Awel y Môr Offshore Wind Farm

Category 5: Reports

Report 5.2, Annex 6: Screeening Matrices

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Awel y Môr Offshore Wind Farm
Annex 6 Screening Matrices

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Glossary

Term	Definition
AA	Appropriate assessment
AyM	Awel Y Môr
C	Construction
D	Decommissioning
ECR	Export cable route
EMF	Electromagnetic frequencies
HRA	Habitat regulations assessment
INNS	Invasive non-native species
LSE	Likely significant effect
O&M	Operation and maintenance
OWFs	Offshore wind farms
PTS	Permanent threshold shift
RIAA	Report to inform appropriate assessment
SAC	Special area of conservation
SPA	Special protected area
SSC	Suspended sediment concentration
TTS	Temporary threshold shift

1 Screening Matrix – Impacts Considered

1.1.1 This document has been produced to present a summary of the screening for LSE assessments undertaken as part of the Report to Inform Appropriate Assessment (RIAA) to which the current Appendix is appended. This document is primarily for the use of The Planning Inspectorate to help inform their report on relevant HRA matters. The table below presents the screening conclusions upon the European site(s) which are considered within the RIAA. Impacts have been grouped where appropriate for ease of presentation.

Table 1.1 Effects considered in the matrices

Designation	Feature(s)	Effects considered in matrices
Special Area of Conservation (SAC)	Terrestrial habitat interest features	Physical habitat loss/ disturbance Pollution Invasive non-native species (INNS) Hydrology (onshore) In-combination
	Marine habitat interest features	Physical habitat loss/ disturbance Suspended sediment and deposition Pollution Invasive non-native species (INNS) Electromagnetic fields Changes to physical processes In-combination
	Migratory fish species interest features	Physical habitat loss/ disturbance Suspended sediment/ deposition Pollution Invasive non-native species Hydrology (onshore) Electromagnetic fields Changes to physical processes Underwater noise Effects on prey In-combination
	Marine mammal species interest features	Underwater noise Suspended sediment Vessel disturbance Physical habitat loss/ disturbance Collision risk Pollution Indirect: effects on prey EMF In-combination
Special Protection Area (SPA)	Ornithology species interest features	Disturbance and displacement Barrier effect Prey availability/Behaviour Collision risk Indirect: effects on prey In-combination

1.2 Matrix Key

1.2.1 ✓: Adverse Effect on Integrity **cannot** be excluded

1.2.2 X: Adverse Effect on Integrity **can** be excluded

1.2.3 Lower case letters in the table relate to the evidence supporting the conclusions below.

- C = construction
- O = operation
- D = decommissioning

1.2.4 Effects that have been identified to have no possible pathway or are not applicable to a particular feature are greyed out.

European sites considered in the Screening exercise with

Marine habitat interest features

Matrix 1: Y Fenai a Bae Conwy/ Menai Strait and Conwy Bay (UK) Special Area of Conservation HRA Screening - Awel y Môr offshore windfarm

Name of European site:	Y Fenai a Bae Conwy/ Menai Strait and Conwy Bay (UK) SAC
European site code:	UK0030202
Distance to relevant project	6.1 km to Array, ECR and Onshore Draft Order Limits

	Potential Likely Significant Effects (LSE) from Awel y Môr Offshore Wind Farm																							
	Physical habitat loss/ disturbance			**Suspended sediment and deposition**			Pollution			Invasive non-native species (INNS)			**EMF**			Changes to physical processes			Hydrology (onshore)			In-combination		
	C	O	D	C	O	D	C	O	D	C	O	D	C	O	D	C	O	D	C	O	D	C	O	D
Sandbanks which are slightly covered by sea water all the time	✓a	✓b	✓c	✓d	✓e	✓c	✓f	✓f	✓c	✓g	✓g	✓c		✓h		✓i	✓j	✓c	xl	xl	xl	✓m	✓m	✓m
Reefs	✓a	✓b	✓c	✓d	✓e	✓c	✓f	✓f	✓c	✓g	✓g	✓c		✓h		✓i	✓j	✓c	xl	xl	xl	✓m	✓m	✓m
Large shallow inlets and bays	✓a	✓b	✓c	✓d	✓e	✓c	✓f	✓f	✓c	✓g	✓g	✓c		✓h		✓i	✓j	✓c	xl	xl	xl	✓m	✓m	✓m
Submerged or partially submerged sea caves	✓a	✓b	✓c	✓d	✓e	✓c	✓f	✓f	✓c	✓g	✓g	✓c		✓h		✓i	✓j	✓c	xl	xl	xl	✓m	✓m	✓m
Mudflats and sandflats not covered by seawater at low tide	xn	xn	xn	✓d	✓e	✓c	✓f	✓f	✓c	✓g	✓g	✓c		xo		✓i	✓j	✓c	xl	xl	xl	✓m	✓m	✓m

Evidence supporting conclusions:

✓a	**Physical habitat loss/ disturbance (C, D):** Direct physical interactions with habitats (causing permanent or temporary loss or damage) would arise within the onshore cable corridor to accommodate infrastructure and cables. LSEs are identified with respect to works anywhere within a European site boundary, or for sites with woodland features, within 100m to account for root systems that might extend outside the site. It is standard good practice to avoid sensitive features and the final design is very unlikely to risk of disturbance or damage to this woodland. As the onshore cable corridor overlaps with the 100m buffer applied to Screening and pending confirmation on the nature of the works proximate to the site, LSE is identified.
✓b	**Physical habitat loss/ disturbance (O):** Cables would be buried in the ground during operation. It is unlikely, but feasible that emergency repairs to the buried cable are required; such operations would be rare and highly localised during the operational phase. Further, any changes to the physical structure of substrates due to excavations and compaction from vehicles and plant could persist until the land recovers. However, as there is no direct spatial overlap between the onshore cable corridor and this site, (and it is standard good practice to avoid sensitive features) no significant habitat impacts are expected. However, pending confirmation on the nature of the works proximate to the site, the potential for LSEs cannot be discounted
✓c	**Decommissioning (D):** Potential impacts during decommissioning are considered to be similar of potentially less than those outlined for construction. Therefore, a finding of no LSE is appropriate.
✓d	**Sediment deposition (C)**: Seabed disturbance during Construction (e.g., during cable installation) would alter SSC in the water and possibly the extent and thickness of sediments subsequently deposited on the intertidal. These habitats have low sensitivity to this impact (and tolerance to a high range of natural variability). Further, SSC would be transient and likely dissipate within a few tidal cycles. However, on the basis of proximity, LSEs cannot be discounted without further clarification on the likely disposition rates associated with the sediment plume and effects on habitats and defining communities through smothering and abrasion. Potential for LSEs.
✓e	**Sediment deposition (O):** The likelihood and magnitude of effects resulting from sediment deposition is considerably reduced due to the limited nature of required activities during O. Based on proximity, LSE cannot be discounted without further clarification on the likely activities during this phase and rates of deposition. LSE cannot be discounted
✓f	**Pollution (C, O, D):** Associated with leaks/ accidental spillages of fuels or oils used in plant. The small-scale, transitory nature of the onshore works are considered to present a low risk of a significant pollution event to ground, water and / or air. Vectors to features within the site are limited given that works would not occur within the site. As standard pollution control measures would be applied to ensure the risks are reduced to negligible levels, LSEs are not therefore anticipated; however, with reference to these measures, this pathway is advanced to Stage Two (AA) (to ensure compliance with the Sweetman ruling.[1]
✓g	**Invasives (C, O, D):** The arrival and movement of land-based plant and machinery, soil stripping and storage areas represents potential vectors for the introduction or spread of INNS. The risk is therefore greater for the construction phase than associated with rare and highly localised activities in O & M. that INNS would negatively habitats within this site is considered to be low, based on assumed compliance with the legislative

[1] People Over Wind and Mr Peter Sweetman v. Coillte. Teoranta (C-323/17)

	framework that controls the spread of INNS, but possible. Additional industry standard control measures will therefore be followed to reduce the risk of INNS propagation to negligible levels. This pathway will be considered at Stage Two (AA) with respect to these measures to ensure compliance with the Sweetman ruling[2]. LSE cannot be discounted.
✓h	**EMF (O):** EMF are generated by the current that passes through an electric cable. It is known that EMF can be detected by fish and it is thought that many benthic invertebrates can also detect EMF. Three types of fields are generated by underwater electric cables: electric fields (E-fields), magnetic fields (B-fields) and induced electric fields (iE-fields). Standard industry practice is for the cables used to have sufficient shielding to contain the E-fields generated and the cable system descriptions for the inter-array and export cables have abided by this (Chapter 1: Offshore Project Description). Shielding and/ or burial does not reduce the B-fields and it is these fields that allow the formation of iE-fields. As such, further reference here to EMF is limited to B-fields and associated iE-fields. Due to the nature of the impact, any potential LSE will only apply during the operation and maintenance phase and cannot be discounted at this stage.
✓i	**Physical processes (C):** Direct interaction with designated (and/or supporting) habitat could occur during C, O and D. Potential linked to various activities, including movement of plant, or installation/maintenance of structures. The installation of the export cables and the wind turbine generators (WTGs) themselves are close enough to the Y Fenai a Bae Conwy/ Menai Strait and Conwy Bay (UK) SAC to potentially affect coastal processes and therefore LSE cannot be discounted at this stage.
✓j	**Physical processes (O**): The presence of array structures, scour/cable protection and/ or sub-surface cables could influence the rate of erosion and deposition of sediment and / or prompt changes in water movement (e.g. to wave action). Extreme changes to wave action could alter the topography of the intertidal area and its physical and biological integrity. Changes to physical processes are expected to be small scale and localised with no implications for the habitats within this site. On present information, and pending evidence from more detailed assessment, LSE cannot be discounted.
✓k	**Hydrology (C, O, D):** A pathway to LSEs exists to habitat loss and /or degradation through the potential disruption of hydrological and / or hydrogeological functioning (hydro-ecology) of the SAC. Changes to ground conditions and drainage could arise during Construction e.g. excavations and/or trenching) and/or through the permanent presence of the buried cable. As there is a need for further information, the pathway to LSEs by hydrological changes should be considered at Stage 2 AA
xl	**Hydrology (C, O, D):** No potential for LSE
✓m	**In-combination (C, O, D):** Where the potential for LSEs has been concluded for the project acting alone, the potential for LSEs has been concluded with respect to effects in-combination. No additional in-combination issues are identified.
xn	**Physical habitat loss/ disturbance:** No potential for LSE
xo	**EMF (O):** No potential for LSE

End of Matrix 1

[2] People Over Wind and Mr Peter Sweetman v. Coillte. Teoranta (C-323/17)

Matrix 2: Dee Estuary/ Aber Dyfrdwy Special Area of Conservation HRA Screening - Awel y Môr offshore windfarm

Name of European site:	Dee Estuary/ Aber Dyfrdwy (UK) SAC
European site code:	UK0030131
Distance to relevant project component:	21 km to array / 3.5 km to ECR / 2.1 km to Onshore Draft Order Limits

	Potential Likely Significant Effects (LSE) from Awel y Môr Offshore Wind Farm																							
	Physical habitat loss/ disturbance			Suspended sediment/ deposition			Pollution			Invasive non-native species			Hydrology (onshore)			Changes to physical processes			EMF			In-combination		
	C	O	D	C	O	D	C	O	D	C	O	D	C	O	D	C	O	D	C	O	D	C	O	D
Mudflats and sandflats not covered by seawater at low tide	xa	xa	xa	✓b	✓c	✓d	✓e	✓e	✓d	✓f	✓f	✓d	xg	xg	xg		✓h			✓i		✓j	✓j	✓j
Salicornia and other annuals colonizing mud and sand	xa	xa	xa	✓b	✓c	✓d	✓e	✓e	✓d	✓f	✓f	✓d	xg	xg	xg		✓h			✓i		✓j	✓j	✓j
Atlantic salt meadows (Glauco-Puccinellietalia maritimae)	xa	xa	xa	✓b	✓c	✓d	✓e	✓e	✓d	✓f	✓f	✓d	xg	xg	xg		✓h			✓i		✓j	✓j	✓j
Estuaries	xa	xa	xa	✓b	✓c	✓d	✓e	✓e	✓d	✓f	✓f	✓d	xg	xg	xg		✓h			✓i		✓j	✓j	✓j
Annual vegetation drift lines																								
Vegetated sea cliffs Embryonic shifting dunes																								
Shifting dunes with Ammophilia arenaria (white dunes)																								
Fixed coastal dunes																								
Humid dune slacks																								
Petalwort																								

Evidence supporting conclusions

xa	**Physical habitat loss/ disturbance (C, O, D):** No potential for LSE
✓b	**Sediment deposition (C)**: Seabed disturbance during Construction (e.g., during cable installation) would alter SSC in the water and possibly the extent and thickness of sediments subsequently deposited on the intertidal. These habitats have low sensitivity to this impact (and tolerance to a high range of natural variability). Further, SSC would be transient and likely dissipate within a few tidal cycles. However, on the basis of proximity, LSEs cannot be discounted without further clarification on the likely disposition rates associated with the sediment plume and effects on habitats and defining communities through smothering and abrasion. Potential for LSEs.
✓c	**Sediment deposition (O):** The likelihood and magnitude of effects resulting from sediment deposition is considerably reduced due to the limited nature of required activities during O. Based on 10proximity, LSE cannot be discounted without further clarification on the likely activities during this phase and rates of deposition. LSE cannot be discounted
✓d	**Decommissioning:** Potential impacts during decommissioning are considered to be similar of potentially less than those outlined for construction. Therefore, a finding of no LSE is appropriate.
✓e	**Pollution (C, O):** Associated with leaks/ accidental spillages of fuels or oils used in plant. The small-scale, transitory nature of the onshore works are considered to present a low risk of a significant pollution event to ground, water and / or air. Vectors to features within the site are limited given that works would not occur within the site. As standard pollution control measures would be applied to ensure the risks are reduced to negligible levels, LSEs are not therefore anticipated; however, with reference to these measures, this pathway is advanced to Stage Two (AA) (to ensure compliance with the Sweetman ruling.[3]

[3] People Over Wind and Mr Peter Sweetman v. Coillte. Teoranta (C-323/17)

✓f	**Invasives (C, O):** Turbine foundations and cable protection could create enhanced habitat for INNS. If this habitat were to provide a sink for particles dispersing from an existing site/source, it may act as a 'stepping stone' for the propogation of INNS, thereby increasing the risk to intertidal habitats. The amount of hard substrate and the existence and spread of INNS already present will influence the measure of risk, this will be investigated at Stage 2 (AA) and with respect to these measures to ensure compliance with the Sweetman ruling. LSE cannot be discounted.
Xg	**Hydrology (C, O, D):** No potential for LSE
✓h	**Physical processes (O**): The presence of array structures, scour/cable protection and/ or sub-surface cables could influence the rate of erosion and deposition of sediment and / or prompt changes in water movement (e.g. to wave action). Extreme changes to wave action could alter the topography of the intertidal area and its physical and biological integrity. Changes to physical processes are expected to be small scale and localised with no implications for the habitats within this site. On present information, and pending evidence from more detailed assessment, LSE cannot be discounted.
✓i	**EMF (O):** EMF are generated by the current that passes through an electric cable. It is known that EMF can be detected by fish and it is thought that many benthic invertebrates can also detect EMF. Three types of fields are generated by underwater electric cables: electric fields (E-fields), magnetic fields (B-fields) and induced electric fields (iE-fields). Standard industry practice is for the cables used to have sufficient shielding to contain the E-fields generated and the cable system descriptions for the inter-array and export cables have abided by this (Chapter 1: Offshore Project Description). Shielding and/ or burial does not reduce the B-fields and it is these fields that allow the formation of iE-fields. As such, further reference here to EMF is limited to B-fields and associated iE-fields. Due to the nature of the impact, any potential LSE will only apply during the operation and maintenance phase and cannot be discounted at this stage.
✓j	**In-combination (C, O, D):** Where the potential for LSEs has been concluded for the project acting alone, the potential for LSEs has been concluded with respect to effects in-combination. No additional in-combination issues are identified.

End of Matrix 2

Matrix 3: Dee Estuary Ramsar (Criterion 1: Habitats) – HRA Screening for Awel y Môr Offshore windfarm

Name of European site:	The Dee Estuary (UK) Ramsar[4]
European site code:	UK11082
Distance to relevant project	21 km to array / 3.5 km to ECC / 2.1 km from Onshore Draft Order Limits

	Potential Likely Significant Effects (LSE) from Awel y Môr Offshore Wind Farm																							
	Physical habitat loss/ disturbance			Suspended sediment/ deposition			Pollution			Invasive non-native species			Hydrology (onshore)			Changes to physical processes			EMF			In-combination		
	C	O	D	C	O	D	C	O	D	C	O	D	C	O	D	C	O	D	C	O	D	C	O	D
Ramsar criterion 1: Habitats Directive Annex I feature present[5]																								
Extensive intertidal mud and sand flats with large expanses of saltmarsh	xa	xa	xa	✓b	✓c	✓d	✓e	✓e	✓d	✓f	✓f	✓d	xg	xg	xg	✓h	✓i	✓c		✓j		✓k	✓k	✓k

Evidence supporting conclusions

xa	**Physical habitat loss/ disturbance (C, D):** No LSE identified.
✓b	**Sediment deposition (C)**: Seabed disturbance during Construction (e.g., during cable installation) would alter SSC in the water and possibly the extent and thickness of sediments subsequently deposited on the intertidal. These habitats have low sensitivity to this impact (and tolerance to a high range of natural variability). Further, SSC would be transient and likely dissipate within a few tidal cycles. However, on the basis of proximity, LSEs cannot be discounted without further clarification on the likely disposition rates associated with the sediment plume and effects on habitats and defining communities through smothering and abrasion. Potential for LSEs.
✓c	**Sediment deposition (O):** The likelihood and magnitude of effects resulting from sediment deposition is considerably reduced due to the limited nature of required activities during O. Based on proximity, LSE cannot be discounted without further clarification on the likely activities during this phase and rates of deposition. LSE cannot be discounted
✓d	**Decommissioning:** Potential impacts during decommissioning are considered to be similar of potentially less than those outlined for construction. Therefore, a finding of no LSE is appropriate.
✓e	**Pollution (C, O):** Associated with leaks/ accidental spillages of fuels or oils used in plant. The small-scale, transitory nature of the onshore works are considered to present a low risk of a significant pollution event to ground, water and / or air. Vectors to features within the site are limited given that works would not occur within the site. As standard pollution control measures would be applied to ensure the risks are reduced to negligible levels, LSEs are not therefore anticipated; however, with reference to these measures, this pathway is advanced to Stage Two (AA) (to ensure compliance with the Sweetman ruling.[6]
✓f	**Invasive non-native species (C, O):** Turbine foundations and cable protection could create enhanced habitat for INNS. If this habitat were to provide a sink for particles dispersing from an existing site/source, it may act as a 'stepping stone' for the propagation of INNS, thereby increasing the risk to intertidal habitats. The amount of hard substrate and the existence and spread of INNS already present will influence the measure of risk, this will be investigated at Stage 2 (AA) and with respect to these measures to ensure compliance with the Sweetman ruling. LSE cannot be discounted.
xg	**Hydrology (C, O, D):** No potential for LSE
✓h	**Physical processes (C):** Direct interaction with designated (and/or supporting) habitat could occur during C, O&M and D. Potential linked to various activities, including movement of plant, or installation/maintenance of structures. The installation of the export cables and the wind turbine generators (WTGs) themselves are close enough to the Y Fenai a Bae Conwy/ Menai Strait and Conwy Bay (UK) SAC to potentially affect coastal processes and therefore LSE cannot be discounted at this stage.

[4] The Dee Estuary Ramsar is split between Wales and England

[5] [redacted]

[6] People Over Wind and Mr Peter Sweetman v. Coillte. Teoranta (C-323/17)

✓i	**Physical processes (O**): The presence of array structures, scour/cable protection and/ or sub-surface cables could influence the rate of erosion and deposition of sediment and / or prompt changes in water movement (e.g. to wave action). Extreme changes to wave action could alter the topography of the intertidal area and its physical and biological integrity. Changes to physical processes are expected to be small scale and localised with no implications for the habitats within this site. On present information, and pending evidence from more detailed assessment, LSE cannot be discounted.
✓j	**EMF (O):** EMF are generated by the current that passes through an electric cable. It is known that EMF can be detected by fish and it is thought that many benthic invertebrates can also detect EMF. Three types of fields are generated by underwater electric cables: electric fields (E-fields), magnetic fields (B-fields) and induced electric fields (iE-fields). Standard industry practice is for the cables used to have sufficient shielding to contain the E-fields generated and the cable system descriptions for the inter-array and export cables have abided by this (Chapter 1: Offshore Project Description). Shielding and/ or burial does not reduce the B-fields and it is these fields that allow the formation of iE-fields. As such, further reference here to EMF is limited to B-fields and associated iE-fields. Due to the nature of the impact, any potential LSE will only apply during the operation and maintenance phase and cannot be discounted at this stage.
✓k	**In-combination (C, O, D):** Where the potential for LSEs has been concluded for the project acting alone, the potential for LSEs has been concluded with respect to effects in-combination. No additional in-combination issues are identified.

End of Matrix 3 (additional features considered in Matrices 18)

European sites considered in the Screening exercise with

Migratory fish species interest features

Matrix 4: Dee Estuary/ Aber Dyfrdwy Special Area of Conservation HRA Screening - Awel y Môr offshore windfarm

Name of European site:	Dee Estuary/ Aber Dyfrdwy (UK) SAC
European site code:	UK0030131
Distance to relevant project component:	21 km to Array / 3.5 km to ECR / 2.1 km to Onshore Draft Order Limits

	Potential Likely Significant Effects (LSE) from Awel y Môr Offshore Wind Farm																										
	Underwater noise			Suspended sediment/ deposition			Pollution			EMF			Physical habitat loss/ disturbance			Invasive non-native species			Hydrology onshore			Effects on prey			In-combination		
	C	O	D	C	O	D	C	O	D	C	O	D	C	O	D	C	O	D	C	O	D	C	O	D	C	O	D
Sea lamprey	✓a	x b	✓a	✓c	x d	✓c	✓e	✓e	✓e		✓f		x g	x g	x g	x h	x h	x h	x i	x i	x i	x j	x j	x j	✓k	✓k	✓k
River lamprey	✓a	x b	✓a	✓c	x d	✓c	✓e	✓e	✓e		✓f		x g	x g	x g	x h	x h	x h	x i	x i	x i	x j	x j	x j	✓k	✓k	✓k

Evidence supporting conclusions

✓a	**Underwater noise (C, D)** Potential impacts range from physical injury and mortality, through temporary hearing impairment (temporary threshold shift (TTS) and or permanent hearing damage (permanent threshold shift, PTS) and disturbance. LSEs cannot be discounted on current information and pending noise modelling outputs and baseline consolidation. Pathway requires consideration at Stage 2 AA.
x b	**Underwater noise (O):** No potential for LSE
✓c	**Sediment deposition (C, D)**: Seabed disturbance during Construction (e.g., during cable installation) would alter SSC in the water and possibly the extent and thickness of sediments subsequently deposited on the intertidal. These habitats have low sensitivity to this impact (and tolerance to a high range of natural variability). Further, SSC would be transient and likely dissipate within a few tidal cycles. However, on the basis of proximity, LSEs cannot be discounted without further clarification on the likely disposition rates associated with the sediment plume and effects on habitats and defining communities through smothering and abrasion. Potential for LSEs.
x d	**Sediment deposition (O)** No potential for LSE
✓e	**Pollution (C, O, D):** Associated with leaks/ accidental spillages of fuels or oils used in plant. The small-scale, transitory nature of the onshore works are considered to present a low risk of a significant pollution event to ground, water and / or air. Vectors to features within the site are limited given that works would not occur within the site. As standard pollution control measures would be applied to ensure the risks are reduced to negligible levels, LSEs are not therefore anticipated; however, with reference to these measures, this pathway is advanced to Stage Two (AA) (to ensure compliance with the Sweetman ruling.[7]
✓f	**EMF (O)** EMF are generated by the current that passes through an electric cable and it is known that EMF can be detected by fish. Three types of fields are generated by underwater electric cables: electric fields (E-fields), magnetic fields (B-fields) and induced electric fields (iE-fields). Standard industry practice is for the cables used to have sufficient shielding to contain the E-fields generated and the cable system descriptions for the inter-array and export cables have abided by this (Chapter 1: Offshore Project Description). Shielding and/ or burial does not reduce the B-fields and it is these fields that allow the formation of iE-fields. As such, further reference here to EMF is limited to B-fields and associated iE-fields. Due to the nature of the impact, any potential LSE will only apply during the operation and maintenance phase and cannot be discounted at this stage.
x g	**Physical habitat loss/ disturbance (C, O, D)** No potential for LSE
x h	**Invasive non-native species (C, O, D):** No potential for LSE
x i	**Hydrology (C, O, D):** No potential for LSE
x j	**Effects on prey (C, O, D):** No potential for LSE
✓k	**In-combination (C, O, D):** Where the potential for LSEs has been concluded for the project acting alone, the potential for LSEs has been concluded with respect to effects in-combination. No additional in-combination issues are identified.

[7] People Over Wind and Mr Peter Sweetman v. Coillte. Teoranta (C-323/17)

End of Matrix 4

Matrix 5: River Dee and Bala Lake/ Afon Dyfrdwy a Llyn Tegid Special Area of Conservation HRA Screening - Awel y Môr offshore windfarm

Name of European site:	River Dee and Bala Lake/ Afon Dyfrdwy a Llyn Tegid SAC
European site code:	UK0030252
Distance to relevant project component:	46.1 km to Array / 27.7 km to ECR / 26.1 km to Onshore Draft Order Limits

	Potential Likely Significant Effects (LSE) from Awel y Môr Offshore Wind Farm																										
	Underwater noise			Suspended sediment/ deposition			Pollution			EMF			Physical habitat loss/ disturbance			Invasive non-native species			Hydrology onshore			Effects on prey			In-combination		
	C	O	D	C	O	D	C	O	D	C	O	D	C	O	D	C	O	D	C	O	D	C	O	D	C	O	D
Atlantic salmon	✓a	x b	✓a	✓c	x d	✓c	✓e	✓e	✓e		✓f		x g	x g	x g	x h	x h	x h	x i	x i	x i	x j	x j	x j	✓k	✓k	✓k
Sea lamprey	✓a	x b	✓a	✓c	x d	✓c	✓e	✓e	✓e		✓f		x g	x g	x g	x h	x h	x h	x i	x i	x i	x j	x j	x j	✓k	✓k	✓k
River lamprey	✓a	x b	✓a	✓c	x d	✓c	✓e	✓e	✓e		✓f		x g	x g	x g	x h	x h	x h	x i	x i	x i	x j	x j	x j	✓k	✓k	✓k
Otter																											
Bullhead																											
Brook lamprey																											
Water courses of plain to montane levels																											
Floating water plantain																											

Evidence supporting conclusions

✓a	**Underwater noise (C, D)** Potential impacts range from physical injury and mortality, through temporary hearing impairment (temporary threshold shift (TTS) and or permanent hearing damage (permanent threshold shift, PTS) and disturbance. LSEs cannot be discounted on current information and pending noise modelling outputs and baseline consolidation. Pathway requires consideration at Stage 2 AA.
x b	**Underwater noise (O):** No potential for LSE
✓c	**Sediment deposition (C, D)**: Seabed disturbance during Construction (e.g., during cable installation) would alter SSC in the water and possibly the extent and thickness of sediments subsequently deposited on the intertidal. These habitats have low sensitivity to this impact (and tolerance to a high range of natural variability). Further, SSC would be transient and likely dissipate within a few tidal cycles. However, on the basis of proximity, LSEs cannot be discounted without further clarification on the likely disposition rates associated with the sediment plume and effects on habitats and defining communities through smothering and abrasion. Potential for LSEs.
x d	**Sediment deposition (O):** No potential for LSE
✓e	**Pollution (C, O, D):** Associated with leaks/ accidental spillages of fuels or oils used in plant. The small-scale, transitory nature of the onshore works are considered to present a low risk of a significant pollution event to ground, water and / or air. Vectors to features within the site are limited given that works would not occur within the site. As standard pollution control measures would be applied to ensure the risks are reduced to negligible levels, LSEs are not therefore anticipated; however, with reference to these measures, this pathway is advanced to Stage Two (AA) (to ensure compliance with the Sweetman ruling.[8]
✓f	**EMF (O)** EMF are generated by the current that passes through an electric cable and it is known that EMF can be detected by fish. Three types of fields are generated by underwater electric cables: electric fields (E-fields), magnetic fields (B-fields) and induced electric fields (iE-fields). Standard industry practice is for the cables used to have sufficient shielding to contain the E-fields generated and the cable system descriptions for the inter-array and export cables have abided by this (Chapter 1: Offshore Project Description). Shielding and/ or burial does not reduce the B-fields and it is these fields that allow the formation of iE-fields. As such, further reference here to EMF is limited to B-fields and associated iE-fields. Due to the nature of the impact, any potential LSE will only apply during the operation and maintenance phase and cannot be discounted at this stage.

[8] People Over Wind and Mr Peter Sweetman v. Coillte. Teoranta (C-323/17)

x g	**Physical habitat loss/ disturbance (C, O, D)** No potential for LSE
x h	**Invasive non-native species (C, O, D):** No potential for LSE
x i	**Hydrology (C, O, D):** No potential for LSE
x j	**Effects on prey (C, O, D)** No potential for LSE
✓k	**In-combination (C, O, D):** Where the potential for LSEs has been concluded for the project acting alone, the potential for LSEs has been concluded with respect to effects in-combination. No additional in-combination issues are identified.

End of Matrix 5

European sites considered in the Screening exercise with

Marine mammal species interest features

Matrix 6: North Anglesey Marine / Gogledd Môn Forol Special Area of Conservation - HRA Screening - Awel y Môr offshore windfarm

Name of European site:	North Anesey Marine / Gogledd Môn Forol
European site code:	UK0030398
Distance to relevant project component:	23.5 km to Array / 30.8 km to ECR / 22.6 km to Onshore Draft Order Limits

	Potential Likely Significant Effects (LSE) from Awel y Môr Offshore Wind Farm																										
	Underwater noise			Suspended sediment			**Vessel disturbance**			Physical habitat loss/ disturbance			Collision risk			Pollution			Indirect: effects on prey			EMF			In-combination		
	C	O	D	C	O	D	C	O	D	C	O	D	C	O	D	C	O	D	C	O	D	C	O	D	C	O	D
Harbour porpoise	✓a	x b	✓a	x c	x c	x c	x d	x d	x d	x e	x e	x e	x f	x f	x f	x g	x g	x g	x h	x h	x h		x i		✓ j	xk	✓ j

Evidence supporting conclusions

✓a	**Underwater noise (C, D)** Harbour porpoises have the potential to be affected by underwater noise from multiple possible sources during Construction. Potential impacts range from physical injury and mortality, through temporary hearing impairment (temporary threshold shift (TTS) and or permanent hearing damage (permanent threshold shift, PTS) and disturbance. LSEs cannot be discounted on current information and pending noise modelling outputs and baseline consolidation. Pathway requires consideration at Stage 2 AA.
x b	**Underwater noise (O)** Operational underwater noise associated with WTG would be low-level and localised. Noise from O&M vessel traffic is also considered likely to be of negligible consequence in the context of background levels generated by shipping and human activities in the area. Together, these sources of underwater noise during O&M are unlikely to produce a significant behavioural response in harbour porpoise. Further noting the distance of the SAC from the array (and reduced likelihood of exposure) LSEs (from pathway acting alone) are therefore discounted.
x c	**Suspended sediment (C, O, D)** Sediment mobilisation, suspension and deposition during Construction and (to a much lesser extent, O&M) could result in a temporary change in marine water quality (i.e. increased turbidity) during works to install the offshore cables and foundations. The most significant impacts of sediment plumes are generally localised, temporary and within the parameters of natural change for cetaceans that often reside in turbid waters. As harbour porpoises can echolocate to acoustically visualise prey in murky waters (MICS, 2019), and given the transitory nature of the species, it has been concluded that LSE can be discounted.
x d	**Vessel disturbance (C, O, D)** Vessels during Construction and O&M could cause disturbance and displacement related impacts. Harbour porpoise is vulnerable to vessel disturbance; however, effects would be low in magnitude and extent. Effects are anticipated to be negligible to harbour porpoise noting that vast areas of unaffected habitat would still be available. LSEs (from pathway acting alone) are therefore discounted.
x e	**Physical habitat loss/ disturbance** Habitat loss and / or degradation of habitat (from physical disturbance) could result within the offshore array and search area during works to install the WTG and cables and also any scour and or / cable protection. Long-term habitat loss would result for the lifetime of the project from the presence of the foundations or cable protection on the seabed and through the water column. The significance of the small loss anticipated within the Application Boundary at 12 km away the SAC is considered *de minimis* to this receptor (and its prey). Therefore, LSE can be discounted.
x f	**Collision risk (C, O, D)** The project would result in a relatively small increase in vessel traffic during Construction and O&M compared to background levels. Such an increase, 12 km away from the SAC, is not likely to present a significant risk to this feature at population level from increased collision risk. Although the implications are high (potential for individual mortality) LSEs are not anticipated. LSEs (from pathway acting alone) are therefore discounted
x g	**Pollution (C, O, D)** Pollution from possible leaks, accidental spillages of fuels or oils used in plant for Construction and maintenance activities, or the disturbance of contaminated sediment could lead to a reduction in marine water quality should pollutants reach the marine environment and disperse. Exposure to toxins can result in reduced species fitness, bioaccumulation in tissues, increased susceptibility to disease and in extreme cases, mortality. Given the nature of the works, project activities and plant have limited potential to generate emissions to the marine environment. Further applying professional judgement about the nature of the receiving environment and the distance between the project and the SAC, contaminants would be subject to significant dilution and dispersion in the open coastal environment. LSE (from pathway acting alone) is therefore discounted.
x h	**Indirect effects on prey** - Prey species could be affected during Construction and (to a much lesser extent O&M) by changes to water quality, suspended sediment underwater noise, direct habitat loss or damage, EMF, changes to physical processes and INNS. Indirect impacts on harbour porpoise could result due to displaced or reduced foraging resource (at lower trophic levels). The pathway to significant impacts due to insufficient prey resource is weak for this highly mobile receptor. Temporary and low-impact effects are anticipated for local fish and benthic ecology. As such, there would be sufficient alternative resource available to support the harbour porpoise population.

x i	**EMF (O)** Marine mammals can detect magnetic fields and some species of fish can detect electric fields. EMF may be emitted from the submarine circuits into the water, but is predicted to be of minor significance based on studies on the potential effects of EMF generated by wind farm submarine cables that (e.g. **Invalid source specified.**) have shown effects to be highly localised and non-significant. There is no evidence that subtidal power cables cause behavioural changes and anecdotal evidence suggests a lack of avoidance reactions. Even the more concentrated effect from the cumulative Operation of the inter-array cables is considered to be non-significant in the context of the habitat area available for this receptor. Effects are considered *de minimis* and LSE (from pathway acting alone) is therefore discounted.
✓ j	**In-combination (C, O, D):** Where the potential for LSEs has been concluded for the project acting alone, the potential for LSEs has been concluded with respect to effects in-combination. No additional in-combination issues are identified.
xk	**In-combination (C, O, D):** Low species sensitivity to the impacts considered, or the small measure of effects predicted mean that Awel y Môr could not contribute to any or no measurable or material degree to in-combination effects.

End of Matrix 6

Matrix 7: Bristol Channel Approaches / Dynesfeydd Môr Hafren Special Area of Conservation - HRA Screening - Awel y Môr offshore windfarm

Name of European site:	Bristol Channel Approaches / Dynesfeydd Môr Hafren
European site code:	UK0030396
Distance to relevant project component:	195.1 km to Array / 191.6 km to ECR / 182.6 km to Onshore Draft Order Limits

	Underwater noise			Suspended sediment			Vessel disturbance			Physical habitat loss/ disturbance			Collision risk			Pollution			Indirect: effects on prey			EMF			In-combination		
	C	O	D	C	O	D	C	O	D	C	O	D	C	O	D	C	O	D	C	O	D	C	O	D	C	O	D
Harbour porpoise	✓a	x b	✓a	x c	x c	x c	x d	x d	x d	x e	x e	x e	x f	x f	x f	x g	x g	x g	x h	x h	x h		x i		✓ j	xk	✓ j

Evidence supporting conclusions

✓a	**Underwater noise (C, D)** Harbour porpoises have the potential to be affected by underwater noise from multiple possible sources during Construction. Potential impacts range from physical injury and mortality, through temporary hearing impairment (temporary threshold shift (TTS) and or permanent hearing damage (permanent threshold shift, PTS) and disturbance. LSEs cannot be discounted on current information and pending noise modelling outputs and baseline consolidation. Pathway requires consideration at Stage 2 AA.
x b	**Underwater noise (O)** Operational underwater noise associated with WTG would be low-level and localised. Noise from O&M vessel traffic is also considered likely to be of negligible consequence in the context of background levels generated by shipping and human activities in the area. Together, these sources of underwater noise during O&M are unlikely to produce a significant behavioural response in harbour porpoise. Further noting the distance of the SAC from the array (and reduced likelihood of exposure) LSEs (from pathway acting alone) are therefore discounted.
x c	**Suspended sediment (C, O, D)** Sediment mobilisation, suspension and deposition during Construction and (to a much lesser extent, O&M) could result in a temporary change in marine water quality (i.e. increased turbidity) during works to install the offshore cables and foundations. The most significant impacts of sediment plumes are generally localised, temporary and within the parameters of natural change for cetaceans that often reside in turbid waters. As harbour porpoises can echolocate to acoustically visualise prey in murky waters (MICS, 2019), and given the transitory nature of the species, it has been concluded that LSE can be discounted.
x d	**Vessel disturbance (C, O, D)** Vessels during Construction and O&M could cause disturbance and displacement related impacts. Harbour porpoise is vulnerable to vessel disturbance, however, effects would be low in magnitude and extent. Effects are anticipated to be negligible to harbour porpoise noting that vast areas of unaffected habitat would still be available. LSEs (from pathway acting alone) are therefore discounted.
x e	**Physical habitat loss/ disturbance** Habitat loss and / or degradation of habitat (from physical disturbance) could result within the offshore array and search area during works to install the WTG and cables and also any scour and or / cable protection. Long-term habitat loss would result for the lifetime of the project from the presence of the foundations or cable protection on the seabed and through the water column. The significance of the small loss anticipated within the Application Boundary at 12 km away the SAC is considered *de minimis* to this receptor (and its prey). Therefore, LSE can be discounted.
x f	**Collision risk (C, O, D)** The project would result in a relatively small increase in vessel traffic during Construction and O&M compared to background levels. Such an increase, 12 km away from the SAC, is not likely to present a significant risk to this feature at population level from increased collision risk. Although the implications are high (potential for individual mortality) LSEs are not anticipated. LSEs (from pathway acting alone) are therefore discounted
x g	**Pollution (C, O, D)** Pollution from possible leaks, accidental spillages of fuels or oils used in plant for Construction and maintenance activities, or the disturbance of contaminated sediment could lead to a reduction in marine water quality should pollutants reach the marine environment and disperse. Exposure to toxins can result in reduced species fitness, bioaccumulation in tissues, increased susceptibility to disease and in extreme cases, mortality. Given the nature of the works, project activities and plant have limited potential to generate emissions to the marine environment. Further applying professional judgement about the nature of the receiving environment and the distance between the project and the SAC, contaminants would be subject to significant dilution and dispersion in the open coastal environment. LSE (from pathway acting alone) is therefore discounted.
x h	**Indirect effects on prey** - Prey species could be affected during Construction and (to a much lesser extent O&M) by changes to water quality, suspended sediment underwater noise, direct habitat loss or damage, EMF, changes to physical processes and INNS. Indirect impacts on harbour porpoise could result due to displaced or reduced foraging resource (at lower trophic levels). The pathway to significant impacts due to insufficient prey resource is weak for this highly mobile receptor. Temporary and low-impact effects are anticipated for local fish and benthic ecology. As such, there would be sufficient alternative resource available to support the harbour porpoise population.

x i	**EMF (O)** Marine mammals can detect magnetic fields and some species of fish can detect electric fields. EMF may be emitted from the submarine circuits into the water, but is predicted to be of minor significance based on studies on the potential effects of EMF generated by wind farm submarine cables that have shown effects to be highly localised and non-significant. There is no evidence that subtidal power cables cause behavioural changes and anecdotal evidence suggests a lack of avoidance reactions. Even the more concentrated effect from the cumulative Operation of the inter-array cables is considered to be non-significant in the context of the habitat area available for this receptor. Effects are considered *de minimis* and LSE (from pathway acting alone) is therefore discounted.
✓ j	**In-combination (C, O, D):** Where the potential for LSEs has been concluded for the project acting alone, the potential for LSEs has been concluded with respect to effects in-combination. No additional in-combination issues are identified.
xk	**In-combination (C, O, D):** Low species sensitivity to the impacts considered, or the small measure of effects predicted mean that Awel y Môr could not contribute to any or no measurable or material degree to in-combination effects.

End of Matrix 7

Matrix 8: Cardigan Bay/ Bae Ceredigion Special Area of Conservation - HRA Screening - Awel y Môr offshore windfarm

Name of European site:	Cardigan Bay/ Bae Ceredigion (UK) SAC
European site code:	UK0012712
Distance to relevant project	63.4 km to array / 64.1 km to ECR / 60.2 km to Onshore Draft Order Limits

	Potential Likely Significant Effects (LSE) from Awel y Môr Offshore Wind Farm																														
	Underwater noise			Suspended sediment			Vessel disturbance			Physical habitat loss/ disturbance			Collision risk			Pollution			Indirect: effects on prey			EMF			Non-physical disturbance			In-combination		
	C	O	D	C	O	D	C	O	D	C	O	D	C	O	D	C	O	D	C	O	D	C	O	D	C	O	D	C	O	D
Grey seal	✓a	x b	✓a	x c	x c	x c	x d	x d	x d	x e	x e	x e	x f	x f	x f	x g	x g	x g	x h	x h	x h		x i		x j	x j	x j	✓k	xl	✓k
Bottlenose dolphin	✓a	x b	✓a	x c	x c	x c	x d	x d	x d	x e	x e	x e	x f	x f	x f	x g	x g	x g	x h	x h	x h		x i					✓k	xl	✓k
Sandbanks which are slightly covered by sea water all the time																														
Reefs																														
Submerged or partially submerged sea caves																														
Sea lamprey																														
River lamprey																														

Evidence supporting conclusions

✓a	Underwater noise (C, D) Harbour porpoises and grey seals have the potential to be affected by underwater noise from multiple possible sources during Construction. Potential impacts range from physical injury and mortality, through temporary hearing impairment (temporary threshold shift (TTS) and or permanent hearing damage (permanent threshold shift, PTS) and disturbance. LSEs cannot be discounted on current information and pending noise modelling outputs and baseline consolidation. Pathway requires consideration at Stage 2 AA.
x b	Underwater noise (O) Operational underwater noise associated with WTG would be low-level and localised. Noise from O&M vessel traffic is also considered likely to be of negligible consequence in the context of background levels generated by shipping and human activities in the area. Together, these sources of underwater noise during O&M are unlikely to produce a significant behavioural response in harbour porpoise. Further noting the distance of the SAC from the array (and reduced likelihood of exposure) LSEs (from pathway acting alone) are therefore discounted.
x c	**Suspended sediment (C, O, D)** Sediment mobilisation, suspension and deposition during Construction and (to a much lesser extent, O&M) could result in a temporary change in marine water quality (i.e. increased turbidity) during works to install the offshore cables and foundations. The most significant impacts of sediment plumes are generally localised, temporary and within the parameters of natural change for cetaceans that often reside in turbid waters. As harbour porpoises can echolocate to acoustically visualise prey in murky waters (MICS, 2019), and given the transitory nature of the species, it has been concluded that LSE can be discounted.
x d	**Vessel disturbance (C, O, D)** Vessels during Construction and O&M could cause disturbance and displacement related impacts. Harbour porpoise is vulnerable to vessel disturbance, however, effects would be low in magnitude and extent. Effects are anticipated to be negligible to harbour porpoise noting that vast areas of unaffected habitat would still be available. LSEs (from pathway acting alone) are therefore discounted.
x e	**Physical habitat loss/ disturbance** Habitat loss and / or degradation of habitat (from physical disturbance) could result within the offshore array and search area during works to install the WTG and cables and also any scour and or / cable protection. Long-term habitat loss would result for the lifetime of the project from the presence of the foundations or cable protection on the seabed and through the water column. The significance of the small loss anticipated within the Application Boundary at 12 km away the SAC is considered *de minimis* to this receptor (and its prey). Therefore, LSE can be discounted.
x f	**Collision risk (C, O, D)** The project would result in a relatively small increase in vessel traffic during Construction and O&M compared to background levels. Such an increase, 12 km away from the SAC, is not likely to present a significant risk to this feature at population level from increased collision risk. Although the implications are high (potential for individual mortality) LSEs are not anticipated. LSEs (from pathway acting alone) are therefore discounted.

x g	**Pollution (C, O, D)** Pollution from possible leaks, accidental spillages of fuels or oils used in plant for Construction and maintenance activities, or the disturbance of contaminated sediment could lead to a reduction in marine water quality should pollutants reach the marine environment and disperse. Exposure to toxins can result in reduced species fitness, bioaccumulation in tissues, increased susceptibility to disease and in extreme cases, mortality. Given the nature of the works, project activities and plant have limited potential to generate emissions to the marine environment. Further applying professional judgement about the nature of the receiving environment and the distance between the project and the SAC, contaminants would be subject to significant dilution and dispersion in the open coastal environment. LSE (from pathway acting alone) is therefore discounted.
x h	**Indirect effects on prey** - Prey species could be affected during Construction and (to a much lesser extent O&M) by changes to water quality, suspended sediment underwater noise, direct habitat loss or damage, EMF, changes to physical processes and INNS. Indirect impacts on harbour porpoise could result due to displaced or reduced foraging resource (at lower trophic levels). The pathway to significant impacts due to insufficient prey resource is weak for this highly mobile receptor. Temporary and low-impact effects are anticipated for local fish and benthic ecology. As such, there would be sufficient alternative resource available to support the harbour porpoise population.
x i	**EMF (O)** Marine mammals can detect magnetic fields and some species of fish can detect electric fields. EMF may be emitted from the submarine circuits into the water, but is predicted to be of minor significance based on studies on the potential effects of EMF generated by wind farm submarine cables that have shown effects to be highly localised and non-significant. There is no evidence that subtidal power cables cause behavioural changes and anecdotal evidence suggests a lack of avoidance reactions. Even the more concentrated effect from the cumulative Operation of the inter-array cables is considered to be non-significant in the context of the habitat area available for this receptor. Effects are considered *de minimis* and LSE (from pathway acting alone) is therefore discounted.
x j	**Non-physical disturbance (C, O, D):** No potential for LSE.
✓k	**In-combination (C, O, D):** Where the potential for LSEs has been concluded for the project acting alone, the potential for LSEs has been concluded with respect to effects in-combination. No additional in-combination issues are identified.
xl	**In-combination (C, O, D):** Low species sensitivity to the impacts considered, or the small measure of effects predicted mean that Awel y Môr could not contribute to any or no measurable or material degree to in-combination effects.

End of Matrix 8

Matrix 9: North Channel Special Area of Conservation - HRA Screening - Awel y Môr offshore windfarm

Name of European site:	North Channel SAC
European site code:	UK0030399
Distance to relevant project component:	112.4 km to array / 123 km to ECR / 112.2 to Onshore Draft Order Limits

	Potential Likely Significant Effects (LSE) from Awel y Môr Offshore Wind Farm																										
	Underwater noise			Suspended sediment			Vessel disturbance			Physical habitat loss/ disturbance			Collision risk			Pollution			Indirect: effects on prey			EMF			In-combination		
	C	O	D	C	O	D	C	O	D	C	O	D	C	O	D	C	O	D	C	O	D	C	O	D	C	O	D
Harbour porpoise	✓a	x b	✓a	x c	x c	x c	x d	x d	x d	x e	x e	x e	x f	x f	x f	x g	x g	x g	x h	x h	x h		x i		✓j	xk	✓j

Evidence supporting conclusions

✓a	**Underwater noise (C, D)** Harbour porpoises have the potential to be affected by underwater noise from multiple possible sources during Construction. Potential impacts range from physical injury and mortality, through temporary hearing impairment (temporary threshold shift (TTS) and or permanent hearing damage (permanent threshold shift, PTS) and disturbance. LSEs cannot be discounted on current information and pending noise modelling outputs and baseline consolidation. Pathway requires consideration at Stage 2 AA.
x b	**Underwater noise (O)** Operational underwater noise associated with WTG would be low-level and localised. Noise from O&M vessel traffic is also considered likely to be of negligible consequence in the context of background levels generated by shipping and human activities in the area. Together, these sources of underwater noise during O&M are unlikely to produce a significant behavioural response in harbour porpoise. Further noting the distance of the SAC from the array (and reduced likelihood of exposure) LSEs (from pathway acting alone) are therefore discounted.
x c	**Suspended sediment (C, O, D)** Sediment mobilisation, suspension and deposition during Construction and (to a much lesser extent, O&M) could result in a temporary change in marine water quality (i.e. increased turbidity) during works to install the offshore cables and foundations. The most significant impacts of sediment plumes are generally localised, temporary and within the parameters of natural change for cetaceans that often reside in turbid waters. As harbour porpoises can echolocate to acoustically visualise prey in murky waters (MICS, 2019), and given the transitory nature of the species, it has been concluded that LSE can be discounted.
x d	**Vessel disturbance (C, O, D)** Vessels during Construction and O&M could cause disturbance and displacement related impacts. Harbour porpoise is vulnerable to vessel disturbance, however, effects would be low in magnitude and extent. Effects are anticipated to be negligible to harbour porpoise noting that vast areas of unaffected habitat would still be available. LSEs (from pathway acting alone) are therefore discounted.
x e	**Physical habitat loss/ disturbance** Habitat loss and / or degradation of habitat (from physical disturbance) could result within the offshore array and search area during works to install the WTG and cables and also any scour and or / cable protection. Long-term habitat loss would result for the lifetime of the project from the presence of the foundations or cable protection on the seabed and through the water column. The significance of the small loss anticipated within the Application Boundary at 12 km away the SAC is considered *de minimis* to this receptor (and its prey). Therefore, LSE can be discounted.
x f	**Collision risk (C, O, D)** The project would result in a relatively small increase in vessel traffic during Construction and O&M compared to background levels. Such an increase, 12 km away from the SAC, is not likely to present a significant risk to this feature at population level from increased collision risk. Although the implications are high (potential for individual mortality) LSEs are not anticipated. LSEs (from pathway acting alone) are therefore discounted.
x g	**Pollution (C, O, D)** Pollution from possible leaks, accidental spillages of fuels or oils used in plant for Construction and maintenance activities, or the disturbance of contaminated sediment could lead to a reduction in marine water quality should pollutants reach the marine environment and disperse. Exposure to toxins can result in reduced species fitness, bioaccumulation in tissues, increased susceptibility to disease and in extreme cases, mortality. Given the nature of the works, project activities and plant have limited potential to generate emissions to the marine environment. Further applying professional judgement about the nature of the receiving environment and the distance between the project and the SAC, contaminants would be subject to significant dilution and dispersion in the open coastal environment. LSE (from pathway acting alone) is therefore discounted.
x h	**Indirect effects on prey** - Prey species could be affected during Construction and (to a much lesser extent O&M) by changes to water quality, suspended sediment underwater noise, direct habitat loss or damage, EMF, changes to physical processes and INNS. Indirect impacts on harbour porpoise could result due to displaced or reduced foraging resource (at lower trophic levels). The pathway to significant impacts due to insufficient prey

	resource is weak for this highly mobile receptor. Temporary and low-impact effects are anticipated for local fish and benthic ecology. As such, there would be sufficient alternative resource available to support the harbour porpoise population.
x i	**EMF (O)** Marine mammals can detect magnetic fields and some species of fish can detect electric fields. EMF may be emitted from the submarine circuits into the water, but is predicted to be of minor significance based on studies on the potential effects of EMF generated by wind farm submarine cables that have shown effects to be highly localised and non-significant. There is no evidence that subtidal power cables cause behavioural changes and anecdotal evidence suggests a lack of avoidance reactions. Even the more concentrated effect from the cumulative Operation of the inter-array cables is considered to be non-significant in the context of the habitat area available for this receptor. Effects are considered *de minimis* and LSE (from pathway acting alone) is therefore discounted.
✓j	**In-combination (C, O, D):** Where the potential for LSEs has been concluded for the project acting alone, the potential for LSEs has been concluded with respect to effects in-combination. No additional in-combination issues are identified.
xk	**In-combination (C, O, D):** Low species sensitivity to the impacts considered, or the small measure of effects predicted mean that Awel y Môr could not contribute to any or no measurable or material degree to in-combination effects.

End of Matrix 9

Matrix 10: Pen Llŷn a`r Sarnau/ Lleyn Peninsula and the Sarnau Special Area of Conservation - HRA Screening - Awel y Môr offshore windfarm

Name of European site:	Pen Llŷn a`r Sarnau/ Lleyn Peninsula and the Sarnau SAC
European site code:	UK0013117
Distance to relevant project	55.2 km to array / 53.7 km to ECR / 47.4 km to Onshore Draft Order Limits

Effects	Potential Likely Significant Effects (LSE) from Awel y Môr Offshore Wind Farm																													
	Underwater noise			Suspended sediment			Vessel disturbance			Physical habitat loss/ disturbance			Collision risk			Pollution			Indirect: effects on prey			EMF			Non-physical disturbance			In-combination		
	C	O	D	C	O	D	C	O	D	C	O	D	C	O	D	C	O	D	C	O	D	C	O	D	C	O	D	C	O	D
Grey seal	✓a	x b	✓a	x c	x c	x c	x d	x d	x d	x e	x e	x e	x f	x f	x f	x g	x g	x g	x h	x h	x h		x i		x j	x j	x j	✓k	xl	✓k
Bottlenose dolphin	✓a	x b	✓a	x c	x c	x c	x d	x d	x d	x e	x e	x e	x f	x f	x f	x g	x g	x g	x h	x h	x h		x i					✓k	xl	✓k
Otter																														
Subtidal sandbanks which are slightly covered by sea water all the time																														
Estuaries																														
Coastal Lagoons																														
Large shallow inlets and bays																														
Reefs																														
Mudflats and sandflats not covered by seawater at low tide																														
Salicornia and other annuals colonising mud and sand																														
Atlantic saltmeadows (Glauco-Puccinellietalia maritimae)																														
Submerged or partially submerged sea caves																														

Evidence supporting conclusions

✓a	**Underwater noise (C, D)** Harbour porpoises and grey seals have the potential to be affected by underwater noise from multiple possible sources during Construction. Potential impacts range from physical injury and mortality, through temporary hearing impairment (temporary threshold shift (TTS) and or permanent hearing damage (permanent threshold shift, PTS) and disturbance. LSEs cannot be discounted on current information and pending noise modelling outputs and baseline consolidation. Pathway requires consideration at Stage 2 AA.
x b	**Underwater noise (O)** Operational underwater noise associated with WTG would be low-level and localised. Noise from O&M vessel traffic is also considered likely to be of negligible consequence in the context of background levels generated by shipping and human activities in the area. Together, these sources of underwater noise during O&M are unlikely to produce a significant behavioural response in harbour porpoise. Further noting the distance of the SAC from the array (and reduced likelihood of exposure) LSEs (from pathway acting alone) are therefore discounted.
x c	**Suspended sediment (C, O, D)** Sediment mobilisation, suspension and deposition during Construction and (to a much lesser extent, O&M) could result in a temporary change in marine water quality (i.e. increased turbidity) during works to install the offshore cables and foundations. The most significant impacts of sediment plumes are generally localised, temporary and within the parameters of natural change for cetaceans that often reside in turbid waters. As harbour porpoises can echolocate to acoustically visualise prey in murky waters (MICS, 2019), and given the transitory nature of the species, it has been concluded that LSE can be discounted.

x d	**Vessel disturbance (C, O, D)** Vessels during Construction and O&M could cause disturbance and displacement related impacts. Harbour porpoise is vulnerable to vessel disturbance, however, effects would be low in magnitude and extent. Effects are anticipated to be negligible to harbour porpoise noting that vast areas of unaffected habitat would still be available. LSEs (from pathway acting alone) are therefore discounted.
x e	**Physical habitat loss/ disturbance** Habitat loss and / or degradation of habitat (from physical disturbance) could result within the offshore array and search area during works to install the WTG and cables and also any scour and or / cable protection. Long-term habitat loss would result for the lifetime of the project from the presence of the foundations or cable protection on the seabed and through the water column. The significance of the small loss anticipated within the Application Boundary at 12 km away the SAC is considered *de minimis* to this receptor (and its prey). Therefore, LSE can be discounted.
x f	**Collision risk (C, O, D)** The project would result in a relatively small increase in vessel traffic during Construction and O&M compared to background levels. Such an increase, 12 km away from the SAC, is not likely to present a significant risk to this feature at population level from increased collision risk. Although the implications are high (potential for individual mortality) LSEs are not anticipated. LSEs (from pathway acting alone) are therefore discounted.
x g	**Pollution (C, O, D)** Pollution from possible leaks, accidental spillages of fuels or oils used in plant for Construction and maintenance activities, or the disturbance of contaminated sediment could lead to a reduction in marine water quality should pollutants reach the marine environment and disperse. Exposure to toxins can result in reduced species fitness, bioaccumulation in tissues, increased susceptibility to disease and in extreme cases, mortality. Given the nature of the works, project activities and plant have limited potential to generate emissions to the marine environment. Further applying professional judgement about the nature of the receiving environment and the distance between the project and the SAC, contaminants would be subject to significant dilution and dispersion in the open coastal environment. LSE (from pathway acting alone) is therefore discounted.
x h	**Indirect effects on prey** - Prey species could be affected during Construction and (to a much lesser extent O&M) by changes to water quality, suspended sediment underwater noise, direct habitat loss or damage, EMF, changes to physical processes and INNS. Indirect impacts on harbour porpoise could result due to displaced or reduced foraging resource (at lower trophic levels). The pathway to significant impacts due to insufficient prey resource is weak for this highly mobile receptor. Temporary and low-impact effects are anticipated for local fish and benthic ecology. As such, there would be sufficient alternative resource available to support the harbour porpoise population.
x i	**EMF (O)** Marine mammals can detect magnetic fields and some species of fish can detect electric fields. EMF may be emitted from the submarine circuits into the water, but is predicted to be of minor significance based on studies on the potential effects of EMF generated by wind farm submarine cables that have shown effects to be highly localised and non-significant. There is no evidence that subtidal power cables cause behavioural changes and anecdotal evidence suggests a lack of avoidance reactions. Even the more concentrated effect from the cumulative Operation of the inter-array cables is considered to be non-significant in the context of the habitat area available for this receptor. Effects are considered *de minimis* and LSE (from pathway acting alone) is therefore discounted.
x j	**Non-physical disturbance (C, O, D):** No potential for LSE.
✓k	**In-combination (C, O, D):** Where the potential for LSEs has been concluded for the project acting alone, the potential for LSEs has been concluded with respect to effects in-combination. No additional in-combination issues are identified.
xl	**In-combination (C, O, D):** Low species sensitivity to the impacts considered, or the small measure of effects predicted mean that Awel y Môr could not contribute to any or no measurable or material degree to in-combination effects.

End of Matrix 10

1.2.5

Matrix 11: Rockabill to Dalkey Island SAC Special Area of Conservation - HRA Screening - Awel y Môr offshore windfarm

Name of European site:	Rockabill to Dalkey Island SAC
European site code:	IE0003000
Distance to relevant project component:	139.8 km to array / 147.8 km to ECR / 139.0 km to Onshore Draft Order Limits

	Potential Likely Significant Effects (LSE) from Awel y Môr Offshore Wind Farm																										
	Underwater noise			Suspended sediment			Vessel disturbance			Physical habitat loss/ disturbance			Collision risk			Pollution			Indirect: effects on prey			EMF			In-combination		
	C	O	D	C	O	D	C	O	D	C	O	D	C	O	D	C	O	D	C	O	D	C	O	D	C	O	D
Harbour porpoise	✓a	x b	✓a	x c	x c	x c	x d	x d	x d	x e	x e	x e	x f	x f	x f	x g	x g	x g	x h	x h	x h		x i		✓j	xk	✓j
Reefs																											

Evidence supporting conclusions

✓a	**Underwater noise (C, D)** Harbour porpoises have the potential to be affected by underwater noise from multiple possible sources during Construction. Potential impacts range from physical injury and mortality, through temporary hearing impairment (temporary threshold shift (TTS) and or permanent hearing damage (permanent threshold shift, PTS) and disturbance. LSEs cannot be discounted on current information and pending noise modelling outputs and baseline consolidation. Pathway requires consideration at Stage 2 AA.
x b	**Underwater noise (O)** Operational underwater noise associated with WTG would be low-level and localised. Noise from O&M vessel traffic is also considered likely to be of negligible consequence in the context of background levels generated by shipping and human activities in the area. Together, these sources of underwater noise during O&M are unlikely to produce a significant behavioural response in harbour porpoise. Further noting the distance of the SAC from the array (and reduced likelihood of exposure) LSEs (from pathway acting alone) are therefore discounted.
x c	**Suspended sediment (C, O, D)** Sediment mobilisation, suspension and deposition during Construction and (to a much lesser extent, O&M) could result in a temporary change in marine water quality (i.e. increased turbidity) during works to install the offshore cables and foundations. The most significant impacts of sediment plumes are generally localised, temporary and within the parameters of natural change for cetaceans that often reside in turbid waters. As harbour porpoises can echolocate to acoustically visualise prey in murky waters (MICS, 2019), and given the transitory nature of the species, it has been concluded that LSE can be discounted.
x d	**Vessel disturbance (C, O, D)** Vessels during Construction and O&M could cause disturbance and displacement related impacts. Harbour porpoise is vulnerable to vessel disturbance, however, effects would be low in magnitude and extent. Effects are anticipated to be negligible to harbour porpoise noting that vast areas of unaffected habitat would still be available. LSEs (from pathway acting alone) are therefore discounted.
x e	**Physical habitat loss/ disturbance** Habitat loss and / or degradation of habitat (from physical disturbance) could result within the offshore array and search area during works to install the WTG and cables and also any scour and or / cable protection. Long-term habitat loss would result for the lifetime of the project from the presence of the foundations or cable protection on the seabed and through the water column. The significance of the small loss anticipated within the Application Boundary at 12 km away the SAC is considered *de minimis* to this receptor (and its prey). Therefore, LSE can be discounted.
x f	**Collision risk (C, O, D)** The project would result in a relatively small increase in vessel traffic during Construction and O&M compared to background levels. Such an increase, 12 km away from the SAC, is not likely to present a significant risk to this feature at population level from increased collision risk. Although the implications are high (potential for individual mortality) LSEs are not anticipated. LSEs (from pathway acting alone) are therefore discounted.
x g	**Pollution (C, O, D)** Pollution from possible leaks, accidental spillages of fuels or oils used in plant for Construction and maintenance activities, or the disturbance of contaminated sediment could lead to a reduction in marine water quality should pollutants reach the marine environment and disperse. Exposure to toxins can result in reduced species fitness, bioaccumulation in tissues, increased susceptibility to disease and in extreme cases, mortality. Given the nature of the works, project activities and plant have limited potential to generate emissions to the marine environment. Further applying professional judgement about the nature of the receiving environment and the distance between the project and the SAC, contaminants would be subject to significant dilution and dispersion in the open coastal environment. LSE (from pathway acting alone) is therefore discounted.

x h	**Indirect effects on prey** - Prey species could be affected during Construction and (to a much lesser extent O&M) by changes to water quality, suspended sediment underwater noise, direct habitat loss or damage, EMF, changes to physical processes and INNS. Indirect impacts on harbour porpoise could result due to displaced or reduced foraging resource (at lower trophic levels). The pathway to significant impacts due to insufficient prey resource is weak for this highly mobile receptor. Temporary and low-impact effects are anticipated for local fish and benthic ecology. As such, there would be sufficient alternative resource available to support the harbour porpoise population.
x i	**EMF (O)** Marine mammals can detect magnetic fields and some species of fish can detect electric fields. EMF may be emitted from the submarine circuits into the water, but is predicted to be of minor significance based on studies on the potential effects of EMF generated by wind farm submarine cables that (e.g. **Invalid source specified.**) have shown effects to be highly localised and non-significant. There is no evidence that subtidal power cables cause behavioural changes and anecdotal evidence suggests a lack of avoidance reactions. Even the more concentrated effect from the cumulative Operation of the inter-array cables is considered to be non-significant in the context of the habitat area available for this receptor. Effects are considered *de minimis* and LSE (from pathway acting alone) is therefore discounted.
✓j	**In-combination (C, O, D):** Where the potential for LSEs has been concluded for the project acting alone, the potential for LSEs has been concluded with respect to effects in-combination. No additional in-combination issues are identified.
xk	**In-combination (C, O, D):** Low species sensitivity to the impacts considered, or the small measure of effects predicted mean that Awel y Môr could not contribute to any or no measurable or material degree to in-combination effects.

End of Matrix 11

Matrix 12: West Wales Marine / Gorllewin Cymru Forol Special Area of Conservation - HRA Screening - Awel y Môr offshore windfarm

Name of European site:	West Wales Marine / Gorllewin Cymru Forol (UK) SAC
European site code:	UK0030397
Distance to relevant project component:	72.2 km to array / 75.7 km to ECR / 71.7 km to Onshore Draft Order Limits

	Potential Likely Significant Effects (LSE) from Awel y Môr Offshore Wind Farm																										
	Underwater noise			Suspended sediment			Vessel disturbance			Physical habitat loss/ disturbance			Collision risk			Pollution			Indirect: effects on prey			EMF			In-combination		
	C	O	D	C	O	D	C	O	D	C	O	D	C	O	D	C	O	D	C	O	D	C	O	D	C	O	D
Harbour porpoise	✓a	x b	✓a	x c	x c	x c	x d	x d	x d	x e	x e	x e	x f	x f	x f	x g	x g	x g	x h	x h	x h		x i		✓j	xk	✓j

1.2.6

Evidence supporting conclusions

✓a	**Underwater noise (C, D)** Harbour porpoises have the potential to be affected by underwater noise from multiple possible sources during Construction. Potential impacts range from physical injury and mortality, through temporary hearing impairment (temporary threshold shift (TTS) and or permanent hearing damage (permanent threshold shift, PTS) and disturbance. LSEs cannot be discounted on current information and pending noise modelling outputs and baseline consolidation. Pathway requires consideration at Stage 2 AA.
x b	**Underwater noise (O)** Operational underwater noise associated with WTG would be low-level and localised. Noise from O&M vessel traffic is also considered likely to be of negligible consequence in the context of background levels generated by shipping and human activities in the area. Together, these sources of underwater noise during O&M are unlikely to produce a significant behavioural response in harbour porpoise. Further noting the distance of the SAC from the array (and reduced likelihood of exposure) LSEs (from pathway acting alone) are therefore discounted.
x c	**Suspended sediment (C, O, D)** Sediment mobilisation, suspension and deposition during Construction and (to a much lesser extent, O&M) could result in a temporary change in marine water quality (i.e. increased turbidity) during works to install the offshore cables and foundations. The most significant impacts of sediment plumes are generally localised, temporary and within the parameters of natural change for cetaceans that often reside in turbid waters. As harbour porpoises can echolocate to acoustically visualise prey in murky waters (MICS, 2019), and given the transitory nature of the species, it has been concluded that LSE can be discounted.
x d	**Vessel disturbance (C, O, D)** Vessels during Construction and O&M could cause disturbance and displacement related impacts. Harbour porpoise is vulnerable to vessel disturbance, however, effects would be low in magnitude and extent. Effects are anticipated to be negligible to harbour porpoise noting that vast areas of unaffected habitat would still be available. LSEs (from pathway acting alone) are therefore discounted.
x e	**Physical habitat loss/ disturbance** Habitat loss and / or degradation of habitat (from physical disturbance) could result within the offshore array and search area during works to install the WTG and cables and also any scour and or / cable protection. Long-term habitat loss would result for the lifetime of the project from the presence of the foundations or cable protection on the seabed and through the water column. The significance of the small loss anticipated within the Application Boundary at 12 km away the SAC is considered *de minimis* to this receptor (and its prey). Therefore, LSE can be discounted.
x f	**Collision risk (C, O, D)** The project would result in a relatively small increase in vessel traffic during Construction and O&M compared to background levels. Such an increase, 12 km away from the SAC, is not likely to present a significant risk to this feature at population level from increased collision risk. Although the implications are high (potential for individual mortality) LSEs are not anticipated. LSEs (from pathway acting alone) are therefore discounted.
x g	**Pollution (C, O, D)** Pollution from possible leaks, accidental spillages of fuels or oils used in plant for Construction and maintenance activities, or the disturbance of contaminated sediment could lead to a reduction in marine water quality should pollutants reach the marine environment and disperse. Exposure to toxins can result in reduced species fitness, bioaccumulation in tissues, increased susceptibility to disease and in extreme cases, mortality. Given the nature of the works, project activities and plant have limited potential to generate emissions to the marine environment. Further applying professional judgement about the nature of the receiving environment and the distance between the project and the SAC, contaminants would be subject to significant dilution and dispersion in the open coastal environment. LSE (from pathway acting alone) is therefore discounted.
x h	**Indirect effects on prey** - Prey species could be affected during Construction and (to a much lesser extent O&M) by changes to water quality, suspended sediment underwater noise, direct habitat loss or damage, EMF, changes to physical processes and INNS. Indirect impacts on harbour porpoise could result due to displaced or reduced foraging resource (at lower trophic levels). The pathway to significant impacts due to insufficient prey

	resource is weak for this highly mobile receptor. Temporary and low-impact effects are anticipated for local fish and benthic ecology. As such, there would be sufficient alternative resource available to support the harbour porpoise population.
x i	**EMF (O)** Marine mammals can detect magnetic fields and some species of fish can detect electric fields. EMF may be emitted from the submarine circuits into the water, but is predicted to be of minor significance based on studies on the potential effects of EMF generated by wind farm submarine cables that (e.g. **Invalid source specified.**) have shown effects to be highly localised and non-significant. There is no evidence that subtidal power cables cause behavioural changes and anecdotal evidence suggests a lack of avoidance reactions. Even the more concentrated effect from the cumulative Operation of the inter-array cables is considered to be non-significant in the context of the habitat area available for this receptor. Effects are considered *de minimis* and LSE (from pathway acting alone) is therefore discounted.
✓j	**In-combination (C, O, D):** Where the potential for LSEs has been concluded for the project acting alone, the potential for LSEs has been concluded with respect to effects in-combination. No additional in-combination issues are identified.
xk	**In-combination (C, O, D):** Low species sensitivity to the impacts considered, or the small measure of effects predicted mean that Awel y Môr could not contribute to any or no measurable or material degree to in-combination effects.

End of Matrix 12

Matrix 13: Pembrokeshire Marine Special Area of Conservation - HRA Screening - Awel y Môr offshore windfarm

Name of European site:	Pembrokeshire Marine SAC
European site code:	UK0013116
Distance to relevant project	189.7 km to array / 191.3 km to ECR / 185.1 km to Onshore Draft Order Limits

	Potential Likely Significant Effects (LSE) from Awel y Môr Offshore Wind Farm																														
	Underwater noise			Suspended sediment			Vessel disturbance			Physical habitat loss/ disturbance			Collision risk			Pollution			Indirect: effects on prey			EMF			Non-physical disturbance			In-combination		
	C	O	D	C	O	D	C	O	D	C	O	D	C	O	D	C	O	D				C	O	D	C	O	D	C	O	D
Grey seal	✓a	xb	✓a	x c	x c	x c	x d	x d	x d	x e	x e	x e	x f	x f	x f	x g	x g	x g	x h	x h	x h		x i		x j	x j	x j	✓k	xl	✓k
Estuaries																														
Large shallow inlets and bays																														
Reefs																														
Sandbanks which are slightly covered by sea water all the time																														
Mudflats and sandflats not covered by seawater at low tide																														
Coastal lagoons																														
Atlantic salt meadows (Glauco-Puccinellietalia maritimae)																														
Submerged or partially submerged sea caves																														
Shore dock																														
Sea lamprey																														
River lamprey																														
Allis shad																														
Twaite shad																														
Otter																														

Evidence supporting conclusions

✓a	**Underwater noise (C, D)** Grey seals have the potential to be affected by underwater noise from multiple possible sources during Construction. Potential impacts range from physical injury and mortality, through temporary hearing impairment (temporary threshold shift (TTS) and or permanent hearing damage (permanent threshold shift, PTS) and disturbance. LSEs cannot be discounted on current information and pending noise modelling outputs and baseline consolidation. Pathway requires consideration at Stage 2 AA.
x b	**Underwater noise (O)** Operational underwater noise associated with WTG would be low-level and localised. Noise from O&M vessel traffic is also considered likely to be of negligible consequence in the context of background levels generated by shipping and human activities in the area. Together, these sources of underwater noise during O&M are unlikely to produce a significant behavioural response in harbour porpoise. Further noting the distance of the SAC from the array (and reduced likelihood of exposure) LSEs (from pathway acting alone) are therefore discounted.
x c	**Suspended sediment (C, O, D)** Sediment mobilisation, suspension and deposition during Construction and (to a much lesser extent, O&M) could result in a temporary change in marine water quality (i.e. increased turbidity) during works to install the offshore cables and foundations. The most significant impacts of sediment plumes are generally localised, temporary and within the parameters of natural change for cetaceans that

	often reside in turbid waters. As harbour porpoises can echolocate to acoustically visualise prey in murky waters (MICS, 2019), and given the transitory nature of the species, it has been concluded that LSE can be discounted.
x d	**Vessel disturbance (C, O, D)** Vessels during Construction and O&M could cause disturbance and displacement related impacts. Harbour porpoise is vulnerable to vessel disturbance, however, effects would be low in magnitude and extent. Effects are anticipated to be negligible to harbour porpoise noting that vast areas of unaffected habitat would still be available. LSEs (from pathway acting alone) are therefore discounted.
x e	**Physical habitat loss/ disturbance** Habitat loss and / or degradation of habitat (from physical disturbance) could result within the offshore array and search area during works to install the WTG and cables and also any scour and or / cable protection. Long-term habitat loss would result for the lifetime of the project from the presence of the foundations or cable protection on the seabed and through the water column. The significance of the small loss anticipated within the Application Boundary at 12 km away the SAC is considered *de minimis* to this receptor (and its prey). Therefore, LSE can be discounted.
x f	**Collision risk (C, O, D)** The project would result in a relatively small increase in vessel traffic during Construction and O&M compared to background levels. Such an increase, 12 km away from the SAC, is not likely to present a significant risk to this feature at population level from increased collision risk. Although the implications are high (potential for individual mortality) LSEs are not anticipated. LSEs (from pathway acting alone) are therefore discounted.
x g	**Pollution (C, O, D)** Pollution from possible leaks, accidental spillages of fuels or oils used in plant for Construction and maintenance activities, or the disturbance of contaminated sediment could lead to a reduction in marine water quality should pollutants reach the marine environment and disperse. Exposure to toxins can result in reduced species fitness, bioaccumulation in tissues, increased susceptibility to disease and in extreme cases, mortality. Given the nature of the works, project activities and plant have limited potential to generate emissions to the marine environment. Further applying professional judgement about the nature of the receiving environment and the distance between the project and the SAC, contaminants would be subject to significant dilution and dispersion in the open coastal environment. LSE (from pathway acting alone) is therefore discounted.
x h	**Indirect effects on prey** - Prey species could be affected during Construction and (to a much lesser extent O&M) by changes to water quality, suspended sediment underwater noise, direct habitat loss or damage, EMF, changes to physical processes and INNS. Indirect impacts on harbour porpoise could result due to displaced or reduced foraging resource (at lower trophic levels). The pathway to significant impacts due to insufficient prey resource is weak for this highly mobile receptor. Temporary and low-impact effects are anticipated for local fish and benthic ecology. As such, there would be sufficient alternative resource available to support the harbour porpoise population.
x i	**EMF (O)** Marine mammals can detect magnetic fields and some species of fish can detect electric fields. EMF may be emitted from the submarine circuits into the water, but is predicted to be of minor significance based on studies on the potential effects of EMF generated by wind farm submarine cables that have shown effects to be highly localised and non-significant. There is no evidence that subtidal power cables cause behavioural changes and anecdotal evidence suggests a lack of avoidance reactions. Even the more concentrated effect from the cumulative Operation of the inter-array cables is considered to be non-significant in the context of the habitat area available for this receptor. Effects are considered *de minimis* and LSE (from pathway acting alone) is therefore discounted.
x j	**Non-physical disturbance (C, O, D):** No potential for LSE.
✓k	**In-combination (C, O, D):** Where the potential for LSEs has been concluded for the project acting alone, the potential for LSEs has been concluded with respect to effects in-combination. No additional in-combination issues are identified.
xl	**In-combination (C, O, D):** Low species sensitivity to the impacts considered, or the small measure of effects predicted mean that Awel y Môr could not contribute to any or no measurable or material degree to in-combination effects.

End of Matrix 13

Matrix 14: Transboundary sites (Special Area of Conservation) for Grey Seal - HRA Screening - Awel y Môr offshore windfarm

Name of European site:			Various transboundary sites designation for harbour porpoise (no connectivity established to other features)																													
			Potential Likely Significant Effects (LSE) from Awel y Môr Offshore Wind Farm																													
			Underwater noise			Suspended sediment			Vessel disturbance			Physical habitat loss/ disturbance			Collision risk			Pollution			Indirect: effects on prey			EMF			Non-physical disturbance			In-combination		
	European site Code	Distance to relevant project	C	O	D	C	O	D	C	O	D	C	O	D	C	O	D	C	O	D	C	O	D	C	O	D	C	O	D	C	O	D
The Saltee Islands (IE) SAC	IE0000707	226.8 km to array / 231.3 km to ECR / 226.2 km to Onshore Draft Order Limits	✓a	xb	✓a																								✓c	xd	✓c
Lambay Island (IE) SAC	IE0000204	141.2 km to array / 149.1 km to ECR / 140.3 km to Onshore Draft Order Limits	✓a	xb	✓a																								✓c	xd	✓c

Evidence supporting conclusions

✓a	**Underwater noise (C, D)** Grey seals have the potential to be affected by underwater noise from multiple possible sources during Construction. Potential impacts range from physical injury and mortality, through temporary hearing impairment (temporary threshold shift (TTS) and or permanent hearing damage (permanent threshold shift, PTS) and disturbance. LSEs cannot be discounted on current information and pending noise modelling outputs and baseline consolidation. Pathway requires consideration at Stage 2 AA.
xb	**Underwater noise (O)** Operational underwater noise associated with WTG would be low-level and localised. Noise from O&M vessel traffic is also considered likely to be of negligible consequence in the context of background levels generated by shipping and human activities in the area. Together, these sources of underwater noise during O&M are unlikely to produce a significant behavioural response in harbour porpoise. Further noting the distance of the SAC from the array (and reduced likelihood of exposure) LSEs (from pathway acting alone) are therefore discounted.
✓c	**In-combination (C, O, D):** Where the potential for LSEs has been concluded for the project acting alone, the potential for LSEs has been concluded with respect to effects in-combination. No additional in-combination issues are identified.
xd	**In-combination (C, O, D):** Low species sensitivity to the impacts considered, or the small measure of effects predicted mean that Awel y Môr could not contribute to any or no measurable or material degree to in-combination effects.

End of Matrix 14

Matrix 15: Transboundary sites (Special Area of Conservation) for harbour porpoise - HRA Screening - Awel y Môr offshore windfarm

Name of European site:			Various transboundary sites designation for harbour porpoise (no connectivity established to other features)																												
			Potential Likely Significant Effects (LSE) from Awel y Môr Offshore Wind Farm																												
			Underwater noise			Suspended sediment			Vessel disturbance			Physical habitat loss/ disturbance			Collision risk			Pollution			Indirect: effects on prey			EMF			Non-physical disturbance			In-combination		
	European site Code	Distance to relevant project	C	O	D	C	O	D	C	O	D	C	O	D	C	O	D	C	O	D	C	O	D	C	O	D	C	O	D	C	O	D
Nord Bretagne DH (FR) SAC	FR2502022	412.3 km to array / 400.4 km to ECR / 391.3 to Onshore Draft Order Limits	✓a	xb	✓a																									✓c	xd	✓c
Roaringwater Bay and Islands SAC (IE) SAC	IE0000101	430.9 km to array / 436.4 km to ECR / 430.1 to Onshore Draft Order Limits	✓a	xb	✓a																									✓c	xd	✓c
Récifs et landes de la Hague (FR) SAC	FR2500084	425.9 km to array / 410.9 km to ECR / 402.3 to Onshore Draft Order Limits	✓a	xb	✓a																									✓c	xd	✓c
Anse de Vauville (FR) SAC	FR2502019	434.8 km to array / 419.9 km to ECR / 411.3 to Onshore Draft Order Limits	✓a	xb	✓a																									✓c	xd	✓c
Banc et récifs de Surtainville (FR) SAC	FR2502018	454.5 km to array / 439.7 km to ECR / 431.1 to Onshore Draft Order Limits	✓a	xb	✓a																									✓c	xd	✓c
Blasket Islands SAC (IE) SAC	IE0002172	468.7 km to array / 475.3 km to ECR / 467.9 to Onshore Draft Order Limits	✓a	xb	✓a																									✓c	xd	✓c
Tregor Goëlo (FR) SAC	FR5310070	486.8 km to array / 476.0 km to ECR / 466.7 to Onshore Draft Order Limits	✓a	xb	✓a																									✓c	xd	✓c
Côte de Granit rose-Sept-Iles (FR) SAC	FR5310011	486.8 km to array / 476.0 km to ECR / 466.7 to Onshore Draft Order Limits	✓a	xb	✓a																									✓c	xd	✓c
Mers Celtiques - Talus du golfe de Gascogne (FR) SAC	FR5302015	505.3 km to array / 502.3 km to ECR / 493.3 to Onshore Draft Order Limits	✓a	xb	✓a																									✓c	xd	✓c
Chausey (FR) SAC	FR2500079	506.2 km to array / 498.1 km to ECR / 483.0 to Onshore Draft Order Limits	✓a	xb	✓a																									✓c	xd	✓c

Cap d'Erquy-Cap Fréhel (FR) SAC	FR5300011	511.4 km to array / 498.1 km to ECR / 489.2 to Onshore Draft Order Limits	✓a	xb	✓a																									✓c	xd	✓c
Baie de Morlaix (FR) SAC	FR5300015	512.1 km to array / 502.5 km to ECR / 493.2 to Onshore Draft Order Limits	✓a	xb	✓a																									✓c	xd	✓c

Evidence supporting conclusions

✓a	Underwater noise (C, D) Harbour porpoises have the potential to be affected by underwater noise from multiple possible sources during Construction. Potential impacts range from physical injury and mortality, through temporary hearing impairment (temporary threshold shift (TTS) and or permanent hearing damage (permanent threshold shift, PTS) and disturbance. LSEs cannot be discounted on current information and pending noise modelling outputs and baseline consolidation. Pathway requires consideration at Stage 2 AA.
xb	Underwater noise (O) Operational underwater noise associated with WTG would be low-level and localised. Noise from O&M vessel traffic is also considered likely to be of negligible consequence in the context of background levels generated by shipping and human activities in the area. Together, these sources of underwater noise during O&M are unlikely to produce a significant behavioural response in harbour porpoise. Further noting the distance of the SAC from the array (and reduced likelihood of exposure) LSEs (from pathway acting alone) are therefore discounted.
✓c	**In-combination (C, O, D):** Where the potential for LSEs has been concluded for the project acting alone, the potential for LSEs has been concluded with respect to effects in-combination. No additional in-combination issues are identified.
xd	**In-combination (C, O, D):** Low species sensitivity to the impacts considered, or the small measure of effects predicted mean that Awel y Môr could not contribute to any or no measurable or material degree to in-combination effects.

End of Matrix 18

European sites considered in the Screening exercise with

Ornithology 'Species Interest Features'

Matrix 16: Liverpool Bay / Bae Lerpwl Special Protection Area - HRA Screening matrix for Awel y Môr offshore windfarm

Name of European site:	Liverpool Bay / Bae Lerpwl (UK) SPA
European site code:	UK9020294
Distance to relevant project component:	0.1 km to array / 0.0 km to ECC / 0.0 km to Onshore Draft Order Limits

	Potential Likely Significant Effects (LSE) from Awel y Môr Offshore Wind Farm																	
	Disturbance and displacement			Barrier effect			Prey availability/ behaviour			Collision risk			Indirect: effects on prey			In-combination		
	C	O	D	C	O	D	C	O	D	C	O	D	C	O	D	C	O	D
Red-throated diver (non-breeding)	✓a	✓ b	✓c		✓ g		x i		x e		x j			x l		✓m	✓m	✓m
Common scoter (non-breeding)	✓a	✓ b	✓c		✓ g		x i		x e		x j			x l		✓m	✓m	✓m
Red-breasted merganser (Assemblage)	✓a	✓ b	✓c		✓ g		x i		x e		✓k			x l		✓m	✓m	✓m
Little gull (non-breeding)	x d	x e	x f		x h		x i		x e		✓k			x l		x n	✓m	x n

Evidence supporting conclusions:

✓a	**Displacement (C, D):** This species is highly vulnerable to disturbance during activities in these phases (Fliessbach et al, 2019). Given the direct spatial overlap between Awel y Môr and this SPA, further clarity is needed on Awel y Môr potential to interact with this species from this SPA, in-combination with the effects of collision mortalities (SNBC, 2017). On this current uncertainty, LSE cannot be discounted.
✓ b	**Displacement (O):** Behavioural responses to stimuli specific to O&M (e.g., operating turbines, maintenance vessels) could result in the displacement of birds at sea and habitat loss. That there is direct spatial overlap between Awel y Môr and this SPA, prompts further (displacement) analysis to determine, together with the effects of collision risk (SNBC, 2017), the sum of potential effects in the context of the local environment and to discount the risk of AEoI. On this current uncertainty, LSE cannot be discounted.
✓c	**Decommissioning (D):** Potential impacts during decommissioning are considered to be similar of potentially less than those outlined for construction. Therefore, a finding of no LSE is appropriate.
x d	**Displacement (C, D):** This species has low or very low vulnerability to disturbance from vessel movements associated with this phase (Fliessbach et al, 2019). Therefore, the potential for LSE to result via this pathway is discounted.
x e	**Displacement (O):** Species has moderate vulnerability ("weak avoidance") to displacement by offshore wind farms Bradbury et al, 2014). However, the typical foraging habitats of these species indicate displacement effects are not likely to be significant. Cormorant for example, move inland to feed. Further, AyM does not spatially overlap with the coastal areas identified on a "strong confidence in the regularity of use of these areas (Lawson et al. 2015)" common tern foraging areas, As such. key and sufficient foraging areas would not be restricted by AyM and no LSEs are identified.
x f	**Decommissioning:** Potential impacts during decommissioning are considered to be similar of potentially less than those outlined for construction. Therefore, a finding of no LSE is appropriate.
✓ g	**Barriers to movement (O):** In practice, barrier effects can be indistinguishable from displacement (disturbance) effects (SNBC, 2017), it follows from the conclusions concerning displacement, that this species has very high vulnerability to barrier effects due to offshore wind farms and construction activities (Bradbury et al, 2014, Fliessbach et al, 2019). LSE cannot be discounted in absence of further inquiry.
x h	Barriers to movement (O): In practice, as its impossible to know where an affected bird originated, barrier effects can be indistinguishable from displacement (disturbance) (SNBC, 2017). It follows from the conclusions concerning displacement, that this species is similarity not sensitive to barrier effects. Therefore, potential for LSEs is therefore discounted
x i	**Prey behaviour (C, D):** Environmental changes can alter the behaviour, distribution and availability of prey (e.g., suspended sediments (could hinder visual foraging), underwater noise (could displaces prey), seabed disturbances (damage habitats could force relocations), or the turbine foundations (could attract prey (reef effect).) Roaming receptors (like seabirds) can tolerate temporary variations in environmental conditions and access alternative resources. Over the scales and the timescales presented for the project, this effect-pathway is low-risk, and a finding of no LSE is appropriate.
x j	**Collision (O):** Species has low vulnerability to collision risk (Bradbury et al, 2014). LSEs can therefore be discounted.

✓k	**Collision (O):** Potential collision risk to species during migration at an alone and in-combination level. With reference to studies undertaken for other OWF[9], impacts are likely to only result in negligible numbers passing through the array during migration and therefore the risk of LSE is likely to be extremely low. However, to a precautionary basis this will be evidenced by modelling with reference to evidence on migration routes (e.g., Wright al). Therefore, potential LSEs are identified.
x l	**Impacts on prey (O):** Indirect effects could arise due to the ecological consequences that might arise at the lower trophic levels from the direct implications of the project, Impacts on migration, the ingestion of contaminated sediments (reduced numbers) reduced resilience, and altered prey-predator or reproductive dynamics could spill-over into the wider ecosystem. Existing OWFs [10] indicate Awel y Môr will cause only small (insignificant), short -term effects for local fish and benthic ecology (see footnote). Such impacts are not therefore anticipated and the potential for LSE is discounted
✓m	**In-combination (C, O, D):** Where potential for LSEs has been concluded for Awel y Môr acting alone, the potential for 'LSE in-combination' has been concluded. Mortalities will be calculated separately for collision and displacement and methodologies for combining additive impacts considered. No additional in-combination issues are identified.
xn	**In-combination (C, O, D):** Low species sensitivity to the impacts considered, or the small measure of effects predicted mean that Awel y Môr could not contribute to any or no measurable or material degree to in-combination effects.

End of Matrix 16

[9] See Scot Gov. (2019) Strategic assessment of collision risk of Scottish offshore wind farms to non-seabird species at this hyperlink or the Collision Risk Modelling for Hornsea Project Three at this hyperlink
10 Assessments undertaken for Hornsea Project Three, which addressed habitat loss, underwater noise, increased SSC and deposition and pollution events, and EMF cumulatively in all phases reported negligible, minor adverse or minor beneficial effects on fish and benthic communities (see Orsted, 2018) at this hyperlink

Matrix 17: Dee Estuary Special Protection Area - HRA Screening for Awel y Môr Offshore windfarm

Name of European site:	The Dee Estuary (UK) Special Protection Area
European site code:	UK9013011
Distance to relevant project component:	21 km to array / 3.5 km to ECC / 2.2 km to Onshore Draft Order Limits

	Potential Likely Significant Effects (LSE) from Awel y Môr Offshore Wind Farm																				
	Disturbance and displacement			Onshore disturbances (visual/audible)			Barrier effect			Changes in prey availability/behaviour			Collision			Indirect: effects on prey			In-combination		
	C	O	D	C	O	D	C	O	D	C	O	D	C	O	D	C	O	D	C	O	D
Little tern (breeding)	x a	x c	x a	x a	x c	x a				x f		x g		✓ h			x i		✓ j	✓ j	✓ k
Common tern (passage)	x a	x c	x a	x a	x c	x a				x f		x g		✓ h			x i		✓ j	✓ j	✓ k
Sandwich tern (passage)	x a	✓ d	x a	x a	x c	x a		✓ e		x f		x g		✓ h			x i		✓ j	✓ j	✓ k
Redshank (Non-breeding)	x b	x b	x b	x b	x b	x b								✓ h			x i		✓ j	✓ j	✓ k
Common shelduck (Non-breeding)	x b	x b	x b	x b	x b	x b								✓ h			x i		✓ j	✓ j	✓ k
Eurasian teal (Non-breeding)	x b	x b	x b	x b	x b	x b								✓ h			x i		✓ j	✓ j	✓ k
Northern pintail (Non-breeding)	x b	x b	x b	x b	x b	x b								✓ h			x i		✓ j	✓ j	✓ k
Eurasian oystercatcher (Non-breeding)	x b	x b	x b	x b	x b	x b								✓ h			x i		✓ j	✓ j	✓ k
Grey plover (Non-breeding)	x b	x b	x b	x b	x b	x b								✓ h			x i		✓ j	✓ j	✓ k
Red knot (Non-breeding)	x b	x b	x b	x b	x b	x b								✓ h			x i		✓ j	✓ j	✓ k
Dunlin (Non-breeding)	x b	x b	x b	x b	x b	x b								✓ h			x i		✓ j	✓ j	✓ k
Black-tailed godwit (Non-breeding)	x b	x b	x b	x b	x b	x b								✓ h			x i		✓ j	✓ j	✓ k
Bar-tailed godwit (Non-breeding)	x b	x b	x b	x b	x b	x b								✓ h			x i		✓ j	✓ j	✓ k
Eurasian curlew (Non-breeding)	x b	x b	x b	x b	x b	x b								✓ h			x i		✓ j	✓ j	✓ k
Waterbird assemblage*	x b	x b	x b	x b	x b	x b								✓ l			x i		✓ l	✓ l	✓ l

*NB waterbirds, includes: G. Crested Grebe, Cormorant, Shelduck, Wigeon, Teal, Pintail, Oystercatcher Grey Plover, Lapwing, Knot, Sanderling, Dunlin, Black-tailed Godwit, Bar-tailed Godwit, redshank, curlew (Dee Estuary SPA Citation, 2004)

Evidence supporting conclusions:

x a	**Displacement (C, D):** This species has low or very low vulnerability to disturbance from vessel movements associated with offshore windfarm construction (Fliessbach et al, 2019). Therefore, the potential for LSE to result via this pathway is discounted.
x b	**Displacement (C, D):** This effect refers to disturbance related to the footprint of wind farm during construction, or once operational and considered most pertinent to birds spending most time at sea. For this feature, impacts are considered most pertinent and captured as 'barriers to movement.' For this category, no LSEs are identified.
x c	**Displacement (O):** Species has moderate vulnerability ("weak avoidance") to displacement by OWF (Bradbury et al, 2014). However, the site's conservation objectives (NRW, 2009) indicate that all breeding tern species, habitually exploit food resources *within* the estuary (the intertidal sand and mudflats, and saltmarsh). As such, thse features would not be excluded from key (or sufficient) foraging areas by the project during breeding and therefore, no LSEs are identified.
✓ d	**Displacement (O):** Sandwich terns have moderate vulnerability to displacement by OWF (Bradbury *et al*, 2014) with some evidence of weak avoidance from post-construction monitoring (Dierschke, Furness & Garth, 2016). As for the other terns, prey species tend to be confined to the sub-tidal channels at low water (NRW, 2009). However, the site is important during migrations along the west coast and LSE cannot be discounted for this feature during autumn passage (and return).
✓ e	**Barrier effect (O):** The OWF (presence of) and/or maintenance works can act as barriers to movement between areas, potentially increasing the cost of migration and mortality risk through energy expenditure or deterrence from critical habitats. The conservation objectives provide the species-specific areas between which, the features "must be able to pass between freely" (NRW, 2009). These include staging areas for migratory waterbirds

	(autumn /spring passage) are all above highest astronomical tide within the estuary and areas outside site. Barriers are a concern if the regular pattern of bird movement is affected long-term. Without further analysis of the location of the project relative to these areas, LSE cannot be discounted.
X f	**Changes in prey availability/behaviour (C,D):** Prey availability could be altered by environmental changes such as suspended sediments in the water (that could hinder visual foraging or settle in sensitive areas) or underwater noise (that displaces prey). Seabed disturbances (or its occupation by infrastructure) could directly, or indirectly (via physical processes) damage habitats and alter prey distribution. Roaming receptors (like seabirds) can tolerate temporary variations in environmental conditions and access alternative resources. Over the scales and the timescales presented for AyM , this effect-pathway is low-risk, and a finding of no LSE is appropriate.
X g	**Decommissioning (D):** Potential impacts during decommissioning are considered to be similar or potentially less than those outlined for construction. Therefore, a finding of no LSE is appropriate.
✓ h	**Collision (O):** Potential collision risk to species during migration at an alone and in-combination level. With reference to studies undertaken for other OWF[11], impacts are likely to only result in negligible numbers passing through the array during migration and therefore the risk of LSE is likely to be extremely low. However, to a precautionary basis this will be evidenced by modelling with reference to evidence on migration routes (e.g., Wright al). Therefore, potential LSEs are identified.
x i	**Indirect: effects on prey (O):** Indirect effects could arise longer-term, from direct impacts on prey species and the deeper ecological consequences that might arise at the lower trophic levels. Impacts on migration, the ingestion of contaminated sediments, reduced resilience, and alter prey-predator or reproductive dynamics could spill-over into the wider ecosystem. Evidence from other OWFs12 indicates that AyM will cause only small (insignificant) and short -term effects for local fish and benthic ecology (see footnote). On this basis, such impacts are not anticipated and the potential for LSE is discounted.
✓j	**In-combination:** Where the potential for LSEs has been concluded for the project acting alone, the potential for LSEs has been concluded with respect to effects in-combination. No additional in-combination issues are identified.
✓ k	**Decommissioning (D):** Potential impacts during decommissioning are considered to be similar or potentially less than those outlined for construction. Therefore, a finding of potential LSE is appropriate.
✓ l	**Assemblage (C, O, D):** As LSEs cannot be discounted at this time for component species of the assemblage, although impacts will be diluted across the assemblage as a collection of 20,000 birds, there is uncertainty about the implications for the diversity and abundances of the assemblage. The potential for LSEs is identified, pending clarification of LSEs for individual and collective components of the assemblage.

End of Matrix 17

[11] See Scot Gov. (2019) Strategic assessment of collision risk of Scottish offshore wind farms to non-seabird species at this hyperlink or the Collision Risk Modelling for Hornsea Project Three at this hyperlink

12 Assessments undertaken for Hornsea Project Three, which addressed habitat loss, underwater noise, increased SSC and deposition and pollution events, and EMF cumulatively in all phases reported negligible, minor adverse or minor beneficial effects on fish and benthic communities (see Orsted, 2018) at this hyperlink

Matrix 18: Dee Estuary Ramsar (Criterion 6: bird assemblages and species) - HRA Screening for Awel y Môr OWF

Name of European site:	The Dee Estuary (UK) Ramsar 13
European site code:	UK11082
Distance to relevant project component:	21 km to array / 3.5 km to ECC / 2.2 km to Onshore Draft Order Limits

	Potential Likely Significant Effects (LSE) from Awel y Môr Offshore Wind Farm																							
	Land-take/cover change			Visual/audio disturbances (onshore)			Hydrology (onshore)			Pollution			Barriers to movement			Collision risk			Emissions to air			In-combination		
	C	O	D	C	O	D	C	O	D	C	O	D	C	O	D	C	O	D	C	O	D	C	O	D
Ramsar criterion 5: Assemblages of international importance																								
Assemblage of wintering waterbirds*				✓a	✓a	✓a											✓a					✓a	✓a	✓a
Redshank (spring/autumn passage / non-breeding)	x b	x b	x b	✓c	✓c	✓d	X e	X e	X f	X g	X g	X f	x h	x h	x h		✓i		X j	X j	X f	✓ k	✓ k	✓ k
Common shelduck (non-breeding)	x b	x b	x b	✓c	✓c	✓d	X e	X e	X f	X g	X g	X f	x h	x h	x h		✓i		X j	X j	X f	✓ k	✓ k	✓ k
Eurasian teal (non-breeding)	x b	x b	x b	✓c	✓c	✓d	X e	X e	X f	X g	X g	X f	x h	x h	x h		✓i		X j	X j	X f	✓ k	✓ k	✓ k
Northern pintail (non-breeding)	x b	x b	x b	✓c	✓c	✓d	X e	X e	X f	X g	X g	X f	x h	x h	x h		✓i		X j	X j	X f	✓ k	✓ k	✓ k
Eurasian oystercatcher (non-breeding)	x b	x b	x b	✓c	✓c	✓d	X e	X e	X f	X g	X g	X f	x h	x h	x h		✓i		X j	X j	X f	✓ k	✓ k	✓ k
Grey plover (non-breeding)	x b	x b	x b	✓c	✓c	✓d	X e	X e	X f	X g	X g	X f	x h	x h	x h		✓i		X j	X j	X f	✓ k	✓ k	✓ k
Red knot (non-breeding)	x b	x b	x b	✓c	✓c	✓d	X e	X e	X f	X g	X g	X f	x h	x h	x h		✓i		X j	X j	X f	✓ k	✓ k	✓ k
Dunlin (non-breeding)	x b	x b	x b	✓c	✓c	✓d	X e	X e	X f	X g	X g	X f	x h	x h	x h		✓i		X j	X j	X f	✓ k	✓ k	✓ k
Black-tailed godwit (non-breeding)	x b	x b	x b	✓c	✓c	✓d	X e	X e	X f	X g	X g	X f	x h	x h	x h		✓i		X j	X j	X f	✓ k	✓ k	✓ k
Bar-tailed godwit (non-breeding)	x b	x b	x b	✓c	✓c	✓d	X e	X e	X f	X g	X g	X f	x h	x h	x h		✓i		X j	X j	X f	✓ k	✓ k	✓ k
Eurasian curlew (non-breeding)	x b	x b	x b	✓c	✓c	✓d	X e	X e	X f	X g	X g	X f	x h	x h	x h		✓i		X j	X j	X f	✓ k	✓ k	✓ k
Habitats supporting species in Criteria 5 and 6**				✓m	✓m	✓m																✓l	✓l	✓l

*120,726 individual wintering waterfowl (5 year peak mean 1994/5 – 1998/9) (JNCC, 2009).

**Habitats key to the maintenance of individual waterfowl and the overall total waterfowl assemblage: coastal grassland and habitats within the following SSSI: Inner Marsh Farm, Shotton Lagoons and Reedbeds, Gronant Dunes and Talacre Warren and Red Rocks (JNCC, 2009)

Evidence supporting conclusions

✓a	**Assemblage (C, O, D):** If LSEs cannot be discounted at this time for component species of the assemblage, then the potential for LSEs to the assemblage feature are identified pending clarification of LSEs for individual and collective components of the assemblage.
x b	**Land-take/cover change (C, O, D):** No potential for direct habitat loss (no spatial overlap with site). Possibility of loss or damage to functionally linked land within the onshore cable corridor due to permanent or temporary land-take to accommodate infrastructure and cables, The terrestrial ecology baseline provides an understanding of the arable and grassland habitats present onshore of landfall and functional linkages relevant to European sites (e.g. high tide roosting areas). With no indication of interactions, and with reference to the amount and location of alternative habitat no LSEs are identified.
✓c	**Visual/noise disturbance (onshore) (C, O, D):** Onshore works could occur within 0.05 km of the site. Species in the vicinity of works (within 500m) when using inland habitats for foraging and roosting during winter could be disturbed (in any phase) by noise and or visual stimuli generated by movements of vehicles, plant, and operatives. Unpredictable, loud or unexpected stimuli cause most disturbance which could manifest as altered foraging behaviour, the temporary loss of habitats, stress and reduced feature condition. Therefore, the potential for LSE cannot be discounted.
✓d	**Decommissioning:** Potential impacts during decommissioning are considered to be similar or potentially less than those outlined for construction. Therefore, a finding of potential LSE is appropriate.

[13] The Dee Estuary Ramsar is split between Wales and England

X e	**Hydrology (onshore) (C, O, D):** Works proximate to the site boundary could result in changes to local hydrology (surface or groundwater flows) (e.g., excavations, watercourse diversions, the temporary positioning of plant or structures or the presence of the cable in the ground) and alter the characteristics of habitats. The scale of the onshore works are such that the potential for and extent of structural or functional change is limited and the potential for effects on bird features more limited still. Given the amount and location of alternative habitat available to these highly mobile species that predate on a range of prey LSE can be discounted.
X f	**Decommissioning:** Potential impacts during decommissioning are considered to be similar or potentially less than those outlined for construction. Therefore, a finding of no LSE is appropriate.
X g	**Pollution (C, O, D):** No direct effects are predicted (no spatial overlap with site). The risk of pollution of pollution to onshore habitats (and impacts on dependent species) is extremely low due to the small-scale plant requirements onshore and the lack of vectors between sources of contamination (e.g., vehicles, plant or fuel) that would not typically come into contact with watercourses. Contaminants brought ashore from offshore incidents are unlikely to occur or otherwise be significant in light of the scale (and associated plant) and temporary duration of the works that would not permit a pervasive, or large-scale contamination event and the capacity of the offshore environment to dilute and disperse any emissions prior to them reaching intertidal areas. Therefore, a finding of no LSE is appropriate.
x h	**Barriers to movement (O):** Barrier effect as a result of the offshore works does not have the potential to affect birds as a consequence of the location of their foraging habitat (intertidal or close to shore), their migratory pathways that are not affected by the short deviation required to fly around the WTGs. Therefore, no LSE applies to barrier effect.
✓i	**Collision (O):** Potential collision risk to species during migration at an alone and in-combination level. With reference to studies undertaken for other OWF[14], impacts are likely to only result in negligible numbers passing through the array during migration and therefore the risk of LSE is likely to be extremely low. However, to a precautionary basis this will be evidenced by modelling with reference to evidence on migration routes (e.g., Wright al). Therefore, potential LSEs are identified.
X j	**Emissions to air (O):** The site is within the zone of influence within which emissions or fugitive dust from the construction could have a significant impact on the habitats supporting qualifying species (Highways Agency, 2007; IAQM, 2014). The risk of loss of habitat supporting qualifying species of SPA due to contamination from air emissions is considered to be very low. No LSEs are anticipated.
✓k	**Supporting habitats (C, O, D):** For species (and prey species) reliant on intertidal /coastal areas during winter or on migration impacts on supporting habitats (e.g., modifications to water movement (onshore hydrology), regime changes (from the introduction of INNS or contaminants) or smothering (sediment deposition), or structural change to or losses associated with changes to offshore physical processes, Pending clarification on the measure of effects on the individual and collective of habitats, the implications for the species dependent on those habitats and others in the local region are addressed separately for the relevant ornithological features of the relevant sites (SEE MATRIX XX). The potential for LSEs is not therefore identified here.

End of Matrix 18

[14] See Scot Gov. (2019) Strategic assessment of collision risk of Scottish offshore wind farms to non-seabird species at this hyperlink or the Collision Risk Modelling for Hornsea Project Three at this hyperlink

Matrix 19: Anglesey Terns / Morwenoliaid Ynys Mon Special Protection Area - HRA Screening for Awel y Môr Offshore windfarm

Name of European site:	Anglesey Terns / Morwenoliaid Ynys Mon Special Protection Area -
European site code:	UK9013061
Distance to relevant project component:	15.2 km to array / 19.7 km to ECC / 14.8 km to Onshore Draft Order Limits

	Potential Likely Significant Effects (LSE) from Awel y Môr Offshore Wind Farm																	
	Direct disturbance and displacement			Barrier effect			Collision			Prey availability/ behaviour			Indirect: effects on prey			In-combination		
	C	O	D	C	O	D	C	O	D	C	O	D	C	O	D	C	O	D
Sandwich tern (breeding and passage)	x a	✓ b	x d		✓ e			✓ g			x i			x j			✓ k	
Roseate tern (breeding and passage)	x a	✓ b	x d		✓ e			✓ g			x i			x j			✓ k	
Arctic tern (breeding and passage)	x a	x c	x d		✓ f			✓ h			x i			x j			✓ k	
Common tern (breeding and passage)	x a	x c	x d		✓ f			✓ h			x i			x j			✓ k	

Evidence supporting conclusions:

x a	**Displacement (C, D):** This species has very low vulnerability to disturbance from vessel movements associated with construction activity (Fliessbach et al, 2019). LSEs are therefore discounted.
✓ b	**Displacement (O):** This species has moderate vulnerability to displacement by offshore wind farms (Bradbury et al. 2014) with some evidence of weak avoidance from post-Construction monitoring (Dierschke, Furness & Garth, 2016).
x c	**Displacement (C, D):** Evidence suggests these species are neither displaced nor attracted from or to offshore wind farms (Dierschke, Furness & Garth, 2016). Additionally, these species are classified by Bradbury et al, (2014) as having low vulnerability to displacement by offshore wind farms. LSEs are therefore discounted.
x d	**Decommissioning:** Potential impacts during decommissioning are considered to be similar of potentially less than those outlined for construction. Therefore, a finding of no LSE is appropriate.
✓ e	**Barriers to movement (O):** Species has moderate vulnerability to displacement by offshore wind farms (Bradbury et al, 2014) with some evidence of weak avoidance from post-construction monitoring (Dierschke, Furness & Garth, 2016).
✓ f	**Barrier effect (O):** The duration, magnitude and extent of impact resulting from barrier effects on SPA qualifying species are assessed as being unlikely to compromise the conservation objectives of any designated SPA. Whilst there is no indication that barrier effects could lead to a LSE on any feature, they have been screened in on a precautionary basis as requested (Table 1 in RIAA).
✓ g	**Collision (O):** Species has moderate vulnerability to collision risk with turbines (Bradbury et al, 2014) and the array is within the mean-maximum foraging range plus 1SD for this species (Woodward et al. 2019). Based on the proximity of Awel y Môr to the breeding colony and the number of foraging trips required by terns per day during the chick rearing period (Masden et al, 2010), LSE cannot be discounted.
✓ h	**Collision (O):** Potential collision risk to species during migration at an alone and in-combination level. With reference to studies undertaken for other OWF[15], impacts are likely to only result in negligible numbers passing through the array during migration and therefore the risk of LSE is likely to be extremely low. However, to a precautionary basis this will be evidenced by modelling with reference to evidence on migration routes (e.g., Wright al). Therefore, potential LSEs are identified.
x i	**Prey behaviour (C, D):** Environmental changes can alter the behaviour, distribution and availability of prey (e.g., suspended sediments (could hinder visual foraging), underwater noise (could displaces prey), seabed disturbances (damage habitats could force relocations), or the turbine foundations (could attract prey (reef effect).) Roaming receptors (like seabirds) can tolerate temporary variations in environmental conditions and access alternative resources. Over the scales and the timescales presented for the project, this effect-pathway is low-risk, and a finding of no LSE is appropriate.
x j	**Impacts on prey (O):** Indirect effects could arise due to the ecological consequences that might arise at the lower trophic levels from the direct implications of the project, Impacts on migration, the ingestion of contaminated sediments (reduced numbers) reduced resilience, and altered prey-predator or reproductive dynamics could spill-over into the wider ecosystem. Existing OWFs [16] indicate Awel y Môr will cause only small (insignificant), short -term effects for local fish and benthic ecology (see footnote). Such impacts are not therefore anticipated and the potential for LSE is discounted.
✓ k	**In-combination (C, O, D):** Where potential for LSEs has been concluded for Awel y Môr acting alone, the potential for 'LSE in-combination' has been concluded. Mortalities will be calculated separately for collision and displacement and methodologies for combining additive impacts considered. No additional in-combination issues are identified.

[15] See Scot Gov. (2019) Strategic assessment of collision risk of Scottish offshore wind farms to non-seabird species at this hyperlink or the Collision Risk Modelling for Hornsea Project Three at this hyperlink

16 Assessments undertaken for Hornsea Project Three, which addressed habitat loss, underwater noise, increased SSC and deposition and pollution events, and EMF cumulatively in all phases reported negligible, minor adverse or minor beneficial effects on fish and benthic communities (see Orsted, 2018) at this hyperlink

End of Matrix 19

Matrix 20: Ribble and Alt Estuaries Special Projection Area - HRA Screening for Awel y Môr Offshore windfarm

Name of European site:	Ribble and Alt Estuaries (UK) SPA
European site code:	UK9005103
Distance to relevant project component:	30.8 km to array / 29.6 km to ECC / 28.8 km to Onshore Draft Order Limits

	Potential Likely Significant Effects (LSE) from Awel y Môr Offshore Wind Farm																	
	Disturbance and displacement			Barrier effect			Prey availability/ behaviour			Collision			Indirect: effects on prey			In-combination		
	C	O	D	C	O	D	C	O	D	C	O	D	C	O	D	C	O	D
Lesser black-backed gull	x a	x b	x c		x d		x e		x e		✓f			x g		x h	✓i	x h
Bewick's swan (non-breeding)																		
Whooper swan (non-breeding)																		
Pink-footed goose (non-breeding)																		
Common shelduck (non-breeding)																		
Eurasian wigeon (non-breeding)																		
Eurasian teal (non-breeding)																		
Northern pintail (non-breeding)																		
Eurasian oystercatcher (non-breeding)																		
Ringed plover (non-breeding)																		
European golden plover (non-breeding)																		
Grey plover (non-breeding)																		
Red knot (non-breeding)																		
Sanderling (non-breeding)																		
Dunlin (non-breeding)																		
Ruff (Breeding)																		
Black-tailed godwit (non-breeding)																		
Bar-tailed godwit (non-breeding)																		
Common redshank (non-breeding)																		
Common tern (Breeding)																		
Waterbird assemblage*																		
Seabird assemblage**																		

* 20,000 waterbirds non-breeding Cormorant, Bewick's Swan, Whooper Swan Pink-footed Goose, Shelduck, Wigeon, Teal, Pintail, Scaup, Common Scoter, Oystercatcher, Ringed Plover, Golden Plover Grey Plover, Lapwing, Knot, Sanderling, Dunlin, Black-tailed Godwit Bar tailed Godwit, Whimbrel, Curlew and Redshank (JNCC, 2015)

** 29,236 breeding seabird (5 year peak mean 1991/92-1995/96) iIncluding: lesser black-backed gull, black-headed gull and common tern. (JNCC, 2015

Evidence supporting conclusions

x a	**Displacement (C, D):** This species has very low vulnerability to disturbance from vessel movements associated with construction activity (Fliessbach et al, 2019). LSEs are therefore discounted.
x b	**Displacement (O):** Evidence suggests these species are neither displaced nor attracted from or to offshore wind farms (Dierschke, Furness & Garth, 2016). Additionally, these species are classified by Bradbury et al, (2014) as having low vulnerability to displacement by offshore wind farms. LSEs are therefore discounted.

x c	**Decommissioning:** Potential impacts during decommissioning are considered to be similar of potentially less than those outlined for construction. Therefore, a finding of no LSE is appropriate.
x d	**Barriers to movement (O):** In practice, as its impossible to know where an affected bird originated, barrier effects can be indistinguishable from displacement (disturbance) (SNBC, 2017). It follows from the conclusions concerning displacement, that this species is similarity not sensitive to barrier effects. Therefore, potential for LSEs is therefore discounted.
x e	**Prey behaviour (C, D):** Environmental changes can alter the behaviour, distribution and availability of prey (e.g., suspended sediments (could hinder visual foraging), underwater noise (could displaces prey), seabed disturbances (damage habitats could force relocations), or the turbine foundations (could attract prey (reef effect).) Roaming receptors (like seabirds) can tolerate temporary variations in environmental conditions and access alternative resources. Over the scales and the timescales presented for the project, this effect-pathway is low-risk, and a finding of no LSE is appropriate.
✓f	**Collision (O):** Species has moderate vulnerability to collision risk with turbines (Bradbury et al, 2014) and the array is within the mean-maximum foraging range plus 1SD for this species (Woodward et al. 2019). Based on the proximity of Awel y Môr to the breeding colony and the number of foraging trips required by terns per day during the chick rearing period (Masden et al, 2010), LSE cannot be discounted.
x g	**Impacts on prey (O):** Indirect effects could arise due to the ecological consequences that might arise at the lower trophic levels from the direct implications of the project, Impacts on migration, the ingestion of contaminated sediments (reduced numbers) reduced resilience, and altered prey-predator or reproductive dynamics could spill-over into the wider ecosystem. Existing OWFs [17] indicate Awel y Môr will cause only small (insignificant), short -term effects for local fish and benthic ecology (see footnote). Such impacts are not therefore anticipated and the potential for LSE is discounted.
x h	**In-combination (C, O, D):** Low species sensitivity to the impacts considered, or the small measure of effects predicted mean that Awel y Môr could not contribute to any or no measurable or material degree to in-combination effects.
✓i	**In-combination (C, O, D):** Where potential for LSEs has been concluded for Awel y Môr acting alone, the potential for 'LSE in-combination' has been concluded. Mortalities will be calculated separately for collision and displacement and methodologies for combining additive impacts considered. No additional in-combination issues are identified.

End of matrix 20

17 Assessments undertaken for Hornsea Project Three, which addressed habitat loss, underwater noise, increased SSC and deposition and pollution events, and EMF cumulatively in all phases reported negligible, minor adverse or minor beneficial effects on fish and benthic communities (see Orsted, 2018) at this hyperlink

Matrix 21: Ribble and Alt Estuaries Ramsar - HRA Screening for Awel y Môr Offshore windfarm:

Name of European site:	Ribble and Alt Estuaries Ramsar
European site code:	UK11057
Distance to relevant project component:	30.8 km to array / 29.6 km to ECC / 28.8 km to Onshore Draft Order Limits

	Potential Likely Significant Effects (LSE) from Awel y Môr Offshore Wind Farm																	
	Disturbance and displacement			Barrier effect			Prey availability/ behaviour			Collision			Indirect: effects on prey			In-combination		
	C	O	D	C	O	D	C	O	D	C	O	D	C	O	D	C	O	D
Lesser black-backed gull	x a	x b	x c		x d		x e		x e		✓f			x g		x h	✓i	x h

Evidence supporting conclusions:

x a	**Displacement (C, D):** This species has very low vulnerability to disturbance from vessel movements associated with construction activity (Fliessbach et al, 2019). LSEs are therefore discounted.
x b	**Displacement (O):** Evidence suggests these species are neither displaced nor attracted from or to offshore wind farms (Dierschke, Furness & Garth, 2016). Additionally, these species are classified by Bradbury et al, (2014) as having low vulnerability to displacement by offshore wind farms. LSEs are therefore discounted.
x c	**Decommissioning**: Potential impacts during decommissioning are considered to be similar of potentially less than those outlined for construction. Therefore, a finding of no LSE is appropriate.
x d	**Barriers to movement (O):** In practice, as its impossible to know where an affected bird originated, barrier effects can be indistinguishable from displacement (disturbance) (SNBC, 2017). It follows from the conclusions concerning displacement, that this species is similarity not sensitive to barrier effects. Therefore, potential for LSEs is therefore discounted.
x e	**Prey behaviour (C, D):** Environmental changes can alter the behaviour, distribution and availability of prey (e.g., suspended sediments (could hinder visual foraging), underwater noise (could displaces prey), seabed disturbances (damage habitats could force relocations), or the turbine foundations (could attract prey (reef effect).) Roaming receptors (like seabirds) can tolerate temporary variations in environmental conditions and access alternative resources. Over the scales and the timescales presented for the project, this effect-pathway is low-risk, and a finding of no LSE is appropriate.
✓f	**Collision (O):** Species has moderate vulnerability to collision risk with turbines (Bradbury et al, 2014) and the array is within the mean-maximum foraging range plus 1SD for this species (Woodward et al. 2019). Based on the proximity of Awel y Môr to the breeding colony and the number of foraging trips required by terns per day during the chick rearing period (Masden et al, 2010), LSE cannot be discounted.
x g	**Impacts on prey (O):** Indirect effects could arise due to the ecological consequences that might arise at the lower trophic levels from the direct implications of the project, Impacts on migration, the ingestion of contaminated sediments (reduced numbers) reduced resilience, and altered prey-predator or reproductive dynamics could spill-over into the wider ecosystem. Existing OWFs [18] indicate Awel y Môr will cause only small (insignificant), short -term effects for local fish and benthic ecology (see footnote). Such impacts are not therefore anticipated and the potential for LSE is discounted.
x h	**In-combination (C, O, D):** Low species sensitivity to the impacts considered, or the small measure of effects predicted mean that Awel y Môr could not contribute to any or no measurable or material degree to in-combination effects.
✓i	**In-combination (C, O, D):** Where potential for LSEs has been concluded for Awel y Môr acting alone, the potential for 'LSE in-combination' has been concluded. Mortalities will be calculated separately for collision and displacement and methodologies for combining additive impacts considered. No additional in-combination issues are identified.

End of matrix 21

18 Assessments undertaken for Hornsea Project Three, which addressed habitat loss, underwater noise, increased SSC and deposition and pollution events, and EMF cumulatively in all phases reported negligible, minor adverse or minor beneficial effects on fish and benthic communities (see Orsted, 2018) at this hyperlink

Matrix 22: Morecambe Bay and Duddon Estuary Special Protection Area - HRA Screening for Awel y Môr Offshore windfarm HRA Screening

Name of European site: European site code: Distance to relevant project component:	Morecambe Bay & Duddon Estuary Special Protection Area UK9020326 58.7 km to array / 65.3 km to ECC / 58.7 km to Onshore Draft Order Limits																	
	Potential Likely Significant Effects (LSE) from Awel y Môr Offshore Wind Farm																	
	Disturbance and displacement			Barrier effect			Prey availability/ behaviour			Collision			Indirect: effects on prey			In-combination		
	C	O	D	C	O	D	C	O	D	C	O	D	C	O	D	C	O	D
Herring gull (Breeding)	x a	x b	x c		x d		X e		x c		✓ f			X g		X i	✓j	X i
Lesser black-backed gull (breeding and non-breeding)	x a	x b	x c		x d		X e		x c		✓ f			X g		X i	✓j	X i
Greater black-backed gull	x a	x b	x c		x d		X e		x c		✓ f			X g		X i	✓j	X i
Sandwich tern (Breeding)																		
Common tern (Breeding)																		
Little tern (Breeding)																		
Little egret (non-breeding)																		
Whooper swan (non-breeding)																		
Pink-footed goose (non-breeding)																		
Common shelduck (non-breeding)																		
Northern pintail (non-breeding)																		
Eurasian oystercatcher (non-breeding)																		
Ringed plover (non-breeding)																		
European golden plover (non-breeding)																		
Grey plover (non-breeding)																		
Red knot (non-breeding)																		
Sanderling (non-breeding)																		
Dunlin (non-breeding))																		
Ruff (non-breeding)																		
Black-tailed godwit (non-breeding)																		
Bar-tailed godwit (non-breeding)																		
Eurasian curlew (non-breeding)																		
Common redshank (non-breeding)																		
Ruddy turnstone (non-breeding)																		
Mediterranean gull (non-breeding)																		

Assemblage features

	Assemblage features
Assemblages	**Non-breeding waterbird assemblage**: 40,672 individual seabirds including: herring gulls, lesser black-backed gulls, sandwich terns, common terns, and little terns
	Breeding seabird assemblage: 266,751 individuals (based on 5-year peak mean 2009/10 – 2013/14) comprising all of the qualifying features listed above, as well as an additional 19 species: great white egret, Eurasian spoonbill, light-bellied brent goose non-breeding): Eurasian wigeon, Eurasian teal, green-winged teal, mallard, ring-necked duck, common eider, common goldeneye, red-breasted merganser, great cormorant, northern lapwing, little stint, spotted redshank, common greenshank, black-headed gull, common gull and European herring gull.

Evidence supporting conclusions:

× a	**Displacement (C, D):** This species has very low vulnerability to disturbance from vessel movements associated with construction activity (Fliessbach et al, 2019). LSEs are therefore discounted.
× b	**Displacement (C, D):** Evidence suggests these species are neither displaced nor attracted from or to offshore wind farms (Dierschke, Furness & Garth, 2016). Additionally, these species are classified by Bradbury et al, (2014) as having low vulnerability to displacement by offshore wind farms. LSEs are therefore discounted.
× c	**Decommissioning:** Potential impacts during decommissioning are considered to be similar of potentially less than those outlined for construction. Therefore, a finding of no LSE is appropriate.
× d	**Barriers to movement (O):** In practice, as its impossible to know where an affected bird originated, barrier effects can be indistinguishable from displacement (disturbance) (SNBC, 2017). It follows from the conclusions concerning displacement, that this species is similarity not sensitive to barrier effects. Therefore, potential for LSEs is therefore discounted.
× e	**Prey behaviour (C, D):** Environmental changes can alter the behaviour, distribution and availability of prey (e.g., suspended sediments (could hinder visual foraging), underwater noise (could displaces prey), seabed disturbances (damage habitats could force relocations), or the turbine foundations (could attract prey (reef effect).) Roaming receptors (like seabirds) can tolerate temporary variations in environmental conditions and access alternative resources. Over the scales and the timescales presented for the project, this effect-pathway is low-risk, and a finding of no LSE is appropriate.
✓ f	**Collision (O): T**hese species have very high vulnerability to collision risk with turbines (Bradbury et al, 2014). Awel y Môr is located within the mean-maximum foraging range
× g	**Impacts on prey (O):** Indirect effects could arise due to the ecological consequences that might arise at the lower trophic levels from the direct implications of the project, impacts on migration, the ingestion of contaminated sediments (reduced numbers) reduced resilience, and altered prey-predator or reproductive dynamics could spill-over into the wider ecosystem. Existing OWFs [19] indicate Awel y Môr will cause only small (insignificant), short -term effects for local fish and benthic ecology (see footnote). Such impacts are not therefore anticipated and the potential for LSE is discounted.
✓ h	**In-combination (C, O, D):** Where potential for LSEs has been concluded for Awel y Môr acting alone, the potential for 'LSE in-combination' has been concluded. Mortalities will be calculated separately for collision and displacement and methodologies for combining additive impacts considered. No additional in-combination issues are identified.
× i	**In-combination (C, O, D):** Low species sensitivity to the impacts considered, or the small measure of effects predicted mean that Awel y Môr could not contribute to any or no measurable or material degree to in-combination effects.

End of matrix 22

19 Assessments undertaken for Hornsea Project Three, which addressed habitat loss, underwater noise, increased SSC and deposition and pollution events, and EMF cumulatively in all phases reported negligible, minor adverse or minor beneficial effects on fish and benthic communities (see Orsted, 2018) at this hyperlink

Matrix 23: Morecambe Bay Ramsar - HRA Screening - Awel y Môr offshore windfarm

Name of European site:	Morecambe Bay Ramsar (UK)
European site code:	UK11045
Distance to relevant project component:	58.7 km to array / 65.3 km to ECC / 58.7 km to Onshore Draft Order Limits

	Potential Likely Significant Effects (LSE) from Awel y Môr Offshore Wind Farm																	
	Disturbance and displacement			Barrier effect			Prey availability/ behaviour			Collision			Indirect: effects on prey			In-combination		
	C	O	D	C	O	D	C	O	D	C	O	D	C	O	D	C	O	D
Herring gull (breeding)	x a	x b	x c		x d		X e		x c		✓ f			X g		X i	✓j	X i
Lesser black-backed gull ((breeding)	x a	x b	x c		x d		X e		x c		✓ f			X g		X i	✓j	X i
Sandwich tern (breeding)																		
Common shelduck (non-breeding)																		
Great cormorant (non-breeding)																		
Northern pintail (non-breeding)																		
Common eider(non-breeding)																		
Eurasian oystercatcher (non-breeding)																		
Ringed plover (non-breeding)																		
Grey plover (non-breeding)																		
Sanderling (non-breeding)																		
Eurasian curlew (breeding)																		
Ruddy turnstone (non-breeding)																		
Lesser black-backed gull																		
Pink-footed goose (non-breeding)																		
Great crested grebe																		
Eurasian wigeon																		
Common goldeneye																		
Red-breasted merganser																		
European golden plover (non-breeding)																		
Northern lapwing																		
Red knot (non-breeding)																		
Dunlin (non-breeding))																		
Bar-tailed godwit (non-breeding)																		

Evidence supporting conclusions:

× a	**Displacement (C, D):** This species has very low vulnerability to disturbance from vessel movements associated with construction activity (Fliessbach et al, 2019). LSEs are therefore discounted.
× b	**Displacement (C, D):** Evidence suggests these species are neither displaced nor attracted from or to offshore wind farms (Dierschke, Furness & Garth, 2016). Additionally, these species are classified by Bradbury et al, (2014) as having low vulnerability to displacement by offshore wind farms. LSEs are therefore discounted.

× c	**Decommissioning:** Potential impacts during decommissioning are considered to be similar of potentially less than those outlined for construction. Therefore, a finding of no LSE is appropriate.
× d	**Barriers to movement (O):** In practice, as its impossible to know where an affected bird originated, barrier effects can be indistinguishable from displacement (disturbance) (SNBC, 2017). It follows from the conclusions concerning displacement, that this species is similarity not sensitive to barrier effects. Therefore, potential for LSEs is therefore discounted.
× e	**Prey behaviour (C, D):** Environmental changes can alter the behaviour, distribution and availability of prey (e.g., suspended sediments (could hinder visual foraging), underwater noise (could displaces prey), seabed disturbances (damage habitats could force relocations), or the turbine foundations (could attract prey (reef effect).) Roaming receptors (like seabirds) can tolerate temporary variations in environmental conditions and access alternative resources. Over the scales and the timescales presented for the project, this effect-pathway is low-risk, and a finding of no LSE is appropriate.
✓ f	**Collision (O):** These species have very high vulnerability to collision risk with turbines (Bradbury et al, 2014). Awel y Môr is located within the mean-maximum foraging range, therefore a potential for LSE is considered.
× g	**Impacts on prey (O):** Indirect effects could arise due to the ecological consequences that might arise at the lower trophic levels from the direct implications of the project, impacts on migration, the ingestion of contaminated sediments (reduced numbers) reduced resilience, and altered prey-predator or reproductive dynamics could spill-over into the wider ecosystem. Existing OWFs [20] indicate Awel y Môr will cause only small (insignificant), short -term effects for local fish and benthic ecology (see footnote). Such impacts are not therefore anticipated and the potential for LSE is discounted.
✓ h	**In-combination (C, O, D):** Where potential for LSEs has been concluded for Awel y Môr acting alone, the potential for 'LSE in-combination' has been concluded. Mortalities will be calculated separately for collision and displacement and methodologies for combining additive impacts considered. No additional in-combination issues are identified.
× i	**In-combination (C, O, D):** Low species sensitivity to the impacts considered, or the small measure of effects predicted mean that Awel y Môr could not contribute to any or no measurable or material degree to in-combination effects.

End of matrix 23

20 Assessments undertaken for Hornsea Project Three, which addressed habitat loss, underwater noise, increased SSC and deposition and pollution events, and EMF cumulatively in all phases reported negligible, minor adverse or minor beneficial effects on fish and benthic communities (see Orsted, 2018) at this hyperlink

Matrix 24: Bowland Fells Special Protection Area (and proposed - HRA Screening - Awel y Môr offshore windfarm

Name of European site:	Bowland Fells Special Protection Area
European site code:	UK9005151
Distance to relevant project component:	76.8 km to array / 81.3 km to ECC / 80.6 km to Onshore Draft Order Limits

	Potential Likely Significant Effects (LSE) from Awel y Môr Offshore Wind Farm																	
	Disturbance and displacement			Barrier effect			Prey availability/ behaviour			Collision			Indirect: effects on prey			In-combination		
	C	O	D	C	O	D	C	O	D	C	O	D	C	O	D	C	O	D
Lesser black-backed gull	x a	x b	x c		x d		X e		x c		✓ f			X g		X h	✓i	X h

Evidence supporting conclusions:

× a	**Displacement (C, D):** This species has very low vulnerability to disturbance from vessel movements associated with construction activity (Fliessbach et al, 2019). LSEs are therefore discounted.
× b	**Displacement (C, D):** Evidence suggests these species are neither displaced nor attracted from or to offshore wind farms (Dierschke, Furness & Garth, 2016). Additionally, these species are classified by Bradbury et al, (2014) as having low vulnerability to displacement by offshore wind farms. LSEs are therefore discounted.
× c	**Decommissioning:** Potential impacts during decommissioning are considered to be similar of potentially less than those outlined for construction. Therefore, a finding of no LSE is appropriate.
× d	**Barriers to movement (O):** In practice, as its impossible to know where an affected bird originated, barrier effects can be indistinguishable from displacement (disturbance) (SNBC, 2017). It follows from the conclusions concerning displacement, that this species is similarity not sensitive to barrier effects. Therefore, potential for LSEs is therefore discounted.
× e	**Prey behaviour (C, D):** Environmental changes can alter the behaviour, distribution and availability of prey (e.g., suspended sediments (could hinder visual foraging), underwater noise (could displaces prey), seabed disturbances (damage habitats could force relocations), or the turbine foundations (could attract prey (reef effect).) Roaming receptors (like seabirds) can tolerate temporary variations in environmental conditions and access alternative resources. Over the scales and the timescales presented for the project, this effect-pathway is low-risk, and a finding of no LSE is appropriate.
✓ f	**Collision (O): T**hese species have very high vulnerability to collision risk with turbines (Bradbury et al, 2014). Awel y Môr is located within the mean-maximum foraging range
× g	**Impacts on prey (O):** Indirect effects could arise due to the ecological consequences that might arise at the lower trophic levels from the direct implications of the project, impacts on migration, the ingestion of contaminated sediments (reduced numbers) reduced resilience, and altered prey-predator or reproductive dynamics could spill-over into the wider ecosystem. Existing OWFs [21] indicate Awel y Môr will cause only small (insignificant), short -term effects for local fish and benthic ecology (see footnote). Such impacts are not therefore anticipated and the potential for LSE is discounted.
× h	**In-combination (C, O, D):** Low species sensitivity to the impacts considered, or the small measure of effects predicted mean that Awel y Môr could not contribute to any or no measurable or material degree to in-combination effects.
✓ i	**In-combination (C, O, D):** Where potential for LSEs has been concluded for Awel y Môr acting alone, the potential for 'LSE in-combination' has been concluded. Mortalities will be calculated separately for collision and displacement and methodologies for combining additive impacts considered. No additional in-combination issues are identified.

End of matrix 24

21 Assessments undertaken for Hornsea Project Three, which addressed habitat loss, underwater noise, increased SSC and deposition and pollution events, and EMF cumulatively in all phases reported negligible, minor adverse or minor beneficial effects on fish and benthic communities (see Orsted, 2018) at this hyperlink

Matrix 25: Lambay Island (IE) Special Protection Area - HRA Screening - Awel y Môr offshore windfarm

Name of European site:	Lambay Island (IE) SPA
European site code:	IE0000204
Distance to relevant project component:	141.2 km to array / 149.1 km to ECC / 140.3 km to Onshore Draft Order Limits

	Potential Likely Significant Effects (LSE) from Awel y Môr Offshore Wind Farm																	
	Disturbance and displacement			Barrier effect			Prey availability/ behaviour			Collision			Indirect: effects on prey			In-combination		
	C	O	D	C	O	D	C	O	D	C	O	D	C	O	D	C	O	D
Kittiwake	x a	x b	× e		× f		× h		× h		✓ i			× k		× l	✓ m	× l
Lesser Black-backed Gull	x a	x b	× e		× f		× h		× h		✓ i			× k		× l	✓ m	× l
Guillemot	✓c	✓ d	✓c		× g		× h		× h		× j			× k		✓ m	✓ m	✓ m
Razorbill	✓c	✓ d	✓c		× g		× h		× h		× j			× k		✓ m	✓ m	✓ m
Puffin	✓c	✓ d	✓c		× g		× h		× h		× j			× k		✓ m	✓ m	✓ m
Shag																		
Greylag Goose																		
Cormorant																		
Herring Gull																		
Fulmar																		

Evidence supporting conclusions:

× a	**Displacement (C, D):** This species has very low vulnerability to disturbance from vessel movements associated with construction activity (Fliessbach et al, 2019). LSEs are therefore discounted.
× b	**Displacement (C, D):** Evidence suggests these species are neither displaced nor attracted from or to offshore wind farms (Dierschke, Furness & Garth, 2016). Additionally, these species are classified by Bradbury et al, (2014) as having low vulnerability to displacement by offshore wind farms. LSEs are therefore discounted.
✓c	**Displacement (C, D):** This species is highly vulnerable to disturbance during activities in these phases (Fliessbach et al, 2019). Given the direct spatial overlap between Awel y Môr and this SPA, further clarity is needed on Awel y Môr potential to interact with this species from this SPA, in-combination with the effects of collision mortalities (SNBC, 2017). On this current uncertainty, LSE cannot be discounted.
✓ d	**Displacement (O):** Behavioural responses to stimuli specific to O&M (e.g., operating turbines, maintenance vessels) could result in the displacement of birds at sea and habitat loss. That there is direct spatial overlap between Awel y Môr and this SPA, prompts further (displacement) analysis to determine, together with the effects of collision risk (SNBC, 2017), the sum of potential effects in the context of the local environment and to discount the risk of AEoI. On this current uncertainty, LSE cannot be discounted.
× e	**Decommissioning:** Potential impacts during decommissioning are considered to be similar of potentially less than those outlined for construction. Therefore, a finding of no LSE is appropriate.
× f	**Barriers to movement (O):** In practice, as its impossible to know where an affected bird originated, barrier effects can be indistinguishable from displacement (disturbance) (SNBC, 2017). It follows from the conclusions concerning displacement, that this species is similarity not sensitive to barrier effects. Therefore, potential for LSEs is therefore discounted.
× g	**Barriers to movement (O):** The duration, magnitude and extent of impact resulting from barrier effects on SPA qualifying species are assessed as being unlikely to compromise the conservation objectives of any designated SPA. Therefore, there is no indication that barrier effects could lead to a LSE on any feature.
× h	**Prey behaviour (C, D):** Environmental changes can alter the behaviour, distribution and availability of prey (e.g., suspended sediments (could hinder visual foraging), underwater noise (could displaces prey), seabed disturbances (damage habitats could force relocations), or the turbine foundations (could attract prey (reef effect).) Roaming receptors (like seabirds) can tolerate temporary variations in environmental conditions and access alternative resources. Over the scales and the timescales presented for the project, this effect-pathway is low-risk, and a finding of no LSE is appropriate.
✓ i	**Collision (O):** These species have very high vulnerability to collision risk with turbines (Bradbury et al, 2014). Awel y Môr is located within the mean-maximum foraging range, therefore a potential for LSE is considered.
× j	**Collision (O):** Species has low vulnerability to collision risk (Bradbury et al, 2014). LSEs can therefore be discounted.

× k	**Impacts on prey (O):** Indirect effects could arise due to the ecological consequences that might arise at the lower trophic levels from the direct implications of the project, impacts on migration, the ingestion of contaminated sediments (reduced numbers) reduced resilience, and altered prey-predator or reproductive dynamics could spill-over into the wider ecosystem. Existing OWFs [22] indicate Awel y Môr will cause only small (insignificant), short -term effects for local fish and benthic ecology (see footnote). Such impacts are not therefore anticipated and the potential for LSE is discounted.
× l	**In-combination (C, O, D):** Low species sensitivity to the impacts considered, or the small measure of effects predicted mean that Awel y Môr could not contribute to any or no measurable or material degree to in-combination effects.
✓ m	**In-combination (C, O, D):** Where potential for LSEs has been concluded for Awel y Môr acting alone, the potential for 'LSE in-combination' has been concluded. Mortalities will be calculated separately for collision and displacement and methodologies for combining additive impacts considered. No additional in-combination issues are identified.

End of matrix 25

22 Assessments undertaken for Hornsea Project Three, which addressed habitat loss, underwater noise, increased SSC and deposition and pollution events, and EMF cumulatively in all phases reported negligible, minor adverse or minor beneficial effects on fish and benthic communities (see Orsted, 2018) at this hyperlink

Matrix 26: Ailsa Craig Special Protection Area - HRA Screening - Awel y Môr offshore windfarm

Name of European site:	Ailsa Craig (UK) SPA
European site code:	UK9020294
Distance to relevant project component:	209.1 km to array / 217.9 km to ECC / 209.0 km to Onshore Draft Order Limits

	Potential Likely Significant Effects (LSE) from Awel y Môr Offshore Wind Farm																	
	Disturbance and displacement			Barrier effect			Prey availability/ behaviour			Collision			Indirect: effects on prey			In-combination		
	C	O	D	C	O	D	C	O	D	C	O	D	C	O	D	C	O	D
Lesser black-backed gull	x a	x b	×e		× g		× i		× i		✓ j			× k		× l	✓ m	× e
Kittiwake	x a	x b	×e		× g		× i		× i		✓ j			× k		× l	✓ m	× e
Gannet	✓ c	✓ d	✓ f		× h		× i		× i		✓ j			× k		× l	✓ m	× e
Guillemot																		
Herring gull																		
Seabird assemblage																		

Evidence supporting conclusions:

× a	**Displacement (C, D):** This species has very low vulnerability to disturbance from vessel movements associated with construction activity (Fliessbach et al, 2019). LSEs are therefore discounted.
× b	**Displacement (C, D):** Evidence suggests these species are neither displaced nor attracted from or to offshore wind farms (Dierschke, Furness & Garth, 2016). Additionally, these species are classified by Bradbury et al, (2014) as having low vulnerability to displacement by offshore wind farms. LSEs are therefore discounted.
✓ c	**Displacement (C):** Behavioural responses to stimuli could result in the displacement of birds at sea and habitat loss. That there is direct spatial overlap between Awel y Môr and this SPA, prompts further (displacement) analysis to determine, together with the effects of collision risk (SNBC, 2017), the sum of potential effects in the context of the local environment and to discount the risk of AEoI. On this current uncertainty, LSE cannot be discounted.
✓ d	**Displacement (O):** Behavioural responses to stimuli specific to O&M (e.g., operating turbines, maintenance vessels) could result in the displacement of birds at sea and habitat loss. That there is direct spatial overlap between Awel y Môr and this SPA, prompts further (displacement) analysis to determine, together with the effects of collision risk (SNBC, 2017), the sum of potential effects in the context of the local environment and to discount the risk of AEoI. On this current uncertainty, LSE cannot be discounted.
×e	**Decommissioning:** Potential impacts during decommissioning are considered to be similar of potentially less than those outlined for construction. Therefore, a finding of no LSE is appropriate.
✓ f	**Decommissioning:** Potential impacts during decommissioning are considered to be similar of potentially less than those outlined for construction. Therefore, a finding of LSE is appropriate.
× g	**Barriers to movement (O):** In practice, as its impossible to know where an affected bird originated, barrier effects can be indistinguishable from displacement (disturbance) (SNBC, 2017). It follows from the conclusions concerning displacement, that this species is similarity not sensitive to barrier effects. Therefore, potential for LSEs is therefore discounted.
× h	**Barriers to movement (O):** The duration, magnitude and extent of impact resulting from barrier effects on SPA qualifying species are assessed as being unlikely to compromise the conservation objectives of any designated SPA. Therefore, there is no indication that barrier effects could lead to a LSE on any feature.
× i	**Prey behaviour (C, D):** Environmental changes can alter the behaviour, distribution and availability of prey (e.g., suspended sediments (could hinder visual foraging), underwater noise (could displaces prey), seabed disturbances (damage habitats could force relocations), or the turbine foundations (could attract prey (reef effect).) Roaming receptors (like seabirds) can tolerate temporary variations in environmental conditions and access alternative resources. Over the scales and the timescales presented for the project, this effect-pathway is low-risk, and a finding of no LSE is appropriate.
✓ j	**Collision (O):** These species have very high vulnerability to collision risk with turbines (Bradbury et al, 2014). Awel y Môr is located within the mean-maximum foraging range, therefore a potential for LSE is considered.

× k	**Impacts on prey (O):** Indirect effects could arise due to the ecological consequences that might arise at the lower trophic levels from the direct implications of the project, impacts on migration, the ingestion of contaminated sediments (reduced numbers) reduced resilience, and altered prey-predator or reproductive dynamics could spill-over into the wider ecosystem. Existing OWFs [23] indicate Awel y Môr will cause only small (insignificant), short -term effects for local fish and benthic ecology (see footnote). Such impacts are not therefore anticipated and the potential for LSE is discounted.
× l	**In-combination (C):** Low species sensitivity to the impacts considered, or the small measure of effects predicted mean that Awel y Môr could not contribute to any or no measurable or material degree to in-combination effects.
✓ m	**In-combination (C, O, D):** Where potential for LSEs has been concluded for Awel y Môr acting alone, the potential for 'LSE in-combination' has been concluded. Mortalities will be calculated separately for collision and displacement and methodologies for combining additive impacts considered. No additional in-combination issues are identified.

End of matrix 26

23 Assessments undertaken for Hornsea Project Three, which addressed habitat loss, underwater noise, increased SSC and deposition and pollution events, and EMF cumulatively in all phases reported negligible, minor adverse or minor beneficial effects on fish and benthic communities (see Orsted, 2018) at this hyperlink

Matrix 27: Ireland's Eye (IE) Special Protection Area - HRA Screening - Awel y Môr offshore windfarm

Name of European site:	Ireland's Eye (IE) SPR
European site code:	IE0004117
Distance to relevant project component:	145.8 km to array / 153.3 km to ECC / 144.7 km to Onshore Draft Order Limits

	Potential Likely Significant Effects (LSE) from Awel y Môr Offshore Wind Farm																	
	Disturbance and displacement			Barrier effect			Prey availability/ behaviour			Collision			Indirect: effects on prey			In-combination		
	C	O	D	C	O	D	C	O	D	C	O	D	C	O	D	C	O	D
Kittiwake	x a	x b	× e		× f		× h		× h		✓ i			× k		× l	✓ m	× l
Guillemot	✓c	✓ d	✓c		× g		× h		× h		× j			× k		✓ m	✓ m	✓m
Razorbill	✓c	✓ d	✓c		× g		× h		× h		× j			× k		✓ m	✓ m	✓ m
Cormorant																		
Herring Gul																		

Evidence supporting conclusions:

× a	**Displacement (C, D):** This species has very low vulnerability to disturbance from vessel movements associated with construction activity (Fliessbach et al, 2019). LSEs are therefore discounted.
× b	**Displacement (C, D):** Evidence suggests these species are neither displaced nor attracted from or to offshore wind farms (Dierschke, Furness & Garth, 2016). Additionally, these species are classified by Bradbury et al, (2014) as having low vulnerability to displacement by offshore wind farms. LSEs are therefore discounted.
✓c	**Displacement (C, D):** This species is highly vulnerable to disturbance during activities in these phases (Fliessbach et al, 2019). Given the direct spatial overlap between Awel y Môr and this SPA, further clarity is needed on Awel y Môr potential to interact with this species from this SPA, in-combination with the effects of collision mortalities (SNBC, 2017). On this current uncertainty, LSE cannot be discounted.
✓ d	**Displacement (O):** Behavioural responses to stimuli specific to O&M (e.g., operating turbines, maintenance vessels) could result in the displacement of birds at sea and habitat loss. That there is direct spatial overlap between Awel y Môr and this SPA, prompts further (displacement) analysis to determine, together with the effects of collision risk (SNBC, 2017), the sum of potential effects in the context of the local environment and to discount the risk of AEoI. On this current uncertainty, LSE cannot be discounted.
× e	**Decommissioning:** Potential impacts during decommissioning are considered to be similar of potentially less than those outlined for construction. Therefore, a finding of no LSE is appropriate.
× f	**Barriers to movement (O):** In practice, as its impossible to know where an affected bird originated, barrier effects can be indistinguishable from displacement (disturbance) (SNBC, 2017). It follows from the conclusions concerning displacement, that this species is similarity not sensitive to barrier effects. Therefore, potential for LSEs is therefore discounted.
× g	**Barriers to movement (O):** The duration, magnitude and extent of impact resulting from barrier effects on SPA qualifying species are assessed as being unlikely to compromise the conservation objectives of any designated SPA. Therefore, there is no indication that barrier effects could lead to a LSE on any feature.
× h	**Prey behaviour (C, D):** Environmental changes can alter the behaviour, distribution and availability of prey (e.g., suspended sediments (could hinder visual foraging), underwater noise (could displaces prey), seabed disturbances (damage habitats could force relocations), or the turbine foundations (could attract prey (reef effect).) Roaming receptors (like seabirds) can tolerate temporary variations in environmental conditions and access alternative resources. Over the scales and the timescales presented for the project, this effect-pathway is low-risk, and a finding of no LSE is appropriate.
✓ i	**Collision (O):** These species have very high vulnerability to collision risk with turbines (Bradbury et al, 2014). Awel y Môr is located within the mean-maximum foraging range, therefore a potential for LSE is considered.
× j	**Collision (O):** Species has low vulnerability to collision risk (Bradbury et al, 2014). LSEs can therefore be discounted.
× k	**Impacts on prey (O):** Indirect effects could arise due to the ecological consequences that might arise at the lower trophic levels from the direct implications of the project, impacts on migration, the ingestion of contaminated sediments (reduced numbers) reduced resilience, and altered prey-predator or reproductive dynamics could spill-over into the wider ecosystem. Existing OWFs [24] indicate Awel y Môr will cause only small (insignificant), short -term effects for local fish and benthic ecology (see footnote). Such impacts are not therefore anticipated and the potential for LSE is discounted.
× l	**In-combination (C, O, D):** Low species sensitivity to the impacts considered, or the small measure of effects predicted mean that Awel y Môr could not contribute to any or no measurable or material degree to in-combination effects.

24 Assessments undertaken for Hornsea Project Three, which addressed habitat loss, underwater noise, increased SSC and deposition and pollution events, and EMF cumulatively in all phases reported negligible, minor adverse or minor beneficial effects on fish and benthic communities (see Orsted, 2018) at this hyperlink

✓ m	**In-combination (C, O, D):** Where potential for LSEs has been concluded for Awel y Môr acting alone, the potential for 'LSE in-combination' has been concluded. Mortalities will be calculated separately for collision and displacement and methodologies for combining additive impacts considered. No additional in-combination issues are identified.

End of matrix 27

Matrix 28: Howth Head Coast Special Protection Area - HRA Screening - Awel y Môr offshore windfarm

Name of European site:	Howth Head Coast (IE) SPA
European site code:	IE0004113
Distance to relevant project component:	145.0 km to array / 152.5 km to ECC / 151.2 km to Onshore Draft Order Limits

	Potential Likely Significant Effects (LSE) from Awel y Môr Offshore Wind Farm																	
	Disturbance and displacement			Barrier effect			Prey availability/ behaviour			Collision			Indirect: effects on prey			In-combination		
	C	O	D	C	O	D	C	O	D	C	O	D	C	O	D	C	O	D
Kittiwake	x a	x b	x c		x d		X e		x c		✓ f			X g		X i	✓j	X i

Evidence supporting conclusions:

× a	**Displacement (C, D):** This species has very low vulnerability to disturbance from vessel movements associated with construction activity (Fliessbach et al, 2019). LSEs are therefore discounted.
× b	**Displacement (C, D):** Evidence suggests these species are neither displaced nor attracted from or to offshore wind farms (Dierschke, Furness & Garth, 2016). Additionally, these species are classified by Bradbury et al, (2014) as having low vulnerability to displacement by offshore wind farms. LSEs are therefore discounted.
× c	**Decommissioning:** Potential impacts during decommissioning are considered to be similar of potentially less than those outlined for construction. Therefore, a finding of no LSE is appropriate.
× d	**Barriers to movement (O):** In practice, as its impossible to know where an affected bird originated, barrier effects can be indistinguishable from displacement (disturbance) (SNBC, 2017). It follows from the conclusions concerning displacement, that this species is similarity not sensitive to barrier effects. Therefore, potential for LSEs is therefore discounted.
× e	**Prey behaviour (C, D):** Environmental changes can alter the behaviour, distribution and availability of prey (e.g., suspended sediments (could hinder visual foraging), underwater noise (could displaces prey), seabed disturbances (damage habitats could force relocations), or the turbine foundations (could attract prey (reef effect).) Roaming receptors (like seabirds) can tolerate temporary variations in environmental conditions and access alternative resources. Over the scales and the timescales presented for the project, this effect-pathway is low-risk, and a finding of no LSE is appropriate.
✓ f	**Collision (O):** These species have very high vulnerability to collision risk with turbines (Bradbury et al, 2014). Awel y Môr is located within the mean-maximum foraging range, therefore a potential for LSE is considered.
× g	**Impacts on prey (O):** Indirect effects could arise due to the ecological consequences that might arise at the lower trophic levels from the direct implications of the project, impacts on migration, the ingestion of contaminated sediments (reduced numbers) reduced resilience, and altered prey-predator or reproductive dynamics could spill-over into the wider ecosystem. Existing OWFs [25] indicate Awel y Môr will cause only small (insignificant), short -term effects for local fish and benthic ecology (see footnote). Such impacts are not therefore anticipated and the potential for LSE is discounted.
✓ h	**In-combination (C, O, D):** Where potential for LSEs has been concluded for Awel y Môr acting alone, the potential for 'LSE in-combination' has been concluded. Mortalities will be calculated separately for collision and displacement and methodologies for combining additive impacts considered. No additional in-combination issues are identified.
× i	**In-combination (C, O, D):** Low species sensitivity to the impacts considered, or the small measure of effects predicted mean that Awel y Môr could not contribute to any or no measurable or material degree to in-combination effects.

End of matrix 28

25 Assessments undertaken for Hornsea Project Three, which addressed habitat loss, underwater noise, increased SSC and deposition and pollution events, and EMF cumulatively in all phases reported negligible, minor adverse or minor beneficial effects on fish and benthic communities (see Orsted, 2018) at this hyperlink

Matrix 29: Wicklow Head Special Protection Area - HRA Screening - Awel y Môr offshore windfarm

Name of European site:	Wicklow Head (IE) SPA
European site code:	IE0004127
Distance to relevant project component:	152.0 km to array / 158.3 km to ECC / 151.2 km to Onshore Draft Order Limits

	Potential Likely Significant Effects (LSE) from Awel y Môr Offshore Wind Farm																	
	Disturbance and displacement			Barrier effect			Prey availability/ behaviour			Collision			Indirect: effects on prey			In-combination		
	C	O	D	C	O	D	C	O	D	C	O	D	C	O	D	C	O	D
Kittiwake	x a	x b	x c		x d		X e		x c		✓ f			X g		X i	✓j	X i

Evidence supporting conclusions:

× a	**Displacement (C, D):** This species has very low vulnerability to disturbance from vessel movements associated with construction activity (Fliessbach et al, 2019). LSEs are therefore discounted.
× b	**Displacement (C, D):** Evidence suggests these species are neither displaced nor attracted from or to offshore wind farms (Dierschke, Furness & Garth, 2016). Additionally, these species are classified by Bradbury et al, (2014) as having low vulnerability to displacement by offshore wind farms. LSEs are therefore discounted.
× c	**Decommissioning:** Potential impacts during decommissioning are considered to be similar of potentially less than those outlined for construction. Therefore, a finding of no LSE is appropriate.
× d	**Barriers to movement (O):** In practice, as its impossible to know where an affected bird originated, barrier effects can be indistinguishable from displacement (disturbance) (SNBC, 2017). It follows from the conclusions concerning displacement, that this species is similarity not sensitive to barrier effects. Therefore, potential for LSEs is therefore discounted.
× e	**Prey behaviour (C, D):** Environmental changes can alter the behaviour, distribution and availability of prey (e.g., suspended sediments (could hinder visual foraging), underwater noise (could displaces prey), seabed disturbances (damage habitats could force relocations), or the turbine foundations (could attract prey (reef effect).) Roaming receptors (like seabirds) can tolerate temporary variations in environmental conditions and access alternative resources. Over the scales and the timescales presented for the project, this effect-pathway is low-risk, and a finding of no LSE is appropriate.
✓ f	**Collision (O):** These species have very high vulnerability to collision risk with turbines (Bradbury et al, 2014). Awel y Môr is located within the mean-maximum foraging range, therefore a potential for LSE is considered.
× g	**Impacts on prey (O):** Indirect effects could arise due to the ecological consequences that might arise at the lower trophic levels from the direct implications of the project, impacts on migration, the ingestion of contaminated sediments (reduced numbers) reduced resilience, and altered prey-predator or reproductive dynamics could spill-over into the wider ecosystem. Existing OWFs [26] indicate Awel y Môr will cause only small (insignificant), short -term effects for local fish and benthic ecology (see footnote). Such impacts are not therefore anticipated and the potential for LSE is discounted.
✓ h	**In-combination (C, O, D):** Where potential for LSEs has been concluded for Awel y Môr acting alone, the potential for 'LSE in-combination' has been concluded. Mortalities will be calculated separately for collision and displacement and methodologies for combining additive impacts considered. No additional in-combination issues are identified.
× i	**In-combination (C, O, D):** Low species sensitivity to the impacts considered, or the small measure of effects predicted mean that Awel y Môr could not contribute to any or no measurable or material degree to in-combination effects.

End of matrix 29

26 Assessments undertaken for Hornsea Project Three, which addressed habitat loss, underwater noise, increased SSC and deposition and pollution events, and EMF cumulatively in all phases reported negligible, minor adverse or minor beneficial effects on fish and benthic communities (see Orsted, 2018) at this hyperlink

Matrix 30: Glannau Aberdaron ac Ynys Enlli/ Aberdaron Coast and Bardsey Island Special Protection Area - HRA Screening - Awel y Môr offshore windfarm

Name of European site:	Glannau Aberdaron ac Ynys Enlli/ Aberdaron Coast and Bardsey Island (UK) SPA
European site code:	UK9013121
Distance to relevant project component:	88.5 km to array / 91.7 km to ECC / 88.1 km to Onshore Draft Order Limits

	Potential Likely Significant Effects (LSE) from Awel y Môr Offshore Wind Farm														
	Disturbance and displacement			Barrier effect			Prey availability/ behaviour			Collision			In-combination		
	C	O	D	C	O	D	C	O	D	C	O	D	C	O	D
Manx shearwater	✓a	✓b	✓c		×d		×e		×e		×f		✓g	✓g	✓g

Evidence supporting conclusions:

✓a	**Displacement (C):** Behavioural responses to stimuli could result in the displacement of birds at sea and habitat loss. That there is direct spatial overlap between **Awel y Môr** and this SPA, prompts further (displacement) analysis to determine, together with the effects of collision risk (SNBC, 2017), the sum of potential effects in the context of the local environment and to discount the risk of AEoI. On this current uncertainty, LSE cannot be discounted.
✓b	**Displacement (O):** Behavioural responses to stimuli specific to O&M (e.g., operating turbines, maintenance vessels) could result in the displacement of birds at sea and habitat loss. That there is direct spatial overlap between **Awel y Môr** and this SPA, prompts further (displacement) analysis to determine, together with the effects of collision risk (SNBC, 2017), the sum of potential effects in the context of the local environment and to discount the risk of AEoI. On this current uncertainty, LSE cannot be discounted.
✓c	**Decommissioning:** Potential impacts during decommissioning are considered to be similar of potentially less than those outlined for construction. Therefore, a finding of LSE is appropriate.
×d	**Barriers to movement (O):** The duration, magnitude and extent of impact resulting from barrier effects on SPA qualifying species are assessed as being unlikely to compromise the conservation objectives of any designated SPA. Whilst, therefore, there is no indication that barrier effects could lead to a LSE on any feature.
×e	**Prey behaviour (C, D):** Environmental changes can alter the behaviour, distribution and availability of prey (e.g., suspended sediments (could hinder visual foraging), underwater noise (could displaces prey), seabed disturbances (damage habitats could force relocations), or the turbine foundations (could attract prey (reef effect).) Roaming receptors (like seabirds) can tolerate temporary variations in environmental conditions and access alternative resources. Over the scales and the timescales presented for the project, this effect-pathway is low-risk, and a finding of no LSE is appropriate.
×f	**Collision (O):** Species has low vulnerability to collision risk (Bradbury et al, 2014). LSEs can therefore be discounted.
✓g	**In-combination (C, O, D):** Low species sensitivity to the impacts considered, or the small measure of effects predicted mean that Awel y Môr could not contribute to any or no measurable or material degree to in-combination effects.

End of matrix 30

Matrix 31: Copeland Islands Special Protection Area - HRA Screening - Awel y Môr offshore windfarm

Name of European site:	Copeland Islands (UK) SPA
European site code:	UK9020291
Distance to relevant project component:	168.9 km to array / 181.0 km to ECC / 200.8 km to Onshore Draft Order Limits

	Potential Likely Significant Effects (LSE) from Awel y Môr Offshore Wind Farm														
	Disturbance and displacement			Barrier effect			Prey availability/ behaviour			Collision			In-combination		
	C	O	D	C	O	D	C	O	D	C	O	D	C	O	D
Manx shearwater (breeding population)	✓a	✓b	✓c		×d		×e		×e		×f		✓g	✓g	✓g
Arctic Tern (breeding population)															

Evidence supporting conclusions:

✓a	**Displacement (C):** Behavioural responses to stimuli could result in the displacement of birds at sea and habitat loss. That there is direct spatial overlap between **Awel y Môr** and this SPA, prompts further (displacement) analysis to determine, together with the effects of collision risk (SNBC, 2017), the sum of potential effects in the context of the local environment and to discount the risk of AEoI. On this current uncertainty, LSE cannot be discounted.
✓b	**Displacement (O):** Behavioural responses to stimuli specific to O&M (e.g., operating turbines, maintenance vessels) could result in the displacement of birds at sea and habitat loss. That there is direct spatial overlap between **Awel y Môr** and this SPA, prompts further (displacement) analysis to determine, together with the effects of collision risk (SNBC, 2017), the sum of potential effects in the context of the local environment and to discount the risk of AEoI. On this current uncertainty, LSE cannot be discounted.
✓c	**Decommissioning:** Potential impacts during decommissioning are considered to be similar of potentially less than those outlined for construction. Therefore, a finding of LSE is appropriate.
×d	**Barriers to movement (O):** The duration, magnitude and extent of impact resulting from barrier effects on SPA qualifying species are assessed as being unlikely to compromise the conservation objectives of any designated SPA. Whilst, therefore, there is no indication that barrier effects could lead to a LSE on any feature.
×e	**Prey behaviour (C, D):** Environmental changes can alter the behaviour, distribution and availability of prey (e.g., suspended sediments (could hinder visual foraging), underwater noise (could displaces prey), seabed disturbances (damage habitats could force relocations), or the turbine foundations (could attract prey (reef effect).) Roaming receptors (like seabirds) can tolerate temporary variations in environmental conditions and access alternative resources. Over the scales and the timescales presented for the project, this effect-pathway is low-risk, and a finding of no LSE is appropriate.
×f	**Collision (O):** Species has low vulnerability to collision risk (Bradbury et al, 2014). LSEs can therefore be discounted.
✓g	**In-combination (C, O, D):** Low species sensitivity to the impacts considered, or the small measure of effects predicted mean that Awel y Môr could not contribute to any or no measurable or material degree to in-combination effects.

End of matrix 31

Matrix 32: Skomer, Skokholm and the Seas off Pembrokeshire / Sgomer, Sgogwm a Moroedd Penfro - HRA Screening - Awel y Môr offshore windfarm

Name of European site:	Skomer, Skokholm and the Seas off Pembrokeshire / Sgomer, Sgogwm a Moroedd Penfro (UK) SPA
European site code:	UK9014051
Distance to relevant project component:	207.9 km to array / 209.3 km to ECC / 202.5 km to Onshore Draft Order Limits

	Potential Likely Significant Effects (LSE) from Awel y Môr Offshore Wind Farm																	
	Disturbance and displacement			Barrier effect			Prey availability/ behaviour			Collision			Indirect: effects on prey			In-combination		
	C	O	D	C	O	D	C	O	D	C	O	D	C	O	D	C	O	D
Kittiwake (breeding and non-breeding)	×a	xb	×a		×e		×h		×h		✓i			×k		×l	✓m	×l
Lesser black-backed gull (breeding and non-breeding)	×a	xb	×a		×e		×h		×h		✓i			×k		×l	✓m	×l
Puffin (breeding)	✓c	✓ d	✓c		×f		×h		×h		×j			×k		✓m	✓m	✓m
Manx shearwater	✓c	✓ d	✓c		×f		×h		×h		×j			×k		✓m	✓m	✓m
Guillemot	✓c	✓ d	✓c		×g		×h		×h		×j			×k		✓m	✓m	✓m
Razorbill	✓c	✓ d	✓c		×g		×h		×h		×j			×k		✓m	✓m	✓m
Storm petrel (breeding)	✓c	✓ d	✓c		×f		×h		×h		✓i			×k		✓m	✓m	✓m
Seabird assemblage*																		

1.2.7 * The main components are razorbill, common guillemot, black-legged kittiwake, Atlantic puffin, lesser black-backed gull, Manx shearwater and European storm petrel.

Evidence supporting conclusions:

×a	**Displacement (C, D):** This species has very low vulnerability to disturbance from vessel movements associated with construction activity (Fliessbach et al, 2019). LSEs are therefore discounted.
xb	**Displacement (O):** Species has moderate vulnerability ("weak avoidance") to displacement by offshore wind farms Bradbury et al, 2014). However, the typical foraging habitats of these species indicate displacement effects are not likely to be significant. Cormorant for example, move inland to feed. Further, AyM does not spatially overlap with the coastal areas identified on a "strong confidence in the regularity of use of these areas (Lawson et al. 2015)" common tern foraging areas, As such. key and sufficient foraging areas would not be restricted by AyM and no LSEs are identified.
✓c	**Displacement (C, D):** This species is highly vulnerable to disturbance during activities in these phases (Fliessbach et al, 2019). Given the direct spatial overlap between Awel y Môr and this SPA, further clarity is needed on Awel y Môr potential to interact with this species from this SPA, in-combination with the effects of collision mortalities (SNBC, 2017). On this current uncertainty, LSE cannot be discounted.
✓ d	**Displacement (O):** Behavioural responses to stimuli specific to O&M (e.g., operating turbines, maintenance vessels) could result in the displacement of birds at sea and habitat loss. That there is direct spatial overlap between Awel y Môr and this SPA, prompts further (displacement) analysis to determine, together with the effects of collision risk (SNBC, 2017), the sum of potential effects in the context of the local environment and to discount the risk of AEoI. On this current uncertainty, LSE cannot be discounted.
×e	**Barriers to movement (O):** In practice, as its impossible to know where an affected bird originated, barrier effects can be indistinguishable from displacement (disturbance) (SNBC, 2017). It follows from the conclusions concerning displacement, that this species is similarity not sensitive to barrier effects. Therefore, potential for LSEs is therefore discounted.
×f	**Barriers to movement (O):** The duration, magnitude and extent of impact resulting from barrier effects on SPA qualifying species are assessed as being unlikely to compromise the conservation objectives of any designated SPA. Whilst, therefore, there is no indication that barrier effects could lead to a LSE on any feature.
×g	**Barriers to movement (O):** Barrier effect as a result of the offshore works does not have the potential to affect birds as their migratory pathways are not affected by the short deviation required to fly around the WTGs. Therefore no LSE applies to barrier effect.
×h	**Prey behaviour (C, D):** Environmental changes can alter the behaviour, distribution and availability of prey (e.g., suspended sediments (could hinder visual foraging), underwater noise (could displaces prey), seabed disturbances (damage habitats could force relocations), or the turbine foundations (could attract prey (reef effect).) Roaming receptors (like seabirds) can tolerate temporary variations in environmental conditions and access alternative resources. Over the scales and the timescales presented for the project, this effect-pathway is low-risk, and a finding of no LSE is appropriate.

✓i	**Collision (O): T**hese species have very high vulnerability to collision risk with turbines (Bradbury et al, 2014). Awel y Môr is located within the mean-maximum foraging range
×j	**Collision (O):** Species has low vulnerability to collision risk (Bradbury et al, 2014). LSEs can therefore be discounted.
×k	**Impacts on prey (O):** Indirect effects could arise due to the ecological consequences that might arise at the lower trophic levels from the direct implications of the project, impacts on migration, the ingestion of contaminated sediments (reduced numbers) reduced resilience, and altered prey-predator or reproductive dynamics could spill-over into the wider ecosystem. Existing OWFs [27] indicate Awel y Môr will cause only small (insignificant), short -term effects for local fish and benthic ecology (see footnote). Such impacts are not therefore anticipated and the potential for LSE is discounted.
×l	**In-combination (C, O, D):** Low species sensitivity to the impacts considered, or the small measure of effects predicted mean that Awel y Môr could not contribute to any or no measurable or material degree to in-combination effects.
✓k	**In-combination (C, O, D):** Where potential for LSEs has been concluded for Awel y Môr acting alone, the potential for 'LSE in-combination' has been concluded. Mortalities will be calculated separately for collision and displacement and methodologies for combining additive impacts considered. No additional in-combination issues are identified.

End of matrix 32

27 Assessments undertaken for Hornsea Project Three, which addressed habitat loss, underwater noise, increased SSC and deposition and pollution events, and EMF cumulatively in all phases reported negligible, minor adverse or minor beneficial effects on fish and benthic communities (see Orsted, 2018) at this hyperlink

Matrix 33: Rathlin Island Special Protection Area - HRA Screening - Awel y Môr offshore windfarm

Name of European site:	Rathlin Island (UK) SPA
European site code:	UK9020011
Distance to relevant project component:	246.9 km to array / 257.4 km to ECC / 246.8 km to Onshore Draft Order Limits

	Potential Likely Significant Effects (LSE) from Awel y Môr Offshore Wind Farm																	
	Disturbance and displacement			Barrier effect			Prey availability/ behaviour			Collision			Indirect: effects on prey			In-combination		
	C	O	D	C	O	D	C	O	D	C	O	D	C	O	D	C	O	D
Puffin	✓a	✓b	✓a		×c		×d		×d		×e			×f		✓g	✓g	✓g

Evidence supporting conclusions:

✓a	**Displacement (C, D):** This species is highly vulnerable to disturbance during activities in these phases (Fliessbach et al, 2019). Given the direct spatial overlap between Awel y Môr and this SPA, further clarity is needed on Awel y Môr potential to interact with this species from this SPA, in-combination with the effects of collision mortalities (SNBC, 2017). On this current uncertainty, LSE cannot be discounted.
✓b	**Displacement (O):** Behavioural responses to stimuli specific to O&M (e.g., operating turbines, maintenance vessels) could result in the displacement of birds at sea and habitat loss. That there is direct spatial overlap between Awel y Môr and this SPA, prompts further (displacement) analysis to determine, together with the effects of collision risk (SNBC, 2017), the sum of potential effects in the context of the local environment and to discount the risk of AEoI. On this current uncertainty, LSE cannot be discounted.
×c	**Barriers to movement (O):** The duration, magnitude and extent of impact resulting from barrier effects on SPA qualifying species are assessed as being unlikely to compromise the conservation objectives of any designated SPA. Whilst, therefore, there is no indication that barrier effects could lead to a LSE on any feature.
×d	**Prey behaviour (C, D):** Environmental changes can alter the behaviour, distribution and availability of prey (e.g., suspended sediments (could hinder visual foraging), underwater noise (could displaces prey), seabed disturbances (damage habitats could force relocations), or the turbine foundations (could attract prey (reef effect).) Roaming receptors (like seabirds) can tolerate temporary variations in environmental conditions and access alternative resources. Over the scales and the timescales presented for the project, this effect-pathway is low-risk, and a finding of no LSE is appropriate.
×e	**Collision (O):** Species has low vulnerability to collision risk (Bradbury et al, 2014). LSEs can therefore be discounted.
×f	**Impacts on prey (O):** Indirect effects could arise due to the ecological consequences that might arise at the lower trophic levels from the direct implications of the project, impacts on migration, the ingestion of contaminated sediments (reduced numbers) reduced resilience, and altered prey-predator or reproductive dynamics could spill-over into the wider ecosystem. Existing OWFs [28] indicate Awel y Môr will cause only small (insignificant), short -term effects for local fish and benthic ecology (see footnote). Such impacts are not therefore anticipated and the potential for LSE is discounted.
✓g	**In-combination (C, O, D):** Where potential for LSEs has been concluded for Awel y Môr acting alone, the potential for 'LSE in-combination' has been concluded. Mortalities will be calculated separately for collision and displacement and methodologies for combining additive impacts considered. No additional in-combination issues are identified.

End of matrix 33

28 Assessments undertaken for Hornsea Project Three, which addressed habitat loss, underwater noise, increased SSC and deposition and pollution events, and EMF cumulatively in all phases reported negligible, minor adverse or minor beneficial effects on fish and benthic communities (see Orsted, 2018) at this hyperlink

Matrix 34: Saltee Islands Special Protection Area - HRA Screening - Awel y Môr offshore windfarm

Name of European site:	Saltee Islands (IE) SPA
European site code:	IE0004002
Distance to relevant project component:	233.2 km to array / 237.7 km to ECC / 232.6 km to Onshore Draft Order Limits

	Potential Likely Significant Effects (LSE) from Awel y Môr Offshore Wind Farm																	
	Disturbance and displacement			Barrier effect			Prey availability/ behaviour			Collision			Indirect: effects on prey			In-combination		
	C	O	D	C	O	D	C	O	D	C	O	D	C	O	D	C	O	D
Kittiwake	×a	xb	×a		×e		×g		×g		✓h			×j		×k	✓l	×k
Lesser black-backed gull	×a	xb	×a		×e		×g		×g		✓h			×j		×k	✓l	×k
Puffin	✓c	✓ d	✓c		×f		×g		×g		×i			×j		✓l	✓l	✓l
Fulmar																		
Gannet																		
Herring Gull																		
Cormorant																		
Shag																		
Guillemot																		
Razorbill																		

Evidence supporting conclusions:

×a	**Displacement (C, D):** This species has very low vulnerability to disturbance from vessel movements associated with construction activity (Fliessbach et al, 2019). LSEs are therefore discounted.
xb	**Displacement (O):** Species has moderate vulnerability ("weak avoidance") to displacement by offshore wind farms Bradbury et al, 2014). However, the typical foraging habitats of these species indicate displacement effects are not likely to be significant. Cormorant for example, move inland to feed. Further, AyM does not spatially overlap with the coastal areas identified on a "strong confidence in the regularity of use of these areas (Lawson et al. 2015)" common tern foraging areas, As such. key and sufficient foraging areas would not be restricted by AyM and no LSEs are identified.
✓c	**Displacement (C, D):** This species is highly vulnerable to disturbance during activities in these phases (Fliessbach et al, 2019). Given the direct spatial overlap between Awel y Môr and this SPA, further clarity is needed on Awel y Môr potential to interact with this species from this SPA, in-combination with the effects of collision mortalities (SNBC, 2017). On this current uncertainty, LSE cannot be discounted.
✓ d	**Displacement (O):** Behavioural responses to stimuli specific to O&M (e.g., operating turbines, maintenance vessels) could result in the displacement of birds at sea and habitat loss. That there is direct spatial overlap between Awel y Môr and this SPA, prompts further (displacement) analysis to determine, together with the effects of collision risk (SNBC, 2017), the sum of potential effects in the context of the local environment and to discount the risk of AEoI. On this current uncertainty, LSE cannot be discounted.
×e	**Barriers to movement (O):** In practice, as its impossible to know where an affected bird originated, barrier effects can be indistinguishable from displacement (disturbance) (SNBC, 2017). It follows from the conclusions concerning displacement, that this species is similarity not sensitive to barrier effects. Therefore, potential for LSEs is therefore discounted.
xf	**Barriers to movement (O):** The duration, magnitude and extent of impact resulting from barrier effects on SPA qualifying species are assessed as being unlikely to compromise the conservation objectives of any designated SPA. Whilst, therefore, there is no indication that barrier effects could lead to a LSE on any feature.
×g	**Prey behaviour (C, D):** Environmental changes can alter the behaviour, distribution and availability of prey (e.g., suspended sediments (could hinder visual foraging), underwater noise (could displaces prey), seabed disturbances (damage habitats could force relocations), or the turbine foundations (could attract prey (reef effect).) Roaming receptors (like seabirds) can tolerate temporary variations in environmental conditions and access alternative resources. Over the scales and the timescales presented for the project, this effect-pathway is low-risk, and a finding of no LSE is appropriate.
✓h	**Collision (O):** These species have very high vulnerability to collision risk with turbines (Bradbury et al, 2014). Awel y Môr is located within the mean-maximum foraging range, therefore a potential for LSE is considered.

×i	**Collision (O):** Species has low vulnerability to collision risk (Bradbury et al, 2014). LSEs can therefore be discounted.
×j	**Impacts on prey (O):** Indirect effects could arise due to the ecological consequences that might arise at the lower trophic levels from the direct implications of the project, impacts on migration, the ingestion of contaminated sediments (reduced numbers) reduced resilience, and altered prey-predator or reproductive dynamics could spill-over into the wider ecosystem. Existing OWFs [29] indicate Awel y Môr will cause only small (insignificant), short -term effects for local fish and benthic ecology (see footnote). Such impacts are not therefore anticipated and the potential for LSE is discounted.
×k	**In-combination (C, O, D):** Low species sensitivity to the impacts considered, or the small measure of effects predicted mean that Awel y Môr could not contribute to any or no measurable or material degree to in-combination effects.
✓l	**In-combination (C, O, D):** Where potential for LSEs has been concluded for Awel y Môr acting alone, the potential for 'LSE in-combination' has been concluded. Mortalities will be calculated separately for collision and displacement and methodologies for combining additive impacts considered. No additional in-combination issues are identified.

End of matrix 34

29 Assessments undertaken for Hornsea Project Three, which addressed habitat loss, underwater noise, increased SSC and deposition and pollution events, and EMF cumulatively in all phases reported negligible, minor adverse or minor beneficial effects on fish and benthic communities (see Orsted, 2018) at this hyperlink

Matrix 35: Wexford Harbour and Slobs Special Protection Area - HRA Screening - Awel y Môr offshore windfarm

Name of European site:	Wexford Harbour and Slobs (IE) SPA
European site code:	IE0004076
Distance to relevant project component:	206.2 km to array / 211.0 km to ECC / 205.5 km to Onshore Draft Order Limits

	Potential Likely Significant Effects (LSE) from Awel y Môr Offshore Wind Farm																	
	Disturbance and displacement			Barrier effect			Prey availability/ behaviour			Collision			Indirect: effects on prey			In-combination		
	C	O	D	C	O	D	C	O	D	C	O	D	C	O	D	C	O	D
Lesser black-backed gull	x a	x b	x c		x d		x e		x e		✓f			x g		x h	✓i	x h
Little Grebe																		
Great Crested Grebe]																		
Cormorant																		
Grey Heron																		
Bewick's Swan																		
Whooper Swan																		
Light-bellied Brent Goose																		
Shelduck																		
Wigeon																		
Teal																		
Mallard																		
Pintail																		
Scaup																		
Goldeneye																		
Red-breasted Merganser																		
Hen Harrier																		
Coot																		
Oystercatcher																		
Golden Plover																		
Grey Plover																		
Lapwing																		
Knot																		
Sanderling																		
Dunlin																		
Black-tailed Godwit																		
Bar-tailed Godwit																		
Curlew																		

Redshank																		
Black-headed Gull																		
Lesser Black-backed Gull																		
Little Tern																		
Greenland White-fronted Goose																		

Evidence supporting conclusions:

x a	**Displacement (C, D):** This species has very low vulnerability to disturbance from vessel movements associated with construction activity (Fliessbach et al, 2019). LSEs are therefore discounted.
x b	**Displacement (O):** Evidence suggests these species are neither displaced nor attracted from or to offshore wind farms (Dierschke, Furness & Garth, 2016). Additionally, these species are classified by Bradbury et al, (2014) as having low vulnerability to displacement by offshore wind farms. LSEs are therefore discounted.
x c	**Decommissioning**: Potential impacts during decommissioning are considered to be similar of potentially less than those outlined for construction. Therefore, a finding of no LSE is appropriate.
x d	**Barriers to movement (O):** In practice, as its impossible to know where an affected bird originated, barrier effects can be indistinguishable from displacement (disturbance) (SNBC, 2017). It follows from the conclusions concerning displacement, that this species is similarity not sensitive to barrier effects. Therefore, potential for LSEs is therefore discounted.
x e	**Prey behaviour (C, D):** Environmental changes can alter the behaviour, distribution and availability of prey (e.g., suspended sediments (could hinder visual foraging), underwater noise (could displaces prey), seabed disturbances (damage habitats could force relocations), or the turbine foundations (could attract prey (reef effect).) Roaming receptors (like seabirds) can tolerate temporary variations in environmental conditions and access alternative resources. Over the scales and the timescales presented for the project, this effect-pathway is low-risk, and a finding of no LSE is appropriate.
✓f	**Collision (O):** Species has moderate vulnerability to collision risk with turbines (Bradbury et al, 2014) and the array is within the mean-maximum foraging range plus 1SD for this species (Woodward et al. 2019). Based on the proximity of Awel y Môr to the breeding colony and the number of foraging trips required by terns per day during the chick rearing period (Masden et al, 2010), LSE cannot be discounted.
x g	**Impacts on prey (O):** Indirect effects could arise due to the ecological consequences that might arise at the lower trophic levels from the direct implications of the project, Impacts on migration, the ingestion of contaminated sediments (reduced numbers) reduced resilience, and altered prey-predator or reproductive dynamics could spill-over into the wider ecosystem. Existing OWFs [30] indicate Awel y Môr will cause only small (insignificant), short -term effects for local fish and benthic ecology (see footnote). Such impacts are not therefore anticipated and the potential for LSE is discounted.
x h	**In-combination (C, O, D):** Low species sensitivity to the impacts considered, or the small measure of effects predicted mean that Awel y Môr could not contribute to any or no measurable or material degree to in-combination effects.
✓i	**In-combination (C, O, D):** Where potential for LSEs has been concluded for Awel y Môr acting alone, the potential for 'LSE in-combination' has been concluded. Mortalities will be calculated separately for collision and displacement and methodologies for combining additive impacts considered. No additional in-combination issues are identified.

End of matrix 35

30 Assessments undertaken for Hornsea Project Three, which addressed habitat loss, underwater noise, increased SSC and deposition and pollution events, and EMF cumulatively in all phases reported negligible, minor adverse or minor beneficial effects on fish and benthic communities (see Orsted, 2018) at this hyperlink

Matrix 36: Helvick Head to Ballyquin Special Protection Area - HRA Screening - Awel y Môr offshore windfarm

Name of European site:	Helvick Head to Ballyquin (IE) SPA
European site code:	IE0004192
Distance to relevant project component:	291.9 km to array / 297.1 km to ECC / 291.2 km to Onshore Draft Order Limits

	Potential Likely Significant Effects (LSE) from Awel y Môr Offshore Wind Farm																	
	Disturbance and displacement			Barrier effect			Prey availability/ behaviour			Collision			Indirect: effects on prey			In-combination		
	C	O	D	C	O	D	C	O	D	C	O	D	C	O	D	C	O	D
Kittiwake	x a	x b	x c		x d		x e		x e		✓f			x g		x h	✓i	x h
Cormorant																		
Peregrine																		
Herring Gull																		
Chough																		

Evidence supporting conclusions:

x a	**Displacement (C, D):** This species has very low vulnerability to disturbance from vessel movements associated with construction activity (Fliessbach et al, 2019). LSEs are therefore discounted.
x b	**Displacement (O):** Evidence suggests these species are neither displaced nor attracted from or to offshore wind farms (Dierschke, Furness & Garth, 2016). Additionally, these species are classified by Bradbury et al, (2014) as having low vulnerability to displacement by offshore wind farms. LSEs are therefore discounted.
x c	**Decommissioning**: Potential impacts during decommissioning are considered to be similar of potentially less than those outlined for construction. Therefore, a finding of no LSE is appropriate.
x d	**Barriers to movement (O):** In practice, as its impossible to know where an affected bird originated, barrier effects can be indistinguishable from displacement (disturbance) (SNBC, 2017). It follows from the conclusions concerning displacement, that this species is similarity not sensitive to barrier effects. Therefore, potential for LSEs is therefore discounted.
x e	**Prey behaviour (C, D):** Environmental changes can alter the behaviour, distribution and availability of prey (e.g., suspended sediments (could hinder visual foraging), underwater noise (could displaces prey), seabed disturbances (damage habitats could force relocations), or the turbine foundations (could attract prey (reef effect).) Roaming receptors (like seabirds) can tolerate temporary variations in environmental conditions and access alternative resources. Over the scales and the timescales presented for the project, this effect-pathway is low-risk, and a finding of no LSE is appropriate.
✓f	**Collision (O):** Species has moderate vulnerability to collision risk with turbines (Bradbury et al, 2014) and the array is within the mean-maximum foraging range plus 1SD for this species (Woodward et al. 2019). Based on the proximity of Awel y Môr to the breeding colony and the number of foraging trips required by terns per day during the chick rearing period (Masden et al, 2010), LSE cannot be discounted.
x g	**Impacts on prey (O):** Indirect effects could arise due to the ecological consequences that might arise at the lower trophic levels from the direct implications of the project, Impacts on migration, the ingestion of contaminated sediments (reduced numbers) reduced resilience, and altered prey-predator or reproductive dynamics could spill-over into the wider ecosystem. Existing OWFs [31] indicate Awel y Môr will cause only small (insignificant), short -term effects for local fish and benthic ecology (see footnote). Such impacts are not therefore anticipated and the potential for LSE is discounted.
x h	**In-combination (C, O, D):** Low species sensitivity to the impacts considered, or the small measure of effects predicted mean that Awel y Môr could not contribute to any or no measurable or material degree to in-combination effects.
✓i	**In-combination (C, O, D):** Where potential for LSEs has been concluded for Awel y Môr acting alone, the potential for 'LSE in-combination' has been concluded. Mortalities will be calculated separately for collision and displacement and methodologies for combining additive impacts considered. No additional in-combination issues are identified.

End of matrix 36

31 Assessments undertaken for Hornsea Project Three, which addressed habitat loss, underwater noise, increased SSC and deposition and pollution events, and EMF cumulatively in all phases reported negligible, minor adverse or minor beneficial effects on fish and benthic communities (see Orsted, 2018) at this hyperlink

Matrix 37: Grassholm Special Protection Area - HRA Screening - Awel y Môr offshore windfarm

Name of European site:	Grassholm (UK) SPA
European site code:	UK9014041
Distance to relevant project component:	217.6 km to array / 219.4 km to ECC / 214.1 km to Onshore Draft Order Limits

	Potential Likely Significant Effects (LSE) from Awel y Môr Offshore Wind Farm																	
	Disturbance and displacement			Barrier effect			Prey availability/ behaviour			Collision			Indirect: effects on prey			In-combination		
	C	O	D	C	O	D	C	O	D	C	O	D	C	O	D	C	O	D
Gannet	✓a	✓b	✓c		x d		x e		x e		✓f			x g		✓h	✓h	✓h

Evidence supporting conclusions:

✓ a	**Displacement (C):** Behavioural responses to stimuli could result in the displacement of birds at sea and habitat loss. That there is direct spatial overlap between Awel y Môr and this SPA, prompts further (displacement) analysis to determine, together with the effects of collision risk (SNBC, 2017), the sum of potential effects in the context of the local environment and to discount the risk of AEoI. On this current uncertainty, LSE cannot be discounted.
✓ b	**Displacement (O):** Behavioural responses to stimuli specific to O&M (e.g., operating turbines, maintenance vessels) could result in the displacement of birds at sea and habitat loss. That there is direct spatial overlap between Awel y Môr and this SPA, prompts further (displacement) analysis to determine, together with the effects of collision risk (SNBC, 2017), the sum of potential effects in the context of the local environment and to discount the risk of AEoI. On this current uncertainty, LSE cannot be discounted.
✓ c	**Decommissioning:** Potential impacts during decommissioning are considered to be similar of potentially less than those outlined for construction. Therefore, a finding of LSE is appropriate.
x d	**Barriers to movement (O):** The duration, magnitude and extent of impact resulting from barrier effects on SPA qualifying species are assessed as being unlikely to compromise the conservation objectives of any designated SPA. Whilst, therefore, there is no indication that barrier effects could lead to a LSE on any feature.
x e	**Prey behaviour (C, D):** Environmental changes can alter the behaviour, distribution and availability of prey (e.g., suspended sediments (could hinder visual foraging), underwater noise (could displaces prey), seabed disturbances (damage habitats could force relocations), or the turbine foundations (could attract prey (reef effect).) Roaming receptors (like seabirds) can tolerate temporary variations in environmental conditions and access alternative resources. Over the scales and the timescales presented for the project, this effect-pathway is low-risk, and a finding of no LSE is appropriate.
✓f	**Collision (O):** Species has moderate vulnerability to collision risk with turbines (Bradbury et al, 2014) and the array is within the mean-maximum foraging range plus 1SD for this species (Woodward et al. 2019). Based on the proximity of Awel y Môr to the breeding colony and the number of foraging trips required by terns per day during the chick rearing period (Masden et al, 2010), LSE cannot be discounted.
x g	**Impacts on prey (O):** Indirect effects could arise due to the ecological consequences that might arise at the lower trophic levels from the direct implications of the project, Impacts on migration, the ingestion of contaminated sediments (reduced numbers) reduced resilience, and altered prey-predator or reproductive dynamics could spill-over into the wider ecosystem. Existing OWFs [32] indicate Awel y Môr will cause only small (insignificant), short -term effects for local fish and benthic ecology (see footnote). Such impacts are not therefore anticipated and the potential for LSE is discounted.
✓h	**In-combination (C, O, D):** Where potential for LSEs has been concluded for Awel y Môr acting alone, the potential for 'LSE in-combination' has been concluded. Mortalities will be calculated separately for collision and displacement and methodologies for combining additive impacts considered. No additional in-combination issues are identified.

End of matrix 37

32 Assessments undertaken for Hornsea Project Three, which addressed habitat loss, underwater noise, increased SSC and deposition and pollution events, and EMF cumulatively in all phases reported negligible, minor adverse or minor beneficial effects on fish and benthic communities (see Orsted, 2018) at this hyperlink

Matrix 38: Ynys Seiriol / Puffin Island Special Protection Area - HRA Screening - Awel y Môr offshore windfarm

Name of European site:	Ynys Seiriol / Puffin Island (IE) SPA
European site code:	IE0004003
Distance to relevant project component:	17.3 km to array / 21.3 km to ECC / 17.03 km to Onshore Draft Order Limits

	Potential Likely Significant Effects (LSE) from Awel y Môr Offshore Wind Farm																	
	Disturbance and displacement			Barrier effect			Prey availability/ behaviour			Collision			Indirect: effects on prey			In-combination		
	C	O	D	C	O	D	C	O	D	C	O	D	C	O	D	C	O	D
Cormorant	✓a	xb	✓a		✓ c		×d		×d		✓e			×f		✓g	✓g	✓g

Evidence supporting conclusions:

✓a	**Displacement (C, D):** This species is highly vulnerable to disturbance during activities in these phases (Fliessbach et al, 2019). Given the direct spatial overlap between Awel y Môr and this SPA, further clarity is needed on Awel y Môr potential to interact with this species from this SPA, in-combination with the effects of collision mortalities (SNBC, 2017). On this current uncertainty, LSE cannot be discounted.
xb	**Displacement (O):** Species has moderate vulnerability ("weak avoidance") to displacement by offshore wind farms Bradbury et al, 2014). However, the typical foraging habitats of these species indicate displacement effects are not likely to be significant. Cormorant for example, move inland to feed. Further, AyM does not spatially overlap with the coastal areas identified on a "strong confidence in the regularity of use of these areas (Lawson et al. 2015)" common tern foraging areas, As such. key and sufficient foraging areas would not be restricted by AyM and no LSEs are identified.
✓c	**Barriers to movement (O):** In practice, barrier effects can be indistinguishable from displacement (disturbance) effects (SNBC, 2017), it follows from the conclusions concerning displacement, that this species has very high vulnerability to barrier effects due to offshore wind farms and construction activities (Bradbury et al, 2014, Fliessbach et al, 2019). LSE cannot be discounted in absence of further inquiry.
×d	**Prey behaviour (C, D):** Environmental changes can alter the behaviour, distribution and availability of prey (e.g., suspended sediments (could hinder visual foraging), underwater noise (could displaces prey), seabed disturbances (damage habitats could force relocations), or the turbine foundations (could attract prey (reef effect).) Roaming receptors (like seabirds) can tolerate temporary variations in environmental conditions and access alternative resources. Over the scales and the timescales presented for the project, this effect-pathway is low-risk, and a finding of no LSE is appropriate.
✓e	**Collision (O):** These species have very high vulnerability to collision risk with turbines (Bradbury et al, 2014). Awel y Môr is located within the mean-maximum foraging range, therefore a potential for LSE is considered.
×f	**Impacts on prey (O):** Indirect effects could arise due to the ecological consequences that might arise at the lower trophic levels from the direct implications of the project, impacts on migration, the ingestion of contaminated sediments (reduced numbers) reduced resilience, and altered prey-predator or reproductive dynamics could spill-over into the wider ecosystem. Existing OWFs [33] indicate Awel y Môr will cause only small (insignificant), short -term effects for local fish and benthic ecology (see footnote). Such impacts are not therefore anticipated and the potential for LSE is discounted.
✓g	**In-combination (C, O, D):** Where potential for LSEs has been concluded for Awel y Môr acting alone, the potential for 'LSE in-combination' has been concluded. Mortalities will be calculated separately for collision and displacement and methodologies for combining additive impacts considered. No additional in-combination issues are identified.

End of matrix 38

33 Assessments undertaken for Hornsea Project Three, which addressed habitat loss, underwater noise, increased SSC and deposition and pollution events, and EMF cumulatively in all phases reported negligible, minor adverse or minor beneficial effects on fish and benthic communities (see Orsted, 2018) at this hyperlink

Matrix 39: Traeth Lafan / Layan Sands, Conway Bay (UK) SPA Special Protection Area - HRA Screening - Awel y Môr offshore windfarm

Name of European site:	Traeth Lafan / Layan Sands, Conway Bay (UK) SPA
European site code:	UK9013031
Distance to relevant project component:	21.3 km to array / 22.8 km to ECC / 21.3 km to Onshore Draft Order Limits

	Potential Likely Significant Effects (LSE) from Awel y Môr Offshore Wind Farm																	
	Disturbance and displacement			Barrier effect			Prey availability/ behaviour			Collision			Indirect: effects on prey			In-combination		
	C	O	D	C	O	D	C	O	D	C	O	D	C	O	D	C	O	D
Oystercatcher	x a	x b	x c		x d		x e		x e		✓f			x g		x h	✓i	x h
Redshank																		
Great Crested Grebe	x a	x b	x c		x d		x e		x e		✓f			x g		x h	✓i	x h
Curlew	x a	x b	x c		x d		x e		x e		✓f			x g		x h	✓i	x h
Red-breasted Merganser	x a	x b	x c		x d		x e		x e		✓f			x g		x h	✓i	x h

Evidence supporting conclusions:

x a	**Displacement (C, D):** This species has very low vulnerability to disturbance from vessel movements associated with construction activity (Fliessbach et al, 2019). LSEs are therefore discounted.
x b	**Displacement (O):** Evidence suggests these species are neither displaced nor attracted from or to offshore wind farms (Dierschke, Furness & Garth, 2016). Additionally, these species are classified by Bradbury et al, (2014) as having low vulnerability to displacement by offshore wind farms. LSEs are therefore discounted.
x c	**Decommissioning**: Potential impacts during decommissioning are considered to be similar of potentially less than those outlined for construction. Therefore, a finding of no LSE is appropriate.
x d	**Barriers to movement (O):** In practice, as its impossible to know where an affected bird originated, barrier effects can be indistinguishable from displacement (disturbance) (SNBC, 2017). It follows from the conclusions concerning displacement, that this species is similarity not sensitive to barrier effects. Therefore, potential for LSEs is therefore discounted.
x e	**Prey behaviour (C, D):** Environmental changes can alter the behaviour, distribution and availability of prey (e.g., suspended sediments (could hinder visual foraging), underwater noise (could displaces prey), seabed disturbances (damage habitats could force relocations), or the turbine foundations (could attract prey (reef effect).) Roaming receptors (like seabirds) can tolerate temporary variations in environmental conditions and access alternative resources. Over the scales and the timescales presented for the project, this effect-pathway is low-risk, and a finding of no LSE is appropriate.
✓f	**Collision (O):** Species has moderate vulnerability to collision risk with turbines (Bradbury et al, 2014) and the array is within the mean-maximum foraging range plus 1SD for this species (Woodward et al. 2019). Based on the proximity of Awel y Môr to the breeding colony and the number of foraging trips required by terns per day during the chick rearing period (Masden et al, 2010), LSE cannot be discounted.
x g	**Impacts on prey (O):** Indirect effects could arise due to the ecological consequences that might arise at the lower trophic levels from the direct implications of the project, Impacts on migration, the ingestion of contaminated sediments (reduced numbers) reduced resilience, and altered prey-predator or reproductive dynamics could spill-over into the wider ecosystem. Existing OWFs [34] indicate Awel y Môr will cause only small (insignificant), short -term effects for local fish and benthic ecology (see footnote). Such impacts are not therefore anticipated and the potential for LSE is discounted.
x h	**In-combination (C, O, D):** Low species sensitivity to the impacts considered, or the small measure of effects predicted mean that Awel y Môr could not contribute to any or no measurable or material degree to in-combination effects.
✓i	**In-combination (C, O, D):** Where potential for LSEs has been concluded for Awel y Môr acting alone, the potential for 'LSE in-combination' has been concluded. Mortalities will be calculated separately for collision and displacement and methodologies for combining additive impacts considered. No additional in-combination issues are identified.

End of matrix 39

34 Assessments undertaken for Hornsea Project Three, which addressed habitat loss, underwater noise, increased SSC and deposition and pollution events, and EMF cumulatively in all phases reported negligible, minor adverse or minor beneficial effects on fish and benthic communities (see Orsted, 2018) at this hyperlink

Matrix 40: Dyfi Estuary / Aber Dyfi SPA Special Protection Area - HRA Screening - Awel y Môr offshore windfarm

Name of European site:	Dyfi Estuary / Aber Dyfi (UK) SPA
European site code:	UK9020284
Distance to relevant project component:	95.2 km to array / 90.0 km to ECC / 80.7 km to Onshore Draft Order Limits

	Potential Likely Significant Effects (LSE) from Awel y Môr Offshore Wind Farm																	
	Disturbance and displacement			Barrier effect			Prey availability/ behaviour			Collision			Indirect: effects on prey			In-combination		
	C	O	D	C	O	D	C	O	D	C	O	D	C	O	D	C	O	D
Greenland white-fronted goose	x a	x b	x c		x d		x e		x e		✓f			x g		x h	✓i	x h

Evidence supporting conclusions:

x a	**Displacement (C, D):** This species has very low vulnerability to disturbance from vessel movements associated with construction activity (Fliessbach et al, 2019). LSEs are therefore discounted.
x b	**Displacement (O):** Evidence suggests these species are neither displaced nor attracted from or to offshore wind farms (Dierschke, Furness & Garth, 2016). Additionally, these species are classified by Bradbury et al, (2014) as having low vulnerability to displacement by offshore wind farms. LSEs are therefore discounted.
x c	**Decommissioning**: Potential impacts during decommissioning are considered to be similar of potentially less than those outlined for construction. Therefore, a finding of no LSE is appropriate.
x d	**Barriers to movement (O):** In practice, as its impossible to know where an affected bird originated, barrier effects can be indistinguishable from displacement (disturbance) (SNBC, 2017). It follows from the conclusions concerning displacement, that this species is similarity not sensitive to barrier effects. Therefore, potential for LSEs is therefore discounted.
x e	**Prey behaviour (C, D):** Environmental changes can alter the behaviour, distribution and availability of prey (e.g., suspended sediments (could hinder visual foraging), underwater noise (could displaces prey), seabed disturbances (damage habitats could force relocations), or the turbine foundations (could attract prey (reef effect).) Roaming receptors (like seabirds) can tolerate temporary variations in environmental conditions and access alternative resources. Over the scales and the timescales presented for the project, this effect-pathway is low-risk, and a finding of no LSE is appropriate.
✓f	**Collision (O):** Species has moderate vulnerability to collision risk with turbines (Bradbury et al, 2014) and the array is within the mean-maximum foraging range plus 1SD for this species (Woodward et al. 2019). Based on the proximity of Awel y Môr to the breeding colony and the number of foraging trips required by terns per day during the chick rearing period (Masden et al, 2010), LSE cannot be discounted.
x g	**Impacts on prey (O):** Indirect effects could arise due to the ecological consequences that might arise at the lower trophic levels from the direct implications of the project, Impacts on migration, the ingestion of contaminated sediments (reduced numbers) reduced resilience, and altered prey-predator or reproductive dynamics could spill-over into the wider ecosystem. Existing OWFs [35] indicate Awel y Môr will cause only small (insignificant), short -term effects for local fish and benthic ecology (see footnote). Such impacts are not therefore anticipated and the potential for LSE is discounted.
x h	**In-combination (C, O, D):** Low species sensitivity to the impacts considered, or the small measure of effects predicted mean that Awel y Môr could not contribute to any or no measurable or material degree to in-combination effects.
✓i	**In-combination (C, O, D):** Where potential for LSEs has been concluded for Awel y Môr acting alone, the potential for 'LSE in-combination' has been concluded. Mortalities will be calculated separately for collision and displacement and methodologies for combining additive impacts considered. No additional in-combination issues are identified.

End of matrix 40

35 Assessments undertaken for Hornsea Project Three, which addressed habitat loss, underwater noise, increased SSC and deposition and pollution events, and EMF cumulatively in all phases reported negligible, minor adverse or minor beneficial effects on fish and benthic communities (see Orsted, 2018) at this hyperlink

Matrix 41: Burry Inlet Special Protection Area - HRA Screening - Awel y Môr offshore windfarm

Name of European site:	Burry Inlet (UK) SPA
European site code:	UK9015011
Distance to relevant project component:	195.7 km to array / 190 km to ECC / 180.6 km to Onshore Draft Order Limits

	Potential Likely Significant Effects (LSE) from Awel y Môr Offshore Wind Farm																	
	Disturbance and displacement			Barrier effect			Prey availability/ behaviour			Collision			Indirect: effects on prey			In-combination		
	C	O	D	C	O	D	C	O	D	C	O	D	C	O	D	C	O	D
Shelduck	x a	x b	x c		x d		x e		x e		✓f			x g		x h	✓i	x h
Wigeon	x a	x b	x c		x d		x e		x e		✓f			x g		x h	✓i	x h
Teal	x a	x b	x c		x d		x e		x e		✓f			x g		x h	✓i	x h
Pintail	x a	x b	x c		x d		x e		x e		✓f			x g		x h	✓i	x h
Shoveler	x a	x b	x c		x d		x e		x e		✓f			x g		x h	✓i	x h
Oystercatcher	x a	x b	x c		x d		x e		x e		✓f			x g		x h	✓i	x h
Grey plover	x a	x b	x c		x d		x e		x e		✓f			x g		x h	✓i	x h
Knot	x a	x b	x c		x d		x e		x e		✓f			x g		x h	✓i	x h
Dunlin	x a	x b	x c		x d		x e		x e		✓f			x g		x h	✓i	x h
Curlew	x a	x b	x c		x d		x e		x e		✓f			x g		x h	✓i	x h
Redshank	x a	x b	x c		x d		x e		x e		✓f			x g		x h	✓i	x h
Turnstone	x a	x b	x c		x d		x e		x e		✓f			x g		x h	✓i	x h
Waterbird assemblage	x a	x b	x c		x d		x e		x e		✓f			x g		x h	✓i	x h

Evidence supporting conclusions:

x a	**Displacement (C, D):** This species has very low vulnerability to disturbance from vessel movements associated with construction activity (Fliessbach et al, 2019). LSEs are therefore discounted.
x b	**Displacement (O):** Evidence suggests these species are neither displaced nor attracted from or to offshore wind farms (Dierschke, Furness & Garth, 2016). Additionally, these species are classified by Bradbury et al, (2014) as having low vulnerability to displacement by offshore wind farms. LSEs are therefore discounted.
x c	**Decommissioning**: Potential impacts during decommissioning are considered to be similar of potentially less than those outlined for construction. Therefore, a finding of no LSE is appropriate.
x d	**Barriers to movement (O):** In practice, as its impossible to know where an affected bird originated, barrier effects can be indistinguishable from displacement (disturbance) (SNBC, 2017). It follows from the conclusions concerning displacement, that this species is similarity not sensitive to barrier effects. Therefore, potential for LSEs is therefore discounted.
x e	**Prey behaviour (C, D):** Environmental changes can alter the behaviour, distribution and availability of prey (e.g., suspended sediments (could hinder visual foraging), underwater noise (could displaces prey), seabed disturbances (damage habitats could force relocations), or the turbine foundations (could attract prey (reef effect).) Roaming receptors (like seabirds) can tolerate temporary variations in environmental conditions and access alternative resources. Over the scales and the timescales presented for the project, this effect-pathway is low-risk, and a finding of no LSE is appropriate.
✓f	**Collision (O):** Species has moderate vulnerability to collision risk with turbines (Bradbury et al, 2014) and the array is within the mean-maximum foraging range plus 1SD for this species (Woodward et al. 2019). Based on the proximity of Awel y Môr to the breeding colony and the number of foraging trips required by terns per day during the chick rearing period (Masden et al, 2010), LSE cannot be discounted.

x g	**Impacts on prey (O):** Indirect effects could arise due to the ecological consequences that might arise at the lower trophic levels from the direct implications of the project, Impacts on migration, the ingestion of contaminated sediments (reduced numbers) reduced resilience, and altered prey-predator or reproductive dynamics could spill-over into the wider ecosystem. Existing OWFs [36] indicate Awel y Môr will cause only small (insignificant), short -term effects for local fish and benthic ecology (see footnote). Such impacts are not therefore anticipated and the potential for LSE is discounted.
x h	**In-combination (C, O, D):** Low species sensitivity to the impacts considered, or the small measure of effects predicted mean that Awel y Môr could not contribute to any or no measurable or material degree to in-combination effects.
✓i	**In-combination (C, O, D):** Where potential for LSEs has been concluded for Awel y Môr acting alone, the potential for 'LSE in-combination' has been concluded. Mortalities will be calculated separately for collision and displacement and methodologies for combining additive impacts considered. No additional in-combination issues are identified.

End of matrix 41

36 Assessments undertaken for Hornsea Project Three, which addressed habitat loss, underwater noise, increased SSC and deposition and pollution events, and EMF cumulatively in all phases reported negligible, minor adverse or minor beneficial effects on fish and benthic communities (see Orsted, 2018) at this hyperlink

Matrix 42: Burry Inlet (UK) Ramsar - HRA Screening - Awel y Môr offshore windfarm

Name of European site:	Burry Inlet (UK) Ramsar
European site code:	UK14001
Distance to relevant project component:	195.7 km to array / 190.0 km to ECC / 180.6 km to Onshore Draft Order Limits

	Potential Likely Significant Effects (LSE) from Awel y Môr Offshore Wind Farm																	
	Disturbance and displacement			Barrier effect			Prey availability/ behaviour			Collision			Indirect: effects on prey			In-combination		
	C	O	D	C	O	D	C	O	D	C	O	D	C	O	D	C	O	D
Pintail	x a	x b	x c		x d		x e		x e		✓f			x g		x h	✓i	x h
Oystercatcher	x a	x b	x c		x d		x e		x e		✓f			x g		x h	✓i	x h
Knot	x a	x b	x c		x d		x e		x e		✓f			x g		x h	✓i	x h
Redshank	x a	x b	x c		x d		x e		x e		✓f			x g		x h	✓i	x h
Waterbird assemblage	x a	x b	x c		x d		x e		x e		✓f			x g		x h	✓i	x h

Evidence supporting conclusions:

x a	**Displacement (C, D):** This species has very low vulnerability to disturbance from vessel movements associated with construction activity (Fliessbach et al, 2019). LSEs are therefore discounted.
x b	**Displacement (O):** Evidence suggests these species are neither displaced nor attracted from or to offshore wind farms (Dierschke, Furness & Garth, 2016). Additionally, these species are classified by Bradbury et al, (2014) as having low vulnerability to displacement by offshore wind farms. LSEs are therefore discounted.
x c	**Decommissioning**: Potential impacts during decommissioning are considered to be similar of potentially less than those outlined for construction. Therefore, a finding of no LSE is appropriate.
x d	**Barriers to movement (O):** In practice, as its impossible to know where an affected bird originated, barrier effects can be indistinguishable from displacement (disturbance) (SNBC, 2017). It follows from the conclusions concerning displacement, that this species is similarity not sensitive to barrier effects. Therefore, potential for LSEs is therefore discounted.
x e	**Prey behaviour (C, D):** Environmental changes can alter the behaviour, distribution and availability of prey (e.g., suspended sediments (could hinder visual foraging), underwater noise (could displaces prey), seabed disturbances (damage habitats could force relocations), or the turbine foundations (could attract prey (reef effect).) Roaming receptors (like seabirds) can tolerate temporary variations in environmental conditions and access alternative resources. Over the scales and the timescales presented for the project, this effect-pathway is low-risk, and a finding of no LSE is appropriate.
✓f	**Collision (O):** Species has moderate vulnerability to collision risk with turbines (Bradbury et al, 2014) and the array is within the mean-maximum foraging range plus 1SD for this species (Woodward et al. 2019). Based on the proximity of Awel y Môr to the breeding colony and the number of foraging trips required by terns per day during the chick rearing period (Masden et al, 2010), LSE cannot be discounted.
x g	**Impacts on prey (O):** Indirect effects could arise due to the ecological consequences that might arise at the lower trophic levels from the direct implications of the project, Impacts on migration, the ingestion of contaminated sediments (reduced numbers) reduced resilience, and altered prey-predator or reproductive dynamics could spill-over into the wider ecosystem. Existing OWFs [37] indicate Awel y Môr will cause only small (insignificant), short -term effects for local fish and benthic ecology (see footnote). Such impacts are not therefore anticipated and the potential for LSE is discounted.
x h	**In-combination (C, O, D):** Low species sensitivity to the impacts considered, or the small measure of effects predicted mean that Awel y Môr could not contribute to any or no measurable or material degree to in-combination effects.
✓i	**In-combination (C, O, D):** Where potential for LSEs has been concluded for Awel y Môr acting alone, the potential for 'LSE in-combination' has been concluded. Mortalities will be calculated separately for collision and displacement and methodologies for combining additive impacts considered. No additional in-combination issues are identified.

End of matrix 42

37 Assessments undertaken for Hornsea Project Three, which addressed habitat loss, underwater noise, increased SSC and deposition and pollution events, and EMF cumulatively in all phases reported negligible, minor adverse or minor beneficial effects on fish and benthic communities (see Orsted, 2018) at this hyperlink

Matrix 43: Severn Estuary Special Protection Area - HRA Screening - Awel y Môr offshore windfarm

Name of European site:	Severn Estuary (UK) SPA
European site code:	UK9015022
Distance to relevant project component:	204.7 km to array / 187.3 km to ECC / 179.5 km to Onshore Draft Order Limits

	Potential Likely Significant Effects (LSE) from Awel y Môr Offshore Wind Farm																	
	Disturbance and displacement			Barrier effect			Prey availability/ behaviour			Collision			Indirect: effects on prey			In-combination		
	C	O	D	C	O	D	C	O	D	C	O	D	C	O	D	C	O	D
Bewick's swan	x a	x b	x c		x d		x e		x e		✓f			x g		x h	✓i	x h
Dunlin	x a	x b	x c		x d		x e		x e		✓f			x g		x h	✓i	x h
Gadwall	x a	x b	x c		x d		x e		x e		✓f			x g		x h	✓i	x h
Greater white-fronted goose	x a	x b	x c		x d		x e		x e		✓f			x g		x h	✓i	x h
Redshank	x a	x b	x c		x d		x e		x e		✓f			x g		x h	✓i	x h
Shelduck	x a	x b	x c		x d		x e		x e		✓f			x g		x h	✓i	x h
Waterbird assemblage	x a	x b	x c		x d		x e		x e		✓f			x g		x h	✓i	x h

1.2.8 *Red-breasted merganser and cormorant as the main components

Evidence supporting conclusions:

x a	**Displacement (C, D):** This species has very low vulnerability to disturbance from vessel movements associated with construction activity (Fliessbach et al, 2019). LSEs are therefore discounted.
x b	**Displacement (O):** Evidence suggests these species are neither displaced nor attracted from or to offshore wind farms (Dierschke, Furness & Garth, 2016). Additionally, these species are classified by Bradbury et al, (2014) as having low vulnerability to displacement by offshore wind farms. LSEs are therefore discounted.
x c	**Decommissioning**: Potential impacts during decommissioning are considered to be similar of potentially less than those outlined for construction. Therefore, a finding of no LSE is appropriate.
x d	**Barriers to movement (O):** In practice, as its impossible to know where an affected bird originated, barrier effects can be indistinguishable from displacement (disturbance) (SNBC, 2017). It follows from the conclusions concerning displacement, that this species is similarity not sensitive to barrier effects. Therefore, potential for LSEs is therefore discounted.
x e	**Prey behaviour (C, D):** Environmental changes can alter the behaviour, distribution and availability of prey (e.g., suspended sediments (could hinder visual foraging), underwater noise (could displaces prey), seabed disturbances (damage habitats could force relocations), or the turbine foundations (could attract prey (reef effect).) Roaming receptors (like seabirds) can tolerate temporary variations in environmental conditions and access alternative resources. Over the scales and the timescales presented for the project, this effect-pathway is low-risk, and a finding of no LSE is appropriate.
✓f	**Collision (O):** Species has moderate vulnerability to collision risk with turbines (Bradbury et al, 2014) and the array is within the mean-maximum foraging range plus 1SD for this species (Woodward et al. 2019). Based on the proximity of Awel y Môr to the breeding colony and the number of foraging trips required by terns per day during the chick rearing period (Masden et al, 2010), LSE cannot be discounted.
x g	**Impacts on prey (O):** Indirect effects could arise due to the ecological consequences that might arise at the lower trophic levels from the direct implications of the project, Impacts on migration, the ingestion of contaminated sediments (reduced numbers) reduced resilience, and altered prey-predator or reproductive dynamics could spill-over into the wider ecosystem. Existing OWFs [38] indicate Awel y Môr will cause only small (insignificant), short -term effects for local fish and benthic ecology (see footnote). Such impacts are not therefore anticipated and the potential for LSE is discounted.
x h	**In-combination (C, O, D):** Low species sensitivity to the impacts considered, or the small measure of effects predicted mean that Awel y Môr could not contribute to any or no measurable or material degree to in-combination effects.
✓i	**In-combination (C, O, D):** Where potential for LSEs has been concluded for Awel y Môr acting alone, the potential for 'LSE in-combination' has been concluded. Mortalities will be calculated separately for collision and displacement and methodologies for combining additive impacts considered. No additional in-combination issues are identified.

38 Assessments undertaken for Hornsea Project Three, which addressed habitat loss, underwater noise, increased SSC and deposition and pollution events, and EMF cumulatively in all phases reported negligible, minor adverse or minor beneficial effects on fish and benthic communities (see Orsted, 2018) at this hyperlink

End of matrix 43

Matrix 44: Severn Estuary (UK) Ramsar - HRA Screening - Awel y Môr offshore windfarm

Name of European site:	Severn Estuary (UK) Ramsar
European site code:	UK11081
Distance to relevant project component:	204.6 km to array / 187.3 km to ECC / 179.4 km to Onshore Draft Order Limits

	Potential Likely Significant Effects (LSE) from Awel y Môr Offshore Wind Farm																	
Effects	Disturbance and displacement			Barrier effect			Prey availability/ behaviour			Collision			Indirect: effects on prey			In-combination		
Phase	C	O	D	C	O	D	C	O	D	C	O	D	C	O	D	C	O	D
	x a	x b	x c		x d		x e		x e		✓f			x g		x h	✓i	x h
Bewick's swan	x a	x b	x c		x d		x e		x e		✓f			x g		x h	✓i	x h
Dunlin	x a	x b	x c		x d		x e		x e		✓f			x g		x h	✓i	x h
Gadwall	x a	x b	x c		x d		x e		x e		✓f			x g		x h	✓i	x h
Greater white-fronted goose	x a	x b	x c		x d		x e		x e		✓f			x g		x h	✓i	x h
Redshank	x a	x b	x c		x d		x e		x e		✓f			x g		x h	✓i	x h
Shelduck	x a	x b	x c		x d		x e		x e		✓f			x g		x h	✓i	x h
Pintail	x a	x b	x c		x d		x e		x e		✓f			x g		x h	✓i	x h
Teal	x a	x b	x c		x d		x e		x e		✓f			x g		x h	✓i	x h
Ringed plover	x a	x b	x c		x d		x e		x e		✓f			x g		x h	✓i	x h
Waterbird assemblage	x a	x b	x c		x d		x e		x e		✓f			x g		x h	✓i	x h

Evidence supporting conclusions

x a	**Displacement (C, D):** This species has very low vulnerability to disturbance from vessel movements associated with construction activity (Fliessbach et al, 2019). LSEs are therefore discounted.
x b	**Displacement (O):** Evidence suggests these species are neither displaced nor attracted from or to offshore wind farms (Dierschke, Furness & Garth, 2016). Additionally, these species are classified by Bradbury et al, (2014) as having low vulnerability to displacement by offshore wind farms. LSEs are therefore discounted.
x c	**Decommissioning**: Potential impacts during decommissioning are considered to be similar of potentially less than those outlined for construction. Therefore, a finding of no LSE is appropriate.
x d	**Barriers to movement (O):** In practice, as its impossible to know where an affected bird originated, barrier effects can be indistinguishable from displacement (disturbance) (SNBC, 2017). It follows from the conclusions concerning displacement, that this species is similarity not sensitive to barrier effects. Therefore, potential for LSEs is therefore discounted.
x e	**Prey behaviour (C, D):** Environmental changes can alter the behaviour, distribution and availability of prey (e.g., suspended sediments (could hinder visual foraging), underwater noise (could displaces prey), seabed disturbances (damage habitats could force relocations), or the turbine foundations (could attract prey (reef effect).) Roaming receptors (like seabirds) can tolerate temporary variations in environmental conditions and access alternative resources. Over the scales and the timescales presented for the project, this effect-pathway is low-risk, and a finding of no LSE is appropriate.
✓f	**Collision (O):** Species has moderate vulnerability to collision risk with turbines (Bradbury et al, 2014) and the array is within the mean-maximum foraging range plus 1SD for this species (Woodward et al. 2019). Based on the proximity of Awel y Môr to the breeding colony and the number of foraging trips required by terns per day during the chick rearing period (Masden et al, 2010), LSE cannot be discounted.
x g	**Impacts on prey (O):** Indirect effects could arise due to the ecological consequences that might arise at the lower trophic levels from the direct implications of the project, Impacts on migration, the ingestion of contaminated sediments (reduced numbers) reduced resilience, and altered prey-predator or reproductive dynamics could spill-over into the wider ecosystem. Existing OWFs [39] indicate Awel y Môr will cause only small (insignificant), short - term effects for local fish and benthic ecology (see footnote). Such impacts are not therefore anticipated and the potential for LSE is discounted.
x h	**In-combination (C, O, D):** Low species sensitivity to the impacts considered, or the small measure of effects predicted mean that Awel y Môr could not contribute to any or no measurable or material degree to in-combination effects.

39 Assessments undertaken for Hornsea Project Three, which addressed habitat loss, underwater noise, increased SSC and deposition and pollution events, and EMF cumulatively in all phases reported negligible, minor adverse or minor beneficial effects on fish and benthic communities (see Orsted, 2018) at this hyperlink

✓i	**In-combination (C, O, D):** Where potential for LSEs has been concluded for Awel y Môr acting alone, the potential for 'LSE in-combination' has been concluded. Mortalities will be calculated separately for collision and displacement and methodologies for combining additive impacts considered. No additional in-combination issues are identified.

End of matrix 44

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