



Awel y Môr Offshore Wind Farm

Category 6: Environmental Statement

Volume 4, Annex 4.5: Offshore Ornithology Scoping and Consultation Responses

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Glossary of terms

TERM	DEFINITION
Collision Risk Model (CRM)	General term to describe the method of estimating the collision risk of seabirds (estimated mortality) to operational turbines, which could be either deterministic or stochastic.
Mean High Water Springs (MHWS)	The height of mean high water during spring tides in a year.
Mean Low Water Springs (MLWS)	The height of mean low water during spring tides in a year.
Mean-Max Foraging Range	The mean-max foraging range is calculated as the maximum reported range that a species for each colony is known to have foraged, averaged across all colonies from the literature review undertaken by Woodward et al. (2019).
SeabORD	A tool developed to estimate the cost to individual seabirds, in terms of changes in adult survival and productivity, of displacement and barrier effects

TERM	DEFINITION
	resulting from offshore renewable developments. See Searle et al. (2018).
Stochastic Collision Risk Model (sCRM)	A programme used to assess the collision risk (estimated mortality) of seabirds to operational turbines of offshore wind farms. A stochastic CRM is used to account for uncertainty around input variables.

Abbreviations and acronyms

TERM	DEFINITION
AEol	Adverse Effect on Integrity
AR	Avoidance Rate
AyM	Awel y Môr Offshore Wind Farm
BDMPS	Biologically Defined Minimum Population Scale
BO1	Band Option 1
BO2	Band Option 2
BO3	Band Option 3
BoCC	Birds of Conservation Concern
BTO	British Trust for Ornithology
CIEEM	Chartered Institute of Ecology and Environmental Management
CoCP	Code of Construction Practice
CRM	Collision Risk Model
DCO	Development Consent Order

TERM	DEFINITION
ECR	Export Cable Route
EIA	Environmental Impact Assessment
ES	Environmental Statement
ETG	Expert Topic Group
GyM	Gwynt y Môr Offshore Wind Farm
HRA	Habitats Regulations Assessments
JNCC	Joint Nature Conservation Committee
MPCP	Marine Pollution Contingency Plan
NE	Natural England
NRW	Natural Resources Wales
ORJIP	Offshore Renewables Joint Industry Programme
OWF	Offshore Wind Farm
PEIR	Preliminary Environmental Information Report
PEMP	Project Environmental Management Plan
PINS	Planning Inspectorate
PVA	Population Viability Analysis
RIAA	Report to Inform Appropriate Assessment
RSPB	Royal Society for the Protection of Birds
RWE	RWE Renewables UK
sCRM	Stochastic Collision Risk Modelling
SD	Standard Deviation
SMP	Seabird Monitoring Programme

TERM	DEFINITION
SNCB	Statutory Nature Conservation Body
SOSS	Strategic Ornithological Support Services
SOSSMAT	Strategic Ornithological Support Services Migratory Assessment Tool
SPA	Special Protection Areas
SSSI	Sites of Special Scientific Interest
UCL	Upper Confidence Level
UK	United Kingdom
WTG	Wind Turbine Generator
WWT	Wildfowl and Wetlands Trust
ZOI	Zone of Influence

Units

UNIT	DEFINITION
cm	Centimetres (distance)
km	Kilometre (distance)
km ²	Kilometre square (area)
m	Metre (distance)
m/s	Metres per second (speed)
NM	Nautical mile (distance)
RPM	Rotations per minute (speed)
°	Degrees (angle)

UNIT	DEFINITION
%	Percentage (proportion)

1 Introduction

- 1 This annex describes the outcome of, and response to Scoping Opinion, responses to statutory consultation and ETG meetings in relation to offshore ornithology, which are summarised in this section and in Table 1. It also provides details of ongoing consultation that has been undertaken to date in relation to the impact assessments for offshore ornithology as presented in Volume 2, Chapter 4: Offshore Ornithology (application ref: 6.2.4).

1.1 Scoping opinion

- 2 RWE Renewables UK (RWE; the Applicant) submitted a Scoping Report and request for a Scoping Opinion to the Secretary of State (administered by the Planning Inspectorate (PINS)) on 11 June 2020 (Innogy, 2020). A Scoping Opinion was received on 31 July 2020. The Scoping Report set out the proposed offshore ornithology assessment methodologies, an outline of the baseline data collected to date, a programme of further surveys and the scope of the proposed impact assessments. The comments received in Section 4 of the PINS Scoping Opinion 'Aspect based scoping tables – offshore ornithology' along with responses received from NRW and RSPB, and how these have been addressed in this ES are set out in Table 1. Regard has also been given to other stakeholder comments that were received in relation to the Scoping Report.

1.2 Section 42 consultation

- 3 RWE published a Preliminary Environmental Impact Report (PEIR) in August 2021. All statutory consultees were notified of the publication and invited to provide responses. The PEIR set out a full environmental impact assessment for AyM, although preliminary in nature. In particular, certain design parameters have been refined between the PEIR and this ES (Volume 2, Chapter 1: Offshore Project Description (application ref: 6.2.1)). Furthermore, the ornithological baseline used for assessment at PEIR was based on the first 18 months of survey data. The results of the final six months of survey data were presented alongside the PEIR, but not used to inform the assessment. The final assessment in this ES has been based on the full 24 months of survey data. The comments received from key consultees (notably NRW, JNCC and the RSPB) and how these have been addressed in this ES are set out in Table 1. Regard has also been given to other stakeholder comments that were received in relation to the PEIR.

1.3 Expert Topic Group meetings

- 4 Six Expert Topic Group (ETG) meetings for EIA ornithology matters have taken place to date, in September and November 2020 and in March, July, November 2021 and February 2022 (RSPB specific ETG). The purpose of these meetings was to discuss the approach to assessment, including the approach set out in the Scoping Report and PEIR, modifications following responses to the Scoping Report and PEIR, and separate position papers and notes that were issued to stakeholders. A summary of topics discussed in each ETG, along with how those discussions have been taking into consideration for this ES, are set out in Table 1.

Table 1: Consultation relating to offshore ornithology.

DATE AND CONSULTATION PHASE/TYPE	CONSULTATION AND KEY ISSUES RAISED	HOW THIS IS ADDRESSED IN THIS ES
July 2020 PINS Scoping Opinion (paragraph 4.6.1)	Indirect impacts through effects on prey species and habitats: Accidental pollution resulting from construction of the Proposed Development. The Scoping Report proposes to scope out the assessment of indirect impacts on offshore ornithology from accidental pollution during the construction on the basis of mitigation proposed to ameliorate the risk of the accident occurring. The Inspectorate agrees that this effect can be scoped out of the assessment. The ES should describe the mitigation proposed, how it would be secured and when this would be delivered. The ES should include details of the proposed mitigation measures to be included in the Code of Construction Practice (CoCP), Project Environmental Management Plan (PEMP) and constituent Marine Pollution Contingency Plan (MPCP).	Indirect impacts on offshore ornithology from accidental spills have been scoped out of this assessment. Embedded environmental measures relevant to offshore ornithology are outlined in Section 4.7 and in Documents 6.1 and 6.2 (Schedule of Mitigation (application ref: 8.11) and Schedule of Monitoring (application ref: 8.12), respectively).
July 2020 PINS Scoping Opinion (paragraph 4.6.2)	Disturbance and displacement (offshore ECR corridor) resulting from the operation of the Proposed Development. The Inspectorate does not agree that operational disturbance can be scoped out, as insufficient justification has been provided at this time to support this approach. In the absence of information such as evidence demonstrating clear agreement with relevant consultation bodies, the Inspectorate is not able to agree to scope these matters from the assessment. Accordingly, the ES should include an assessment of these matters or the information referred to demonstrating agreement with the relevant consultation bodies and the absence of an LSE. The Applicant scoped out operational disturbance and displacement on the basis that potential impacts were ' <i>highly localised and episodic</i> '. However, little evidence has been provided to support these statements. Any such statements should be clarified within the ES, with reference to relevant guidance and/ or research from which conclusions have been drawn. The Applicant's attention is drawn to advice from NRW, on the need to consider operational impacts of the offshore ECR on features of Liverpool Bay SPA.	An assessment of the potential impacts on offshore ornithology from disturbance and displacement during operation is included in Section 4.12.
July 2020 PINS Scoping Opinion (paragraph 4.6.3)	Barrier effects resulting from the operation of the Proposed Development. The Inspectorate does not agree that barrier effects caused by operation can be scoped out, as insufficient justification has been provided at this time to support this approach. Accordingly, the ES should include an assessment of these matters where significant effects are likely to occur. The Applicant should make effort to agree the approach with relevant consultation bodies including NRW.	An assessment of the potential impact from barrier effects on offshore ornithology during operation is included in Section 4.12.

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July 2020 PINS Scoping Opinion (paragraph 4.6.4)	Cumulative impacts. The Inspectorate does not agree that cumulative impacts identified in paragraphs 559-566 of the Scoping Report can be scoped out for the reasons provided at paragraph 3.3.3 of this Scoping Opinion.	Cumulative impacts across development phases are assessed in Section 4.16.
July 2020 PINS Scoping Opinion (paragraph 4.6.5)	Proposed approach to assessment. The Applicant has not yet completed two years of survey information to inform the baseline assessment, which is the widely accepted duration of survey effort required. The Applicant should make an effort to agree the level of survey effort with relevant consultation bodies including NRW and JNCC. If the assessment of the ES is based on less than two years of survey data, a clear justification should be provided to demonstrate the robustness of the assessment in the ES.	Two years of aerial digital baseline data were collected between March 2019 and February 2021, inclusive, as agreed with consultee bodies including NRW and JNCC. Given the time required to analyse aerial digital imagery, the assessment contained within the PEIR was based upon the first 18 months of data collection (March 2019 – August 2020, inclusive). The remaining six months of data are included in the ES chapter with all assessments updated accordingly. To provide confidence in the baseline data used for PEIR, results from the final six months of data collection (September 2020 – February 2021, inclusive) were submitted as an annex to the PEIR chapter.
July 2020 PINS Scoping Opinion (paragraph 4.6.6)	Collision risk. The ES should set out the Band model, avoidance rates, flight height variations and any other relevant information in the ES. The parameters used within the collision risk model should be detailed, justified and account for the flexibility applied for in the Development Consent Order (DCO). In addition, the collision risk assessment should explain the extent to which existing monitoring and modelling data has informed the baseline assessment and assumptions made in this context.	Detailed information regarding the collision risk modelling methodology and additional supporting information is provided in Volume 4, Annex 4.3 (application ref: 6.4.4.3).
July 2020 PINS Scoping Opinion (paragraph 4.6.7)	Direct temporary habitat loss/ disturbance due to construction. It is unclear, based on the information provided in Table 46 of the Scoping Report, why habitat loss and disturbance are being evaluated together as a single impact. Based on the description provided in Table 46 of the Scoping Report increased vessel activity and underwater noise would lead to temporary habitat disturbance/ displacement and not direct habitat loss. It is considered that temporary habitat disturbance/ displacement and direct habitat loss should be described and assessed as two distinct impacts in the ES.	Direct habitat loss to seabirds during construction is expected to be minimal and remains scoped out of detailed assessment. Indirect habitat loss in the form of disturbance and displacement during the construction phase has been assessed in Sections 4.11.
July 2020 PINS Scoping Opinion (paragraph 4.6.8)	Direct habitat loss resulting from construction and operation of the Proposed Development. The ES should assess impacts on offshore ornithology through direct habitat	Direct habitat loss to seabirds during construction and operation is expected to be minimal and remains scoped out of detailed assessment.

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	loss during construction and operation of the Proposed Development where significant effects are likely to occur.	
July 2020 PINS Scoping Opinion (paragraph 4.6.9)	Operational disturbance and displacement. The Scoping Report refers to a ' <i>matrix approach</i> ' to assess potential effects of disturbance/ displacement on offshore ornithology receptors using predicted impact magnitudes. The ES should clearly set out the methodology and justification for values and outputs used in the assessment. The ES should make use of the relevant tools such as the SeabORD and Offshore Renewables Joint Industry Programme (ORJIP) to inform the assessment.	Detailed information regarding potential effects of disturbance/ displacement on offshore ornithology including the methodology and justification are set out in Sections 4.9 and 4.12.
July 2020 PINS Scoping Opinion (paragraph 4.6.10)	Aviation and navigation lighting. The ES should assess the impacts of aviation and navigation lighting on offshore ornithological receptors in the ES.	The main impacts of aviation and navigational lighting are expected to be avoidance or attraction, which may result in displacement from the array area, increased collision risk, or decreased collision risk (depending on the response of individual species). Therefore, the impacts are included in the assessments for displacement (Section 4.12) and collision risk (Section 4.12).
July 2020 PINS Scoping Opinion (paragraph 4.6.11)	Seabird population estimates. The ES should make use of relevant information sources such as the British Trust for Ornithology (BTO) Seabird Monitoring Programme (SMP) for estimating seabird populations.	Relevant information sources used to inform the assessment are outlined in Section 4.4.
July 2020 PINS Scoping Opinion (paragraph 4.6.12)	Birds of conservation value. The ES should include a list specifying the birds of conservation value for the assessment. The Applicant should make effort to agree the approach to assigning the conservation value to offshore ornithological receptors with relevant consultation bodies.	The approach to assigning value to offshore ornithological receptors is outlined in Section 4.8. Key species for this assessment are listed in Table 15, with justification as to why they have been screened into assessment.
July 2020 NRW Scoping Opinion Consultation Response	NRW advise that flexibility should be retained to use the most appropriate assessment tools once the baseline ornithological surveys are completed.	Further consultation has been sought on the appropriateness of proposed assessment tools though the Evidence Plan process and ETG meetings.
July 2020 NRW Scoping Opinion Consultation Response	The applicant refers to a 4 km buffer. As stated in paragraph 533 the buffer is larger than 4 km south of the site due to potential displacement to red-throated divers.	Baseline survey methodologies are outlined in Section 4.4.

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July 2020 NRW Scoping Opinion Consultation Response	Most up to date data on seabird population estimates can be found in the BTO's Seabird Monitoring Programme (SMP). In "Seabird counts" the most recent census, the vast majority of the Welsh coast has been covered by recent counts within the last 5 years.	Noted. Baseline data sources used for the assessment are outlined in Section 4.4.
July 2020 NRW Scoping Opinion Consultation Response	There is information on Welsh statutory sites on the NRW web page https://naturalresources.wales/guidance-and-advice/environmental-topics/wildlife-andbiodiversity/protected-areas-of-land-and-seas/find-protected-areas-of-land-and-sea/?lang=en And also, potentially useful information on the Lle portal hosted by Welsh government. http://lle.gov.wales/home	Noted. Baseline data sources used for the assessment are outlined in Section 4.4.
July 2020 NRW Scoping Opinion Consultation Response	Here the applicant states "Flight height data will be reported, however owing to the technical difficulties in estimating flight height from aerial imagery it is anticipated that generic flight data (Johnston et al., 2014a, 2014b) will be used in the collision risk model (subject to discussion with stakeholders)." In the initial document APEM shared with NRW during pre-application discussions (IR0485 GyM Extension Aerial Baseline Surveys) they stated that "Following various trials to better understand the accuracy and precision of bird flight heights generated from high resolution aerial digital imagery, APEM has developed a new robust approach to generating confidence intervals for bird flight heights." If it is the case that, owing to technical difficulties, generic flight heights need to be used then NRW agrees that these can be used in conjunction with the appropriate collision risk model.	Methods used for collision risk modelling are provided in detail in Volume 4, Annex 4.3 (application ref: 6.4.4.3).
July 2020 NRW Scoping Opinion Consultation Response	The applicant states that "Any species recorded in very small numbers within the Study Area will be screened out of further assessment". The applicant does not supply a definition of what would be considered "very small numbers" here. In addition to this and more importantly, both the screening and the scoping for Awel y Môr are being done without the full two years' worth of agreed aerial surveys. Therefore, there isn't the adequate survey data to screen or scope out sites and/or species at this stage.	Noted. Full definitions of terminology used for assessment are provided in Section 4.8. Table 15 provides the justification to where species have been screened out for assessment based on very small/ negligible numbers being present within the 24 months of site-specific survey data.
July 2020 NRW Scoping Opinion Consultation Response	Here the applicant states "A matrix approach (see SNCBs, 2017) will be used to calculate a range of predicted impact magnitudes." At the present time the matrix can be used but NRW advise that the applicant should also consider the potential use of the SeabORD tool. There are also other tools under development by the Offshore Renewables Joint Industry Programme (ORJIP) which may be able to help with this assessment if completed in time.	Further consultation has been sought on the appropriateness of proposed assessment tools through the Evidence Plan process and ETG meetings. Currently the SeabORD tool is not suitable for use at AyM.

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July 2020 NRW Scoping Opinion Consultation Response	NRW do not agree that disturbance and displacement by maintenance and repair of offshore cables can be scoped out. These could potentially be done in the winter months and could cause significant or additive displacement and disturbance on the features of Liverpool Bay SPA.	Noted. Impacts on offshore ornithology from disturbance and displacement are assessed across development phases in Section 4.11, 4.12 and 4.16.
July 2020 NRW Scoping Opinion Consultation Response	Here the applicant wants to scope out barrier effects during operation. Barrier effects on both foraging breeding birds and on migratory birds should be left in at this stage. For example, there are species such as Greenland white fronted geese at the Dyfi SPA which may be impacted by a barrier effect during migration to and from the SPA.	Noted. Barrier effects have been scoped in for further assessment during operation (Section 4.12). Further details regarding wildfowl and waders can be found in Volume 4, Annex 4.4 (application ref: 6.3.5), with further details regarding potential impacts on designated sites provided within Report 5.2: RIAA (application ref: 5.2).
July 2020 NRW Scoping Opinion Consultation Response	Regarding requirements for CRM methodologies: the UK SNCBs are currently working on a joint advice note on bird collision risk modelling. This will provide guidance on methodologies and provide continuity between SNCB's.	Noted. This joint advice note is currently unavailable.
July 2020 RSPB EIA Scoping Report Response	The data sources [outlined in the Scoping Report] are comprehensive and are likely to be sufficient to inform the baseline, although they appear to be incomplete in terms of the desk study, as it does not capture the recently acquired data sets listed in the recent Site Selection consultation, including: <ul style="list-style-type: none"> • Liverpool Bay SPA foraging mapping; • Little tern/ common scoter foraging mapping. We assume data sources in the EIA Scoping Report predates the more recent Site Selection documents. We would be grateful if this could be confirmed.	Noted. Baseline data sources used for the assessment are outlined in Section 4.4 and within Report 5.2: RIAA (application ref: 5.2).
July 2020 RSPB EIA Scoping Report Response	Barrier effects can be excluded as long as it is made clear that this is because they are considered alongside displacement and the displacement rates and mortalities used in assessment reflect this.	Barrier effects have been considered alongside disturbance and displacement, with additional information provided in Section 4.12.
July 2020 RSPB EIA Scoping Report Response	The embedded mitigation measures appear to be adequate. However, we note that in respect of the HRA these will need to be considered as part of the appropriate assessment, rather than at the screening stage.	Noted. Further details are provided in Report 5.2: RIAA (application ref: 5.2).
July 2020 RSPB EIA Scoping Report Response	CRM parameters will be confirmed subsequent to ongoing discussions and review with the SNCBs. The preference will be for the modelling to be carried out using the Marine Scotland Science stochastic version of the Band Collision Risk model (McGregor et al., 2018).	Further consultation has been sought on the appropriateness of proposed assessment tools though the Evidence Plan process and ETG meetings. Methods used for collision risk modelling are outlined in Volume 4, Annex 4.3 (application ref: 6.4.4.3).

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September 2020 ETG#1	NRW stated their preference for use of site-specific flight heights as inputs to CRM, provided details of the method used to estimate flight heights are described and deemed to be appropriate.	Noted. the Applicant has reviewed the full 24 months of site-specific flight height data for inclusion into assessment, the results of which found insufficient amount of data for it to include in assessments. Therefore, collision risk has only been modelled using Band Option 2 and 3 only.
September 2020 ETG#1	It was agreed that the data sources presented in the Scoping Report with the addition of relevant new data (particularly The Breeding Birds of North Wales; Brenchley et al., 2013) were comprehensive and sufficient to inform the baseline technical report.	Noted and agreed.
September 2020 ETG#1	RSPB stated their preference for CRM to be run stochastically. It was discussed that there remained uncertainty over key input parameters required to run the CRM.	See below – issue raised again at ETG#3.
November 2020 ETG#2	NRW highlighted that monitoring from Burbo Bank Extension OWF showed displacement of red-throated divers across all post-construction monitoring years out to 4 km, with displacement occurring up to 10 km from the array in some years. It was noted that this may reflect the higher density of this species present in this part of Liverpool Bay. Monitoring at Gwynt y Môr OWF has shown that red-throated diver are present within the operational array, demonstrating that birds have not been displaced entirely at this site.	The agreed approach to red-throated diver displacement is set out in Section 4.12.1.
March 2021 ETG #3 JNCC written response to Position Paper set out at ETG#3	JNCC propose that the sCRM be used stochastically, in as far as appropriate mean and SDs are available to do so. There not be appropriate SDs available for all parameters and these may need to be set to zero.	Following advice from NRW, the sCRM has been run deterministically for the PEIR, given that new avoidance rates for use with this model are yet to be agreed. This follows recent advice received from Natural England for other recent OWF projects.
March 2021 JNCC written response to Position Paper set out at ETG#3	May need to consider inclusion of Manx shearwater in CRM assessment; Aerial surveys at Rhianon/Celtic Array suggested a good proportion of Manx shearwaters were at altitudes above 20m, including a small proportion at altitudes above 50m. This has led to questions around the assumptions that Manx shearwater consistently fly too low to be at risk of collision. researchers at Oxford University are exploring GPS tracking collected from Skomer island and extracting altitudes from this data.	Data from the first 18 months of baseline surveys were summarised in the PEIR. These formed the basis of the assessment within the PEIR chapter. The sCRM has been run deterministically for all species screened into assessment (Table 15). Manx shearwater has been assessed for displacement analysis only on a precautionary basis.
March 2021 JNCC written response to Position Paper set out at ETG#3	JNCC propose that in addition to using site specific flight height data, the Donovan, 2017 sCRM tool also be applied based on generic flight heights, as a comparison.	Option 2 of the basic Band model has been run for all species screened into assessment, with results from Option 3 of the extended Band model also presented for large gull species following published advice from the SNCBs (SNCBs, 2014).

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March 2021 JNCC written response to Position Paper set out at ETG#3	Table 1-1 should be updated as/when additional evidence or guidance becomes available. For example an updated SNCB advice note on avoidance rates is currently being developed. There is work to extract behaviour parameters from tracking data commissioned by Marine Scotland that may be published soon.	sCRM has been run using the parameters agreed through the ETG.
March 2021 JNCC written response to Position Paper set out at ETG#3	"other species recorded ... in trivial numbers (and thus predicted impacts would be negligible)" Although this might generally be a sensible approach, we'd argue that even trivial numbers of highly sensitive species can be meaningful, especially if the species is rare and so low numbers of individuals affected can lead to meaningful impacts.	The assessment methodology used, including definitions of terminology used, are presented in Section 4.8 and follow CIEEM (2019).
March 2021 NRW written response to Position Paper set out at ETG#3	We agree with the Marine Science Scotland Stochastic Collision Risk Model being used deterministically, following on from the advice given by Natural England for Hornsea Four, as the new avoidance rates for the stochastic model are yet to be finalised. NE's advice at Hornsea Four is that Option 2 of the basic Band model is preferred, run multiple times per species to capture variability, on an individual parameter basis, for the key input parameters (Nocturnal Activity Factor, Potential Collision Height, Avoidance Rate, bird density). This gives an indication of which parameters might have the most influence on the prediction of collision risk, recognising that individually these will not reflect the effect of uncertainty across all parameters as within a stochastic model. A matrix detailing the permutations of these parameters that have been used should be provided, in order to allow a clear understanding of the range of scenarios.	The sCRM has been run deterministically following advice received from NRW, given that new avoidance rates for stochastic use with this model are yet to be agreed. Option 2 of the basic Band model has been run for all species considered screened into assessment, with results from Option 3 of the extended Band model presented for large gull species following published advice from the SNCBs (SNCBs, 2014). Models were run with three scenarios per species to capture variability around key input parameters, with further detail provided in Volume 4, Annex 4.3 (application ref: 6.4.4.3).
March 2021 NRW written response to Position Paper set out at ETG#3	We cannot agree to only looking at the species mentioned as we have yet to see the data to see what birds are potentially at collision risk. Even if Lesser black-backed gull and terns species are in small numbers CRM should be done for these species so that cumulative assessments can be made.	The justification for species screened in for assessment of collision risk is provided in Table 15.
March 2021 NRW written response to Position Paper set out at ETG#3	Here the applicant mentions "Flight heights will be based on site-specific flight height data from the digital aerial surveys". We advise all CRM's to be done with the Johnston et al data (2014). APEM's method could be used for comparison but this method hasn't been proven to give accurate data on flight heights.	Option 2 of the basic Band model has been run for all species screened in for assessment, with results from Option 3 of the extended Band model presented for large gull species (SNCBs 2014). These two options both use the generic flight height data presented in Johnston et al., (2014). Site-specific flight height data was found to be Insufficient for inclusion for assessment.
March 2021	We agree that if the sCRM app can't be used then Band (2012) model can be used instead.	Noted.

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NRW written response to Position Paper set out at ETG#3		
March 2021 NRW written response to Position Paper set out at ETG#3	Table1-1: For this table it would be good that the parameters are referenced so we know where they are from. We can only comment on the parameters presented and cannot comment that other species may need CRM until we examine the data.	All input parameters have been referenced as detailed in Volume 4, Annex 4.3 (application ref: 6.4.4.3).
March 2021 NRW written response to Position Paper set out at ETG#3	Table1-1: We agree with the species biometrics used for body length and wingspan.	Noted.
March 2021 NRW written response to Position Paper set out at ETG#3	Table1-1: We agree with the avoidance rates for the four species presented.	Noted.
March 2021 NRW written response to Position Paper set out at ETG#3	Table1-1: We advise the use of gannets upper value of 14.9 as opposed to the lower value of 13.3 as advised by NE for Hornsea Four, from Cook et al (2014). We agree with the use of the flight speed for the other species.	Noted. A precautionary approach has been taken and the upper flight speed value of 14.9 from Cook et al., (2014) has been used for gannet as detailed in Volume 4, Annex 4.3 (application ref: 6.4.4.3).
March 2021 NRW written response to Position Paper set out at ETG#3	Table1-1: We agree with the nocturnal activity for the four species presented.	Noted.
March 2021 NRW written response to Position Paper set out at ETG#3	Table1-1: For flight heights, we advise the use of maximum likelihood as the mean and the upper and lower limits from the 95% confidence intervals (Johnstone et al, (2014).	Noted. the Applicant disagrees with the use of 95% confidence intervals around flight data for inclusion in assessment. This is due to maximum likelihood flight height data (Johnston et al., 2014) being calculated from a considerable number of studies, providing confidence in the values.
March 2021 NRW written response to Position Paper set out at ETG#3	Table1-1: We advise that mean density should be used as the mean but for the min and max to be based around the SD of the mean. For the creation of the SD on Hornsea Four NE advised that the use of 1000 samples from a distribution of mean densities (eg from a bootstrapped sample). We would welcome a detailed description and justification being provided on how this is done.	Mean densities have been presented in addition to minimum (-SD) and maximum (+SD) densities around the mean. A full methodology outlining the calculation of species densities (+/-SD) has been

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		presented in Volume 4, Annex 4.3 (application ref: 6.4.4.3).
March 2021 NRW written response to Position Paper set out at ETG#3	We agree to the use of the matrix as described in the Joint SNCB Interim Displacement Advice Note (2017)	Noted. Displacement matrices for all species screened in for displacement assessment are provided in Volume 4, Annex 4.2 (application ref: 6.4.4.2).
March 2021 NRW written response to Position Paper set out at ETG#3	We cannot agree that these are the only species that need to be looked at in terms of displacement as we haven't seen the data yet. Although we do agree that these will need to be looked at there may be others depending on the data.	The justification for species screened in for displacement assessment is provided in Table 15.
March 2021 NRW written response to Position Paper set out at ETG#3	"other species recorded within the AyM array area plus buffer, additional species were either recorded in trivial numbers (and thus predicted impacts would be negligible)" There is no definition of what is trivial and what that might mean to the species population or site and there is uncertainty about whether some species are affected by displacement or not. For example kittiwake can be displaced and Manx shearwaters have been shown to avoid the windfarm at North Hoyle in Liverpool Bay (Dierschke et al., 2016)	The assessment methodology used, including definitions of terminology used, is presented in full in Section 4.8 and follows CIEEM (2019).
March 2021 NRW written response to Position Paper set out at ETG#3	Here the document states "Birds which have remained within the existing GyM OWF array area seem unlikely to be subsequently displaced by the construction of AyM." However, during construction there's likely to be more, larger vessels in AyM which could displace birds in GyM.	Noted. Full consideration of potential disturbance and displacement effects within the construction phase is provided in Section 4.11.
March 2021 NRW written response to Position Paper set out at ETG#3	Here the document states "Birds within the array area of AyM but within a short distance of GyM would also seem to be more tolerant of disturbance and therefore less likely to be subsequently displaced than would be assumed for an OWF in a previously undisturbed region." This assumption is un-founded. Individuals may respond differently to size, spatial configuration etc of infrastructure. However, we do agree that the best available evidence in terms of how birds have behaved to present wind farms would be from the local area itself so an analysis of the GYM data in terms of displacement would probably give the best available evidence to bear on this issue.	Noted. Full consideration of potential disturbance and displacement effects across all development phases is provided in Sections 4.11, 4.12 and 4.16.
March 2021 NRW written response to Position Paper set out at ETG#3	We agree that the buffer doesn't need to extend into the existing windfarm for the reasons given.	Noted.
March 2021	In line with the NE advice used at East Anglia One North and East Anglia Two OWFs, we recommend that a default displacement of up to 100% displacement and 10% mortality,	Noted. Following the approach described in the Joint SNCB Interim Displacement Advice Note (2017),

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NRW written response to Position Paper set out at ETG#3	across the site and 4 km buffer should be used. Past 4 km the 1 km buffer assessment could be used. However, if there is local evidence from existing windfarms which are adjacent to Awel y Môr such as Gwynt y Môr or close by such as Rhyl Flats, which can inform how red-throated divers have been displaced or not, then this can be used to inform the assessment.	displacement for all species assessed is presented in displacement matrices in Volume 4, Annex 4.2 (application ref: 6.4.4.2). The matrix approach allows outcomes from all possible displacement and mortality rates to be considered.
July 2021 ETG #4	The remaining six months of baseline data were presented to the ETG members to gain agreement that the conclusions of the PEIR would remain valid at ES stage.	SNCBs did not raise any concerns at the ETG and welcomed the inclusion of the additional data as an annex to the PEIR chapter.
October 2021 Section 42 NRW Response	NRW would normally expect the full two-year dataset to be used in the assessment of ornithological impacts for the PEIR. However, it is noted that the PEIR is based on only 18 months of data and the additional 6 months of data will be fully integrated in the final ES submission. NRW note that the figures presented in the PEIR for the assessments of displacement and collision risk are subject to change following the addition of this data. Therefore, all assessments and conclusions will need to be revisited once the full data set is available. Thus, NRW reserves the right to revise the advice provided on the PEIR document based on the best available evidence presented.	The full 24 months of survey data has been used to inform all assessments in this ES.
October 2021 Section 42 NRW Response	Here the document fails to acknowledge the agreed use of an 8km buffer in “Awel y Môr Offshore Wind Farm: Ornithological Approach to Assessment Position Paper” “Gradient approach for red-throated diver displacement analysis 1.1.2.16 For red-throated diver, APEM proposes considering abundances in buffer zones in steps of 1 km, out to 8 km to the south (agreed with Natural Resources Wales and in line with the asymmetric survey design: IR0485 GyM Extension Aerial Baseline Surveys, Innogy Renewables UK Ltd. APEM Ref: P00003481, Date: November 2019.). This would enable a graduated approach to displacement analysis, with different displacement rates applied to the array area and each subsequent buffer.” NRW agree to the use of a study area with a 4 km buffer and an 8 km buffer to the south of the array, for Red-throated diver, as mentioned within the Non-technical Summary (Pg 37; 6.3; 97). NRW also acknowledges the reference in Table 3 that you would “welcome(s) further discussion on how best to use existing site-specific data to devise appropriate displacement rates”.	Red-throated diver displacement assessment has been updated to consider a gradient approach out to 8 km (see Section 4.12.1).
October 2021 Section 42 NRW Response	4.3.3; 19: Here the document lists potential receptors (although inclusion of Sandwich tern is inconsistent, and should also be included in Table 8), but it omits species that were stated as being present such as Puffin, Shag, Black guillemot, Red-breasted merganser and Great-crested grebe. Clarification is needed here to explain why these species are not being further considered.	All species recorded in the surveys are listed in Section 4.5 and Volume 4, Annex 4.1 (application ref: 6.4.4.1). Evaluation of potential receptors is presented in Table 15.

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October 2021 Section 42 NRW Response	Table 4: States that displacement analyses will only be undertaken on Common scoter, Guillemot, Razorbill, Red-throated diver and Gannet. However, as stated on the 22nd April 2021 in NRW comments on the Awel y Môr: Ornithological Approach to Assessment Position Paper, other birds have been known to be displaced, “for example Manx shearwaters have been shown to avoid the windfarm at North Hoyle in Liverpool Bay (Dierschke et al, 2016)” Also it is not clear why there is no consideration of Sandwich tern, Puffin, Black guillemot, Red-breasted merganser and Great-crested grebe for displacement analysis as suggested in the SNCB guidance note (2017). This document should clarify the reason for the exclusion from the assessment of some species that are noted as being present in the surveys.	Displacement analysis has also been carried out for Manx shearwater within the ES on a precautionary basis. All species recorded within the 24 months of site-specific surveys have been considered for assessment, with rationale for a receptor’s inclusion for displacement assessment provided in Table 15.
October 2021 Section 42 NRW Response	Table 4: Lists a number of species for collision risk modelling (CRM): Kittiwake, Great black-backed gull, Herring gull and Gannet, but fails to state why they aren’t doing CRM on Common gull, Lesser Black-backed gull, Sandwich tern, Common and Arctic tern and Fulmar. It would be useful to provide a detailed rationale early on in this ornithology section for excluding certain bird species in the assessment. NRW advises that CRM should be undertaken on Fulmar, Common gull and Lesser black-backed gull for assessment and CRM for tern species, most probably through the SOSS migration model or APEM’s MigroPath tool.	Rationale for a receptor’s inclusion within the collision assessment is provided in Table 15. Collision risk for common gull, Sandwich tern, common tern and Arctic tern have been considered in relation to migratory bio-seasons, as detailed in Volume 4, Annex 4.4 (application ref: 6.4.4).
October 2021 Section 42 NRW Response	Key Results; 34: states “A number of species were only recorded in the study area in trivial numbers or numbers determined by expert judgement to be too low to warrant detailed species accounts”. Clarity is needed on what is referred to as trivial to make this judgement. It would be helpful if the densities were included written down here so they can be checked.	Rationale for a receptor’s inclusion within the assessment is provided in Table 15, including densities.
October 2021 Section 42 NRW Response	Table 8: Only states that the species in bold should be considered further, but NRW need to see where species such as the Great-crested grebe and Red-breasted merganser were detected to be able to make this judgement, as these birds were seen in surveys and both are features of Traeth Lafan SPA. Waders species should be looked at using the SOSSMAT or APEM migration tools as these can be missed on surveys. Sandwich terns and Commic terns should be looked at in terms of collision if they were seen in the array area, however the assessment isn’t presented to confirm this. They are also a feature of Anglesey Terns SPA.	Table 8 within the PEIR has been superseded by the rationale for a receptor’s inclusion within the assessment provided in Table 15. Migratory collision risk modelling has been undertaken for species including terns with details provided Section 4.12 and in Volume 4, Annex 4.4 (application ref: 6.4.4.4).
October 2021 Section 42 NRW Response	4.5.3: NRW welcomes the use of BDMPs.	Noted

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October 2021 Section 42 NRW Response	41: NRW would like to see all the impacts considered by each bio-season and added together for a year and then assessed against the largest seasonal BDMPS for an annual impact for the EIA. This method was advised by NE for previous windfarms.	This standard method of assessment is followed for all assessments presented in the ES.
October 2021 Section 42 NRW Response	Table 11: The calculation for kittiwake “Potential Total Regional Baseline Population During Non-Migratory Breeding Bio-Season” is incorrect as it is not a sum of the “Breeding population at colonies within mean-max foraging range” and “Juvenile, immature and non-breeding individuals”. Clarification is needed for these calculations.	Calculations have been revised with amended regional populations presented in Section 4.10.
October 2021 Section 42 NRW Response	Table 11: The calculation of “Juvenile, immature and non-breeding individuals” column (expected to be “BDMPS return migration population size” multiplied by the “Proportion of juvenile, immature and non-breeding individuals”) is either not correct or the methodology is currently unclear and needs clarification. There are then cascading issues to other columns and tables elsewhere. It is also unclear how “The potential total regional baseline population during non-migratory breeding bio-season” has been reached. Explanation of these calculations is needed.	Calculations have been revised with amended regional populations presented in Section 4.10.
October 2021 Section 42 NRW Response	Table 11 The great black-backed gull “BDMPS return migration population size” used is non-breeding (needs ** added within table).	Noted and amended in Section 4.10.
October 2021 Section 42 NRW Response	Table 11 Fulmar – The value for “BDMPS return migration population size” for Migration seasons (Sept-Oct and Dec-Mar) should be 828,194 according to Furness 2015.	Calculations have been revised with amended regional populations presented in Section 4.10.
October 2021 Section 42 NRW Response	Table 11 Red-throated diver – The “Proportion of juvenile, immature and non-breeding individuals” value used in table is 0.43. However, Furness (2015) states that the “model population comprised 60% adults”. This proportion should be corrected to 0.4.	Calculations have been revised with amended regional populations presented in Section 4.10.
October 2021 Section 42 NRW Response	Table 11 Sandwich tern is not within this table (but is in Table 12).	Noted and amended in Section 4.10.
October 2021 Section 42 NRW Response	Table 12: In this table (note *1) it states that the biogeographic population for Common scoter is based on the populations of Liverpool Bay SPA, Carmarthen Bay SPA, Ribble and Alt Estuaries SPA and Solway Firth SPA. However, there is a sizeable population of scoters in North Cardigan Bay which could be included in this.	North Cardigan Bay SPA has now been included with the biogeographic population for common scoter (see Section 4.10).
October 2021 Section 42 NRW Response	Table 12: The values for “Migration-free breeding” do not correspond to those in Table 11 for some species (i.e. Kittiwake, Great black-backed gull, Lesser black-backed gull, Razorbill).	Calculations have been revised with amended regional populations presented in Section 4.10.

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October 2021 Section 42 NRW Response	Table 12: The herring gull value for breeding does not match that used in Table 11.	Calculations have been revised with amended regional populations presented in Section 4.10.
October 2021 Section 42 NRW Response	Table 13: Clarification is needed on the source of the figures for the demographic rates and population age ratios.	Further information regarding the source of demographic data is provided in Section 4.10.
October 2021 Section 42 NRW Response	Table 13: The average mortality value for Red-throated diver of 0.143 given in this table is not used in any further calculations, but a value of 0.233 is used throughout this document (while a value of 0.2 is used within the RIAA). Clarification is needed on the method used for calculating these values, and use should be consistent.	The mortality value for red-throated diver of 0.233 is the average mortality across age classes as shown in Section 4.10. This has been reviewed and used consistently throughout the ES and RIAA (Report 5.2: application ref: 5.2).
October 2021 Section 42 NRW Response	Table 13: The average mortality value for Red-throated diver of 0.143 given in this table is not used in any further calculations, but a value of 0.233 is used throughout this document (while a value of 0.2 is used within the RIAA). Clarification is needed on the method used for calculating these values, and use should be consistent.	The mortality value for red-throated diver of 0.233 is the average mortality across age classes as shown in Section 4.10. This has been reviewed and used consistently throughout the ES and RIAA (Report 5.2: application ref: 5.2).
October 2021 Section 42 NRW Response	Table 13: All Sandwich tern values are copy pasted from Table 12 and don't appear to be appropriate here.	Sandwich tern values have been reviewed and revised in Section 4.10.
October 2021 Section 42 NRW Response	Environmental assessment: construction phase: All of the assessments in this section have been made only on the impact of the construction phase on its own. The assessment should also consider this cumulatively with the displacement and collision risk from the constructed project, as well as the cable laying.	Predicted mortality for each species is calculated per year, and not as an overall impact number for the combined phases of the project. Therefore, it is not appropriate to combine impacts across construction, O&M and decommissioning. Also, the impacts are different for each phase and therefore, need to be addressed in isolation.
October 2021 Section 42 NRW Response	Displacement assessments: Currently the displacement assessments only consider mean peak seasonal abundances, as per the SNCB note (2017). However, to consider the variability in the underlying population estimates the upper and lower 95% confidence intervals around the abundance could be presented in the final submission. Displacement matrices could be presented for the mean peak bird population estimates and the upper and lower confidence limits of these. Natural England have asked for this to be presented since the Hornsea Three case.	Mean peak seasonal abundances have been presented with the ES and Volume 4, Annex 4.2 (application ref: 6.4.4.2) following the SNCB note (2017). APEM do not consider it applicable to use 95% confidence intervals for assessment of AyM given the level of precaution already inherent within the assessment.

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October 2021 Section 42 NRW Response	Table 20: NRW advise that Manx shearwater should be included in this assessment of displacement. They have been shown to avoid the windfarm at North Hoyle in Liverpool Bay (Dierschke et al, 2016) and are features of both SSSIs and SPAs within Wales. Therefore, NRW advises that these should be assessed, especially as this will need to be looked at to add to other impacts at this project and other projects in the cumulative assessments. The range of 30-70% displacement and a range of 1-10% mortality could be used to assess the Manx shearwater displacement from the project.	Manx shearwater has been included within the ES on a precautionary basis and an assessment of potential disturbance and displacement presented in Sections 4.11 & 4.12.
October 2021 Section 42 NRW Response	77: NRW agrees that an estimate of displacement during construction can be assessed as being half that during operation.	Noted.
October 2021 Section 42 NRW Response	78: States that "For red-throated diver and common scoter, the evidence-based approach suggests that displacement should be considered for the array area plus a 4 km buffer." However, there is considerable evidence that suggests that Red-throated diver has been displaced to a much greater distance in the past. This is the reason why the buffer extends down to the south of the windfarm by 8 km. For example, in the German North Sea, using both visual aerial and boat-based surveys, Mendel et al. (2019) reported a 94.5% decrease in Red-throated diver density within 3km from OWFs, decreasing to 83.7% at 10 km. Using a combination of digital aerial survey and telemetry data, Heinänen et al. (2020) reported similar displacement rates, i.e. >90% within 5km from OWFs. In the UK, Webb et al. (2007) estimated an 83% decrease in density within the Lincs, Lynn & Inner Dowsing OWF based on visual and digital aerial surveys, decreasing to 55% at 4 km and 34% at 8 km. Estimates reported by Percival et al. (2010) using boat-based surveys indicated a 95% displacement rate within the Kentish Flats OWF site, decreasing to 63% at 3 km. Therefore, NRW advise that displacement for red-throated diver should be estimated out to 8 km. This new evidence has been considered and is informing a new draft SNCB note, which will be recommending that a 10 km buffer and displacement analysis should be used in future. However, this was formulated after NRW's original advice for a 8km buffer, so NRW accepts that the 8km buffer will suffice. Also any evidence of displacement or not by Gwynt y Môr could potentially be looked at to inform this process as it is a wind farm in a similar area within Liverpool Bay.	Displacement analysis for common scoter and red-throated diver has been undertaken out to 4 or 8 km within the ES respectively, using the approach set out at ETG #5.
October 2021 Section 42 NRW Response	78: NRW agree with the use of a displacement rate Gannet of 60-80%, however the applicant needs to present a range of mortalities for this species from 1-10% mortality as was used in Hornsea 4. The results for Gannet need to be shown for the array and the 2km buffer as the SNCB note stipulates (JNCC, 2017).	Gannet displacement has been assessed out to 2 km within the ES and Volume 4, Annex 4.2 (application ref: 6.4.4.2). It should be noted that mortality of 1% has been considered acceptable for many recent OWF

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		applications, although a range of 1-10% is presented in Volume 4, Annex 4.2: (application ref: 6.4.4.2)
October 2021 Section 42 NRW Response	78: NRW agree with the presentation of a range of displacement from 30-70% for Guillemot & Razorbill presenting a range of mortalities from 1-10% for the array area plus 2 km buffer. The use of the SNCB preferred mortality rate of 10% of displaced birds is referred to within the operation displacement section (193 Guillemot, 206 Razorbill), but not clearly presented for construction or operational displacement. However, NRW note that the matrix tables within Annex 4.2 cover the full ranges of up to 100% displacement and 100% mortality, so the figure for the NRW preferred worst case scenario of 100% displacement and 10% mortality can be assessed.	Noted.
October 2021 Section 42 NRW Response	78: NRW agrees when looking at displacement of Common scoter that they should look at 100% displacement in a 4km buffer with 10% mortality.	The full range of displacement and mortality rates for common scoter have been presented in Volume 4, Annex 4.2: (application ref: 6.4.4.2). Evidence for the Applicant's position is provided in Section 4.12.
October 2021 Section 42 NRW Response	78: NRW agrees when looking at displacement of Red-throated diver that they should be looking at 100% displacement within 4km with a mortality of 10%, however displacement needs to be looked at out to 8km as stated in the Awel y Môr Offshore Wind Farm: Ornithological Approach to Assessment Position Paper, March 2021, Revision 1. However, this might not be the case beyond the 4 km and a reduced displacement could potentially be used. Also, the assessment needs to bring to bear local evidence of displacement or not from previous windfarms in Liverpool Bay. NRW suggest the use of a range of 30-70% displacement and a range of 1-10% mortality to assess the Manx shearwater displacement as a result of the proposal.	Displacement analysis for red-throated diver has been undertaken out to 8 km within the ES, using the approach set out at ETG #5. Local evidence of potential avoidance behavior has been provided in Section 4.12 and in Volume 4, Annex 4.1 (application ref: 6.4.4.1). A range of 30-70% displacement and a range of 1-10% mortality has been applied within the assessment of Manx shearwater displacement (Section 4.12 and in Volume 4, Annex 4.1 Report (application ref: 6.4.4.1)).
October 2021 Section 42 NRW Response	126: See comments above about use of a larger displacement buffer for red-throated diver. This analysis does not currently include a large enough buffer.	Displacement analysis for common scoter and red-throated diver has been undertaken out to 4 to 8 km within the ES respectively, using the approach set out at ETG #5.
October 2021 Section 42 NRW Response	138- 140: States that "As this species is not connected with a significant number of designated sites within the UK Western Waters BDMPS or wider bio-geographic population scales, but is Amber listed in BoCC, this species is afforded a feature importance level of "local" to reflect that." Gannet is a feature of Grassholm SPA, which is within the mean max foraging range of this site.	The conservation value of all potential receptors has been revised in line with the assessment methods set out in Section 4.8.

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October 2021 Section 42 NRW Response	147-149: NRW agrees with the assessment for displacement of Red-throated diver from cabling looking at a 2km buffer with 100% displacement and 10% mortality. Also, the applicant could bring to bear local evidence of displacement or not from previous cable laying in Liverpool Bay for this assessment. This potential mortality needs to be added to the other mortality from construction and operation and the combined impacts considered alone and cumulatively with other relevant sources of impacts (e.g. other offshore wind farms).	Additional evidence regarding the Applicant's position with regard to red-throated diver displacement and mortality rates has been presented in Section 4.12. The Applicant has undertaken assessment of displacement in keeping with the most recent consented projects in UK waters. As such, predicted mortality for species is calculated per year, and not as an overall impact number for the combined phases of the project. This is due to combining impacts not being considered to be appropriate across the construction, O&M and decommissioning phases, as they have different scales both temporally and spatially. These potential impacts are also different for each phase and therefore, need to be addressed in isolation. It is also apparent that there would be a level of double counting should construction phase potential impacts within the array area be combined with cable laying, as an element of displacement is already accounted for outside from the array area extending over the cable laying area within the buffers being assessed for species such as red-throated diver. As no clear guidance is available or methods agreed as being appropriate for this type of additional assessment the Applicant considers that sufficient precaution is provided for displacement impact assessments in this chapter for all phases of the project lifecycle.
October 2021 Section 42 NRW Response	148: There is inconsistency in the mortality rate used, both within this document (0.143 in Table 13, and 0.233 used widely in the text) and the mortality rate used in the RIAA (0.217).	Average mortality rates used within the ES are presented in Section 4.10 and the ES and RIAA (Report 5.2; application ref: 5.2) revised to ensure consistency.
October 2021 Section 42 NRW Response	153 – 157: NRW agrees with the assessment for displacement of Common scoter from cabling looking at a 2km buffer with 100% displacement and 10% mortality. These values are however not currently used within the RIAA (Pg 198 & 199), where a 1 km buffer and 1% mortality is explicitly mentioned. This potential mortality needs to be added to the	Additional evidence regarding the Applicant's position with regard to common scoter displacement and mortality rates has been presented in Section

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	other mortality from construction and operation and the combined impacts considered alone and cumulatively with other relevant sources of impacts (e.g. other offshore wind farms).	4.12. The ES and RIAA (Report 5.2; application ref: 5.2) have been revised to ensure consistency.
October 2021 Section 42 NRW Response	154: Although a 2 km buffer is proposed, the quoted range of total number of Common scoter displaced here is actually for a 1 km buffer. An area of 6.28 km ² has been used (i.e. 99.22 x 6.28 km ² = 623.10) rather than the 25.13 km ² area of a 2 km buffer, which would displace between 2493.4 and 3473.7 Common scoter.	Noted. The assessment has been revised accordingly in Section 4.11.
October 2021 Section 42 NRW Response	156 & 157: There is inconsistency in the mortality rate used in Volume 2, Chapter 4 of 0.238 (Table 13, Horswill & Robinson 2015) and the mortality rate used in the RIAA of 0.217 (Robinson, 2017).	Average mortality rates used within the ES, along with the source of these estimates, are presented in Section 4.10.
October 2021 Section 42 NRW Response	189: States that there is good evidence to use a displacement rate of 50% for auks. However, like NE, NRW would still advise that a range of displacement and mortalities should be displayed as we stated previously. Table 28 only displays the 1% mortality and not the 10% mortality, and although the range of displacement of 30-70 % is within parenthesis, these values are not referred to in the main text, and only the 50% level is discussed.	A range of displacement and mortality rates has been presented within Volume 4, Annex 4.2 (application ref: 6.4.4.2). The assessment has focused on the Applicant's evidence-led position in Section 4.12, with due cognisance of the SNCBs position.
October 2021 Section 42 NRW Response	226: NRW does not agree with the use of only a 4km buffer for Red-throated diver, as stated previously.	Displacement analysis for red-throated diver has been undertaken out to 8 km within the ES, using the approach set out at ETG #5.
October 2021 Section 42 NRW Response	Table 30: For this, and all other displacement estimate tables, NRW advise the use of clearer descriptions within the legend and/or column headings of what values within parenthesis represent. An alternative would be to have a separate table for the values for 1% and 10% mortality.	Displacement estimate tables have been revised to ensure clarity of data presented.
October 2021 Section 42 NRW Response	252: NRW advise that a range of mortality (1-10%) should be presented as well as the displacement to make an assessment by.	A range of displacement and mortality rates has been presented in matrix form within Volume 4, Annex 4.2 (application ref: 6.4.4.2).
October 2021 Section 42 NRW Response	Table 31: It is not clear what the table is based on. The document needs to show a range of displacement and mortality. It would appear that it is only showing the mortality of 1%. If range of estimated number of individuals (for 60-80% displacement) are being displayed it is not consistent with other tables when showing range (0 and 1 are 0-0 and 1-1).	A range of displacement and mortality rates has been presented in matrix within Volume 4, Annex 4.2 (application ref: 6.4.4.2).

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October 2021 Section 42 NRW Response	Table 32: NRW advise that CRM should be undertaken for Fulmar, Common gull, Lesser black-backed gull, Commic tern and Sandwich tern, so that this can be looked at cumulatively with other windfarms.	Common gull, 'commic' tern and Sandwich tern were all recorded in the migratory bio-seasons and have therefore been included within migratory collision risk modelling (Volume 4, Annex 4.4: application ref: 6.4.4.4). Fulmar and lesser black-backed gull were scoped out from collision risk modelling on the basis of the rationale presented in Table 15.
October 2021 Section 42 NRW Response	302 For great black-backed gulls "The addition of 9.77 (0.41 – 33.52) mortalities will increase the mortality relative to the baseline mortality rate by 0.592% (0.025 – 2.032%) under BO2" is high and so NRW need to see what effect this would have on the regional population. NRW agree with using the more precautionary collision risks for GBBG of Band Option 2 from Table 35.	Following design changes between PEIR and ES, great black-backed gull collision risk has reduced (Table 9). Further assessment of how predicted great black-backed gull collision is likely to affect the regional population has been presented in Section 4.12.
October 2021 Section 42 NRW Response	328: NRW advise the use of bespoke modelling using APEM's MigroPath model or the SOSS migration model so that a quantitative assessment can be made against protected sites as well as populations and they have stated that they will do this in the ES. This will also need to be done for the HRA assessments.	Migratory collision risk modelling using APEM's MigroPath model has been undertaken and is presented in Section 4.12 and in Volume 4, Annex 4.4 (application ref: 6.4.4.4).
October 2021 Section 42 NRW Response	330: NRW welcomes an assessment of Common tern migration in the upcoming ES but we advise this assessment is expanded to other terns (i.e. Arctic terns, Sandwich terns and Roseate tern) within Wales and Welsh SSSI's and SPAs.	Tern species been included within migratory collision risk modelling (Volume 4, Annex 4.4: application ref: 6.4.4.4) with the results presented in Section 4.12 of the ES.
October 2021 Section 42 NRW Response	348: Pen y Gogarth/Great Ormes Head SSSI only has features of Razorbill, Guillemot and kittiwake and therefore should only be assessed for these species. The potential casualties from displacement and collision risk need to be allocated through the SNH apportionment tool and this SSSI as well as other potentially effected such as Carreg y Llam which is a SSSI for these two features and within Woodward et al. (2019) mean max + SD foraging range needs to be assessed as well. The assessment made previously in this report is for the biogeographic population and therefore does not suffice as an assessment for a protected site such as Pen y Gogarth/Great Ormes Head SSSI.	Detailed assessment of razorbill, guillemot and kittiwake has been provided within Section 4.12 of the ES. While no detailed apportionment has been carried out given that these sites do not form the national site network (see the Report 5.2; application ref: 5.2), impacts will be split between the various colonies and non-breeding birds approximately in proportion to their contribution to the regional population. Therefore, it is expected that the conclusion of a magnitude of impact of negligible will apply to each individual colony.

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October 2021 Section 42 NRW Response	352: The Little Ormes Head SSSI only has a feature of Cormorant and therefore won't be adversely affected by this project.	Noted
October 2021 Section 42 NRW Response	356: The Dee Estuary SSSI needs to be assessed using the APEM or SOSS tool looking at the effect of collision on migration of waterfowl and waders as well as for the breeding Common tern which is a feature.	Migratory waterfowl, waders and terns have been considered in Volume 4, Annex 4.4 (application ref: 6.4.4.4), with assessment of the features of the Dee Estuary SPA (which encapsulates the SSSI) included in the RIAA (Report 5.2; application ref: 5.2)
October 2021 Section 42 NRW Response	359: Puffin Island SSSI only has cormorant as a feature and therefore won't be adversely affected by this project.	Noted.
October 2021 Section 42 NRW Response	364: Arfordir Gogledd Penmon SSSI has features of cormorant and black guillemot and therefore won't be adversely affected by this project.	Noted.
October 2021 Section 42 NRW Response	367: The Skerries SSSI has features of Common, Arctic and Roseate tern only. These tern features need to be assessed looking at CRM most probably through the SOSS or APEM tool apportioning out potential collisions. The applicant should also look at Cemlyn SSSI as well as Ynys Feurig SSSI. Cemlyn SSSI has features of Sandwich tern and Arctic tern whilst Ynys Feurig has features of Arctic tern and Roseate tern. These will need to be looked at in terms of collision.	Tern species have been considered in Volume 4, Annex 4.4 (application ref: 6.4.4.4), with assessment of the features of SPAs with potential connectivity to AyM included in the RIAA (Report 5.2; application ref: 5.2)
October 2021 Section 42 NRW Response	373: NRW agree that any effects of decommissioning are likely to be similar to those generated during the construction phase. However further consultation regarding decommissioning activities will be required with SNCBs to allow any best practice to be incorporated to minimise potential impacts.	Noted.
October 2021 Section 42 NRW Response	393: Here the effects of the different impacts need to be added together e.g. such as collision and displacement for Gannet and construction and operation to provide a quantitative assessment seeing the total effect of this project rather than a qualitative assessment (see RIAA pg 319; 696 for addition of operational effects).	A combined assessment of collision and displacement for gannet is provided in Section 4.12 & 4.16.
October 2021 Section 42 NRW Response	405: Here the mean-max foraging range (rather than mean max + 1SD) from Woodward et al 2019 is used. So instead of 315.2 km being the largest foraging range, it would be 509.4 km for Gannet. A 500 km ZOI is detailed in 1.3.1 for offshore energy projects.	The ZOI has been amended accordingly.
October 2021 Section 42	418: The cumulative effects such as aggregate dredging and dredging and disposal and cable laying may need to be considered in terms of birds such as common scoter and	Aggregate dredging, dredging and disposal, and cable laying have all been considered within the

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NRW Response	Red-throated diver which are sensitive to disturbance, especially in context of HRA issues for Liverpool Bay SPA.	<p>long-list (Volume 1, Annex 3.1; application ref: 6.1.3.1) and were screened out on the basis of the following criteria:</p> <ul style="list-style-type: none"> ▲ The plan/ project has already been accounted for within the offshore ornithology baseline; ▲ There is no conceptual effect-receptor pathway between plans/ projects; ▲ There is no physical effect-receptor overlap between plans/ projects; ▲ There is no temporal overlap between plans/ projects; or ▲ The plan/ project is ongoing and is part of the current baseline; or ▲ There is low data confidence or data are not available.
October 2021 Section 42 NRW Response	Table 43: This table seems to miss out the potential collisions with Morlais that have been predicted through the CRM and ERM modelling.	Potential impacts from the West Anglesey Demonstration Zone (Morlais) have been examined for all relevant receptors within Section 4.16.
October 2021 Section 42 NRW Response	Table 44: This table seems to miss out the potential collisions with Morlais that have been predicted through the CRM and ERM modelling.	Potential impacts from the West Anglesey Demonstration Zone (Morlais) have been examined for all relevant receptors within Section 4.16.
October 2021 Section 42 NRW Response	Table 45: This table shows what was estimated. Post construction data relating to displacement from Gwynt y Môr and Burbo Bank Extension as well as potentially other wind farms in Liverpool Bay may provide additional evidence to consider here.	Consideration of Gwynt y Môr post construction data has been undertaken and is presented for red-throated diver in Section 4.12.
October 2021 Section 42 NRW Response	437: NRW advise that the applicant needs to make the assessment here on 10% mortality for red-throated diver.	Predicted mortality rates of both 1% and 10% are presented for transparency. The assessment has been undertaken based on the Applicant's position, the evidence for which is provided in Section 4.12.
October 2021 Section 42 NRW Response	465: NRW advise that the applicant needs to make the assessment here on 10% mortality for red-throated diver.	Predicted mortality rates of both 1% and 10% are presented for transparency. The assessment has been undertaken based on the Applicant's position, the evidence for which is provided in Section 4.12.
October 2021 Section 42	Cumulative collision risk: Currently only the mean of collisions (e.g. Kittiwake from Table 34) are used in the cumulative assessments (e.g. kittiwake Table 50). NRW advise that the	The range of predicted collisions is only available for AyM, and this is now presented in Table 4.16.

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NRW Response	range of collisions (minimum and maximum) should also be included here within the cumulative assessment table.	
October 2021 Section 42 NRW Response	479, 484, 490, 496: Here Tables 50 – 53 are described in the text as “the expected number of birds displaced from each other development” but these refer to collision mortalities.	Amended.
October 2021 Section 42 NRW Response	486: GBBG 2.3% increase in baseline mortality is quite high so it would be good to see what potential effect that would have on the regional population. This further consideration could be through the use of population modelling (e.g. Population Viability Analysis PVA), to assess the sustainability of the impact.	Following design changes between PEIR and ES, great black-backed gull collision risk has reduced (Table 44). Further assessment of how predicted great black-backed gull collision is likely to affect the regional population has been presented in Section 4.16.
October 2021 Section 42 NRW Response	Table 53: This table seems to miss out the potential collisions with Morlais that have been predicted through the CRM and ERM modelling.	Potential impacts from the West Anglesey Demonstration Zone (Morlais) have been examined for all relevant receptors within Section 4.16.
November 2021 Section 42 JNCC Response	4.4.2, and Table 3. We note that the PEIR is based on only 18 months of data and the additional 6 months of data will be fully integrated in the final ES submission. The final 6 months of data has been collected but not yet fully analysed. Data is presented as an Annex for information. Whilst we are content to comment on the PIER on this basis, we note that our conclusions might change once assessment based on the full 24months of data is available.	The full 24 months of survey data has been used to inform all assessments in this ES.
November 2021 Section 42 JNCC Response	4.3.3; 19. There are species present within baseline surveys but which are not listed here as receptors for ornithology impact assessment. This needs to be justified. For example, Atlantic puffin, European shag, black guillemot, red-breasted merganser and great-crested grebe.	An evaluation of valued ornithological receptors and associated rationale is presented in Section 4.9.
November 2021 Section 42 JNCC Response	Table 4. There are additional species listed in 4.3.3. which may be at risk of collision, why are these not being considered? E.g. Common gull, Lesser Black-backed gull, Sandwich tern, Common and Arctic tern and Fulmar.	An evaluation of valued ornithological receptors, potential impacts and associated rationale is presented in Section 4.9.
November 2021 Section 42 JNCC Response	4.5.1; 34. How is ‘trivial numbers’ determined? What criteria is used? Even small numbers of rare species could be important and warrant detailed species account; please present the numbers for all species, and criteria used to assess ‘trivial’.	Terminology throughout the assessments presented in the ES has been updated in line with the outlined terminology presented in the assessment methodology (Section 4.8).
November 2021 Section 42 JNCC Response	Table 5. No justification for scoping out indirect impacts through effects on prey species and habitats is provided.	Justification for activities or impacts scoped out of assessment is presented in Section 4.9.

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November 2021 Section 42 JNCC Response	Table 13. The demographic rates presented for red-throated diver are not those presented in Horswill and Robinson 2015. Please check and clarify.	Demographic rates used within the ES, along with the source of these estimates, are presented in Section 4.10.
November 2021 Section 42 JNCC Response	4.9.1; 78. Evidence now exists from various post-consent monitoring of red-throated divers being displaced from windfarm arrays plus buffers of considerably larger than 4km. Upon what evidence is a mortality rate of 1% based? We are aware of very little (if any) evidence of mortality rates of displaced gannet, guillemot razorbill or red-throated diver. Searle et al (2020) estimate mortality rates of displaced razorbill, for example, based on a modelling approach using latest available data and understanding of the ecology of seabirds, ranging from 5.9 to 14.5.	Red-throated diver displacement assessment has been updated to consider a gradient approach out to 8 km (see Section 4.11 & 4.12). Evidence regarding the use of a 1% mortality rate is provided in Section 4.12).
November 2021 Section 42 JNCC Response	4.9.1; 79 – 86. And Table 21. Common scoter is a feature of nearby Liverpool Bay SPA. It should be clarified whether the AYM array and (4km) buffer would overlap with the SPA, and if so impacts on the SPA population and distribution of scoter should be provided.	Potential impacts on Liverpool Bay SPA are assessed in the RIAA (Report 5.2; application ref: 5.2).
November 2021 Section 42 JNCC Response	4.9.1; Table 24. What do the numbers in brackets in the last two columns mean/represent?	Those number in brackets refer to predicted impacts using a 10% mortality rate. This table has been amended in the ES for clarity.
November 2021 Section 42 JNCC Response	4.9.1; 110 - 131. A buffer of 10km (or, as previously discussed and agreed for AYM, 8km) should be used for red-throated diver, instead of 4km. Red-throated diver is a feature of nearby Liverpool Bay SPA. It should be clarified whether the AYM array and (8 or 10km) buffer would overlap with the SPA, and if so, impacts on the SPA population and distribution of red-throated diver should be provided.	Red-throated diver displacement assessment has been updated to consider a gradient approach out to 8 km (see Section 4.11 & 4.12).
November 2021 Section 42 JNCC Response	4.9.1; 112. What evidence is there that a mortality rate of 10% is highly precautionary? Very little is known about the impact of displacement, but as noted above Searle et al (2020) estimate mortality rates for some displaced birds higher than 10%, albeit different species and season than wintering red-throated diver.	Evidence regarding mortality rates is provided in Section 4.12.
November 2021 Section 42 JNCC Response	4.9.2; 147. What evidence is there that a mortality rate of 1% may be appropriate? We were not able to find this evidence in section 4.10.1	Evidence regarding mortality rates is provided in Section 4.12.
November 2021 Section 42 JNCC Response	4.10.1; same comments as made in section 4.9.1 re mortality rates and displacement buffers, and Liverpool Bay SPA, apply to this section.	Evidence regarding mortality rates is provided in Section 4.12.
November 2021 Section 42	Table 32; it would be useful to see estimated peak numbers of birds in AYM array area, in addition to peak density (and month or season in which peak numbers were seen).	Monthly abundance estimates are provided in Volume 4, Annex 4.1 (application ref: 6.4.4.1).

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JNCC Response	Without knowing the numbers of individuals seen within the AYM array area, we would like to see common gull lesser black-backed gull, fulmar and terns included in CRM analyses.	Evaluation of valued ornithological receptors, potential impacts and associated rationale is provided in Table 15.
November 2021 Section 42 JNCC Response	4.10.3; 294 - 305. Estimates of additional mortality (relative to baseline) for great black-backed gulls is over 0.5%, and therefore a consideration of cumulative impacts on regional population will be required.	Following design changes between PEIR and ES, great black-backed gull collision risk has reduced (Table 44).
November 2021 Section 42 JNCC Response	4.12; 388. A quantitative assessment on how individual effects may combine to create inter-related effects should be undertaken, rather than a qualitative assessment. A quantitative assessment has been undertaken for each phase (construction, operation etc), and for each type of effect (e.g. collision, displacement) so a quantitative assessment across these can be undertaken (and additional effects which may not have been quantified can be discussed qualitatively).	Details of inter-related effects are provided in Volume 2, Chapter 14: Inter-relationships (application ref: 6.2.14)
November 2021 Section 42 JNCC Response	4.12; 393. This is premature given comments above.	Noted. This has been revised within the ES based on the updated assessments.
November 2021 Section 42 JNCC Response	4.13; 396. Data exists to allow an assessment (e.g. MERP monthly seabird distribution for 12 seabird species).	The Applicant assumed that the data referred to are those presented in Waggitt et al. (2019). The spatial scale of these data (10 km²) are too coarse to extract any meaningful information regarding potential avoidance behavior for those Round 1 and 2 developments in the region of interest.
November 2021 Section 42 JNCC Response	4.14.1; 405 and 4.14.2; 415. And 4.14.4; 471. The mean max +1 S.D foraging range for gannet is 509.4km (Woodward et al. 2019).	Amended.
November 2021 Section 42 JNCC Response	4.14.1; 407 and 4.14.4; 473. how would a plan/project that is ongoing be considered part of the current baseline? We would not consider this to be the case.	For plans/ projects which are operational at the time of baseline data collection, it is considered that any effects of their operation will be encapsulated within the baseline dataset.
November 2021 Section 42 JNCC Response	4.14.1; 408 and 4.14.2; 418. We disagree; for species such as red-throated diver and common scoter, there are sensitivities to pressures associated with aggregate dredging, cabling projects and given the localised distributions of these species in some seasons, cumulative effects should be considered across sectors/activities.	Aggregate dredging, dredging and disposal, and cable laying have all been considered within the long-list (Volume 1, Annex 3.1; application ref: 6.1.3.1) and were screened out on the basis of the following criteria:

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		<ul style="list-style-type: none"> ▲ The plan/ project has already been accounted for within the offshore ornithology baseline; ▲ There is no conceptual effect-receptor pathway between plans/ projects; ▲ There is no physical effect-receptor overlap between plans/ projects; ▲ There is no temporal overlap between plans/ projects; or ▲ The plan/ project is ongoing and is part of the current baseline; or ▲ There is low data confidence or data are not available.
November 2021 Section 42 JNCC Response	4.14.1; 410 and 4.14.2; 420 and 4.14.4; 476. Data exists to allow an assessment for projects which may not have project-specific data available (e.g. MERP monthly seabird distribution for 12 seabird species).	The Applicant assumed that the data referred to are those presented in Waggitt et al. (2019). The spatial scale of these data (10 km ²) are too coarse to extract any meaningful information regarding potential avoidance behavior for those Round 1 and 2 developments in the region of interest.
November 2021 Section 42 JNCC Response	4.14.1; Table 41. cumulative full development how is this assessed for projects in Table 40 that are still going through the planning process and are not yet fully developed?	Projects that are still going through the planning process and are not yet fully developed have been included in the long-list following the Planning Inspectorate's Advice Note Seventeen (PINS, 2019). Where data are available within application documentation, these have been included within the cumulative assessment presented in Section 4.16.
November 2021 Section 42 JNCC Response	4.14.2; 437 and 4.14.3; 465. Consideration should also be given to cumulative mortality based on a mortality rate of 10%; Searle et al (2020) estimate mortality rates for some displaced birds higher than 10%, albeit different species and season than wintering red-throated diver. Given the numbers presented, this may increase the baseline mortality rate by more than 1%, but should be presented so an assessment can be made.	Mortality rates of 1% and 10% are presented in Section 4.16.
November 2021 Section 42 JNCC Response	4.14.2; 441 and 4.14.3; 468. Given above comment, we cannot agree that it is not significant until more information, based on 10% mortality rate, is provided.	Mortality rates of 1% and 10% are presented in Section 4.16.

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November 2021 Section 42 JNCC Response	4.14.4; 489. Given increase in baseline mortality of more than 2%, we can't agree with conclusion until this is considered further; e.g. has a PVA been undertaken to assess implications of this increased mortality to wider population?	Following design changes between PEIR and ES, great black-backed gull collision risk has reduced (Table 44). Further assessment of how predicted great black-backed gull collision is likely to affect the regional population has been presented in Section 4.12 & 4.16.
November 2021 Section 42 JNCC Response	4.16.2; 508 and 509. JNCC agrees that the integration of the final 6 months of aerial survey data with the first 18 months of data is required to allow a baseline for assessment that is characterised by a full 24 months of data and an update of all assessments. We note that our conclusions might change once assessment based on the full 24 months of data is available.	The full 24 months of survey data has been used to inform all assessments in this ES.
December 2021 Section 42 NE Response	The analysis has been undertaken on 18 months of survey data. Natural England advise that 24 months of (preferably consecutive) baseline survey data are required. We acknowledge from the Offshore Ornithology Expert Technical Group (ETG) that 24 months of data will be integrated into a single Baseline Technical Report for the Environmental Statement. Some additional analysis may be required once 24 months of data is available, e.g., birds considered to have been recorded in 'trivial' numbers up to this point may need to be considered.	The full 24 months of survey data has been used to inform all assessments in this ES.
December 2021 Section 42 NE Response	Mortality estimates arising from each pathway (collision, displacement) have been presented for discrete project time frames (cable laying, construction, operation, and decommissioning). Total mortality estimates have not been calculated. Natural England advise that the total estimated mortality impacts should be presented for each pathway (e.g. collision, displacement). Further, for species which may be impacted by both collision and displacement (e.g. gannet), the impacts from both should also be considered cumulatively. At present, the Statutory Nature Conservation Bodies (SNCBs) regard the two impacts (collision and displacement) as additive and advise that they should be summed. Further information on this is available in the 2017 SNCB Interim Displacement Advice Note.	The Applicant has undertaken assessment of displacement in keeping with the most recent consented projects in UK waters. As such, predicted mortality for species is calculated per year, and not as an overall impact number for the combined phases of the project. This is due to combining impacts not being considered to be appropriate across the construction, O&M and decommissioning phases, as they have different scales both temporally and spatially. These potential impacts are also different for each phase and therefore, need to be addressed in isolation. It is also apparent that there would be a level of double counting should construction phase potential impacts within the array area be combined with cable laying, as an element of displacement is already accounted for outside from the array area extending over the cable laying area within the

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		<p>buffers being assessed for species such as red-throated diver. As no clear guidance is available or methods agreed as being appropriate for this type of additional assessment the Applicant considers that sufficient precaution is provided for displacement impact assessments in this chapter for all phases of the project lifecycle.</p> <p>Gannet collision and displacement impacts have been considered cumulatively and presented in Section 12.4 and Section 4.16.</p>
December 2021 Section 42 NE Response	<p>Conclusions of no Adverse Effect on Integrity (AEoI) do not consider all Special Protection Area (SPA) conservation objectives. Using Liverpool Bay SPA and red-throated diver as an example, the conclusion of no AEoI has been made against the objective to maintain or restore the population, through putting the estimated mortality into context against the SPA population. However, the objective to maintain or restore the distribution of the qualifying feature has not been properly considered. It is likely that the operation of the wind farm will lead to a change in distribution of red-throated diver at Liverpool Bay SPA. Natural England advise that all SPA conservation objectives must be considered throughout the assessment.</p>	Please refer to the RIAA (Report 5.2; application ref; 5.2).
December 2021 Section 42 NE Response	<p>Generic population age ratios (Furness, 2015) have been used throughout. No site-specific data is utilised. It is noted that throughout the assessment generic age ratios have been applied in preference to site specific data, with small sample sizes being used to justify this approach. In some cases (e.g. gannet where most observations are from within the breeding season and birds can be accurately aged) it may be more appropriate to use site specific age data. Further clarity is required on what constitutes a small sample size, how this has been determined, and the implications of using generic data.</p>	Demographic rates used within the ES, along with the source of these estimates, are presented in Section 4.10.
December 2021 Section 42 NE Response	<p>Assessment has been made against the citation populations, but also an updated population based on the latest count which is often based on a single year of data and may not be contemporary (e.g. para 454 Lambay Island guillemot count from 2015). It is not appropriate to assess impacts using a single population count, which does not account for any source of variation and may not be representative. Natural England advise that impacts should be assessed using the citation population unless an alternative (e.g. a mean count from the most recent 3-5 years of count data) is agreed with the</p>	Please refer to the RIAA (Report 5.2; application ref; 5.2).

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	relevant SNCBs. This may be appropriate if a population can be shown to have increased or declined significantly against the baseline.	
December 2021 Section 42 NE Response	Anglesey terns SPA - only sandwich tern and roseate tern features have been assessed. It is not clear why common and arctic terns have been excluded from the assessment. If this cannot be adequately justified Natural England advise that they should be considered for assessment.	Please refer to the RIAA (Report 5.2; application ref; 5.2).
December 2021 Section 42 NE Response	Copy/paste leading to errors in text. A number of species names are incorrect in the text, see e.g. paragraph 440 (gannet should read herring gull), paragraph 482 (gannet should read guillemot).	Please refer to the RIAA (Report 5.2; application ref; 5.2).
December 2021 Section 42 NE Response	1% Mortality rates have been used in displacement assessments. Natural England's general position regarding mortality rates from displacement is that as definitive mortality rates for seabirds are unknown, we advise investigating a range of figures for mortality rates. Natural England do not agree that a 1% mortality rate for red-throated diver is precautionary. Natural England's response to the MacArthur Green review ² of available evidence for red-throated diver displacement at our Deadline 3 submission for the Norfolk Vanguard Offshore Wind Farm is available on the PINS website ³ Natural England advise that mortality rates of 1-10% should be considered in displacement assessments for red-throated diver and auks (for impacts arising from the developed site, its construction and cable laying vessels). We advise that the same approach is taken for common scoter (mortality rate range of 1-10%).	A full range of displacement matrices has been provided in Volume 4, Annex 4.2 (application ref: 6.4.4.2) for relevant receptors. Evidence regarding the use of a 1% mortality rate is provided in Section 4.12.
December 2021 Section 42 NE Response	A 4km buffer has been used to assess displacement of red-throated diver. Natural England have recently approved the Joint SNCB Interim Advice on The Treatment of Displacement for Red-Throated Diver (2021) which will be published shortly. Following this guidance, it is advised that displacement is assessed using a 10km buffer as the project is within 10km of Liverpool Bay SPA, which is designated for non-breeding red-throated diver. This buffer is not necessarily required in all directions from the array (i.e. a 4km buffer may be appropriate on the seaward boundary). Assessing a displacement gradient (rather than assuming 100%) may be appropriate over the 10km buffer.	Displacement analysis for red-throated diver has been undertaken out to 8 km within the ES, using the approach set out at ETG #5.
December 2021 Section 42 NE Response	Method used to assess displacement in construction and decommissioning phases (displacement rates have been reduced by 50%). Natural England have advised other projects that it is acceptable to broadly reflect the likely reduced spatial and temporal scale of displacement effects during construction by calculating displacement for the construction period as 50% of that at the operational phase. We suggest this method is simpler than reducing displacement rates by 50%.	Noted.

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December 2021 Section 42 NE Response	Common scoter displacement during cable laying has been assessed using a 1 km buffer around cable laying vessels, justified by Schwemmer et al. (2011). Note that reference list is incomplete, e.g. does not include Schwemmer et al. (2011). Although Schwemmer et al. (2011) found a median flush distance of 804m for common scoter, the study found the species flush distance response to vessels to be highly variable. A flock was recorded flushing at 3.2km, and the 95% upper confidence level flush distance presented is >2km (see figure 3). Note that flush distances of 1-2km were reported by Kaiser et al. (2006). Natural England advise that a 2km buffer should be used to assess displacement of common scoter by cable laying activities, as used for red-throated diver.	Common scoter displacement during cable laying has been assessed using a 2 km buffer within the ES (see Section 4.11).
December 2021 Section 42 NE Response	Gannet displacement – assessment only considers the array area. There is no justification for the use of the array area only. NE advises that displacement assessments should also consider the 2km buffer.	Gannet displacement has been assessed using a 2 km buffer in the ES (see Section 4.11,4.12 & 4.16).
December 2021 Section 42 NE Response	Total crew transfer vessel movements appear to be very low (1095) over the operating life of the wind farm. The stated number of movements equates to less than one crew transfer vessel visiting the site each week. Vessel routes are unknown at present. If routes do not follow pre-existing shipping routes new areas within Liverpool Bay SPA will be subject to additional disturbance. Please confirm if vessel movements listed are totals over the 25-year operational period and correct (it appears more likely than annual vessel movements have been presented). Natural England cannot currently agree that “vessels transiting to and from the port during the 25-year operational lifetime of the Awel y Mor project and the wind farm will have a negligible effect on the levels of shipping disturbance”. A vessel management plan will need to be produced to avoid and mitigate disturbance as far as possible. If vessels are routed through Liverpool Bay SPA it will be necessary to assess displacement (particularly of red-throated diver and common scoter) along those routes, especially where those routes deviate from existing shipping lanes.	Please refer to the RIAA (Report 5.2; application ref; 5.2).
December 2021 Section 42 NE Response	A site-specific foraging range for Sandwich tern breeding at the Cemlyn colony has been used to evidence the claim that adverse effects can be discounted (no connectivity). Data informing the colony specific maximum foraging range is not considered robust. It was gathered over a single breeding season (2009) and many of the tracks were incomplete. Natural England advise the use of the precautionary mean max +1SD foraging range presented in Woodward et al. (2019) to account for inter-annual variation and a high level of uncertainty in the colony specific range.	Please refer to the RIAA (Report 5.2; application ref; 5.2).
December 2021 Section 42	Manx shearwater displacement has not been assessed. Natural England advise that displacement of Manx shearwater should be assessed due to a lack of evidence on	Assessment of Manx shearwater displacement is presented in Section 4.11,4.12 & 4.16 of the ES.

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NE Response	potential sensitivity and impacts and potential for future in-combination impacts in the region. It is suggested that analysis considers a displacement rate range of 30-70% and mortality rate range of 1-10% at the array + 2km buffer area (i.e., the same parameters as auks). We acknowledge that it has been set out in the ETG meeting that Manx shearwater will be included in the Environmental Statement, although were missing from the PEIR.	
December 2021 Section 42 NE Response	Predicted collision mortality estimates are presented (assumed to be the mean value), but the assessment does not account for the range of predicted impacts. I.e. a worst-case scenario is not considered. Natural England advise that collision risk assessments need to present data and predicted impacts in a way that allows the full range of uncertainty (e.g. around input data, analysis, methodology) to be understood and evaluated. Natural England advise the use of a 95% UCL to represent a precautionary worst-case scenario of collision mortality.	Full details surrounding the collision risk modelling undertaken are provided in Volume 4, Appendix 4.3 (application ref; 6.4.4.3). Predicted mortality including upper and lower confidence intervals are provided in Section 4.12.
December 2021 Section 42 NE Response	Migrating terns have not been considered. Natural England advise that low numbers of birds recorded in baseline surveys is not sufficient justification to scope out migrant species from Collision Risk Modelling (CRM) assessments. Digital Aerial Survey represent a snapshot and can easily miss migratory movements. The SOSS Migration Tool (SOSS- MAT) or MigroPath are not considered suitable to assess migrant seabirds (including terns), which tend to migrate following coastlines at a distance offshore and do not migrate following straight lines between a point of origin and a destination. An alternative approach is to estimate the number of a species of bird migrating through a wind farm footprint area based on an apportionment of migrant bird numbers across a broad migratory front. See the report for the Marine Scotland project on strategic assessment of collision risk of Offshore Wind Farms to migrating birds (WWT Consulting & MacArthur Green Ltd. 2014).	Collision risk to migrating terns has been considered in Volume 4, Annex 4.4 (application ref: 6.4.4.4) using the APEM MigroPath tool, and in Section 4.12 of the ES.
December 2021 Section 42 NE Response	In-combination impacts do not consider data from projects that previously scoped in SPA populations using Thaxter et al. (2012) foraging ranges. No displacement analysis of gannet at sites in range. A number of projects have not been considered due to a lack of data. Natural England advise that all Offshore Wind Farm plan and projects within the relevant spatial scale should be considered by in-combination assessments. In some cases, it is likely that sites with "no data" could have been assessed by other more recent sites to assess in-combination impacts. In any case, simply disregarding impacts from such sites is not appropriate.	Please refer to the RIAA (Report 5.2; application ref: 5.2).
December 2021 Section 42 NE Response	In-combination displacement assessments only consider impacts at operation and maintenance phase for Awel y Mor. Natural England advise that the assessment should also fully consider the impacts of the construction phase (including cable installation) and	Please refer to the RIAA (Report 5.2; application ref: 5.2).

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	operation and maintenance works, in addition to effects from the array itself. This should consider vessel movements (including cabling vessels and helicopter traffic).	
October 2021 Section 42 RSPB Response	4.5.2 Conservation status of offshore ornithology receptors. Table 9: Summary of nature conservation value of species considered at potential risk of impacts. The nature conservation value of species depicted in Table 9 relates to the UK conservation status originating from Birds of Conservation Concern 4 (2015 update) which is not specific to Wales. Whereas Chapter 3.5 Onshore Biodiversity and Nature Conservation refers to both the UK and Wales conservation status. It would be helpful to be mirror the onshore chapter and include species listed under Section 7 of the Environment (Wales) Act 2016 and Birds of Conservation Concern in Wales 3 (2016 update).	Conservation status takes into account species of Principal Importance listed under Section 7 of the Environment (Wales) Act 2016 and the most recent Birds of Conservation Concern 5 (Stanbury et al. 2021).
October 2021 Section 42 RSPB Response	4.7 Embedded mitigation. Table 15: Relevant embedded environmental measures for offshore ornithology. The lowest tip height is given as 22m above Mean High Water Springs. Given the evidence that the greater the air gap the lesser the risk of mortality through collisions (Johnson et al., 2014), the RSPB would prefer if a higher height was used as early as possible in the assessment.	Noted.
October 2021 Section 42 RSPB Response	4.10.8 Impact on local and national designated sites. Chapter 4 does not appear to have a section that identifies internationally designated sites for nature conservation. Whereas Chapter 3.5 Onshore Biodiversity and Nature Conservation does include internationally designated sites. We acknowledge international sites relevant to offshore ornithology are listed in Report 5.1, Annex 2: HRA Screening Update (Ornithology). The list of local and national designated sites appears incomplete. It omits some local SSSIs linked with SPAs that are listed in the Report 5.1, Annex 2: HRA Screening Update (Ornithology). For example, it omits the following SSSIs: Cemlyn SSSI a component SSSI of the Anglesey Terns / Morwenoliaid Ynys Môn SPA; and Traeth Lafan SSSI which underpins Traeth Lafan SPA.	Please refer to the RIAA (Report 5.2: application ref; 5.2).
October 2021 Section 42 RSPB Response	Table 40: Projects considered within the offshore ornithology cumulative effect assessment. The list of projects and plans appears extensive, although it appears to exclude some Round 4 offshore wind leases including two neighbouring Offshore Wind projects, namely Morgan and Mona offshore wind projects	The list of plans/ projects included in the cumulative assessment follows Planning Inspectorate's Advice Note Seventeen (PINS, 2019) and includes all projects currently in the planning system including those Round 4 sites in the region.
December 2021 JNCC, NE & NRW written response to Position Paper set out at ETG#5.	ACTION [point 4] – SNCBs to provide written feedback on red-throated diver displacement approach presented by APEM. All agree the displacement approach presented by APEM would be acceptable if there was an adjustment to reflect the best available evidence. There is evidence from the	The recommended gradient approach and associated displacement rates has been incorporated in the red-throated diver assessment of

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	<p>German Bight that displacement rates remain as high as 90% out to 5 km (Heinänen et al., 2020). Therefore, if the 4-5 km buffer zone had its displacement rate raised from 50% to 90%, we would accept the displacement rates proposed for the remaining buffer bands (final values: 100% at the array, 90% between 0-5 km, 50% between 5-8 km).</p> <p>The displacement approach presented by APEM only considers a 1% mortality rate for red-throated divers. JNCC continue to advise the displacement assessment is presented for a range of mortality rates (1-10%). Heinänen, S., Žydelis, R., Kleinschmidt, B., Dorsch, M., Burger, C., Morkūnas, J., Quillfeldt, P. & Nehls, G. (2020). Satellite telemetry and digital aerial surveys show strong displacement of red-throated divers (<i>Gavia stellata</i>) from offshore wind farms. Marine Environmental Research, 104989.</p>	displacement in Section 4.11, 4.12 & 4.16 and in Volume 4, Annex 4.2 (application ref: 6.4.4.2).
December 2021 JNCC, NE & NRW written response to Position Paper set out at ETG#5.	ACTION [point 6] – SNCBs to provide written agreement on APEM use of Migropath and broad-front approach described in the example report in Action point 5. All agree with the use of Migropath for assessing waterbirds and a broad-front approach for seabirds.	Noted.
December 2021 JNCC, NE & NRW written response to Position Paper set out at ETG#5.	ACTION [point 9] – SNCBS to check agreement regarding auk correction factors Rounding error between AyM and EA ONE. All agree with the approach set out regarding auk correction factors.	Noted.
December 2021 JNCC, NE & NRW written response to Position Paper set out at ETG#5.	ACTION [point 10] – JNCC to check that avoidance rates used in PEIR and approach suggested for using gannet macro-avoidance matches that which will be presented in updated advice note. SNCBs continue to advise use of AR's presented in the 2014 CRM note. Both JNCC and NRW agree that the avoidance rates used for the PEIR can be used for the final ES.	The approach taken for combining predicted gannet collision and displacement mortality is set out in Section 4.12 & 4.16. Noted.
December 2021 JNCC, NE & NRW written response to Position Paper set out at ETG#5.	ACTION [point 11] – SNCBs to check approach suggested for gannet macro-avoidance. All state that until the available evidence is reviewed in detail we are unable to advise on a suitable generic macro-avoidance rate for gannet. Therefore at this time, analyses should be presented that do not include gannet macro-avoidance, and simply apply the overall avoidance rates as advised in the SNCB 2014 CRM note. However, given the location of AYM in relation to gannet breeding colonies, at this stage we would welcome additional analyses that would present gannet collision rates allowing for gannet macro-avoidance; this should be calculated by reducing the density of birds inputted into collision risk modelling by 70% which is consistent with the mid-point displacement level which is currently advised.	Noted. The approach taken for combining predicted gannet collision and displacement mortality is set out in Section 4.12 & 4.16.

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December 2021 JNCC written response to Position Paper set out at ETG#5.	<p>ACTION [point 12] – SNCBs to provide feedback on 95% CIs.</p> <p>Firstly, we would like to clarify that Natural England have requested 95% CI around abundance on displacement assessments be presented in recent cases, including at Hornsea 3 and Hornsea 4. We advise presenting the upper and lower 95% confidence intervals around the abundance in the final submission to allow consideration of the variability in the underlying population estimates. Displacement matrices could be presented for the mean peak bird population estimates and the upper and lower 95% confidence limits of these (which is broadly comparable to the approach of applying uncertainty to input parameters within the sCRM tool).</p> <p>Regarding grid versus transect survey designs; whilst we recognise that grid-based designs may have reduced uncertainty, this uncertainty should still be presented as in above paragraph.</p>	<p>Mean peak seasonal abundances have been presented with the ES and Volume 4, Annex 4.2 (application ref: 6.4.4.2) following the SNCB note (2017). The Applicant does not consider it applicable to use 95% confidence intervals for assessment of AyM given the level of precaution already inherent within the assessment and the fact that AyM is based on a grid-based design, rather than a transect as used for Hornsea Project Three and Four.</p> <p>As the grid surveys undertaken to provide AyM with its project data for offshore ornithology sample the area systematically and evenly across the survey area these data are less prone to missing areas of possible significance through more complete coverage. As such, in comparison to transect data they provide closer CVs associated with the abundance estimates and closer CIs surrounding them.</p> <p>For grid-based surveys, each individual Node can be considered to be a separate and independent sample. The independence of the Nodes can be formally tested for to ensure that there is no pseudo-replication. Grid surveys thus normally have a much greater sample number, reducing variation between images and resulting in a greater confidence in the estimate and a high degree of precision thus eliminating the need for assessment using 95% CI.</p> <p>Other recently consented projects relying on grid-based data include Norfolk Boreas and Norfolk Vanguard, both of which undertook and agreed on assessments and final impact values using the central abundance and density estimates rather than CIs, in part due to increased confidence in the data collected following this survey design and method.</p>
December 2021	ACTION [point 12] – SNCBs to provide feedback on 95% CIs.	Mean peak seasonal abundances have been presented with the ES and Volume 4, Annex 4.2

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NRW written response to Position Paper set out at ETG#5.	Natural England have requested 95% CI around abundance on displacement assessments be presented since Hornsea Three, including at Hornsea Four. NRW continue to advise presenting the upper and lower 95% confidence intervals around the abundance in the final submission to allow consideration of the variability in the underlying population estimates. Displacement matrices could be presented for the mean peak bird population estimates and the upper and lower 95% confidence limits of these.	(application ref: 6.4.4.2) following the SNCB note (2017). APEM do not consider it applicable to use 95% confidence intervals for assessment of AyM given the level of precaution already inherent within the assessment.
December 2021 JNCC, NE & NRW written response to Position Paper set out at ETG#5.	ACTION [point 14] – SNCBs to check that updated BDMPS populations presented are correct and to provide rationale for any numbers they do not agree with. NRW welcomed the inclusion of the BDMPS calculation spreadsheet within the ETG meeting minutes, which allowed confirmation that the calculations undertaken were accurate. NRW agree with the corrected values for kittiwake and common gull presented in this table. However, there is still an outstanding comment from NRW's PEIR response that remains unaddressed within this table, "Pg 82; Table 11 Fulmar – Value for BDMPS RETURN MIGRATION POPULATION SIZE for Migration seasons (Sept-Oct and Dec-Mar) should be 828,194 according to Furness 2015." Value in the table remains 818,194.	Noted. Values for fulmar have been amended in line with advice in Section 4.10.
January 2022 NRW written advice in relation to Awel y Môr Migrant Screening Matrix	NRW welcomes that the majority of Welsh wintering SPA features have been screened in within the migrant screening matrix. However, NRW advise that pintail should be included as this species is a wintering feature of multiple Welsh SPAs, but has not been selected for modelling. It is not clear why some breeding sites/features have been left out such as Anglesey terns SPA but then breeding Little tern for the Dee has been included in the matrix. NRW advise that all of the relevant sites should be assessed in this manner, breeding and non-breeding (breeding sites currently omitted that NNRW would like assessed are Aberdaron Coast and Bardsey Island SPA, Anglesey Terns SPA, Grassholm SPA, Skomer, Skokholm and the Seas off Pembrokeshire SPA)	At the Request of NRW, the Applicant has included pintail within its final assessment. The SPAs included within the screening matrix were sites which included waterbird features, which in order to quantitatively assess would need to be run through Migropath. The qualifying features of the SPAs mentioned in NRW's response are primarily seabird features which have been assessed quantitatively using the site-specific survey data and standard CRM assessments where applicable, with the exception of tern features although these features have been screened in and assessed for migratory collision.
January 2022 JNCC email response on migrant screening matrix for AYM	JNCC welcomes the overall approach to screening for migrant collision risk. We would request that the following species are screened in: <ul style="list-style-type: none"> ▲ lesser black-backed gull ▲ short-eared owl;. Given potential variability in migratory behaviour, it should be screened in for 'potential' risk acknowledging that this may not be consistent across years. 	The Applicant undertook an appropriate screening process as presented in Volume 4, Annex 4.4 (application ref: 6.4.4.4) and included species on a precautionary basis for inclusion within Migropath modelling or an apportionment process to determine

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	<p>We would ask that confirmation from NRW, NE and DEARA is sought regarding roseate tern breeding attempts at west-coast Britain or Northern Ireland, in recent years. This information should be used for any screening decision for this species.</p> <p>There is some inconsistency in terms of which species have been screened in/out where there is uncertainty regarding migratory paths, and request further justification for excluding the following species:</p> <ul style="list-style-type: none"> 📌 pintail 📌 goldeneye 📌 Slavonian grebe 📌 great crested grebe, especially given that it has been seen in AYM and GYM surveys 📌 merlin; subaeson race would seem to be more at risk. 📌 dotterel 	<p>the number of birds that may fly through the footprint of AyM.</p> <p>An element of expert judgement from undertaking migratory studies and collision risk for migrant species for other projects around the UK provided the Applicant with the ability to consider all species as appropriate. Those species not included are justified within the screening table in Volume 4, Annex 4.4 (application ref: 6.4.4.4) and were excluded due to the numbers being considered to be inconsequential with regards to numbers that may fly through the AyM footprint and therefore would be highly unlikely to be at risk of collision.</p>
23 rd February 2022 RSPB only ETG Meeting	<p>RSPB specific meeting whereby the Applicant provided an update on the following topics in relation to EIA:</p> <ul style="list-style-type: none"> 📌 Evaluation of receptors and impacts for the full 24 months of data; 📌 S.42 feedback; 📌 Final red-throated diver displacement approach; and 📌 Population Viability Analysis (PVA) <p>No key issues were raised by RSPB during the ETG.</p>	N/A

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