Menter Mon Morlais Ltd

Morlais Variation Scoping Report

MCRP-MM-DOC-0060

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Glossary of Terms and Definitions

Term	**Definition**
CfD	Contracts for Difference
CRM	Collision Risk Modelling
DDP	Device Deployment Protocol
EMMP	Environmental Mitigation and Monitoring Plan
ES	Environmental Statement
IACC	Isle of Anglesey County Council
LAT	Lowest Astronomical Tide
MDZ	Morlais Demonstration Zone
MW	Megawatt
MWS	Marine Warranty Survey
NRA	Navigation Risk Assessment
NRW	Natural Resources Wales
NRW A	Natural Resources Wales Advisory
NRW MLT	Natural Resources Wales Marine Licensing Team
O&M	Operation and Maintenance
PDE	Project Design Envelope
rpm	Revolutions Per Minute
SLVIA	Seascape Landscape and Visual Impact Assessment
TTL	Tidal Technologies Limited
TWA	Transport and Works Act

Contents

1 Introduction

This Scoping Report has been prepared by Menter Môn in support of a formal request for a Scoping Opinion for a variation to the Morlais Marine Licence (reference ORML1938) to amend some of the licenced parameters to allow the proposed Tidal Technologies Ltd (TTL) device deployment within the Morlais Demonstration Zone (MDZ).

2 Approach to Scoping for the TTL device

Under the Marine Works (Environmental Impact Assessment) Regulations 2007 (as amended), a variation to a Marine Licence must be assessed to determine whether it introduces new or altered environmental impacts beyond those identified and assessed in the original Environmental Impact Assessment (EIA).

As set out in this document, with the exception of 3 parameters, the proposed TTL device falls entirely within the technical specifications and operational parameters assessed and consented in the original Morlais EIA and as explicitly outlined in the current Marine Licence. The original EIA assessed impacts based upon defined maximum and minimum operational parameters, including turbine dimensions, rotor diameter, power rating, installation methods, operational noise levels, electromagnetic fields, collision risks, seabed footprint, and hydrodynamic effects. All relevant environmental pathways, receptor sensitivities, and potential impact magnitudes have already been comprehensively evaluated within this parameter envelope. These are summarised in the Project Design Envelope (PDE) Matrix document [MMC156 MOR-RHDHV-DOC-0127b PDE Matrix Spreadsheet] which clearly illustrates which parameters are used to assess which pathways and impacts.

As validated by a review of the PDE Matrix, with the exception of 3 parameters of the TTL device which will be considered further, the device proposed in this variation does not exceed or differ from these previously assessed parameters and hence for these parameters there are no new or materially different environmental pathways or impacts that could occur. Therefore, for these unchanged parameters it is justified to conclude that the consent variation does not necessitate additional EIA work or reconsideration of impacts, as there are no new, altered, or intensified interactions with sensitive receptors or environmental features beyond those previously assessed. Following on from this, for those parameters that are within the existing PDE, the existing EIA findings remain valid, and no further assessment or amendment to the original Environmental Statement (ES) is required.

As presented in this document for those parameters that are outside of those previously consented and assessed in the original EIA it is proposed to vary the Marine Licence. For each parameter it is described how it differs from previously consented limits using the PDE matrix and then specifies which environmental impacts and pathways these variations potentially affect.

An assessment of potential changes in impacts specifically linked to the parameters that are outside the consented envelope is then undertaken. For those where a potential change in impact is identified, the methodology for assessment of these impacts and supplement to the existing ES is given. The discussion also describes how the existing Marine Licence conditions will act to control any remaining uncertainty at the time of the assessment, following the PDE approach as employed in the Morlais Marine Licence.

2.1 The Project Design Envelope approach

The PDE approach to EIA used in the Morlais consenting process allowed the impact assessment process to be undertaken on an envelope of worst-case parameters that were used to assess realistic worst case impacts on sensitive receptors. Natural Resources Wales (NRW) endorse this approach:

"A PDE approach is a consenting approach that allows a project proponent to submit an assessment of the potential maximum impacts of a range of design parameters within its application." [1]

Also, in accordance with that guidance;

"PDEs should be based on a robust evidence base on impact pathways and sensitive receptors evidence base on impact pathways and sensitive receptors"

It is clear from this that the mechanism by which the PDE functions in terms of the consent is via the defined parameters that are used to identify and assess the impact pathways to sensitive receptors. To determine the tidal turbine parameters to use in the MDZ, a consultation with turbine developers was used to identify the maximum parameters to take forward to assess the impacts on sensitive receptors.

To aid in the understanding of this process of determining parameters, turbine technologies were split into categories that shared similar characteristics, and these groups are described as 'Device Types'; and there are three categories, surface emergent, mid water column and seabed mounted (and not surface emergent). However, these categories are only used to aid understanding rather than to define particular parameters for assessment. Instead, the maximum parameters for assessment are derived from the consultation with developers and the turbines included in that exercise.

The whole site 'worst' or 'extreme case' figures then used in the EIA are then based on different scenarios across the entire site for each parameter so as to allow each impact pathway and receptor to be considered. As described in Chapter 4, Appendix III of the ES[2], each scenario was developed based on the maximum number of devices that represented a 'worst case' for that particular parameter, whilst assuming no more than 30 megawatts (MW) of any one technology. E.g. for each parameter, the figures were calculated taking 30MW of a technology that represented the 'worst case' impact, then 30MW of the technology with the second 'worst', 30MW of 3rd 'worst; etc. until the full potential across the site was reached. However, note that example devices were considered here rather than a mix of particular 'Device Types'.

The consented parameters of the project are then outlined in Chapter 4 Project Description of the ES. See, in particular, Tables 4-21 to 4-30. Note in the Inquiry, the Inspector considered these broad parameters to be satisfactory in terms of the description of the development for the purposes of the Transport and Works Act (TWA) Application and EIA Regulations.[3]

Then to ensure that the turbines deployed are within the assessed parameters, the Marine Licence states that:

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[1] NRW 2019 "*Defining project envelopes for marine energy projects: review and tidal energy test facility and marine mammals case study"*

[2] MDZ_A27.7 MMC121 MOR-RHDV-APP-0005,0006 Vol III_Chapter 4 Project Description

[3] Morlais TWAO Inspectors Report

"Tidal Devices must be within the parameters set out within Environmental Statement Chapter 4 Project Description (MOR/RHDHV/DOC/0004) as detailed in Appendix 1 [of the Marine Licence]"

It is therefore essential that to be considered within the PDE, devices must have parameters that are within those as described and be within the scope of the work that was assessed in the ES. If parameters are outside of these, or it is different scope, then a variation is expected to be required. However, the nature of the PDE approach means that it is clearly expected that turbines or devices that were not explicitly included in the original assessment will be deployed and, so long as the parameters are within those as defined, and the scope has been assessed, they will be allowed to deploy, subject to clearing the relevant Marine Licence conditions.

2.2 The Tidal Tech Device scope and proposed approach

In the response received from NRW Marine Licensing Team (NRW MLT) on 10 December 2024, with respect to the proposed Marine Licence variation, NRW MLT reference the three 'Device Type' categories and that the proposed TTL device would represent a 'new Device Type'. As detailed above, the Device Type categories are intended in the ES to help to communicate the variety of technologies and provide a route to identify and quantify the maximum parameters and consider how they may change with different device designs.

Whilst it is agreed that the TTL device does not fit exactly within the scope of any of the Device Type categories, there are no elements of the proposed device scope that introduce new components or impact pathways that have not been considered previously in the PDE. To clarify, the surface emergent devices have both surface emergent elements and elements that travel from above the water to under the water, for example the Aquantis Spar Buoy was a device that fed into the PDE definition. In terms of component parts and impact pathways this is effectively the same as the proposed TTL device. Under the water, the structure is affixed to the seabed with a gravity base in the same way that some of the seabed mounted devices that were considered in the derivation of the PDE and has vertical axis rotors like the Repetitive Energy device which for clarity do not ever break the surface.

For this reason, it is considered that the TTL device fits within the scope of the assessments in the ES and there are no new impact pathways introduced by the TTL device and hence rather than it being a "New Device Type" it is more appropriately considered as a hybrid of two Device Types. In any case the question is not so much about device types, but more whether the scope has been considered and whether the parameters are within the envelope.

This concept is illustrated in the simplified schematic in Figure 1 below. This shows a circular axial flow rotor for ease of illustration. Device (A) shows a gravity-based seabed mounted structure illustrating the scope of the seabed foundation, support structure and turbine system considered in the ES. Device (B) shows a moored spar-buoy system that shows the support structure being both underwater and surface emergent as considered in the ES. Device (C) then shows a hybrid incorporating elements of both (A) and (B) but not introducing scope that isn't already considered in the ES.

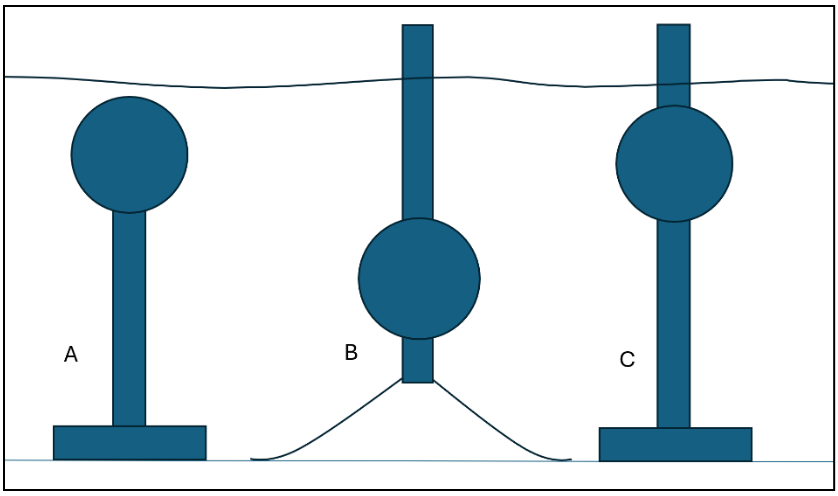

Figure 1 Schematic of various tidal energy device types

Given that the TTL device type is therefore considered to be within the ES scope, the proposed approach to determining what, if any, variation is required to the Marine Licence is a question of assessing whether any of the maximum parameters exceed those that are used in the EIA.

3 Project Description

TTL is proposing to install up to 15 devices at berth GR1 within the MDZ, with capacity of up to 30MW. The location of the TTL deployment within the MDZ is outlined in Figure 2.

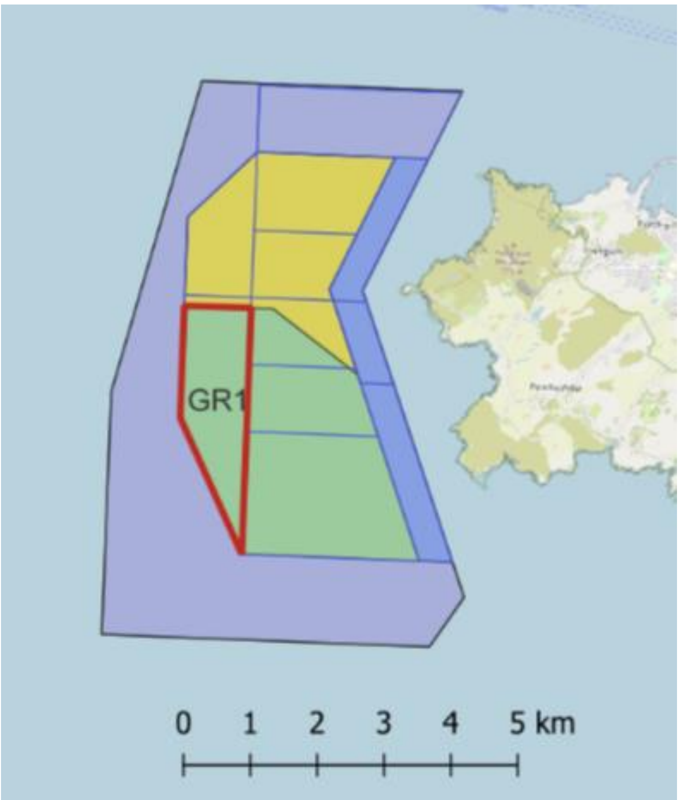

Figure 2 TTL Device Deployment Location (GR1)

TTL has developed the TT2 device, a 2MW tidal stream turbine arrangement based on 2x 1MW vertical axis turbines (VATs), connected to a central integrated electrical hub.

3.1 Foundation and seabed Interface

TT2s VAT design incorporates a ballasted, reinforced concrete gravity base, positioned on the seabed and kept in place solely by its own weight with no need for micro-piling or anchoring.

From the gravity base, extends an integral reinforced concrete tower extending vertically out of the water. The gravity base and tower is a heavy, robust and cost effective structure, designed to withstand the very worst storm conditions and this provides a safe support structure for the central electrical hub and 2 x 1MW generators, all housed in storm proof containers on a steel truss, supported on top of the tower above the highest waves.

The detailed design of each gravity base will be adjusted for each specific location but in most cases, it will be a hollow sealed structure that floats, either with or without additional floatation designed for the purpose. This means that installation will involve towing the device to site and then seawater ballasting (sinking) it to a predetermined position on the seabed without the use of large vessels. Decommissioning will involve re-floating the entire device making this a routine and straightforward solution.

3.2 Installation strategy

Current installation methodology assumes that TT2 turbines will be fully assembled in port. Fully assembled TT2s will float in circa 4.0m of water and will be towed to their operational site. Installation will simply require pumping seawater into the base and tower through the top of the tower until the unit starts to sink. The descent to the seabed will be controlled by the rate of further flooding and with the use of a separate purpose built stabilisation platform. Installation methodology will be confirmed in conjunction with the Project Marine Warranty Surveyor (MWS) in due course.

3.3 Operations and Maintenance (O&M) strategy

Because all equipment requiring maintenance is accessible above water, scheduled Operation and Maintenance (O&M) costs are minimised and can be carried out by a small team from small maintenance vessels.

Generators, gearboxes and associated electrical equipment in the electrical hub are standard “off the shelf” components from the wind turbine industry fully protected in storm proof containers, always above the highest projected waves. This means that all scheduled O&M tasks can be done on site without the need for heavy lifting vessels or divers.

Additional important design elements include foils and foil arms which can be raised up the drive shaft, out of the water to the level of the foil connection points. This enables simple foil connection, maintenance, de-snagging and/or replacement. Arms and foils are then lowered back down to at least 5m below Lowest Astronomical Tide (LAT) when in operation.

3.4 Device schematics

Figure 3 TTL Device illustration

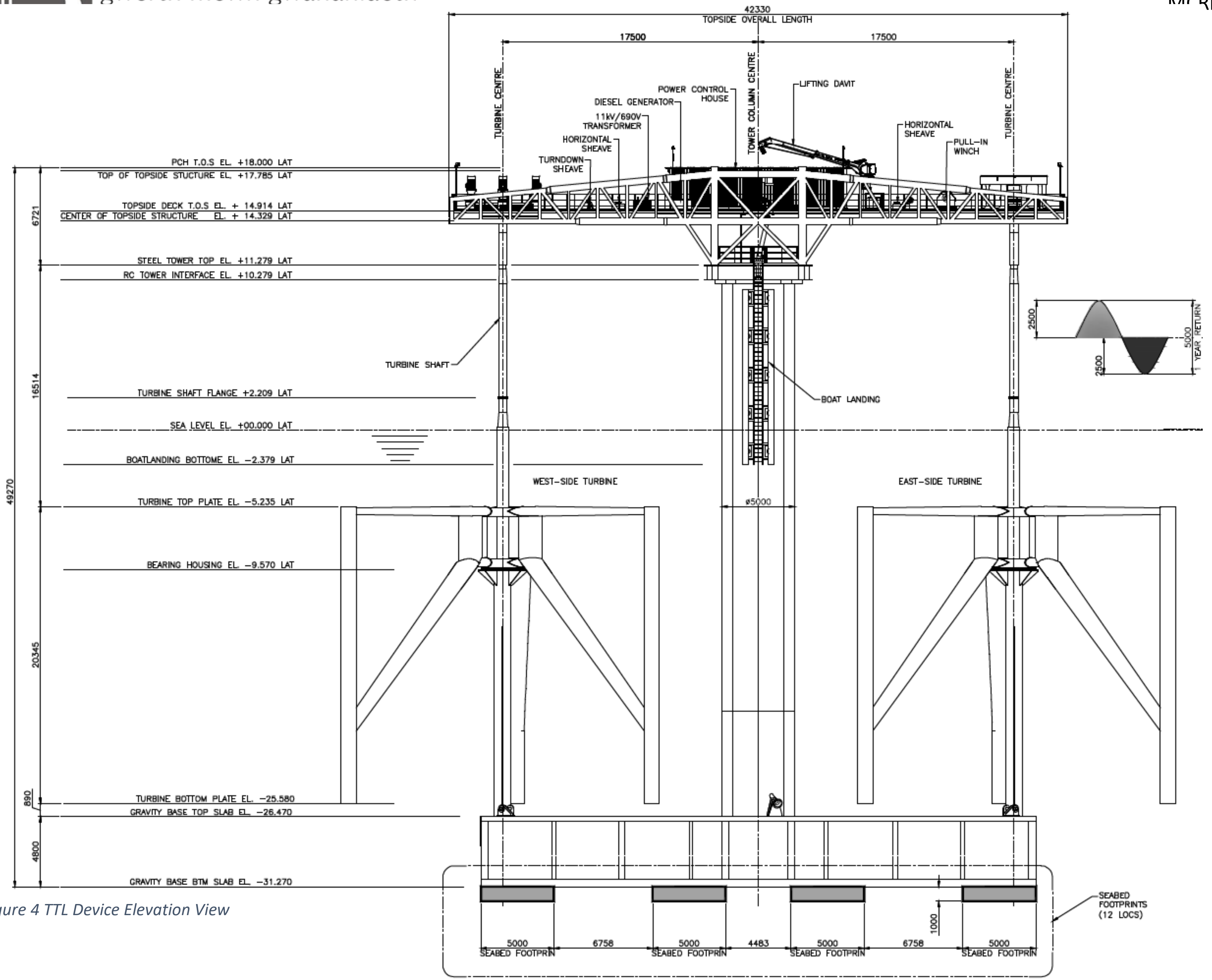

Figure 4 TTL Device Elevation View

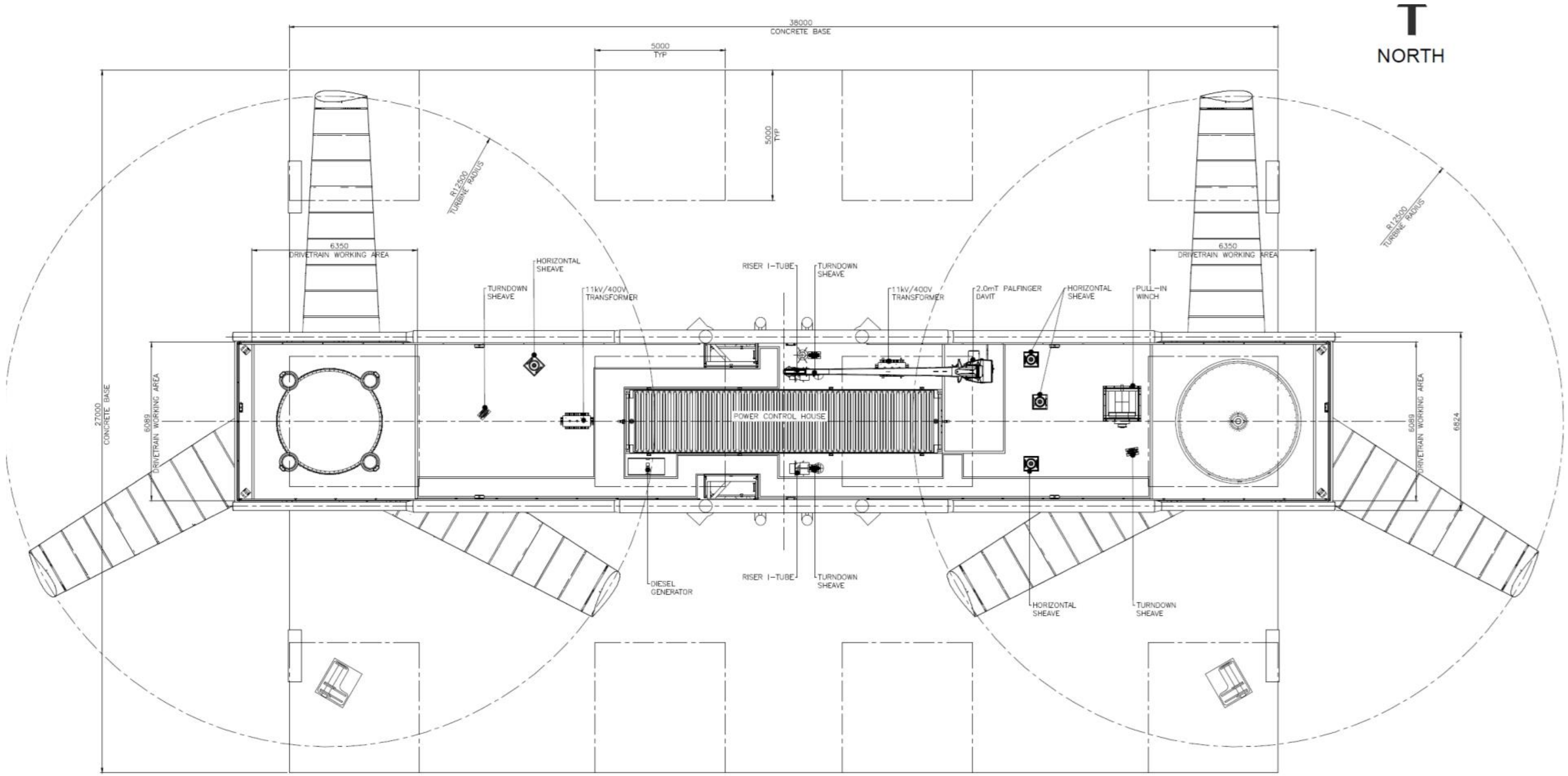

Figure 5 TTL Device Plan view

4 Comparison of device to Project Design Envelope parameters

The device parameters used in the ES as categorised in the PDE Matrix are shown below. Where the proposed parameters for the TT device are outside of the consenting envelope, the parameters are shown in red. In summary this is:

- Height above sea level 18m compared to 6.5m in the licenced parameters
- Device swept area 1000m^2 compared to 982m^2 in the Marine Licence
- Blade width 3m compared to 2m used in the ES.

Parameter	Device Value	Relevant worst case Licenced Parameter
Structure		
Overall length	Gravity Base: 40m (Max), Outside of Turbines below water: 65m, Above water superstructure: 45m (Max)	72 m
Overall breadth	Below water 30m (Max), Above water (visible): 7.0m	30 m
Operational draught	Not applicable	Not specified
Worst case foundation type	Concrete Gravity base, with feet / grout pads sitting on seabed with no additional anchoring. Max area in contact with seabed 312m^2. Decommissioning by refloating and towing away. (Reverse of Installation method)	Gravity based foundation 312m^2
Volume of oil (litres)	Lubricants for generators and gearboxes etc. above water only in weatherproof superstructure	444,000 litres
Max. height above Sea Level	18m (Max) above LAT, 11.5m above max spring high tide.	6.5m
Foundation pile dimensions	N/A	1.0 - 2.5m diameter
No. hubs	No separate hubs required	120
No. hub piles	N/A	4
Total max no. of drilled piles	None	1,490
Area of device foundation (m2)	Maximum area of foundation feet in contact with seabed 312m^2 (Max). Final design expected to be below this.	312m^2 per device
Depth of drilling (m)	N/A	Not specified
Volume of drill arisings (m3)	N/A	117,780 m^3
No. Surface Emergent Devices	15 x 2MW units	130
No. of devices using gravity bases	15	590
Pile drilling duration	N/A	Not specified
No. of concurrent foundation installations	1 in 2026 followed by 14 in 2028	Not specified
No. marker buoys	None	60
Footprint of marker buoys	None	540 m^2

No. ADCP	TBC but below maximum allowable	40
Footprint per ADCP (m2)	TBC	7 m^2
Footprint of seabed mounted environmental monitoring units (m2)	N/A	112 m^2
Footprint of mooring for floating environmental monitoring units (m2)	All monitoring equipment will be attached to the device	540 m^2
Footprint of sea level environmental monitoring buoy moorings	N/A	22.5 m
Device spacing centre to centre	Perpendicular to flow / Parallel to flow	Perpendicular to flow / Parallel to flow
Fully submerged seabed mounted device	N/A	50 to 100m / 100 to 250m
Surface emergent and buoyant mid water device	50 to 200m / 120 to 500m	50 to 200m / 120 to 500m
Cables		
Worst case export cable length (km)	GR01 is max circa. 6km from cable landing point	40.5km
Cable catenary swept area following installation of floating devices (m2)	TBC but below maximum allowable	2,055,000m^2
Cable tail footprint (m2)	TBC but below maximum allowable	120m^2 (based on 9 x tails of 620m length)
Intertidal Trench (m2)	TBC but below maximum allowable	7,400m^2
Export cable footprint including protection (m2)	TBC but below maximum allowable	11,745 m^2
Worst case inter-array cable length (km)	TBC but below maximum allowable	2.5 km
Inter-array cable footprint including protection (m2)	TBC but below maximum allowable	30,040 m^2
Duration of cable installation	TBC but below maximum allowable	20 days per year
Duration of cable protection installation	TBC but below maximum allowable	12 days per year
Intertidal sand excavated due to due to open trenching (m3)	TBC but below maximum allowable	Not specified
Total Cable Length (km)	TBC but below maximum allowable	40.5 km
Total cable footprint (m2) (export and interarray cables)	TBC but below maximum allowable	41,75 m^2
Foundation Structure & Mooring Cables		

Mooring system	Gravity base. Relies on own installed weight with no additional anchoring or piling	Gravity based moorings
Total project footprint (m2)	TBC, depends on layout of 15 units. Within allowable parameters. 2MW per unit and VATs allows for efficient project footprint	74,790 m^2
Footprint of temporary seabed disturbance (m2)	Units are lowered to the seabed with no additional "temporary disturbance" expected beyond the footprint of the gravity base feet.	48,000 m^2
O&M		
Cable Inspection	TBC but below maximum allowable	Annually for first 2-3 years reducing to every 2 years thereafter
Device inspection	TBC but below maximum allowable	15 visits annually
No. cable repairs	TBC but below maximum allowable	10 during operational phase
Cable repair duration	TBC but below maximum allowable	
Area of Cable repairs (m)	TBC but below maximum allowable	750 m per event
Turbine maintenance	TBC but below maximum allowable	
Rotors		
Type of rotor	Vertical Axis Turbines	Not specified
Rotor design	Vertical Axis Turbines	Not specified
Number of rotors	2 per device	5
Min depth	5m below LAT	Not specified
Rotor radius	12.5m as seen from above	Max TEC DIAMETER 27 m
No. blades	up to 12 per unit. Current design has 6 per unit. Not expected to change.	4,750 blades
Blade width/depth	Length is 20m, Blade width (chord) up to 3m, Blade depth up to 750mm.	Blade "Depth" (front-to-back, side view) 0.09 to 0.84 meters Blade "Width" (side-to-side, front view) 0.064 to 2.0 m
Rotation speed	Max 10 RPM. Current design Contracts for Difference (CfD) analysis shows <4 rpm	22 rpm
Mean tangential blade speed	Vertical Axis Turbine blade speed is all the same. Max 13m/s	Not specified
% time not in operation	TBC for use in Device Deployment Protocol (DDP) and Environmental Mitigation and Monitoring Plan (EMMP) Collision Risk Modelling (CRM) modelling prior to deployment	Not specified
Mean current speed	TBC for use in DDP and EMMP CRM modelling prior to deployment	Not specified
Blade pitch	TBC for use in DDP and EMMP CRM modelling prior to deployment	Not specified
Blade pitch at blade tip	TBC for use in DDP and EMMP CRM modelling prior to deployment	Not specified

Blade profile	TBC for use in DDP and EMMP CRM modelling prior to deployment	Not specified
Median water depth	TBC for use in DDP and EMMP CRM modelling prior to deployment	Not specified
Swept area (m2)	Current specification is 1000m^2 per device	982.1 m^2
Turbine export power (MW)	2MW	4MW
Vessels		
Max vessel installation days	TBC but installation method is expected to be towing and sinking to deployment position on seabed within 1 day so minimal.	431 days per year
No. vessels at any one time	No more than 3.	3
No. vessel trips	TBC but within consented parameters	Not specified
No. vessel days	TBC but within consented parameters	Total of 774 days per year
Vessel safety zone (m)	TBC but within consented parameters	Not specified
Vessel route area	TBC but within consented parameters	Not specified
Vessel anchor footprint during device installation (m^2)	TBC but within consented parameters	248,000 m^2
Vessel anchor footprint during hub installation (m^2)	TBC but within consented parameters	48,000 m^2
Vessel anchor footprint during cable installation (m^2)	TBC but within consented parameters	100,240 m^2

5 Tidal Technologies Scoping Assessment

The TTL device PDE has been reviewed against the maximum worst-case parameters of the EIA to determine any areas in which the TT device may exceed these worst-case parameters. As described above the parameters that fall outside of the consented PDE are:

- Height above sea level 18m compared to 6.5m in the Marine Licence
- Device swept area 1000m^2 compared to 982m^2 in the Marine Licence
- Blade width (chord) 3m compared to 2m used in the ES.

5.1 Scoping out impacts where there is no change in the relevant parameters

As determined by a review of the PDE Matrix and ES, with the exception of the above 3 parameters which will be considered further, the device proposed in this variation does not exceed or differ from the previously assessed parameters and hence there are no new or materially different environmental pathways or impacts that could occur resulting from unchanged parameters. Therefore, for these unchanged parameters it is justified to conclude that the consent variation does not necessitate additional EIA work or reconsideration of impacts, as there are no new, altered, or intensified interactions with sensitive receptors or environmental features beyond those previously assessed.

Following on from this, for those parameters that are within the existing PDE, the existing EIA findings remain valid, and no further assessment or amendment to the original ES is required under current regulatory requirements. The list of impacts scoped out on this basis is given in Appendix 1.

An updated version of the PDE Matrix Spreadsheet is also appended which aims to provide a central reference document for all the project design parameters used as a worst-case scenario of the project used for the impact assessment in each Chapter. The text has been coloured red where parameters and impacts shown in the table below are being proposed to be varied and green where there is no change.

5.2 Scoping of impacts where there is a change in the relevant parameters

A scoping assessment of impacts specifically linked to the parameters that are outside the consented envelope is undertaken in Table 1 below with explanations provided.

Table 1 Summary of impacts scoped in

Topic	Project Stage	Impact	Scoping	Explanation
Seascape Landscape and Visual Impact Assessment (SLVIA)	Construction	Impact 1: Visual impacts associated with offshore project components	Scoped in	The worst-case parameter for this impact is 6.5m above sea level. The TTL device max height above LAT is 18m. An updated SLVIA assessment will be undertaken to understand the impact of the additional device height. Engagement has already taken place between NRW Advisory and Isle of Anglesey County Council to scope the work required.
SLVIA	Operation	Impact 1: Visual impacts associated with operation (including repowering)	Scoped in	The worst-case parameter for this impact is 6.5m above sea level. The TTL device max height above LAT is 18m. An updated SLVIA assessment will be undertaken to understand the impact of the additional device height. Engagement has already taken place between NRW Advisory and Isle of Anglesey County Council to scope the work required.
SLVIA	Repowering/ Decommissioning	Impact 2: Potential impacts during repowering and decommissioning	Scoped in	The worst-case parameter for this impact is 6.5m above sea level. The TTL device max height above LAT is 18m. An updated SLVIA assessment will be undertaken to understand the impact of the additional device height. Engagement has already taken place between NRW Advisory and Isle of Anglesey County Council to scope the work required.
Marine Ornithology	Operation and Maintenance	Impact 4: Airborne Noise and Visual Disturbance	Scoped out	Whilst the device height above the water is greater than envisaged in the ES (18m vs 6.5m) it is not considered that this increase in structure height would materially affect the impact on bird species. This impact was considered negligible in the ES and recent initial consultation with NRW Advisory (NRW A) via the advisory group did not suggest any change in impact. For this reason it is proposed to scope out.

Topic	Project Stage	Impact	Scoping	Explanation
Marine Ornithology	Operation and Maintenance	Impact 5: Disturbance at breeding sites	Scoped out	Whilst the device height above the water is greater than envisaged in the ES (18m vs 6.5m) it is not considered that this increase in structure height would materially affect the impact on breeding bird populations owing to the distance offshore being over 2km.
Marine Ornithology	Operation and Maintenance	Impact 6: Collision risk with tidal devices	Scoped out	The blade width and swept area proposed are slightly greater than those used in the original ES and will be used in collision modelling for ornithology and marine mammals. However, it is important to note that collision risk is determined on a device specific basis and is controlled by the need to approve the EMMP and DDP required to be approved prior to deployment. Given that these parameters do not affect any other impact other than collision, it is proposed that these impacts are scoped out of the variation and form part of the pre deployment collision risk assessments.
Marine Ornithology	Operation and Maintenance	Impact 7: Collision risk with tidal devices	Scoped out	
Marine Mammals	Operation and Maintenance	Collision risk with operational turbines	Scoped out	

5.3 Navigational Risk

The navigational risk assessment of the Morlais project was undertaken by way of a Navigational Risk Assessment (NRA) at the pre-consent phase owing to the level of uncertainty with respect to what device technologies would be installed and where, assumptions were made to enable a worst case to be considered. This assumed that any device type that could be deployed within a Restricted Area would be deployed, i.e. in the Green Restricted Area risks were considered for surface emergent and seabed mounted devices. For this reason, the TTL surface emergent elements and seabed mounted elements have already been assessed for deployment in GR1 area.

In addition, owing to the possible variations in device types, the Marine Licence uses conditions to control development Navigational Risk post consent. Particularly Condition 3.36.4:

> *The Licence Holder must submit a tidal device/array specific NRA for written approval to the Licensing Authority at least 4 months prior to deployment. The NRA must consider the in-combination effect with already deployed tidal devices or arrays. No deployment of tidal device may be undertaken prior to written approval from the Licensing Authority.*

For this reason, it is not proposed to undertake a device specific NRA for the TTL device until the pre-deployment NRA under condition 3.9.

6 Proposed approach to Marine Licence variation

6.1 Intended changes to the Marine Licence

The intended approach to the Marine Licence variation is to change the licenced PDE parameters for swept area and blade width across the whole project. The variation to the device height localised to GR1 only.

6.2 Proposed methodology to update the ES

It is proposed to issue an Addendum to the Environmental Statement which will include:

i) Cover note
ii) Updated Chapter 4 Project Description (version F5.0) to include reference to seabed mounted and surface emergent devices and the changes parameters
iii) Updated Restricted Area Plan, showing area where 18m height devices can be installed (GR1)
iv) Updated PDE Scoping Matrix to include updated parameters
v) Addendum to Chapter 24 SLVIA with associated maps and visualisations (see below)

6.3 Proposed methodology to undertake the updated SLVIA

The proposed methodology for undertaking an updated SLVIA is being discussed with NRWA and Isle of Anglesey County Council (IACC). The proposal is as follows:

It is proposed that this technology type would only be deployed in the south western part of the MDZ, within area GR1 as shown in Figure 2. The approach to the Marine Licence variation would be consistent with the ES. It would be based on PDE approach and would be based on design parameters, with the TTL device type used as a representative device type for the purpose of the assessment.

The proposed location of the devices within the MDZ would be indicative, as further survey and engineering design work would be required to define the detail of the array. However, this technology type would be limited to berth area GR1. Each berth is proposed to have a generating capacity of 30MW and a specific technology would be limited to one berth. The PDE would take account of this, with 15 x 2MW TTL devices positioned in an array. The detail of the proposed deployment would be refined after the submission of the variation application to the Marine Licence, and this would form part of a subsequent submission under the DDP, as is the case with any specific deployment of devices within the MDZ.

The SLVIA for the Marine Licence variation would assess the revised PDE for a full theoretical deployment of tidal energy devices within the MDZ. The difference between the SLVIA chapter included in the ES and the assessment for the variation would be the inclusion of TTL devices as part of the overall array, which would be used to represent the inclusion of fixed, seabed mounted devices, which extend above sea level. The assumed worst case would include visualisations with the sea level shown at LAT, therefore showing the maximum extent of each TTL device (18m above LAT) that would be seen. The photomontages would be prepared to show the extent of devices that would be visible at LAT, although noting that the sea level in the baseline photography will be at varying tide heights.

There are differing opinions on which viewpoints should be included in the assessment, reviewing these it is proposed to prepare visualisations for the following locations, outlining the reason for inclusion:

- Viewpoint 1: Summit of Holyhead Mountain – elevated view, including the full extent of the MDZ
- Viewpoint 3: car park at South Stack Lighthouse – relatively elevated view relative to sea level and a popular location for visitors

- Viewpoint 6: South Stack Cliffs Nature Reserve/Penrhyn Mawr – lower elevation, closer to sea level, in the vicinity of the Wales Cast Path

The need for an additional offshore viewpoint was identified by IACC. All the viewpoints included in the SLVIA (including Viewpoint 14) were consulted on and agreed as part of the EIA process. It is considered that Viewpoint 6 provides a location that is broadly representative of recreational receptors close the coastal edge and is at a sufficiently low elevation to provide an indication of the nature of views that may be experienced. Therefore, it is considered Viewpoint 6 provides an indication of the view that may be experienced by receptors such as kayakers.

In relation to the other viewpoints included in the SLVIA, these have been considered in relation to this variation to the PDE. We are not proposing to use the other viewpoints for various reasons. Viewpoint 4 is close to Viewpoint 3 and shows a similar nature of view. Views to the MDZ from Viewpoints 2, 5 and 7 are more restricted by the intervening landform. Other viewpoints are more distant and the potential effects more limited as a consequence i.e. Viewpoints 8, 9, 10, 11 and 12.

The viewpoints would be used as representative locations to inform judgements regarding whether the predicted effects would be greater or less than those assessed in the ES. A concise assessment would be prepared compared with the SLVIA included in the ES. The IACC response requests that all receptors should be re-considered against the new PDE. It is proposed this would comprise a high-level assessment, with a focus on receptors closer to the MDZ, to assess all receptors to the same level that was undertaken for the ES would require preparing a comparably detailed SLVIA.

The visualisation would be presented in accordance with Landscape Institute Technical Guidance Note 06/19 Visual Representation of Development Proposals. Two different approaches have been suggested by NRW and IoACC, one requesting the visualisations be presented adjacent to the baseline photography, one requesting that separate pages are used for each It is proposed to present the baseline photography above the wireline visualisation or photomontage, but a different approach could be taken if necessary. The full extent of the MDZ extends beyond a 90 degree horizontal field of view and therefore will need to be split across more than one page. The specific detail of the presentation can be discussed and agreed if necessary.

6.4 Expected function of controls through existing Marine Licence Conditions

Whilst all of the existing Marine Licence Conditions are expected to control the development in the same way as they currently do, note that the following elements will have a particular role in managing the proposed changes introduce by the changes to the PDE.

6.4.1 Restricted Area Plan

This will be amended to show GR1 as a subset of the Green Restricted Area where the device height is permitted to be up to 18m above LAT.

6.4.2 Condition 3.23.1 vii – Device Deployment Protocol (updated SLVIA)

This condition will not be amended however it will be used to control the eventual deployment of TTL devices prior to deployment.

6.4.3 3.38.1 EMMP

The approved version of the EMMP for Phase 1 and the Subsea EMMP currently under consultation have confirmed the principle that the Collision Risk Models will be undertaken and agreed with the advisory group prior to deployment of the devices. This is the mechanism where the rotor parameters including the swept area and blade width (chord) will be used in combination with the EMMP sensory system to ensure the devices are acceptable from a collision perspective.

6.4.4 Condition 3.36.4 Navigational Risk Assessment

An array specific NRA will be undertaken and submitted under 3.36.4 once the exact locations and technology for the TT project are known.

7 Summary

A scoping assessment has been undertaken to identify areas in which the TTL device PDE parameters exceeded the worst-case parameters used within the ES. The result of this assessment found that only the device height, blade width (chord) and swept area exceeded the worst-case parameters for the construction, operation and decommissioning phases of the project. All of the other parameters are within the consented envelope and it is demonstrated that the TTL device is a hybrid of those devices already considered in the ES.

On this basis, impacts that have no pathway to be altered by the changes in device height, blade width and swept area are scoped out of the ES Addendum that will support the variation application. Further to this, potential changes to noise and disturbance impacts to ornithological receptors during operation are considered to be negligible and this impact is scoped out. Minor changes to the rotor swept and blade width parameters will be used in the collision risk assessments via the EMMP prior to device deployment and will be confirmed at that time and hence are scoped out of the ES addendum. The key Marine Licence Conditions are noted that will have a particular role in managing the proposed changes introduce by the changes to the PDE, including the array specific NRA in due course.

This leaves a requirement for updated SLVIA for which discussions are relatively advanced with NRWA and IACC and a methodology is being proposed.

Lastly the documentation expected to be submitted with the Marine Licence variation application is outlined.

8 Appendix 1 - Impacts considered and scoped out owing to no change in relevant parameters

Table 2 Tidal Technologies Scoping Assessment – impacts scoped out of further assessment

Topic	Project Stage	Impact	Scoping Conclusion
SLVIA	Construction	Impact 2: Visual impacts associated with onshore project components	Scoped out
Onshore Receptors	All Project Stages	All associated onshore project impacts	Scoped out
Metocean Conditions and Coastal Processes	Construction and Repowering	Impact 1: Changes in suspended sediment concentrations due to foundation installation in the Project	Scoped out
Metocean Conditions and Coastal Processes	Construction and Repowering	Impact 2: Changes in seabed level (morphology) due to deposition during foundation installation	Scoped out
Metocean Conditions and Coastal Processes	Construction and Repowering	Impact 3: Changes in suspended sediment concentrations during offshore export cable installation (including nearshore) (construction only)	Scoped out
Metocean Conditions and Coastal Processes	Construction and Repowering	Impact 4: Changes in seabed level due to offshore export cable installation (construction only)	Scoped out
Metocean Conditions and Coastal Processes	Construction and Repowering	Impact 5: Changes in suspended sediment concentrations during inter-array cable installation	Scoped out
Metocean Conditions and Coastal Processes	Construction and Repowering	Impact 6: Changes in seabed level due to inter-array cable installation	Scoped out
Metocean Conditions and Coastal Processes	Construction and Repowering	Impact 7: Changes in seabed level (morphology) due to indentations (vessels) during installation in the Project	Scoped out
Metocean Conditions and Coastal Processes	Operation and Maintenance	Impact 1: Changes to the tidal regime due to the presence of structures in the Project	Scoped out
Metocean Conditions and Coastal Processes	Operation and Maintenance	Impact 2: Changes to the wave regime due to the presence of structures in the Project	Scoped out
Metocean Conditions and Coastal Processes	Operation and Maintenance	Impact 3: Changes to the sediment transport regime due to the presence of structures in the Project	Scoped out

Topic	Project Stage	Impact	Scoping Conclusion
Metocean Conditions and Coastal Processes	Operation and Maintenance	Impact 4: Increases in Suspended Sediment Concentrations Due to Seabed Scour Induced by the Project	Scoped out
Metocean Conditions and Coastal Processes	Operation and Maintenance	Impact 5: Loss of seabed morphology due to the footprint of structures in the Project	Scoped out
Metocean Conditions and Coastal Processes	Operation and Maintenance	Impact 6: Changes to the Morphology and Sediment Transport Regime Due to Offshore Cable and Cable Protection (including Nearshore and Landfall)	Scoped out
Metocean Conditions and Coastal Processes	Operation and Maintenance	Impact 7: Changes to the Morphology and Sediment Transport Regime Due to Inter-Array Cable and Cable Protection	Scoped out
Metocean Conditions and Coastal Processes	Operation and Maintenance	Impact 8: Changes in Seabed Level Due to Indentations During Maintenance in the Project	Scoped out
Metocean Conditions and Coastal Processes	Decommissioning and repowering	Impact 1: Changes in suspended sediment concentrations due to device and hub removal	Scoped out
Metocean Conditions and Coastal Processes	Decommissioning and repowering	Impact 2: Changes in seabed level due to device and hub removal	Scoped out
Metocean Conditions and Coastal Processes	Decommissioning and repowering	Impact 3: Changes in suspended sediment concentrations during offshore export cable removal (including nearshore and at the coastal landfall) (decommissioning only)	Scoped out
Metocean Conditions and Coastal Processes	Decommissioning and repowering	Impact 4: Changes in seabed levels due to removal of the offshore export cables (decommissioning only)	Scoped out
Metocean Conditions and Coastal Processes	Decommissioning and repowering	Impact 5: Changes in suspended sediment concentrations during removal of parts of the inter-array cables	Scoped out
Metocean Conditions and Coastal Processes	Decommissioning and repowering	Impact 6: Changes in seabed levels due to removal of parts of the inter-array cables	Scoped out
Metocean Conditions and Coastal Processes	Decommissioning and repowering	Impact 7: Changes in seabed level (morphology) due to indentations during decommissioning in the Project	Scoped out
MWSQ	Construction and Repowering	Impact 1: Change in water quality due to sediment plume generated via foundation installation	Scoped out
MWSQ	Construction and Repowering	Impact 2: Change in water quality due to sediment plume generated via cable installation (construction only)	Scoped out

Topic	Project Stage	Impact	Scoping Conclusion
MWSQ	Construction and Repowering	Impact 3: Change in water quality due to release of contaminated sediments	Scoped out
MWSQ	Construction and Repowering	Impact 4: Change in water quality due to discharge of construction material and/or chemicals	Scoped out
MWSQ	Construction and Repowering	Impact 5: Deterioration in status of WFD waterbodies and/or local designated bathing waters	Scoped out
MWSQ	Operation and Maintenance	Impact 1: Change in water and/or sediment quality due to accidental spillages/leaks from operational devices	Scoped out
MWSQ	Operation and Maintenance	Impact 2: Change in water sediment quality due to sediment plumes generated by repowering and/or cable repair works	Scoped out
MWSQ	Operation and Maintenance	Impact 3: Change in water sediment quality due to sediment plumes produced via scour around seabed mounted project infrastructure	Scoped out
MWSQ	Decommissioning	Impact 1: Changes in suspended sediment concentrations during removal of project infrastructure	Scoped out
MWSQ	Decommissioning	Impact 2: Change in water and/or sediment quality due to accidental spillages/leaks from vessels involved in decommissioning works	Scoped out
Benthic	Construction and Repowering	Impact 1: Physical disturbance to habitats and species and temporary habitat loss	Scoped out
Benthic	Construction and Repowering	Impact 2: Increased suspended sediment concentration and sediment deposition	Scoped out
Benthic	Construction and Repowering	Impact 3: Pollution of water and sediment through accidental events	Scoped out
Benthic	Construction and Repowering	Impact 4: Physical disturbance to intertidal habitats and species during landfall works	Scoped out
Benthic	Construction and Repowering	Impact 5: Potential spread of non-native	Scoped out
Benthic	Operation and Maintenance	Impact 1: Long term loss of benthic habitat via placement of project infrastructure	Scoped out
Benthic	Operation and Maintenance	Impact 2: Changes in hydrodynamic and inter-related effects on benthic ecology	Scoped out
Benthic	Operation and Maintenance	Impact 3: Introduction of new habitat in the form of project infrastructure	Scoped out
Benthic	Operation and Maintenance	Impact 4: Temporary physical disturbance of seabed caused by maintenance and repowering activities	Scoped out
Benthic	Decommissioning	Impact 1: Physical disturbance to habitats and species and temporary habitat loss	Scoped out
Benthic	Decommissioning	Impact 2: Increases in suspended sediment concentration and subsequent deposition	Scoped out
Benthic	Decommissioning	Impact 3: Permanent loss of habitat	Scoped out
Fish and Shellfish Ecology	Construction	Impact 1: Underwater noise	Scoped out
Fish and Shellfish Ecology	Construction	Impact 2: Temporary habitat disturbance	Scoped out

Topic	Project Stage	Impact	Scoping Conclusion
Fish and Shellfish Ecology	Construction	Impact 3: Increased suspended sediment concentration and sediment deposition	Scoped out
Fish and Shellfish Ecology	Operation and Maintenance	Impact 1: Underwater Noise	Scoped out
Fish and Shellfish Ecology	Operation and Maintenance	Impact 2: Long-term habitat loss via placement of project infrastructure (project footprint)	Scoped out
Fish and Shellfish Ecology	Operation and Maintenance	Impact 3: Physical disturbance of habitats and temporary habitat loss (repowering only)	Scoped out
Fish and Shellfish Ecology	Operation and Maintenance	Impact 4: Increased suspended sediment concentration and sediment deposition (repowering only)	Scoped out
Fish and Shellfish Ecology	Operation and Maintenance	Impact 5: Barrier effects	Scoped out
Fish and Shellfish Ecology	Operation and Maintenance	Impact 6: Collision risk	Scoped out
Fish and Shellfish Ecology	Operation and Maintenance	Impact 8: Electromagnetic fields	Scoped out
Fish and Shellfish Ecology	Decommissioning	As per construction	Scoped out
Marine Ornithology	Construction	Impact 1: Airborne Noise and Visual Disturbance	Scoped out
Marine Ornithology	Construction	Impact 2: Disturbance at Breeding Sites	Scoped out
Marine Ornithology	Construction	Impact 3: Other Impacts	Scoped out
Marine Ornithology	Operation and Maintenance	Impact 8: Entanglement with Tidal devices	Scoped out
Marine Ornithology	Operation and Maintenance	Impact 9: Other Impacts	Scoped out
Marine Ornithology	Decommissioning	Impact 10: Airborne Noise and Visual Disturbance	Scoped out
Marine Ornithology	Decommissioning	Impact 11: Disturbance at Breeding Sites	Scoped out
Marine Ornithology	Decommissioning	Impact 12: Other Impacts	Scoped out
Marine Mammals	Construction	Underwater noise	Scoped out
Marine Mammals	Construction	Barrier effects from underwater noise	Scoped out
Marine Mammals	Construction	Disturbance haul-out sites	Scoped out
Marine Mammals	Construction	Increased collision risk with vessels	Scoped out
Marine Mammals	Construction	Changes in water quality	Scoped out

Topic	Project Stage	Impact	Scoping Conclusion
Marine Mammals	Construction	Changes in prey availability	Scoped out
Marine Mammals	Operation and Maintenance	Underwater noise	Scoped out
Marine Mammals	Operation and Maintenance	Collision risk with operational turbines	Scoped out
Marine Mammals	Operation and Maintenance	Increased collision risk with vessels	Scoped out
Marine Mammals	Operation and Maintenance	Entanglement with mooring lines	Scoped out
Marine Mammals	Operation and Maintenance	EMF effects	Scoped out
Marine Mammals	Operation and Maintenance	Barrier effects	Scoped out
Marine Mammals	Operation and Maintenance	Changes in water quality	Scoped out
Marine Mammals	Operation and Maintenance	Changes in prey availability	Scoped out
Marine Mammals	Decommissioning	Impacts same or less than construction	Scoped out
Offshore archaeology	Construction and Repowering	Impact 1: Direct physical impact on known and unknown maritime, aviation and submerged prehistoric cultural heritage assets	Scoped out
Offshore archaeology	Construction and Repowering	Impact 2: Indirect physical impacts on known and unknown maritime, aviation and submerged prehistoric cultural heritage assets	Scoped out
Offshore archaeology	Operation and Maintenance	Impact 3: Direct physical impact on known and unknown maritime, aviation and submerged prehistoric cultural heritage assets	Scoped out
Offshore archaeology	Operation and Maintenance	Impact 4: Indirect physical impacts on known and unknown maritime, aviation and submerged prehistoric cultural heritage assets	Scoped out
Offshore archaeology	Decommissioning	Impact 5: Direct physical impact on known and unknown maritime, aviation and submerged prehistoric cultural heritage assets	Scoped out
Offshore archaeology	Decommissioning	Impact 6: Indirect physical impacts on known and unknown maritime, aviation and submerged prehistoric cultural heritage assets	Scoped out
Commercial fisheries	Construction and Repowering	Impact 1: Loss of access to fishing grounds due to construction activity	Scoped out
Commercial fisheries	Construction and Repowering	Impact 2: Collision risk between commercial fishing vessels and construction vessels	Scoped out
Commercial fisheries	Construction and Repowering	Impact 3: Obstruction to regular fishing vessel transit routes	Scoped out
Commercial fisheries	Construction and Repowering	Impact 4: Interference with static fishing gear due to additional vessel traffic	Scoped out
Commercial fisheries	Construction and Repowering	Impact 5: Supply chain opportunities for local fishing vessels	Scoped out
Commercial fisheries	Operation and Maintenance	Impact 6: Collision risk between commercial fishing vessels and project infrastructure	Scoped out
Commercial fisheries	Operation and Maintenance	Impact 7: Loss of access to fishing grounds and displacement of fishing effort onto adjacent grounds	Scoped out

Topic	Project Stage	Impact	Scoping Conclusion
Commercial fisheries	Operation and Maintenance	Impact 8: Reduction in abundance of target species and reduced supply of catch to established local buyers	Scoped out
Commercial fisheries	Operation and Maintenance	Impact 9: Presence of seabed fasteners	Scoped out
Commercial fisheries	Operation and Maintenance	Impact 10: Supply chain opportunities for local fishing vessels	Scoped out
Commercial fisheries	Decommissioning	No worse than construction	Scoped out
Marine Infrastructure	Construction and Repowering	Impact 1: Disruption of ongoing MOD activities	Scoped out
Marine Infrastructure	Construction and Repowering	Impact 2: Interaction with UXO	Scoped out
Marine Infrastructure	Construction and Repowering	Impact 3: Interaction with active telecommunication cables	Scoped out
Marine Infrastructure	Operation and Maintenance	Impact 4: Disruption of ongoing MOD activities	Scoped out
Marine Infrastructure	Operation and Maintenance	Impact 5: Interaction with active telecommunication cables	Scoped out
Marine Infrastructure	Decommissioning	Impact 6: Disruption of ongoing MOD activities	Scoped out
Marine Infrastructure	Decommissioning	Impact 7: Interaction with UXO	Scoped out