Bowdun Offshore Wind Farm, Offshore EIA Report

Volume 1, Chapter 6: Site Selection and Consideration of Reasonable Alternatives

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Glossary

Defined Term	Definition
Annex I	Habitats of community interest whose conservation requires the designation of Special Areas of Conservation (SACs), as identified in Annex I of the Habitats Directive (Council Directive 92/43/EEC).
Applicant (the)	Bowdun Offshore Wind Farm Limited (BOWFL).
Array Area	The Array Area is the area in which the Offshore Generation Assets will be located.
Bowdun Offshore Wind Farm Limited (BOWFL)	A Special Purpose Vehicle (SPV) (legal entity) for the purpose of developing the Project. BOWFL are the Applicant for the Offshore Application.
Benthic	Living on or in the seabed.
Cetacean	Marine mammals that are entirely aquatic. These include whales, dolphins, and porpoises.
Commercial Fishing	Any form of fishing activity legally undertaken where the catch is sold for taxable profit.
Crown Estate Scotland (CES)	Public corporation accountable to Scottish Government, responsible for the management of land and property, including marine assets in Scotland owned by the monarch.
Cumulative Effects	The effects of the Proposed Development assessed together with effects from the Onshore Infrastructure forming the Project as well as one or more different projects on the same receptor/resource.
Draft Plan Option (DPO)	Draft Plan Option Area (POA) identified in the 2019 Draft Sectoral Marine Plan (SMP).
Effect	Term used to express the consequence of an impact (i.e. the result of change or changes on specific environmental resources or receptors). The significance of an effect is determined by correlating the magnitude of the impact with the importance, or sensitivity of the receptor or resource in accordance with defined significance criteria.
Engineering, Procurement, Construction, and Installation (EPCI)	EPCI refers to when all of activities associated with the development and delivery of a particular aspect of the project are brought together.
Environmental Impact Assessment (EIA)	Process for the assessment of likely significant environmental effects of a project on the physical, biological and human environment during construction, Operation and Maintenance (O&M) and decommissioning.
Environmental Impact Assessment Regulations (EIA Regulations)	Terminology used in this Offshore EIA Report to refer to three sets of regulations: • The Electricity Works (Environmental Impact Assessment) (Scotland) Regulations 2017; • The Marine Works (Environmental Impact Assessment) (Scotland) Regulations 2017; and • The Marine Works (Environmental Impact Assessment) Regulations 2007.
Export Cable Corridor	The area seaward of Mean High Water Springs (MHWS) which connects the Array Area with the Landfall within which the Offshore Export Cables will be installed.

Defined Term	Definition
Habitats Regulations	A term that refers to the collective legislation that translates the Habitats Directive into specific legal obligations in Scotland, namely: the Conservation (Natural Habitats, &c.) Regulations 1994; the Conservation of Habitats and Species Regulations 2017; and the Conservation of Offshore Marine Habitats and Species Regulations 2017 (in each case as amended).
Habitats Regulations Appraisal (HRA)	An assessment carried out under the Habitats Regulations to determine if a plan or project could adversely affect the integrity of a European Site.
Impact	A change caused by an action that occurs during a project's lifetime.
Inter-Array Cables (IAC)	Cables which link the Wind Turbines to each other and with the OSPs.
Interconnector Cables	Cables which will connect individual OSPs to each other to provide redundancy against cable failure elsewhere.
Intertidal Area	The area between MHWS and Mean Low Water Springs (MLWS).
Landfall	The area in which the Offshore Export Cables make landfall and is also the transitional area between the Offshore Transmission Assets and the Onshore Transmission Assets. Located in the Intertidal Area at Benholm.
Marine Directorate (MD)	The Marine Directorate of the Scottish Government, formerly known as Marine Scotland. The planning and licensing authority for Scotland's seas and custodian of Scotland's National Marine Plan (NMP). The Marine Directorate - Licensing Operations Team (MD-LOT) are specifically responsible for managing Section 36 Consent and Marine Licence Applications seaward of MHWS.
Marine Directorate – Science, Evidence, Data and Digital (MD-SEDD)	The scientific division of the MD, which provides expert scientific, economic and technical advice and services on issues relating to marine fisheries, aquaculture, marine renewable energy, and the aquatic environment and its flora and fauna.
Marine Licence	A Marine Licence permits the undertaking of different activities in the marine environment, including construction, the deposition or removal of substances or objects, and dredging. The Marine (Scotland) Act 2010 requires Marine Licences to be obtained for licensable activities taking place within Scottish Territorial Seas (MHWS to 12 nm). The Marine and Coastal Access Act (MCAA) 2009 requires a Marine Licence to be obtained for licensable marine activities within the Scottish offshore region (12 nm – 200 nm).
Marine Protected Areas (MPAs)	MPAs are designated under the Marine (Scotland) Act 2010 and the Marine and Coastal Access Act (MCAA) 2009. The MPA network protects nationally and internationally important marine wildlife, habitats, geology, and underwater landforms. Scotland's MPAs are significantly important for European, North-East Atlantic, and global MPA networks.
Maximum Design Scenario (MDS)	The scenario within the design envelope likely to result in the greatest impact on a particular topic receptor, and therefore the one that should be assessed for that topic receptor.
Mitigation	Measures to avoid, prevent, reduce or control effects on the environment. See also definitions for Embedded Mitigation and Additional Mitigation.

Defined Term	Definition
Offshore Environmental Impact Assessment (EIA) Report (hereafter, 'Offshore EIA Report')	Document prepared to report the findings of the EIA for the Proposed Development and produced in accordance with the EIA Regulations. The Offshore EIA Report is submitted to support the Offshore Application for the Proposed Development, and to comply with EIA Regulations.
Offshore Export Cables	Subsea cables used to transmit electricity generated offshore by the Wind Turbines from the OSPs to shore. The Transition Joint Bay (TJB) is the location where the Offshore Export Cables terminate, and the onshore cabling begins.
Offshore Scoping Report	The report that presents the findings of the EIA scoping process undertaken for the Proposed Development with the purpose of obtaining a Scoping Opinion. The Offshore Scoping Report defines what is intended to be assessed and reported as part of the EIA.
Offshore Substation Platform(s) (OSPs)	OSPs comprise the support structure, topside and electrical components used for collecting and/or converting electricity generated by the Wind Turbines for transmission by the Offshore Export Cables.
Onshore Transmission Assets	The transmission infrastructure associated with the Project above MLWS which is subject to the Planning Permission in Principle (PPP) Application submitted to Aberdeenshire Council (REF: APP/2025/1952).
Operation and Maintenance (O&M)	The phase of the Proposed Development following completion of construction. This phase of development includes routine inspections, repairs and replacement of infrastructure and equipment (including Interconnector Cables and IACs), Scour Protection replenishment or replacement, major component replacement, painting and/or other coating works, removal of marine growth, and replacement of access ladders.
Option to Lease Agreement (OLA)	An agreement between CES and a developer, permitting the future development of offshore wind within an agreed area.
Plan Option Area (POA)	A location identified in the SMP as a preferred area for commercial scale offshore wind development.
Project (the)	An overarching term for the Bowdun Offshore Wind Farm (Bowdun OWF) comprising the offshore and onshore infrastructure required to generate and transmit electricity from the Array Area to the onshore Grid Connection Point (GCP). The Project includes the Offshore Generation Assets, the Offshore Transmission Assets and the Onshore Transmission Assets.
Project Design Envelope (PDE)	A description of the range of possible elements that make up the design options for the Proposed Development under consideration when the exact engineering parameters are not yet known.
Proposed Development	Term used to define the Offshore Infrastructure associated with the Project seaward of MHWS for which consent is being sought. Further details of the parameters are included in Volume 1, Chapter 3: Project Description.
Scoping Opinion	A document produced by MD-LOT which is issued in response to submission and review of the Offshore Scoping Report. The Scoping Opinion is supported with feedback and advice from consultees, which details what is expected to be included in the Offshore EIA Report and what can be scoped out of the EIA process.

Defined Term	Definition
Scoping Workshop	A series of sessions preceding the finalisation of the Offshore Scoping Report to provide an opportunity for the Applicant to consult on the draft scope and for stakeholders to request additional information on key issues.
Scour Protection	Protective materials installed to avoid sediment being eroded away from the base of the foundations and/or buried subsea cable due to the flow of water.
Sectoral Marine Plan (SMP)	A plan developed by the Scottish Government which provide the strategically planned spatial footprint for offshore wind development in Scotland.
Sectoral Marine Plan Iterative Plan Review (SMP IPR)	The iterative plan review process as new information becomes available (e.g. consented projects, environmental data, cumulative effects assessment, etc.).
Site Boundary	The boundary within which all elements of the Proposed Development will be located. The Site Boundary comprises the Array Area and Export Cable Corridor which ends at MHWS.
Special Areas of Conservation (SACs)	SACs are areas designated for the conservation of certain plant and animal species listed in the Directive 92/43/EEC on the conservation of natural habitats and of wild fauna and flora.
Special Protection Areas (SPAs)	SPAs are sites that are designated to protect rare or vulnerable birds (as listed on Annex I of the Directive 2009/147/EC on the conservation of wild birds), as well as regularly occurring migratory species.
Study Area	For each environmental topic, the baseline environment will be characterised, and the potential environmental impacts will be described within a topic-specific study area. Specific study areas are defined for each topic and are based on the maximum spatial extent across which potential impacts of the Project may be experienced by the relevant receptors (i.e. Zone of Influence).
Subsea Noise	Noise which propagates underwater.
Thistle Wind Partners (TWP)	Company established for the development of the Project.
Transition Joint Bay (TJB)	Used to connect the Offshore Export Cables with the onshore export cables. These are typically concrete lined and are located above MHWS.
Wind Turbines	Structures comprising of a tubular tower, rotor blades, and a nacelle which houses the Wind Turbine generator.

Acronyms

Acronym	Definition
AEP	Annual Energy Production
AIS	Automatic Identification System
BOWFL	Bowdun Offshore Wind Farm Limited
BRAG	Black/Red/Amber/Green
CES	Crown Estate Scotland
DPO	Draft Plan Option
EIA	Environmental Impact Assessment
ESO	Electricity System Operator
GCP	Grid Connection Point
HDD	Horizontal Directional Drilling
HNDFUE	Holistic Network Design Follow-Up Exercise
HRA	Habitats Regulations Appraisal
IAC	Inter-Array Cable
LAT	Lowest Astronomical Tide
LCOE	Levelised Cost of Energy
MCA	Maritime & Coastguard Agency
MD-LOT	Marine Directorate - Licensing Operations Team
NESO	National Energy System Operator
OLA	Option Lease Agreement
OSP	Offshore Substation Platform
OTNR	Offshore Transmission Network Review
OWF	Offshore Wind Farm
PDE	Project Design Envelope
POA	Plan Option Area
SFF	Scottish Fishermen's Federation
SLA	Special Landscape Areas
SMP	Sectoral Marine Plan
SMP-OWE	Sectoral Marine Plan for Offshore Wind Energy
SPA	Special Protection Area
SSEN	Scottish and Southern Electricity Networks
UK	United Kingdom

Table of Units

Units	Definition
%	Percent
GW	Giga Watt
kJ	Kilo Joules
km	Kilometre
km²	Kilometre squared
m	Metre
mm	Millimetre
MW	Mega Watt

6 Site Selection and Consideration of Reasonable Alternatives

6.1 Introduction and Overview

6.1.1 This chapter of the Offshore Environmental Impact Assessment (EIA) Report covers site selection and reasonable alternatives that have been considered by Bowdun Offshore Wind Farm Limited (BOWFL) (hereafter referred to as the 'Applicant') during the design of the offshore elements of the Bowdun Offshore Wind Farm (OWF) (hereafter referred to as the 'Proposed Development'), prior to site award following the ScotWind Leasing Round in January 2022 through to design freeze of the Project Design Envelope (PDE) to inform the EIA. Further detailed design will be undertaken post-consent.

6.1.2 The Marine Works (Environmental Impact Assessment) Regulations 2007, The Marine Works (Environmental Impact Assessment) (Scotland) Regulations 2017, and The Electricity Works (Environmental Impact Assessment) (Scotland) Regulations 2017 (hereafter referred to as the 'EIA Regulations') require the Applicant to provide information on their consideration of alternatives.

6.1.3 Each of the EIA Regulations state that the following information must be included in the EIA Report: "*A description of the reasonable alternatives (for example in terms of project design, technology, location, size and scale) studied by the applicant, which are relevant to the proposed project, the regulated activity and their specific characteristics, and an indication of the main reasons for selecting the chosen option, including a comparison of the environmental effects*" (His Majesty's Government, 2017). The requirements of the EIA Regulations have been given due consideration within this chapter which sets out the reasonable alternatives considered by the Applicant, as well as the design process followed in defining the Proposed Development. Further detail on relevant legislation, planning policy and guidance is included in Volume 1, Chapter 2: Policy and Legislation.

6.1.4 In the Scoping Opinion (Marine Directorate – Licensing Operations Team (MD-LOT), 2024) Scottish Ministers advised that the Offshore EIA Report '*must include an up to date consideration of the reasonable alternatives studied as the parameters of the Proposed Development have been refined. This includes but is not limited to the identification of the potential Wind Turbine layouts within the array area, the parameters of the export cables, the cable corridor options and the landfall location or locations. The Scottish Ministers expect this to comprise a discrete section in the EIA Report that provides details of the reasonable alternatives studied across all aspects of the Proposed Development and the reasoning for the selection of the chosen option(s), including a comparison of the environmental effects.*'

6.1.5 Scottish Ministers also advised that '*considerations must include how decommissioning has been taken into account within the design options. The Scottish Ministers advise that this must be based on the presumption of as close to full removal as possible of all infrastructure and assets and should consider the methods and processes of doing so.*'

6.1.6 This chapter provides information on the consideration of reasonable alternatives. It includes, but is not limited to: potential Wind Turbine layouts within the Array Area (Paragraph 6.2.59); the parameters of the Offshore Export Cables (Paragraph 6.2.46); cable corridor options and the Landfall location or locations (Paragraph 6.2.49 to 6.2.51); and details of the reasonable alternatives studied across all aspects of the Proposed Development and the reasoning for the selection of the chosen option(s), including a comparison of the environmental effects. Consideration of alternatives also includes how decommissioning has been accounted for within the design options, with a preference for as close to full removal as possible of all Offshore Infrastructure (Paragraph 6.2.61 to6.2.64).

6.2 Site Selection Process

6.2.1 In November 2017, Crown Estate Scotland (CES) announced its intention to launch a leasing round for commercial scale offshore wind energy projects within Scottish waters (Scottish Government, 2020a). The Sectoral Marine Plan for Offshore Wind Energy (hereafter referred to as the 'SMP') provided the spatial framework for this leasing round through identification of which areas of seabed could be available for leasing by CES. The development of the SMP began in 2018, with 17 Draft Plan Options (DPOs), spread over five geographical regions: North East (eight DPOs), North (four DPOs), East (three DPOs), West (one DPO), and South West (one DPO). This was published in early 2019 which considered the environmental, social and economic information to identify areas best suited for further OWF development. A plan-level Strategic Environmental Assessment and Habitats Regulations Appraisal (HRA) were undertaken to consider OWF development within the DPOs.

6.2.2 In June 2020, the first ScotWind Leasing round was released by CES in which developers were able to apply for the rights to develop OWFs in Scottish Waters within specific lease areas (Scottish Government, 2020a). Originally, these were based on the DPOs, as per the SMP, and subject to obtaining the required consents (Figure 6.1). The final Plan Option Areas (POAs) were published in October 2020. Fifteen POAs were included: North East (seven POAs), North (four POAs), East (three POAs), and West (one POAs), with the NE2 POA reduced from the eastern flank following feedback from the Scottish Fishermen's Federation (SFF) and Scottish White Fish Producers Association.

6.2.3 The application window for registered applicants opened in January 2021 and closed in July 2021, with Option to Lease Agreements (OLAs) offered in January 2022. Successful developers were awarded 17 sites, which are a mixture of fixed and floating wind projects, with a final total capacity of approximately 25 GW.

6.2.4 The NE1 POA, located east of Shetland, was made available during CES's ScotWind clearing process for alternative applications. In March 2022, the procedural update for the clearing process was published, with new sites added in August 2022 (increasing the total ScotWind capacity to 27.6 GW).

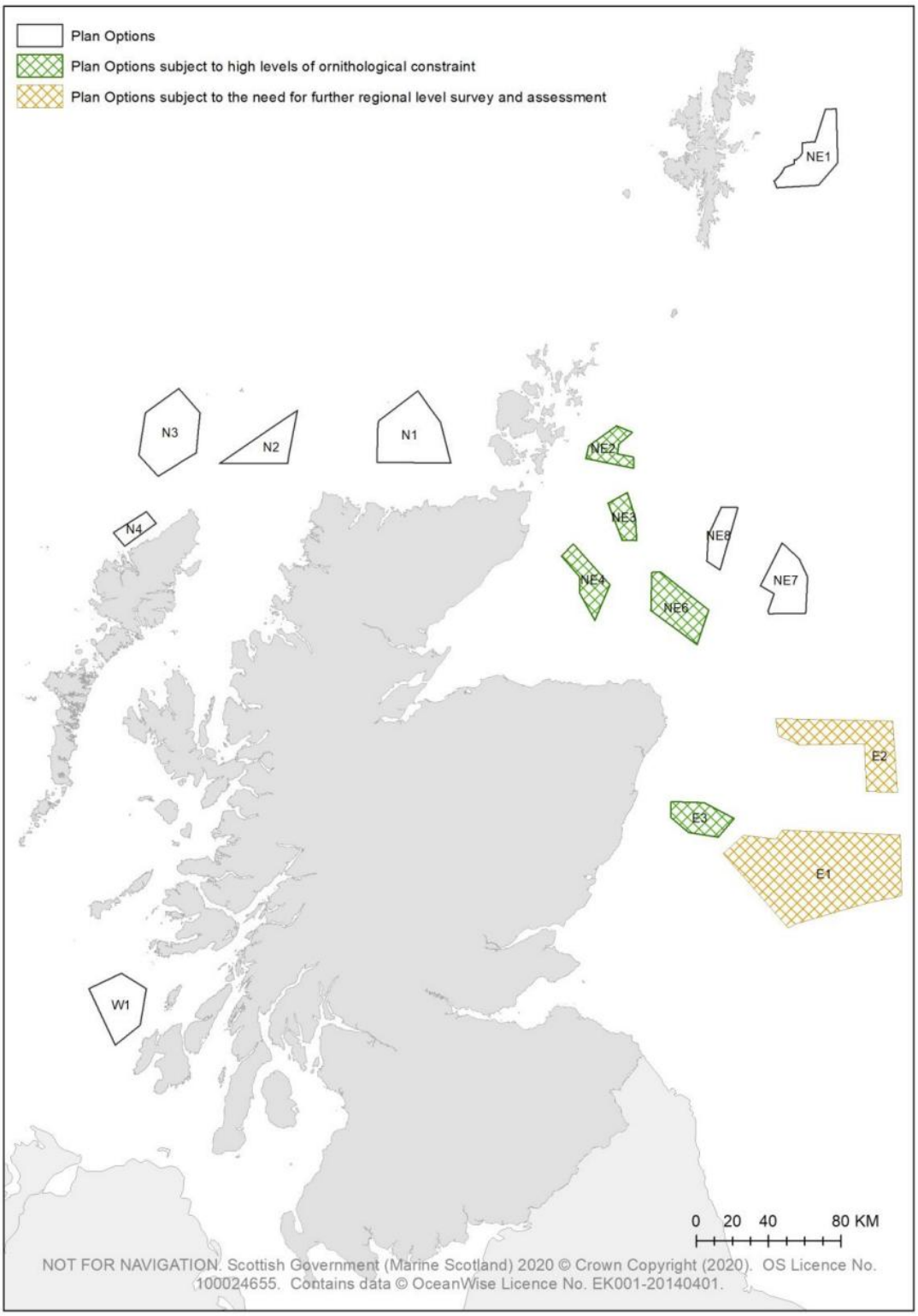

Figure 6.1: SMP Option Areas (Scottish Government, 2020b)

6.2.5 The following stages were followed by the Applicant with regards to site selection and refinement of the Proposed Development:

- Stage 1: Assessment and selection of preferred SMP POA;
- Stage 2: Refinement of Array Area Site Boundary;
- Stage 3: Identification of Offshore Export Cable Corridor and Grid Connection Point (GCP);
- Stage 4: Proposed Development and PDE - EIA Scoping; and
- tage 5: Proposed Development and PDE – Offshore EIA and Application.

6.2.6 Site characterisation, constraint mapping, and analysis for Stages 1 to 4 were carried out using publicly available desktop data, complemented by the expertise of consultants as well as the knowledge and experience of the Applicant and its shareholders. Stage 5 additionally drew on collected survey data.

Stage 1 – Assessment and Selection of Preferred SMP POA

6.2.7 Following announcement of the ScotWind Leasing process, and in parallel to the SMP production, the Applicant undertook detailed analysis of each POA to understand the development constraints, risks, and opportunities to support a strong ScotWind bid submission for a consentable and buildable project. The following factors were taken into consideration:

- consideration of environmental impacts and 'consentability', including the realistic development scenarios detailed in the SMP and supporting documentation, the SMP identifies environmental constraints across POAs (for example protected sites, seabirds, marine mammals, fish, benthic habitats, shipping and fishing activity, visual receptors and the historic environment), and these constraints informed area selection, deployment limits and the need for project-level surveys and measures, which were incorporated into the assessment;
- potential interactions with other marine users (e.g. commercial fisheries, shipping lanes) and existing infrastructure (e.g. oil and gas, telecommunications and electrical cables);
- military practice areas;
- visual impacts;
- aviation;
- metocean conditions (wind, wave and tidal);
- water depths and distance to shore;
- geotechnical information and seabed characteristics;
- foundation technology optioneering and feasibility: fixed foundations were initially preferred because the technology is proven, which reduces project delivery risk (supply chain, consenting) and offering higher bankability compared with floating foundations;

- grid connection options and alternative routes to market;
- Annual Energy Production (AEP) and Levelised Cost of Energy (LCOE) modelling;
- optimisation of POA footprints and consideration of installed capacity densities of >5 MW/km^2; and
- construction workability (drawing upon the world leading capabilities of DEME Offshore in foundation Engineering, Procurement, Construction, and Installation).

6.2.8 Each of these factors were used to undertake a Black/Red/Amber/Green (BRAG) assessment, in order to categorise the POAs and inform POA selection. Under the BRAG, definitions were applied to each of the factors (Table 6.1).

Table 6.1: Plan Option Areas Appraisal Criteria

Constraint	Analysis
Black	Hard constraint not possible to mitigate or resolve.
Red	Constraint, or number of constraints, that would be challenging to mitigate or resolve, but possible.
Amber	Limited number of constraints with clear established mitigation approach.
Green	No constraint(s).

6.2.9 Following analysis of each POA considering the aforementioned factors, all the POAs were ranked based on their BRAG scores to form a shortlist of key POAs for the Applicant to consider. This was considered an appropriate method to allow direct comparison between each of the POAs. The E3 POA was concluded to be a preferred ScotWind bid site, covering an area of 474 km^2, with technical and environmental/consenting risks deemed manageable, based on the initial assessment, to ensure a clear route to delivery.

Stage 2 – Refinement of Array Area Site Boundary

6.2.10 Following identification of the E3 POA as the preferred site, the Applicant undertook further detailed assessment of the preliminary project design, additional heat-mapping of consenting constraints (this involved the spatial overlay and weighting of multiple constraint datasets to produce maps that highlighted areas of higher and lower constraint across the POA), and a preliminary construction feasibility assessment to inform the refinement of the spatial extent of Array Area within the E3 POA and inform the ScotWind bid application.

6.2.11 The outcome of the SMP plan-level HRA concluded that, in order to avoid an Adverse Effect on Site Integrity, development within individual plan options would be restricted to the scenarios assessed in the HRA, otherwise known as 'maximum realistic development scenarios'. The SMP concluded a maximum realistic development scenario of 1 GW for the E3 POA (equating to 42% of the total area of the POA being available for the bid) and assumed a deployment density of 5 MW/km^2. Additionally, the SMP and accompanying documents highlighted that several key environmental and technical sensitivities were known to exist within, and around, the E3 POA:

- potential socio-economic cost impacts on the Commercial Fishing and power interconnector sectors;
- the area's importance as a foraging area for kittiwake from designated Special Protection Area (SPA) sites, and considerations regarding potential in-combination impacts on key seabird species, which resulted in E3 being classified within the SMP as being 'subject to higher levels of ornithological constraint';
- potential impacts on important fish spawning grounds including herring, cod, whiting, plaice and sandeel which may require project-level mitigation; and
- navigational safety, due to overlap with areas of high shipping density. There is potential to mitigate the effects on navigational safety at the project-level through spatial planning, as there are areas of higher and lower density shipping within the POA.

6.2.12 The aforementioned sensitivities were taken into consideration in the constraint analysis study which incorporated more detailed datasets and included heat mapping of consenting constraints, preliminary construction feasibility evaluations, and an integrated review of key technical parameters. The analysis systematically considered a broad range of technical, environmental and human factors (Table 6.2).

Table 6.2: Summary of Constraints Analysis Considered by the Develop of the E3 POA

Constraint		Analysis
Technical	**Water depth and distance to shore**	Bathymetry data shows that the average water depth across the site is 65 m, which means fixed technologies are feasible. Distance to shore within approximately 80 km which allows for High Voltage Alternating Current technology.
	Wind speed and metocean conditions	Wind speed and metocean conditions data provide a high level of confidence in modelled wind resource assessment for the site, allowing initial AEP and LCOE modelling (which was undertaken using Vortex SL, 'Openwind' and 'Windpro' wind modelling software).
	Geotechnical conditions	Seabed soil types and stratigraphy data shows the site is mainly comprised coarse grained material, with sands and gravels encountered in most areas. All parts of the POA were considered to be suitable for development, utilising a range of potential foundation and cable installation technologies.

Constraint		Analysis
Environmental	**Environmental designations**	The POA does not overlap with any environmental designations - including SPAs, Ramsar sites, Sites of Special Scientific Interest, Special Areas of Conservation and Nature Conservation Marine Protected Areas – therefore this did not impact the Array Area site refinement.
	Ornithology	In the SMP-OWE (Scottish Government, 2020b), the POA had been highlighted as being 'subject to high levels of ornithological constraint' due to the connectivity with onshore designated sites, this constraint decreased with increasing distance from shore. Detail heat mapping was conducted and a decision made to move the Array Area to the eastern extent of the POA.
	Benthic ecology	The POA does not overlap with known sensitive habitats, therefore this did not impact the Array Area site refinement.
	Fish and shellfish ecology	The SMP highlighted potential impacts on important fish spawning grounds due to Subsea Noise (mainly piling noise). Desktop studies found that there was no significant variation in the constraint across the POA due to the large spatial extent of nursery and spawning grounds.
	Marine mammals	Data sources (such as Small Cetaceans in the European Atlantic and North Sea, national distribution models, and recent offshore wind EIA and scoping reports) showed that marine mammals are known to use the POA but in low densities, therefore this did not impact the Array Area site refinement.
Human	**Shipping and navigation**	A desktop study concluded that the western POA section faced higher risk from dense vessel activity. This risk decreases eastwards with reduced traffic but increases again to a moderate level in the north and north-east owing to increased commercial vessel presence. This was considered in the final Array Area location.
	Commercial Fishing activity	The SMP highlighted the impacts on Commercial Fishing, and a desktop study using publicly available data was conducted to establish the baseline within the POA. The desktop environmental assessment identified only low levels of fishing activity across most of the E3 POA with activity increasing closer to the coastline southwest of the POA. This was considered in the final Array Area location.
	Seascape and landscape	The POA is approximately 38 km from the Scottish coast at its closest point, with visibility/landscape impacts being considered as limited at this distance.
	Aviation and radar	The E3 POA was located approximately 16 nm south-east of Aberdeen Airport, in complex airspace that includes multiple aviation receptors. This area lies within 'Danger Area D613A (FL100–FL660)', which is designated for military training and supersonic flight. However, Wind Turbine operations pose no consenting risk as the lower limit, FL100, is 10,000 feet Above Mean Sea Level, therefore the maximum Wind Turbine height is far below controlled/military airspace.
	Existing infrastructure	A desktop study using publicly available data sets identified existing infrastructure constraints: • the Array Area does not overlap with any oil and gas infrastructure; • the Array Area does not overlap with any other energy infrastructure; and • known archaeology wrecks within the site and Offshore Export Cable Corridor (low-risk).

6.2.13 This multi-layered approach ensured that technical, environmental and human constraints were fully integrated into the project planning process, providing a robust basis for subsequent design development and stakeholder engagement.

6.2.14 The preferred Site Boundary for the Array Area and the indicative offshore layout option considered areas of suitable water depth up to -70 m for the deployment of fixed foundation concepts, and assumed deployment of approximately 1 GW with a density of 5 MW/km^2, whilst considering ecological, offshore ornithology and commercial fisheries constraints.

6.2.15 It should be noted that the Proposed Development was always envisaged as a fixed-bottom OWF; floating foundations were considered, until Stage 5, due to the water depths of around -70 m, which is at the upper limit for traditional fixed concepts. This analysis ensured all feasible technologies were evaluated, confirmed that fixed foundations remained the most practical, cost-effective, and environmentally compliant solution, and demonstrated robust project planning and due diligence.

6.2.16 The detailed assessment concluded that the eastern part of the E3 POA was the least constrained environmentally, with these risks increasing in the western portion of the POA. Figure 6.2 shows the refined Array Area of 187 km^2 within the E3 POA that was prepared at the end of Stage 2, on which the ScotWind bid was based. This area was selected as it balanced relevant constraints, wind yield and the ability to deliver approximately 1 GW of power at suitable water depths. At this stage, a degree of flexibility was maintained for the project design to be optimised once detailed site characterisation (e.g. geotechnical and geophysical surveys, ornithology surveys, and benthic surveys) was undertaken and project concepts developed.

6.2.17 In January 2022, the Applicant was awarded an OLA for the Array Area within the E3 POA.

6.2.18 In March 2023, the Applicant announced the E3 OWF was to be renamed ‘Bowdun’ (previously ‘Cluaran Deas Ear’); the OLA and Array Area boundaries remained unchanged.

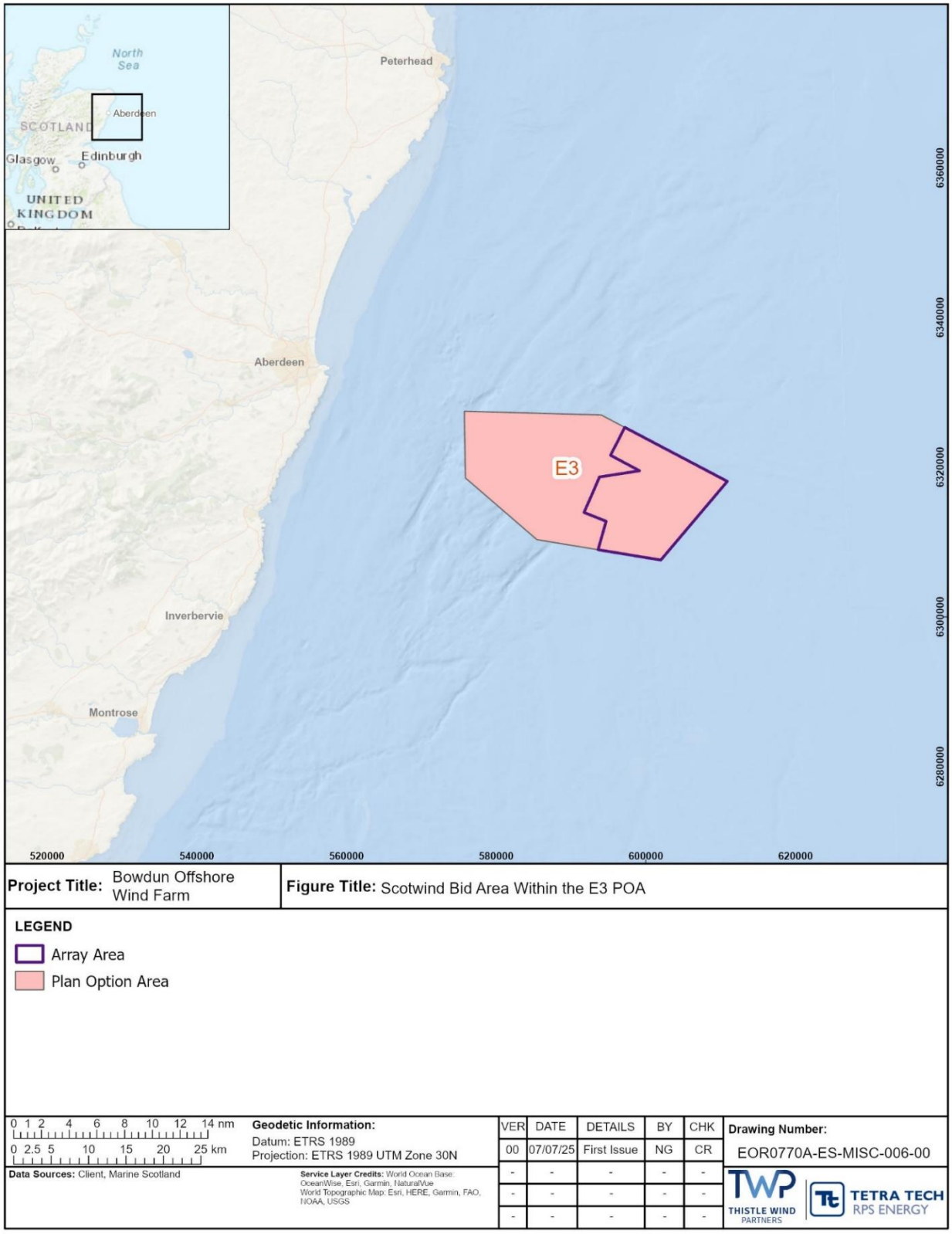

Figure 6.2: ScotWind Bid Area Within the E3 POA

Stage 3 – Identification of Offshore Export Cable Corridor and Grid Connection Point

Strategic Context

6.2.19 For an electricity generation project, a developer is required to submit a grid connection application to the Electricity System Operator (ESO). The National Energy System Operator (NESO) and the Transmission Operator (which, for the north of Scotland where the Project is located, is Scottish and Southern Electricity Networks (SSEN) Transmission) undertake the assessment for grid connection options for the Project to identify the most suitable GCP.

6.2.20 The Offshore Transmission Network Review (OTNR) was launched in 2020, with the focus of coordinating offshore networks for onshore connection of OWFs. As part of the OTNR, a Holistic Network Design (HND) was undertaken by NESO to coordinate offshore generators. The HND Follow-Up Exercise (FUE) (National Grid, 2024) was then launched in 2022 to expand the initial HND to accommodate additional OWFs beyond the initially foreseen circa 10 GW, ensure efficient and cost-efficient transmission infrastructure, and support timely connection for offshore wind generation to support the United Kingdom's (UK's) net zero targets.

Initial Screening and Route Scoping

6.2.21 At the time of the ScotWind Leasing Round bid, a Peterhead GCP was considered by the Applicant with a provisional Export Cable Corridor identified from the Array Area to land in Sandford Bay, Scotland. This route was determined following a desktop geotechnical and environmental constraints mapping and assessment exercise. The export cable routing was designed to follow as direct a path as possible from the array area while taking account of key offshore constraints, including marine archaeology, seabed boulders, and other geophysical features, to provide a technically and environmentally robust end-to-end solution.

6.2.22 Post bid submission, the Applicant continued the offshore Export Cable Corridor optioneering and refinements including more detailed feasibility studies to further identify possible offshore Export Cable Corridors from the Array Area to suitable GCP options (Thistle Wind Partners, 2023). The GCP options were selected in anticipation of the range of possible outcomes from the HNDFUE, undertaken by NESO (National Grid, 2024).

6.2.23 Initial screening identified 19 potential Landfall locations (Figure 6.3), with six potential GCP locations Peterhead, 'New Deer 2', 'New Deer-Hatton', Fetteresso, Fiddes, and Tealing(Figure 6.3)), seven Export Cable Corridors to Landfall, and two Export Cable Corridors to offshore GCPs (E1a Morven, and E1b Bellrock), to prepare for a potential offshore GCP hub solution from the HNDFUE. All options were evaluated to consider potential environmental and engineering constraints using the same routing approach applied to the offshore Export Cable Corridor.

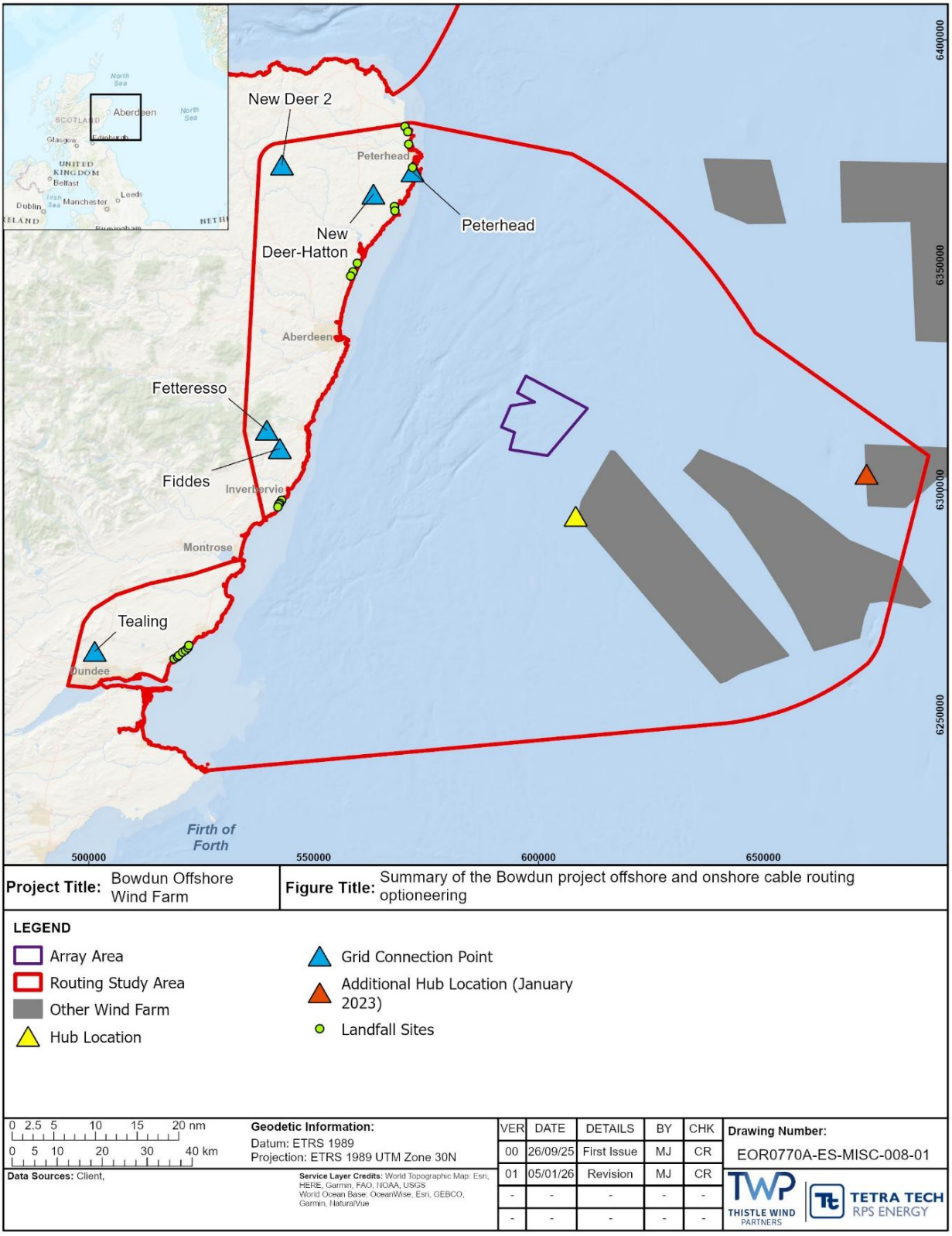

Figure 6.3: Summary of the Bowdun Project Offshore and Onshore Cable Routing Optioneering

6.2.24 A holistic approach was taken with a full end-to-end connection assessment including onshore elements of the Project to inform a robust optioneering process. As the HNDFUE process was progressed by NESO, the offshore hub solution was removed as a favourable option, with a radial connection being proposed by NESO as the transmission solution for an onshore GCP. The offshore hub solutions were removed by NESO primarily due to technical, economic, and regulatory constraints identified during the HNDFUE. For clarity, onshore constraints were used to help identify and screen potential Landfall locations, but detailed consideration of onshore routing, land-based environmental constraints and construction methods is reported in the Onshore EIA Report (BOWFL, 2025). This Offshore EIA Report therefore summarises onshore issues only insofar as they directly informed offshore Landfall selection and corridor routing.

6.2.25 The Applicant secured an initial grid connection agreement in 2022, with a holding GCP of New Deer 2 400kV substation. The HNDFUE exercise was ongoing through 2022 and 2023, through that process, a number of connection options were identified. Fiddes, which later became Hurlie through SSEN-Ts process, became the preferred option in 2023, and was contractually confirmed in 2024.This allowed the Applicant to progress with the refinement of the Landfall location and Export Cable Corridor routing options.

Initial Study

6.2.26 A preliminary desk study was carried out along the 322.95 km of the Routing Study Area to identify the potential Landfall zones capable of meeting the following environmental, social and technical criteria:

- topography – A cliff shoreline of less than 15 m;
- avoidance of any major and obvious onshore engineering issues, such as a mountain, lake or other physical features (e.g. urban buildings, key utility infrastructure (e.g. pipelines and cables);
- potential environmental constraints (e.g. designates sites, habitats, water features and sea bed conditions);
- potential access; and
- minimum 300 m width of Landfall.

6.2.27 The initial desk study identified six zones in which the Landfall sites could be situated i.e. that they could comply with the aforementioned criterion:

- St Fergus – lies on the north-east coast of Aberdeenshire, approximately 4 km north of Peterhead.
- Craigewan Links - situated on the northeast coast of Aberdeenshire, approximately 0.8 km north of Peterhead. The coast of Craigewan Links is characterised as beaches, dunes and links.
- Sandford Bay – located to the south of Peterhead.
- Cruden Bay - lies on the north-east coast of Aberdeenshire, approximately 10 km south-west of Peterhead and 3 km south-east of Hatton. Cruden

Bay is characterised as fragmented rocky coast although Cruden Bay beach is a sandy beach with dunes behind it.

- Newburgh - on the east coast of Aberdeenshire on the south side of the river and potential landfalls were investigated on the stretch of the coast, between Newburgh and Balmedie characterised by beaches, dunes and links.
- Benholm - lies on the south-east coast of Aberdeenshire, sitting between Gourdon and Johnshaven, approximately 2.1 km north-east of Johnshaven and 1.5 km south-west of Gourdon. The area is characterised by a rocky raised beach.

6.2.28 As part of the initial considerations of potential Landfall locations within the selected zones, 13 initial potential candidate Landfall locations were identified as shown on Figure 6.3 and listed in Table 6.4. The appraisal of these locations was carried out using the criteria outlined in Table 6.3. Additional work commissioned looked at a further six sites at East Haven, Tealing (between Arbroath and Carnoustie).

6.2.29 Sandford Bay, located to the south of Peterhead, was initially identified as a potential Landfall location. However, its availability was constrained due to the presence of other known projects in the vicinity. Based on this, it was concluded that no further work would be undertaken at this site.

Table 6.3: Landfall Options Appraisal Criteria

Constraint	Analysis
Black	Features or designations which affect the likelihood of a Landfall option being achieved to such a degree the option should not be considered.
Red	Features or designations that are so significant or pose such a high degree of risk to the design that they should be avoided, except in exceptional cases which include where potential mitigation (or compensation) is known; where the potential benefits to the design would clearly outweigh the potential harm and/or impacts; or where there are no alternatives.
Amber	The most protected features and/or areas that are likely to require detailed assessment and/or mitigation and should be avoided if possible.
Green	Features or designations to be considered in constraint assessment/study but which are likely to be capable of resolution.

Table 6.4: E3 Landfall Appraisal Summary

Landfall Option	Onshore Appraisal	Offshore Appraisal	Comments
E3.1 St Fergus and E3.2 Craigewan Links			
E3.1(a)			Onshore in the North East Aberdeenshire Coast Special Landscape Area (SLA) but no other onshore designations. Significant dunes assumed to require Horizontal Directional Drilling (HDD). Sparsely populated with few properties nearby. E3.1(b) has a significant conflict with Kirkton solar photovoltaic scheme application awaiting determination (hence Black). E3.2(a) must cross Peterhead golf course but assumed HDD. Nearshore - Amber due to constraints present within all cable corridors, including the Southern Trench MPA, cable crossings, and high-density vessel activity (Automatic Identification System (AIS)). Annex 1 reef, pipeline crossings and wreck site assumed capable of mitigation.
E3.1(b)			
E3.2(a)			
E3.4 Cruden Bay			
E3.4(a)			Onshore in the North East Aberdeenshire Coast SLA but no other onshore designations. Low dunes behind the beach might be possible to surface cut but HDD would not be possible because of land height behind the golf course. Surface installation of cables through this well-renowned golf course appears unlikely and HDD appears not to be an option (hence Red). Nearshore appraised as Amber due to multiple Amber rated constraints present within cable corridor, including the Buchan Ness to Collieston Coast SPA, cable crossings, and high-density vessel AIS.
E3.4(b)			Onshore in the North East Aberdeenshire Coast SLA but no other onshore designations as E3.4(a). Low dunes behind the beach might be possible to surface cut or HDD. Cables would have to cross the cables and pipeline for the Forties Pipeline System onshore at this Landfall. Nearshore appraised as Amber due to multiple Amber rated constraints present within cable corridor, including the Buchan Ness to Collieston Coast SPA and high-density vessel AIS. Cable crossing avoided as done onshore in this case.
E3.5 Newburgh			
E3.5(a)			Onshore in the North East Aberdeenshire Coast SLA. No other onshore designations but multiple nature conservation designations in the vicinity. Significant dunes of approximately 17 m assumed crossed by HDD. Nearshore appraised as Amber due to multiple constraints present within cable corridor, including the Ythan Estuary, Sands of Forvie and Meikle Loch SPA, cable crossings, and high-density AIS.
E3.5(b) and E3.5 (c)			Onshore - as E3.5(a) but HDD would have to cross the Trump International Golf Links, and the HDD site would be located on land which is either in use associated with the existing course or on land allocated for the second course. Nearshore as above.

Landfall Option	Onshore Appraisal	Offshore Appraisal	Comments
E3.6 Benholm			
E3.6(a) to E3.6(d)			Onshore - in the South East Aberdeenshire Coast SLA. No other onshore designations. Up to approximately 30 clustered dwellings and/or farmsteads within 1 km. Nearshore appraised as GreenAnnex 1 reef nearshore assumed to be crossed by trenchless techniques and a potential wreck site avoided by micrositing.
E3.7 East Haven (Tealing)			
E3.7(t-z)			Onshore appraised as Green. No designations at the point of Landfall, no property constraints. Nearshore appraised as Amber due requirement to route through the Outer Firth of Forth and St Andrews Bay Complex SPA and the multiple additional constraints requiring attention to resolve (cable interactions, oil and gas pipelines and Annex I reef).

6.2.30 Following the consideration of the technical and environmental constraints, options at East Haven, St Fergus, Craigewan Links, Cruden Bay and Newburgh were discounted due to conflicts with existing or planned land uses and the presence of environmental designations.

6.2.31 Most of the coastline was subject to significant environmental constraints including designated SPAs at Cruden Bay, Newburgh and East Haven, and the MPA off St Fergus and Craigewan Links. These have often coincided with additional nearshore constraints such as Annex I reef habitats and existing physical infrastructure.

6.2.32 Further onshore challenges included extensive dune systems behind many beaches, land uses such as golf courses (Cruden Bay, Newburgh and Craigewan Links), proposed developments near St Fergus and other designated areas such as Forvie National Nature Reserve at Newburgh.

6.2.33 The combination of these constraints led to very few Landfall opportunities that would be considered suitable, as such Benholm emerged as the least constrained and most technically feasible Landfall zone.

Route Development and Shortlisting

6.2.34 The potential Export Cable Corridors were identified based on the shortest route from the Array Area to the potential Landfall site(s) (or offshore hub area), avoiding known environmental and geotechnical constraints where practicable. A holistic approach was taken with a full end-to-end connection assessment including onshore elements of the Project to inform a robust optioneering process.

6.2.35 The Offshore Export Cable Corridor optioneering exercise was a dynamic process, updated regularly as new information became available regarding the anticipated GCP. Early indications suggested a connection at Fiddes; however, following public consultation and revisions by SSEN, the expected GCP was confirmed as Hurlie, a new substation to be constructed in Fetteresso Forest, Aberdeenshire (SSEN, 2023; BOWFL, 2025). This update aligns with the Beyond 2030 Report (National Grid, 2024) by reflecting the report's strategic direction to expand and reinforce the onshore transmission network to accommodate substantial additional offshore wind capacity (including new gateway substations and transmission reinforcements in the Hurlie/Fetteresso area) beyond 2030. A robust shortlist of Landfall locations (Table 6.4) was developed and maintained throughout the optioneering process to ensure flexibility and responsiveness to the evolving GCP information.

6.2.36 Seven offshore routes were initially identified to connect to Landfall, and a further two routes to offshore GCP (Figure 6.5).

6.2.37 As discussed previously, further work at Sandford Bay was discounted due to landfall constraints (Paragraph 6.2.29). Offshore environmental constraints (including multiple cable and pipeline crossings and designated sites) were identified in close proximity to Peterhead affecting routes to St Fergus, Craigewan Links and Cruden Bay. Nearshore constraints at the Newburgh location, whilst more manageable, were still present (including high density shipping and navigation AIS data and OWF infrastructure).

6.2.38 Four routes were identified as the least constrained route options to follow-up for further investigation, these are summarised in Table 6.5.

6.2.39 As the HNDFUE process was progressed by NESO, the offshore hub solution was removed as a favourable option (technical, economic and regulatory constraints identified during the HNDFUE) with a radial connection being proposed by NESO as the transmission solution to an onshore GCP.

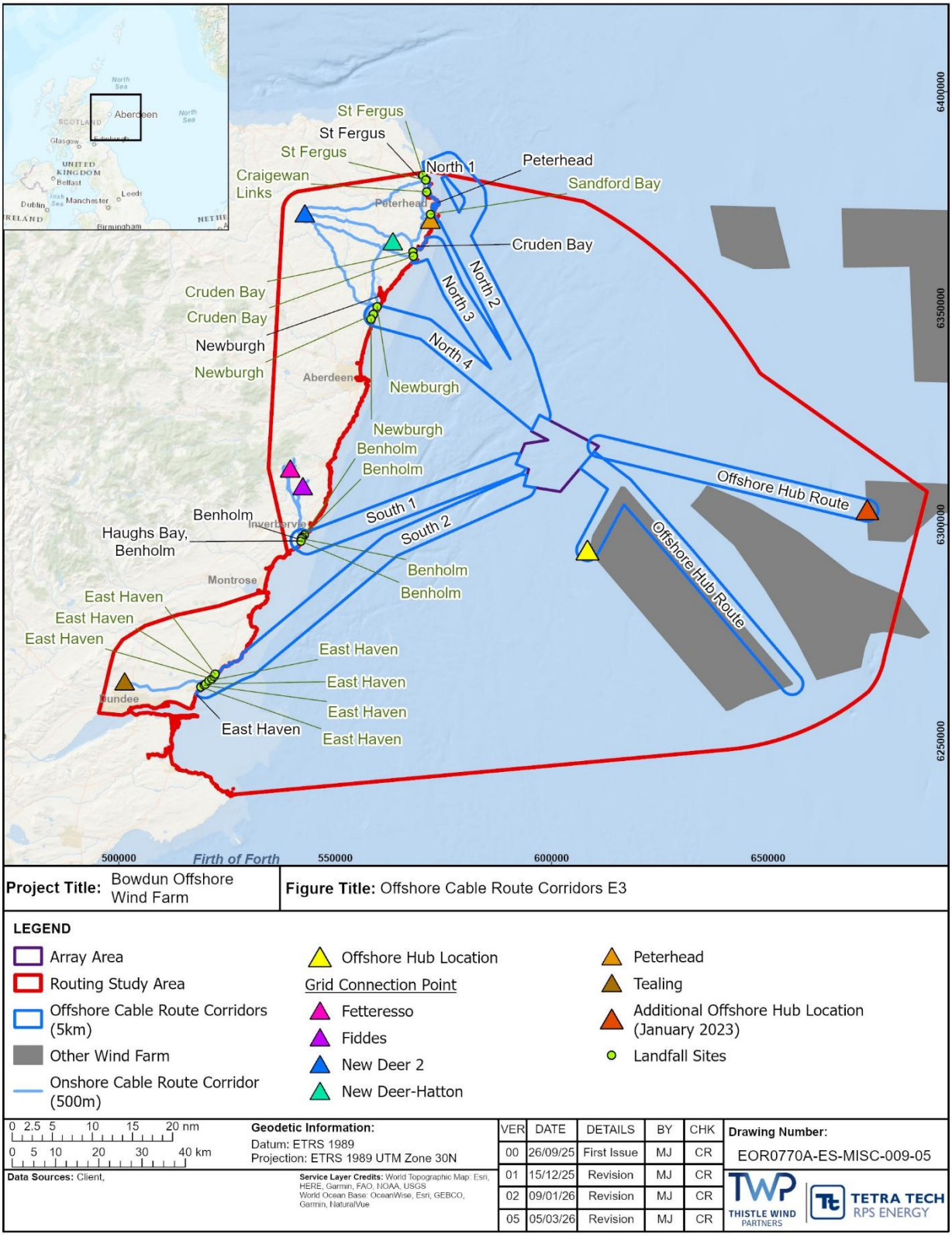

Figure 6.4: Offshore Export Cable Corridor Routes

Table 6.5: Best Performing Cable Corridors for E3 of Least Constraint Based on Environmental Appraisal

Offshore Route	Landfall Option	Overview	Classification
E3 to Offshore Hub	N/A	Offshore route No significant constraints in offshore route corridors avoiding the Firth of Forth Banks Complex MPA	
South 1	E3.6a-d (Benholm)	Offshore route No significant constraints in offshore route corridor. Nearshore/Landfall Annex 1 reef main constraint to consider but trenchless techniques can likely mitigate impact to this feature.	
South 2	E3.7t-u (East Haven)	Offshore route Commercial fisheries constraints in offshore route corridor. Offshore area of Annex 1 reef can be avoided with route selection. Nearshore/Landfall Outer Firth of Forth and St Andrews Bay Complex SPA and Annex 1 reef are main constraints to consider but micrositing appears possible to avoid impacts on the reefs on these northern most options.	
South 2	E3.7v-z (East Haven)	Offshore route Commercial fisheries constraints on offshore route corridor. Offshore area of Annex 1 reef can be avoided with route selection. Nearshore/Landfall Outer Firth of Forth and St Andrews Bay Complex SPA and Annex 1 reef are main constraints to consider but micrositing and/or HDD can likely mitigate impacts on the reefs.	

6.2.40 Following the optioneering process, and consideration of updates from SSEN and the Beyond 2030 Report, there was a strong indication by mid-2023 from the HNDFUE process that the preferred GCP location was going to be Kincardineshire (this area incorporated the Fetteresso and Fiddes GCP options). Benholm provided the most suitable Landfall zone for these GCP options and was identified.

6.2.41 The Benholm Landfall zone sits between the settlements of Johnshaven and Gourdon, characterised by area of rocky raised beach where the cliff heights fall away. The absence of high cliffs and sand dune systems meant this location was preferred from an engineering perspective. Although there are areas of Annex I reef in the nearshore this can be avoided by trenchless installation techniques.

6.2.42 Four Landfall options were considered within this zone. All of which scored similarly on the environmental appraisal, based on the highest engineering appraisal score. Haughs Bay, Benholm (option E3.6b) was identified as the preferred Landfall location. This preferred Landfall meets the technical and environmental criteria, including consentability, providing a Landfall as close as practicable to the Array Area, and with both open cut trenching and Horizontal Directional Drilling (HDD) installation options considered (now refined at Stage 5 to only trenchless, e.g. HDD, detailed in Paragraph 6.2.53).

6.2.43 The combination of both the Offshore Export Cable Corridor and the Array Area formed the Scoping Boundary on which the Offshore Scoping Report was based.

Stage 4 – Proposed Development and PDE - EIA Scoping

6.2.44 In order to undertake EIA Scoping for the Proposed Development, the Applicant developed the base case PDE for the Offshore EIA Scoping Report (BOWFL, 2024). During development of the base case PDE, several options and parameters were evaluated with respect to the Wind Turbines, foundation design, Offshore Substation Platforms (OSPs), Inter-Array Cables (IACs), Interconnector Cables and scour and cable protection. The Scoping PDE considered both fixed and floating foundations to reduce delivery risk. Although the Proposed Development was always intended to be a fixed-bottom project, floating options were reviewed because the -70 m depth sits at the upper limit for conventional fixed designs. This assessment confirmed that fixed foundations remain the most practical, cost-effective and environmentally suitable solution. It also demonstrated sound project planning and due diligence. The engineering and conceptual studies underpinning the Scoping PDE, and the options assessed, are outlined in this section.

6.2.45 In April 2024, the Applicant held a pre-Scoping Workshop with statutory consultees and key stakeholders (MD-LOT, Marine Directorate – Science Evidence Data and Digital, NatureScot, Royal Society for the Protection of Birds, Aberdeen City Council, Historic Environmental Scotland, Maritime and Coastguard Agency (MCA), Northern Lighthouse Board, Scottish Government: Marine Analytical Unit, SFF, Scottish Pelagic Fisherman's Association, UK Chamber of Shipping) prior to submission of the Offshore EIA Scoping Report (BOWFL, 2024). The aim of the workshop was to provide an update on the Proposed Development and the initial understanding for key biological and human topics, and to seek feedback and agreement on impacts to be scoped in and out of the topic assessments.

6.2.46 The Applicant presented the draft Offshore EIA Scoping PDE, with the main PDE parameters presented at the pre-Scoping Workshop as follows:

- OWF with up to 1 GW capacity;
- installation of up to 67 Wind Turbines with floating and/or fixed foundations;
- maximum blade tip height of 369.36 m above Lowest Astronomical Tide (LAT);
- maximum rotor diameter of 326 m above LAT;

- maximum hub height of 206.36 m above LAT;
- consideration of a range of mooring systems, monopile, or jacket foundations;
- installation of up to three OSPs with fixed jacket foundations; and
- up to four Offshore Export Cables.

6.2.47 Feedback from the pre-Scoping workshop and subsequent scoping responses was used to refine the PDE and scope for the EIA. Consultee input helped confirm key issues to be addressed at the EIA stage, informed the selection of PDE parameters to be carried forward, and identified further technical assessment requirements. Further details of the pre-Scoping workshop are presented in Volume 1, Chapter 5: Consultation and Engagement. Feedback from the pre-Scoping Workshop was used to inform this Offshore EIA Report and can be found in the consultation section of each topic chapter (Volume 2, Chapters 7 to 23).

6.2.48 The Scoping Boundary included a Landfall at Haughs Bay, Benholm (Figure 6.5). The Offshore Export Cable is aligned to the centre of the Array Area representing the shortest distance to Landfall to reduce the export cable length and interaction between the export cables and IACs.

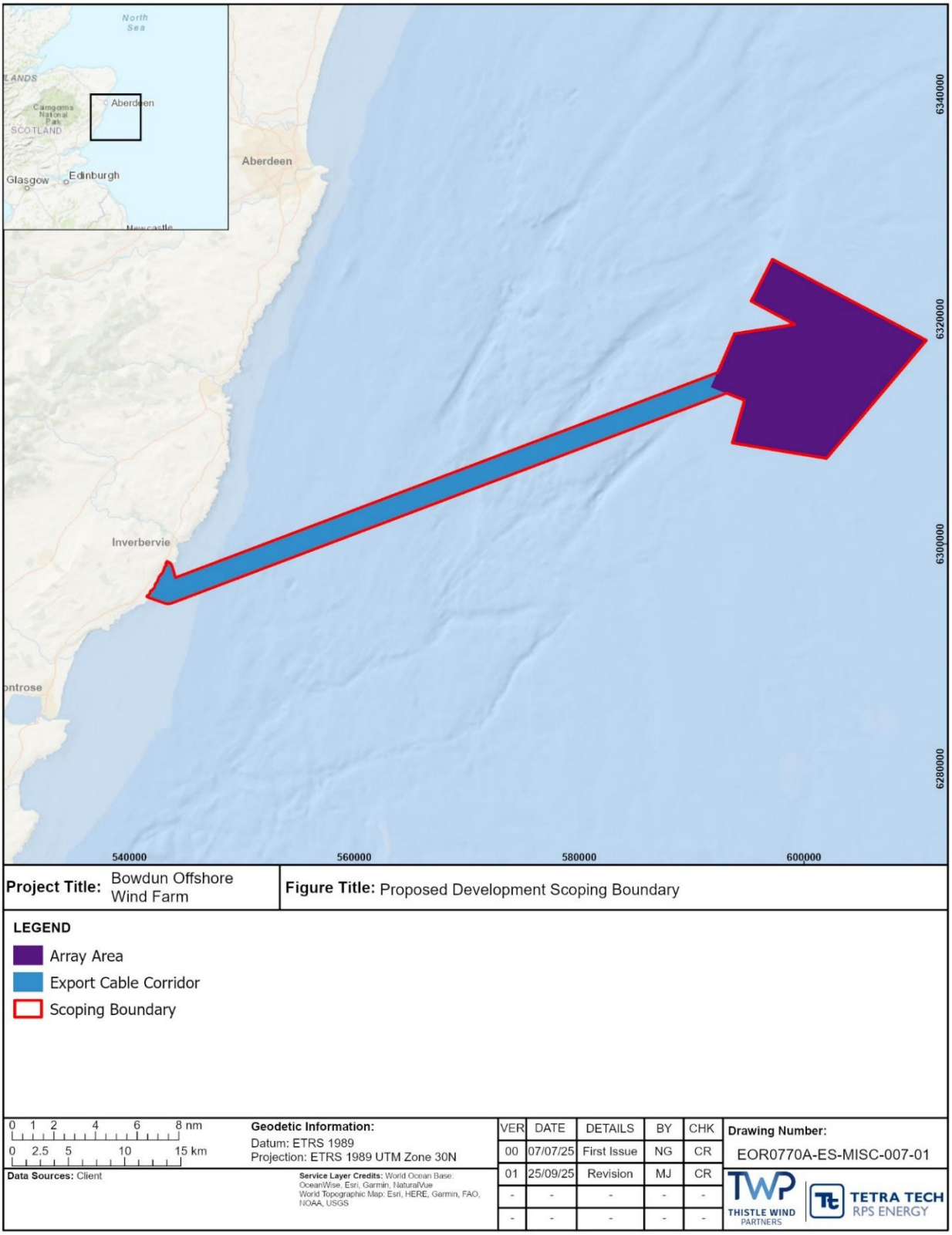

Figure 6.5: Proposed Development Scoping Boundary

Stage 5 – Proposed Development and PDE – Offshore EIA and Application

6.2.49 Following submission of the Offshore EIA Scoping Report (BOWFL, 2024) in August 2024, scoping responses and consultee feedback were used by the Applicant to refine the PDE. Subsequent detailed assessments during the EIA process further refined the Site Boundary and PDE to identify sufficient detail to undertake a robust EIA and support the application.

Site Boundary and Landfall

6.2.50 The Site Boundary has changed since scoping. The Export Cable Corridor now funnels inwards to a much smaller area as it approaches Landfall at Benholm (Figure 6.6) to align with the Onshore Export Cable Corridor. The identification and assessment of the Onshore Export Cable Corridor options included the assessment of the key environmental constraints (e.g. designated sites and or Ancient Woodlands Inventory) that would provide obstacles and constraints (e.g. settlements, existing infrastructure and high flood risk areas) between the point of Landfall at Benholm and the GCP at Hurlie. The Onshore Export Cable Corridor was refined to a smaller corridor following preliminary environmental walkovers, ground investigations and discussions with stakeholders. This was developed into the Planning Permission in Principle (PPP) Application Boundary (BOWFL, 2025). Following Scoping, the Onshore Export Cable was refined to avoid these areas of constraint. The Export Cable Corridor and Landfall have therefore been narrowed to align. The rest of the Site Boundary covering the Array Area and Export Cable Corridor remains the same as in the Offshore Scoping Report (BOWFL, 2024).

6.2.51 At Landfall, the open trench option for bringing the Offshore Export Cables ashore has been removed, for the reasons explained in this paragraph. The Offshore Export Cables will be installed in the Intertidal Area using trenchless technology such as HDD. HDD involves drilling a hole (or holes) along an underground pathway from one point to another, through which the Offshore Export Cables are installed, without the need to excavate an open trench. The drilling installation will commence from above Mean High Water Springs, with the HDD exit point (punch out location) located seaward of Mean Low Water Springs. As such, no construction works above ground are planned to take place in the Intertidal Area. This decision was primarily driven to reduce the environmental impact of the Proposed Development's construction, areas of Annex I reef in the nearshore can be avoided by trenchless installation techniques.

Project Design Envelope

6.2.52 The key refinements made to the PDE from the Offshore EIA Scoping Report (BOWFL, 2024) to this Offshore EIA Report are summarised in Table 6.6 and have been informed by early engineering works and consultation with stakeholders. In addition to stakeholder consultation, the Applicant held internal workshops to develop and inform the Offshore EIA PDE with representatives from the engineering and consenting teams to ensure proportionate and realistic parameters have been set whilst considering environmental, consenting and engineering constraints.

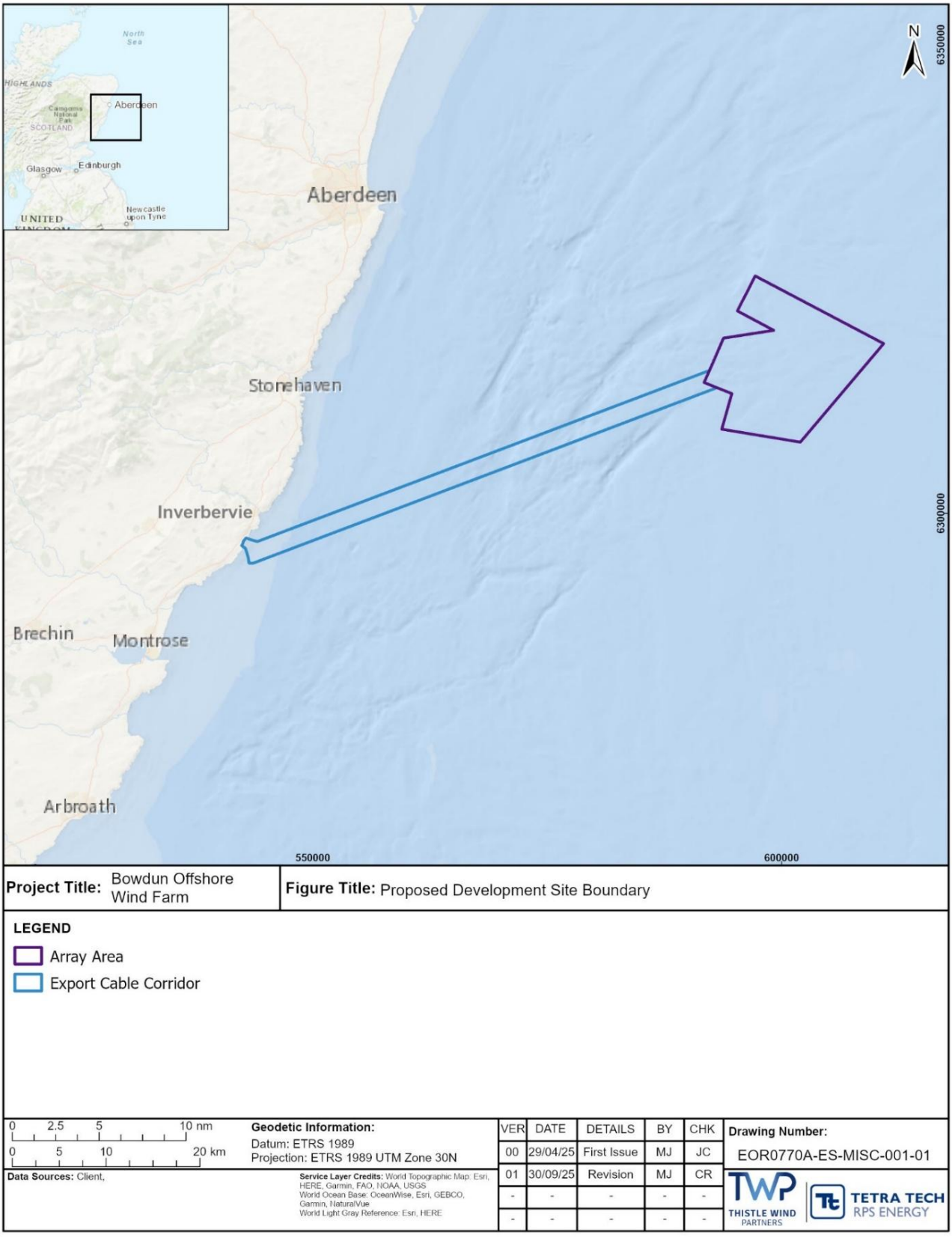

Figure 6.6: Proposed Development Site Boundary

Table 6.6: Overview of PDE Refinements for the Proposed Development

Parameter	PDE presented within the Offshore EIA Scoping Report (June 2024)	PDE presented within this Offshore EIA Report (April 2026)	Rationale for refinement
Maximum Number of Wind Turbines	Up to 67 floating and/or fixed Wind Turbines	Up to 67 Fixed Wind Turbines	Fixed foundations represents the most technically robust and low-risk solution for the Proposed Development, as discussed in Paragraph 6.2.54. In addition, removal of floating options reduces the potential impact to commercial fisheries receptors and is consistent with advice from SFF's consultation response.
Wind Turbine maximum tip height from LAT for largest Wind Turbine option	369.36 m	359.12 m	The reduction in maximum tip height reduces the potential impacts on landscape and seascape, cultural heritage and aviation/radar impact and ornithology/bat collision risk.
Maximum hub height above LAT for largest Wind Turbine option	206.36 m	196 m	The reduction in maximum hub height reduces the potential impacts on landscape and seascape, cultural heritage and aviation /radar impact and ornithology/bat collision risk.
Lower blade tip height above LAT	25.36 m	33.12 m	The lower blade tip height has been increased to mitigate potential collision risk for key ornithology receptors.
Minimum Wind Turbine spacing for small Wind Turbine option	826 m	1,038 m	Increased minimum spacing between Wind Turbines potentially reduces potential impacts on commercial fisheries and enhances navigational safety.
Maximum diameter of piles	5.5 m	5.0 m	Smaller piles reduce potential seabed footprint and potentially reduce impacts resulting from percussive piling and underwater noise.
Maximum hammer energy	6,000 kJ	6,250 kJ	Aligned with the manufacturer specification, which has a performance range up to 6,250 kJ.
Number of Offshore Export Cables	4	3	Based on the maximum number of circuits identified in the Pre-FEED Particle Size Analysis.
Maximum IAC network length	156	167	Based on estimated cable lengths from Pre-FEED plus a 20% contingency allowance to cover routing refinement and installation tolerances.
Landfall options	Open trenching and trenchless technology (e.g. HDD)	Trenchless technology (e.g. HDD)	More detailed site characterisation, and feasibility assessment confirmed trenchless technique such as HDD is possible with the removal of an open trenching methodology mitigating potential impacts on a range of ecological receptors by avoiding direct disturbance to habitats and species within the Intertidal Area.

Parameter	PDE presented within the Offshore EIA Scoping Report (June 2024)	PDE presented within this Offshore EIA Report (April 2026)	Rationale for refinement
Offshore Export Cables	4 Offshore Export Cables	3 Offshore Export Cables	Power system studies undertaken after scoping showed that up to 3 cables would be sufficient.
IAC	156 km	167 km	Assessment of different layout and OSP options showed an increase was necessary.
	Static and dynamic IACs	Dynamic IACs	Dynamic IACs were only considered for the floating Wind Turbine option, they are therefore excluded as the Proposed Development has adopted fixed foundations.

6.2.53 The key design changes since scoping are:

- refinement in Wind Turbine foundations to fixed, with floating foundations no longer considered;
- refinement of piling parameters for Wind Turbine foundations and OSPs;
- increasing the Air Gap from 25.36 m to 33.12 m above LAT;
- refinement of Offshore Export Cable installation at Landfall to trenchless technology only (e.g. HDD).

Wind Turbines and Foundation Design

6.2.54 Since the scoping stage, further design development has been carried out, which informed the Applicant's decision to prioritise fixed foundations and rule out floating foundations for the Proposed Development. Detailed site characterisation, particularly bathymetric and geophysical surveys, alongside engineering assessments, confirmed that the seabed conditions and water depths are well suited to fixed foundation technology.

6.2.55 Consideration was given to the distinct environmental effects of fixed versus floating foundation types. Fixed foundations will generally concentrate construction phase activities and seabed works in closer proximity to Wind Turbine locations whereas floating foundations would distribute seabed interaction through moorings and anchors and may result in more dispersed, longer term seabed and mooring related effects. Vessel activity patterns likewise differ, with floating foundations potentially requiring more frequent specialist maintenance visits during operation, although some impacts to commercial fisheries receptors may be reduced by using fixed foundations. However, many of the potential effects including ornithological, visual, socioeconomics etc, are unlikely to be affected significantly by a choice between the fixed and floating foundations as the range of Wind Turbine options including numbers, size and scale were not foundation option specific. Moreover, likely to be dependent on the final design to be built resulting from number and size of Wind Turbines, construction methodologies etc.

6.2.56 Fixed foundations are a proven and well-understood approach in offshore wind, offering predictable installation methods, long-term structural reliability, and reduced technical uncertainty. In contrast, floating foundations remain an emerging technology with limited deployment experience in UK waters; their inclusion would introduce additional project delivery risks, including higher engineering complexity, operational uncertainty, and potential cost escalation.

6.2.57 Therefore, selecting fixed foundations represents the most technically robust and low-risk solution for the Proposed Development while ensuring timely delivery and maximising project efficiency. As a result, the PDE includes installation methods such as driven piles, drilled piles, and drive-drill-drive techniques.

Fixed Foundation Design

6.2.58 The range of fixed foundation options has been refined since scoping to focus on those most appropriate for the site conditions and to reduce delivery risk. The retained options include:

- driven or drive-drill-drive monopiles;
- driven or drive-drill-drive piled jackets (three or four-legged); and
- suction bucket jackets (three-legged).

Wind Turbine Layouts

6.2.59 Indicative Wind Turbine layouts are presented in Figure 3.3, Figure 3.4 and Figure 3.5 of Volume 1, Chapter 3: Project Description. These layouts were developed to align with the requirements set out within key shipping and navigation guidance documents including Marine Guidance Note 654 (MCA, 2021) and to avoid existing subsea cabling. The Wind Turbine layout takes account of the agreed buffers with SSEN and National Grid for the Eastern Green Link 2 High Voltage Direct Current cable which passes through the eastern side of the OLA. Indicative layout development has included multiple lines of orientation to comply with Search and Rescue requirements (MCA, 2021). The Maximum Design Scenario (MDS) layout was also developed and included within the PDE for this Offshore EIA Report which incorporates a packed perimeter with internal grid and aims to increase the energy generation within the Array Area by reducing wake loss. Additionally, indicative layouts incorporate increased minimum spacing between Wind Turbines, which helps reduce navigational risk and improves accessibility for commercial fisheries operating within or near the Array Area.

Air Gap

6.2.60 Within the Offshore Scoping Report (BOWFL, 2024), the Applicant committed to identifying an appropriate Air Gap to reduce and mitigate collision mortality of seabird species that may forage in the vicinity of the Array Area. A precautionary comparison of collision mortality based on preliminary collision risk modelling, was carried out to understand the relationship between increasing Air Gap and decreasing collision mortality. The lower blade tip height has been increased to 33.12 m (above LAT).

Decommissioning

6.2.61 In line with the requirements under Section 105 of the Energy Act 2004 (as amended), described fully in Volume 1, Chapter 2: Policy and Legislation, the Applicant will prepare a Decommissioning Programme for approval by the Scottish Ministers which will include anticipated costs and financial securities, and consider good industry practice, guidance and legislation relating to decommissioning at the time. A draft of the Decommissioning Programme will be submitted to MD-LOT prior to construction of the Proposed Development. The Decommissioning Programme will be updated during the Proposed Development's lifetime to take account of changing good practice, new technologies and any changes to legislation.

6.2.62 At the end of the Proposed Development's operational lifetime, it is expected that all structures above the seabed will be fully removed where reasonably practicable. This assumption formed a key part of the PDE determination, ensuring the design envelope accommodates the methods, vessel access, and environmental considerations associated with full removal. Driven and/or drilled piles installed as part of the Wind Turbine foundations, IACs, Interconnector Cables, Offshore Export Cables, Scour Protection and cable protection are either expected to remain *in situ* or the method of decommissioning is yet to be determined. Legislation, guidance and good practice will be kept under review throughout the lifetime of the Proposed Development and will be followed at the time of decommissioning. Environmental conditions and sensitivities will also be considered since removal of structures may result in greater environmental impacts in comparison to leaving *in situ*.

6.2.63 The sequence of decommissioning is likely to be the reverse of the construction sequence, and similar types and numbers of vessels and equipment are expected to be involved. The Option for Lease agreement for the Bowdun OWF awarded by the CES requires the Proposed Development to be decommissioned at the end of its lifetime.

6.2.64 There is potential that the operational period may be extended and/or repowering of Wind Turbines carried out at the end of the 30-year operational period. Should this be required this would be subject to further discussions with MD-LOT and consultees, and to additional assessments and consenting processes.

6.3 Conclusion

6.3.1 The process to site selection and consideration of reasonable alternatives considered for the Proposed Development have been summarised in this chapter.

6.3.2 Site selection of the Array Area was primarily informed by the SMP, ScotWind Leasing process and the Applicant's appraisal of POAs and how they met the Project objectives.

6.3.3 The Export Cable Corridor and Landfall location was largely driven by the HND exercise (and the Applicant's GCP), and subsequently informed by Export Cable Corridor constraints analysis, option appraisal and Landfall feasibility studies.

6.3.4 The Offshore Infrastructure, including design options and range of parameters which forms the PDE, have been refined during pre-application based upon:

- increased understanding of site conditions including seabed/ground conditions;
- further design and engineering studies;
- feedback from stakeholders including during scoping; and
- a reduction in potential environmental impacts from the Proposed Development (e.g. increased Air Gap and avoidance of open trench at Landfall).

6.3.5 When refining and finalising the PDE, consideration has been made to decommissioning at the end of life, and all design options included in the PDE are considered to be feasible for decommissioning.

6.3.6 The PDE approach which considers a realistic range of project design parameters, is described in Volume 1, Chapter 3: Project Description, for which the Applicant has applied for consent. Any impacts resulting from the Proposed Development have been assessed within this Offshore EIA Report using the MDS approach.

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