



Picture courtesy of Principle Power

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# Celtic Sea Floating Offshore Wind Leasing Round 5

PDA Characterisation Report - PDA 1

December 2023

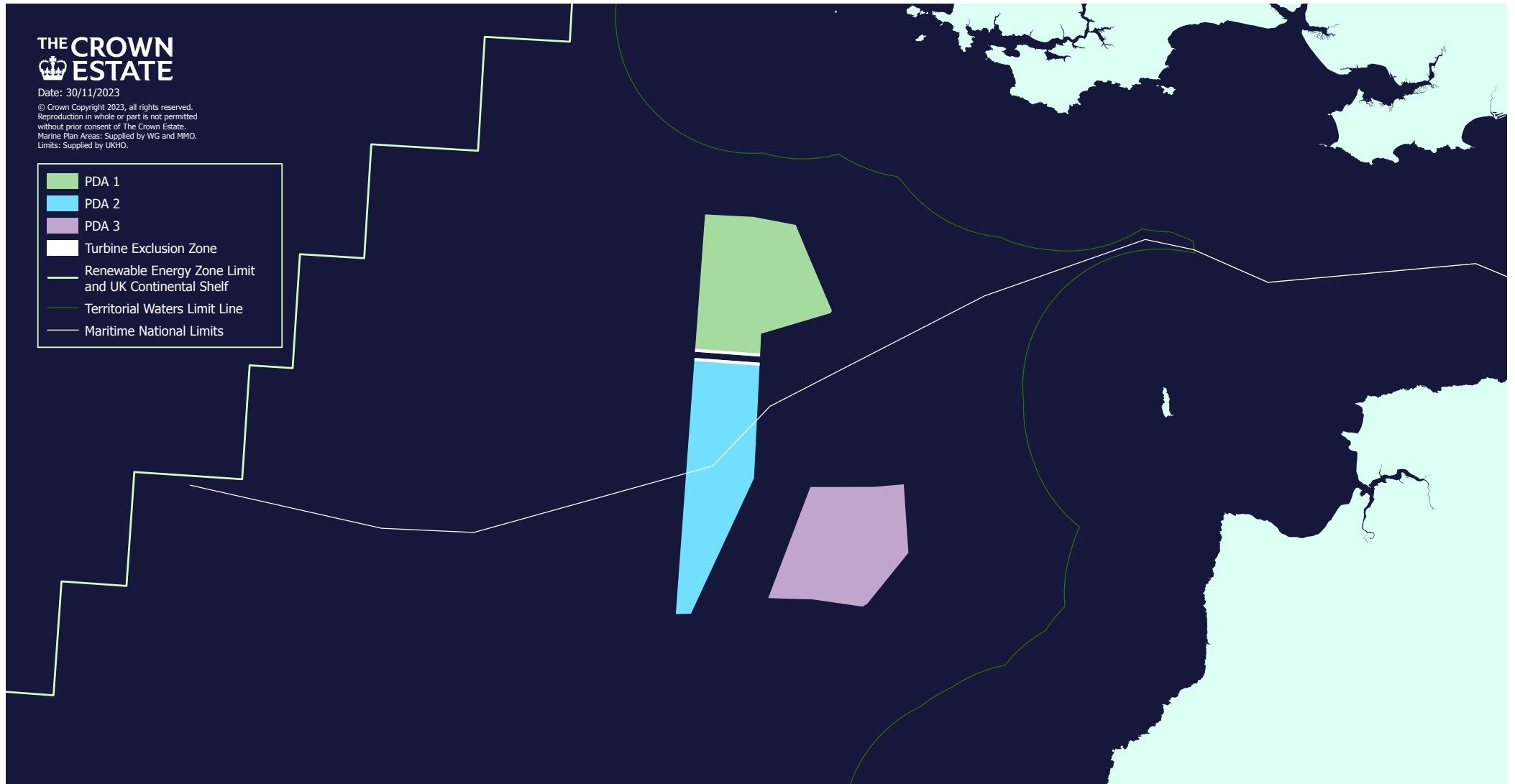


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## The report

Spatial Design for Offshore Wind Leasing Round 5 has sought to identify the most suitable locations within the Celtic Sea to enable the first commercial scale Floating Offshore Wind leasing opportunity. Three Project Development Areas (PDAs) have been identified, characterised and assessed against the various users and activities in the region in combination with assessments of cost and technical risk. They represent locations close to onshore grid infrastructure with lower levels of constraint following extensive stakeholder engagement and spatial analysis. The report outlines key PDA information, considerations and links to external guidance.

The information included in this report should be read in conjunction with the [Site Selection Methodology](#) and the [Summary Stakeholder Report](#).

The Crown Estate has undertaken the analysis in this report using the evidence available to it, internal expertise and support from external advisers where appropriate. The analysis does not prejudge the potential outcome of the plan-level Habitat Regulations Assessment (HRA) or any project level consideration of the potential impact of development. The analysis does not supersede any statutory policies or marine plans. The analysis, including the data and information contained in this document, presents a point in time assessment with changes likely to both the presence and nature of constraints.

This report is provided for information purposes only and no party may rely on the accuracy, completeness or fitness of its content for any particular purpose. The Crown Estate makes no representation, assurance, undertaking or warranty in respect of the analysis in the report including all data and information contained in it.



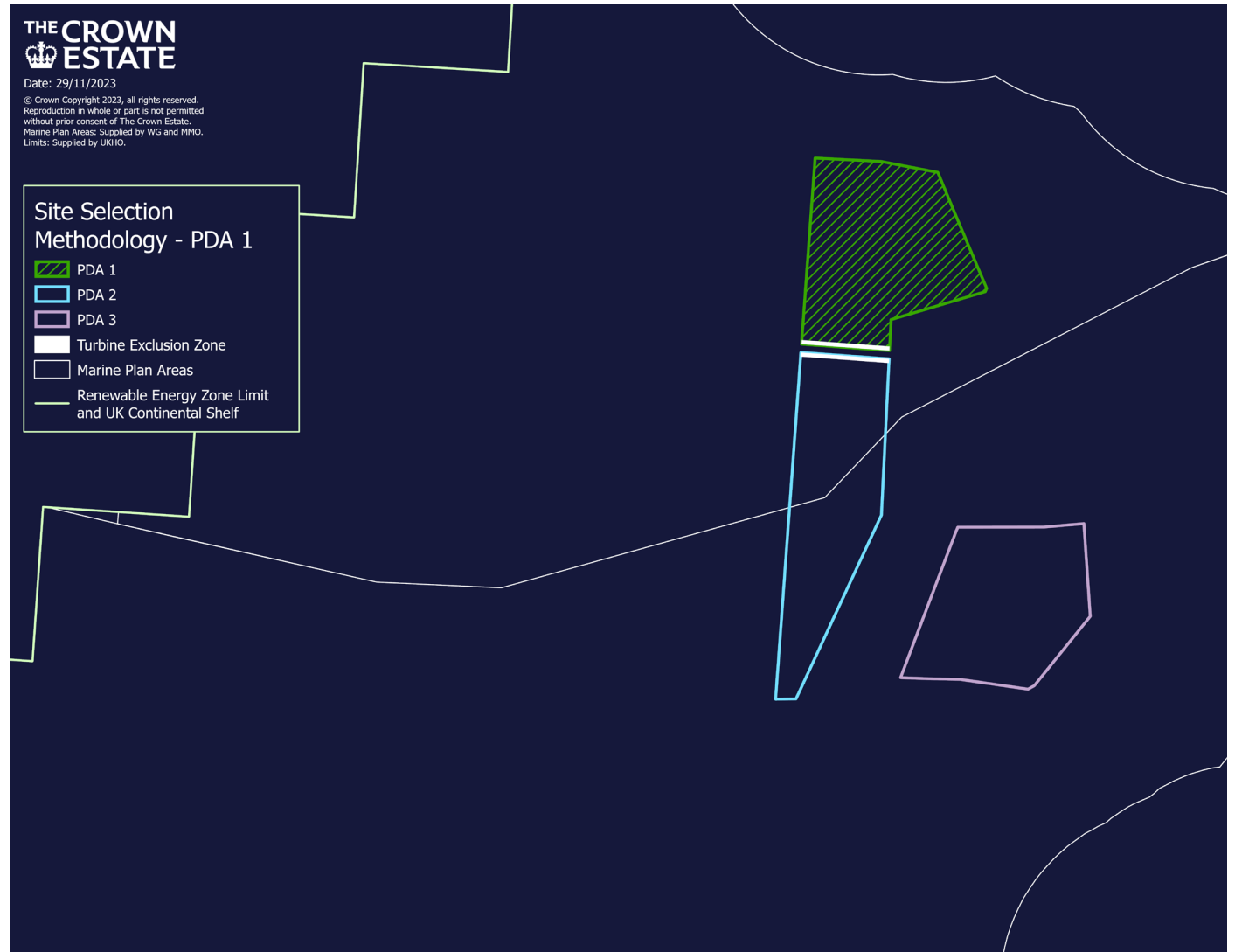
# Project Development Area 1:

**Size:** 369km<sup>2</sup>

**Governance:** Wales

**Dataset:** TCE Open Data Portal

**Borders:** A 1km external buffer exists between PDA 1 on its southern boundary and PDA 2. An internal Turbine Exclusion Zone (TEZ) of 500m also exists on the southern boundary of PDA 1. A TEZ is an area within which foundation anchors can be installed, but in which a turbine cannot be located.





## Environmental

The Celtic Sea supports a diverse array of wildlife, including charismatic megafauna such as cetaceans, basking shark and, in recent years, an increasing abundance of tuna. The area is important for large numbers of seabirds, including more than half the world's population of Manx shearwater. Cetaceans are afforded strong legal protection and the wider Celtic Sea region is recognised as being of relatively high importance for this group. Species such as common dolphin are present in high numbers seasonally while larger whale species such as sperm whale also frequent Celtic Sea waters. A frontal system which develops in the southern Irish Sea in summer is associated with high concentrations of primary and secondary production, attracting seabirds, fish, squid and larger species, some of which (e.g. fin whale) normally occur only in open seas. Seabed habitats are similarly diverse and the region supports important features such as cold water corals, relict sandbanks and burrowing megafauna communities.

A number of areas have been designated to protect their nature conservation interest and PDA 1 is located within 500m of the Skomer, Skokholm and the Sea of Pembrokeshire Special Protection Area (SPA). This SPA is designated for a variety of bird features including lesser black backed gull, Manx shearwater, storm petrel, kittiwake, common guillemot, razorbill and puffin.

Due to the proximity of the designated PDA to the SPA and the flight height of some species potentially overlapping with the area swept by turbines, careful consideration will need to be given during wind farm planning and assessment to minimise impacts and avoid significant adverse effects.

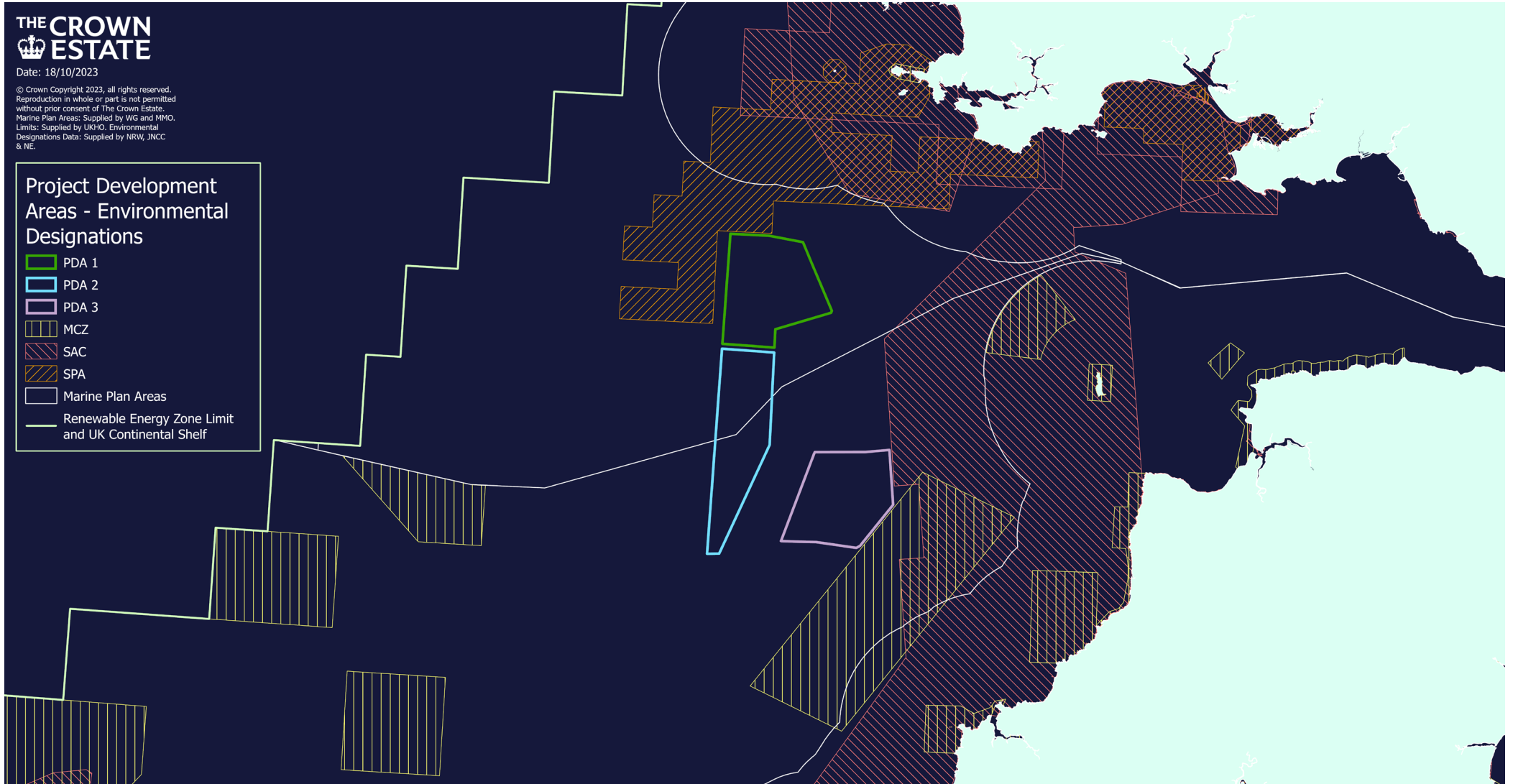
The PDA is also located approximately 140km from the Isles of Scilly SPA which is designated for breeding birds including fulmar, Manx shearwater, storm petrel, kittiwake, guillemot, razorbill, lesser black-backed gull and puffin and approximately 160km from Severn estuary SPA designated for lesser black backed gull. Birds can fly great distances when foraging for food and may range into the area. Impact assessments will need to consider the potential for these and other species to encounter a wind farm, and the consequences thereof.

PDA 1 is located 13km of West Wales Marine Special Area of Conservation (SAC) and 12km from Bristol Channel Approaches SAC which are both designated for harbour porpoise. The PDA is also 105km from Cardigan Bay SAC which is designated for bottlenose dolphin. These cetacean species are sensitive to underwater noise and in the case of very high levels of noise, for example pile driving or Unexploded Ordnance (UXO) detonations, there is potential for physical harm to occur. Mitigation may need to be applied during construction works.

The PDA is approximately 24km from Pembrokeshire Marine SAC, 50km of Lundy SAC, 100km of Saltee Island SAC and 105km from Cardigan Bay SAC, all designated for grey seal. Seals can be sensitive to noise, both below and above water. As with cetaceans, consideration will need to be given to minimising the impacts from noise.

PDA 1 is located in the vicinity of a number of SACs designated for the protection of migratory fish species. The closest, Pembroke Marine SAC, is 24km from PDA 1 and is designated for features including sea lamprey, river lamprey, Allis shad and Twaite shad. These species may occur considerable distances from their natal rivers and could occur in or around the wind farm area.

The PDA is not located within or adjacent to any SAC for Annex I habitat features or any MCZ site.





## Navigation

The Celtic Sea represents a gateway to global shipping and navigation. The spatial design process has taken due consideration of the extensive vessel density that moves through the region.

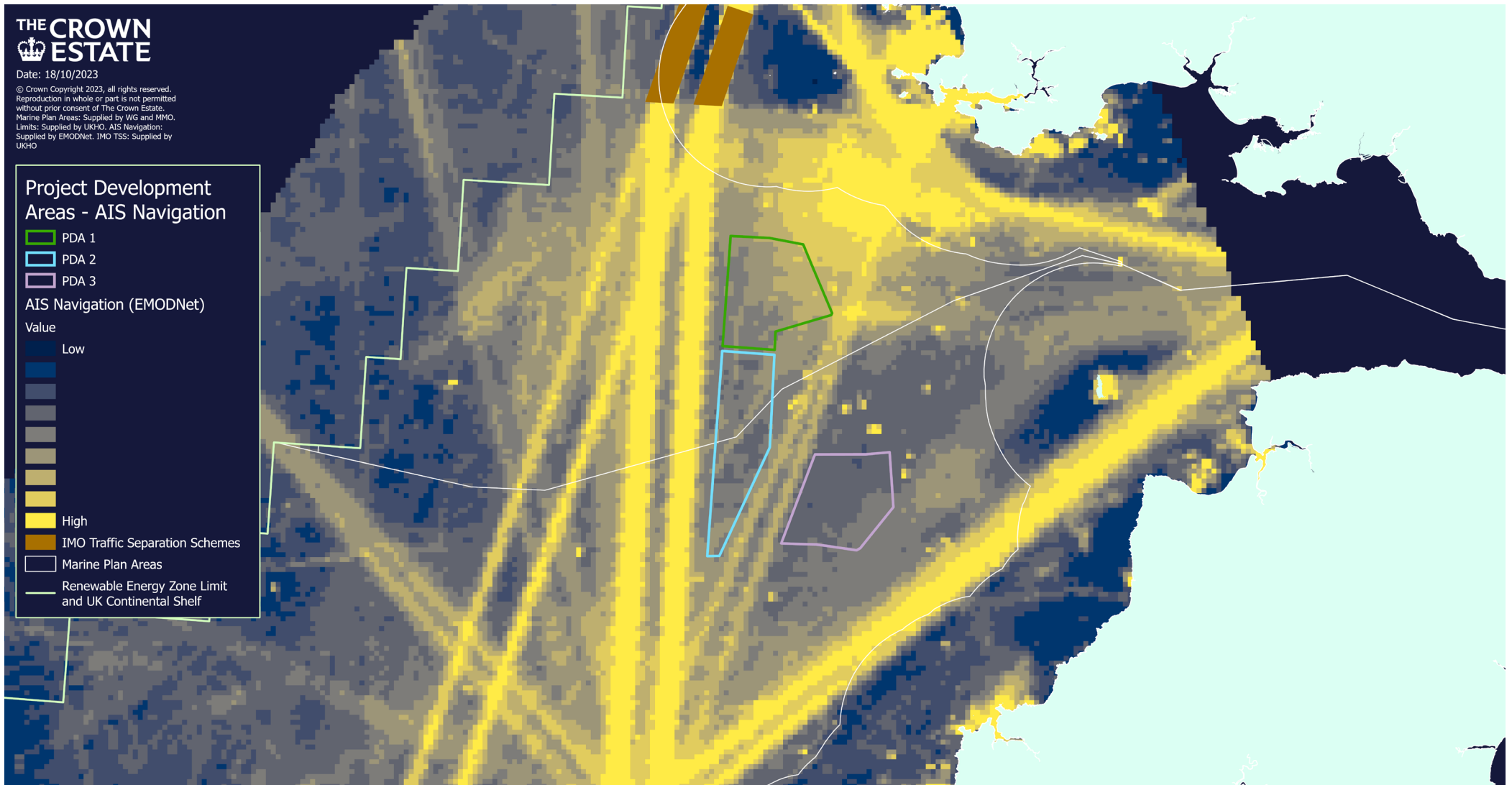
By utilising Automatic Identification System (AIS) Vessel Density data and undertaking engagement with targeted navigation stakeholders, PDA 1 has been designed to sit 2 nautical miles to the east of a major shipping route. The route connects the Celtic Sea, north to south between Traffic Separation Schemes (TSS) west of Pembroke and east of the Isles of Scilly. To the east of, and in the far east of the PDA, vessel traffic moves into and out of the port of Milford Haven.

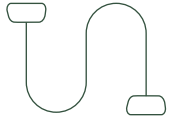
The PDA has been designed to reduce interference with shipping, and as far as possible, seeks to ensure safe navigation is maintained, utilising a precautionary approach.

Useful Guidance published by the Marine Coastguard Authority is [available here](#).









### Subsea telecommunication cables

Subsea telecoms cables represent critical connectivity and resilience to communication for the United Kingdom. The Celtic Sea holds routes that connect North America, Europe and Africa. Our engagement with the industry association, the European Subsea Cables Association (ESCA) has taken place throughout the spatial design process and has aided in how existing and future cables are considered in the design process.

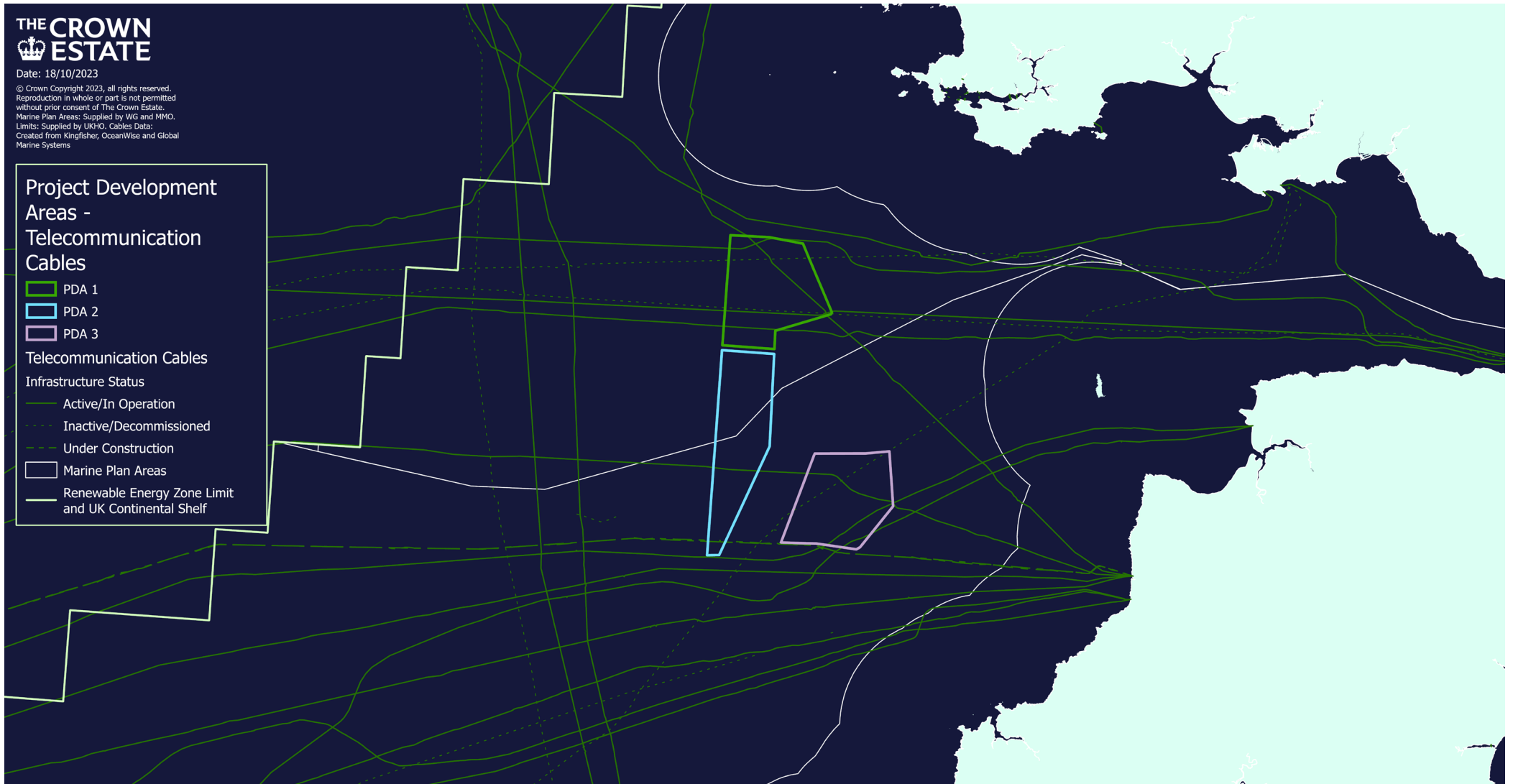
PDA 1 is currently intersected by four active subsea telecoms cables. The Crown Estate has engaged directly with ESCA and individual cable owners to understand the length of service remaining for each cable.

It is anticipated that one cable will remain active within the PDA after 2030.

Successful bidders will be provided with appropriate contact information for the cable owner.

ESCA have published updated guidance for Floating Offshore Wind on the proximity of Offshore Renewable Energy installations and submarine cable infrastructure. The guidance can be found [here](#).







## Fishing

Fishing activity across the Celtic Sea is expansive and the areas encompassing the Celtic Sea are some of the most heavily fished areas in English and Welsh Waters. The Celtic Sea is fished by vessels from the UK, Belgium, France, Ireland and Holland with landings sought by United Kingdom (UK) and European Union (EU) markets. The combined fishing fleets work a diverse range of gear types including potting, netting, trawling (Beam, Otter trawl, single and twin rig) with fishing occurring throughout the year.

The Crown Estate has adopted a fresh approach for site selection in the Celtic Sea in recognition of the above and engagement across fishing stakeholders has been extensive. This has yielded data supplied from across the UK and the EU to inform our final design.

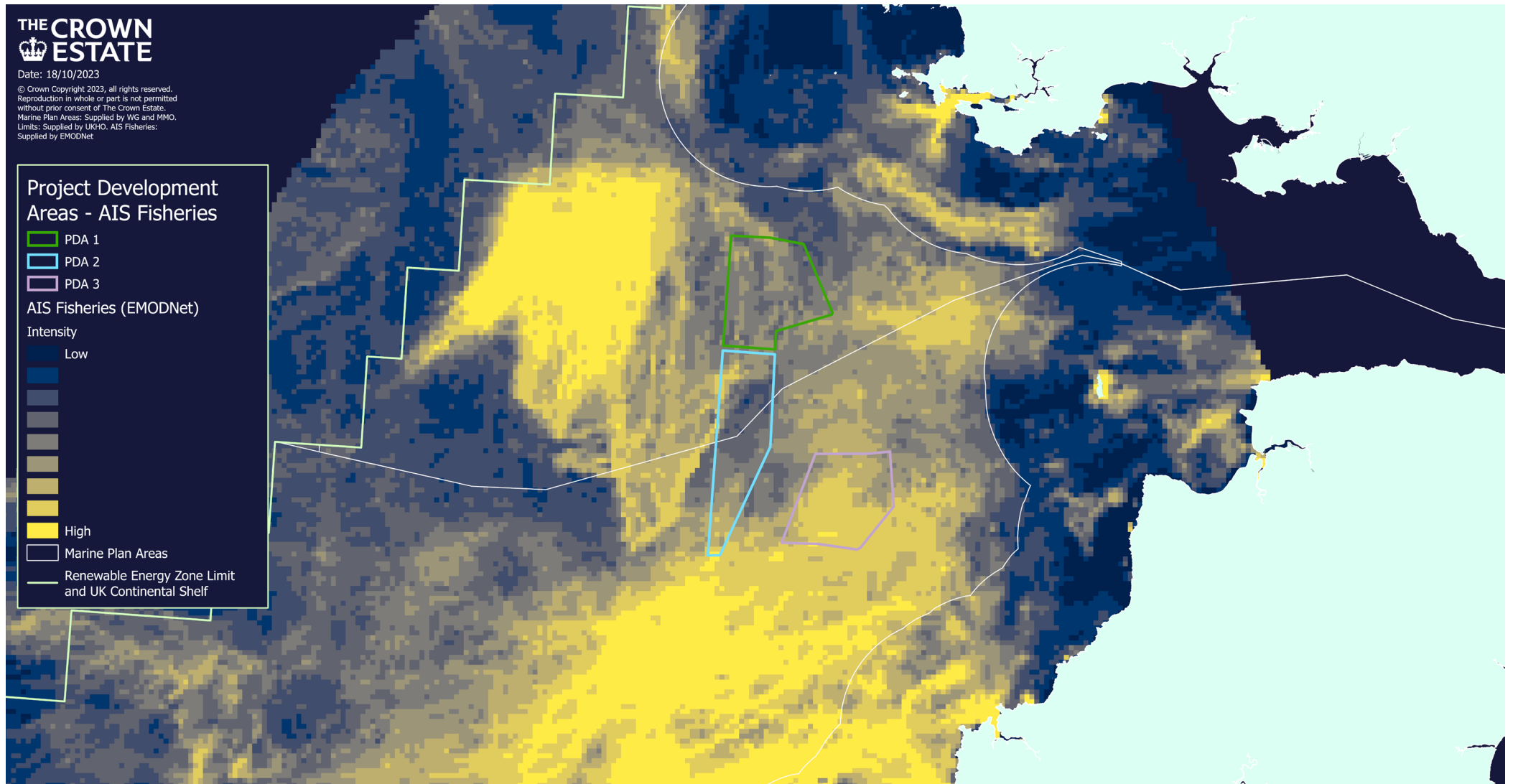
PDA's have been designed to limit the potential displacement of fishing activity as far as possible. The Crown Estate will seek to convene relevant organisations, to aid with further engagement with fisheries for successful bidders, in a timely manner, ahead of project-level design. Consideration by developers could include exploring mitigation options for things such as layout, anchoring and cabling, that can be achieved through dialogue and benefit both industries.

Our [Summary Stakeholder Report](#) outlines in further detail how the industry has been engaged.

The following map highlights a portion of the fishing density data we can share publicly. Whilst this data has informed conversations with fisheries stakeholders, we have utilised specific data and evidence through targeted engagement to ensure we best represent the activity within the region. Please note we cannot share all of this information.

Where there are overlaps with historic fishing data within PDA1, the majority of fishing gear deployed is mobile.







## Civil Aviation

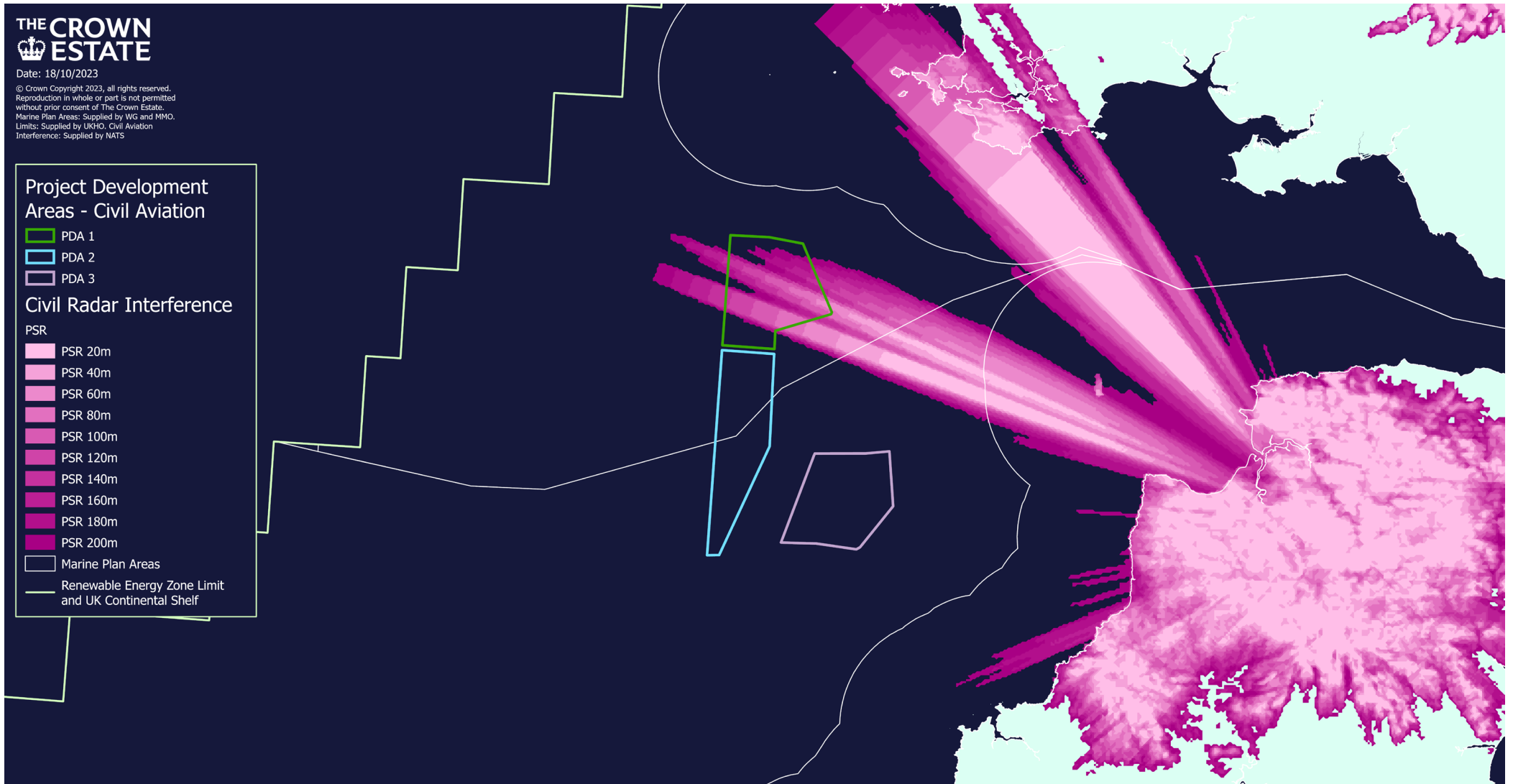
The Crown Estate has engaged with National Air Traffic Services (NATS) on civil aviation throughout our spatial design to understand potential constraints and mitigation available within the Celtic Sea.

PDA 1 intersects with Primary Surveillance Radar (PSR).

Suitable mitigation has been assessed as likely to be available. Specific details should be assessed at project level discussion.

The relevant dataset on PSR can be sourced from [NATS](#).







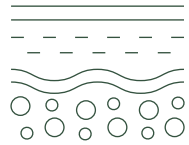
## Defence

The Defence Infrastructure Organisation and Ministry of Defence have been engaged throughout the spatial design process to help guide and refine the final scenario.

Bidders should note the potential need for Ministry of Defence (MoD) and civil radar mitigation measures for offshore wind development in this area. Enabling the co-existence of aviation and wind farm activity is being progressed through the cross-government and industry Joint Air Defence and Offshore Wind Mitigation Task Force. This includes the development of a strategic approach to providing mitigation across a number of wind farms (rather than project by project), in particular, for air defence radar. This work is also exploring potential requirements for developers to share the costs of funding the air defence radar mitigations required.







## Technical

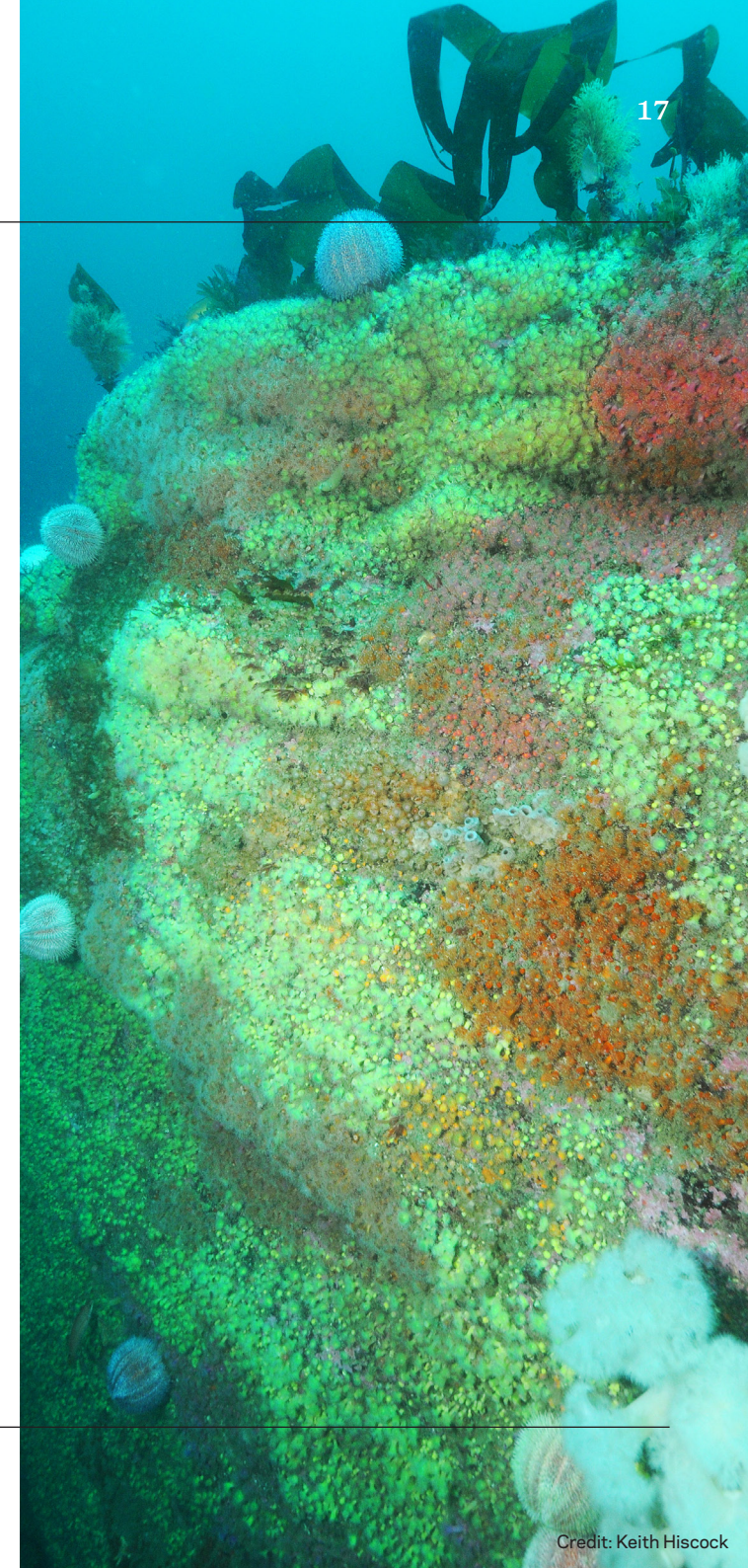
The Crown Estate has undertaken a spatial analysis of Levelised Cost of Energy (LCOE) and engineering risk. PDAs 1 to 3 span an area of relatively low LCOE, compared to the Celtic Sea Area of Interest in general, driven principally by proximity to shore which enables the use of a relatively short-run High Voltage Alternate Current (HVAC) export system.

A spatial engineering risk assessment (focused primarily on metocean and geotechnical risks) identified multiple feasible floating offshore wind technology types as well as some significant but mitigable technical risks. The key inputs to the engineering risk assessment are summarised in [Table 1](#).

Within PDA 1 there is a Turbine Exclusion Zone (TEZ) (see Page 5). A TEZ is designed to ensure separation of turbines on the boundary of a PDA which may be immediately adjacent to the boundary of another PDA. It is an area within which foundation anchors can be installed, but in which the turbine cannot be located.

This is to ensure there is always a 2km distance between centre-points of turbines (including allowing for maximum excursion of the foundation on its moorings) in neighbouring PDAs. Details on TEZs will form part of legal documentation made available during the tender.

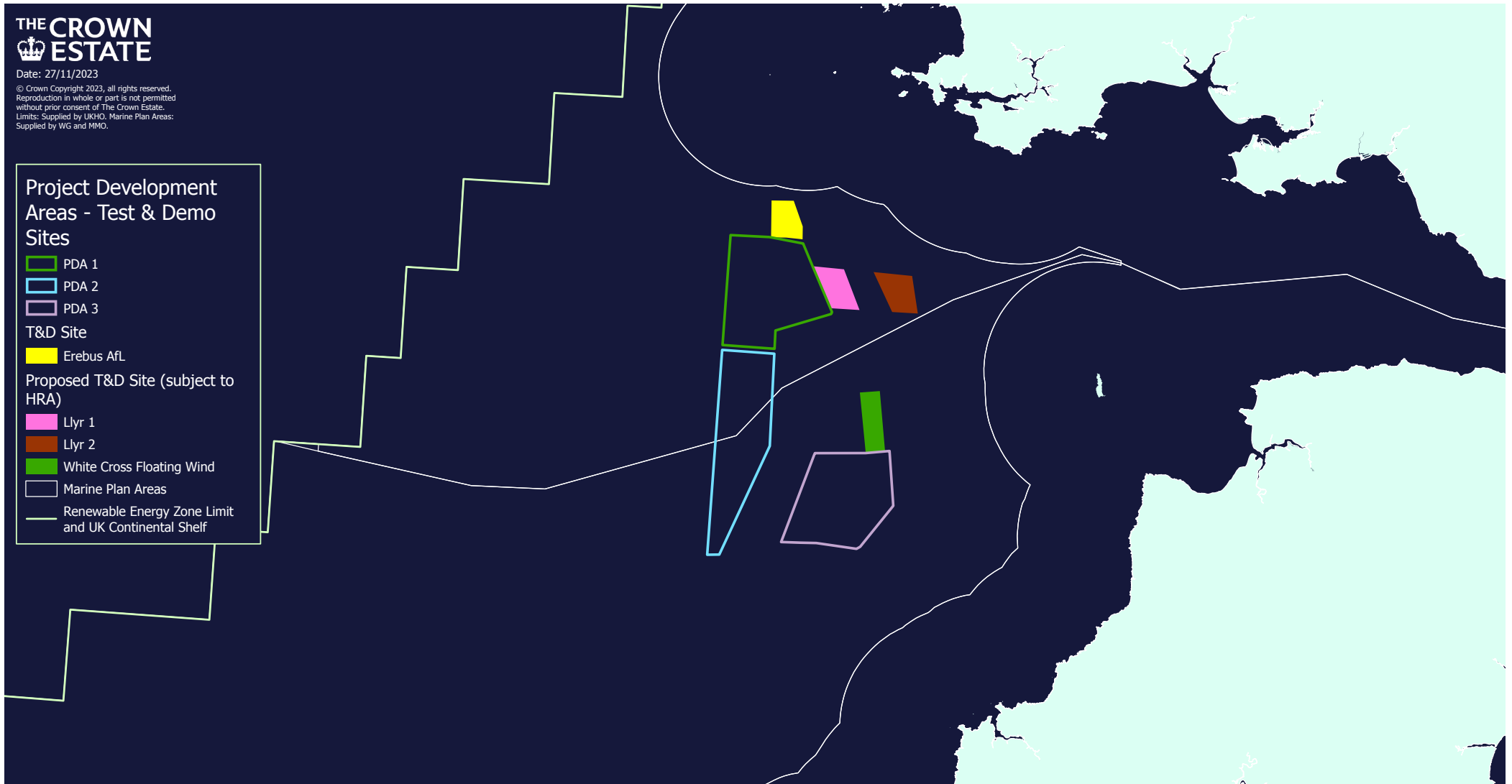
Three Test and Demonstration projects are part of the integrated plan-level Habitats and Regulations Assessment. One of the prospective projects sits due east of the PDA. The Erebus Agreement for Lease (AfL) is located north of PDA 1.



**Table 1**

Parameter	Data Source	PDA #1
Water Depth (LAT)	EMODnet	68-84m
Quaternary Thickness	BGS	0 to >50m
Bedrock Type	BGS	Chalk+ Mesozoic interbedded
Annual Mean Significant Wave Height ( $H_{m0}$ )	MetOceanWorks	1.8m
Extreme 10-min Wind Speed ( $V_{ref}$ ) at 150m AMSL		47.5m/s
Extreme Wave Height ( $H_{m0,50yr}$ )		13.4m
Presence of shallow gas	BGS	Gas blanking not registered in BGS dataset. Pockmark distribution potentially present

NB: where a single value is stated, this corresponds to the highest value observed within each PDA in the modelled spatial data





## Pre-Consent Surveys

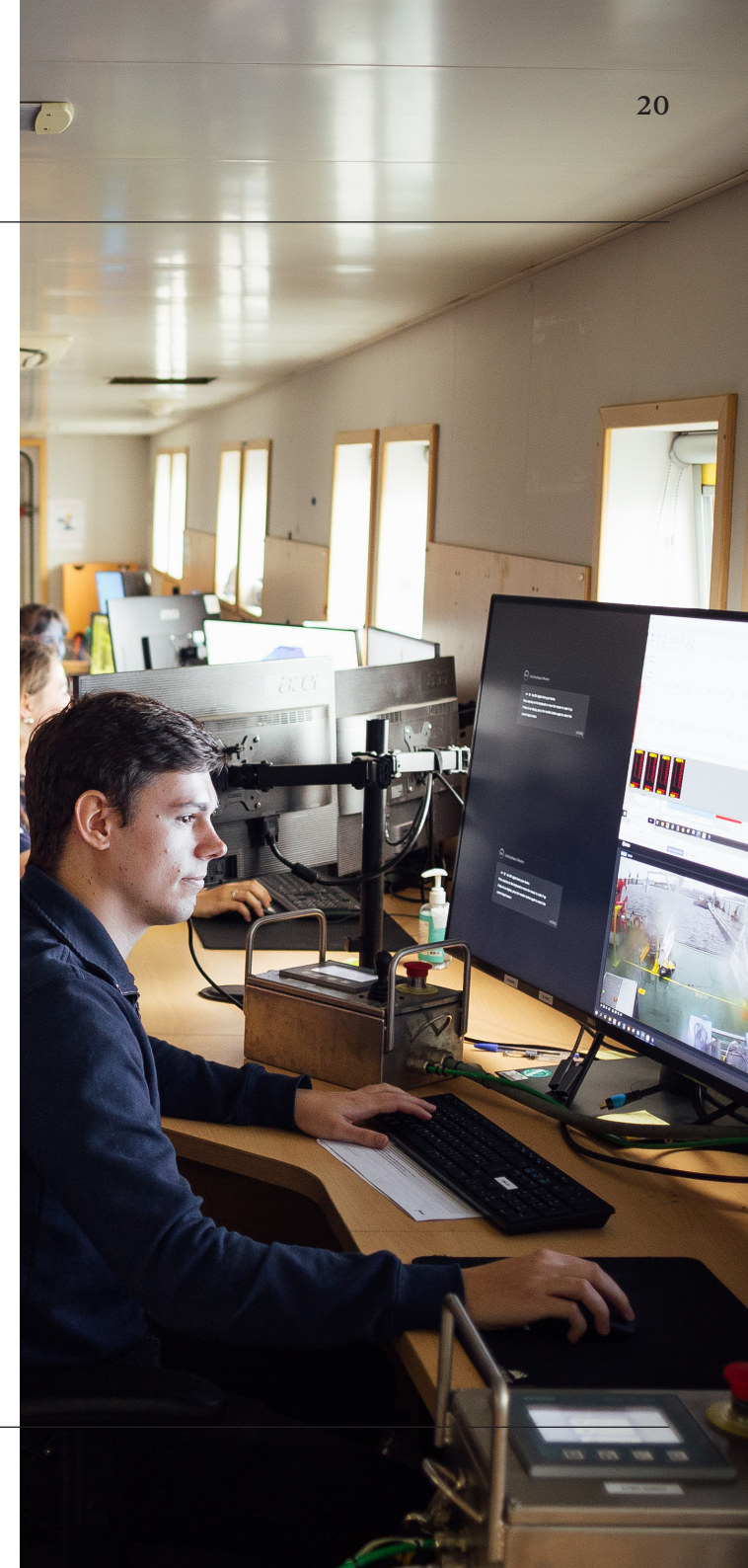
The Crown Estate is a world leader in gathering, investing in and sharing marine data and evidence. In April 2022, we set out plans for a multi-million pound investment in an extensive programme of marine surveys (Round 5 preconsent surveys) to support floating offshore wind in the Celtic Sea. By making the data gathered from the Round 5 preconsent surveys available, The Crown Estate is aiming to accelerate the delivery of Round 5 Developments, making it easier for successful Bidders to take early decisions and manage engineering design risk, while supporting future Environmental Impact Assessments (EIAs) as part of the planning process.

We have worked closely with our technical advisors, ABPmer and DORIS Engineering to develop the scope and specifications for our Pre-consent Survey programme. Other key stakeholders, including statutory nature conservation bodies, have been carefully engaged to ensure the surveys will deliver reliable and useful datasets for Bidders.

The technical specifications for the Round 5 pre-consent surveys will be available via [marinedataexchange.co.uk](https://marinedataexchange.co.uk).

Our pre-consent surveys will cover:

- Geophysical surveys of the seabed, which were started in July 2023 by Fugro
- Population assessments of birds and marine mammals, from digital aerial surveys, which were started in September 2023 by HiDef Aerial Surveying Ltd
- Metocean surveys to characterise wind, wave and current patterns in the Celtic Sea, which will commence in early 2024 and will be delivered by Partrac
- Geotechnical investigations of the seabed which are planned for the summer of 2024





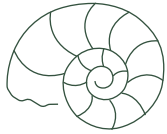
## Marine Plans

This site falls within the boundaries of the Welsh National Marine Plan. The Welsh National Marine Plan provides a policy framework which will be used to help inform decision-making on what activities take place in the marine environment and how the marine environment is developed, protected and improved in the next 20 years. It provides a clear, evidence-based approach to inform decision-making by marine users and regulators on where, when or how activities might take place within Welsh waters to ensure sustainable development.

The plan is made up of general overarching policies and sectoral policies.

Sector specific policies which are relevant include:

Policy Code	Policy Text
ELC_01	Low carbon energy (supporting) wind. This plan supports proposals for offshore wind, in consideration to the general and sectoral policies of the plan and support strategic planning for the sector.
CAB_01	Subsea cabling (supporting). This plan supports the optimal distribution of energy where they contribute to this plan, in consideration of the general and sectoral policies of this plan.
SAF_01	Safe guarding existing activities. Proposals must show how they will avoid adverse impacts to other activities, if not the hierarchy avoid, minimise, mitigate. This include safeguarding subsea cables and energy infrastructure.
ECON_02	Co-existence. Proposals should demonstrate how they have considered opportunities for colocation to make the best use of the marine space
SOC-07	Seascapes. Proposals should consider how potential impacts to seascapes have been considered following the hierarchy, avoid, minimise, mitigate.
ENV_02	Marine Protected Areas. Proposals should demonstrate how they avoid adverse impacts on individual MPA, have regard to the management and avoid adverse impacts on designated sites not part of the MPA network.
ENV_03	Invasive non-native species. Proposals should demonstrate how they avoid or minimise the risk and where appropriate include biosecurity measures.
ENV_05	Underwater noise. Proposals should demonstrate the consideration of underwater noise impacts through the hierarchy, avoid, minimise, mitigate.
ENV_07	Fish and Habitats. Proposals should demonstrate avoiding adverse effects to important breeding and migratory fish species, via the hierarchy avoid, minimise, mitigate.
GOV_01	Cumulative effects. Proposals should demonstrate consideration of these in light of the hierarchy, avoid, minimise, mitigate.



## Marine Cultural Heritage

As part of the spatial design process, marine cultural heritage and the historic environment has been considered and incorporated through feedback provided via direct stakeholder engagement and at a dataset level. The process has drawn in the use of protected and non-protected wrecks data provided by Historic England and the UK Hydrographic Office.

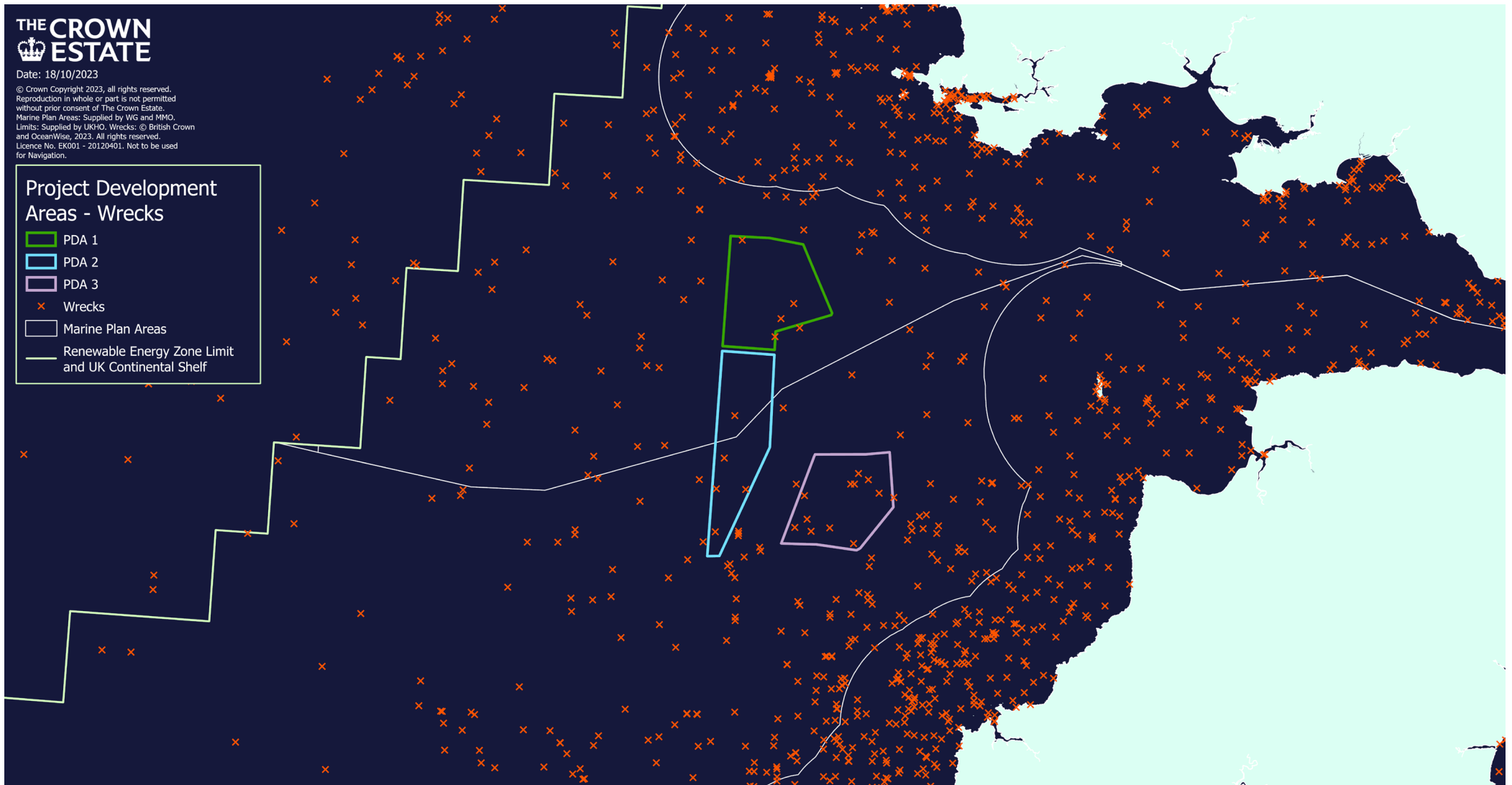
The PDA and its surroundings have potential for the recovery of a wide variety of archaeological material and associated remains from the Palaeolithic to the present day. There are no protected wrecks sitting within the PDA boundary, however several unprotected wrecks and obstructions, including 20th century steel vessels, have been identified within the data assessed within the PDA.

The potential for recovery of aviation archaeological material within the PDA is considered to be limited, given the location further offshore away from the major areas of airborne conflict along the Welsh coast and Bristol Channel during the two World Wars, however such discoveries cannot be discounted.

Given the depths across the PDA, there is considered to be some limited potential for recovery of material associated with periods of lower sea level when the PDA and its environs would have been exposed beyond the limits of the Welsh Ice Cap.

The potential for archaeological and palaeoarchaeological material and associated remains across the PDA will need to be appropriately assessed, and any relevant mitigation applied, as part of the project level consenting for any offshore wind farm development within the PDA.







### Legacy use

A portion of the PDA overlaps a closed disposal site, Milford Haven Industrial (LU040).

Reporting from the site stopped in 1984. Consultation with the Centre for Environment, Fisheries and Aquaculture Science (Cefas) on historic documents for the closed site has indicated that it may have been used for sewage sludge disposal .

The UK Disposal Site dataset can be sourced from Cefas .







## Glossary

AfLs	Agreements for Lease
AIS	Automatic Identification System
AMSL	Above Mean Sea Level
AoS	Large areas of sea space identified in the Celtic Sea region, presented in this report following detailed spatial modelling and stakeholder engagement, within which smaller Project Development Areas (PDAs) will be located.
BGS	British Geological Survey
EMODnet	European Marine Observation and Data Network
ESCA	European Subsea Cables Association
GIS	Geographic Information System HRA Habitats Regulations Assessment
HRA	Habitats Regulations Assessment
HVAC	High-Voltage Alternating Current
IMO	International Maritime Organisation
LAT	Lowest Astronomical Tide
LCOE	Levelised Cost of Energy, a measure of the average net present cost of electricity generation for a generator over its lifetime.
LIDAR	Light Detection and Ranging, a remote sensing method that uses light in the form of a pulsed laser to measure ranges to the Earth.
MCZ	Marine Conservation Zone
MPA	Marine Protected Area
NATS	National Air Traffic Services
NM	Nautical Mile
PDAs	Smaller areas of sea space identified through further stakeholder engagement, environmental and technical analysis, within which an individual floating offshore wind project could be developed. These areas will be offered up to tender.
SAC	Special Area of Conservation
SPA	Special Protection Area
TEZ	Turbine Exclusion Zone
TSS	Traffic Separation Scheme
UXO	Unexploded Ordinance



#### Additional Documentation and Links:

More details on spatial design, engagement and access to open data for Offshore Wind Leasing Round 5 can be found in the following documents and links:

- [Offshore Wind Leasing Round 5 - Site Selection Methodology](#)
- [Offshore Wind Leasing Round 5 - Stakeholder Summary Report](#)
- [PDA 2 Characterisation Report](#)
- [PDA 3 Characterisation Report](#)
- [The Crown Estate Open Data Portal](#)
- [GIS Story Map](#)

Credit: Valery Joncheray