likely significant effects together with the Project considering the scale and nature. However, professional judgement may be applied to support the exclusion of projects which exceed the thresholds, but which may not give rise to discernible cumulative effects on receptors, and vice versa. The reasons for including or excluding each project will be clearly stated.

31.2.16 The long and short lists will be sent to the relevant Local Planning Authorities for comment, input and agreement prior to progressing to Stage 2. The long list will be prepared for the PEIR with the deadline for any reasonably foreseeable projects to be considered to be the end of the statutory consultation period. The short list will then be finalised and cumulative impact assessment undertaken for ES alongside the intra-effects assessment. The lists will be finalised towards the end of the EIA programme, so as to ensure that the search of other developments is as up to date as possible whilst also ensuring that there is sufficient time to complete the assessment.

Step 2 – Identification of Common Receptors

31.2.17 A list of common sensitive receptors will be prepared by identifying receptors which are listed as one of the five receptor categories set out in Regulation 5(2) of the EIA Regulations. This corresponds with Stage 3 of PINS Advice Note 17.

31.2.18 Once identified, the specific receptors will then be evaluated to ensure that inter-project Cumulative Effects are duly considered at the receptor level and that a more detailed level of assessment is only undertaken where there is a common sensitive receptor and a likely effect. The identification of impact source pathway that each common receptor(s) may experience will also be considered.

Step 3 – Assessment of Inter-project Cumulative Effects

31.2.19 The assessment of the inter-project Cumulative Effects will be based upon the residual effects identified in the technical chapters of the ES, as well as available

environmental information for the other development(s). This step corresponds with Stage 4 of PINS Advice Note 17.

31.2.20 The qualitative evaluation at the receptor level will consider the following:

- Combined magnitude of change;
- Sensitivity / value / importance of the receptor / receiving environment to change; or / and
- Duration and reversibility of effect.

31.2.21 Through a combination of evaluating the residual effects presented in the ES and the environmental information available for other development(s), conclusions will be drawn as to the likelihood for significant inter-project cumulative environmental effects.

31.2.22 Each environmental topic chapter of the ES will present the inter-project cumulative effects assessment of their topic. The ES chapter will then summarise the assessment, including reporting where significant inter-project cumulative effects have been identified.

31.2.23 The ES will also describe measures envisaged to avoid, prevent, reduce or, if possible, offset any identified significant Cumulative Effects and, where appropriate, any proposed monitoring arrangements. The means of securing delivery of these measures will be identified within the Commitments Register to be submitted as part of the ES.

31.3 LIMITATIONS AND ASSUMPTIONS

31.3.1 The assessment of intra-project combined effects resulting from the Project will be focused on the residual effects from the construction and operational phases following the implementation of mitigation measures that are secured through DCO requirements or other mechanisms.

31.3.2 The assessment of inter-project cumulative effects will be based on the interpretation and assessment of publicly available data and limited by the level of information available.

31.3.3 There may be cases that other developments are screened into the short-list which have environmental information available for some or the majority of technical topics, but not for others. In such instances, the cumulative assessment for the given other development(s) may be limited to only those topics which have sufficient environmental information to inform an assessment. However, in

such cases, efforts will be made for the topics lacking environmental information to make an assessment based upon assumptions. This will be stated in the ES.

31.3.4 Although environmental information may be available for other developments, it may be limited in its compatibility where different assessment methodologies or criteria have been used. Where a lack of information limits and / or prevents the cumulative assessment, this will be stated in the ES.

31.4 REFERENCES

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