

MONA OFFSHORE WIND PROJECT

Environmental Statement

Volume 1, Chapter 4: Site Selection and Consideration of Alternatives

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Image of an offshore wind farm

MONA OFFSHORE WIND PROJECT

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Glossary

Term	Meaning
Applicant	Mona Offshore Wind Limited.
Bodelwyddan National Grid Substation	This is the Point of Interconnection (POI) selected by National Grid for the Mona Offshore Wind Project.
Cable Route Protocol	This comprises a set of requirements developed by The Crown Estate detailed in Appendix 1, to help developers establish a transmission system infrastructure including export cabling.
Development Consent Order (DCO)	An order made under the Planning Act 2008 granting development consent for one or more Nationally Significant Infrastructure Project (NSIP).
Environmental Statement	The document presenting the results of the Environmental Impact Assessment (EIA) process for the Mona Offshore Wind Project.
Expert Working Group (EWG)	Expert working groups set up with relevant stakeholders as part of the Evidence Plan process.
Evidence Plan process	The Evidence Plan process is a mechanism to agree upfront what information the Applicant needs to supply to the Planning Inspectorate as part of the Development Consent Order (DCO) applications for the Mona Offshore Wind Project.
Export Cable Region	The Region defined by Niras within the Round 4 HRA for the Irish Sea and North Wales bidding area where preferred bidders may place cable infrastructure.
Inter-array cables	Cables which connect the wind turbines to each other and to the offshore substation platforms. Inter-array cables will carry the electrical current produced by the wind turbines to the offshore substation platforms.
Interconnector cables	Cables that may be required to interconnect the Offshore Substation Platforms in order to provide redundancy in the case of cable failure elsewhere.
Intertidal area	The area between Mean High Water Springs (MHWS) and Mean Low Water Springs (MLWS).
Landfall	The area in which the offshore export cables make contact with land and the transitional area where the offshore cabling connects to the onshore cabling.
Local Authority	A body empowered by law to exercise various statutory functions for a particular area of the United Kingdom.
Local Highway Authority	A body responsible for the public highways in a particular area of England and Wales, as defined in the Highways Act 1980.
Maximum design scenario	The scenario within the design envelope with the potential to result in the greatest impact on a particular topic receptor, and therefore the one that should be assessed for that topic receptor.
Mona 400kV Cable Corridor	The corridor from the Mona onshore substation to the Bodelwyddan National Grid substation.
Mona Array Area	The area within which the wind turbines, foundations, inter-array cables, interconnector cables, offshore export cables and offshore substation platforms (OSPs) forming part of the Mona Offshore Wind Project will be located.
Mona Offshore Wind Project	The Mona Offshore Wind Project is comprised of both the generation assets and offshore and onshore transmission assets and associated activities.

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Term	Meaning
Mona Offshore Cable Corridor and Access Areas	The corridor located between the Mona Array Area and the landfall up to Mean High Water Springs (MHWS), in which the offshore export cables and the offshore booster substation will be located.
Mona Offshore Transmission Infrastructure Scoping Search Area	The area that was presented in the Mona Scoping Report as the area encompassing and located between the Mona Potential Array Area and the landfall up to Mean High Water Springs (MHWS), in which the offshore export cables and any offshore booster substation will be located.
Mona Onshore Cable Corridor Search Area	The corridor located between Mean High Water Springs (MHWS) at the landfall and the Mona onshore substation, in which the onshore cable route will be located.
Mona Onshore Transmission Infrastructure Scoping Search Area	The area that was presented in the Mona Scoping Report as the area located between Mean High Water Springs (MHWS) at the landfall and the onshore National Grid substation, in which the onshore export cables, onshore substation and other associated onshore transmission infrastructure will be located.
Mona Potential Array Area	The area that was presented in the Mona Scoping Report as the area within which the wind turbines, foundations, meteorological mast, inter-array cables, interconnector cables, offshore export cables and offshore substation platforms (OSPs) forming part of the Mona Offshore Wind Project were likely to be located.
Mona Proposed Onshore Development Area	The area in which the landfall, onshore cable corridor, onshore substation, mitigation areas, temporary construction facilities (such as access roads and construction compounds), and the connection to National Grid Bodolwyddan substation will be located.
Mona Scoping Report	The Mona Scoping Report that was submitted to The Planning Inspectorate (on behalf of the Secretary of State) and Natural Resources Wales (NRW) for the Mona Offshore Wind Project.
Non-statutory consultee	Organisations that an applicant may choose to consult in relation to a project who are not designated in law but are likely to have an interest in the project.
National Policy Statement	The current national policy statements published by the Department for Energy Security and Net Zero in 2024.
Offshore Substation Platform (OSP)	The offshore substation platforms located within the Mona Array Area will transform the electricity generated by the wind turbines to a higher voltage allowing the power to be efficiently transmitted to shore.
Offshore Wind Leasing Round 4	The Crown Estate auction process which allocated developers preferred bidder status on areas of the seabed within Welsh and English waters and ends when the Agreements for Lease (AfLs) are signed.
Preferred Bidding Areas	The Applicant identified two Preferred Bidding Areas (Morgan and Mona) within the Northern Wales and Irish Sea Bidding Area. In February 2021, The Crown Estate awarded the Applicant the right to develop up to 1.5GW of wind capacity within each of the two Preferred Bidding Areas.
Relevant Local Planning Authority	The Relevant Local Planning Authority is the Local Authority in respect of an area within which a project is situated, as set out in Section 173 of the Planning Act 2008. Relevant Local Planning Authorities may have responsibility for discharging requirements and some functions pursuant to the Development Consent Order, once made.
Round 4 HRA	The Plan Level Habitats Regulations Assessment undertaken by The Crown Estate for UK offshore leasing Round 4.

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Term	Meaning
Secretary of State for the Department for Energy Security and Net Zero	The decision maker with regards to the application for development consent for the Mona Offshore Wind Project.
Statutory consultee	Organisations that are required to be consulted by an applicant pursuant to the Planning Act 2008 in relation to an application for development consent. Not all consultees will be statutory consultees (see non-statutory consultee definition).
The Northern Wales and Irish Sea Bidding Area	The Northern Wales and Irish Sea Bidding Area was one of four Bidding Areas identified by The Crown Estate through the Offshore Wind Leasing Round 4 process.
The Planning Inspectorate	The agency responsible for operating the planning process for Nationally Significant Infrastructure Projects (NSIPs).
Wind turbines	The wind turbine generators, including the tower, nacelle and rotor.

Acronyms

Acronym	Description
AfL	Agreement for Lease
AEF	Archaeology Engagement Forum
AoS	Area of Search
BRAG	Black, Red, Amber, Green
CCS	Carbon Capture and Storage
CION	Connection and Infrastructure Options Note
CPAT	Clywd-Powys Archaeological Trust
CRIA	Cable Route Identification and Approval
CRP	Cable Route Protocol
DCO	Development Consent Order
ECRA	Export Cable Region Assessment
EIA	Environmental Impact Assessment
EPP	Evidence Plan Process
ES	Environmental Statement
EWG	Expert Working Group
FRAP	Flood Risk Activity Permit
GHG	Greenhouse gas
HDD	Horizontal Directional Drilling
HND	Holistic Network Design
HRA	Habitats Regulations Assessment
JNCC	Joint Nature Conservation Committee
LPA	Local Planning Authority

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Acronym	Description
LSE	Likely Significant Effect
LVIA	Landscape Visual Impact Assessment
MCZ	Marine Conservation Zone
MHWS	Mean High Water Springs
MMO	Marine Management Organisation
MNEF	Maritime Navigation Engagement Forum
MPA	Marine Protected Area
NGESO	National Grid Electricity System Operator
NGET	National Grid Electricity Transmission
NMWTRA	North and Mid Wales Trunk Road Agent
NNR	National Nature Reserve
NPS	National Policy Statement
NRW	Natural Resources Wales
NSIP	Nationally Significant Infrastructure Projects
OFTO	Offshore Transmission Owner
OTNR	Offshore Transmission Network Review
PEIR	Preliminary Environmental Information Report
POI	Point of Interconnection
PRoW	Public Rights of Way
SAC	Special Area of Conservation
SNCB	Statutory Nature Conservation Body
SoS	Secretary of State
SPA	Special Protection Area
SSSI	Site of Special Scientific Interest
TCE	The Crown Estate
TSS	Traffic Separation Scheme
UK	United Kingdom
ZTV	Zone of Theoretical Visibility

4 Site Selection and Consideration of Alternatives

4.1 Introduction

4.1.1 Overview

4.1.1.1 This chapter of the Environmental Statement presents a description of the site selection process and the approach undertaken by Mona Offshore Wind Ltd (the Applicant) to develop and refine the design of the Mona Offshore Wind Project.

4.1.1.2 This chapter sets out the stages of design iteration that the Mona Offshore Wind Project has been through from inception to submission of the application for Development Consent. The site selection process is described in the following stages:

- Stage 1 – Identification of Agreement for Lease (AfL) area
- Stage 2 – Identification of Point of Interconnection (POI)
- Stage 3 – Identification of onshore and offshore areas of search for Environmental Impact Assessment (EIA) scoping (including substation zone)
- Stage 4 – Refinement of project for Preliminary Environmental Information Report (PEIR)
- Stage 5 – Further Refinement of the project design following review of statutory consultation responses and further EIA studies
- Stage 6 – Final design for application

4.1.2 Purpose of chapter

4.1.2.1 The primary purpose of the ES is outlined in Volume 1, Chapter 1: Introduction of the Environmental Statement. In summary, the primary purpose of an Environmental Statement is to support the Development Consent Order (DCO) application for the Mona Offshore Wind Project under the Planning Act 2008 (the 2008 Act). The Environmental Statement sets out the findings of the EIA and will accompany the application for Development Consent.

4.1.2.2 In particular, this Environmental Statement chapter:

- Outlines the approach taken to defining the spatial boundaries and constituent parts of the Mona Offshore Wind Project
- Explains the siting decisions taken to date by the Applicant
- Details the reasonable alternatives considered for the project, including location and infrastructure options.

4.1.3 Project overview

4.1.3.1 Figure 4.1 identifies the proposed offshore and onshore infrastructure associated with the Mona Offshore Wind Project.

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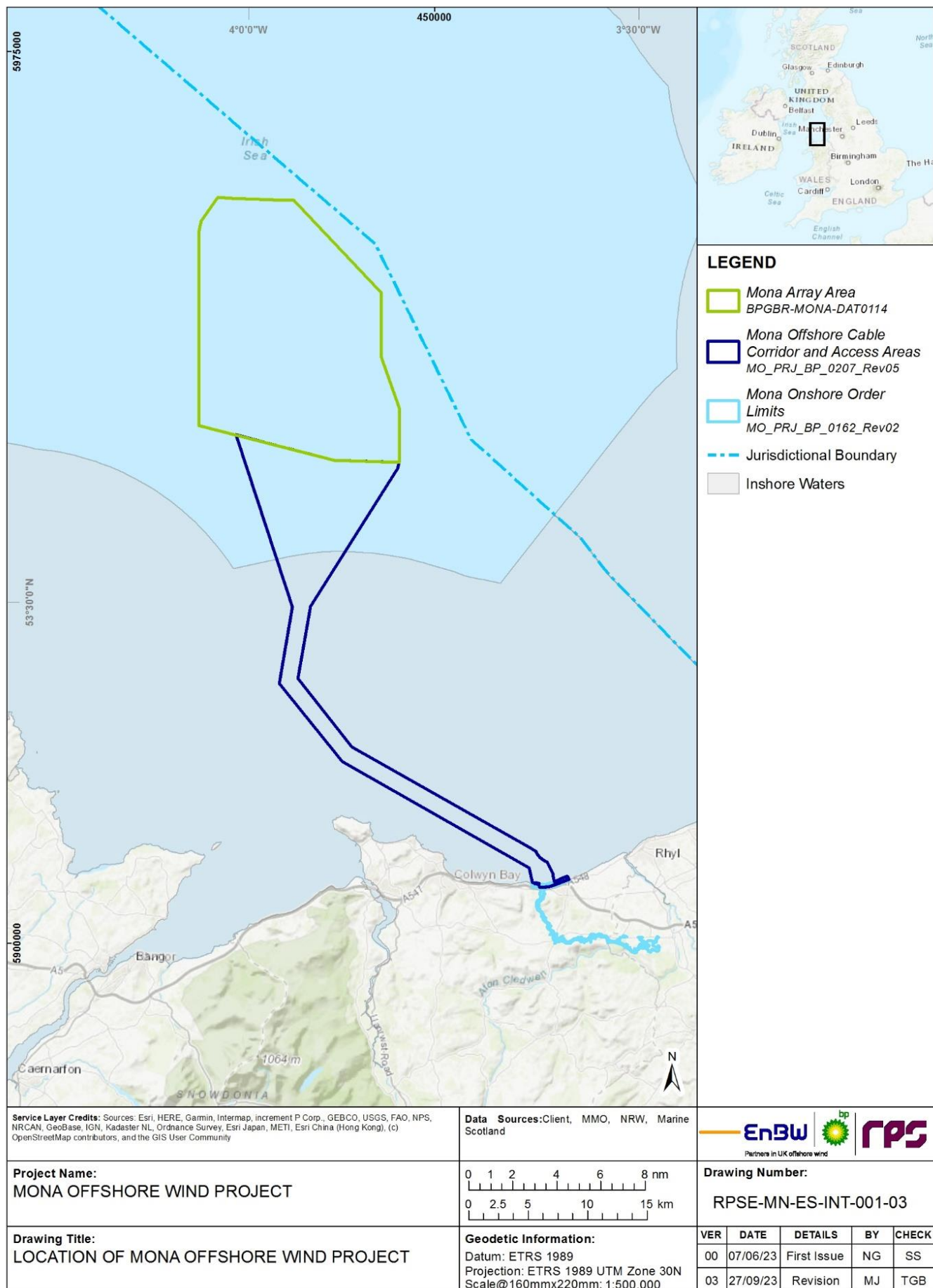


Figure 4.1: Mona Offshore Wind Project Boundary.

4.2 The Crown Estate

4.2.1 Offshore Wind Leasing Round 4

- 4.2.1.1 As described in Volume 1, Chapter 1: Introduction to the Environmental Statement, Offshore Wind Leasing Round 4 was instigated by The Crown Estate (TCE) in September 2019, and four Bidding Areas were identified for the development of offshore wind in England and Wales. As part of a competitive tender, the Applicant was awarded Preferred Bidder status for two sites within the Northern Wales and Irish Sea Bidding Area.
- 4.2.1.2 As the manager of the seabed, TCE have a number of requirements that must be met to grant rights for cable routes which are identified in its Cable Route Protocol (described in section 4.2.3) (The Crown Estate, 2021).
- 4.2.1.3 TCE is also the Competent Authority for the Offshore Wind Leasing Round 4 and undertook a Plan Level HRA for the Round 4 plan (described in section 4.2.4).

4.2.2 TCE Plan Level Habitats Regulations Assessment (HRA)

- 4.2.2.1 As the Competent Authority under the Habitats Regulations, TCE is required to conduct a plan-level Habitats Regulations Assessment (HRA) for any leasing/licencing activity that constitutes a 'plan'. TCE completed a plan-level HRA (the Round 4 HRA) which assessed the potential impact of the preferred bidding areas that were selected through the Round 4 process on the UK's network of designated sites and protected habitats and species. The Round 4 HRA was finalised in November 2022 with preferred bidders entering into AfLs in January 2023.
- 4.2.2.2 In the Round 4 HRA TCE identified mitigation and compensation measures to manage potential adverse effects on European Sites potentially affected by the Round 4 plan. The Round 4 HRA Plan supports decarbonisation and security of the UK's energy supply and government targets. TCE considered a range of alternative solutions and concluded that there are no feasible alternative solutions to the Round 4 Plan.
- 4.2.2.3 In addition to mitigation measures secured at the plan level, mitigation has been identified to be considered and implemented at the project level, where there is potential for a Likely Significant Effect (LSE) on a European site. Further information on the potential impact of the Mona Offshore Wind Project on designated sites is described within the HRA Stage 1 screening and HRA Stage 2 Information to Support Appropriate Assessment which accompanies the application for Development Consent.
- 4.2.2.4 The key mitigation within the Round 4 HRA relating to site selection is the consideration of the Export Cable Route Assessment (ECRA) undertaken by NIRAS (2022), on the site selection for offshore export cables, which is described further in section 4.2.4.

4.2.3 TCE Cable Route Protocol

- 4.2.3.1 The Crown Estate's Cable Route Protocol (CRP) (described within TCE Cable Route Identification and Leasing Guidelines, 2021) comprises a set of principles and requirements for offshore wind developers in the planning of export cable routes, with the specific purpose of reducing the direct and indirect impacts of cable routing on the marine environment. Compliance with the CRP is a requirement for entry into TCE's transmission assets AfL.

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4.2.3.2 The Mona Offshore Wind Project has considered the CRP throughout the site selection process. Requirements that relate to the site selection process and how these requirements have been met are described in Table 4.1.

Table 4.1: CRP requirements and how these have been addressed in the Site Selection chapter.

Requirement number	Requirement	Where this requirement has been addressed
2	<p>Under this CRP, developers must undertake consultation with Statutory Nature Conservation Bodies (SNCBs) throughout the route selection and refinement process. The nature of this consultation will vary from project to project, but to be effective the consultation should be ongoing throughout the process and both parties must provide clear information and advice within the agreed timeframes.</p> <p>Developers must demonstrate...that clear information on the offshore export cable route has been provided for SNCBs at appropriate stages in cable route planning and that SNCB advice has been sought at appropriate stages (whether through formal or informal consultation). It is acknowledged that some elements of the cable planning process are time-constrained and that delays in receiving input from consultees can result in difficulties for developers.</p>	The Applicant has sought to consult with SNCBs on the proposed cable routing. Details of consultation undertaken is described in section 4.5.
4	In planning survey work on potential cable routes (or exploratory works within a cable route Area of Search (AoS)), developers must consult with SNCBs to ensure that they have the opportunity to provide feedback on the scope and adequacy of the overarching survey plan. Consultation on the survey plan will be required in order to obtain individual survey licences.	The scope of export cable surveys was consulted on with relevant SNCBs.
5	Developers must demonstrate...that planned offshore cable routes are in alignment with the relevant policies and principles within the applicable National Policy Statements and relevant marine plan(s) (including draft marine plans). Particular note should be taken of cable-specific policies within marine plans.	Section 4.3 sets out how the relevant National Policy Statements and marine plans (Welsh National Marine Plan and North West Offshore Marine Plan) have been considered within the site selection process.
6	Developers must demonstrate... that planned cable corridors have taken into account the outcomes of the relevant plan-level HRA (where applicable) as described in the Report to Inform Appropriate Assessment. This includes any specific requirements on cable planning and any geographically-specific findings in which examples of appropriate project-level cable mitigations.	Section 4.2.2 sets out how the Applicant has taken into account the outcomes of the Plan Level HRA in site selection.
7	Developers must demonstrate... that they have had regard to documents and advice produced by SNCBs in relation to offshore export cabling, including current best practice guidance. Developers must also have regard to the outcomes of relevant research programmes which are available. This may include (amongst other things) research into the impacts of cabling, the recovery of habitats and the efficacy of mitigation measures.	Section 0 sets out how the Applicant has had regard to the Natural Resources Wales (NRW) export cable guidance for Round 4 developers.
9	Within the offshore AoS the developer must identify (and map where possible) the following, which are to be given significant weight in cable route planning:	The sites referred to within Requirement 9 have been mapped within section 4.10.

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Requirement number	Requirement	Where this requirement has been addressed
	<p>Habitats Regulations sites (SACs, SPAs and Ramsar sites, whether fully designated or not)</p> <p>MCZs and SSSIs (whether fully designated or not)</p> <p>Features of these Protected Sites (including priority habitats and species)</p> <p>Protected Sites with conservation objectives to recover features to favourable condition</p> <p>Areas of known Annex I habitat outside protected areas but within the AoS</p> <p>Habitats that are known to be irreplaceable or very difficult to replace (e.g. chalk reef)</p> <p>Having undertaken this exercise the developer must consult with SNCBs (and, where appropriate, other relevant non-statutory consultees) to ensure that the best available evidence about the environment and specific sensitivities has been incorporated into the AoS mapping, and that the consultees have the opportunity to provide additional narrative information about particularly sensitive areas or areas of concern to them.</p>	<p>The Applicant has had ongoing engagement with SNCBs through the EPP to ensure the most recent evidence around designated sites was taken into assessments and that SNCBs have had an opportunity to flag any concerns regarding the site selection process which have been given weight within cable route planning.</p>
10	<p>Developers must prepare an outline view of the possible cabling infrastructure requirements (acknowledging that this may change as the design of the project evolves). The outline should include the potential number and capacities of the export cables with their indicative spacing requirements and the additional structures (e.g. substations and converter stations) which the project is likely to require. Where there are uncertainties in the required infrastructure these should be set out (with reasons).</p> <p>Within the AoS, developers must identify (and where possible, map) hard engineering constraints such as existing infrastructure/licence areas, challenging ground conditions and sections of the coast where landfall is not possible.</p> <p>Developers should also form an initial view on the likely areas within the AoS where cable preparation works and/or cable protection may be needed (noting that this information is likely to change as survey work is undertaken). Where possible, this information should be presented alongside the environmental information from Requirement 9.</p> <p>The developer must consult with SNCBs (and, where appropriate, non-statutory consultees) to seek to ensure that they understand the likely infrastructure requirements and constraints and that they have the opportunity to raise any areas of concern about placement of infrastructure (including cable protection) and specific Protected Sites/features.</p>	<p>Volume 1, Chapter 3: Project Description of the Environmental Statement identifies cable infrastructure requirements for the Mona Offshore Wind Project.</p> <p>Hard engineering constraints have been considered throughout the site selection process and are described within this chapter.</p> <p>Details of discussions had with SNCBs on infrastructure requirements, cable preparation works and/or cable protection and any potential impacts on designated sites are captured in section 4.5.</p>
11	<p>Developers must demonstrate.... That they have undertaken regular consultation with SNCBs as the cable route selection process progresses. In line with the requirements for pre-application consultation, communication should be comprehensively documented but need not take the form of formal reporting. The frequency of communication is a matter for agreement</p>	<p>Stakeholder engagement undertaken on the Mona Offshore Cable Corridor and Access Areas and Mona Proposed Onshore Development Area is described within section 4.5.</p>

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Requirement number	Requirement	Where this requirement has been addressed
	between developers and consultees, taking into account consultee resource constraints. The consultation must encompass the entire process from AoS to final route selection and should include communication of the evolving understanding of cabling infrastructure requirements (including cable protection) as well as the evolving understanding of environmental and technical constraints on the cable route. Consultees must be given the opportunity to comment on proposals.	
12	Where SNCBs provide advice and guidance during the cable route planning process this must be clearly documented and considered in cable route decision-making. The way in which SNCB advice has been incorporated into the cable route plan must be documented. If a developer chooses not to follow SNCB advice, or there a developer disagrees with the conclusions of the SNCB, it must provide clear and detailed justification of this.	SNCB advice has been sought throughout the site selection process and is described within this chapter.
13	The expectation is that the cable route should avoid the risk of harm to Habitats Regulations sites and other Protected Sites. Where this is not possible and a developer seeks to rely on mitigation measures for engineering or commercial reasons, the developer must be able to demonstrate that appropriate weight has been given to environmental considerations in the cable route evaluation process. In practice, this means that the developer must demonstrate that the potential impact of the route on Protected Sites has been carefully considered throughout the process and that all reasonable efforts have been made to avoid environmental impacts and adverse effects on the integrity of sites. If avoidance is not possible then this must be clearly justified (including reasons why alternative cable routes are unsuitable), only then can mitigation be considered. Advice given by SNCBs on the efficacy of proposed mitigation should be provided where available and the mitigation must be capable of being secured via the project consents.	Section 4.10 describes how the Applicant has considered designated sites within the refinement of the Mona Offshore Cable Corridor and Access Areas and Mona Onshore Development Area.

4.2.4 Export Cable Region Assessment (ECRA)

- 4.2.4.1 The ECRA took a risk-based approach (consideration of both the vulnerability of species and the vulnerability of the Protected Sites) to derive an overall risk score for the potential impacts arising from the installation of offshore wind farm export cables and their associated infrastructure.
- 4.2.4.2 The risk scores corresponded to a category of mitigation measures as below:
- **Green (low risk):** no specific measures but activities to be undertaken in line with industry best practice (e.g. application of an environmental management plan, pollution control plan and spillage response plan, and adherence to international conventions such as International Convention for the Prevention of Pollution from Ships (MARPOL) and International Regulations for Preventing Collisions at Sea (COLREGS))

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- **Amber (low-medium risk):** specific detail must be provided to TCE at the route selection and refinement stage. Cable route selection studies should be undertaken with a detailed evidence document provided outlining the process completed to identify the proposed Supply Cable route(s) as well as feature specific information
- **Red (high risk):** the project must avoid irreparable damage (loss of a non-recoverable habitat) to red risk features. Evidence should be submitted to the TCE at the route selection and refinement stage outlining avoidance measures, mitigation and installation methods to reduce impacts depending on the type of risk
- **Black (high risk):** the affected project must spatially avoid these black risk features. Evidence should be submitted to the TCE at the route selection and refinement stage outlining the avoidance of these features.

4.2.4.3 Section 4.10.3.9 describes how the ECRA measures have been considered for the Mona Offshore Wind Project.

4.3 Policy Context

4.3.1 Climate change and renewable energy

4.3.1.1 The UK government has an ambition to generate 50 GW of clean, renewable energy from offshore wind by 2030. The Mona Offshore Wind Project has a critical role to play, both in helping the UK to achieve its net zero ambitions, and specifically, in reaching our offshore wind generation goals.

4.3.1.2 The UK's ambition is to lead the world in combatting climate change, reducing our reliance on fossil fuels and embracing a future where renewable energy powers our homes and businesses. At the centre of this drive is a commitment to reducing UK greenhouse gas (GHG) emissions and reaching net zero. Under the Climate Change Act 2008, the UK committed to a net reduction in GHG emissions of 80% by 2050 against the 1990 baseline in line with the commitments of the Kyoto Protocol. In June 2019, secondary legislation (the Climate Change Act 2008 (2050 Target Amendment) Order 2019) was passed that extended that target to at least 100% against the 1990 baseline. In order for the UK to meet these ambitions the UK Government needs to work with developers to support proposals to produce clean, renewable energy within the UK. The Welsh Government has recognised the need to support renewable energy to reduce carbon emissions as set out in Planning Policy Wales 11 and Future Wales: the National Plan 2040 (see section 4.3.2). As the Mona Offshore Wind Project is planned to be operational by 2030 it would significantly contribute to reducing reliance of fossil fuels and reducing GHG emissions by at least 100% against the 1990 baseline.

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- 4.3.1.3 On 7 April 2022, the UK Government published its British energy security strategy (BEIS and Prime Minister's Office, 2022). The strategy builds on the UK net zero target, placing a heavy reliance on a renewable and low carbon energy supply with a view to '*bring clean, affordable, secure power to the people for generations to come...*'. The strategy plans to accelerate delivery of offshore wind by strengthening the renewable National Policy Statements (NPSs) to reflect the importance of energy security and net zero. It proposes an Offshore Wind Acceleration Task Force to work on reducing the consenting and delivery times for offshore wind projects and fast tracking priority projects. Specifically, the strategy states an ambition to deliver up to 50GW of offshore wind by 2030, an increase on previous targets of 40GW. The Mona Offshore Wind Project would bring clean, affordable, secure power to millions of homes and be a key project to deliver 50GW of offshore wind by 2030.
- 4.3.1.4 In July 2022, the UK Government published the Pathway to 2030 Holistic Network Design (HND) documents, which set out the approach to connecting 50GW of offshore wind to the UK electricity network (National Grid ESO, 2022).
- 4.3.1.5 There is, therefore, a clear urgent need and policy drivers to bring about secure, clean energy in order to meet the ambitious climate change and carbon reduction targets, through the development of offshore wind energy.

4.3.2 National Policy Statements

- 4.3.2.1 Planning policy on renewable energy infrastructure is presented in Volume 1, Chapter 2: Policy and legislation of the Environmental Statement. Planning policy on offshore renewable energy Nationally Significant Infrastructure Projects (NSIPs), specifically in relation to site selection and consideration of alternatives, is contained in the Overarching National Policy Statement (NPS) for Energy (EN-1; DESNZ, 2024a), the NPS for Renewable Energy Infrastructure (EN-3, DESNZ, 2024b) and the NPS for Electricity Networks Infrastructure (EN-5, DESNZ, 2024c)
- 4.3.2.2 NPS EN-1 and NPS EN-3 include guidance on what matters are to be considered in the assessment. These are summarised in Table 4.1. NPS-5 includes guidance on what matters are to be considered in the onshore assessment of electrical networks. These are summarised in Table 4.2 below.

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Table 4.2: Summary of the NPS EN-1 and NPS EN-3 provisions relevant to Site Selection and Alternatives.

Summary of NPS EN-3 and EN-1 provision	How and where considered in the Environmental Statement
EN-1	
<p>NPS EN-1 paragraph 4.3.9</p> <p>As in any planning case, the relevance or otherwise to the decision making process of the existence (or alleged existence) of alternatives to the proposed development is, in the first instance, a matter of law. This NPS does not contain any general requirement to consider alternatives or to establish whether the proposed project represents the best option from a policy perspective. Although there are specific requirements in relation to compulsory acquisition and habitats sites, the NPS does not change requirements in relation to compulsory acquisition and habitats sites.</p>	<p>This chapter details the assessments of the reasonable alternatives undertaken as part of the Mona Offshore Wind Project and includes the environmental, social and economic reasons for the preferred choices. The approach to alternatives is described within section 4.6.2.</p>
<p>NPS EN-1 paragraph 4.3.15</p> <p>Applicants are obliged to include in their ES, information about the main alternatives they have studied. This should include an indication of the main reasons for the applicant's choice, taking into account the environmental, social and economic effects and including, where relevant, technical and commercial feasibility</p>	<p>This chapter details the assessments of the reasonable alternatives undertaken as part of the Mona Offshore Wind Project and includes the environmental, social and economic reasons for the preferred choices. The approach to alternatives is described within section 4.6.2.</p>
<p>NPS EN-1 paragraph 4.3.22 – 4.3.25-</p> <p>Given the level and urgency of need for new energy infrastructure, the Secretary of State should, subject to any relevant legal requirements (e.g. under the Habitats Regulations) which indicate otherwise, be guided by the following principles when deciding what weight should be given to alternatives:</p> <ul style="list-style-type: none"> • the consideration of alternatives in order to comply with policy requirements should be carried out in a proportionate manner; and • only alternatives that can meet the objectives of the proposed development need to be considered. <p>The Secretary of State should be guided in considering alternative proposals by whether there is a realistic prospect of the alternative delivering the same infrastructure capacity (including energy security, climate change, and other environmental benefits) in the same timescale as the proposed development.</p> <p>4.3.24 The Secretary of State should not refuse an application for development on one site simply because fewer adverse impacts would result from developing similar infrastructure on another suitable site, and should have regard as appropriate to the possibility that all suitable sites for energy infrastructure of the type proposed may be needed for future proposals.</p> <p>4.3.25 Alternatives not among the main alternatives studied by the applicant (as reflected in the ES) should only be considered to the extent that the Secretary of State thinks they are both important and relevant to the decision.</p>	<p>This chapter contains information about the reasonable spatial and geographical alternatives that have been considered by the Mona Offshore Wind Project, and, where appropriate, presents a comparison of the environmental effects between different options. Section 4.6.2 includes consideration of overhead lines or buried onshore cables; trenchless or trenched techniques for major crossing onshore; and selection of gas insulated or air insulated switchgear for the onshore substation.</p> <p>In addition, alongside the site selection and consideration of alternatives, guiding principles for locating the Project's onshore substation are to achieve an economic and efficient connection (i.e. as close as possible to the National Grid connection point) whilst taking into account environmental and social constraints including siting principles in the Horlock Rules and consideration of Schedule 9 of the Electricity Act 1989. Engineering considerations regarding economy and efficiency include minimising distance as far as is reasonably practicable as it minimises the cable reactive power component and losses.</p> <p>Section 4.6 (and Volume 7, Annex 4.2: Selection and Refinement of the Onshore Infrastructure) explains a Black/Red/Amber/Green (BRAG) methodology has been used to inform site selection of onshore infrastructure. BRAG is a standard assessment tool used in the pre-EIA process to assess the potential risks to proposed development options. This is considered appropriate to compare a number of sites for similar onshore infrastructure such as landfall, onshore cable route and onshore substation, given the ability to capture and classify the main differentiating issues in four fundamental categories. A BRAG assessment of this type</p>

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Summary of NPS EN-3 and EN-1 provision	How and where considered in the Environmental Statement
EN-3	enables a clear and direct comparison between each site.
<p>NPS EN-3 paragraph 2.8.119</p> <p>Applicant assessment of the effects of installing offshore transmission infrastructure across the intertidal/coastal zone should demonstrate compliance with mitigation measures in any relevant plan-level HRA including those prepared by The Crown Estate as part of its leasing round, and include information, where relevant, about:</p> <ul style="list-style-type: none"> any alternative landfall sites that have been considered by the applicant during the design phase and an explanation for the final choice any alternative cable installation methods that have been considered by the applicant during the design phase and an explanation for the final choice. 	<p>The selection process for landfall sites is described in Section 4.10, Section 4.11. The Applicant undertook a detailed site selection process to refine the Mona Offshore Wind Project to a single landfall in preparation for application.. Following the identification of the landfall AoS, five zones were identified as areas where the offshore export cables could be brought onshore and where the landfall works to connect to the onshore export cabling could occur. The five options, with associated initial constraints, are described in outline in Table 4.14 and illustrated in Figure 4.13</p> <p>A shortlisting exercise, including a detailed analysis comprising land, engineering, environmental and consents reviews was undertaken. Two specific locations within the Llanddulas zone were identified. Following informal consultation and receipt of the Scoping Opinion in June 2022 (Document Reference J8), a further technical analysis and environmental and consenting review was undertaken of the Llanddulas landfall options. Further analysis was also undertaken for the potential onshore cable routes associated with each landfall option, to understand potential constraints and risks which may further influence the balance of landfall options. As a result, the Llanddulas landfall (at Pensarn Beach) was progressed for the PEIR.</p> <p>Consultation feedback received from the PEIR consultation and regular Onshore Ecology EWGs stated that the NRW preference was to reduce or remove any potential interaction with the intertidal area to reduce the potential direct impact on the Traeth Pensarn SSSI and intertidal habitats, and to reduce the potential activity on the beach to support the trenchless techniques (including access to these areas). A design decision was made to commit to no above-ground works through the intertidal area, and to commit to a trenchless technique that would achieve this with an exit point below MLWS and therefore the Mona Offshore Wind Project will not be installing cables across the intertidal zone at the landfall.</p>
<p>NPS EN-3 paragraph 2.8.328</p> <p>The Secretary of State should be satisfied that the site selection has been made with a view to avoiding or minimising disruption or economic loss to the shipping and navigation industries, with particular regard to approaches to ports and to strategic routes essential to regional, national and international trade, lifeline ferries and recreational users of the sea.</p>	<p>Section 4.11.2 details the changes made to the Mona Array Area boundary to minimise disruption to shipping and navigation.</p>

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Summary of NPS EN-3 and EN-1 provision	How and where considered in the Environmental Statement
<p>NPS EN-3 paragraph 2.8.345</p> <p>The Secretary of State should be satisfied that the site selection and site design of a proposed offshore wind farm and offshore transmission has been made with a view to avoiding or minimising disruption or economic loss or any adverse effect on safety to other offshore industries. Applicants will be required to demonstrate that risks to safety will be reduced to as low as reasonably practicable.</p>	<p>Section 4.10.3 and section 4.11.3 describes how the site selection process for the Mona Offshore Cable Corridor and Access Areas was used to minimise potential impacts on existing offshore industries and other sea users.</p> <p>Section 4.11.2 and section 4.11.3 described the changes made to the Mona Array Area boundary and arrangement of infrastructure within the Mona Array Area to minimise potential impacts on existing offshore industries and other sea users.</p>

Table 4.3: Summary of NPS EN-5 policy on decision making relevant to Site Selection and Alternatives.

Summary of NPS EN-5 provision	How and where considered in the Environmental Statement
<p>NPS EN-5 paragraph 2.2.8</p> <p>There will usually be a degree of flexibility in the location of the development's associated substations, and applicants should consider carefully their location, as well as their design.</p>	<p>The siting process for the onshore substation is described within Section 4.9.6, Section 4.10.6 and Section 4.11.7.</p> <p>A BRAG methodology (Section 4.6) was used to inform site selection and consideration of alternatives. Development considerations captured within the BRAG assessment included archaeology/cultural heritage, ecology, landscape, hydrology and hydrogeology, engineering, community, landscape and visual, property and planning. Landscape considerations for the BRAG assessment were based on criteria for judging landscape capacity and sensitivity, for example proximity to valued landscapes, landscape character susceptibility, visual sensitivity/presence of visual receptors and opportunities to utilise existing features (such as woodlands) for screening and mitigation. This approach took account of the siting principles in the Horlock Rules and considered Schedule 9 of the Electricity Act 1989.</p>

Welsh National Marine Plan

- 4.3.2.3 The site selection and alternatives chapter has also been developed with consideration of the specific policies set out in the Welsh National Marine Plan (Welsh Government, 2019). Whilst there is limited specific reference to consideration of alternatives within the Welsh National Marine Plan the plan outlines that the Welsh Government has considered alternatives to the need for large scale deployment of marine renewable technologies and concluded that there is a strategic need to support the development of marine renewable energy generation.

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- 4.3.2.4 The Welsh National Marine Plan specifically recognises the need for offshore wind, in recognition that other technologies such as wave and tidal remain in relative infancy. Paragraph 331 states that the Plan area includes good wind resource in deeper water, and that offshore wind energy is a proven and strategically important energy technology and the costs of deployment are decreasing rapidly, making this a viable and attractive renewable energy option for Wales, with considerable scope. Paragraph 335 states that the Welsh Government has considered alternatives to the need for large scale deployment of marine renewable technologies and concluded that there is a strategic need to support the development of marine renewable energy generation capacity.
- 4.3.2.5 The Sector Policy on Subsea Cabling includes specific reference to cable landfall, considered further in Table 4.4.

Table 4.4: Welsh National Marine Plan policies of relevance to site selection and alternatives.

Policy	Key provisions	How and where considered in the Environmental Statement
Sector Policy - Subsea Cabling (CAB_01, paragraph 449)	When selecting locations for landfall of power and telecommunications cables, developers and relevant public authorities should give consideration to utilising an existing landfall site (where appropriate) and ensure that any proposals are aligned with land planning policies.	The selection process for landfall sites is described in section 4.10. As part of this process, consideration was given to whether it would be possible to utilise an existing landfall site.

North West Offshore Coast Marine Plans

- 4.3.2.6 The site selection and alternatives chapter has also been developed with consideration to the specific policies set out in the North West Inshore and North West Offshore Coast Marine Plans (MMO, 2021). The North West Inshore and North West Offshore Marine Plans define the need for offshore renewable energy generation and Policy NW-REN1 states that proposals that enable the provision of renewable energy technologies will be supported.
- 4.3.2.7 Policies specific to cable infrastructure have not been referenced in this chapter as there is no export cable infrastructure associated with the Mona Offshore Wind Project located within the marine plan area.

Planning Policy Wales 11 and Future Wales: The National Plan 2040

- 4.3.2.8 The site selection and alternatives chapter has also been developed with consideration of the specific policies set out in Planning Policy Wales 11 and Future Wales: the National Plan 2040. Key provisions are set out in Table 4.5 along with details as to how these have been addressed within the assessment.

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Table 4.5: Welsh Planning Policy of relevance to site selection and alternatives.

Policy	Key provisions	How and where considered in the Environmental Statement
Planning Policy Wales 11 Development Management and Low Carbon Energy (paragraph 5.9.20)	<p>Planning authorities should also identify and require suitable ways to avoid, mitigate or compensate adverse impacts of renewable and low carbon energy development. The construction, operation, decommissioning, remediation and aftercare of proposals should take into account:</p> <ul style="list-style-type: none"> • the need to minimise impacts on local communities, such as from noise and air pollution, to safeguard quality of life for existing and future generations; • the impact on the natural and historic environment; • cumulative impact; • the capacity of, and effects on the transportation network; • grid connection issues where renewable (electricity) energy developments are proposed; and • the impacts of climate change on the location, design, build and operation of renewable and low carbon energy development. In doing so, consider whether measures to adapt to climate change impacts give rise to additional impacts. 	These matters have been considered in sections 4.4 Site Selection Principles, 4.6.2 Consideration of Alternatives and 4.6.3 Site Selection process.
Future Wales: the National Plan 2040 Policy 24 – North West Wales and Energy	<p>There are a number of opportunities for offshore renewable energy developments in this area (north Wales) and the role of development plans is to enable appropriate onshore development, including cable landfall sites.</p>	The site selection process for onshore infrastructure is described throughout this chapter.

4.3.3 Planning Inspectorate Advice Note Seven

- 4.3.3.1 The Planning Act 2008 (as amended), and related secondary legislation, establishes the legislative requirements in relation to applications for orders granting development consent for NSIPs.
- 4.3.3.2 The Planning Inspectorate Advice Note Seven (Planning Inspectorate, 2020) suggests that the EIA needs to explain: *“the reasonable alternatives considered and the reasons for the chosen option taking into account the effects of the Proposed Development on the environment”*.

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4.3.4 Horlock Rules

- 4.3.4.1 The relevance of planning and environmental considerations in the siting of onshore substations was set out by the Central Electricity Generating Board and more recently reviewed and adopted by National Grid Electricity Transmission (NGET) in the 'Horlock Rules'. The Horlock Rules are a set of guidelines produced by NGET to assist those responsible for siting and designing substations to mitigate the environmental effects of such developments (National Grid, 2003). They are still referred to and used by NGET (and endorsed in ministerial decisions and at public inquiry) when undertaking planning studies for new infrastructure although they now have to be considered alongside the relevant policy set out in National Policy Statements, Development Plan documents and other sources.
- 4.3.4.2 The principles embedded in the Horlock Rules are relevant to the Mona Onshore Development Area.
- 4.3.4.3 In the Horlock Rules, NGET states that it will encourage generators to adopt the guidelines when working with NGET on proposals for substations, sealing end compounds or line entries. These guidelines also confirm that consideration must be given to environmental issues at the earliest stage in order to keep adverse effects to a reasonably practical minimum in the planning of new substations.
- 4.3.4.4 Table 4.6 below summarises the Horlock Rules and the Mona Offshore Wind Project's approach to them.

Table 4.6: Mona Offshore Wind Project application of the Horlock Rules.

Overall system options and site selection	Mona Offshore Wind Project approach
In the development of system options including new substations, consideration must be given to environmental issues from the earliest stage to balance the technical benefits and capital cost requirements for new developments against the consequential environmental effects in order to keep adverse effects to a reasonably practicable minimum.	Environmental issues have been considered since the commencement of the site selection process as described in section 4.10.6.
Amenity, cultural or scientific value of sites	
The siting of new substations, sealing end compounds and line entries should as far as reasonably practical seek to avoid altogether internationally and nationally designated areas of the highest amenity, cultural or scientific value by the overall planning of the system connections.	<p>The site selection process has considered designated sites including those designated for ecological, landscape and historic environment reasons.</p> <p>All internationally and nationally designated sites have been avoided as part of onshore substation site selection.</p>
Local context, land use and site planning	
Areas of local amenity value, important existing habitats and landscape features including ancient woodland, historic hedgerows, surface and ground water sources and nature conservation areas should be protected as far as reasonably practicable.	<p>The onshore substation options have sought to protect areas of local amenity value, important existing habitats and landscape features as far as reasonably possible.</p> <p>Where impacts cannot be avoided. They are addressed through appropriate mitigation and design as described within this Environmental Statement.</p>

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Overall system options and site selection	Mona Offshore Wind Project approach
<p>The siting of substations, extensions and associated proposals should take advantage of the screening provided by land form and existing features and the potential use of site layout and levels to keep intrusion into surrounding areas to a reasonably practicable minimum.</p>	<p>The substation shortlisting process has considered opportunities to benefit from existing screening.</p> <p>Additional landscape screening has been identified within the Outline Landscape and Ecology Management Plan (document reference: J22).</p>
<p>The proposals should keep the visual, noise and other environmental effects to a reasonably practicable minimum.</p>	<p>Visual, noise and other environmental effects have been minimised as far as possible through the selection of the substation options. Further mitigation for noise and vibration impacts is considered in Volume 3; Chapter 22: Noise and vibration of the Environmental Statement.</p>
<p>The land use effects of the proposal should be considered when planning the siting of substations or extensions.</p>	<p>The use of existing land has been considered within the site selection process; further details on the consideration of land use are contained within section 4.10.6.</p>
Design	
<p>In the design of new substations or line entries, early consideration should be given to the options available for terminal towers, equipment, buildings and ancillary development appropriate to individual locations, seeking to keep effects to a reasonably practicable minimum.</p>	<p>The effects associated with potential equipment within the substation have been taken into account in the development of site proposals and through the assessment of environmental effects.</p>
<p>Space should be used effectively to limit the area required for development consistent with appropriate mitigation measures and to minimise the adverse effects on existing land use and rights of way, whilst also having regard to future extension of the substation.</p>	<p>The initial footprint of the onshore substation has been determined based on the Applicants current view of land required. The design of the onshore substation will be subject to ongoing refinement as the project progresses.</p> <p>Note: the reference to the “future extension of the substation” is related to the future extension of National Grid substations. This is not considered as part of the site selection process for the Mona Offshore Wind Project.</p>
<p>The design of access roads, perimeter fencing, earth shaping, planting and ancillary development should form an integral part of the site layout and design to fit in with the surroundings.</p>	<p>The requirement for access roads, fencing, site levelling, planting and other works (including the need for attenuation ponds) has been taken into account throughout the site selection process.</p>
Line Entry	
<p>In open landscape especially, high voltage line entries should be kept, as far as possible, visually separate from low voltage lines and other overhead lines so as to avoid a confusing appearance.</p>	<p>The Applicant has not included overhead lines within the project design envelope. All cables will be buried underground.</p>
<p>The inter-relationship between towers and substation structures and background and foreground features should be studied to reduce the prominence of structures from main viewpoints. Where practicable the exposure of terminal towers on prominent ridges should be minimised by siting towers against a background of trees rather than open skylines.</p>	<p>The Applicant has not included overhead lines within the project design envelope. All cables will be buried underground.</p>

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4.3.5 Natural Resources Wales Cable Advice for Round 4 Developers

- 4.3.5.1 NRW have issued advice to inform the routing of offshore windfarm cabling within Round 4 leasing areas in relation to key marine ecosystem receptors (2019).
- 4.3.5.2 Key sensitivities and concerns are outlined for these different receptor groups along with pathways by which cable installation, operation and maintenance and decommissioning activities can interact with and impact these different receptor groups. This is then linked with NRW's detailed conservation advice for these receptors. NRW recommends early engagement from developers when identifying potential cable routes to ensure all key environmental effects and consenting risks are considered. NRW will work with developers to assist with the application of the avoid-reduce-mitigate hierarchy, if required.

4.4 Site Selection Principles

- 4.4.1.1 Alongside published principles and guidance the following site selection principles were developed and applied at the outset of the site selection process for the Mona Offshore Wind Project. These are drawn from the experience of the Applicant and technical expertise of consultants supporting the process and comprise:
- Shortest route preference to reduce impacts by minimising footprint for the Mona Offshore Cable Corridor and Access Areas and Mona Onshore Cable Corridor as well as considering cost (hence ultimately reducing the cost of energy to the consumer) and minimising transmission losses
 - Avoidance of key sensitive features where possible, and where not, ensure mitigation of impacts
 - Minimise the disruption to populated areas
 - The need to accommodate the range of technology sought within the design envelope for the onshore substation.
- 4.4.1.2 Prior to starting each stage of the site selection process (described in section 4.6.3 below), a series of transparent design principles and engineering assumptions were identified which governed the decisions made at each stage. These design principles and engineering assumptions covered environmental, physical, technical, commercial and social considerations and opportunities. Each step of the process involved gathering data from a number of different sources to define and assess the options for each component of project infrastructure. Internal project workshops were then held at key stages of the site selection process to collate and review the data gathered to date, and to reach cross-discipline decisions about refining the site selection options.

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4.5 Consultation

- 4.5.1.1 Stakeholder engagement and public consultation is recognised as vitally important for shaping the approach to development. Early engagement was undertaken with a wide range of stakeholders to refine the process, design and wider spatial constraints and considerations. Consultation on refinements in the Mona Offshore Wind Project site selection, layout and configurations has been undertaken through the informal and formal pre-application stages to date between submitting the Scoping Report (Mona Offshore Wind Ltd, 2022) in May 2022 and submission of the application for Development Consent. The Applicant met with a range of stakeholders to discuss their feedback in more detail and to make any necessary amendments to the proposed approach ahead of formal consultation on the PEIR, and based on feedback to the PEIR, ahead of submission of the application for Development Consent. Feedback received has been taken into consideration throughout the process, through a range of means including (but not limited to):
- Consultation events held at locations within and adjacent to the Mona Proposed Onshore Development Area and online webinars
 - Direct discussions with relevant land interests:
 - Letters were sent to all potentially affected parties offering to meet to discuss the Mona Offshore Wind Project proposals
 - The Applicant and the Applicant's land agents have met and engaged with potentially affected relevant land interests and/or their appointed land agents, where possible
 - The Applicant has engaged with relevant land interests regarding survey access through consultation meetings.
 - Feedback reports shared with all registered participants, key local and community stakeholders, and on the Mona Offshore Wind Project website
 - Town Council briefings
 - Parish Council briefings
 - Dedicated project e-mail address and freepost address to assist local communities in contacting the Applicant
 - Provision of a dedicated Mona Offshore Wind Project website
 - Regular and targeted discussion with regulators and other stakeholder bodies through various means, where the siting of onshore and offshore infrastructure was discussed in detail.
- 4.5.1.2 The Applicant engaged with technical stakeholders through the EPP to ensure the most recent evidence was taken into assessments and that stakeholders had an opportunity to raise any issues and suggestions regarding the site selection process. The process provided an opportunity for stakeholders to advise on proposals at an early stage to help mitigate any potential significant effects. As part of this, a steering group was established, as well as Expert Working Groups (EWGs) to discuss topic-specific issues with relevant stakeholders. EWGs were established for the following topics:

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4.5.1.3

- Benthic Ecology, Fish and Shellfish and Physical Processes
- Marine mammals
- Offshore ornithology
- Onshore ecology
- Onshore and intertidal ornithology.

4.5.1.4

In addition to the EPP, a Maritime Navigation Engagement Forum (MNEF) and separate onshore and offshore Archaeology and Heritage Engagement Forum's (AHEF) were established.

4.5.1.5

A summary of the key issues raised during consultation activities undertaken to date specific to site selection and consideration of alternatives is presented in Table 4.7 below, together with how these issues have been considered in the site selection process. The Consultation Report (document reference E3) and Technical Engagement Plan (document reference E4) presents full details of all technical consultation carried out with stakeholders.

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Table 4.7: Summary of key consultation issues raised during statutory and non-statutory consultation activities undertaken for the Mona Offshore Wind Project relevant to site selection and consideration of alternatives.

Date	Consultee and type of response	Issues raised	Response to issue raised and/or where considered in this chapter
June 2022	Denbighshire County Council – Scoping Opinion	<p>Planning Policy Wales (PPW 11) Section 3.58 and 3.59 obliges weight to be given to protecting land of grades 1, 2, and 3a quality in the Agricultural Land Classification (ALC).</p> <p>PPW 11 notes this land is considered to be the best and most versatile and justifies conservation as a finite resource for the future. It indicates that land of this quality should only be developed if there is an overriding need for the development, and either previously developed land or land of a lower grade is not available, or available lower grade land has an environmental value recognised by a landscape, wildlife, historic or archaeological designation which outweighs the agricultural considerations.</p>	<p>The Applicant has considered Agricultural Land Classification as a factor in the selection of the onshore substation location. The land for both substation options is ALC 3b.</p> <p>Further information on the land classification in the area is described in Volume 3; Chapter 20: Land Use and Recreation of the Environmental Statement.</p>
June 2022	Natural Resources Wales – Scoping Opinion	<p>NRW note in Part 3: Section 2.4 Ongoing siting and routing process, that the potential routes for offshore export cables and landfall are currently undergoing a process of review to refine the potential feasible options. NRW would welcome the opportunity to engage with the applicant in discussions on the potential environmental constraints of the offshore export cable route and landfall options once they have been refined further. In particular around potential interactions with sensitive features (Annex I habitats within SACs, Annex I habitats outside SACs, Section 7 habitats and OSPAR habitats).</p>	<p>The Applicant has engaged with NRW on the potential routes and route constraints for export cables and landfall options as described within this consultation table and throughout the chapter.</p>
July 2022	<p>Evidence Plan Steering Group Meeting with:</p> <ul style="list-style-type: none"> Natural Resources Wales JNCC Planning Inspectorate Natural England 	<ul style="list-style-type: none"> Presentation and discussion on site selection process for offshore cable route including interaction with designated sites. Feedback received from NRW on the preference to avoid the Constable Bank and the need to avoid reef features of the Menai Strait and Conwy Bay SAC. Feedback also received on the Traeth Pensarn SSSI and the need to consider this as a key environmental constraint. 	<p>Consideration of the Mona Offshore Cable Corridor route through Constable Bank, Menai Strait and Conwy Bay Special Area of Conservation (SAC) and Traeth Pensarn Site of Special Scientific Interest (SSSI) is described in sections 4.10.3 and 4.11.4 of this chapter.</p>

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Date	Consultee and type of response	Issues raised	Response to issue raised and/or where considered in this chapter
	<ul style="list-style-type: none"> Marine Management Organisation 		
September 2022	Site selection workshop with: <ul style="list-style-type: none"> Natural Resources Wales Denbighshire County Council Conwy County Borough Council Cadw Clwyd-Powys Archaeological Trust Royal Commission on the Ancient and Historical Monuments of Wales 	<ul style="list-style-type: none"> Presentation and discussion of areas of search and the background information used to inform the decision-making to date; Presentation of the indicative long list of options; and Agreement of site selection methodology, request for any missing datasets/ baseline data, and the opportunity for stakeholders to identify and indicate preferences for long list options. 	Feedback received on landfall options is summarised in of this chapter.
October 2022	Targeted community consultation events seeking feedback on short list of onshore substations for PEIR	<ul style="list-style-type: none"> Background information regarding the Mona Offshore Wind Project Presentation of AoS for the onshore substation and the indicative short list of options; Presentation of indicative onshore cable routes from landfall to onshore substation; Presentation of constraints in the vicinity of the onshore substation including ecology, traffic & transport and historic environment; and Opportunity for non-statutory consultees to identify and indicate preferences for preferred onshore substation locations for PEIR assessment. 	Feedback received on onshore substation options is summarised in Table 4.20. Details on the preferred onshore substation options (for PEIR) are detailed in section 4.8.6 which includes a summary of how the preferred onshore substation options (for PEIR) has taken account of responses received.

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Date	Consultee and type of response	Issues raised	Response to issue raised and/or where considered in this chapter
December 2022	Site selection workshop with: <ul style="list-style-type: none"> Natural Resources Wales Denbighshire County Council Conwy County Borough Council Cadw Clwyd-Powys Archaeological Trust Royal Commission on the Ancient and Historical Monuments of Wales Welsh Government 	<ul style="list-style-type: none"> Provision of an update to the selected landfall in response to consultation responses received; Presentation of the outcomes of the onshore substation targeted consultation and presentation of preferred onshore substation locations for comment; and Provision of an update to the proposed onshore cable route – a request from stakeholders for an opportunity to provide comment in advance of the next site selection EWG. 	Details on the chosen landfall site, onshore cable route and onshore substation options are detailed in sections 4.10.4, 4.10.5 and 4.10.6 respectively.
February 2023	Evidence Plan Steering Group Meeting with: <ul style="list-style-type: none"> Natural Resources Wales JNCC Planning Inspectorate Natural England Marine Management Organisation 	<ul style="list-style-type: none"> Presentation on the site selection process for the Mona Offshore Cable Corridor and Access Areas. Discussion around the need to minimise risk to annex 1 habitats and designated sites. 	Details on the Mona Offshore Cable Corridor and Access Areas presented in the statutory consultation are provided in section 4.10.3. Feedback received from the Steering Group is summarised in Table 4.13. Section 4.11.4 describes how the Mona Offshore Cable Corridor and Access Areas was refined to address feedback.
June 2023	Wildlife Trust Wales (WTW) Statutory consultation feedback	Export Cable Corridor and Cabling <ul style="list-style-type: none"> Site selection assumptions underpinning route selection for Mona Offshore Cable Corridor and Access Areas and need for prioritising routing through areas already hosting anthropogenic 	The Applicant has engaged with WTW on the potential routes and route constraints for export cables and landfall options throughout the development process through the Benthic Ecology, Fish and Shellfish and Physical Process EWG attended by WTW.

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Date	Consultee and type of response	Issues raised	Response to issue raised and/or where considered in this chapter
		<p>infrastructure, where possible and minimising offshore wind farm development sprawl.</p> <ul style="list-style-type: none"> • A key area of concern highlight by WTW is approach at the landfall. • 	<p>Sections 4.6 to 4.9 describe the approach to site selection, identification of the POI and identification of Mona Offshore Cable Corridor and Access Areas, whilst sections 4.11.4 and 4.11.5 describes how the Mona Offshore Cable Corridor and Access Areas and installation at the landfall was refined to address feedback received through the statutory consultation.</p>
August 2023	<p>Site selection workshop with:</p> <ul style="list-style-type: none"> • Natural Resources Wales • Denbighshire County Council • Conwy County Borough Council • Cadw • Clwyd-Powys Archaeological Trust • Royal Commission on the Ancient and Historical Monuments of Wales • Welsh Government 	<ul style="list-style-type: none"> • Presentation of the post-PEIR consultation feedback on site selection and project refinements; • Provision of an update to the proposed landfall access strategy – a request from NRW to provide comment and invitation to agree an ‘exclusion zone’ from the order limits to reduce potential impacts; • Presentation of reduced onshore substation parameters for footprint and maximum building height; • Presentation of the project refinements in response to consultation feedback on the selection of a preferred onshore substation location. Confirmation that Option 2 was the selected option; • Presentation of potential onshore substation operational access options; • Presentation of the project refinements in response to consultation feedback on the selection of a preferred onshore cable route. Presentation of the preferred route with removal of optionality; • Presentation of indicative order limits with refinement to 74 m onshore cable corridor; and • Provision of a draft indicative outline landscape plan in advance of Onshore Ecology & Landscape EWG and a request for inputs from stakeholders. 	<p>Details on the refinements to the landfall site, onshore cable route and onshore substation options are detailed in sections 4.11.5, 4.11.6 and 4.11.7 respectively.</p>

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4.6 Site Selection Methodology

4.6.1 Overview

- 4.6.1.1 The Applicant has followed a staged site selection and design iteration process from inception to the point of submission of the application for Development Consent to identify the most suitable locations and configuration, based on the criteria outlined above for the Mona Offshore Wind Project infrastructure. The process has taken account of environmental, physical, technical, commercial, and social considerations and opportunities as well as engineering requirements.
- 4.6.1.2 The aim was to identify sites and routes that will be environmentally acceptable and can be delivered from a technical and consenting perspective, whilst also enabling the benefits in the long term of the lowest energy cost to be passed to the consumer. As described in Section 4.4 site selection principles were developed at the outset and these principles were followed as far as possible throughout the site selection process.
- 4.6.1.3 A multi-disciplinary team was formed to undertake the site selection process, which included input from engineers, planners, land advisors, legal and environmental consultants whose expertise was drawn upon through the process.

4.6.2 Consideration of alternatives

- 4.6.2.1 This Environmental Statement chapter provides a description of the reasonable spatial and geographical alternatives that have been considered by the Mona Offshore Wind Project, and, where appropriate, presents a comparison of the environmental effects between different options. This consideration of alternatives is captured within each of the sections below.
- 4.6.2.2 Strategic-level project design alternatives were also considered as part of the site selection and project design decision-making process. The strategic consideration of alternatives which fed directly into the Mona Offshore Wind Project's site selection process are set out in Table 4.8 below.

Table 4.8: Strategic alternatives considered and project decisions.

Alternatives considered	Decision	Justification
Onshore cables: Buried onshore cables or Overhead lines	Buried onshore cables	From the outset the Applicant discounted the option of overhead lines to reduce potential environmental effects.
Post PEIR and statutory consultation		
Cable landfall: Trenchless techniques from below mean low water springs (MLWS) to onshore (the long trenchless technique option) or A combination of open cut trenching through the intertidal zone and trenchless techniques to onshore (the short trenchless technique option)	Long trenchless technique	Both short and long trenchless technique options (such as HDD, micro-tunnelling, auger boring) were included within the design of the Mona Offshore Wind Project at PEIR due to a need to complete engineering feasibility studies. Following this, the Applicant has made a decision to bring cables onshore using the long trenchless techniques option.

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Alternatives considered	Decision	Justification
Major crossings onshore: Trenchless techniques Or Open cut trenching	Trenchless techniques	The Applicant is looking to employ trenchless techniques at all major crossings (including beneath Llanddulas Limestone and Gwrych Castle Wood SSSI and major roads) to minimise environmental impacts along the Mona Onshore Cable Corridor. Significant ecological receptors (e.g. important hedgerows) will also be crossed via trenchless techniques.
Selection of Gas Insulated Switchgear (GIS) transformer technology for the onshore substation. Or Selection of Air Insulated Switchgear (AIS) transformer technology for the onshore substation.	Selection of Gas Insulated Switchgear (GIS) transformer technology for the onshore substation.	Environmental benefit of the onshore substation Gas Insulated Switchgear (GIS) transformer technology is that it allows for a lower building height within the onshore substation and reduces the physical footprint of the onshore substation, minimising the visual impacts and increasing distances to receptors.

4.6.3 Site selection process

4.6.3.1 As discussed in section 4.1.1 the Applicant has followed a staged site selection and design iteration process from inception to the point of submission of the application for Development Consent. The following key factors have driven the process:

- Review of environmental constraints and planning policy which led to site specific refinement of the Mona Offshore Wind Project (see section 4.9)
- The selection of the Northern Wales and Irish Sea Bidding Area within Offshore Leasing Round 4 by the Crown Estate, and subsequent award of the AfL to Mona Offshore Wind Limited (see section 4.2.1 for further details)
- The HND which identified the Bodelwyddan National Grid substation as the grid connection point for the Mona Offshore Wind Project, and therefore enabled identification of the Mona Offshore and Onshore Cable Corridors and the onshore substation location (see section 4.8)
- Consultation with statutory and non-statutory consultees from the outset of the Mona Offshore Wind Project. As described in Section 4.5 the Applicant has undertaken pre-application engagement with stakeholders, communities and landowners in order to seek input to refine the project design
- Strategic review of statutory and non-statutory consultation feedback to facilitate back-checking of site selection assumptions and decisions following project refinements. This allowed for confirmation checks that new information or project refinements did not undermine previous site selection decisions.
- Other proposed development in the area and managing consultation fatigue. Several development schemes are currently being promoted near to the Bodelwyddan National Grid substation including the recently consented Awel y Mor offshore wind project. To manage consultation fatigue in the area the Applicant has reviewed and considered feedback received by the Awel y Môr project within its consideration of site selection and alternatives

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- The site selection process and consideration of alternatives for the Mona Offshore Wind Project included consideration of the proposed Morgan Offshore Wind Project Generation Assets and Morecambe Offshore Windfarm Generation Assets, specifically in relation to the array area boundary and shipping and navigation considerations.

4.6.3.2 The remainder of this chapter is structured as follows:

- Stage 1 - Identification of the Mona AfL area
- Stage 2 - Identification of POI
- Stage 3 - Identification of onshore and offshore areas of search for scoping (including substation zone)
- Stage 4 - Refinement of project for PEIR
- Statutory consultation
- Stage 5 - Further refinement of the project following review of statutory consultation responses and EIA studies
- Stage 6 - Final design for application

4.6.3.3 It should be noted that there was some overlap of the stages presented above and / or workstreams and parallel activities. However, for ease of reading, the stages have been set out in a linear manner. Each stage of the site selection process is described in further detail below.

4.7 Stage 1: Identification of Mona Agreement for Lease area

4.7.1 Overview

4.7.1.1 The following section describes the process of identifying the Mona Offshore Wind Project AfL area which was the basis of the Mona Offshore Wind Project Scoping Report (Mona Offshore Wind Ltd, 2022).

4.7.2 Offshore Leasing Round 4 process

4.7.2.1 As described in section 4.6.1 above, TCE launched the Offshore Wind Leasing Round 4 process in September 2019. The Northern Wales and Irish Sea Bidding Area was one of four Bidding Areas identified by TCE through the Offshore Wind Leasing Round 4 process. The Northern Wales and Irish Sea Bidding Area covers an area of approximately 8,500 km² and has water depths up to 50 m, with an average water depth of 34 m (shown in Figure 4.2).

4.7.2.2 A Bidding Area Report was prepared by TCE that identified the environmental designations within the Northern Wales and Irish Sea Bidding Area and the key species present (e.g. birds and fish). The report also identified a number of other constraints from activities such as fishing, oil and gas, NATS radar, defence and navigation as shown in Figure 4.3.

4.7.2.3 In order to bid in Round 4, projects were required to meet certain criteria, including around the siting of bids. A summary of the relevant spatial siting requirements is summarized in Table 4.9 below.

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Table 4.9: Offshore Wind Leasing Round 4 bidding rules (Crown Estate, 2019).

Offshore Wind Leasing Round 4 criteria	Mona Offshore Wind Project compliance
All Projects must be located entirely within a single Bidding Area.	Mona Offshore Wind Project is located entirely within the North Wales and Irish Sea Bidding Area.
Projects must avoid certain constraints identified within the Bidding Areas, including IMO traffic separation schemes and deep-water channels, existing offshore wind farm agreements, marine aggregate licences, capital and navigation dredging areas and coastal outfalls (Hard Constraints).	The Mona Array Area is located to avoid all hard constraints as shown in Figure 4.3.
Projects may not be located within 7.5 km of an existing offshore wind farm (meaning a wind farm at any stage of development which has been awarded an agreement for lease or lease from The Crown Estate unless the owner of the existing offshore wind farm has given its written consent).	The Mona Array Area is located at least 7.5 km away from existing offshore wind farms as shown in Figure 4.3.

4.7.3 AfL area

- 4.7.3.1 Prior to the submission of a bid to TCE, detailed consideration of key constraints was undertaken to identify potential project locations within the North Wales and Irish Sea Bidding Area. This was then refined to the Mona AfL area, which is shown in Figure 4.2 through further analysis of engineering, environmental, economic and consenting risks. Further study work was undertaken to understand key issues such as designated sites, shipping routes, other offshore industries and offshore ornithology.
- 4.7.3.2 The siting of the Mona AfL area was undertaken considering likely constraints, including:
- Ecological designations:
 - Avoidance of overlap with European designated sites and the decision to maintain a 10 km offset from the Liverpool Bay Special Protection Area (SPA)
 - Avoidance of Marine Conservation Zones
 - Other Sea User considerations:
 - Avoidance of TCE defined 'hard constraints' (described in Table 4.9)
 - Avoidance of oil and gas platforms
 - Avoidance of military disposal sites
 - Consideration of shipping and navigation routes
 - Consideration of pipelines and cables infrastructure
 - Other constraint considerations:
 - Consideration of wrecks
 - Consideration of aviation constraints (both military and civil aviation)
 - Consideration of seascape, landscape and visual constraints
- 4.7.3.3 The Mona AfL area extent was limited to the south by the requirement to maintain at least a 1 nm offset from the International Maritime Organisation (IMO) vessel routing measure (Liverpool Traffic Separation Scheme (TSS)).

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- 4.7.3.4 The Mona AfL area extent was limited to the east by the presence of existing oil and gas infrastructure, the closest of which (Conwy platform, operated by Eni) is located approximately 1.8 km from the Mona AfL area. The Mona AfL area extent was also limited to the east and the south by the project decision to maintain a 10 km offset from the Liverpool Bay SPA to align with feedback from SNCBs within the Offshore Wind Leasing Round 4 Bidding Area Report (v2.0) (Crown Estate, 2020) that projects within 10 km of the Liverpool Bay SPA would face significant consenting risks.

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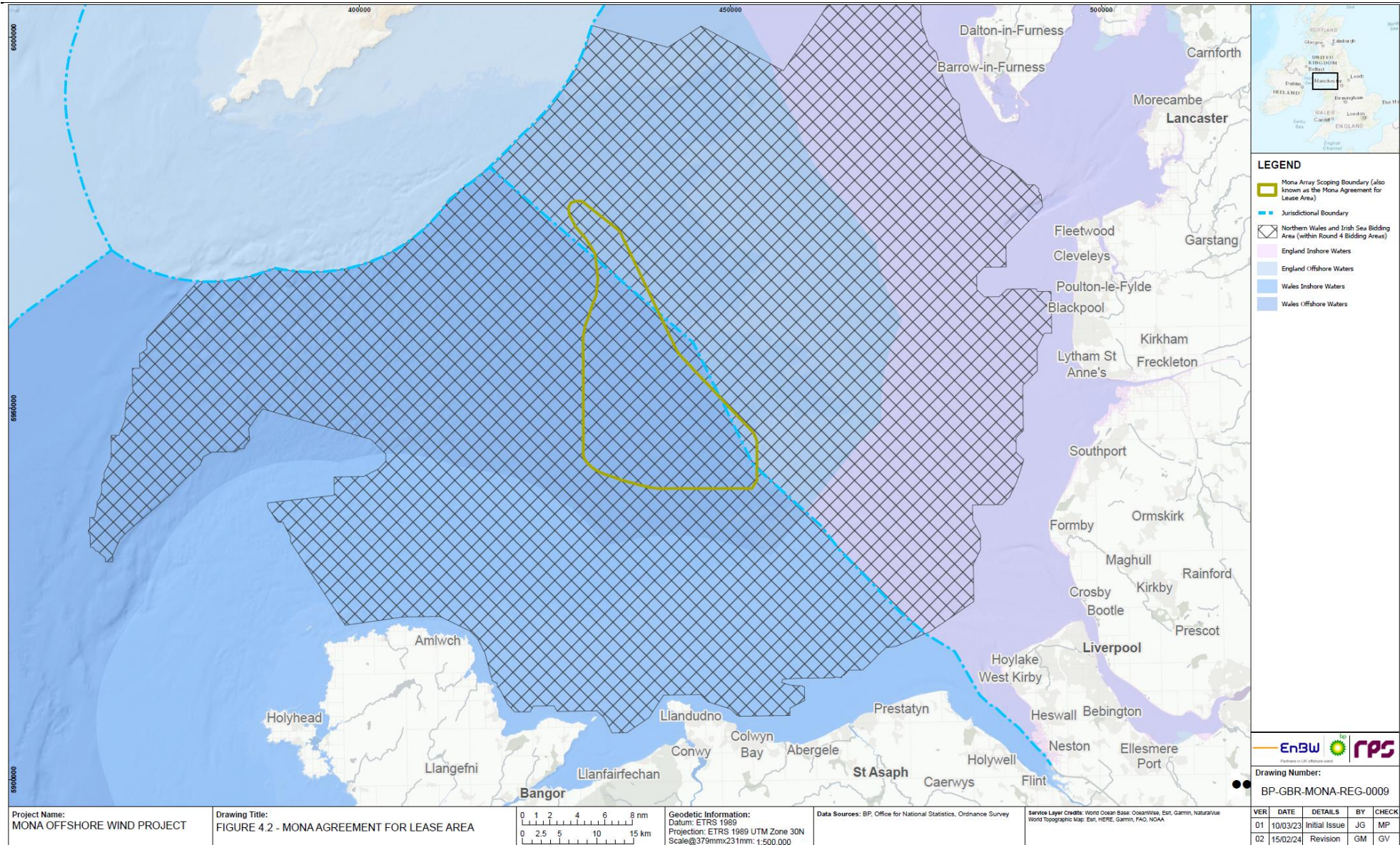


Figure 4.2: Mona Agreement for Lease Area.

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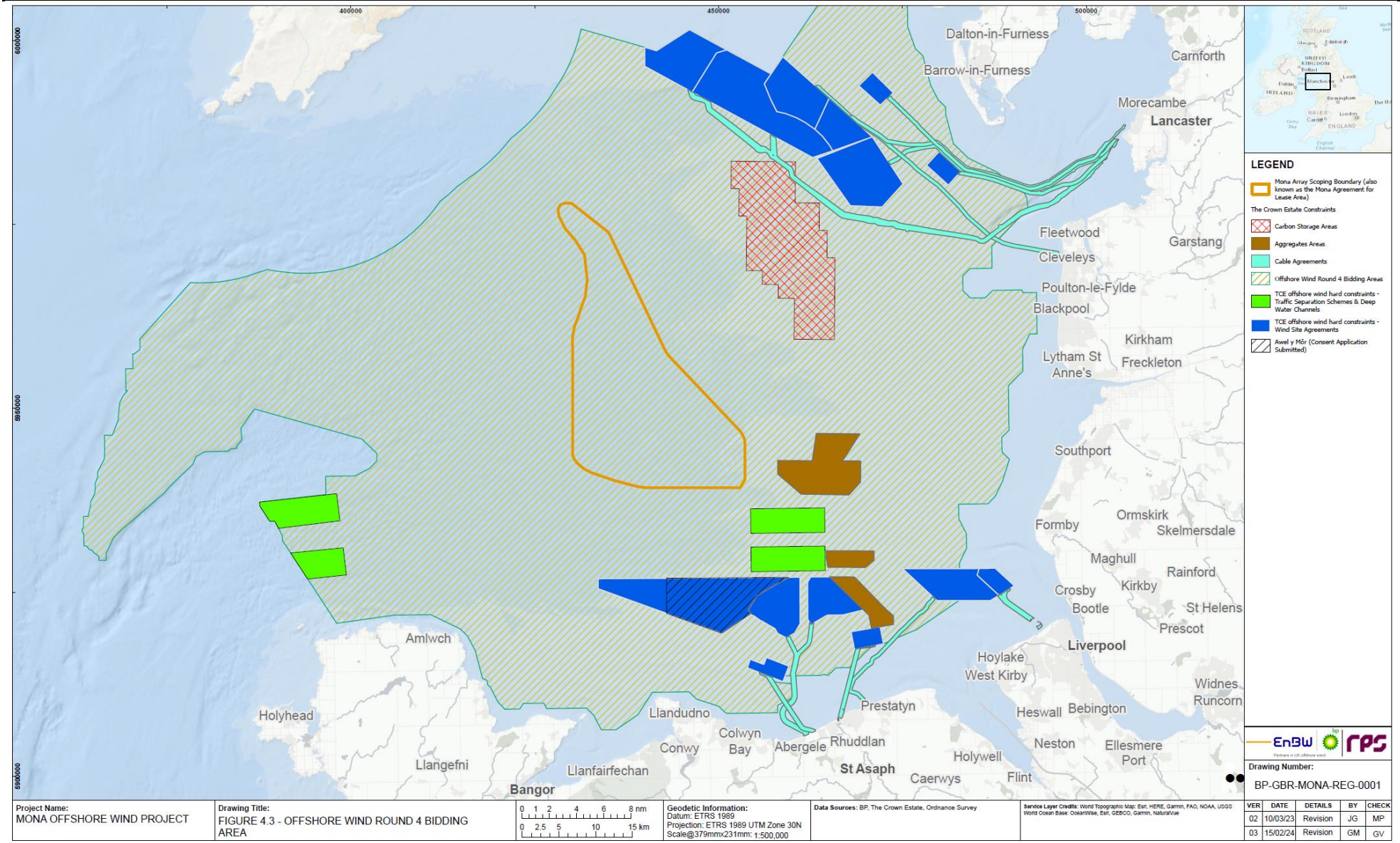


Figure 4.3: Offshore Wind Round 4 Bidding Area.

4.8 Stage 2: Identification of Point of Interconnection

- 4.8.1.1 Until 2021, National Grid (NGESO) used the Connection and Infrastructure Operations Note (CION) process to coordinate changes needed to the electricity network to accommodate new offshore connections from offshore energy infrastructure.
- 4.8.1.2 In its 2020 report to parliament, the Climate Change Committee called for government to develop a strategy to coordinate interconnectors and offshore networks for wind farms and their connections to the onshore network and bring forward any legislation necessary to enable coordination (Climate Change Committee, 2020). Following this, the UK government announced the Offshore Transmission Network Review (OTNR) to identify near-term actions and opportunities for offshore windfarm projects to coordinate and thereby address the barriers that the existing offshore transmission regime was considered to present to deployment of offshore wind; the intention being to develop an offshore transmission network that facilitates coordination between offshore wind developments.
- 4.8.1.3 The output of the OTNR was the HND; an integrated approach for connecting new offshore wind infrastructure to the grid cohesively.
- 4.8.1.4 Mona Offshore Wind Project was scoped into the HND as a Pathway to 2030 Project. The recommended design for the Northwest Region is a combination of collaborative developer-led solutions and single radial connections.
- 4.8.1.5 A number of potential grid connection locations and options were considered by NGESO through the HND process based on an understanding of the grid infrastructure capacity in relation to the location of the Mona Offshore Wind Project (and considering other Round 4 offshore wind projects coming forwards in the Irish Sea).
- 4.8.1.6 Whilst the decision for where projects connect to the grid ultimately sits with NGESO, the Mona Offshore Wind Project engaged with NGESO throughout the HND to understand the proposed solutions for connecting the Mona Offshore Wind Project to the grid and to provide input on environmental and consenting constraints for the POI under consideration.
- 4.8.1.7 The Applicant undertook constraints analysis for six POI in the Irish Sea; Wylfa, Pentir, Bodelwyddan, Connah's Quay, Kirkby and Penwortham. A full analysis of the constraints at each of the potential POI is not presented within this document, but below are the key constraints identified for the five POIs not taken forward:
- **Wylfa:** areas of rocky seabed around coast, environmental constraints associated with Morwenoliaid Ynys Môn/Anglesey Terns SPA and Gogledd Môn Forol/North Anglesey Marine SAC
 - **Pentir:** very long intertidal area with strong currents, environmental constraints associated with Y Fenai a Bae Conwy/Menai Strait and Conwy Bay SAC and Traeth Lafan/Lavan Sands SSSI
 - **Connah's Quay:** significant offshore constraints associated with existing offshore wind, oil and gas infrastructure and cables and pipelines, limited potential landfall options avoiding designated sites (Aber Dyfrdwy/Dee Estuary SPA, SAC, Ramsar and SSSI), challenging route to site substation as immediately adjacent to Aber Dyfrdwy/Dee Estuary SPA, SAC, Ramsar and SSSI, substation sites in area of high flood risk
 - **Kirkby:** close proximity to shipping lanes, significant number of offshore cable and pipeline crossings required, long intertidal zone, environmental constraints

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associated with Ribble and Alt Estuaries SPA and Ramsar and Sefton Coast SAC and SSSI at potential landfalls

- **Penwortham:** potential crossing of Fylde MCZ, potential crossing of gas field, long intertidal zone, environmental constraints associated with Ribble and Alt Estuaries SPA and Ramsar and Lytham St Annes SSSI and National Nature Reserve (NNR) at potential landfall, complex trenchless techniques solution across river Ribble.

4.8.1.8 Initially, NGESO concluded, through a CION process, that the preferred connection option for the Mona Offshore Wind Project was a single radial grid connection into Wylfa substation in Anglesey, North Wales. However, NGESO's process was always to review this POI through the HND process.

4.8.1.9 Ultimately, NGESO confirmed, through the review of HND, that the preferred connection option representing the most optimal design (economic, efficient and co-ordinated) considering all criteria (i.e. technical, cost, environmental and deliverability) for the Mona Offshore Wind Project was a single radial grid connection into Bodelwyddan Substation in Denbighshire, North Wales (NGESO, 2022) and therefore this is the only option the Applicant considered as part of the site selection process.

4.9 Stage 3: Identification of onshore and offshore areas of search for scoping (including onshore substation zone)

4.9.1 Overview

4.9.1.1 Initial mapping and consideration of onshore and offshore constraints was undertaken to develop defined search areas (within which future infrastructure would be sited) for each project component (offshore cable corridor, landfall, onshore cable corridor and onshore substation) for the purposes of scoping and non-statutory consultation with the public and relevant statutory and non-statutory stakeholders.

4.9.1.2 The scoping boundaries defined included sufficient buffers to enable an iterative design refinement process (based on stakeholder feedback, further data acquisition and interrogation and engineering optimisation) for the evaluation of specific routes and infrastructure to take place as the Mona Offshore Wind Project progressed through the pre-application phase.

4.9.1.3 The search areas formed the basis of the Mona Array Scoping Boundary, the Mona Offshore Transmission Infrastructure Scoping Search Area and the Mona Onshore Transmission Infrastructure Scoping Search Area, as shown in Figure 4.4, used within the Mona Offshore Wind Project EIA Scoping Report (Mona Offshore Wind Ltd. 2022), submitted to the Planning Inspectorate in May 2022.

4.9.2 Identification of the Mona Array Area

4.9.2.1 Early in the Mona Offshore Wind Project development the Applicant identified the need to remove the northernmost part of the Mona AfL area to mitigate potential impacts on shipping and navigation (see Figure 4.2). This reduced area was identified as the Mona Potential Array Area within the scoping report submitted to the Planning Inspectorate in May 2022 and the Mona Array Area within the PEIR.

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4.9.3 Identification of an Offshore Scoping Search Area

- 4.9.3.1 The Mona Offshore Transmission Infrastructure Scoping Search Area was drawn for the purpose of identifying the Mona Offshore Export Cable Corridor and aimed at meeting the site selection principles (described in section 4.4) and using environmental constraints and engineering development considerations.
- 4.9.3.2 The distribution of 'hard constraints' including existing offshore wind farms (Burbo Bank, Burbo Bank Extension, North Hoyle, Rhyl Flats, Gwynt y Mor and Awel y Môr AfL area), an existing anchorage area, pipeline and cable infrastructure and the 'Liverpool Bay' marine aggregate extraction Area 457 (see Figure 4.3), which necessitated a wide AoS for the Mona Offshore Cable Corridor and Access Areas.
- 4.9.3.3 This created an AoS from the southern extent of the Mona Array Area to the Welsh coastline which extended to the east to the boundary of the Burbo Bank extension lease area, and to the west past the Awel y Môr AfL area as shown in Figure 4.4.
- 4.9.3.4 The AoS sought to specifically avoid interactions with key ecological designations including the Aber Dyfrdwy/Dee Estuary SAC and SPA, Traeth Lafan/Lavan Sands, Conwy Bay SPA, Morwenoliaid Ynys Môn/Anglesey Terns SPA and the Gogledd Môn Forol/North Anglesey Marine SAC. The AoS looked to minimise interaction with ecological designations that could not be avoided, specifically Y Fenai a Bae Conwy/Menai Strait and Conwy Bay SAC, for which only a small portion of the northeast corner overlapped with the AoS. However, the Bae Lerpwl/Liverpool Bay SPA extends from the east coast of Anglesey to Morecambe Bay making crossing the site unavoidable.

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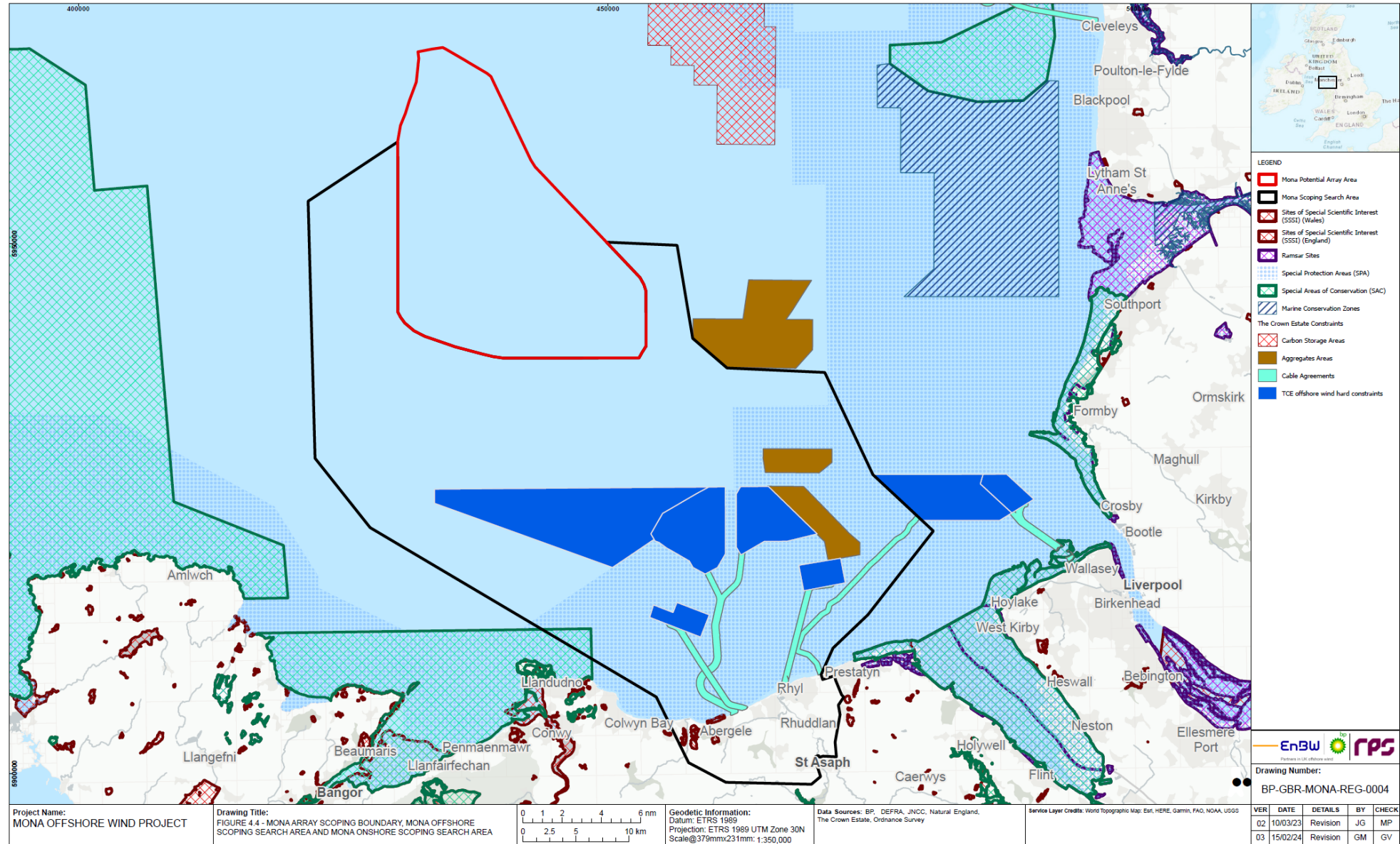


Figure 4.4: Mona Array Scoping Boundary, Mona Offshore Scoping Search Area and Mona Onshore Scoping Search Area.

4.9.4 Identification of a Landfall Area of Search

- 4.9.4.1 One of the key considerations in the identification of onshore and offshore cable routing options was the identification of landfall options in the vicinity of the National Grid substation at Bodelwyddan. An initial search area was identified for the landfall between the Penrhyn peninsula and Prestatyn on the North Wales coast. The extent of the landfall search area was designed to accommodate feasible offshore export cable options and to avoid the ecological designations of the Aber Dyfrdwy/Dee Estuary SAC, SPA and Ramsar to the east, and minimise the overlap with ecological designations of the Y Fenai a Bae Conwy/Menai Strait and Conwy Bay SAC to the west. This landfall search area was used to define the landfall boundary for scoping (approximate length of coastline of 16 km) and avoided any direct impact to the ecological designations referenced above and protected features within them. The landfall search area is shown in Figure 4.5.

4.9.5 Identification of the Mona Onshore Transmission Infrastructure Scoping Search Area

- 4.9.5.1 Following on from the landfall search area, the Mona Onshore Transmission Infrastructure Scoping Search Area was defined for the purposes of consultation and the EIA scoping. The key influences on the Mona Onshore Transmission Infrastructure Scoping Search Area (Figure 4.4) were the landfall search area along the Welsh coastline and an initial 3 km AoS for the onshore substation (which was later expanded to 5 km for the onshore substation AoS) placed around the identified National Grid connection point at the Bodelwyddan Substation (see section 4.9.6 and Figure 4.6). A broad area of land was then identified to join these two geographical areas, which was then further refined to avoid the Bryniau Clwyd A Dyffryn Dyfrdwy/Clwydian Range and Dee Valley National Landscape and the city of St. Asaph (Figure 4.7).
- 4.9.5.2 In parallel with the scoping phase of the Mona Offshore Wind Project, in March to June 2022, a long list of onshore cable corridors within the overall AoS was identified.

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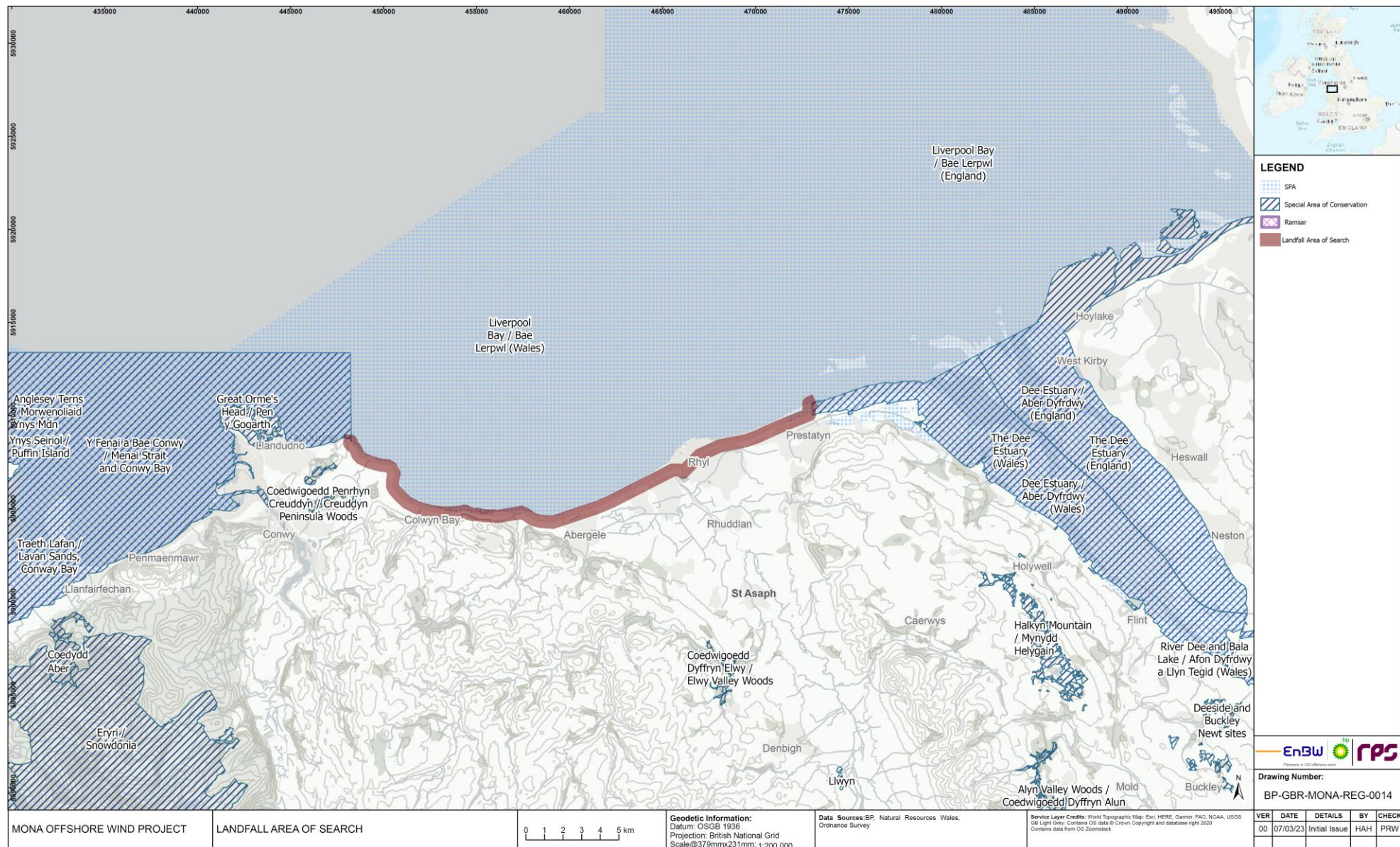


Figure 4.5: Landfall Area of Search for the Mona Offshore Wind Project.

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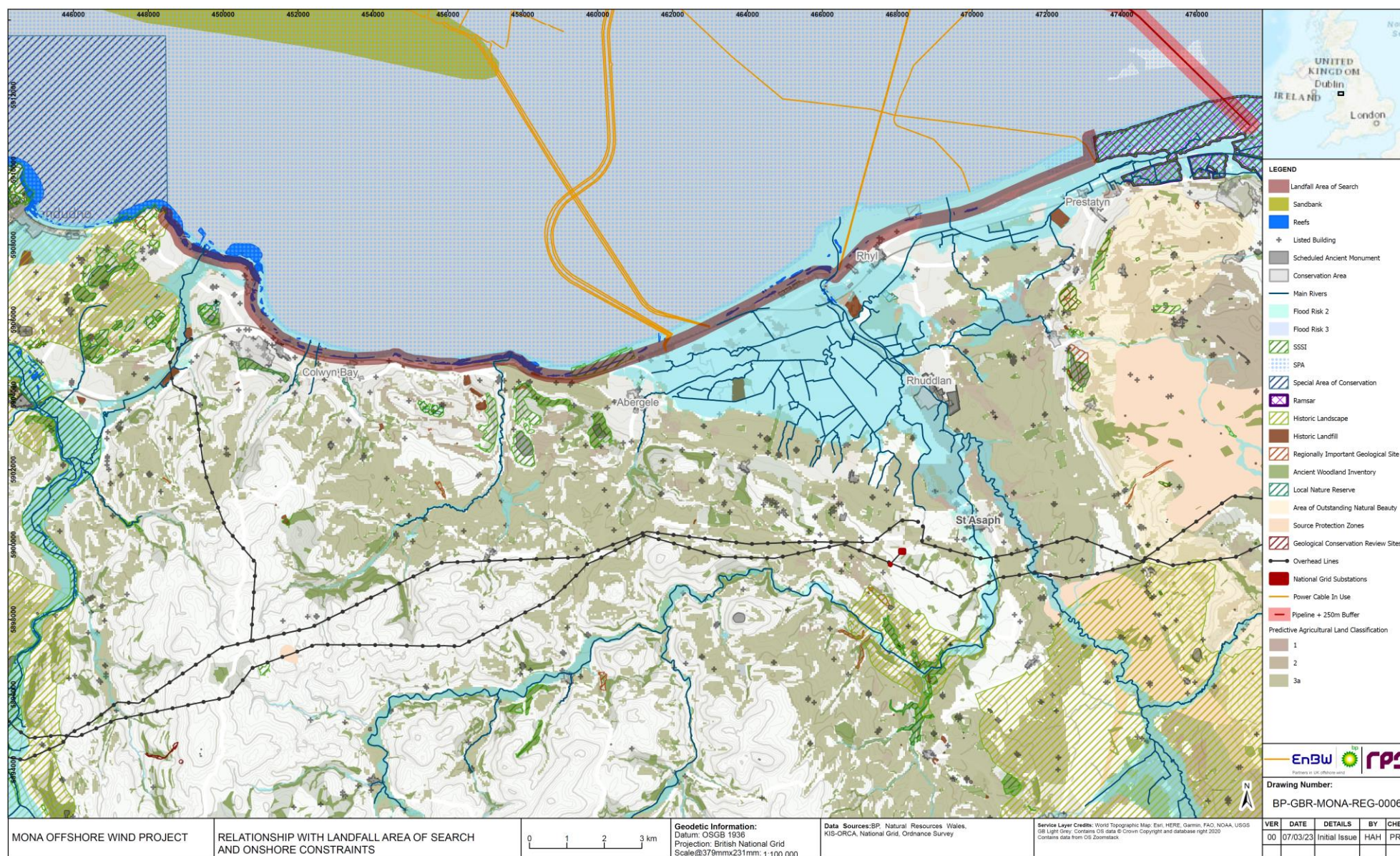


Figure 4.6: Relationship between Landfall Area of Search and Onshore Constraints.

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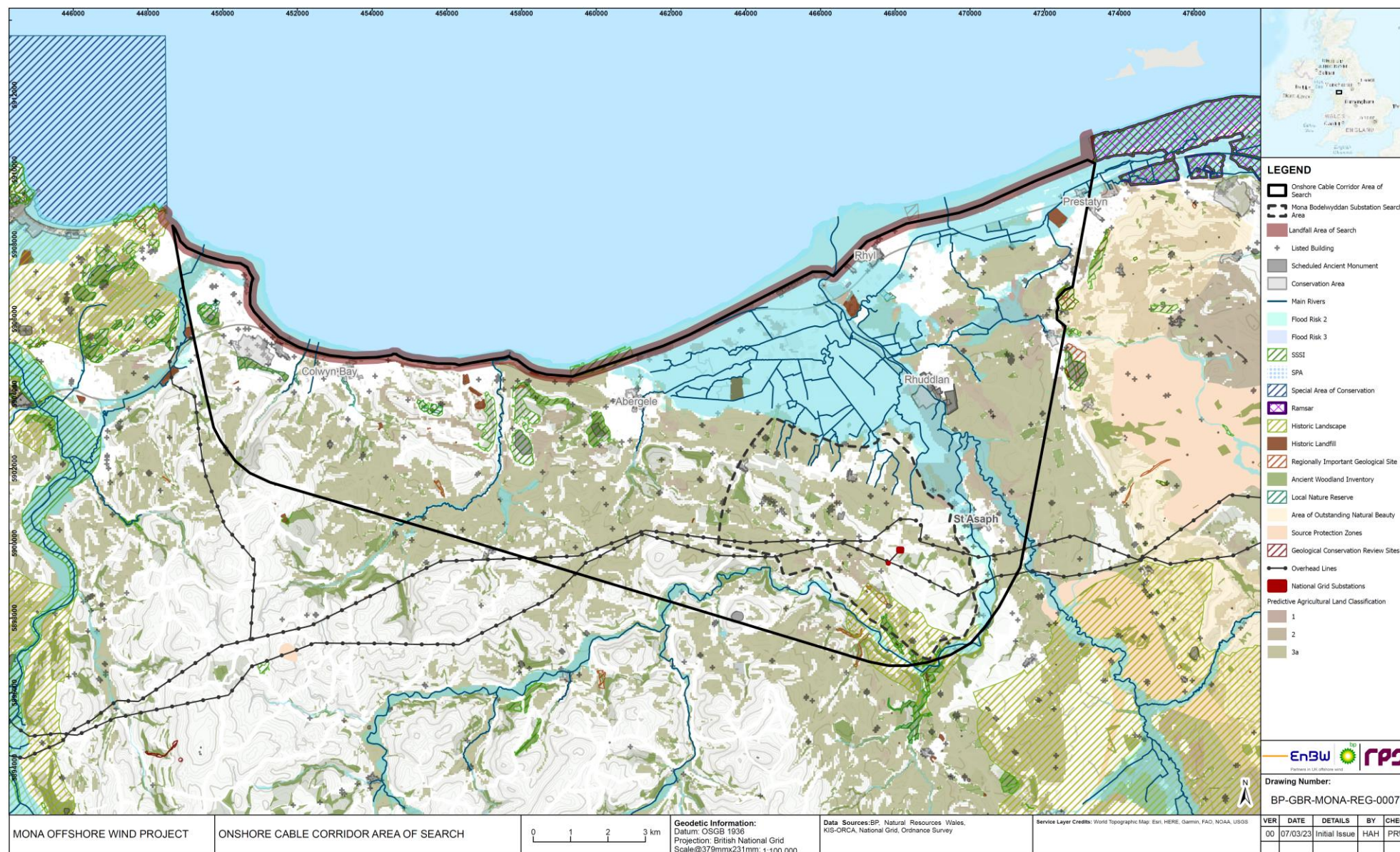


Figure 4.7: Onshore Cable Corridor Area of Search.

4.9.6 Identification of an Onshore Substation Area of Search

- 4.9.6.1 The guiding principles for locating the project's onshore substation are to achieve an economic and efficient connection (i.e. as close as possible to the National Grid connection point) whilst taking into account environmental constraints including siting principles in the Horlock Rules (described in section 4.3.4). The onshore substation AoS was initially defined as a 3 km buffer around the grid connection point at Bodelwyddan National Grid Substation. As noted in section 4.3.4 the Horlock Rules state *"Consideration must be given to environmental issues from the earliest stage to balance the technical benefits and capital cost requirements for new developments against the consequential environmental effects in order to keep adverse effects to a reasonably practicable minimum...Consideration at an early point of the study should be given to placing the electrical infrastructure as close as possible to the existing National Grid connection point (if feasible) in order to minimise the landscape and visual effects associated with introducing new electricity infrastructure to the environment"*.
- 4.9.6.2 Additional engineering considerations regarding an economic and efficient connection (i.e. as close as possible to the National Grid connection point) include minimising distance as far as is reasonably practicable as it minimises the cable reactive power component and losses.
- 4.9.6.3 At this stage in the project the design, layout and final location of the onshore substation and associated infrastructure was subject to ongoing assessment and was dependent on land availability, environmental and technical constraints, formal and information consultation with landowners and consultation with stakeholders. The likely design parameters and space requirements that were used at this stage in the site selection process are outlined in Section 1.2.3 in Volume 5, Annex 4.2: Selection and Refinement of the Onshore Infrastructure. This is summarised as:
- A footprint of up to 125,000 m² for the indicative onshore substation footprint (with an onshore substation building footprint within this of 105,000 m²)
 - Structures will be up to 20 m tall
 - The onshore substation will require land for temporary construction works (e.g. welfare, parking, storage areas and associated temporary access tracks) and a temporary construction compound footprint of up to 250,000 m².
- 4.9.6.4 The 3 km buffer was subsequently expanded to 5 km (Figure 4.8) following engineering review of the maximum electrical distance between the Mona Offshore Wind Project onshore substation and the National Grid substation. This also increased the potential number of areas to site the onshore substation as part of the site selection process.

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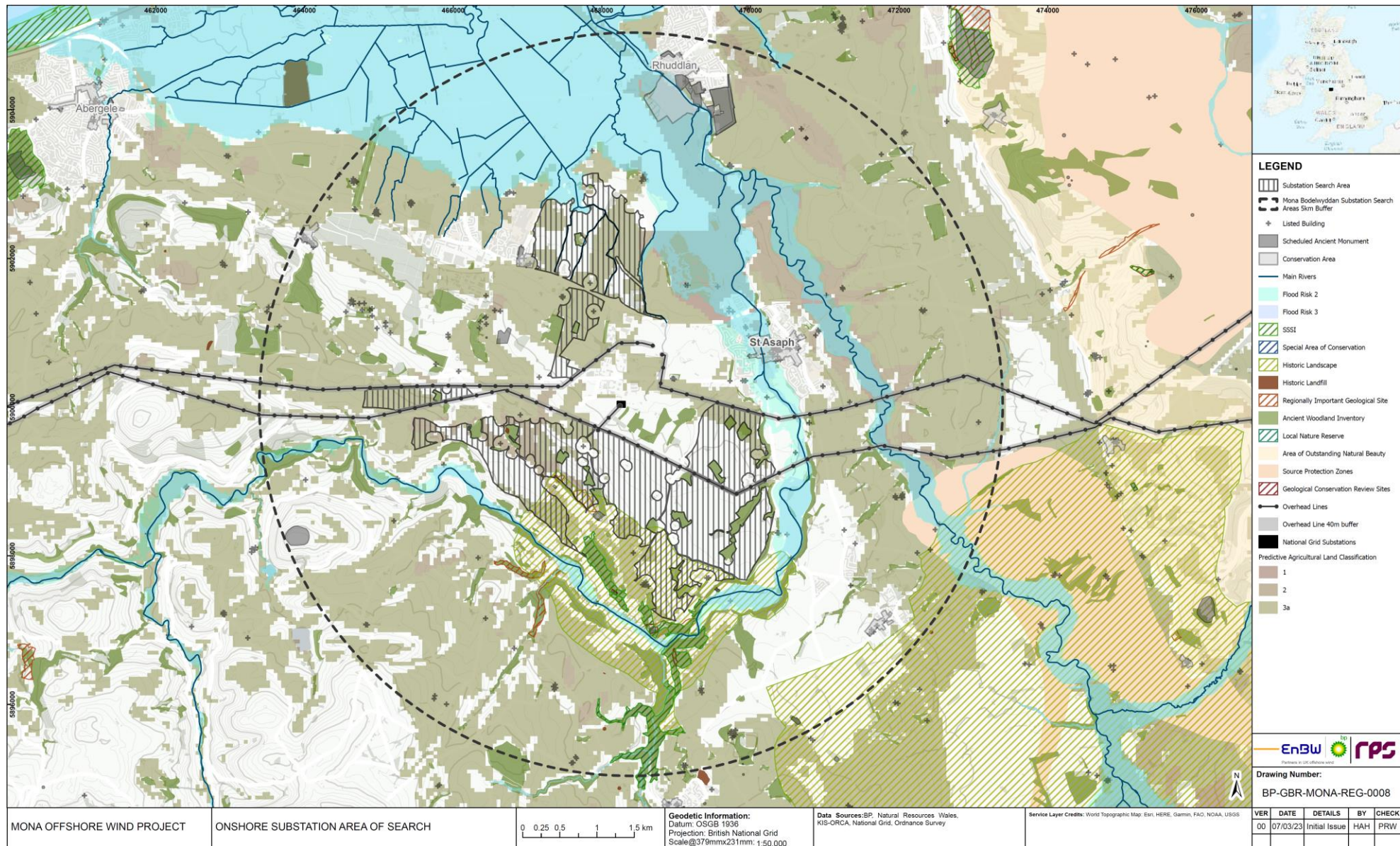


Figure 4.8: Onshore Substation Area of Search.

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4.9.6.5 Hard constraints such as areas of infrastructure, landfills, roads, railways, National Grid overhead lines, and other potential constraints to development and / or construction (as outlined in Volume 5, Annex 4.1: Site Selection Area of Search Identification of the PEIR) were plotted and removed from the onshore substation AoS. These are illustrated in Figure 4.9.

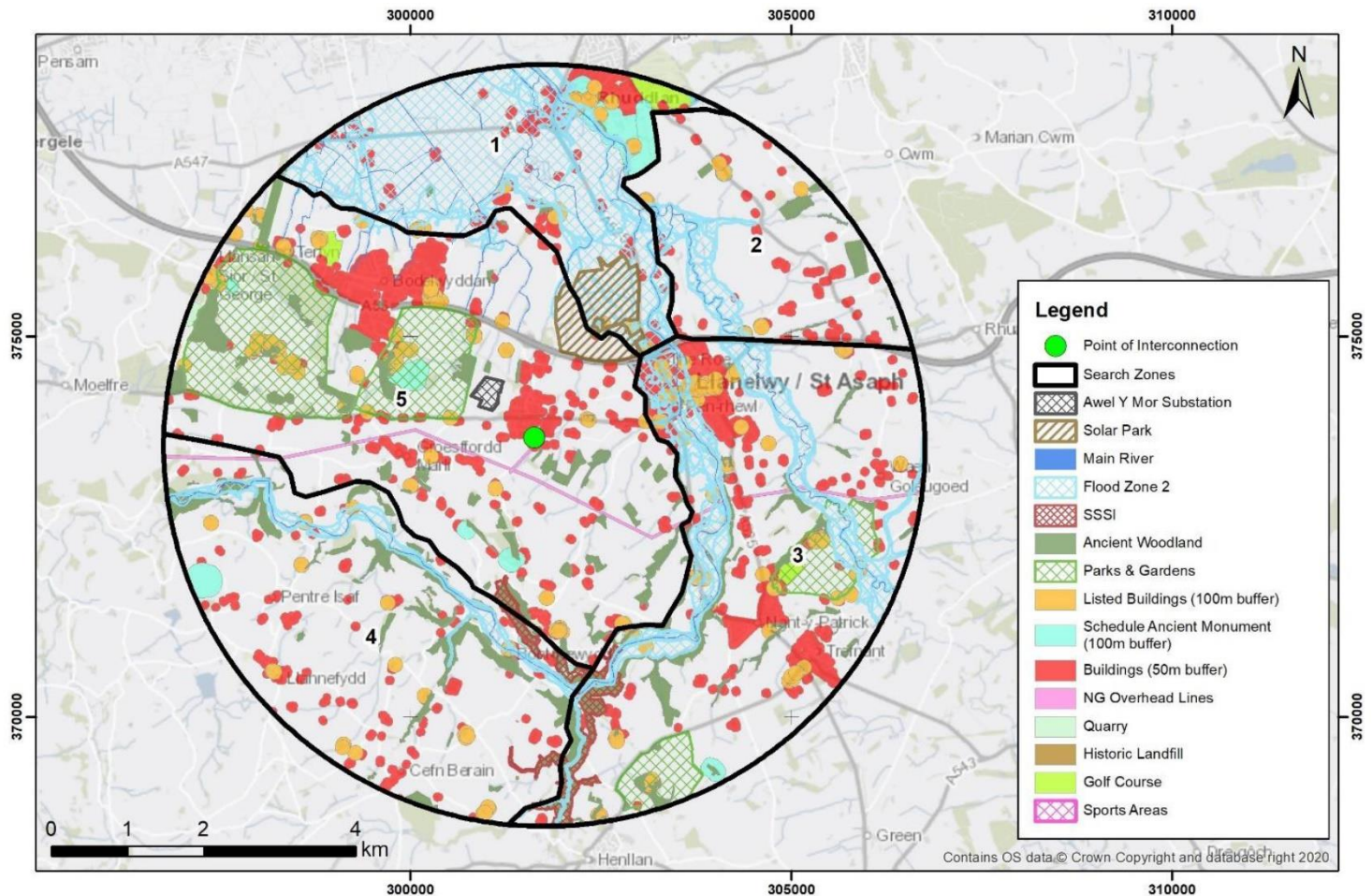


Figure 4.9: Mona Offshore Wind Project onshore substation search area and zones.

4.9.6.6 Five onshore substation search zones were identified (see Figure 4.9) with zone boundaries coinciding with the perimeters of hard constraint areas. The extents of Flood Risk Zone 2 (areas of higher risk flood) were used to define the boundary of Zone 1, extending south as far as the A55. Continuing the line of the A55 to the east created Zone 2, an area of relatively sparse constraint but from which connection to the Bodelwyddan National Grid Substation would mean crossing two river crossings or circumnavigation of the planned Elwy Solar Energy park to the west (Note: planning application for the Elwy Solar Energy Park was refused. This does not affect the outcomes of the site selection process).

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- 4.9.6.7 Zone 3, south of the A55, was defined by continuing the western limit of Zone 1 to the south, following the extent of Flood Zone 2 associated with the Afon Elwy. This zone is more densely constrained than Zone 1 to the north, and connection to the Bodelwyddan National Grid Substation is complicated by the town of St. Asaph in the northwest corner as well as the river running along the western edge. The final boundary broadly follows Afon Elwy west towards its source but is defined by an area (Zone 4) of high slopes around and to the south of the river. The remaining land in the middle, surrounding the Bodelwyddan National Grid Substation and extending to the east, is Zone 5.
- 4.9.6.8 An appraisal of each zone was made, with conclusions as to the viability of each summarised in Table 4.10. Only Zone 5 was retained for further assessment, the other four having been discounted from further consideration for the reasons outlined in Table 4.10 at the time that the appraisal was undertaken (i.e. pre-submission of the PEIR).

Table 4.10: Onshore substation search zone appraisal*

*(note BRAG methodology is outlined in Volume 5, Annex 4.2: Selection and Refinement of the Onshore Infrastructure).

Zone	Appraisal	Status
1	Zone lies almost entirely within higher risk flood zones 2 and 3, going against Horlock Rules as well as National Grid policy – that equates to a BRAG Black finding. The increased flood risk also presents a design and construction challenge.	Discounted
2	Access to the zone from the west is all but prevented by the planned development and solar farms within the southern portion of Zone 1 – that equates to a BRAG Black finding. Access from the south is blocked by St. Asaph town and the necessity of crossing River Clwyd and Afon Elwy.	Discounted
3	South of the A55 the urban settlement of St. Asaph presents a barrier to cable connectivity and this barrier extends down the St. Asaph Road to Trefant effectively removing the land to the east of St. Asaph from further consideration – that equates to a BRAG Black finding. The western boundary of Zone 3 (where it adjoins Zone 5) runs along a ridge line in the topography. On the river Elwy side of this boundary there is a very long slope deemed to present a highly challenging cable laying prospect. The remaining part of Zone 3 to the west of this slope, up to the settlement of St. Asaph Road is removed from further consideration.	Discounted
4	There are large areas of land in Zone 4 which are potentially suitable based on the constraints screened thus far. However, the northern boundary of Zone 4 (where it abuts Zone 5) traverses the foot of a steep hill line with a north facing aspect. This line of hills rises steeply to the south and then falls down into the River Elwy valley, before rising again to the south towards Llanefydd. The sequence of steep topography along the boundary with Zone 4 is deemed to represent a significant cable laying challenge and renders Zone 4 inaccessible – that equates to a BRAG Black finding.	Discounted
5	This area is relatively flat with rising topography to the south along the B5381 Roman Road and towards Plas-yn-Cefn in the south. There are increasing areas of built development in the St. Asaph Business Park, Bodelwyddan town to the north and large inaccessible areas of Registered Parks and Gardens to the west of the zone. These existing features will limit flexibility for cable routing but nevertheless the zone is deemed accessible. The land to the south of the Pol is relatively unconstrained.	Retained

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- 4.9.6.9 Key areas removed from the AoS were the city of St. Asaph with its associated Conservation Area and listed buildings, as well as the Main River (Elwy), and its associated Flood Zones 2 and 3 to the east. The southern boundary was refined to avoid a further stretch of the River Elwy and its associated flood zones, along with the Coedwigoedd Dyffryn Elwy/Elwy Valley Woods SAC, Coedydd Ac Ogofau Elwy A Meirchion SSSI and the Lower Elwy Valley Historic Landscape, which encompasses scattered listed buildings and Scheduled Monuments.
- 4.9.6.10 The AoS (Zone 5) then formed the basis for the selection of available parcels of land to site potential onshore substations for site selection consideration. In parallel with the scoping phase of the Mona Offshore Wind Project, in March to June 2022, a long list of onshore substation zones within the overall AoS was identified.

4.10 Stage 4: Refinement of the Mona Offshore Wind Project for PEIR

4.10.1 Overview

- 4.10.1.1 The following sub-sections describe the process in evolution of the Mona Offshore Wind Project design from the scoping phase, through to the design presented in the PEIR, for the purposes of informing statutory consultation.
- 4.10.1.2 Once environmental constraints, engineering assumptions and the framework provided by relevant guidance had been applied to the offshore and onshore areas of search, the next step in the site selection process was to identify defined options for each element to take forward for further assessment and consultation.
- 4.10.1.3 The Mona Array Area was refined for PEIR to take into account feedback from key stakeholders.
- 4.10.1.4 Landfall options were identified and assessed to find a feasible option once engineering and environmental constraints were taken into account.
- 4.10.1.5 A longlist of offshore export cable route options was identified and subject to detailed assessment between the Mona Array Area and landfall location. This included consideration of feasible landfall options as described above.
- 4.10.1.6 It was not possible to undertake an options assessment for the Mona Onshore Cable Corridor as a number of planning, land, consenting and engineering constraints meant that there was limited optionality for the route between landfall and the Bodelwyddan National Grid Substation (see section 4.10.4).

4.10.2 Mona Array Area refinement for PEIR

- 4.10.2.1 The key refinement to the Mona Array Area between EIA Scoping and PEIR was to adopt the Mona Potential Array Area over the Mona AfL area to mitigate potential impacts on shipping and navigation as discussed in section 4.9.2.

4.10.3 Mona Offshore Cable Corridor and Access Areas selection for PEIR

- 4.10.3.1 The location of the Mona Offshore Cable Corridor and Access Areas was driven by the location of the Mona Array Area and POI. As noted in section 4.9 the offshore environment between the Mona Array Area and potential landfall options is congested with the presence of key constraints including environmental designations and the need to route around existing offshore wind farms, anchorage areas, pipelines and cable infrastructure. This limited the number of viable offshore export cable route options.

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- 4.10.3.2 As described in section 4.9, a broad AoS was defined for the purposes of scoping, taking into consideration key constraints described above. In parallel the Applicant undertook a process of refinement on the Mona Offshore Cable Corridor and Access Areas. This process began with consideration of the site selection principles (described in section 4.4) and TCE Cable Route Protocol (described in section 0).
- 4.10.3.3 The next step in the site selection process was to identify defined options for the Mona Offshore Cable Corridor and Access Areas to take forward for further assessment and consultation.
- 4.10.3.4 The Mona Offshore Cable Corridor and Access Areas was defined as being 1.5 km wide for the majority of the Mona Offshore Cable Corridor and Access Areas with a defined separation distance of 200 m between cables to be applied, with up to four export cables required. The width of the Mona Offshore Cable Corridor and Access Areas was defined by the requirement to have sufficient separation distance between the cables to avoid the risk of damage or sterilisation to neighbouring cables during installation and to mitigate the risk of damage or sterilisation of neighbouring cables during maintenance or repair operations. It was also characterised by the need for cables to be able to enter the Mona Array Area at different points as the location of Offshore Substation Platforms (OSPs) will not be defined within the Mona Array Area until the detailed design stage post-consent.
- 4.10.3.5 An initial list of four potential offshore export cable route options and associated landfall locations were identified which were subject to further assessment, as described in Table 4.11. These routes were identified by undertaking a Black, Red, Amber, Green (BRAG) assessment of environmental and technical constraints and comprised two routes to the west of the Awel y Môr offshore wind farm (West A and West B) and two routes between the eastern and western Gwynt y Mor array areas (East A and East B). Routes to the east of the eastern array of the Gwynt y Mor offshore windfarm were discounted from further consideration as it was determined that it would not be feasible to route around the marine aggregate extraction lease area without encroaching on the large anchorage area located between Burbo Bank (and Burbo Bank Extension) offshore wind farm and the marine aggregate extraction area (see Figure 4.10). Encroaching on the large anchorage area would present a significant technical and commercial risk for the offshore export cables due to the depth of burial required and thus the anchorage area was therefore considered a hard constraint by the Applicant.
- 4.10.3.6 West A and West B were considered to minimise interaction with the Y Fenai a Bae Conwy/Menai Strait and Conwy Bay SAC and Constable Bank Annex 1 sandbank feature whilst maintaining shortest route preference. Further options to the west of the Awel y Môr offshore wind farm and offshore cable corridor, beyond those presented in Table 4.11, were considered by the Applicant but were not taken forward for shortlisting and further consideration as they would still pass through the Y Fenai a Bae Conwy/Menai Strait and Conwy Bay SAC, but would have a longer cable route which did not align with site selection principles (shortest route preference).

Table 4.11: Offshore export cable route options taken forward for further assessment.

Option	Description	Associated landfall option
West A	Offshore cable routeing south from Mona Array Area travelling to west of Gwynt y Mor and proposed Awel y Môr windfarms.	Llanddulas West
West B	Offshore cable routeing south from Mona Array Area travelling to west of Gwynt y Mor and proposed Awel y Môr windfarms.	Belgrano

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Option	Description	Associated landfall option
East A	Offshore cable routeing south from Mona Array Area travelling between Gwynt y Mor offshore windfarm western and eastern arrays.	Belgrano
East B	Offshore cable routeing south from Mona Array Area travelling between Gwynt y Mor offshore windfarm western and eastern arrays.	Rhyl

4.10.3.7 After completion of the BRAG assessment and engineering feasibility studies, the East A and B offshore export cable routes between the Gwynt y Mor array areas (East A and East B in Table 4.11) were determined by the Applicant to have too great a technical and consenting risk associated with them due to the existing presence of the Douglas gas pipeline in the gap which runs between the Douglas Field and Point of Ayr terminal. This pipeline is likely to be repurposed as part of the Hynet scheme for CO₂ transportation.

4.10.3.8 The removal of East A and East B left only the West A and West B offshore export cable route options under consideration. As described in 4.10.3 the Belgrano landfall option was discounted from further consideration due to the presence of nearshore constraints which meant that only West A was taken forward.

Mona Offshore Cable Corridor consultation and further consideration of designated sites

4.10.3.9 A key consideration for the Applicant within the design of the Mona Offshore Cable Corridor and Access Areas was the consideration of the output of the ECRA (described in 4.2.4) and the avoidance of key ecological designations where possible. As described in section 4.9, the initial landfall AoS was identified to avoid interaction with the Aber Dyfrdwy/Dee Estuary SAC/SPA/Ramsar site and to minimise overlap with designated features of the Y Fenai a Bae Conwy/Menai Strait and Conwy Bay SAC (the reasons for minimising overlap rather than avoiding is explained below in paragraphs 4.10.3.14 to 4.10.3.21). The Applicant also took into account the conclusions of the ECRA (described in further detail below) within the siting of the Mona Offshore Cable Corridor.

4.10.3.10 Key ecological designations in the vicinity of the Mona Offshore Cable Corridor are shown in Figure 4.12, listed in Table 4.12 below and described further in the following sections.

Table 4.12: Key designated sites and Annex 1 features in the vicinity of the Mona Offshore Cable Corridor and Access Areas.

Designated Site Name	Designated Site Type	Overlap
Bae Lerpwl/Liverpool Bay	SPA	Mona Offshore Cable Corridor and Access Areas goes through approximately 19 km of the SPA
Y Fenai a Bae Conwy/Menai Strait and Conwy Bay	SAC	Mona Offshore Cable Corridor and Access Areas goes through approximately 2.5 km of the north eastern corner of the SAC

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Designated Site Name	Designated Site Type	Overlap
Constable Bank	Annex 1 sandbank outside an SAC	Mona Offshore Cable Corridor and Access Areas goes through the western extent of the Constable Bank Annex 1 sandbank feature (but avoids Constable Bank admiralty charted feature)
Traeth Pensarn	SSSI	Mona Offshore Cable Corridor and Access Areas overlaps with 0.75 km of western extent of Traeth Pensarn SSSI
<i>Sabellaria alveolata</i> reef	Annex 1 reef feature outside an SAC	Located to the west within the Mona Offshore Cable Corridor and Access Areas. Reef covers an area of 47,473 m ²

Bae Lerpwl/Liverpool Bay SPA

- 4.10.3.11 The Mona Offshore Cable Corridor and Access Areas intersects the Bae Lerpwl/Liverpool Bay SPA. This large site extends from the east coast of Anglesey to Morecambe Bay making crossing the site with the Mona Offshore Cable Corridor and Access Areas unavoidable. The SPA is designated for red-throated diver *Gavia stellata*, common scoter *Melanitta nigra*, little gull *Hydrocoloeus minutus*, common tern *Sterna hirundo*, little tern *Sterna albifrons* and an internationally important waterbird assemblage.
- 4.10.3.12 The ECRA identified a number of medium and high risk species associated with the Bae Lerpwl/Liverpool Bay SPA including red-throated diver, little gull and Little tern. The route selection for the Mona Offshore Cable Corridor and Access Areas at PEIR sought to take the shortest viable route through the SPA to minimise potential interaction with designated species.
- 4.10.3.13 Further information on the Mona Offshore Wind Project interaction with the Bae Lerpwl/Liverpool Bay SPA is detailed within the Information to Support the Appropriate Assessment (ISAA) (document reference: E1.1 – 1.3) and within Volume 2; Chapter 5: Offshore ornithology of the Environmental Statement.

Y Fenai a Bae Conwy/Menai Strait and Conwy Bay SAC

- 4.10.3.14 A small portion of the Mona Offshore Cable Corridor and Access Areas overlaps with the Y Fenai a Bae Conwy/Menai Strait and Conwy Bay SAC as shown on Figure 4.12. The Y Fenai a Bae Conwy/Menai Strait and Conwy Bay SAC is designated for the following features: sandbanks slightly covered by water at all time, mudflats and sandflats not covered by seawater at low tide, large shallow inlets and bays, reefs and submerged or partially submerged sea caves.
- 4.10.3.15 The Mona Offshore Cable Corridor and Access Areas avoids all features (large shallow inlets and bays, submerged or partially submerged sea caves and reef features) of the SAC (see Figure 4.15). This takes into account feedback received from NRW, described in Table 4.12.

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- 4.10.3.16 The ECRA identified a low to medium vulnerability for the sandbanks which are slightly covered by seawater all the time and mudflats and sandflats not covered by seawater at low tide. The Mona Offshore Cable Corridor and Access Areas will avoid the mudflats and sandflats not covered by seawater at low tide feature of the SAC as the Mona Offshore Cable Corridor and Access Areas is located beyond one tidal excursion of the intertidal section of the SAC. The description of the feature (JNCC, 2015) refers specifically to Traeth Lafan, the shores of the Menai Strait and the Foryd Estuary, all of which were avoided through the site selection process. The location of mud and sandflat features has also been assessed using the Data Map Wales (2023) which confirms that these features are limited to the Conwy Bay area.
- 4.10.3.17 The sandbanks slightly covered by seawater at all time features of the Y Fenai a Bae Conwy/Menai Strait and Conwy Bay SAC were mapped for the PEIR using Data Map Wales (2023) which indicated that sandbank features are limited to Conwy Bay and do not interact with the Mona Offshore Cable Corridor and Access Areas. However, given the mobile nature of this feature the project applied caution and assumed that sandbank features could be present in the Mona Offshore Cable Corridor and Access Areas. It was noted in the PEIR that further refinement of the Mona Offshore Cable Corridor and Access Areas and assessment of mitigations may be undertaken for the Environmental Statement following the receipt of site specific survey data for the Mona Offshore Cable Corridor and Access Areas that was not available for inclusion in the PEIR.
- 4.10.3.18 Further information on the Mona Offshore Wind Project interaction with the Y Fenai a Bae Conwy/Menai Strait and Conwy Bay SAC is detailed within the ISAA and within Volume 2, Chapter 2: Benthic subtidal and intertidal ecology of the Environmental Statement.

Constable Bank Annex 1 Sandbank Feature

- 4.10.3.19 Constable Bank is a designated Annex 1 sandbank feature outside of an SAC that covers a large area off the north Wales coast.
- 4.10.3.20 As described in Table 4.13, NRW advised avoiding cable installation through the Constable Bank. However, this was not possible due to the proximity of the Constable Bank to the Y Fenai a Bae Conwy/Menai Strait and Conwy Bay SAC (see Figure 4.11 and Figure 4.12). The Mona Offshore Cable Corridor and Access Areas was routed as far to the west as possible to avoid the charted Constable Bank feature and target the deeper water, whilst minimising overlap with the Y Fenai a Bae Conwy/Menai Strait and Conwy Bay SAC.
- 4.10.3.21 Further information on the Mona Offshore Wind Project interaction with the Constable Bank Annex 1 Sandbank is detailed within Volume 2, Chapter 1: Physical processes of the Environmental Statement and Volume 2, Chapter 2: Benthic subtidal and intertidal ecology of the Environmental Statement.

Sabellaria alveolata reef

- 4.10.3.22 The intertidal survey of the Mona Offshore Cable Corridor and Access Areas identified an extensive mature *Sabellaria alveolata* reef, an Annex 1 habitat at the landfall. To mitigate potential impacts associated with the worst-case open-cut trenching landfall option, the Applicant made a commitment in the PEIR to maintaining a 50 m buffer from the reef at its current extent (which has been maintained through to the Environmental Statement).

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Consultation

4.10.3.23 The West offshore cable route options formed the basis of consultation undertaken with the project EPP Steering Group in July 2022. By the time the Steering Group meeting was undertaken the decision had been taken not to progress the Belgrano landfall (West B) due to existing infrastructure constraints. As such, only the Llanddulas option (West A) was presented.

4.10.3.24 The feedback received from the Steering Group is summarised in Table 4.13 below.

Table 4.13: Feedback received on the Mona Offshore Cable Corridor and Access Areas during July 2022 Steering Group meeting.

Recommendation	Stakeholder
Offshore cable corridors crossing the Constable Bank sandbank feature should be avoided. Sandwave clearance should not occur on the bank and rock protection for cables should not be placed on the bank or in close vicinity.	NRW
Reef features of the Menai Strait and Conwy Bay SAC should be avoided by micro-siting of cables. No rock protection should be placed within the SAC.	NRW
The Traeth Pensarn SSSI should be considered as a key environmental constraint. The vegetative shingle bank feature should be considered as an Annex 1 feature.	NRW

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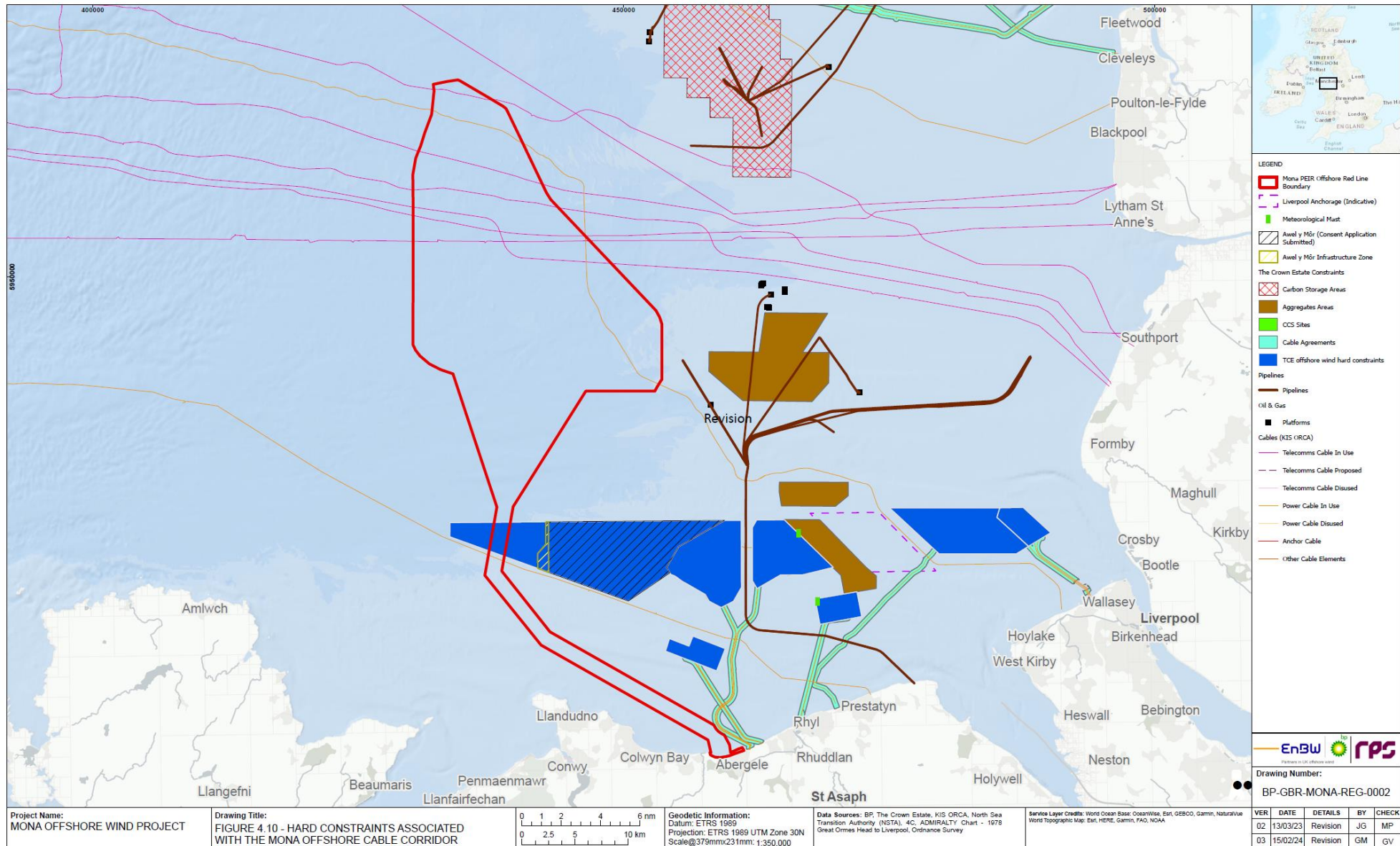


Figure 4.10: Hard constraints associated with the Mona Offshore Cable Corridor and Access Areas.

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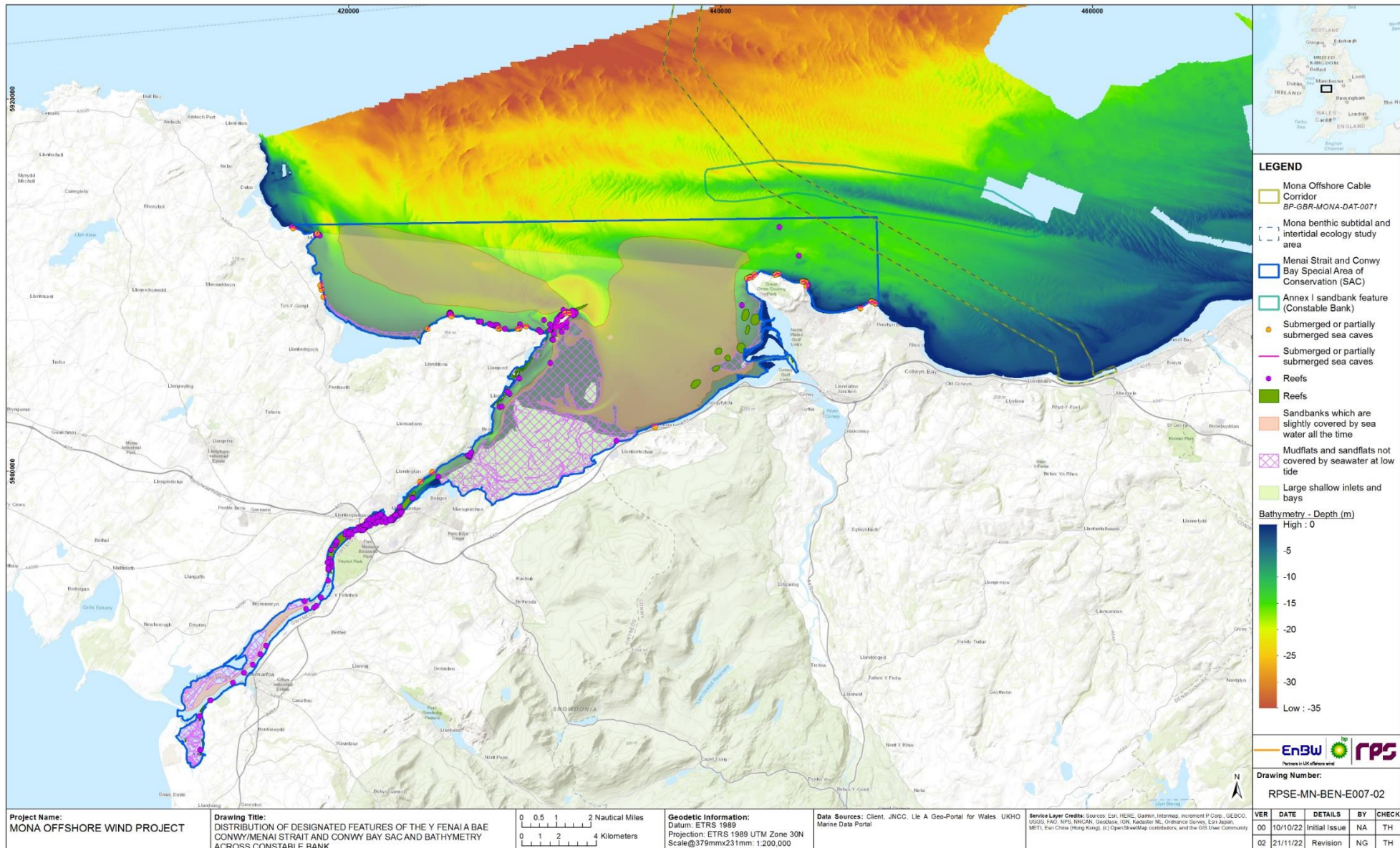


Figure 4.11: Distribution of designated features of the Y Fenai a Bae Conwy/Menai Strait and Conwy Bay SAC and bathymetry across Constable Bank.

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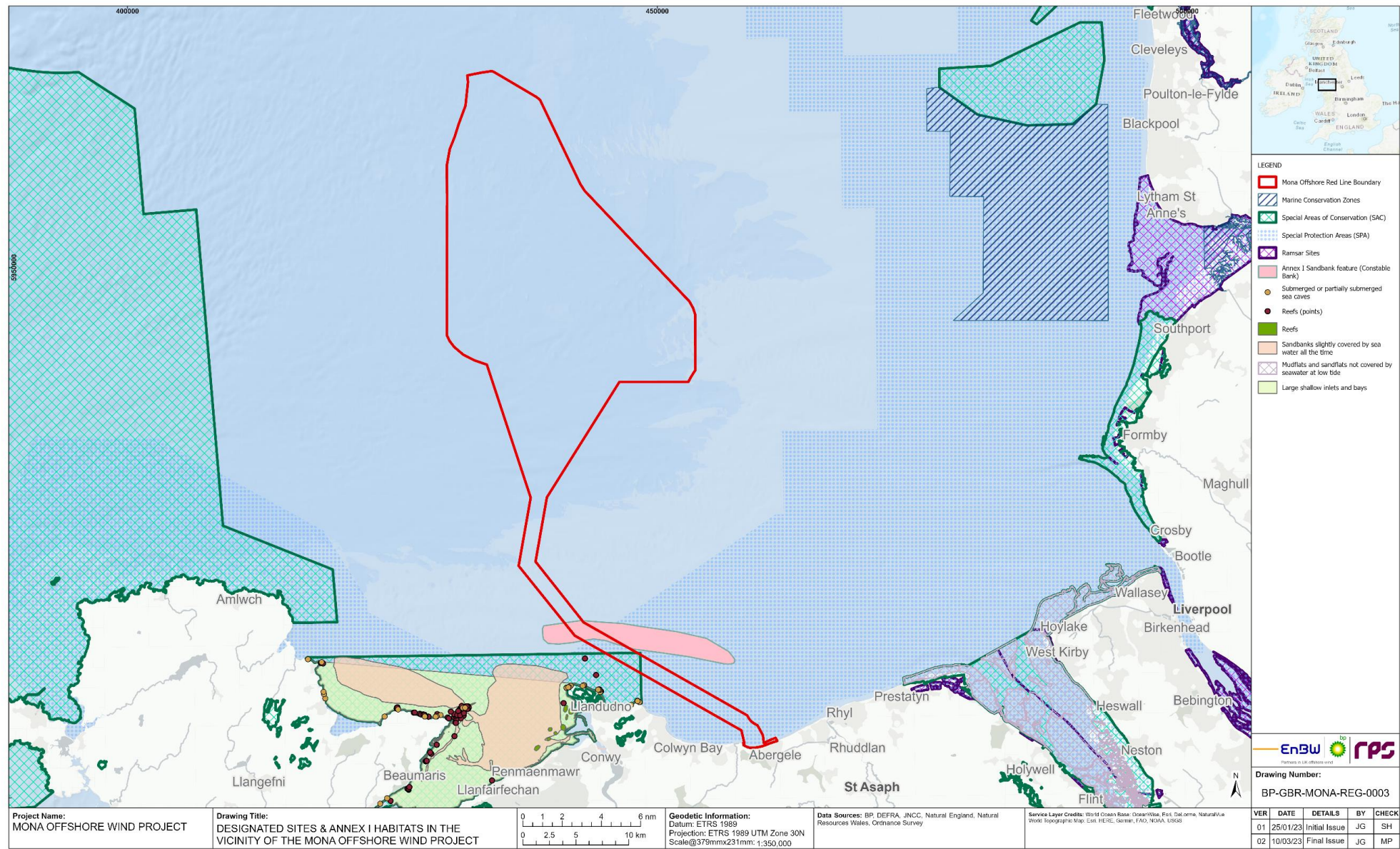


Figure 4.12: Designated sites and Annex 1 habitats in the vicinity of the Mona Offshore Wind Project.

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4.10.4 Identification and Refinement of Landfall Options for PEIR

- 4.10.4.1 The Applicant undertook a detailed site selection process to refine the Mona Offshore Wind Project to a single landfall in preparation for PEIR and statutory consultation. It should be noted that there was some overlap of the stages presented above and / or workstreams and parallel activities. However, for ease of reading the chapter, the stages have been set out in a linear manner.
- 4.10.4.2 The Applicant followed robust site selection principles for the landfall location, ensuring:
- Availability of adequate space and site suitability for landfall construction including adequate working areas for cable installation, jointing bays and cable pull-in for trenchless techniques such as HDD, micro-tunnelling and auger boring
 - Availability of appropriate site access routes for construction and later operations and maintenance through proximity to existing highways
 - Consideration of the suitability of land for trenchless techniques to cross intertidal areas, important coastal habitats and sea defenses.
- 4.10.4.3 Following the identification of the landfall AoS (described in section 4.9), five zones were identified as areas where the offshore export cables could be brought onshore and where the landfall works to connect to the onshore export cabling could occur. The five options, with associated initial constraints, are described in outline in Table 4.14 and illustrated in Figure 4.13.

Table 4.14: Landfall options assessed for the Mona Offshore Wind Project

Landfall zone	Outline description	Initial environmental constraints analysis
Llanddulas	Situated between the coastal settlements of Llanddulas to the west and Abergele to the East. Key infrastructure concentrated along coastal strip includes A55, Railway line and the A547 Abergele Road.	Nearshore constraints identified from the mapping include a mature <i>Sabellaria alveolata</i> Annex 1 Reef habitat and the Traeth Pensarn SSSI. Onshore, along with the infrastructure identified above, was the presence of an historic landfill along the shoreline area, ancient woodland and historic landscape associated with Gwrych Castle (a Grade I listed country house, which stands in 250 acres of gardens and grounds and has extensive views over former parkland including a deer park). The area also contains the Llanddulas Limestone and Gwrych Castle Wood SSSI and Coed y Gopa SSSI.
Belgrano West	Situated between the coastal settlements of Pensarn and Belgrano, which are suburbs of Abergele. This landfall location is where the existing Gwynt y Môr Offshore Wind Farm cables reach land. Key infrastructure concentrated along coastal strip in this location include the A548 Towyn Road and the railway line.	Nearshore constraints identified from the mapping are the presence of Gwynt y Môr Offshore Wind Farm cables and Welsh Water sewage effluent outfall offshore. Also, the Traeth Pensarn SSSI to the west. Onshore, along with the infrastructure identified above, are the onshore Gwynt y Môr Offshore Wind Farm cables, a possible sewage effluent pumping station facility and the built-up settlements of Pensarn and Belgrano.
Belgrano East	Situated between the coastal settlements of Belgrano and Towyn. This landfall location is to the east of where the existing Gwynt y Môr Offshore Wind Farm cables reach land and west of the existing Rhyl Flats Offshore Wind Farm cables come onshore. Key infrastructure	Nearshore the presence of Gwynt y Môr Offshore Wind Farm and Rhyl Flats OWF cables is the key constraint. Onshore, along with the infrastructure identified above, are the onshore Rhyl Flats OWF cables to the east. Along with the infrastructure identified above, is the presence of a large flood Zones 2 and 3 area associated with presence of main rivers.

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Landfall zone	Outline description	Initial environmental constraints analysis
	concentrated along coastal strip in this location include the A548 Towyn Road and the railway line, along with a static caravan site to the north of the A548.	
Rhyl West	Situated between the coastal settlements of Rhyl and Prestatyn at Ffrith Beach. This landfall option, along with Rhyl East, are located in the most easterly stretch of the landfall AoS. Key infrastructure concentrated along the coastal strip in this location include the Rhyl Coastal Road (A548) and the railway line.	<p>Nearshore constraints identified from the mapping are the presence of some Annex 1 Reef habitats (see Figure 4.13), and the presence of the Burbo Bank Extension offshore wind cables.</p> <p>Onshore, along with the infrastructure identified above, is the presence of a large flood Zones 2 and 3 area associated with presence of main rivers.</p>
Rhyl East	Situated between the coastal settlements of Rhyl and Prestatyn at Ffrith Beach. This option, along with Rhyl West, is located along the most easterly stretch of the landfall AoS. Key infrastructure concentrated along the coastal strip in this location include the Rhyl Coastal Road (A548) and the railway line, along with the presence of built development along Victoria Road West.	<p>Nearshore constraints include the presence of the North Hoyle offshore wind farm cables.</p> <p>Onshore, along with the infrastructure identified above, is the presence of a large flood Zones 2 and 3 area associated with presence of main rivers.</p>

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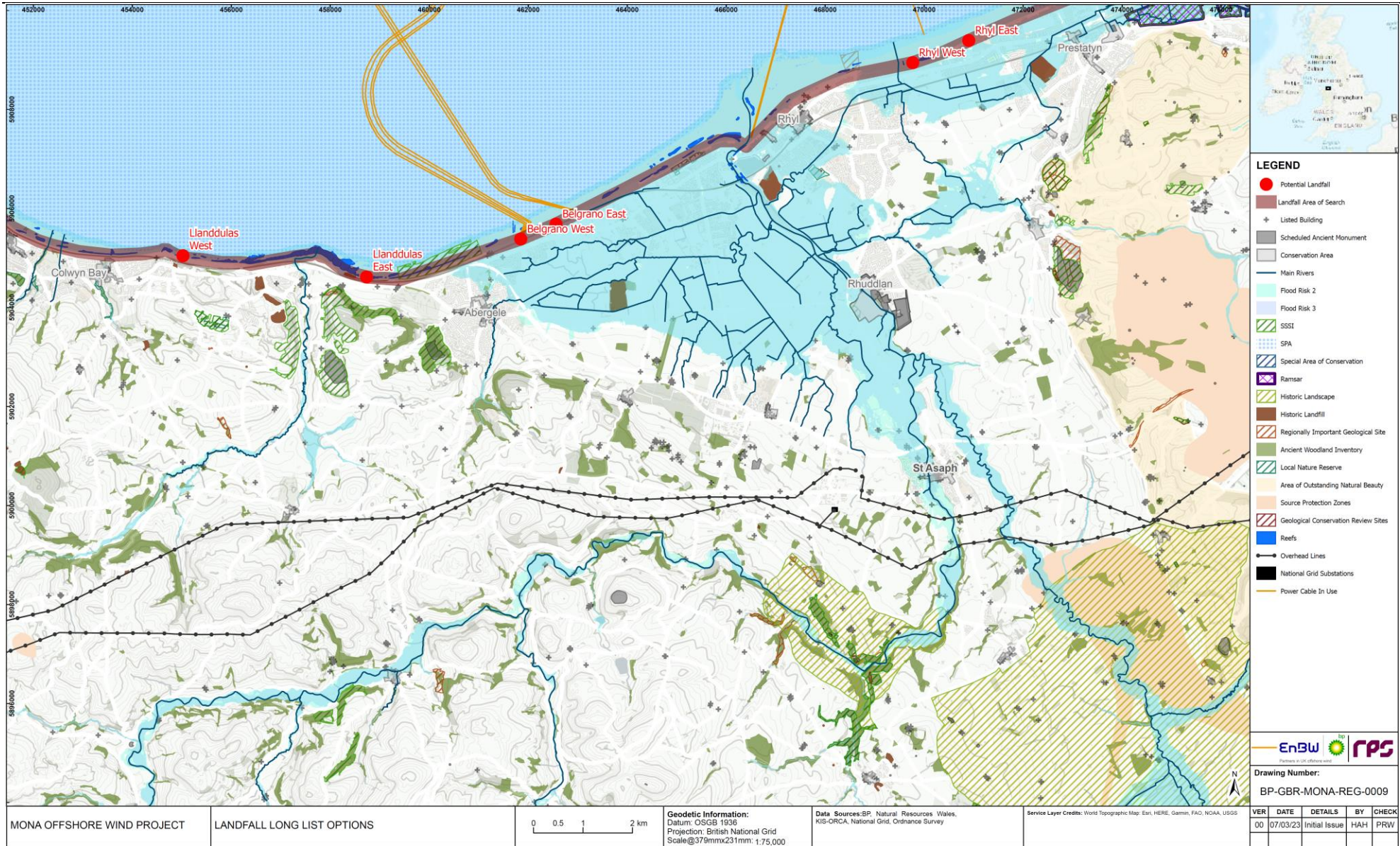


Figure 4.13: Landfall long list options

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4.10.4.4 The list of landfall options was then subject to further detailed analysis. A land, engineering, environmental and consents review was undertaken and by the Applicant. The summary of this workshop is presented in Table 4.15.

Table 4.15: Summary of landfall review.

Landfall zone	Summary of review
Llanddulas	<p>The environmental and consents review concluded overall a risk of medium and low impacts for this option. The results of the trenchless techniques feasibility study indicated the elevations involved would be challenging (passing beneath the historic landfill, coastal defences, railway and A55) but would allow a feasible trenchless techniques solution to be undertaken and that a trenchless techniques solution under the Gwrych Castle SSSI was also considered feasible. There are a number of engineering and consenting constraints associated with this zone but the review of options has determined that these can be overcome through design and consultation.</p> <p>As a result, the Llanddulas East zone was recommended to be taken forward for further assessment.</p>
Belgrano West	<p>The environmental and consents review identified a number of constraints including the Welsh water outfall and Gwynt y Môr Offshore Wind Farm cables coming onshore along this section of the coastline. The required width immediately parallel to the Gwynt y Môr Offshore Wind Farm cables meant that it is not feasible to engineer a route at this landfall location.</p> <p>Belgrano West zone was not recommended to be taken forward for further assessment.</p>
Belgrano East	<p>This option is viewed not to be feasible from an engineering perspective due to the requirement to cross the Rhyl Flats Offshore Wind Farm cables in the nearshore from the landfall locations. This would require a 'long trenchless techniques' option, which included the crossing of a railway asset and limited opportunity for successive 'short trenchless techniques' option to mitigate the risk of trenchless techniques failure in the alluvial/ tidal flat deposits.</p> <p>Belgrano East zone was not recommended to be taken forward for further assessment.</p>
Rhyl West	<p>A number of constraints were identified at this location including Burbo Bank Extension Offshore Wind Farm and North Hoyle Offshore Wind Farm landfall cables, and other key infrastructure along this section of the more populated and designated coastal strip (including that of the Lyons Robin Hood Holiday Park Caravan Park).</p> <p>Awel y Môr Offshore Wind Farm has also selected this location for landfall. Due to the selection of this option by Awel y Môr there is not the required width to engineer a landfall for the Mona Offshore Wind Project at this location. As such, the feasibility of this location is discounted.</p> <p>Rhyl West zone was not recommended to be taken forward for further assessment.</p>
Rhyl East	<p>The environmental review concluded a range of potential impact scorings, from low for water, ecology and archaeology, to medium/high for tourism, recreation and traffic. The complexity and impact of the long trenchless techniques required at the residential properties at Prestatyn meant that Rhyl East zone was not recommended to be taken forward for further assessment.</p>

4.10.4.5 As a result of the analysis presented in Table 4.14, one shortlisted zone was progressed for consultation and further analysis. Two specific locations within the Llanddulas zone were identified. The two landfalls progressed were re-named:

- Llanddulas West Landfall
- Llanddulas East Landfall

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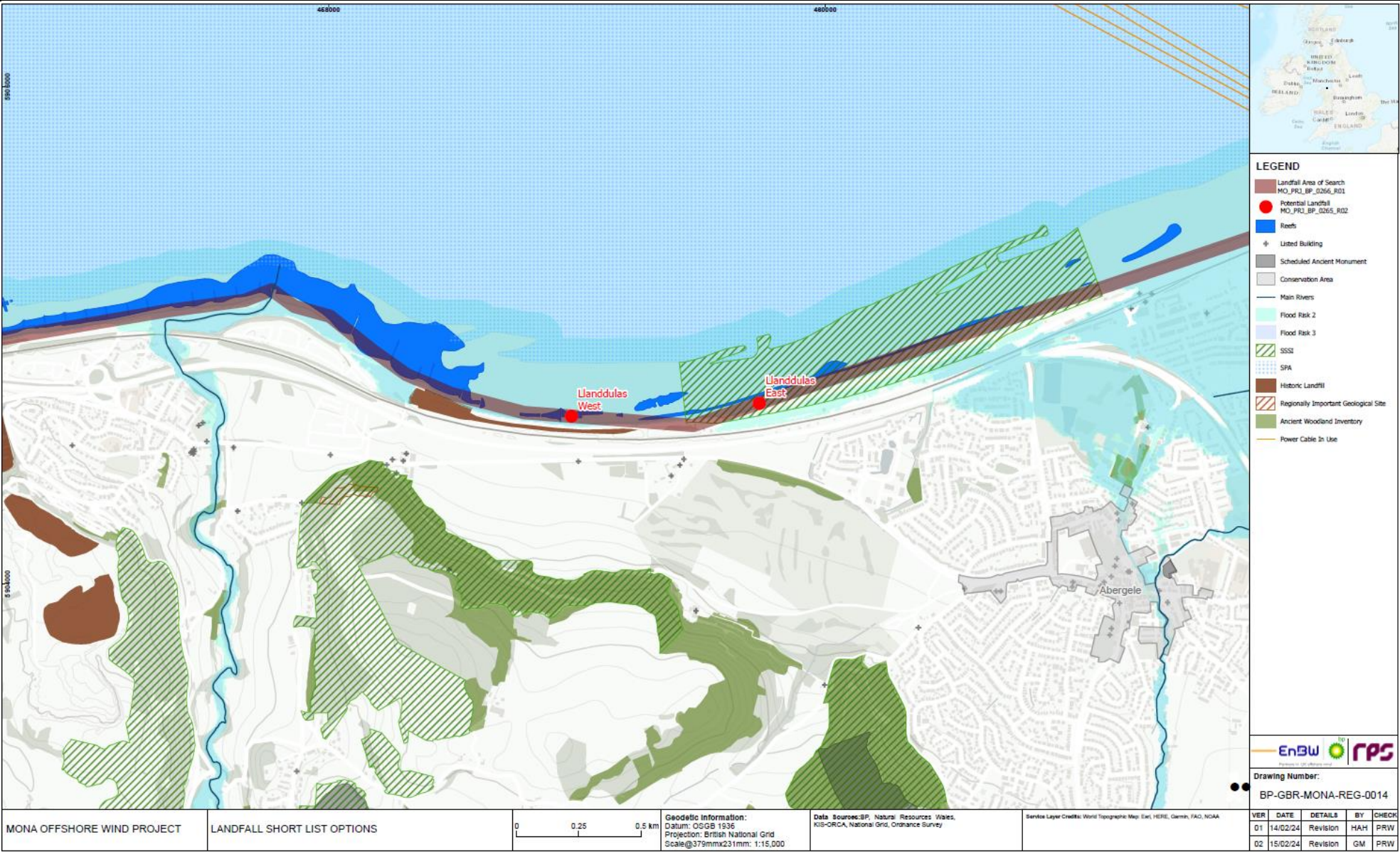


Figure 4.14: Landfall short list options

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4.10.4.6 The consultation feedback received is summarised in Table 4.15.

Table 4.16: Consultation feedback – landfall.

Stakeholder Recommendation	
Cadw	Cadw notes that both landfall options will result in an onshore cable route that will pass through the Gwrych Castle Registered Park and Garden which has the potential to have significant settings impacts on the Gwrych Castle listed building. An onshore cable route from these locations would need to minimize, or avoid, any impacts on the Gwrych Castle woodland otherwise significant settings impacts would be unavoidable.
NRW	We note that the Llanddulas East landfall passes through the Traeth Beach SSSI and therefore may cause disruption at this site resulting in significant impacts. The Llanddulas West landfall has the potential to also cause disruption. NRW recommends removing the Llanddulas East landfall from consideration.
NRW	Similar to Cadw's statement, any onshore cable route from these landfall locations would need to minimize, or avoid, any impacts on the Llanddulas Limestone and Gwrych Castle Wood SSSI otherwise significant impacts would be unavoidable.

- 4.10.4.7 Following informal consultation and receipt of the Scoping Opinion in June 2022, a further technical analysis and environmental and consenting review was undertaken of the Llanddulas landfall options where it was noted that both options were considered challenging from consenting, environmental and engineering perspectives.
- 4.10.4.8 Llanddulas East was considered the most challenging due to the constrained (small) land parcel within which to locate the onshore transition joint bay, the presence of Abergele Golf Course to the immediate south of the landfall, and the need to potentially use a trenchless technique below the golf course (which would have required the Mona Onshore Cable Corridor to double-back on itself to make sufficient room for the Onshore Transition Joint Bays (TJBs) and entry/exit pit for the trenchless technique within the small parcel of land).
- 4.10.4.9 Following further investigation, it was identified that Welsh Water had recently installed a pumping station in the western-most corner of the landfall land parcel and had also installed a water main along the southern boundary. The land parcel had also been put forward as a site of interest for development land due to its proximity to a housing development immediately east. It was also recognized that the Llanddulas East landfall was less than 200 m from noise sensitive residential receptors.
- 4.10.4.10 The Llanddulas East landfall would also cross the Traeth Pensarn SSSI, which NRW had requested be avoided (as described in Table 4.15).
- 4.10.4.11 By comparison, it was recognized that while the Llanddulas West landfall would also need to use a trenchless technique to pass beneath the railway, A55, coastal defences and historic landfill, there were significantly fewer spatial and environmental constraints. The presence of sensitive noise receptors within the Gwrych Castle Registered Park and Garden was recognised, but mitigation could be developed to manage these short-term effects during construction. Furthermore, the Llanddulas West landfall was recognised as having limited sensitive ecological receptors within the intertidal and nearshore.
- 4.10.4.12 Further analysis was also undertaken for the potential onshore cable routes associated with each landfall option, to understand potential constraints and risks which may further influence the balance of landfall options. As a result of the analysis and consultation feedback detailed above, the Llanddulas East landfall was removed from the landfall options and the Llanddulas West landfall was progressed

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- 4.10.4.13 With regard to export cable installation at Llanddulas West, two options were identified:
- Long trenchless techniques option – use of trenchless techniques under the intertidal zone from seaward of MLWS to onshore (south of the Llanddulas historic landfill, railway, A55, A547, coastal defences and other constraints)
 - Short trenchless techniques option – use of trenchless techniques from a point in the intertidal area (between MLWS and MHWS) to onshore (south of the Llanddulas historic landfill, railway, A55, A547, coastal defences and other constraints) with open cut trenching from approximately MLWS to the trenchless techniques entry / exit pit in the intertidal.
- 4.10.4.14 In the absence of geotechnical information to determine the feasibility of using trenchless techniques, both cable landfall installation options were taken forward in the PEIR. The short trenchless techniques option was identified as the Maximum Design Scenario (MDS) for potential impacts on the receiving environment due to its inclusion of open cut trenching in the intertidal area.

4.10.5 Onshore cable route refinement for PEIR

- 4.10.5.1 Through reference to the identified AoS, combined with constraints analysis, a list of possible onshore cable route options were identified. The location of the onshore cable route for PEIR was driven by the location of the Bodelwyddan National Grid substation and the location of the landfall to the proposed onshore substation site.
- 4.10.5.2 Key international and national environmental constraints sourced from the public domain were mapped (see Volume 5, Annex 4.1: Site Selection Area of Search Identification for a full list of data layers used). These included National Landscapes, SSSIs, SACs, SPAs, Ancient Woodland, Scheduled Monuments and Grade I, II and II* Listed Buildings (including Historic Environment Records). Local environmental constraints were then identified including areas of mature woodland, land classifications and Best and Most Versatile Agricultural Land. Potential onshore cable routes, based on environmental constraints were identified.
- 4.10.5.3 In parallel, an engineering feasibility study considered how cables could, in practice, route around, through or under existing infrastructure.
- 4.10.5.4 An iterative and multidisciplinary approach incorporating engineering, constructability, cost, environmental, landowner, community, and stakeholder considerations was used in the development of onshore cable route options. A series of internal Mona Offshore Wind Project team workshops were held to ensure each of the factors were considered effectively.
- 4.10.5.5 Following identification of the long list of landfall options, a number of broad, 500 m wide onshore cable corridors were identified, to create a long list of potential options. These onshore corridors were designed to connect the long list of landfall options to the Bodelwyddan National Grid substation (Figure 4.15 and Table 4.17).
- 4.10.5.6 Due to the width of these cable corridors, a number of constraints were identified within these broad areas, but during the process of refinement the constraints would be avoided where possible.
- 4.10.5.7 As with the offshore export cable corridor and landfall processes, the initial long list was subject to analysis to further refine the options and identify a short list for the purposes of consultation. Table 4.17 provides lists the onshore cable corridor options, and the accompanying analysis.

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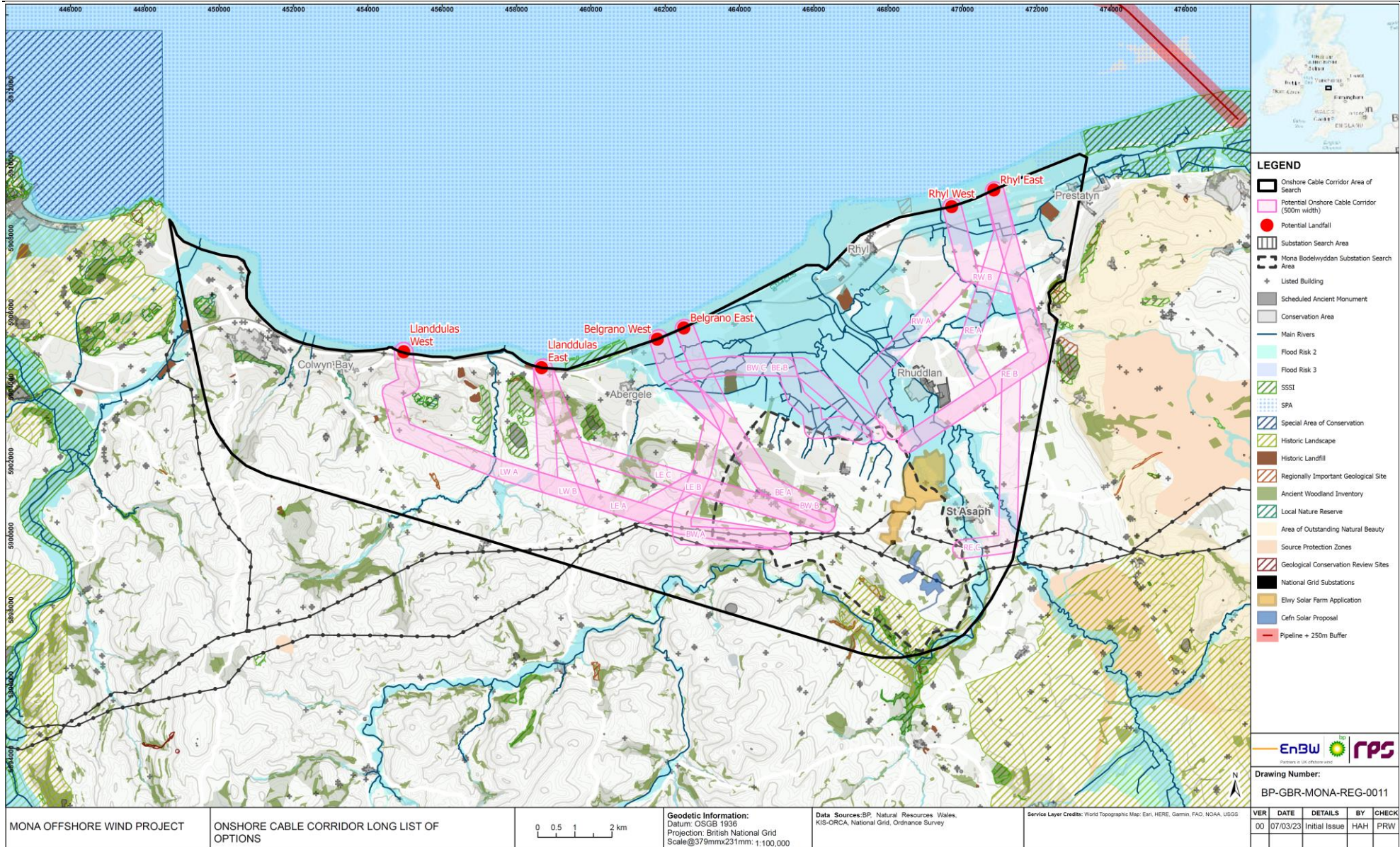


Figure 4.15: Onshore Cable Corridor Long List of Options.

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Table 4.17: Onshore cable route summary of long list of options.

Onshore cable corridor option	Length (km)	General description	Summary of analysis
Llanddulas West – a	16.4	Most westerly corridor option, making landfall at Llanddulas West, heading in a south easterly direction near Raynes Quarry, passing key areas of Llysfaen, River Dulas, and Moelfre and entering the Bodelwyddan National Grid substation from the westerly side near Glascoed.	Option not progressed following parallel analysis screening landfall zone Llanddulas West from further consideration.
Llanddulas West – b	17.7	Most westerly corridor options, making landfall at Llanddulas West, heading in a south easterly direction, passing key areas of Llysfaen, River Dulas, and Moelfre and entering the Bodelwyddan National Grid substation from the westerly side near to Bodelwyddan Park, slightly further north than Option 1a.	Option not progressed following parallel analysis screening landfall zone Llanddulas West from further consideration.
Llanddulas East – a	12.4	Making landfall at Llanddulas East at Llanddulas Beach, heading in a south direction, passing key areas east of Abergele, before heading in a southeast direction crossing the River Gele, Moelfre and entering the Bodelwyddan National Grid substation from the westerly side near Glascoed, at the same location as Llanddulas West – a.	<p>Cable option taken forward to short list of options.</p> <p>Review of the onshore cable route resulted in high risk of potential impacts for archaeological considerations, due to designated assets present (Gwrych Castle Historic Park and Garden) with potential for archaeological remains to survive, however mitigation options are likely to be available due to the ability to micro-site.</p> <p>Further receptor groups subject to potential high impacts included ecology (ancient woodland and Llanddulas Limestone and Gwrych Castle Wood SSSI), setting of designated assets (Gwrych Castle and Kinmel Estate), with potentially moderate impacts to land use (some Agricultural Land Classification Grade 2 land south of Gwrych Castle and south of Groesffordd Marli), landscape visual impact assessment (LVIA) and traffic.</p>
Llanddulas East – b	12.5	Making landfall at Llanddulas East at Llanddulas Beach, heading in a south direction parallel to Llanddulas East – a, passing key areas east of Abergele, before joining the same route at the crossroads between Abergele Road and Glascoed Road, heading in a southeast direction crossing the River Gele, Moelfre and entering the Bodelwyddan National Grid substation from the westerly side near Glascoed,	<p>Cable option taken forward to short list of options.</p> <p>Review of the onshore cable route is comparable with the onshore cable route option Llanddulas East – a.</p>

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Onshore cable corridor option	Length (km)	General description	Summary of analysis
		at the same location as Llanddulas West – a.	
Llanddulas East – c		Making landfall at Llanddulas East at Llanddulas Beach, heading in a south direction until the southern extent of Abergele before heading in an easterly direction to skirt the southern extent of Abergele and then pass key areas of Belgrano and Pensarn before heading in a south easterly direction past Terfyn and Kimmel Park, entering the Bodelwyddan National Grid substation from the north westerly side near Bodelwyddan Park	<p>Review of the onshore cable route indicated high potential impact risk for ecology, due to potential impacts to ancient woodland, land use (some Agricultural Land Classification Grade 2 land south of Gwrych Castle) and planning due to the presence of Key Strategic Sites identified in the Conwy Replacement Local Plan immediately south of Abergele.</p> <p>In addition, the Awel y Môr Wind Farm has selected an onshore substation location immediately west of St. Asaph Business Park which means it is not feasible from an engineering perspective to route the Mona Offshore Wind Project onshore cable route through at that location.</p> <p>Other potential impacts were generally considered to be moderate, as a result of potential impacts to archaeology, water quality, and LVIA, or low for receptor groups such as traffic.</p> <p>As a result of these constraints, this option was not progressed for further consideration.</p>
Belgrano West – a	9.7	<p>Making landfall at Belgrano West at Pensarn Beach, heading in a south easterly direction, passing key areas of Belgrano and Pensarn</p> <p>to the east and west, heading south through Kimmel Park and entering the Bodelwyddan National Grid substation from the north westerly side near Bodelwyddan Park, slightly further north than Llanddulas West – b.</p>	Option not progressed following parallel analysis screening landfall zone Belgrano West from further consideration.
Belgrano West – b	10.0	Making landfall at Belgrano West at Pensarn Beach, heading in a south easterly direction, passing key areas of Belgrano and Pensarn to the east and west, before heading east, south of Towyn, then south easterly direction entering the Bodelwyddan National Grid substation from the north side near Pengwern, slightly further east than Belgrano East – b.	Option not progressed following parallel analysis screening landfall zone Belgrano West from further consideration.
Belgrano West – c	10.1	Making landfall at Belgrano West, this cable corridor heads south, and to the west of Kimmel Park, before making a right turn east toward the Bodelwyddan National Grid substation.	Option not progressed following parallel analysis screening landfall zone Belgrano West from further consideration.

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Onshore cable corridor option	Length (km)	General description	Summary of analysis
Belgrano East – a	9.5	Making landfall at Belgrano East at Ty Gwyn Caravan Park, heading in a southerly direction, passing key areas of Belgrano before heading in a south easterly direction past Terfyn and Kimmel Park, entering the Bodelwyddan National Grid substation from the north westerly side near Bodelwyddan Park, at the same location as Belgrano West – a.	Option not progressed following parallel analysis screening landfall zone Belgrano East from further consideration.
Belgrano East – b	9.7	Making landfall at Belgrano East at Ty Gwyn Caravan park, heading in a southerly direction, passing key areas of Belgrano before heading in a easterly direction south of Towyn, then south, entering the Bodelwyddan National Grid substation from the north, northwest of Bodelwyddan, slightly further west than Belgrano West – b.	Option not progressed following parallel analysis screening landfall zone Belgrano East from further consideration.
Rhyl West – a	10.2	Making landfall at Rhyl West at Rhyl Golf Course, heading in a southerly direction between key areas of Prestatyn and Rhyl to the east and west, before heading in a south westerly direction between Rhyl and Rhuddlan, entering the Bodelwyddan National Grid substation from a north easterly direction near Pengwern, slightly further east than Belgrano West – b.	Option not progressed following parallel analysis screening landfall zone Rhyl West from further consideration.
Rhyl West – b	12.3	Making landfall at Rhyl West at Rhyl Golf Course, heading in a southerly direction between key areas of Prestatyn and Rhyl to the east and west, before heading further south east near Meliden, then heading in a south westerly direction near Dyserth, entering the Bodelwyddan National Grid substation from a north easterly direction at Pengwern, south east of Rhyl West – a.	Option not progressed following parallel analysis screening landfall zone Rhyl West from further consideration.
Rhyl West – c	14.7	Making landfall at Rhyl West, this corridor heads in a southerly direction, passing to the west of key areas of Dyserth and east and then south of St Asaph where it enters the Bodelwyddan National Grid substation.	Option not progressed following parallel analysis screening landfall zone Rhyl West from further consideration.

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Onshore cable corridor option	Length (km)	General description	Summary of analysis
Rhyl East – a	11.8	Most easterly corridor option, making landfall at Rhyl East at Ffrith Beach, heading in a southerly direction, passing keys areas of Prestatyn, Meliden and Dyserth before heading in a south westerly direction south of Rhuddlan and entering the Bodelwyddan National Grid substation to the north east at the same location as Rhyl West – b.	Option not progressed following parallel analysis screening landfall zone Rhyl East from further consideration.
Rhyl East – b	11.2	Most easterly corridor option, making landfall at Rhyl East at Ffrith Beach heading in a south westerly direction, passing keys areas of Rhyl and Rhuddlan entering the Bodelwyddan National Grid substation to the north east at the same location as Rhyl West – b.	Option not progressed following parallel analysis screening landfall zone Rhyl East from further consideration.
Rhyl East – c	14.0	Most easterly corridor option, making landfall at Rhyl East at Ffrith Beach, heading in a southerly direction, passing keys areas of Prestatyn, Meliden, Dyserth and St Asaph entering the Bodelwyddan National Grid substation to the east near Penrhewl.	Option not progressed following parallel analysis screening landfall zone Rhyl East from further consideration.

4.10.5.8 The review of the onshore cable route resulted in the following routes being put forward for further short list consultation:

- Llanddulas East – a
- Llanddulas East – b

4.10.5.9 Consultation feedback received focused primarily on the potential environmental sensitivities, a summary of which is presented in Table 4.18.

Table 4.18: Onshore cable route shortlist consultation feedback.

Recommendation	Stakeholder
Cadw notes that both landfall options will result in an onshore cable route that will pass through the Gwrych Castle Registered Park & Garden which has the potential to have significant settings impacts on the Gwrych Castle listed building. An onshore cable route from these locations would need to minimize, or avoid, any impacts on the Gwrych Castle woodland otherwise significant settings impacts would be unavoidable.	Cadw
Similar to Cadw's statement, any onshore cable route from these landfall locations would need to minimize, or avoid, any impacts on the Llanddulas Limestone and Gwrych Castle Wood SSSI otherwise significant impacts would be unavoidable.	NRW

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- 4.10.5.10 Of the two shortlisted options, the landfall for Llanddulas East – b was considered the most challenging due to the constrained (small) land parcel within which to locate the onshore transition joint bay and the presence of the Abergele Golf Course to the immediate south and the need to potentially use a trenchless technique such as HDD under the golf course – this would have also required the cable route to double-back on itself to make sufficient room for the use of a potential trenchless technique.
- 4.10.5.11 Following further investigation, it was identified that Welsh Water had recently installed a pumping station in the western-most corner of the landfall land parcel and had also installed a water main along the southern boundary. The land parcel had also been put forward as a site of interest for development land due to its proximity to a housing development immediately east. As such, it was also recognized that the Llanddulas East landfall was less than 200 m from noise sensitive residential receptors. It was also recognized through reference to the receive feedback that the Llanddulas East landfall would also cross the Traeth Pensarn SSSI, which NRW had requested be avoided (see Table 4.10).
- 4.10.5.12 Traeth Pensarn SSSI is designated for the value of the plant communities on the shingle and boulders MHWS, a habitat type now considered fragmented and vulnerable around the coast.
- 4.10.5.13 During consultation NRW requested that the overlap with the SSSI be avoided and the Applicant has subsequently committed to not installing export cables within the SSSI. The SSSI will remain within the Mona Offshore Wind Project Boundary to facilitate access to the working area on the beach but impacts from construction access will be managed to minimise any effects on the SSSI.
- 4.10.5.14 By comparison, it was recognized that while the Llanddulas East – a landfall would also need to use trenchless techniques to pass beneath the railway, A55, A547, coastal defences and historic landfill, there were significantly fewer space and environmental constraints. The presence of sensitive noise receptors and landing within the Gwrych Castle Registered Park & Garden was recognised, but mitigation would be available to manage the short-term effect. Furthermore, the Llanddulas East – a landfall was recognised as having limited sensitive ecological receptors within the intertidal and nearshore.
- 4.10.5.15 Following analysis and consultation feedback, the landfall for the Llanddulas East – b onshore cable route was removed from the design options. This means that the Llanddulas East – a onshore cable route would be progressed for design.
- 4.10.5.16 At this stage of the proposed development of the Mona Offshore Wind Project (i.e. PEIR), it was noted that the onshore cable route would pass through the Llanddulas Limestone and Gwrych Castle Wood SSSI and ancient woodland. It is recognized that open cut trenching through this would likely result in:
- Cutting through SSSI woodland resulting in a likely significant ecological impact and additional scrutiny on site selection
 - A permanent change to the woodland within the Gwrych Castle Historic Park and Garden (i.e. removal of it) which would require compensatory land to be replace the losses
 - A very visible permanent change to the woodland resulting in a significant visual impact from the coastal footpath and A55 as trees cannot be planted over the onshore cable route
 - A potential significant impact associated with a change to the historic setting of the Gwrych Castle.

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- 4.10.5.17 As a responsible developer, the Applicant made the early commitment to use trenchless techniques to avoid these potential impacts.
- 4.10.5.18 Following detailed investigation of the section of the onshore cable route between the Abergele Road and Glascoed Road crossroad to the Bodelwyddan National Grid substation a number of significant utilities (such as high pressure gas main, water mains and overhead lines) have been identified that mean that a straight route cannot be optimized.
- 4.10.5.19 As such, the onshore cable route as assessed in the PEIR, as illustrated in Volume 1, Chapter 3: Project Description of the PEIR, contained optionality that was intended to be refined following formal consultation. Within the identified Proposed Onshore Development Area were emerging routes of approximately 100 m identified for the onshore cable corridor. At the point of final application, a single route of approximately 70 m was proposed to be defined for the onshore cable corridor and a single route of approximately 60 m for the 400kV cable corridor that would incorporate the results of ongoing studies and feedback received during consultation.
- 4.10.5.20 Following consultation on the PEIR, the onshore cable corridor and 400kV cable corridor were reviewed and a final onshore cable route option selected (see section 4.11.6).

4.10.6 Onshore substation refinement

- 4.10.6.1 To support the evaluation process, a number of potential onshore substation footprint locations were identified which followed the design principles and engineering assumptions set out in section 4.4.
- 4.10.6.2 In order to ensure that the onshore substation options could also viably connect up with the onshore cable corridors, a number of indicative cable corridor connections between the long list of onshore substation options and the onshore cable corridor options were identified.
- 4.10.6.3 Long listing of the onshore substation took place through reference to the onshore substation AoS, combined with the application of the design principles, engineering assumptions, and the relevant guidance relating to the siting of above-ground electrical infrastructure (e.g. Horlock Rules).
- 4.10.6.4 These included key international and national environmental constraints sourced from the public domain were mapped (see Volume 5, Annex 4.1: Site Selection Area of Search Identification for a full list of data layers used such as National Landscapes, SSSIs, SACs, SPAs, Ancient Woodland, Scheduled Monuments and Grade I, II and II* Listed Buildings (including Historic Environment Records). Local environmental constraints were then identified including areas of mature woodland, land classifications and Best and Most Versatile Agricultural Land. Potential onshore substation locations, based on environmental constraints and available land parcels were identified
- 4.10.6.5 At this early stage, 17 onshore substation locations were identified for further consideration (illustrated in Figure 4.16).

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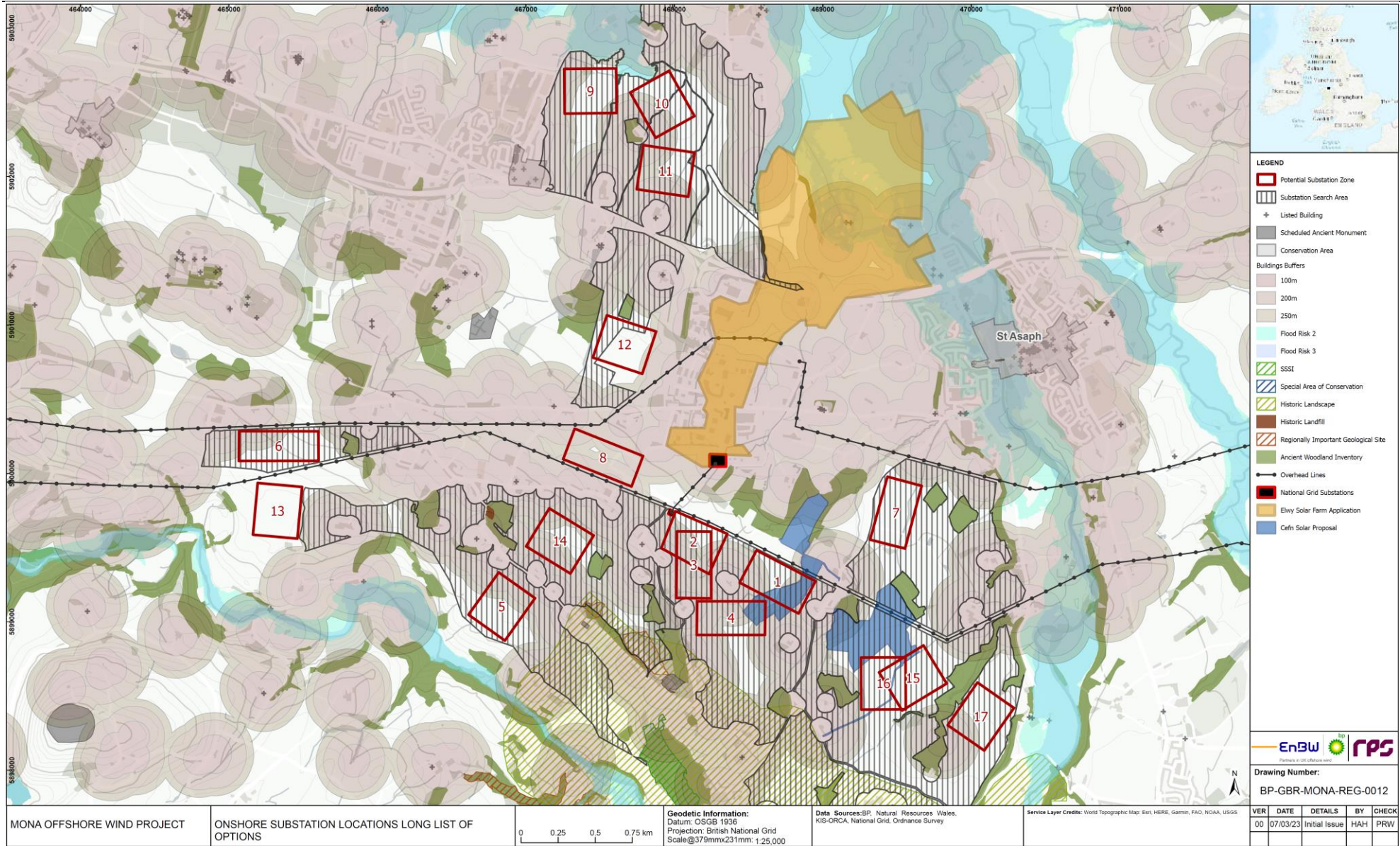


Figure 4.16: Onshore Substation Locations Long List of Options.

Onshore Substation Long List of Options

Onshore Substation Option 1

- 4.10.6.6 Onshore substation option 1 is located in the central area of the AoS, with the current Bodelwyddan National Grid and existing Gwynt y Mor substations to the north, along with associated overhead lines.
- 4.10.6.7 It is located in agricultural fields with a slight gradient to the north east. It is clipped by the 250 m buffer to an existing building to the southern portions of the footprint. This option is in close proximity to a small watercourse/drainage and to areas of ancient woodland to the north, which could be used as screening/mitigation.
- 4.10.6.8 Potential access could be from the north via the B5381 and then minor (singletrack) roads. A new access road may be required from B5381 to avoid singletrack roads. Or an extension of the access for the existing Gwynt y Mor substation from the north.
- 4.10.6.9 Residential properties to the northeast and west are at close proximity.

Onshore Substation Option 2

- 4.10.6.10 Onshore substation option 2 is located in the central area of the AoS, with the current Bodelwyddan National Grid and existing Gwynt y Mor substations to the north, along with associated overhead lines.
- 4.10.6.11 It is located in agricultural fields with a slight gradient to the north east. It is clipped by the 250 m buffer to an existing building to the southern portions of the footprint. This option is in close proximity to a small watercourse/drainage and to areas of ancient woodland to the north, which could be used as screening/mitigation.
- 4.10.6.12 Potential access could be from the north via the B5381 and then minor (singletrack) roads. A new access road may be required from B5381 to avoid singletrack roads. Or an extension of the access for the existing Gwynt y Mor substation from the north.
- 4.10.6.13 Residential properties to west and south are at close proximity.

Onshore Substation Option 3

- 4.10.6.14 Onshore substation option 3 is located in the central area of the AoS, with the current Bodelwyddan National Grid and existing Gwynt y Mor substations to the north, along with associated overhead lines.
- 4.10.6.15 It is located in agricultural fields with a slight gradient to the northeast. The footprint is almost entirely within the 250 m buffer to an existing building. This option is in close proximity to a small watercourse/drainage and to areas of ancient woodland to the north, which could be used as screening/mitigation.
- 4.10.6.16 Potential access could be from the north via the B5381 and then minor (singletrack) roads. A new access road may be required from B5381 to avoid singletrack roads or an extension of the access for the existing Gwynt y Mor substation from the north.
- 4.10.6.17 Residential properties to west and south are at close proximity.

Onshore Substation Option 4

- 4.10.6.18 Onshore substation option 4 is located in the more central area of the AoS, with the current Bodelwyddan National Grid and existing Gwynt y Mor substations to the north, along with associated overhead lines.

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- 4.10.6.19 It is located in agricultural fields with a slight gradient to the northeast. It is clipped by the 250 m buffer to an existing building to the northern portions of the footprint. This option is in close proximity to a small watercourse/drainage and to areas of ancient woodland to the north, which could be used as screening/mitigation.
- 4.10.6.20 Potential access could be from the north via the B5381 and then minor (singletrack) roads. A new access road may be required from B5381 to avoid singletrack roads. Or an extension of the access for the existing Gwynt y Mor substation from the north.
- 4.10.6.21 Residential properties to north and northeast are at close proximity.

Onshore Substation Option 5

- 4.10.6.22 Onshore substation option 5 is located in the southwest corner of the AoS, to the north of the Coedwigoedd Dyffryn Elwy / Elwy Valley Woods (SAC).
- 4.10.6.23 Located in agricultural fields with a gradient to the southwest above a steeper slope down to Afon Elwy. Although outwith the AoS, this option is in close proximity to a number of designated areas associated with the Coedwigoedd Dyffryn Elwy / Elwy Valley Woods (SAC).
- 4.10.6.24 A new potential access would be from the north from the B5381 via minor (singletrack) roads, which is likely to be difficult or unsuitable.
- 4.10.6.25 Residential properties to southeast and northeast are in close proximity. The option is overlooked by higher ground to the south. The option will appear to sit above the River Elwy and may impinge upon its character with a potential direct impact on small scale field pattern and hedgerow trees.

Onshore Substation Option 6

- 4.10.6.26 Onshore substation option 6 is located to the west of the AoS, south of the Ffordd Rufeinig Road near Glascoed, located between two sets of overhead lines.
- 4.10.6.27 It is located in agricultural fields with a slight slope to the northeast. Due to smaller field parcel sizes to the central/west and eastern end of the AoS, this option crosses field boundaries. It does however have areas of woodland to the east which could be extended to use as screening/mitigation.
- 4.10.6.28 A new access would be required from the north from the B5381. A potential construction compound would be in a 'remote' location due to space constraints. The onshore cable corridor route to the National Grid substation would be approximately 3 km from this location.
- 4.10.6.29 Two storey properties are at close proximity to the west and north in farm clusters. Kinmel Hall and Park may have visibility from the northwest.

Onshore Substation Option 7

- 4.10.6.30 Onshore substation option 7 is located in the east corner of the AoS, near to Penrhewl.
- 4.10.6.31 It is located in agricultural fields with a slight gradient to the north. It is in close proximity to watercourses/drainage and ponds in this location. There are areas of ancient woodland to the east, which could be used as screening/mitigation.
- 4.10.6.32 Potential access could be taken from the north via the B5381 and then minor roads (narrow / singletrack). The onshore cable corridor route to the National Grid substation may be difficult for this location.
- 4.10.6.33 There is a caravan site to the southeast and a residential property in relatively close proximity to the northeast.

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Onshore Substation Option 8

- 4.10.6.34 Onshore substation option 8 is adjacent to the east of Glan Clwyd Hospital and Sarn Lane in Bodelwyddan, north of junction 26 of the A55 within the northern extent of the AoS.
- 4.10.6.35 It is Located within agricultural fields with a flat/slight gradient to the north. Listed buildings are to the south, footpaths and overhead lines to the north. Temporary construction compound options would be within the 250 m residential buffers, but the operational footprint is not. There are small areas of woodland around the northwest and southeast of the option which could be used for screening/mitigation.
- 4.10.6.36 A new access would be required from the west (near Glan Clwyd Hospital) across agricultural land. It is very close to minor watercourse / drainage in the area, but would need to be sited over existing agricultural access track. The proposed onshore cable corridor route to the National Grid substation is approximately 2.5-3 km from this location.
- 4.10.6.37 There are a small number of residential properties to northwest and northeast; and a Public Rights of Way (ProW) to the east.

Onshore Substation Option 9

- 4.10.6.38 Onshore substation option 9 is adjacent to the east of Glan Clwyd Hospital and Sarn Lane in Bodelwyddan north of the A55 within the northern extent of the AoS.
- 4.10.6.39 It is located within agricultural fields with a flat / slight gradient to the north. This option slightly clips the 250 m buffer placed around sensitive/residential properties in its north west corner. Main rivers are present to the east, with associated flood risk zones. The Bodelwyddan Conservation Area and associated Listed Buildings are present to the south of this option. Woodland to the north and east could be used for screening/mitigation. There is room for a temporary construction compound to the south.
- 4.10.6.40 A new access would be required from the west (near Glan Clwyd Hospital) across agricultural land. It is very close to or potentially encroaching on minor watercourse / drainage in the vicinity. The onshore cable corridor to the National Grid substation is approximately 2.5-3 km from this location.
- 4.10.6.41 It has proximity to single storey housing on Marble Church Grove approximately 250 m away. There is very little intervening screening. There is also proximity to 4 storey housing on Sarn Lane although there is screening by roadside planting. There is also proximity to the PRoW immediately to the west of the site and potential compound location. There would be clear views from grounds and cemetery around Marble Church and Conservation Area; and views from Bodelwyddan Castle (Hotel). This option looks to be an aligned avenue to north through arboretum/garden which will require further investigation as well as other views from park/castle. 2/3 houses are at close proximity to the northwest but these are largely screened by intervening vegetation.

Onshore Substation Option 10

- 4.10.6.42 Onshore substation option 10 is adjacent to the east of Glan Clwyd Hospital and Sam Lane in Bodelwyddan, north of junction 26 of the A55 within the northern extent of the AoS.

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- 4.10.6.43 It is located within agricultural fields with a flat/slight gradient to the north. There is a listed building to the south, with footpaths and overhead line to the north. A potential temporary construction compound would be within the 250 m buffer of residential properties, but the operational footprint could be outside the 250 m buffer with orientation adjustments. Small areas of woodland around the northwest and southeast of the option could be used for screening/mitigation.
- 4.10.6.44 A new access would be required from the west (near Glan Clwyd Hospital) across agricultural land. The option is very close to a minor watercourse/drainage in the area and would be sited over an existing agricultural access track. The onshore cable corridor to the National Grid substation would be approximately 2.5-3 km from this location.
- 4.10.6.45 A small number of residential properties are to northwest and northeast; with a PRow to the east.

Onshore Substation Option 11

- 4.10.6.46 Onshore substation option 11 is adjacent to the east of Glan Clwyd Hospital and Sarn Lane in Bodelwyddan, north of junction 26 of the A55 within the northern extent of the AOS.
- 4.10.6.47 It is located within agricultural fields with a flat / slight gradient to the north. Areas of flood risk are associated with Main Rivers to the north, overhead line to the eastern edge, and areas of woodland to the south which could be extended to use as screening/mitigation.
- 4.10.6.48 A new access would be required from the west (near Glan Clwyd Hospital) across agricultural land. It is very close to minor watercourses / drainage. The potential construction compound would be 'remote' from the location due to space constraints/presence of woodland.
- 4.10.6.49 There are a small number of residential properties to northwest and northeast with clear views from grounds and cemetery around Marble Church and Conservation Area; and views from Bodelwyddan Castle (Hotel). It looks to be parkland to the north through the arboretum/garden as well as other views from the park/castle. If the potential construction compound is as for Option 10 then similar views would also apply from houses and Bodelwyddan Castle and park.

Onshore Substation Option 12

- 4.10.6.50 Onshore substation option 12 is located between Bodelwyddan Park and New Vision Business Park, situated between the A55 and the B5381.
- 4.10.6.51 It is located within agricultural fields, with a slight gradient to the north/northeast. Due to smaller field parcel sizes to the central/southern end of the AoS, this option crosses field boundaries. It does however have areas of woodland to the north and west which could be extended to use as screening/mitigation.
- 4.10.6.52 A new access would be required from the south from the B5381 or from the northeast off the link road to the A55.
- 4.10.6.53 Two storey properties are at close proximity to the south-southwest facing towards this option: with a PRow to the north.

Onshore Substation Option 13

- 4.10.6.54 Onshore substation option 13 is located to the south of Option 6, and south of both sets of overhead lines in the Glascoed area.

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- 4.10.6.55 It is located in agricultural fields with a slight slope to the northeast. Due to smaller field parcel sizes to the central/southern end of the AoS, this option crosses field boundaries.
- 4.10.6.56 A new access would be required from the north from the B5381 or from the B5381 via minor (singletrack) roads. The onshore cable corridor route to the National Grid substation approximately 3 km from this location.
- 4.10.6.57 A two storey property is at close proximity to the east as part of a farm cluster. Kinmel Hall and Park may have visibility from the northwest. This location would appear to sit above the River Elwy and could impinge upon its character.

Onshore Substation Option 14

- 4.10.6.58 Onshore substation option 14 is located near to Groesffordd Marli.
- 4.10.6.59 It is located in agricultural fields with a gradient to the northeast, in an elevated position. This option does clip the edges of the 250 m buffer to an existing building. Due to smaller field parcel sizes to the central/southern end of the AoS, this option crosses field boundaries. It does however have areas of ancient woodland to the east and west which could be extended to use as screening/mitigation. A small area of historic landfill is situated to the west of this option within the ancient woodland. There are also Listed Buildings to the north, west and east.
- 4.10.6.60 Potential access from the north from the B5381 via a minor (singletrack) road is likely to be difficult or unsuitable.
- 4.10.6.61 This option will appear on land sitting above height of properties located at close proximity to the north which may make it more apparent. There are also properties in close proximity to the south; and a PRoW to northeast.

Onshore Substation Option 15

- 4.10.6.62 Onshore substation option 15 is located in the southeast corner of the AOS, near to Nant-y-Patrick.
- 4.10.6.63 It is located in agricultural fields with a slight gradient to the north east. It is in close proximity to watercourses/drainage and ponds in this location. Areas of ancient woodland surround it in all directions and could be used as screening/mitigation.
- 4.10.6.64 Potential access could be taken from the east from the B5381 but it would require a new access track approximately >0.5 km long. The onshore cable corridor route to the National Grid substation may be difficult. Any potential construction compound would be 'remote' from location due to the space constraints.
- 4.10.6.65 Residential properties to the southwest are at relatively close proximity. There is potential for visibility from Wigfair Hall (country house hotel to south) and its grounds at relatively close proximity.

Onshore Substation Option 16

- 4.10.6.66 Onshore substation option 16 is located in the southeast corner of the AoS, near to Nant-y-Patrick.
- 4.10.6.67 It is located in agricultural fields with a very slight gradient to the northeast. It encroaches on ponds (as does any potential construction compound). Areas of ancient woodland are in all directions and could be used as screening/mitigation.
- 4.10.6.68 Potential access could be achieved from the east from the B5381 but it requires a new access track approximately >0.8 km long. Access from the minor road (narrow /singletrack) to the west is unlikely to be viable. The onshore cable corridor to the National Grid substation may be difficult from this location.

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4.10.6.69 Residential properties to the southwest are at relatively close proximity. There is potential for visibility from Wigfair Hall and its grounds at relatively close proximity.

Onshore Substation Option 17

4.10.6.70 Onshore substation option 17 is located in the southeast corner of the AoS, near to Nant-y-Patrick. It extends from the overhead lines to the north, ancient woodland to the east and west, and roads to the south.

4.10.6.71 This option is surrounded by farmland with some irregular and some enlarged fields – some with intact hedges and mature hedgerow trees. It is situated on low lying land above lower valley, which it is separated from by a wooded scarp slope.

4.10.6.72 There is a gentle site gradient (approximately 1 in 49).

4.10.6.73 Potential access could be taken from the B5381 to the east of the site (or via minor road to the south).

4.10.6.74 Woodland blocks offer some containment of views particularly to the east and west.

4.10.6.75 Visibility at multiple residential properties, with some intervening trees and hedgerows.

Onshore Substation Options BRAG Summary

4.10.6.76 During the preliminary long listing BRAG assessment it was recognised that there were potentially significant constraints present for several of the onshore substation options, with associated engineering feasibility challenges. Table 4.19 below presents the conclusions of the analysis, with the justification for each of the onshore substation options taken forward for further consultation. Full details of the onshore substation BRAG, including the methodology applied, is contained within Volume 5, Annex 4.2: Selection and Refinement of the Onshore Infrastructure.

Table 4.19: Onshore substation preliminary review of long list constraints and LVIA risks.

Onshore substation option	Summary of analysis	Recommendation for taking forward to medium list of options
1	<p>Large area around for mitigation although views from above would be more problematic to mitigate. LVIA therefore considered high risk of impact due to visual effects on nearby properties likely. Also considered higher risk of impact for traffic, archaeology (impacts associated with setting of designated assets). Generally moderate risk of impact for other receptor groups including ecology.</p> <p>No high risk engineering constraints were identified for this option. Medium risks are associated with local topography (a 1:30 drop across the site), local utilities connections, possibility of local geology issues from limestone dissolution and historic lead mining, vehicular access.</p>	<p>Based upon the engineering feasibility and the assessment work, this option is proposed to be taken forward to the medium list of options for further assessment.</p> <p>Further consideration of access will be required during the site selection process to ensure this option is viable.</p>
2	<p>Large area around for mitigation although views from above would be more problematic to mitigate. LVIA therefore considered high risk of impact due to visual effects on nearby properties likely. Also considered higher risk of impact for traffic, archaeology (impacts associated with setting of designated assets). Generally moderate risk of impact for other receptor groups including ecology.</p>	<p>Based upon the engineering feasibility and the assessment work, this option is proposed to be taken forward to the medium list of options for further assessment.</p> <p>Further consideration of access will be required during the site selection process to ensure this option is viable.</p>

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Onshore substation option	Summary of analysis	Recommendation for taking forward to medium list of options
	No high risk engineering constraints were identified for this option. Medium risks are associated with local topography (a 1:30 drop across the site), local utilities connections, possibility of local geology issues from limestone dissolution and historic lead mining, vehicular access, and encroachment into Grade 3a agricultural land.	
3	<p>Large area around for mitigation although views from above would be more problematic to mitigate. LVIA therefore considered high risk of impact due to visual effects on nearby properties likely. Also considered higher risk of impact for traffic, archaeology (impacts associated with setting of designated assets). Generally moderate risk of impact for other receptor groups including ecology.</p> <p>No high risk engineering constraints were identified for this option. High risks are associated with local topography (a 1:30 drop across the site but needing to cut into the highest point), with medium risks associated with local utilities connections, possibility of local geology issues from limestone dissolution and historic lead mining, vehicular access.</p>	<p>Based upon the engineering feasibility and the assessment work, this option is proposed to be taken forward to the medium list of options for further assessment.</p> <p>Further consideration of access and topography will be required during the site selection process to ensure this option is viable.</p>
4	<p>Large area around for mitigation although views from above would be more problematic to mitigate. LVIA therefore considered high risk of impact due to visual effects on nearby properties likely. Also considered higher risk of impact for traffic, archaeology (impacts associated with setting of designated assets). Generally moderate risk of impact for other receptor groups including ecology.</p> <p>No high risk engineering constraints were identified for this option. High risks are associated with local topography (a 1:30 ridgeline across the site), with medium risks associated with local utilities connections, possibility of local geology issues from limestone dissolution and historic lead mining, vehicular access.</p>	<p>Based upon the engineering feasibility and the assessment work, this option is proposed to be taken forward to the medium list of options for further assessment.</p> <p>Further consideration of access and topography will be required during the site selection process to ensure this option is viable.</p>
5	<p>LVIA considered high risk of impact as visual effects on nearby properties highly likely, with mitigation challenging as landscape is unsuitable to accommodate development.</p> <p>High risk of impact also for traffic,</p>	<p>Due to the location of this option furthest away from larger scale residential areas, this site is potential preferable to minimise community impacts. This option is not preferable from an engineering, access or landscape perspective. Due to this.</p> <p>Option 5 is proposed to be taken forward to the medium list of options for further assessment.</p> <p>Further consideration of access and topography will be required during the site selection process to ensure this option is viable.</p>
6	Large scale modification of levels required and visibility and landform changes difficult to mitigate due to lower levels of surrounding land. This was therefore considered of highest potential LVIA Impact	This location has the best access of all proposed locations. The site is constrained but has opportunity for engineering within existing infrastructure (overhead lines).

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Onshore substation option	Summary of analysis	Recommendation for taking forward to medium list of options
	<p>due to topography being highly unsuitable for accommodating development.</p> <p>Archaeology indicated potentially high impacts due to high potential for impacts associated with the setting of designated assets. Other receptor groups such as ecology, agricultural land (option is entirely in Grade 3a) and traffic considered at risk of moderate impacts.</p> <p>Engineering risk considered high to moderate due to lack of suitable drainage, ground conditions, new accesses required, and construction compounds likely subject to spatial constraints.</p>	<p>This is not preferable from a landscape perspective due to the location of this option on a ridgeline with steep gradients and visibility across the valley.</p> <p>Option 6 is proposed to be taken forward to the medium list of options for further assessment. Further consideration of landscape and topography will be required during the site selection process to ensure this option is viable.</p>
7	<p>Some tree copses offering visual containment, with site overall relatively flat, allowing mitigation in the form of screening. LVIA therefore relatively moderate risk of impact, with some capacity to accommodate development.</p> <p>Other receptor groups such as archaeology considered moderate risk of impact (designated asset setting) alongside land use impacts with encroachment into Grade 3a agricultural land, with traffic considered higher risk of impacts due to access challenges.</p> <p>Engineering risk high, reflecting uncertainty and challenge associated with access.</p>	<p>Based upon the engineering feasibility and the assessment work, this option was taken forward to the medium list of options for further assessment.</p> <p>Further consideration of access will be required during the site selection process to ensure this option is viable.</p>
8	<p>LVIA and land use constraints (high associated with road user views and residential properties, and encroachment onto Grade 2 and 3a agricultural land), with other constraints such as archaeology, designated asset setting, considered at moderate risk of impact. Traffic and transport, water quality, ecology generally lower risk of impact.</p> <p>Few likely engineering risks aside from higher risk for drainage.</p>	<p>Based upon the engineering feasibility and the assessment work, this option is proposed to be taken forward to the medium list of options for further assessment.</p> <p>Further consideration of topography and proximity to residential properties will be required during the site selection process to ensure this option is viable.</p>
9	<p>LVIA constraint (high) with potential impacts associated with the setting of designated assets. Moderate risk of impact for other receptor groups such as ecology (designated sites), traffic and transport, Planning application present for 1,700 dwellings.</p> <p>Few notable engineering risks.</p>	<p>Due to the outline planning application for 1,700 dwellings on the land around this option (as identified during ETG meeting) and the number of high risk BRAG scores, Option 9 was not taken forward to the medium list.</p>
10	<p>LVIA constraint (high) with potential impacts associated with the setting of designated assets. Moderate impact potential for other receptor groups such as ecology (designated sites), traffic and transport, Planning application present for 1,700 dwellings.</p> <p>Few notable engineering risks.</p>	<p>Due to the outline planning application for 1,700 dwellings on the land around this option, Option 10 was not taken forward to the medium list.</p>
11	<p>LVIA constraint (high) with potential impacts associated with dwellings and the setting of designated assets. High risk of potential impacts existing for archaeology and ecology. Moderate risk</p>	<p>Due to the outline planning application for 1,700 dwellings on the land around this option, Option 11 was not taken forward to the medium list.</p>

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Onshore substation option	Summary of analysis	Recommendation for taking forward to medium list of options
	<p>of potential impacts to other receptor groups such as traffic and transport, Planning application present for 1,700 dwellings.</p> <p>Higher engineering risk associated with presence of flood zone (2/3) and ground conditions.</p>	
12	<p>Lower LVIA impact risks due to capacity to accommodate development and potential to mitigate visibility with planting and earthworks. Potential high archaeology impacts due to designated asset setting, ecology and tourism both considered subject to potential moderate impacts, other receptor groups such as traffic considered subject to lower impact potential.</p> <p>Engineering risk generally low-medium, with new access noted as being required.</p>	Due to the Development Consent Order application for the Awel y Môr Offshore Wind Farm on the land around this option, Option 12 was not taken forward to the medium list.
13	<p>LVIA constraint considered high due to landscape unsuitable to accommodate development. Potential risk of high impacts also considered to exist for archaeology (setting of designated assets), land use (proximity to school and landfill). Other receptor groups such as ecology and traffic/transport and land use (for Grade 3a agricultural land) considered at risk of moderate impacts.</p> <p>Engineering risk considered high due to ground conditions (made ground and distance from watercourse), and moderate due to accesses</p>	Due to the location of this option on a ridgeline with steep gradients, this is not preferable from an engineering, access or landscape perspective. Due to this, Option 13 was not taken forward to the medium list of options.
14	<p>Large scale modification of levels required and visibility and landform changes difficult to mitigate due to lower levels of surrounding land. LVIA considered to be of higher risk of impact, due to topography highly unsuitable for accommodating development.</p> <p>Other receptor groups such as traffic, ecology (ancient woodland), and land use (proximity to school and sited on Grade 2 agricultural land) also considered high risk of impact.</p> <p>Engineering risk considered High due to moderate (1 in 9) site gradient and drainage challenges. Moderate access risk.</p>	Due to the location of this option on a ridgeline with steep gradients, this is not preferable from an engineering, access or landscape perspective. Due to this, Option 14 is not taken forward to the medium list of options.
15	<p>Some tree copses and lines provide visual containment. Small number of rural properties and minor road provide a degree of settled character. Relatively flat with some room for screen planting if moved back from road. Therefore, low risk of impact for LVIA. Low risk of impact also for land use, tourism and socioeconomics and water and sediment quality (no identified constraints). Archaeology and ecology considered moderate risk of impact (setting, and indirect effects on nationally designated sites, respectively).</p> <p>Moderate engineering risk, associated with access and remote construction compound options.</p>	Due to the location of this option within the same area as Option 16, only one of the two options was considered relevant to take forward to the medium list, as further micro-siting of the option would take place following the LVIA modelling. When compared against Option 16, Option 15 has similar risks, although has a more settled rural character and as such was identified as less favourable at this stage from a LVIA perspective. As such, Option 15 was not taken forward to the medium list of options.
16	<p>Relatively flat with good area to be able to add linked woodland belts to improve containment. Therefore,</p>	Based upon the engineering feasibility and the assessment work, this option was taken

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Onshore substation option	Summary of analysis	Recommendation for taking forward to medium list of options
	low LVIA risk of impact as some interaction with visual receptors and valued local landscapes, but capacity to accommodate development exists. High risk of impact for ecology (ancient woodland). Moderate risk of impact for archaeology (setting) Low risk of impact also for land use, tourism and socioeconomics and water and sediment quality (no identified constraints).	forward to the medium list of options for further assessment. Further consideration of access was noted as required during the site selection process to ensure this option is viable.
17	Low LVIA risk of impact as some interaction with visual receptors and valued local landscapes, but capacity to accommodate development exists.	Based upon the engineering feasibility and the assessment work, this option was taken forward to the medium list of options for further assessment. Further consideration of access was noted as required during the site selection process to ensure this option is viable.

4.10.6.77 The following onshore substation options were then put forward for the medium list:

- Option 1
- Option 2
- Option 3
- Option 4
- Option 5
- Option 6
- Option 7
- Option 8
- Option 16
- Option 17

Consultation (and cross-referencing with Awel y Môr)

4.10.6.78 During the Mona Offshore Wind Project Site Selection EWG it was suggested by stakeholders that the Applicant cross-reference the medium list locations against the locations presented by Awel y Môr Offshore Wind Farm to identify synergies with comments previously submitted. The medium list was cross-referenced against the responses received by the Awel y Môr onshore substation site selection process for comments by the following consultees:

- CPAT
- Cadw
- NRW
- North and Mid Wales Trunk Road Agent (NMWTRA).

4.10.6.79 The consultation responses on the medium-listed onshore substation options are presented in Table 4.20 below.

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Table 4.20: Onshore substation medium list statutory consultee responses.

Onshore substation option	Recommendation	Stakeholder
All options	Require crossing of the A55	NMWTRA
1-4	An area of generally undefined surface and subsurface archaeological potential. Few recorded sites here and no prior surveys. Potential indirect visual impact on Lower Elwy Registered Historic Landscape – may need ASIDOHL2 assessment.	CPAT
	There are no designated heritage assets in this zone but could have adverse impact on setting of listed building Pentre	Cadw
5	No comments received	N/A
6	No comments received	N/A
7	Lies immediately to east of Bodewlyddan Park RPG but possibly screened by trees – would need a setting impact assessment. Undefined sub-surface archaeological potential. Possible WWI practice trench earthworks or related sub-surface archaeology. Roman road on southern boundary which may be affected by access works	CPAT
	There are no designated heritage assets in this zone	Cadw
8	Undefined sub-surface potential. Potential for impact to Roman road on north boundary by access and cable works. A large number of recorded non-designated sites in this area (field system earthworks)	CPAT
	There are no designated heritage assets in this zone	Cadw
16	An area of generally undefined surface and subsurface archaeological potential. Few recorded sites here and no prior surveys. Non-designated sites recorded are limited to a number of ponds recognised on early OS mapping. Potential indirect visual impact on Lower Elwy Registered Historic Landscape – may need ASIDOHL2 assessment.	CPAT
	There are no designated heritage assets in this zone	Cadw
	Option 16 could have an impact on the Elwy Valley Woods SAC and Coedydd ac Ogofau Elwy a Meirchion SSSI to the south. This would need to be determined once further details about the preferred substation location are available.	NRW
17	An area of generally undefined surface and subsurface archaeological potential. Few recorded sites here and no prior surveys. Potential setting impacts for listed buildings to east which would need to be assessed. Potential indirect visual impact on Lower Elwy Registered Historic Landscape – may need ASIDOHL2 assessment.	CPAT
	There are no designated heritage assets in this zone	Cadw
	Option 17 could have an impact on the Elwy Valley Woods SAC and Coedydd ac Ogofau Elwy a Meirchion SSSI to the south. This would need to be determined once further details about the preferred substation location are available.	NRW

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- 4.10.6.80 Onshore Substation Option 8 was not taken forward primarily due to the Black classification identified for landscape and visual criteria. This was related to the potential impact on nearby residential receptors in terms of visual amenity, and critically the likelihood that mitigation would not be achievable given the local topography constraints.
- 4.10.6.81 Onshore Substation Options 16 and 17 were not taken forward primarily due to the Black classification identified for traffic and transport. This was related to the access constraints for making these options achievable. Creating new access routes from existing highways to these two zones presented a significant health and safety concern and therefore these options were deselected.
- 4.10.6.82 The remaining options were all considered potentially viable options, based on the information available at that time, to be taken to the next stage of site selection refinement and consultation for the onshore substation. Therefore, following the discounting of the options outlined above, the following seven options comprise the shortlist for the onshore substation (Figure 4.17):
- Option 1
 - Option 2
 - Option 3
 - Option 4
 - Option 5
 - Option 6
 - Option 7

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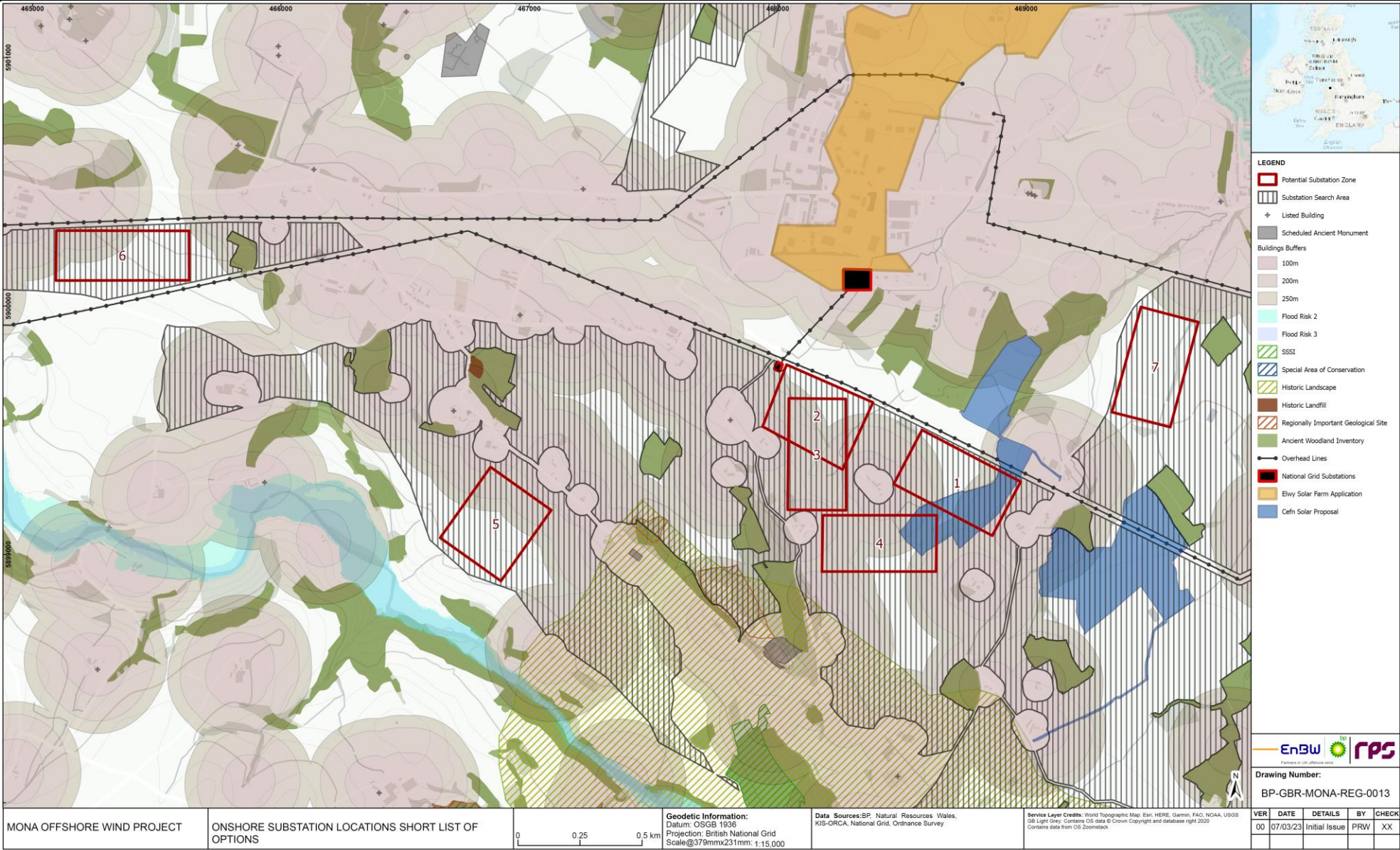


Figure 4.17: Onshore Substation Locations Short List of Options.

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- 4.10.6.83 This shortlist of onshore substation options was used to form the basis of a targeted onshore substation consultation that ran from Monday 26 September 2022 until Monday 7 November 2022. The targeted consultation was designed specifically to seek feedback on the shortlisted locations and identify if there was any information about the shortlisted locations that the site selection process was unaware of. The site selection process would then combine the ongoing environmental assessment and technical studies with local knowledge to help narrow the location for the onshore substation for PEIR assessment. The intention of the consultation was to select one or more preferred onshore substation location(s) which would be the subject of PEIR to feed into the selection of a preferred onshore substation for DCO application. Events were held at Bodelwyddan Village Hall, as well as an online webinar, and feedback forms were available on the Mona Offshore Wind Project website – with the potential to email, use a written feedback form or freephone call.
- 4.10.6.84 A summary of the consultation responses on the short-listed onshore substation options is presented in Table 4.21 below, including subjective views of consultees. The full responses from the targeted consultation events will be reported in full in the Consultation Report.

Table 4.21: Onshore substation medium list community consultation responses.

Onshore substation option	Summary of consultation feedback
1	<ul style="list-style-type: none"> • Rates low on negative aspects identified by the majority of residents • Impacts on the environment, LVIA and cultural heritage were identified
2	<ul style="list-style-type: none"> • Potentially favourable option due to the proximity to the existing National Grid substation • Impacts on cultural heritage and the environment are identified (although the concerns are smaller in comparison to Onshore Substation Option 1) • The site is the lowest above sea level and behind the business park so it is recognised as having a lower visual impact from the wider area
3	<ul style="list-style-type: none"> • Varied responses, but closely aligned to the responses to Onshore Substation Option 2 • Potential views from the adjacent highway network were identified • Potential impacts on the close proximity watercourse and associated wildlife were identified • Slightly favoured due to its location and proximity to the National Grid substation
4	<ul style="list-style-type: none"> • Consultation responses generally acknowledged its positive / favourable location (predominantly due to the proximity to the existing National Grid substation) • Concerns were raised around the environmental and visual impacts due to the proximity to homes and roads
5	<ul style="list-style-type: none"> • Mixed responses but predominantly negative from residents and stakeholders • Potential impacts on the Lower Elwdy Valley were identified due to potential visibility across the valley • Potential impacts on wildlife, landscape and the surrounding designated Listed Buildings was also identified
6	<ul style="list-style-type: none"> • Mixed feedback from residents and stakeholders • Some responses preferred this location due to its accessibility and potential reduced impacts on the road network • Potential LVIA impact is identified as the location has visibility from several directions and potential visibility across the valley

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Onshore substation option	Summary of consultation feedback
7	<ul style="list-style-type: none"> • Very mixed feedback with some describing this location as the best and some describing it as the worst • Good access to the site was identified • Potential impacts to amenity to surrounding residential properties were identified • General comments received on the overdevelopment of the area (associated with connections into the National Grid substation) – this could be applicable to all onshore substation options
4.10.6.85	<p>Following consultation responses, a further review of the preferred onshore substation options was undertaken. The most important responses on each of the onshore substation options were those that identified new information and / or new potential impacts, and these responses informed the next stage of the site selection process in de-selecting onshore substation options.</p>
4.10.6.86	<p>Responses to onshore substation options 1 and 2 were comparatively more positive to those of onshore substation options 3 and 4 – despite their immediate proximity to one another. Onshore substation option 3 required significant excavations due to the topography in the south of the potential footprint. Onshore substation option 4 overlaps the proposed St Asaph Solar Farm footprint. As a result, onshore substation options 3 and 4 were discarded.</p>
4.10.6.87	<p>Due to the location of onshore substation options 1 and 2 being in close proximity to one another, only one of the two options was considered relevant to take forward to the shortlist, as further micro-siting of the option would take place following the LVIA modelling. When compared against onshore substation 2, onshore substation 1 has similar risks, although has a slightly increased distance from the National Grid substation and pylons and therefore has a slightly more settled rural character and as such was identified as less favourable of the two locations at this stage from an LVIA perspective. In addition, onshore substation option 1 overlaps the proposed St Asaph Solar Farm footprint. As such onshore substation option 2 was selected for the shortlist of onshore substation locations.</p>
4.10.6.88	<p>Consultation responses to onshore substation option 5 was the most negative and, in conjunction with the constraints associated with steep gradients, access and landscape visibility, this option was discounted as a result. Further engineering review of onshore substation option 6 identified that the location of this option on a ridgeline with steep gradients was not preferable from an engineering, access or landscape perspective. In addition, the Zone of Theoretical Visibility (ZTV) modelling confirmed that the onshore substation option 6 would be visible from the other side of the valley. Due to this, onshore substation option 6 was not taken forward to the shortlist of options.</p>
4.10.6.89	<p>Onshore substation option 7 received mixed consultation responses, with some comments describing it as the best location and some as the worst location. Onshore substation option 7 also retains the flexibility to orient along an east-west axis or a north-south axis and therefore has a larger Onshore Substation Zone identified.</p>
4.10.6.90	<p>Therefore, following the discounting of the options outlined above, the following two options comprise the final options for the onshore substation to be taken into the PEIR assessment:</p>

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- Onshore substation option 2
- Onshore substation option 7.

Onshore Substation Option 2

- 4.10.6.91 At this stage of the site selection process, further consideration was also given to the likely onshore cable routes connecting the landfall location with the proposed onshore substation options. Connectivity with the emerging preferred route (from Llanddulas) therefore influenced the decision with regards to onshore substation option 2, as the associated onshore cable routes had been identified as feasible. There is an anticipated high risk of potentially significant impacts for LVIA due to the likely visual effects on nearby properties, with the closest property approximately 130 m to the southeast, and mitigation opportunities being limited at these distances; stakeholder feedback had also indicated a potential impact on historic landscapes. Onshore substation option 2 also has higher risk of potentially significant impacts for traffic, archaeology, and a generally moderate risk of potential impacts for ecology receptor groups.
- 4.10.6.92 Connectivity between Onshore Substation Option 2 and the Bodelwyddan National Grid substation would follow a 400kV cable corridor directly north, avoiding the mature woodland blocks surrounding the Gwynt y Mor and National Grid substation. Due to its close proximity, the length of 400kV cable corridor required would be less than 500 m.
- 4.10.6.93 Further consideration of access, landscape mitigation and impacts associated with operation and construction noise will need to be addressed as part of the ongoing project design, assessment and mitigation proposals.

Onshore Substation Option 7

- 4.10.6.94 For onshore substation option 7, stakeholder feedback was broadly positive, with limited constraints identified. The LVIA and wider receptor analysis indicated that this onshore substation option benefitted from some tree copses offering visual containment in an overall relatively flat setting, with site overall relatively flat, allowing mitigation in the form of screening. During the initial appraisal onshore substation option 7 was therefore considered to be moderate-lower risk of potentially significant impacts, with capacity to accept some development. Following further analysis, including preliminary ZTV analysis, it was considered to have two higher potential impacts in relation to landscape receptors. The preliminary ZTV assessment, noted views from a cluster of 18 properties within 400-500 m of the option which could represent a high risk of impact to those receptors, given their proximity. Furthermore, visibility of the option from the St Asaph cathedral would also present a high risk of impact to the cathedral setting.
- 4.10.6.95 Connectivity with the emerging preferred route (from Llanddulas) is challenging from onshore substation option 7 due to the need to 'double-back' on the onshore cable route. The onshore cable route will approach from the west, passing south of the National Grid substation, and on to onshore substation option 7. This will mean that the 400kV cable corridor will need to return west along a similar alignment so that the mature woodland blocks surrounding the Gwynt y Mor and National Grid substation can be avoided.
- 4.10.6.96 Further consideration of cable routing, access, landscape mitigation and impacts associated with operation and construction noise will need to be addressed as part of the ongoing project design, assessment and mitigation proposals.

Onshore Substation Refinement Conclusions

- 4.10.6.97 The two preferred zones were considered, relative to one another, to determine preferred options for PEIR assessment and consultation. Further consideration was given to matters such as topography, access, landscape framework/screening, hydrology and ground conditions, with a particular focus on heritage, ecology, and LVIA assessment.
- 4.10.6.98 The constraints on the physical availability of the land at the two onshore substation options fed into the assessment of mitigation and access. It was determined that both options had limited but sufficient land available for potential mitigation to be implemented as they are constrained by existing woodland, properties to the west and east, and overhead lines. In addition, an assessment of the potential access to both options identified that both are constrained, with a need to include multiple options for access that could offer optionality – the PEIR consultation sought comments on the most feasible and less impactful solution.
- 4.10.6.99 For PEIR consultation, assessments were undertaken on the preferred onshore substation options within an Onshore Substation Zone. The indicative onshore substation footprints (of 105,000 m² as identified in Volume 5, Annex 4.1: Site Selection Area of Search Identification) would contain the footprint of the main buildings and will be within the Onshore Substation Zone of 125,000 m² (which would include grading and earthworks for levelling the onshore substation platform). The Onshore Substation Zones retain flexibility for the onshore substation footprints to be re-oriented for engineering design and mitigation of potential impacts.
- 4.10.6.100 Onshore Substation Option 7 retained the flexibility to orient along an east-west axis or a north-south axis and therefore has a larger Onshore Substation Zone identified. Assessment within the PEIR documentation focused on the realistic worst case orientation for the MDS and this is the north-south axis orientation.
- 4.10.6.101 No conclusion was drawn on the preferred onshore substation option for the Mona Offshore Wind Project at the PEIR stage.

4.10.7 Identification of Potential Temporary Construction Compounds

- 4.10.7.1 Construction activities will need to be supported by a series of temporary construction compounds along the onshore cable route close to the cable corridor. Further development of the onshore cable corridor AoS allowed for the identification of several potential locations within Conwy and Denbighshire. These areas were incorporated into the draft Works Plans of the PEIR and were illustrated in detail in Volume 1, Chapter 3: Project Description of the PEIR.

4.10.8 Summary for PEIR

- 4.10.8.1 The Mona Offshore Wind Project site selection work (as informed through stakeholder engagement, landowner discussions and technical studies) enabled the refinement of Mona Offshore Wind Project to the point of PEIR assessment. The following aspects of the proposed project were identified and refined:
- A refined array boundary area
 - A single preferred offshore cable corridor search area of ~1 km in width
 - A refined landfall at Llanddulas

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- A single preferred onshore cable corridor of 100 m in width with emerging preferred route of approximately 70 m
- Two feasible onshore HVAC substation sites (to be refined down to one for DCO application).

4.10.8.2 The Mona Offshore Wind Project considered that these options and refinements were sufficiently justified and narrowed down to enable stakeholders (through the consultation process) to meaningfully comment on the potential scheme and its potential effects on the receiving environment.

4.11 **Stage 5: Further Refinement of the Mona Offshore Wind Project design following review of statutory consultation responses, and EIA studies**

4.11.1 **Overview**

4.11.1.1 Following the statutory consultation on the PEIR, a number of modifications and refinements were made to the Mona Offshore Wind Project as a result of responses to the statutory consultation, formal and information consultation with landowners, further design refinements, engineering optimisation, and findings from additional environmental appraisals and surveys that were ongoing during and after statutory consultation on the PEIR. Responses from the consultation have been reviewed and appropriate revisions to project design and environmental studies have been implemented as detailed in the following sections.

4.11.1.2 The refinements are illustrated in Figure 4.18 to Figure 4.21, and include:

- A refinement of the proposed Mona Array Area, reducing it from approximately 450 km² to 300 km²
- A reduction in the maximum number of turbines from 107 to 96
- Removal of the short trenchless techniques landfall option and commitment to use the long trenchless technique option with an entry / exit point below MLWS
- Refined landfall access and temporary construction compound
- Refined onshore cable corridor from 100m to a 74m (widening to 100m in places)
- Reduction in onshore cable route optionality running parallel to the Glascoed Road
- Selection of a preferred onshore substation location and a reduction in the surrounding land around the onshore substation required for mitigation
- Refined operational accesses for the onshore substation
- Refined 400kV cable route.

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4.11.2 Refinement of the Mona Array Area boundary

- 4.11.2.1 Refinements to the Mona Array Area boundary related to minimising interaction with other sea users; existing offshore wind farms, telecommunication and power cables, commercial fisheries and aviation and radar, with key refinements made to minimise risks to shipping and navigation. Potential impacts on existing shipping and navigation stakeholders was identified as a key issue early in the development of Mona Offshore Wind Project, leading to the creation of the MNEF in November 2021. In consultation with the Maritime and Coastguard Agency (MCA) and Trinity House (meeting of 1 February 2022) and key shipping and navigation stakeholders (meeting of 14 February 2022), it was agreed that consideration of potential cumulative issues with other Round 4 wind farm proposals (Morgan Offshore Wind Project Generation Assets and Morecambe Offshore Windfarm Generation Assets) was also particularly important in the eastern Irish Sea. It was also agreed that navigation simulations would be used to explore the potential impacts of Mona Offshore Wind Project. This was subsequently agreed at MNEF meeting 2 on 6 May 2022 where it was also agreed that a Mona Offshore Wind Project navigation risk assessment (NRA) and cumulative regional navigation risk assessments (CRNRA) and associated workshops would be undertaken.
- 4.11.2.2 The NRA and CRNRA workshops, undertaken between 10 - 12 October 2022 to inform the PEIR concluded that the Mona Offshore Wind Project would result in a number of unacceptable risks to navigation and significant impacts to ferry services, both individually and cumulatively, as reported within Volume 2, Chapter 7: Shipping and navigation of the Environmental Statement. This was reflected in the responses to the statutory consultation from key stakeholders as shown in Table 4.22 and in the Technical Engagement Plan (document reference: E4). Feedback received through non-statutory and statutory consultation also highlighted a general concern over the impact of the Mona Wind Farm Project alone and cumulatively on users of the ferry services as set out in the Consultation Report (document reference: E3).

Table 4.22: Key shipping and navigation stakeholder feedback on the statutory consultation

Stakeholder	Consultation feedback
MCA	<ul style="list-style-type: none"> Navigation simulations were conducted with the ferry operators followed by a Hazard Identification (HAZID) workshop in October 2022 where several concerns were raised by MCA and navigation stakeholders on the unacceptable collision risks, including cumulative risks
Stena Line	<ul style="list-style-type: none"> Stena Line's main concern throughout the consultation period has been and still is the risks to navigational safety for its vessels, as well as other vessels operating in the array areas of the Wind Farms.
Isle of Man Steam Packet Company	<ul style="list-style-type: none"> The company is concerned that the cumulative impact of all the various Irish Sea windfarms will compromise safety, reduce freedom of navigation and reduce weather routing options, leading to safety issues and increased sailing cancellations
Chamber of Shipping	<ul style="list-style-type: none"> The results of the simulator exercises along with the risk ratings as calculated in the Cumulative Regional Navigational Risk Assessment (CRNRA) show that there are unacceptable risks to navigational safety and that changes to the design envelope are required.

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4.11.2.3 These concerns, alongside other feedback on the PEIR and further engineering, environmental and technical work, informed the Applicant's decision to reduce the Mona Array Area from what was presented in the PEIR. The spatial extent of the Mona Array Area was reduced from approximately 450 km² to 300 km² with refinements in the north, east and south as shown in Figure 4.18. The benefits associated with these refinements to the existing environment and other sea users are given in Table 4.23 below.

Table 4.23: Benefits gained through refinement of the Mona Array Area boundary

Refinement	Main environmental benefits
Reduction in northern extent of array area	<ul style="list-style-type: none"> Minimise potential impacts on shipping and navigation stakeholders both from the project alone and cumulatively with other proposed offshore wind farms Avoids several existing telecommunications and power cables Minimise potential impacts on aviation and radar stakeholders by removal of overlap with the Holyhead CTA D FL45-FL195 airspace classification
Reduction in eastern extent of array area	<ul style="list-style-type: none"> Minimise potential impacts on shipping and navigation stakeholders both from the project alone and cumulatively with other proposed offshore wind farms Avoids an existing power cable Avoids existing oil and gas industry activity
Reduction in southern extent of array area	<ul style="list-style-type: none"> Increases separation from the Liverpool Traffic Separation Scheme (TSS) and vessel traffic between the Skerries and Liverpool TSSs. Reduces potential impacts on vessel activity around the southwestern corner of the array area Avoids locating wind turbine / OSPs within a Ministry of Defence (MOD) highly surveyed area
General reduction in array area	<ul style="list-style-type: none"> Reduces potential impacts on commercial fisheries associated with spatial overlap of the array area with existing fishing activities Increases the distance from, and reduces the potential for impacts on, existing operating and recently consented offshore wind farms, including operations and maintenance activities. Increases separation from some visual receptors

4.11.2.4 Morgan Offshore Wind Project Generation Assets and Morecambe Offshore Windfarm Generation Assets also made revisions to their respective array area boundary's. It was agreed at MNEF meeting 4 held on 18 January 2023 that the efficacy of the revisions made to the array area boundary's for all three Round 4 projects would be investigated through further navigation simulations with each of the ferry companies and additional NRA and CRNRA workshops prior to preparation of the Environmental Statement.

4.11.2.5 The NRA and CRNRA for the Environmental Statement were held on the 28 and 29 September 2023 where it was found that the revisions made the Mona Array Area (and by the other Round 4 projects) allowed for all previously unacceptable risks to be reduced to tolerable (if As Low As Reasonably Possible (ALARP)) as reported in Volume 6, Annex 7.1: Navigation risk assessment of the Environmental Statement.

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4.11.3 Refinement of the offshore array design

- 4.11.3.1 In reducing the Mona Array Area boundary, and seeking to minimise potential impacts on the existing environment as far as practicable, the Applicant also refined the array design by reducing the total number of wind turbines. The design has been refined in response to feedback received during the statutory consultation and in response to likely available turbine models in the rapidly evolving supply chain. As such, the Applicant has reduced the maximum number of wind turbines from 107 as proposed within PEIR to a final maximum design of 96. Whilst the total number of wind turbines has decreased, it has been necessary to increase the rotor diameter, and thus, maximum tip height, of the larger wind turbine in response to feedback from the supply chain. Maximum rotor diameter has increased from 280 m at PEIR to 320 m, whilst maximum tip height has increased from 324 m to 364 m over LAT.
- 4.11.3.2 Despite the reduction in the size of the Mona Array Area, the Applicant has been able to increase the separation distance between infrastructure from 1000 m between rows of wind turbines and 875 m between each wind turbine in a row at PEIR to a minimum spacing of 1400 m within and between rows. The Applicant has also committed to maintaining two 'lines of orientation' throughout the Mona Array Area and wind turbine rows will be orientated roughly north to south. These refinements to the Mona Array Area have been designed to provide additional space for marine users, facilitate search and rescue (SAR) and to promote co-existence and co-location with commercial fisheries stakeholders. Further details on the refinements described above are provided in Volume 1; Chapter 3: Project description of the Environmental Statement.

4.11.4 Refinement for the Mona Offshore Cable Corridor and Access Area

- 4.11.4.1 Following review of responses to the statutory consultation, no refinements were made to the route of the Mona Offshore Cable Corridor and Access Areas offshore. However, a number of commitments to refinements have been made relating to the installation and protection of export cables through the Constable Bank feature and Y Fenai a Bae Conwy/Menai Strait and Conwy Bay SAC, as set out below:
- No cable protection will be installed within Constable Bank
 - Any sandwave clearance on the Constable Bank will be within the swept path area (20m) of the cable installation tool
 - No sandwaves clearance will occur within the Y Fenai a Bae Conwy/Menai Strait and Conwy Bay SAC
 - No cable protection higher than 70 cm will be installed within in the Menai Strait and Conwy Bay SAC. Additionally, the percentage of export cable requiring cable protection will not exceed 10% of the total length of the export cable within the Conwy Bay and Menai Straits SAC.
- 4.11.4.2 With regard to the Mona Offshore Cable Corridor and Access Areas more generally, the maximum width of sandwave clearance along each cable was reduced, thereby reducing overall sandwave clearance requirements, and the following commitments were made:
- As per the standard navigation requirements, any cable protection used will cause no more than a 5% reduction in water depth (referenced to Chart Datum) at any point along the export cables without prior written approval from the Licensing Authority in consultation with the Maritime and Coastguard Agency

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- Material arising from drilling and/or sandwave clearance will be deposited in close proximity to the works.

4.11.4.3 The commitments discussed above are secured through conditions in the deemed marine license in Schedule 14 of the Draft DCO (document reference: C1) and expected to be secured in the NRW marine licence as set out in the Mitigation and monitoring schedule (document reference: J10).

4.11.5 Trenchless techniques at landfall below MLWS, and a refined landfall access / temporary construction compound

4.11.5.1 Following receipt of responses to the statutory consultation, both the short trenchless technique (with open cut trenching in the intertidal area) option and long trenchless technique option were retained until further site investigation studies could be undertaken.

4.11.5.2 Consultation feedback received via the PEIR phase and regular Onshore Ecology EWGs stated that the NRW preference was to reduce or remove any potential interaction with the intertidal area to reduce the potential direct impact on the Traeth Pensarn SSSI (see Table 4.7) and intertidal habitats, and to reduce the potential activity on the beach to support the trenchless techniques (including access to these areas).

4.11.5.3 The terms 'long' and 'short' drill are only used to distinguish relatively between the considered options for the landfall at Llanddulas. The 'short drill' trenchless technique was proposed to be approximately 350m long; and the 'long drill' trenchless technique was proposed to be approximately 800m long.

4.11.5.4 From an engineering perspective, locating the trenchless technique exit location within the intertidal zone would mean that the exit point would be landward of a boulder field and an area with mega ripples and ridge/runnel features that require a larger depth of lowering field cable pull-in. There is also an outcrop of bedrock that would mean that any open cut trenching for the cable lay within the intertidal zone would be exceptionally challenging due to the bedrock outcrop and not considered viable. Access restrictions associated with traversing from the east between MLWS and MHWS (avoiding the designated features of the SSSI) and a tidally restricted working window within the intertidal zone would also compromise the viability of the short drill option.

4.11.5.5 Furthermore, there are a number of environmental constraints at the landfall intertidal area which could be impacted by the 'short drill' that could involve open cut trenching:

- Area of piddocks in clay habitat, a protected habitat, located across the line of the route would be impacted by the 'short drill' option as the cable would likely need to be trenched through this habitat. It is an irreplaceable habitat and there are no instances where this habitat has been successfully reinstated (at the time of writing). If the cable was open cut through this habitat it would be a potentially significant impact with little opportunity to mitigate this. It would be very difficult to drill under the piddocks in clay habitat area and still come up in the intertidal area as the beach is very short at this point. The high tide comes into the sea defence and therefore there is no beach left available for construction activities.
- *Sabellaria alveolata* reef and *Mytilus edulis* beds (blue mussels) to the east of the proposed 'short drill' route, which are highly protected and sensitive habitats. The project has committed to avoiding the current mapped extent of these habitats with a 50m buffer, and reduced the development order limits to accommodate

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this commitment. A 'long drill' trenchless technique would remove any indirect impacts to these habitats as there would be no trenching in the intertidal area.

- 4.11.5.6 NRW gave a strong steer in their response to PEIR regarding the intertidal area: *"NRW (Advisory) strongly encourages the applicant to use Horizontal Directional Drilling (HDD) where possible given the potential environmental impacts of open cut trenching on sensitive features found during the intertidal survey"*.
- 4.11.5.7 A 'short drill' would require commitments to mitigate impacts on these environmental receptors, primarily through avoidance, which would limit options for routing of cables through the intertidal area. NRW have also raised concerns regarding the potential need to consider cable protection in the intertidal area if open trenching was undertaken as burial of the cable may not be guaranteed due to potential changes in bed morphology.
- 4.11.5.8 The Mona Offshore Wind Project has committed to dropping the 'short drill' option and has committed to a 'long drill' option with an exit point below MLWS.
- 4.11.5.9 As a result of this commitment, the landfall / beach access route to the east was refined, with an associated temporary construction compound. The access route and temporary construction compound location were determined through consultee engagement at the Site Selection EWG in August 2023 and through separate meetings with NRW, and consideration of the technical and environmental constraints. The eastern access passes through the Traeth Pensarn SSSI, however the project has committed to any vehicular traffic passing below the vegetated shingle bank (the area which the SSSI is designated for) to minimise any disturbance or potential impacts. This approach was discussed and agreed with NRW at the EWG onshore ecology meeting 5 held on 4 October 2023.
- 4.11.5.10 The eastern landfall / beach access has identified the need for a parking area (to be identified as a temporary construction compound) for the purposes of the trenchless technique installation. This will likely contain 4x4 vehicles for personnel movements to be parked overnight. Therefore, it will require fencing and security. This area will have maximum dimensions of 40m x 20m.
- 4.11.5.11 As a result of this commitment to the eastern beach access route, the option to use the landfall / beach access route to the west was removed.

4.11.6 Refinement of the onshore cable route, associated infrastructure, and optionality

- 4.11.6.1 Taking on board the PEIR phase consultee feedback, the entire onshore cable route was also reviewed by the same multidisciplinary team assessing every request for a change to the route, and seeking to reduce the development order limits where possible, re-route and select between alternatives put forward for consultation. The following text summarises why those modifications were implemented:
- The need for further refinement of the landfall
 - The need to define a final onshore cable route, and reduce the broad corridor down to a final narrow corridor that accommodates the onshore cable width, plus working areas
 - Avoiding ecologically sensitive ponds
 - Reducing the requirement to cross PRowS
 - Responding to consultation feedback. This has influenced many of the post-PEIR route refinements

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- The desire to reduce optionality at key crossing points including a marked reduction associated with the crossing beneath Gwrych Wood
 - The requirement for construction compounds and cable construction access routes
 - Proactive changes to the onshore cable route using the results of detailed ecological and archaeological survey to inform the detailed route selection
 - Proactive changes to the onshore cable route using the results of early landowner engagement.
- 4.11.6.2 The Mona Offshore Wind Project onshore cable route retained optionality at the PEIR consultation phase. Optionality was at four specific locations due to potential constraints associated with landowners, drainage, utilities, Ancient Woodland, historic landfill, hedgerows, etc.:
- East of the Glascoed Road – Abergele Road crossroads
 - At Llanfair Talhaiarn
 - At Llannefydd
 - South of Groesfford Marli.
- 4.11.6.3 BRAG assessment of each option is contained with Volume 5, Annex 4.2 Selection and Refinement of the Onshore Infrastructure of the Environmental Statement.
- 4.11.6.4 The northern onshore cable route option east of the Glascoed Road – Abergele Road crossroads was selected primarily to avoid any potential interaction with the water supply for Tan-y-Mynydd Trout Fishery.
- 4.11.6.5 The southern onshore cable route options at Llanfair Talhaiarn and at Llannefydd were selected primarily to avoid steep gradients and topography that would result in challenging engineering and potential issues with surface water runoff and drainage, where alternative options were available..
- 4.11.6.6 The southern onshore cable route option south of Groesfford Marli was selected to avoid any potential requirement to use trenchless techniques beneath Ancient Woodland and historic landfill, where alternative options were available.
- 4.11.6.7 These optionality decisions were presented to the Site Selection EWG and announced via newsletter and online publication in August 2023 (along with an announcement regarding the preferred onshore substation location). One area of optionality remained on the onshore cable route at Llanfair Talhaiarn. This was dependent on engagement with Wales and West Utilities. Following engagement in October 2023, the southern onshore cable route option was selected primarily to avoid any potential interaction with hedgerows and severance of landowner field parcels.
- 4.11.6.8 The width of the onshore cable corridor was also refined to 74m. This width increases to 100m for trenchless technique crossings beneath public highways, woodlands, hedgerows and utilities (as identified in Volume 5, Annex 4.3 Crossing Schedule); and to retain route flexibility around mine shafts (particularly south of Groesfford Marli). These trenchless technique crossings are identified in Volume 5, Annex 4.3 Crossing Schedule. Some areas of wider onshore cable corridor (in particular in the north-south section from Gwrych Wood down to the junction between Abergele Road and Glascoed Road) are also accompanied by access tracks that go ‘outside’ the onshore cable corridor to facilitate construction traffic to pass around a feature (for example a hedgerow) – removing the need to run the haul road through it.

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- 4.11.6.9 The onshore cable corridor also widens to approximately 300 m at the trenchless technique crossing beneath Gwrych Wood – this is to facilitate drill angles and retain flexibility in technique as site investigations at this location have discovered historic mining voids that will make trenchless techniques challenging. These site investigations also determined that the use of trenchless techniques is feasible in this location. Further workstreams will be undertaken post-consent to determine the appropriate angle, depth and alignment of the trenchless technique to pass beneath Gwrych Wood.
- 4.11.6.10 The final onshore cable corridor for the Mona Offshore Wind Project application is considered to balance environmental and technical constraints whilst taking into account feedback from landowners and other stakeholders wherever feasible.

4.11.7 Refinement of onshore substation and associated accesses

- 4.11.7.1 Following the decision at PEIR consultation to consider two potential onshore substation locations, a process of micro-siting and feedback review was undertaken to refine the best location for onshore substation, taking into account Statutory Consultation feedback, technical input including onshore substation construction layouts, platform layouts and onshore cable route options, ongoing ecological and archaeological surveys, and EIA / Engineering / Land BRAG assessment criteria.
- 4.11.7.2 Statutory consultation feedback also included responses from Denbighshire County Council, NRW and members of the community that the Mona Offshore Wind Project onshore substation proposed infrastructure was too high and the footprint was too large. As a result of these comments, the project has committed to reducing the maximum height of the onshore substation by 5m (from 20m). This results in a maximum building height of 15m.
- 4.11.7.3 To achieve this height reduction, the project has also committed to a GIS onshore substation (as referred to in Table 4.8). This also means that the maximum footprint of the onshore substation has reduced by 60,000m² (from 125,000m²). This results in a maximum footprint of 65,000m².
- 4.11.7.4 These project refinements demonstrate that the Mona Offshore Wind Project is intent on reducing its potential impacts and minimising potential effects on the local community and landowners.
- 4.11.7.5 Following these commitments the likely design parameters and space requirements that were used at this stage in the site selection process are outlined in section 1.4.3 in Volume 5, Annex 4.2: Selection and Refinement of the Onshore Infrastructure. This is summarised as:
- A footprint of up to 65,000m² for the indicative onshore substation footprint
 - Structures will be up to 15 m tall
 - The onshore substation will require land for temporary construction works (e.g. welfare, parking, storage areas and associated temporary access tracks) and a temporary construction compound footprint of up to 150,000 m². A potential construction layout was produced for the purposes of the BRAG assessment as shown in Figure 1.6 of Volume 5, Annex 4.2: Selection and Refinement of the Onshore Infrastructure.
- 4.11.7.6 BRAGs were undertaken of the remaining two options, incorporating updated layouts / options and reviewed those BRAGs for the onshore substation against consultation responses. Micro-siting suggestions for the onshore substation were also reviewed against consultation responses.

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- 4.11.7.7 The BRAG assessment for the onshore substation options is included within Volume 5, Annex 4.2 Selection and Refinement of the Onshore Infrastructure of the Environmental Statement.
- 4.11.7.8 It is the Applicant's position, in accordance the policies set out in both the extant and draft NPS EN-1, and based on input from the multidisciplinary project team and stakeholder engagement, that the proposed onshore substation south of immediately south the National Grid Bodelwyddan substation (Onshore Substation Option 2) offers the most appropriate option for the siting of the Mona Offshore Wind Project onshore substation.
- 4.11.7.9 This decision was presented to the Site Selection EWG and announced via newsletter and online publication in August 2023 (along with an announcement regarding the preferred onshore cable route).
- 4.11.7.10 Following further electrical onshore substation design, the location and orientation of the onshore substation has been micro-sited to take account of specific features and constraints surrounding it. This location and orientation differs to what was proposed during the site selection process for PEIR. The updated location and orientation of the onshore substation was chosen to place it as far away from residential receptors as practicable, whilst maintaining appropriate distances from the Ancient Woodland to the north (as well as avoiding the National Grid overhead lines). Further to this, the temporary construction compound was similarly located, to the north / northeast of the onshore substation site, to place it as far as practicable from residential receptors whilst also utilising the available screening of the woodland to the north to screen works from the Glascoed Road.
- 4.11.7.11 Areas to the east and west of the proposed onshore substation, surrounding the former onshore substation zone, have been identified as suitable for strategic landscape screening, inclusive of tree planting to complement the surrounding woodland and tree species to the north of the zone. The preferred onshore substation site benefits from existing topography such that appropriate planting will enable residential properties to the east and west to be screened over the lifetime of the project.
- 4.11.7.12 For the purposes of the PEIR, a number of potential operational and construction phase access routes were identified that have also been refined. These refinements were also reviewed as part of the BRAG assessment included in Volume 5, Annex 4.2 Selection and Refinement of the Onshore Infrastructure of the Environmental Statement. The refinements, which include a lateral reduction in the width of the construction and operational access road and location as far east as possible, have been introduced to minimise traffic, visual and noise-related impacts, as well as cumulative effects associated with Awel y Môr, to residential properties on Glascoed Road. This process was discussed with the Site Selection EWG in August 2023 and through additional consultation with stakeholders including Denbighshire County Council, councillors, NRW, National Grid, existing Offshore Transmission Owner (OFTO) operators (including Gwynt y Môr OFTO and Burbo Bank Extension OFTO), Wales and West Utilities and relevant land interests.

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4.11.8 Refinement of the 400 kV route

- 4.11.8.1 In line with the approach taken for the broader onshore export cable route, the 400kV cable route was similarly refined to generally reduce the corridor from the 100 m route, and to minimise tree and hedgerow loss. Where practicable the final option will be sited to distance works from nearby residential receptors. The order limits (Works Plans – Onshore (Document Reference: B3) retain necessary flexibility approaching the National Grid substation by opening into a fan that will allow a suitable connection point to be identified by National Grid, whilst also allowing flexibility to avoid the proposed projects that are due to undergo construction activities (e.g. National Grid substation extension, overhead line realignment, Awel y Môr Offshore Wind Farm and other projects that may be developed in the area). The intention for the 400 kV cable route is that it will be 48 m in width within that wider area, depending on an understanding of constraints at the detailed design stage (post-consent).

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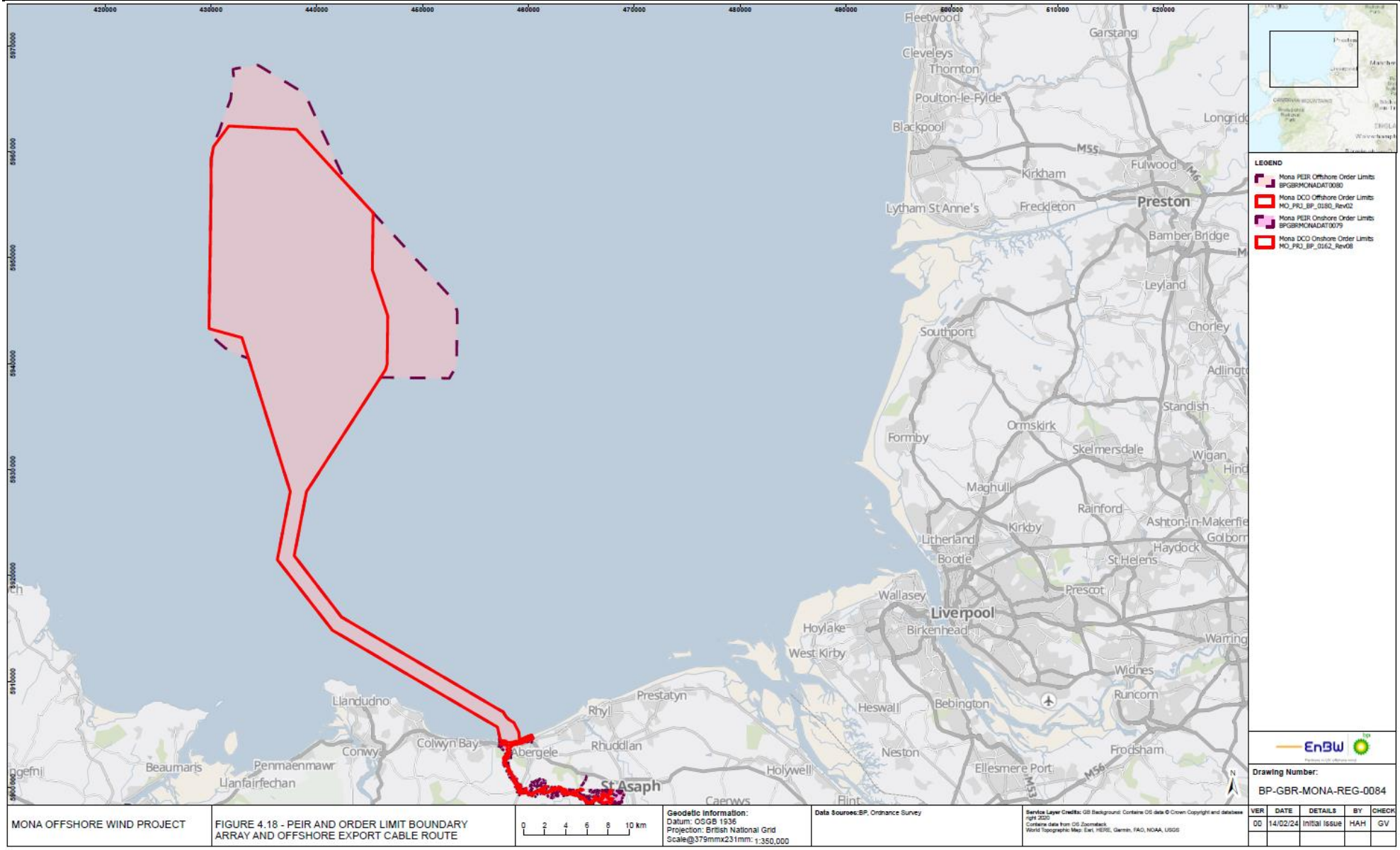


Figure 4.18: PEIR and Order Limit Boundary – Array and Offshore Export Cable Corridor

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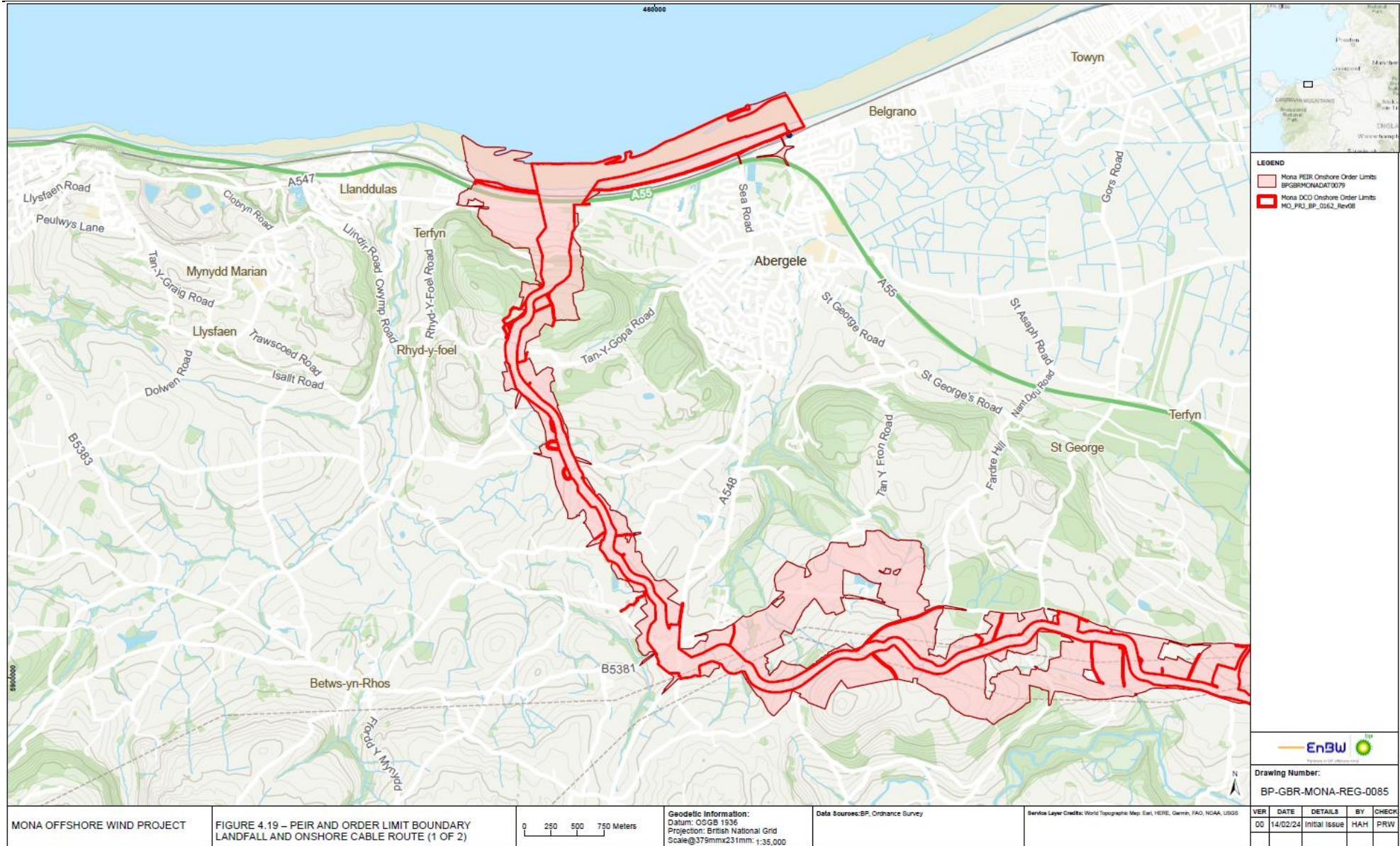


Figure 4.19: PEIR and Order Limit Boundary – Landfall and Onshore Cable Route (1 of 2)

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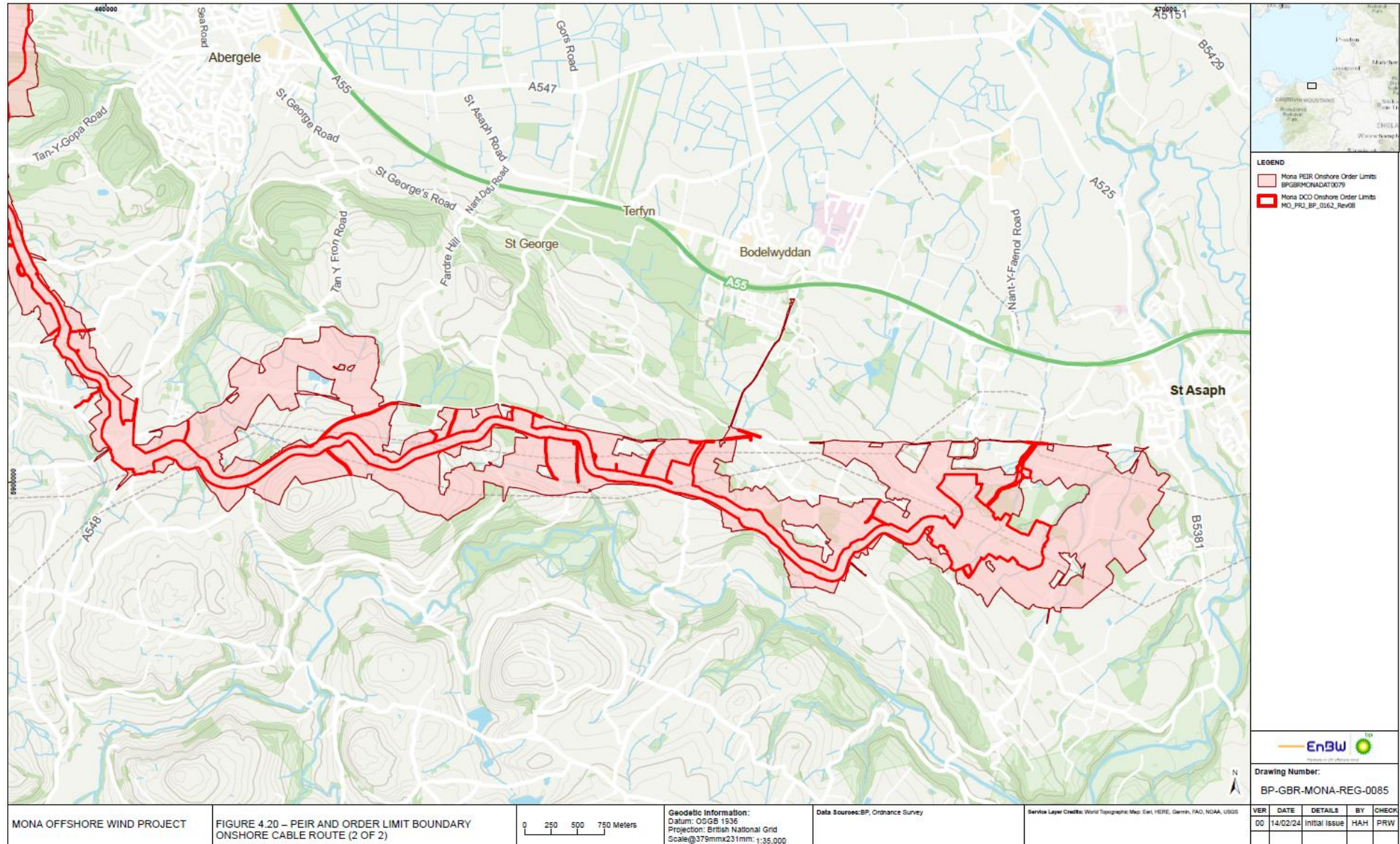


Figure 4.20: PEIR and Order Limit Boundary – Landfall and Onshore Cable Route (2 of 2)

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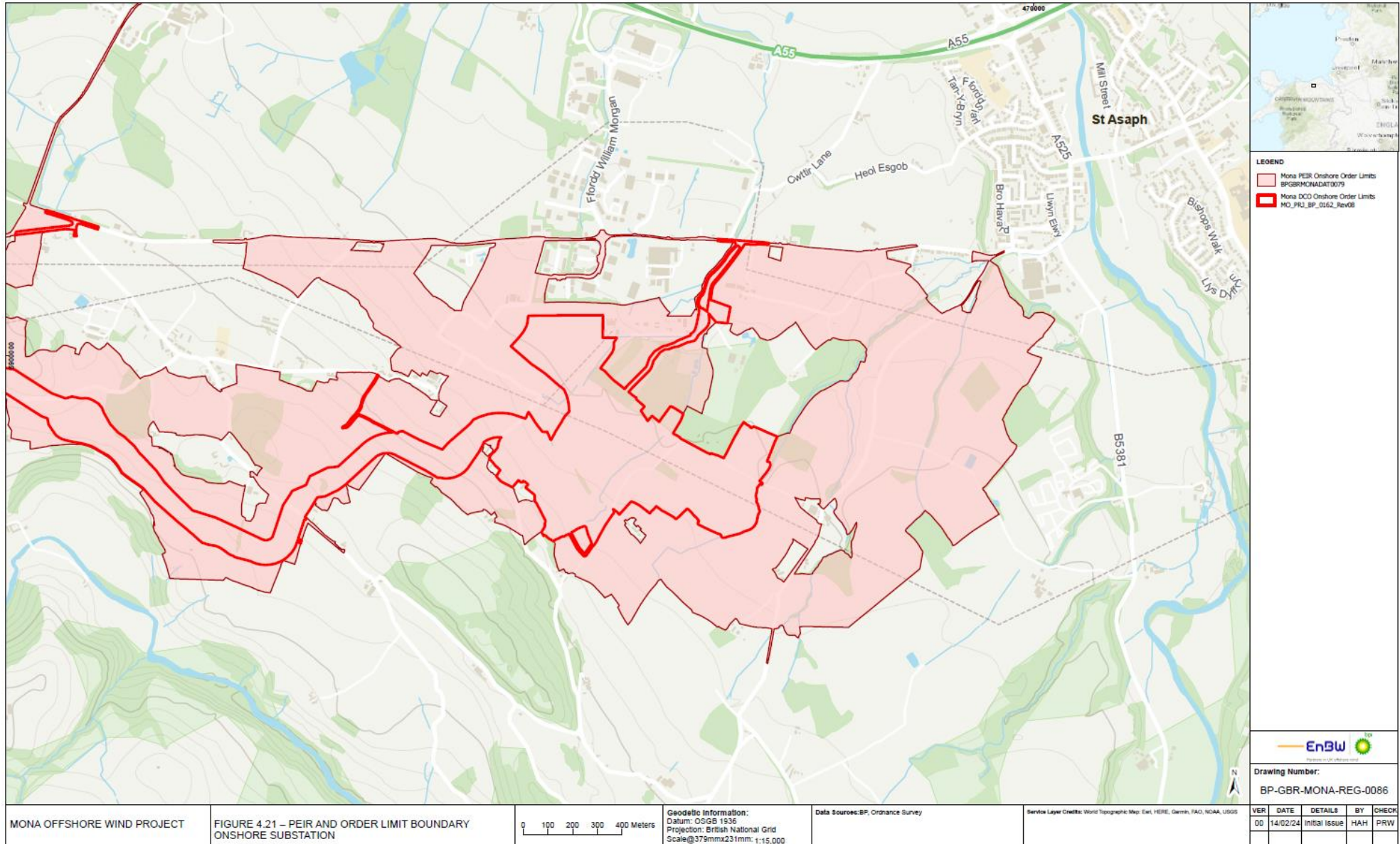


Figure 4.21: PEIR and Order Limit Boundary – Onshore Substation

4.12 Stage 6: Final Details for application

- 4.12.1.1 The Mona Offshore Wind Project site selection work (as informed through stakeholder engagement, landowner discussions and technical studies) enabled the refinement of the project to the point of a final application that has benefited significantly from stakeholder feedback and the associated iterative design process. The following aspects of the proposed project have been refined to the details that are included within the application for development consent:
- A refined Mona Array Area which reduces the total footprint from approximately 450 km² within the PEIR to 300 km² for this application
 - A reduction in the maximum number of wind turbines from 107 to 96
 - A single preferred offshore cable corridor
 - A refined landfall at Llanddulas which includes a commitment to trenchless techniques under the intertidal zone, sea defences, North Wales coastal footpath, historic landfill, Network Rail, A55 trunk road, A547 and Gwrych Castle Grade II listed wall
 - A single preferred onshore cable corridor route of 74m to 100m width with associated accesses and temporary construction compounds (see Figure X)
 - Commitment to a number of trenchless technique crossings at waterbodies, hedgerows, public highway and utilities (see Volume 5, Annex 4.3 Crossing Schedule of the Environmental Statement)
 - A single preferred and refined HVAC onshore substation site, with associated accesses and temporary construction compounds
 - Commitment to a GIS onshore substation with reduced maximum footprint of 65,000m² and reduced maximum height of 15m
 - A number of mitigation and compensation areas to adequately mitigate for ecological and landscape related impacts (as detailed in the Outline Landscape and Environmental Management Plan, document reference J22).
- 4.12.1.2 The Mona Array Area has decreased from approximately 450 km² during the PEIR, to a maximum area of 300 km² for the final application. Maximum numbers of wind turbines have been reduced and the MDS for several aspects of the layout has been refined to reduce potential impacts on SAR and other sea users such as commercial fisheries. The process of refinement has been driven by regular and comprehensive consultation through both the statutory and non-statutory processes recorded in the Consultation Report and Technical Engagement Plan respectively (document references E3 and E4). The Mona Array Area is now considered to balance the environmental and technical constraints, whilst taking into account feedback from stakeholders as far as practicable.
- 4.12.1.3 The Mona Offshore Cable Corridor and landfall area was informed by a number of technical and environmental factors, and similarly informed by consultee feedback through the statutory and non-statutory processes. The offshore route has been refined generally and specifically to reduce interaction with the Constable Bank and Y Fenai a Bae Conwy/Menai Straights and Colwyn Bay SAC, in response to stakeholder feedback received through the statutory and non-statutory consultation processes.

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- 4.12.1.4 The optimum route for an onshore grid connection is generally considered to be the shortest route from A to B from landfall to Bodelwyddan National Grid Substation. The final route presented within this ES is considered to effectively achieve this optimisation, within the environmental, technical and social constraints that have been identified along the proposed onshore cable route.
- 4.12.1.5 Decisions made by the Applicant in response to consultee comments and feedback, detailed technical, commercial and environmental studies, have directly informed the final route alignment and selection of the trenchless technique locations. The final route includes, for example, a commitment to trenchless techniques under the woodland at Gwrych Hill to minimise potential landscape and ecological impacts.
- 4.12.1.6 The final route for the Mona Offshore Wind Project application can be seen in detail within the Works Plans – Onshore (document reference: B3) that accompany the application for Development Consent. This route is considered to balance environmental and technical constraints whilst taking into account feedback from relevant land interests and other stakeholders wherever feasible.
- 4.12.1.7 The onshore substation footprint, height and associated compound were substantially reduced in extent from the larger search areas identified at PEIR, through refining the onshore substation location and committing to GIS technology. In addition, the alignment of the onshore substation was adjusted slightly to optimise the location and increase the distance from residential receptors as far as practicable. The substation is also sited to reduce the overall visual effect and provide the greatest opportunity for screening possible. Strategic landscaping areas were identified to allow for additional tree planting and visual screening, in addition to that provided by the existing woodland around the site. Throughout the site selection process, these and previous refinements were made in an effort to take account of landowner and other stakeholder concerns and environmental constraints whilst providing a viable technical solution for the project by maintaining a site for an onshore substation.

MONA OFFSHORE WIND PROJECT

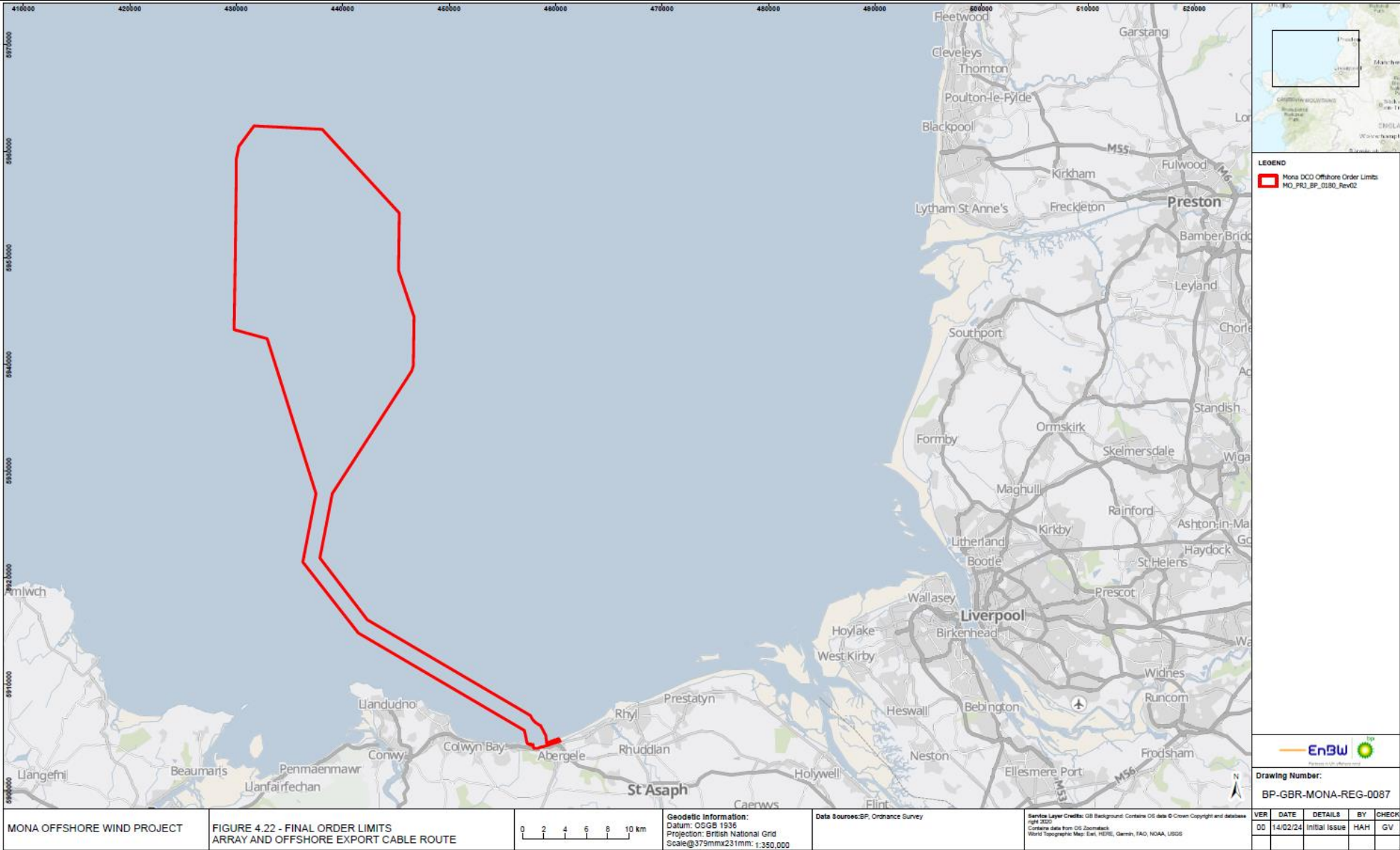


Figure 4.22: Final Order Limits – Array and Offshore Export Cable Corridor

MONA OFFSHORE WIND PROJECT

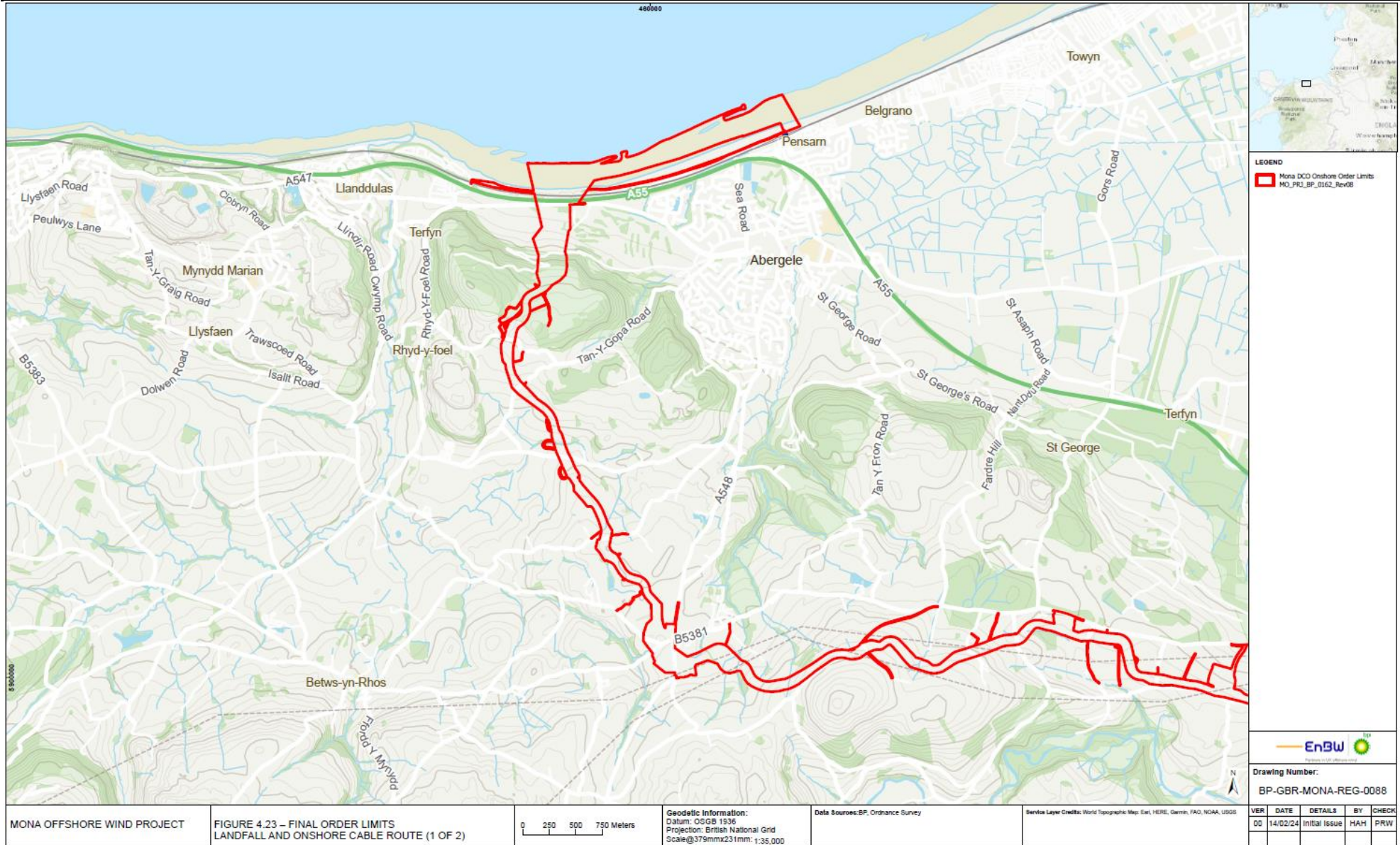


Figure 4.23: Final Order Limits – Landfall and Onshore Cable Corridor (1 of 2)

MONA OFFSHORE WIND PROJECT

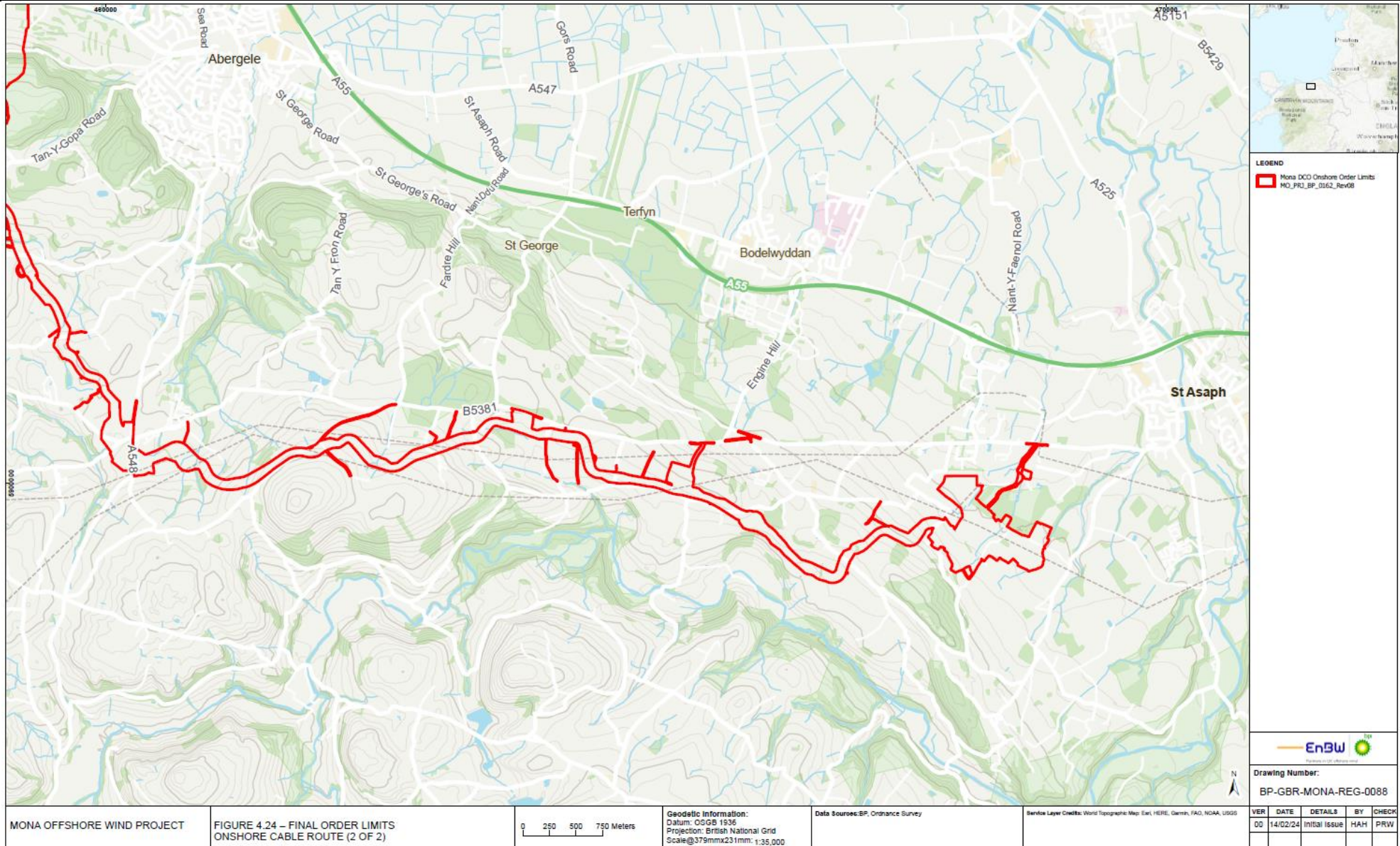


Figure 4.24: Final Order Limits – Landfall and Onshore Cable Corridor (2 of 2)

MONA OFFSHORE WIND PROJECT

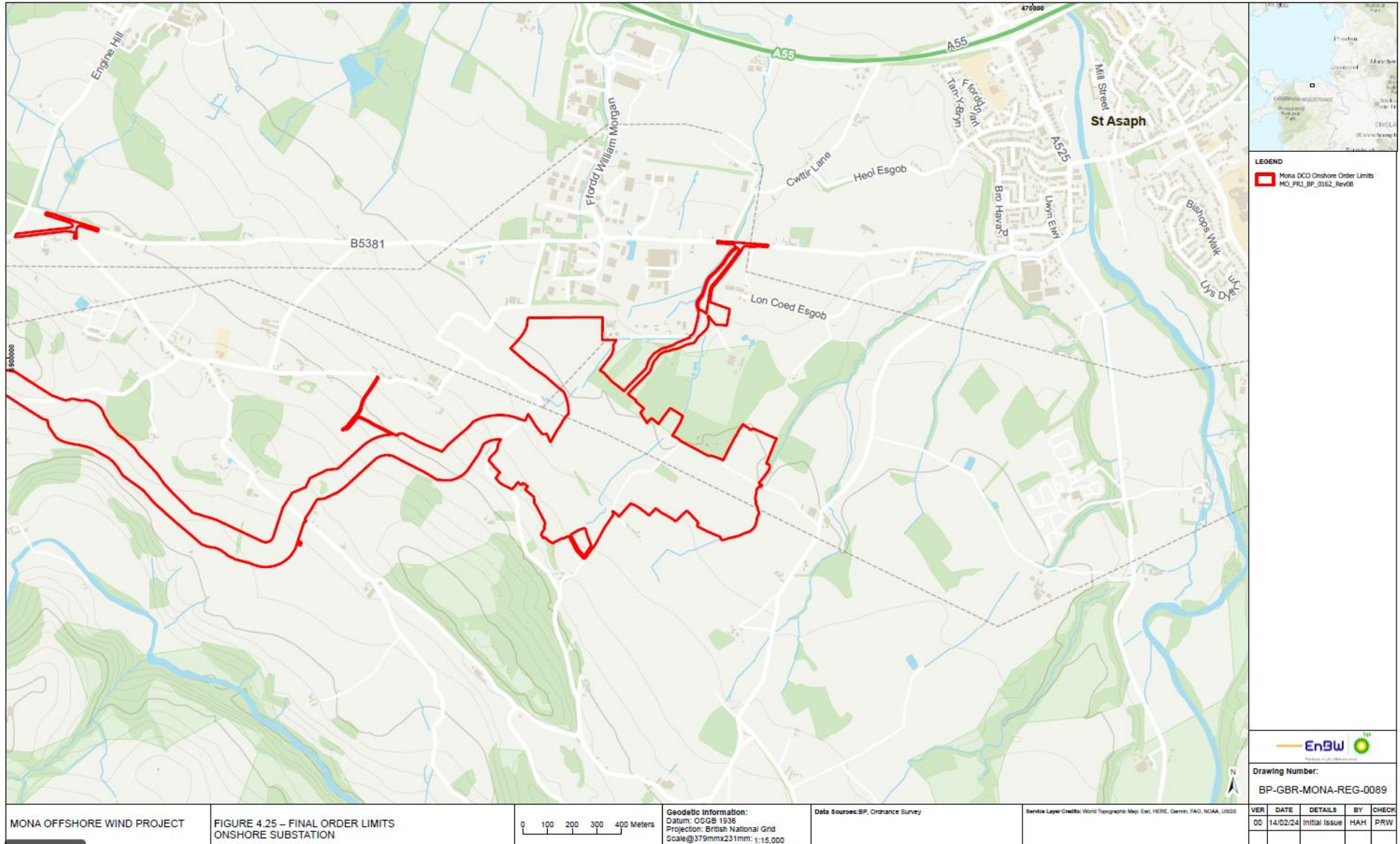


Figure 4.25: Final Order Limits – Onshore Cable Route

4.13 Conclusion

- 4.13.1.1 The site selection process undertaken for the Mona Offshore Wind Project has concluded in the application for development consent for the areas and works assessed throughout this Environmental Statement. Wherever possible and practicable, the Applicant has sought to accommodate preferences and concerns raised by stakeholders through the site selection process whether by adjustments to the development boundary, areas of works, or designs being considered.
- 4.13.1.2 Examples of this regard to stakeholder comments are set out in the ES. The site selection process and alternatives considered have been through a process of detailed analysis of environmental, social, and engineering constraints, with key feasible alternatives taken forward for consultation either through the Scoping process, the EPP, or through the statutory consultation undertaken on the PEIR. The consultation processes undertaken are summarised in this document and provided in full detail within the Consultation Report (document reference: E3) and the Technical Engagement Plan (document reference: E4).
- 4.13.1.3 As detailed in Volume 1, Chapter 5: Environmental Impact Assessment Methodology of the Environmental Statement, the project has employed a Maximum Design Envelope approach. Therefore, it is recognised that whilst the site selection process undertaken to date has included a number of refinements to the project envelope so far as practical, there remain some necessary areas of flexibility in the final project design.
- 4.13.1.4 Whilst the detailed design of the offshore array and onshore substation has not yet been undertaken and is dependent on a number of factors including pre-construction baseline surveys, site investigation data, and further engineering studies, various documents within the application that require subsequent agreement with the relevant authorities constrain how these project components could be built out in future. These include:
- The Draft DCO (document reference: C1), Volume 1, Chapter 3: Project Description of the Environmental Statement – prescribe the MDS which must be complied with for each component
 - The outline Landscape and Ecology Management Plan (document reference: J22) and the Design Principles document (document reference: J3) – provides commitments on the detailed design of key components, namely the principles that will guide the design of the onshore substation and associated landscaping, including specifying which body is responsible for confirming that the Mona Offshore Wind Project complies with these requirements
 - The Works Plans – Onshore (document reference: B3) details the area within which works associated with each component can take place.

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