Morecambe Offshore Windfarm: Generation Assets

Examination Documents

Volume 9

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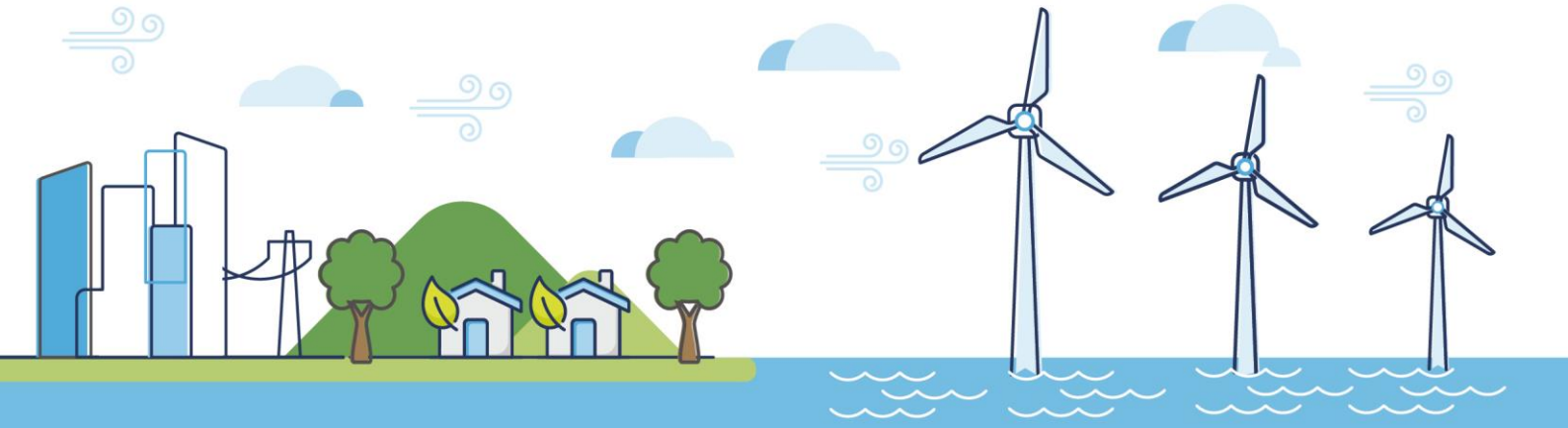

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Glossary of Acronym

AEoI	Adverse Effect of Integrity
CEA	Cumulative Effects Assessment
CIS	Celtic and Irish Sea
DRC	Dose Response Curve
DCO	Development Consent Order
EDR	Effective Deterrence Range
EIA	Environmental Impact Assessment
ES	Environmental Statement
HF	High Frequency
iPCoD	Interims Population Consequences of Disturbance
IS	Irish Sea
JNCC	Joint Nature Conservation Committee
LSE	Likely Significant Effect
MU	Management Unit
NE	Natural England
NI	Northern Ireland
NW	North-West
OWF	Offshore Wind Farm
PEIR	Preliminary Environmental Information Report
PINS	Planning Inspectorate
RIAA	Report to Inform Appropriate Assessment
RoI	Republic of Ireland
RR	Relevant Representation
SAC	Special Area of Conservation
SE	South-East
SPL	Sound Pressure Level
SW	South-West
UK	United Kingdom
VHF	Very-High Frequency
WTG	Wind Turbine Generators

Glossary of Unit Terms

dB	Decibel
dB re 1 µPa	Underwater dB are referenced to a pressure of 1 micro Pascal (µPa), which is abbreviated as dB re 1 µPa
Hz	Hertz
kHz	Kilohertz
km	kilometre
km^2	square kilometre
µPa	Micro pascal

Glossary of Terminology

Applicant	Morecambe Offshore Windfarm Ltd
Application	This refers to the Applicant's application for a Development Consent Order (DCO). An application consists of a series of documents and plans which are published on the Planning Inspectorate's (PINS) website.
Generation Assets (the Project)	Generation assets associated with the Morecambe Offshore Windfarm. This is infrastructure in connection with electricity production, namely the fixed foundation wind turbine generators (WTGs), inter-array cables, offshore substation platform(s) (OSP(s)) and possible platform link cables to connect OSP(s).
Sound Pressure Level (SPL)	The sound pressure level or SPL is an expression of the sound pressure using the decibel (dB) scale, and the standard reference pressures of 1 µPa for water and 20 µPa for air.
The Planning Inspectorate	The agency responsible for operating the planning process for Nationally Significant Infrastructure Projects.
Windfarm site	The area within which the WTGs, inter-array cables, OSP(s) and platform link cables would be present.

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1 Introduction

1. This document presents an update to the Volume 4 Marine Mammals Report to Inform Appropriate Assessment (RIAA) (APP-027), submitted as part of the assessment of the Morecambe Offshore Windfarm Generation Assets on marine mammal receptors.

2. This has been undertaken at the request of Natural England (NE), who in their Relevant Representation (RR) (RR-061), indicated that further information, updates and clarifications were required, as summarised in **Table 1.1**.

Table 1.1 RRs that have been addressed within this technical note

RR ID	Section in this Note where the RR is addressed
RR-061-196 (NE Ref D32)	The full population modelling results (for both mean and median results), including explanatory text, are included in **Section 2.1**.
RR-061-224 (NE Ref D60)	Additional information to support the in-combination assessments has been provided in **Section 36**.
RR-061-171 (NE Ref D7)	The updates regarding the assessments that are based on the ES (Environmental Statement) have been covered in **Section 2.3**.

2 Updates and Amendments for the Report to Inform Appropriate Assessment – Marine Mammals (Volume 4 (APP-027))

3. The following assessments were carried out using the methodology outlined in paragraph 3251 in the RIAA (APP-027). In summary, the potential for a Likely Significant Effect (LSE) on a Special Area of Conservation (SAC) population has been based on:

   - Permanent effects: > 1% of a population
   - Temporary effects: > 5% of a population
   - For population modelling: a continued decline of >1% per year (versus a modelled unimpacted reference population) over a set period of time (e.g. the first 6 years, based on the former Favourable Conservation Status reporting period), then there is a high likelihood that a significant effect (NRW, 2023).

2.1 Clarification for Interims Population Consequences of Disturbance (iPCoD) modelling (NE Ref D32)

4. The following section is provided in response to NE's comment (D32) in relation to the assessment of the population consequences of pile driving noise disturbance on marine mammal receptors:

   "*The values in the median impacted as percentage of unimpacted column of this table do not correspond to the difference between the un-impacted population mean and the impacted population mean. For example, 288 as a percentage of 293 is 98.29%, not 100.00%. Indeed, Plate 11.3 shows a visible difference in the population size between the two, which is not reflected in Table 11.39.*

   We advise that the difference between the two presented means is included in the table, alongside the median values. The Applicant can provide information to support the value they consider to be most appropriate. Note this comment applies to all tables which present the iPCoD (Interims Population Consequences of Disturbance) *modelling results, including in the CEA* (Cumulative Effects Assessment). *This is of particular importance in the CEA assessment of bottlenose dolphin, where in 2031 the impacted population mean is >5% lower than the un-impacted population mean, and so potentially significant.*

   Present the difference between the two means in each table that presents iPCoD modelling results, including in the CEA. The Applicant can provide information to support the value they consider to be most appropriate".

5. In relation to the assessment of the population consequences of pile driving noise disturbance on marine mammal receptors, further information and clarification is provided in this section. The iPCoD modelling results presented in Sections 9.4.2.1; 9.4.4.1; 9.5.2.1; 9.5.4.1; 9.7.2.1; 9.7.4.1 in RIAA (APP-027) considered the median of the ratio of impacted: unimpacted population sizes for the relevant marine mammal populations as the key metric to determine effect significance using the iPCoD method. This is due to the fact that the median of the ratio of impacted: unimpacted population sizes is considered more robust to the effects of extreme outliers than the mean value, particularly with lower sample sizes (Sinclair *et al.,* 2019).

6. In addition, this metric is considered least sensitive to misspecification of demographic parameters, therefore enabling more robust assessment of offshore renewable effects (Jital *et al*., 2017; Sinclair *et al*., 2019). Evaluations of the sensitivity of outputs to misspecification of demographic parameters have demonstrated that the ratio output metric of the counterfactual of population size (the median of the ratio of the impacted to un-impacted population size across all simulated matched replicate pairs) is a robust metric, and is therefore recommended for population viability type analyses that compare modelled populations with counterfactual populations in the context of offshore wind Environmental Impact Assessment (EIA) (Jital *et al*., 2017; Sinclair *et al*., 2019). The approach taken in the ES Chapter 11 Marine Mammals (APP-048) and the RIAA (APP-027) is therefore in line with the guidance set out by the iPCoD developers (Sinclair *et al*., 2019) and others (Jitlal *et al*., 2017).

7. This rationale, developed by the authors of the iPCoD code, has resulted in the median of the ratio of impacted: unimpacted population sizes being used and accepted for other recent Offshore Wind Farm (OWF) EIAs, such as Moray West, Seagreen Alpha and Bravo Wind farms, the Sheringham and Dudgeon Extension Projects, North Falls and the Dogger Bank South Projects which all presented the median of the ratio of impacted to un-impacted population size.

8. It is important to note that iPCoD runs 1,000 permutations of a population growth projection for impacted and unimpacted populations. This results in 1,000 impacted: unimpacted population pairs for each time-point in the modelling period (often 25 years). Calculating the ratio between each pair and then taking the median of all ratios results in the “median of the ratio of impacted: unimpacted population sizes”, which is expressed in percentage terms in the iPCoD results tables Table 9.9, Table 9.14, Table 9.21, Table 9.22, Table 9.26, Table 9.27, Table 9.52, Table 9.53, Table 9.57 and Table 9.58 in the RIAA (APP-027). Crucially, this is not the same process as taking the median of the 1,000 impacted populations sizes at a given time point, the median of the unimpacted population sizes, and then comparing the ratio

between these two medians. In short, one method results in the median of all modelled population differences (which is used in the RIAA), whilst the other calculates the median of all impacted and unimpacted populations sizes and presents the difference between the two medians (not used or presented in RIAA). Therefore it is not possible to use the median population values presented within iPCoD tables to calculate the median of the ratio of impacted: unimpacted population sizes. These are different metrics that don't directly relate to each other.

9. For completeness, and at the request of NE in comment D32, the mean and median ratios of impacted: unimpacted population sizes are presented for the iPCoD simulation runs conducted for the Project alone (**Section 2.1.1**) and in-combination (**Section 2.1.2**) in relation to reference populations used in the RIAA. Once again, it is important to note that it should not be expected that calculating the percentage difference between the mean impacted and unimpacted population sizes at a given timepoint presented in the result tables will result in the same value as the mean ratio of impacted:unimpacted population sizes presented in the same tables.

10. For the in-combination assessment, for all species assessed, the modelled impact of piling from the Project alone fell below the threshold of a 1% annual decline in population over a 25-year period (regardless of whether median or mean values are used) which is considered insignificant.

11. For the reasons set out above, comparison of the median ratio of impacted: unimpacted populations is considered to be a measure more robust to the influence of outliers and misspecification of demographic parameters than the mean. However, the additional information presented in this section demonstrates that the choice of using median or mean values to compare population sizes does not materially affect the outcomes of the assessment presented in the RIAA (APP-027), with all modelling results having no potential for adverse effect in all cases.

12. This comment only applies to harbour porpoise, bottlenose dolphin, and harbour seal. For grey seal, population modelling was not undertaken within the RIAA (APP-027).

2.1.1 Clarifications to the Project-alone assessment

2.1.1.1 Harbour porpoise

13. In the RIAA (APP-027), five SACs were screened in for harbour porpoise:

- North Anglesey Marine SAC
- North Channel SAC
- West Wales Marine SAC

- Rockabill to Dalkey Island SAC
- Bristol Channel Approaches SAC

14. For harbour porpoise, iPCoD results were presented for Project-alone effects in the RIAA (APP-027). The results have been presented again here, with both median and mean population sizes (**Table 2.1**). The results show a less than 1% average[1] annual decline over the first six years and over the 25 year period for both the mean and median.

15. Therefore, as stated in Paragraph 3333 of the RIAA (APP-027), there would be **no LSE on the harbour porpoise population of the Celtic and Irish Sea (CIS) Management Unit (MU)** and **no Adverse Effect of Integrity (AEoI)** on any SAC from the effects of disturbance from underwater noise during piling.

[1] This was determined by dividing the overall percentage change for the 6 and 25 year timepoints by 6 and 25, respectively, to obtain an annual average change.

Table 2.1 Results of the iPCoD modelling for the Project, giving the mean population size of the harbour porpoise population (CIS MU) for years up to 2052 for both impacted and un-impacted populations, in addition to the mean and median ratio between their populations in addition to the mean and median ratio between their population sizes (clarifications to Table 9.9 of the RIAA (APP-027))

Year	Un-impacted population mean	Impacted population mean	Mean impacted as % of un-impacted	Un-impacted population median	Impacted population median	Median impacted as % of un-impacted
Start	62,516	62,516	100.00%	62,516	62,516	100.00%
End 2028	62,451	62,451	100.00%	62,590	62,590	100.00%
End 2029	62,424	62,268	99.75%	62,431	62,304	99.89%
End 2032	62,524	62,403	99.81%	62,317	62,191	99.89%
End 2037	62,307	62,180	99.80%	61,858	61,698	99.89%
End 2047	62,036	61,908	99.80%	61,274	61,197	99.89%
End 2052	61,876	61,750	99.80%	60,910	60,745	99.89%

2.1.1.2 Bottlenose dolphin

16. For bottlenose dolphin, the Irish Sea (IS) MU and two SACs were assessed which support the same population:

    - Pen Llŷn a`r Sarnau SAC
    - Cardigan Bay SAC.

17. For bottlenose dolphin, iPCoD results were presented for Project-alone effects in the RIAA (APP-027). The results have been presented again here, with both median and mean population sizes, and the mean and median ratios of impacted: unimpacted population sizes.

18. For bottlenose dolphin, the modelling indicated there would be no potential for a significant impact of disturbance due to less than a 1% average[1] annual decline of the IS MU population over both the first six years and 25 year modelled periods for both mean and median (**Table 2.2**).

19. The Cardigan Bay SAC population results show that over the first six and entire 25 year period, there is less than 1% average[1] annual decline over the periods assessed, thus no significant impact of disturbance on bottlenose dolphin populations due to piling (**Table 2.3**).

20. Therefore, as stated in paragraph 3530 of the RIAA (APP-027), **there would be no LSE on the bottlenose dolphin from the Cardigan Bay SAC population (and no AEoI on any SAC)** from underwater noise during piling.

Table 2.2 Results of the iPCoD modelling for the Project, giving the mean population size of the bottlenose dolphin population (IS MU) for years up to 2052 for both impacted and un-impacted populations in addition to the mean and median ratio between their population sizes (clarifications to Table 9.21 of the RIAA (APP-027))

Year	Un-impacted population mean	Impacted population mean	Mean impacted as % of un-impacted	Un-impacted population median	Impacted population median	Median impacted as % of un-impacted
Start	296	296	100.00%	296	296	100.00%
End 2028	295	295	100.00%	296	296	100.00%
End 2029	293	288	98.30%	294	290	100.00%
End 2032	287	283	98.69%	288	284	100.00%
End 2037	278	275	98.85%	278	274	100.00%
End 2047	262	259	98.75%	258	256	100.00%
End 2052	255	252	98.73%	252	250	100.00%

Table 2.3 Results of the iPCoD modelling for the Project, giving the mean population size of the Cardigan Bay SAC bottlenose dolphin population for years up to 2052 for both impacted and un-impacted populations in addition to the median and mean ratio between their population sizes (clarifications to Table 9.22 of the RIAA (APP-027))

Year	Un-impacted population mean	Impacted population mean	Mean impacted as % of un-impacted	Un-impacted population median	Impacted population median	Median impacted as % of un-impacted
Start	148	148	100.00%	148	148	100.00%
End 2028	148	148	100.00%	148	148	100.00%
End 2029	147	143	97.57%	148	144	100.00%
End 2032	145	142	98.18%	144	142	100.00%
End 2037	141	139	98.46%	140	138	100.00%
End 2047	132	130	98.35%	128	126	100.00%
End 2052	128	126	98.34%	124	122	100.00%

2.1.1.3 Harbour seal

21. For harbour seal, only one SAC was screened in:

    - The Strangford Lough.

22. As outlined in the RIAA (APP-027), the population modelling has been conducted using two sets of demographic parameters provided by Sinclair *et al*. (2020). The Northern Ireland (NI) parameters have been used to model a stable population representative of the wider MU where the SAC is located, whilst the Orkney & North Coast parameters have been used to model a declining population to represent the current condition of the SAC population (Table 9.51 in the RIAA (APP-027)).

23. For harbour seal, the modelling indicated no potential for a significant impact from disturbance. Less than 1% population level impact is estimated over both the first six years and entire 25 year modelled periods assuming a stable population (**Table 2.4**) and a declining population (**Table 2.5**).

24. Therefore, as stated in paragraph 3873 of the RIAA (APP-027), **there would be no LSE on the harbour seal reference populations (and no AEoI on any SAC) from underwater noise during piling**.

Table 2.4 Results of the iPCoD modelling for the Project, assuming a stable population (Northern Irish MU/SMA demographic parameters from Sinclair et al., (2020)), giving the mean population size of the harbour seal population (Strangford Lough SAC) for years up to 2052 for both impacted and un-impacted populations in addition to the median and mean ratio between their population sizes (clarifications to Table 9.52 of the RIAA (APP-027))

Year	Un-impacted population mean	Impacted population mean	Mean impacted as % of un-impacted	Un-impacted population median	Impacted population median	Median impacted as % of un-impacted
Start	106	106	100.00%	106	106	100.00%
End 2028	107	107	100.00%	106	106	100.00%
End 2029	107	107	100.00%	106	106	100.00%
End 2032	107	107	100.00%	106	106	100.00%
End 2037	107	107	100.00%	104	104	100.00%
End 2047	108	108	100.00%	106	106	100.00%
End 2052	108	108	100.00%	106	106	100.00%

Table 2.5 Results of the iPCoD modelling for the Project, assuming a declining population (Orkney and North Coast MU/SMA demographic parameters from Sinclair et al., (2020)), giving the mean population size of the harbour seal population (Strangford Lough SAC) for years up to 2052 for both impacted and un-impacted populations in addition to the median and mean ratio between their population sizes (clarifications to Table 9.53 of the RIAA (APP-027))

Year	Un-impacted population mean	Impacted population mean	Mean impacted as % of un-impacted	Un-impacted population median	Impacted population median	Median impacted as % of un-impacted
Start	106	106	100.00%	106	106	100.00%
End 2028	96	96	100.00%	96	96	100.00%
End 2029	86	86	100.00%	86	86	100.00%
End 2032	61	61	100.00%	60	60	100.00%
End 2037	35	35	100.00%	34	34	100.00%
End 2047	11	11	100.00%	10	10	100.00%
End 2052	6	6	100.00%	4	4	100.00%

2.1.2 Clarifications on the potential for in-combination effects

25. Sections 9.4.4, 9.5.4, 9.6.4 and 9.7.4 in the RIAA (APP-027) present the assessment of the potential effects of the Project in-combination with other plans and projects. Population modelling was deemed the best tool to use to assess the potential impacts of in-combination disturbance as it considers the consequences of disturbance and hearing damage (worst-case numbers) that might result from the construction of the Project and other projects.

26. The results have been presented again here, with both median and mean population sizes, and the mean and median ratios of impacted: unimpacted population sizes.

2.1.2.1 Harbour porpoise

27. The results of the population modelling for harbour porpoise (**Table 2.6**) show, that over the 25 year period, there is less than 2% of population decline considering the mean results, and less than 1% decline for the median results. Therefore, as there is less than a 1% decline per year for the first six years (for either the mean or median), there would be no significant effect on the harbour porpoise population due to piling.

28. Therefore, as stated in paragraph 3429 of the RIAA (APP-027), **there would be no LSE on the harbour porpoise CIS MU population (and no AEoI on any SAC)** from in-combination effects of underwater noise from piling at the Project and at other projects.

Table 2.6 Results of the iPCoD modelling for the in-combination assessment, giving the mean population size of the harbour porpoise population (CIS MU) for years up to 2051 for both impacted and un-impacted populations in addition to the mean and median ratio between their population sizes (clarifications to Table 9.14 of the RIAA (APP-027))

Year[2]	Un-impacted population mean	Impacted population mean	Mean impacted as % of un-impacted	Un-impacted population median	Impacted population median	Median impacted as % of un-impacted
Start	62,516	62,516	100.00%	62,516	62,516	100.00%
End 2027	62,574	62,569	99.99%	62,730	62,721	100.00%
End 2028	62,509	62,278	99.63%	62,837	62,508	99.78%
End 2031	62,389	61,703	98.91%	62,426	61,650	99.22%
End 2036	62,482	61,818	98.95%	62,299	61,505	99.26%
End 2046	62,436	61,770	98.95%	61,605	60,900	99.27%
End 2051	62,564	61,897	98.95%	61,739	61,130	99.26%

[2] The years for the in-combination iPCoD modelling are brought into line with the cumulative effects assessment in the ES Chapter 11 Marine Mammals (APP-048). The modelling was conducted using the correct project parameters (years), so this change has not affected the overall outcome.

2.1.2.2 Bottlenose dolphin

29. For bottlenose dolphin from the IS MU, iPCoD modelling resulted in no significant impact on the population (**Table 2.7**). Whether the mean or median value is used to inform the results, the results show a less than 1% annual decline for the first six years and over the 25 year period in both the mean and median.

30. For bottlenose dolphin from the Cardigan Bay SAC, the results show a less than 1% annual decline over a 25-year period for both the mean and median (**Table 2.8**). Over the first six years however, there is a population level change of greater than 1% when looking at the mean results (a marginal 1.23% average[1] annual change), whilst the median results show less than a 1% average[1] annual decline (**Table 2.7**). Whilst the mean value is marginally above the 1% threshold, and for the reasons outlined in **Section 2.1**, the median values are the preferred and accepted method to evaluate a population level change. Based on the median results, the in-combination assessment shows that there is no significant impact on the population of bottlenose dolphin (**Table 2.7**).

31. Whilst not dismissing the result presented by the mean values that indicate a significant population level change, this in-combination assessment is considered very precautionary as it does not take into account any potential mitigation and/or management measures that may be undertaken at other projects. It is unlikely that all projects would pile on the same day, for various reasons such as project timings, technical and mechanical issues, port calls, and varying weather restraints affecting vessels and equipment.

32. Taking this into account (and as stated in paragraph 3613 of the RIAA (APP-027)), **there would be no LSE on the bottlenose dolphin from the Cardigan Bay SAC population (and no AEoI on any SAC)** from in-combination effects of underwater noise from piling at the Project and at other projects.

Table 2.7 Results of the iPCoD modelling for the in-combination assessment, giving the mean population size of the bottlenose dolphin population (IS MU) for years up to 2051 for both impacted and un-impacted populations in addition to the median and mean ratio between their population sizes (clarifications to Table 9.26 of the of the RIAA (APP-027))

Year[2]	Un-impacted population mean	Impacted population mean	Mean impacted as % of un-impacted	Un-impacted population median	Impacted population median	Median impacted as % of un-impacted
Start	296	296	100.00%	296	296	100.00%
End 2027	295	289	98.13%	296	292	100.00%
End 2028	292	281	96.14%	294	284	98.61%
End 2031	286	271	94.85%	288	272	97.71%
End 2036	277	264	95.64%	276	262	97.87%
End 2046	261	249	95.32%	260	245	97.80%
End 2051	254	242	95.27%	250	236	97.97%

Table 2.8 Results of the iPCoD modelling for the in-combination assessment, giving the mean population size of the Cardigan Bay SAC for years up to 2051 for both impacted and un-impacted populations in addition to the mean and median ratio between their population sizes (clarifications to Table 9.27 of the RIAA (APP-027))

Year[2]	Un-impacted population mean	Impacted population mean	Mean impacted as % of un-impacted	Un-impacted population median	Impacted population median	Median impacted as % of un-impacted
Start	148	148	100.00%	148	148	100.00%
End 2027	147	145	98.41%	148	146	100.00%
End 2028	146	140	95.70%	146	140	97.26%
End 2031	144	133	92.63%	144	132	94.44%
End 2036	140	131	93.63%	140	130	95.04%
End 2046	132	123	93.26%	132	122	94.85%
End 2051	128	119	93.16%	126	116	95.10%

2.1.2.3 Harbour seal

33. For harbour seal, iPCoD modelling was used to assess population consequences of disturbance to the Strangford Lough SAC assuming a stable population (**Table 2.9**) and a declining population (**Table 2.10**) (as outlined in **Section 2.1.1.3**)

34. Whether the mean or median value is used to inform the results, the results show a less than 1% annual decline over the first six years and over the 25 year period for both the mean and median. This applies to both, using the stable and unstable SAC population.

35. Therefore, as stated in paragraph 3965 of the RIAA (APP-027), **there would be no LSE on the harbour seal reference population (and no AEoI on any SAC)** from in-combination effects of underwater noise from piling at the Project and at other projects.

Table 2.9 Results of the iPCoD modelling for the Project, in-combination with other plans and projects, assuming a stable population (Northern Irish MU/SMA demographic parameters from Sinclair et al., (2020)), giving the mean population size of the harbour seal populations in addition to the mean and median ratio between their population sizes (clarifications to Table 9.57 of the RIAA (APP-027))

Year[2]	Un-impacted population mean	Impacted population mean	Mean impacted as % of un-impacted	Un-impacted population median	Impacted population median	Median impacted as % of un-impacted
Start	106	106	100.00%	106	106	100.00%
End 2027	106	106	100.00%	106	106	100.00%
End 2028	107	107	100.00%	106	106	100.00%
End 2031	107	107	100.00%	106	106	100.00%
End 2036	108	108	100.00%	106	106	100.00%
End 2046	108	108	100.01%	106	106	100.00%
End 2051	109	109	100.02%	106	106	100.00%

Table 2.10 Results of the iPCoD modelling for the Project, in-combination with other plans and projects, assuming a declining population (Orkney and North Coast MU/SMA demographic parameters from Sinclair et al., (2020)), giving the mean population size of the harbour seal population (Strangford Lough SAC) for years up to 2052 for both impacted and un-impacted populations in addition to the median ratio between their population sizes (clarifications to Table 9.58 of the RIAA (APP-027))

Year[2]	Un-impacted population mean	Impacted population mean	Mean impacted as % of un-impacted	Un-impacted population median	Impacted population median	Median impacted as % of un-impacted
Start	106	106	100.00%	106	106	100.00%
End 2027	95	95	99.99%	96	96	100.00%
End 2028	85	85	99.98%	86	86	100.00%
End 2031	62	62	99.99%	62	62	100.00%
End 2036	36	36	100.00%	34	34	100.00%
End 2046	12	12	100.00%	10	10	100.00%
End 2051	7	7	100.00%	6	6	100.00%

36. In response to NE's comment (D32; RR-061-196) on the presentation of iPCoD modelling results, particularly with regard to the mean and median of the ratio of impacted: unimpacted population sizes, the Applicant considers that the additional information provided in this section is sufficient to determine that the median is the most appropriate key metric to evaluate whether there is a significant population level effect. Having demonstrated both the mean and the median values to compare population sizes, the assessment conclusions presented for Project-alone and in-combination in the RIAA (APP-027) remain unchanged.

2.2 Clarification on disturbance assessments (NE Ref D28)

37. The following section is in response to NE's comment (D28) in relation to the in-combination assessments (in line with D60, this comment has been applied to the RIAA (APP-027) as well as the ES Chapter 11 Marine Mammals (APP-048)):

"*The significance of the disturbance impact must be presented for each of the approaches used to determine disturbance distance. Each approach and subsequent assessment of impact significance provides necessary information for Natural England to inform its advice. For example, the magnitude of impact to harbour porpoise using the EDR approach is Medium, which when combined with a Medium sensitivity, leads to a Moderate impact significance which is Significant in EIA terms. Information such as this is currently missing. It is not appropriate to only present the significance of the disturbance impact after population modelling has been undertaken. This also applies to the CEA. We advise that an assessment of cumulative impacts to cetacean species is presented using the approach that generates the worst-case numbers disturbed. The Applicant should not only present the iPCoD modelling results.*

Present the impact significance for each approach used to determine the disturbance range, using the combination of sensitivity and magnitude (percentage of reference population within the disturbance range). Present the cumulative impact significant for each species using the worst-case numbers disturbed i.e. not only the iPCoD modelling results."

38. This comment only applies to harbour porpoise, bottlenose dolphin, and harbour seal. For grey seal, the worst-case assessment method was already used within the RIAA (APP-027), whereby a precautionary 25km disturbance range (Russell, 2016) was applied. Therefore, a conclusion based on each method is already provided.

2.2.1 Clarifications to the Project-alone assessment

2.2.1.1 Harbour porpoise

39. For harbour porpoise, the assessments in the RIAA (APP-027) refer to those carried out in the ES Chapter 11 Marine Mammals (APP-048). This is because the population and density estimates used in the ES Chapter 11 Marine Mammals (APP-048) are the same as those used in the RIAA (APP-027), as both assessments are based on the CIS MU. Given the distance of the Project windfarm site from the closest SAC (49km), there is no direct pathway for effect upon harbour porpoise within any SAC considered in this assessment.

40. A full underwater noise assessment has been undertaken in Section 11.6.3 of ES Chapter 11 Marine Mammals (APP-048). To assess for the potential disturbance of harbour porpoise, the CIS MU was used with three assessment approaches:

- Effective Deterrence Range (EDR) approach
- Dose Response Curve (DRC) approach
- iPCoD (population modelling).

41. **Table 2.11** shows that under the EDR approach for harbour porpoise, there is the potential for a LSE on all harbour porpoise sites, however, this is investigated further under the population modelling approach. The results from the DRC and population modelling show that there would be no LSE on any of the harbour porpoise designated sites assessed.

42. It is therefore concluded, as stated in paragraph 3342 of the RIAA (APP-027), that there would be **no LSE on the harbour porpoise CIS MU population (and no AEoI on any SAC)** from the effects of disturbance impacts from underwater noise during piling at the Project.

Table 2.11 Assessment of potential disturbance for harbour porpoise at the designated sites

Assessment method	Assessment of Effect	Potential adverse effect on site integrity
EDR Approach 26km (2,124km^2)	3,443 (5.5% of CIS MU)	**Yes** *Further investigation through iPCoD modelling*
DRC	1,857.9 (2.97% of the CIS MU)	**No** Less than 5% of the population affected
iPCoD modelling (see **Section 2.1.1.1**)	<1% population level effect	**No**

Assessment method	Assessment of Effect	Potential adverse effect on site integrity
		Less than a 1% population level impact over both the first six years and 25-year periods

2.2.1.2 Bottlenose dolphin

43. **Table 2.12** presents the assessment of underwater noise impacts on bottlenose dolphin SACs, using the population estimate from the Cardigan Bay SAC and the IS MU (for the Pen Llŷn a`r Sarnau SAC), based on the harbour porpoise EDR approach and the harbour porpoise DRC method (used as a proxy due to lack of information on dolphin species). However, taking into account the difference in hearing sensitivity between harbour porpoise (Very-High Frequency (VHF) cetaceans) and bottlenose dolphin (High-Frequency (HF) cetaceans (see Table 11.20 in ES Chapter 11 Marine Mammals (APP-048); Southall *et al.,* 2019)), then even the 15km EDR (for pin-piles) would present a very precautionary worst-case.

44. It is also important to note that bottlenose dolphin have a predominantly coastal distribution (see Appendix 11.2 Marine Mammal Information and Survey Data (APP-066)). They are primarily an inshore species, with most sightings within 10km of land. The Project windfarm site would be located approximately 30km from the nearest point on the coast, therefore bottlenose dolphin are unlikely to be significantly disturbed.

45. **Table 2.12** shows that under the EDR and DRC approach for bottlenose dolphin, there is the potential for LSE on both sites. Using the EDR or the DRC assessment is considered over precautionary, as this assessment is not specifically designed for dolphin species and both methods as based on harbour porpoise disturbance responses as a proxy. Harbour porpoise are known to be the most sensitive species in terms of underwater noise disturbance, and therefore these methods are likely to overestimate the potential for effect on any dolphin species. This disturbance assessment has therefore been investigated further using the population modelling approach which incorporated the worst-case numbers of disturbance and auditory injury and provided data on how that could impact the bottlenose dolphin populations (IS MU or Cardigan Bay). The results from the population modelling subsequently show that there would be no LSE on either bottlenose dolphin SAC.

46. Taking into account all factors, and that the effect would occur outside of any SAC and based on population modelling, as stated in paragraph 3530 of the RIAA (APP-027), **there would be no LSE on the bottlenose dolphin IS MU population or the Cardigan Bay SAC population (and no AEoI on any SAC)** from underwater noise during piling at the Project.

Table 2.12 Assessment of potential disturbance for bottlenose dolphin at the designated sites

SAC	Assessment method	Assessment of effect	Potential adverse effect on site integrity
Cardigan Bay SAC	EDR Approach (26km ($2,124km^2$))	22.1 (15% of Cardigan Bay SAC)	**Yes** *Further investigation through iPCoD modelling*
	DRC	56.3 (38.3% of Cardigan Bay SAC)	**Yes** *Further investigation through iPCoD modelling*
	iPCoD modelling (see **Section 2.1.1.2**)	<1% population level effect	**No** Less than 1% of the population affected
IS MU	EDR Approach (26km ($2,124km^2$))	22.1 (7.5% of IS MU)	**Yes** *Further investigation through iPCoD modelling*
	DRC	56.3 (19.2% of IS MU)	**Yes** *Further investigation through iPCoD modelling*
	iPCoD modelling (see **Section 2.1.1.2**)	<1% population level effect	**No** Less than 1% of the population affected

2.2.1.3 Harbour seal

47. The 25km EDR (Russel *et al*., 2016) was also applied to assess from potential disturbance (**Table 2.13**) and therefore, as stated in paragraph 3868 of the RIAA (APP-027), **there would be no LSE on the reference population (and no AEoI on the SAC)** from underwater noise during piling at the Project.

Table 2.13 Assessment of potential disturbance for harbour seal at the designated sites

Assessment method	Assessment of effect	Potential adverse effect on site integrity
EDR Approach 25km ($1,963.5km^2$)	0.00002 (0.000019% of the SAC reference population)	**No** Less than 5% of the population affected
iPCoD modelling (see **Section 2.1.1.3**)	<1% population level effect	**No** Less than 1% of the population affected

48. In response to NE's comment on the insufficient presentation of disturbance assessments (D4; RR-061-168) for Project-alone and in-combination with other plans and projects, the Applicant has undertaken a review and a comparison of all methods used to assess for potential disturbance from underwater noise due to piling. The Applicant considers that the results presented in the ES Chapter 11 Marine Mammals (APP-048) were the most appropriate and the Applicant's position remains unchanged.

2.3 Clarification on in-combination disturbance assessments (NE Ref D60 & D7)

49. The following section is in response to NE's comment (D60) in relation to the in-combination assessments:

"*The in-combination assessment in the HRA mirrors that in the CEA. Therefore our comments on the CEA are also relevant to the in-combination assessment. Any changes made to the CEA as a result of our comments should be applied to the in-combination assessment also. We advise that our recommendations for further mitigation to reduce impacts to the marine mammal populations, would also reduce the risk of an impact occurring to English marine mammal SACs in the region.*"

50. The section also provides a further response to NE's comment D7:

"As we have significant outstanding concerns on the ES assessment, and the HRA method is based on the ES (e.g. the in-combination assessment is based on the CEA), we cannot agree with the HRA conclusions at this stage. Address concerns on ES and cascade the changes / commitments to the HRA".

51. The following section applies to harbour porpoise and bottlenose dolphin where a quantitative assessment (beyond population modelling) has not been presented previously in Section 9.4.4. and 9.5.4, respectively, in the RIAA (APP-027).

52. Following the initial screening of United Kingdom (UK) and European OWFs, further screening was undertaken to identify those OWF projects that have the potential for overlapping construction phases with the Project. This screening considered known piling activities and/or construction timings, in order to determine a more realistic, but still worst-case, list of UK and European OWF projects that may have the potential for overlapping piling activities with the Project (see Appendix 11.4 Marine Mammal CEA Project Screening (APP-068) for further details).

53. The potential disturbance from underwater noise during piling activities has been assessed based on the worst-case numbers of animals disturbed taken from assessments either using disturbance ranges or EDRs or the dose-response curves (Project-alone). The worst-case numbers of animals

disturbed by the Project and other plans and projects used for the assessment is presented in Table 7.6 in Appendix 11.2 Marine Mammal Information and Survey Data (APP-066) from other OWF projects' ESs and Preliminary Environmental Information Report (PEIR)s. These numbers were only presented in the iPCoD modelling, however to address NE's comment (NE Ref. D28 and D60), these numbers are presented **Table 2.14** and **Table 2.16** and quantitatively assessed by adding the numbers of potentially disturbed animals together to get the total estimated number, estimated effect on the population. The total estimates of the number of animals that could be potentially disturbed from underwater noise from other piling projects is presented with and without the Project, with the significance of effect.

54. There were six OWFs screened in as having a construction period that could potentially overlap with the construction of the Project, that could be undertaking piling activities at the same time as the Project (Table 11.84, in the ES Chapter 11 Marine Mammals (APP-048)). These other projects were included in individual marine mammal assessments if the projects were within the marine mammals MU. The numbers of animals potentially disturbed were added together to get an overall estimated impact on the population.

55. For grey seal and harbour seal, the quantified assessments using disturbance ranges or DRC have already been provided within the RIAA (APP-027) in Sections 9.6.4.1 and 9.7.4.1, respectively.

2.3.1 Harbour porpoise

56. **Table 2.14** provides a quantified assessment of disturbance due to piling overlap with other OWFs, utilising project-specific data from published PEIRs and ESs for other OWFs.

Table 2.14 Quantified in-combination assessment for the potential disturbance for the harbour porpoise population during single piling event at the OWF projects which could be piling at the same time as the Project

Harbour porpoise			
Project	**Harbour porpoise density (/km^2)**	**Impact area (km^2)**	**Maximum number of individuals potentially disturbed during single piling**
The Project	1.621	2123.7	3,442.5
Awel y Mor	1.00	DRC	2,112
Mona	0.097	DRC	429.0
Morgan Generation Assets	0.274	DRC	979.0

Harbour porpoise			
Project	**Harbour porpoise density (/km^2)**	**Impact area (km^2)**	**Maximum number of individuals potentially disturbed during single piling**
Morgan and Morecambe Transmission Assets[3]	0.560	DRC	1,793.0
Erebus	0.400	DRC	1,967.0
White Cross	0.92	2123.7	1,949.6
Total number of harbour porpoise (*without the Project*)			**12,672.1**
			9,229.6
Percentage of CIS MU (*without the Project*)			**20.3%**
			14.8%

57. **Table 2.14** presents the assessment of significance of effect for harbour porpoise due to effects from piling and using data such as EDRs and DRC assessments from other projects. This is considered very precautionary as it does not take into account any potential mitigation and/or management measures that may be undertaken by any of these projects, and it is unlikely that all projects would pile on the same day for various reasons such as project timings, technical and mechanical issues, port calls, and varying weather restraints affecting vessels and equipment. In addition, the potential for a significant effect was further investigated through iPCoD modelling, to determine the validity of the indicated significant effect on the harbour porpoise population. The results of the population modelling, using the same data as shown **Table 2.15**, found that there is less than a 1% population level effect to be expected and thus no LSE on any of the harbour porpoise designated sites assessed.

58. The Applicant considers iPCoD to be the most appropriate approach. The model requires detailed demographic information and an understanding of the relationship between days of disturbance and individual survival and reproduction rates (Sinclair *et al*., 2023) by taking the worst-case numbers of disturbance, models a thousand scenarios, and looks at population effects on an annual and longer term basis. Therefore, it is considered to be the most appropriate tool to assess in-combination disturbance.

[3] At the time of writing the RIAA/ES, a decision had been taken that the offshore substation platforms (OSPs) would not be included within the DCO Application for the Transmission Assets. This decision post-dated the Transmission Asset PEIR (within which the OSPs are also assessed). The final ES for the Transmission Assets will therefore not include the OSPs or associated interconnector cables. Additionally, a decision had been taken since the PEIR that the Morgan Offshore Booster Station (OBS) would no longer be required. Whilst the OSPs, OBS and interconnector cables will not form part of the DCO Application for the Transmission Assets, they are included here as they were contained within the Transmission Asset PEIR which has been used to inform the ES.

59. Therefore, as stated in paragraph 3342 of the RIAA (APP-027), **there would be no LSE on the harbour porpoise CIS MU population (and no AEoI on any SAC)** from the effects of in-combination disturbance impacts from underwater noise during piling.

Table 2.15 Assessment of potential in-combination disturbance of harbour porpoise from underwater noise (piling at all OWFs)

Assessment method	Assessment of effect	Potential adverse effect on site integrity
Quantified assessment (see **Table 2.14**)	12,672.1 (20.3% of the CIS MU)	**Yes** *Further investigation through iPCoD modelling*
iPCoD modelling (see **Section 2.1.2.1**)	<1% population level effect	**No** Less than 1% of the population affected

2.3.2 Bottlenose dolphin

60. **Table 2.16** provides a quantified assessment of disturbance due to piling overlap with other OWFs, utilising project-specific data from published PEIRs and ESs for other OWFs.

Table 2.16 Quantified in-combination assessment for the potential disturbance for bottlenose dolphin during single piling at the OWF projects which could be piling at the same time as the Project

Bottlenose dolphin			
Project	**Bottlenose Dolphin density (/km²)**	**Impact area (km²)**	**Maximum number of individuals potentially disturbed during single piling**
The Project	0.0104	DRC	56.3
Awel y Mor	0.0350	DRC	23
Mona	0.0350	DRC	13
Morgan Generation Assets	0.0350	DRC	11
Morgan and Morecambe Transmission Assets[3]	0.0010	DRC	4
Total number of bottlenose dolphin *(without the Project)*			**107.3** ***51.0***
Percentage of IS MU **Percentage of Cardigan Bay SAC** **(*With Project*)**			**36.6%** **73.0 %**
Percentage of IS MU			**17.4%** ***34.6%***

Bottlenose dolphin			
Project	**Bottlenose Dolphin density (/km^2)**	**Impact area (km^2)**	**Maximum number of individuals potentially disturbed during single piling**
Percentage of Cardigan Bay SAC *(without the Project)*			

61. **Table 2.16** presents the assessment of significance of effect for bottlenose dolphin due to in-combination effects from piling and using data such as EDRs and DRC assessments from other projects. **Table 2.16** shows that a high percentage of bottlenose dolphins would be at risk of potential disturbance. However, this assessment does not consider the distance to the piling activity nor the unlikelihood of all activities taking place on the same day. This is due to factors such as project timings, technical and mechanical issues, port calls, and varying weather constraints affecting vessels and equipment.

62. The Applicant considers iPCoD to be the best approach. The model takes into account detailed demographic information and an understanding of the relationship between days of disturbance and individual survival and reproductive rates (Sinclair *et al*., 2023) by taking the worst-case numbers of disturbance, models a thousand scenarios, and looks at population effects on an annual and longer term basis. This method is, therefore, regarded as the most appropriate tool for evaluating potential disturbances of the Project and other plans and projects and the population consequences for bottlenose dolphin from the Cardigan Bay SAC.

63. **Table 2.17** shows that under the quantified in-combination approach for bottlenose dolphin, there is the potential for a LSE on both SACs, however, this is investigated further under the population modelling approach. The results from this subsequent population modelling show that there would be no LSE on either of the bottlenose dolphin SACs assessed.

64. Therefore, as stated in paragraphs 3613 and 3614 of the RIAA (APP-027), **there would be no LSE on either of the bottlenose dolphin populations assessed (and no AEoI on any SAC)** from the effects of in-combination disturbance impacts from underwater noise during piling.

Table 2.17 Assessment of potential in-combination disturbance of bottlenose dolphin from underwater noise (piling at all OWFs)

Assessment method	Assessment of effect	Potential adverse effect on site integrity
Quantified assessment (see **Table 2.16**)	107.3	**Yes**

Assessment method	Assessment of effect	Potential adverse effect on site integrity
	(36.6% of the IS MU population; 73.0% of the Cardigan Bay SAC population)	*Further investigation through iPCoD modelling*
iPCoD modelling (see **Section 2.1.2.2**)	<1% population level effect for the IS MU <1% population level effect for the Cardigan Bay SAC	**No** Less than 1% of the population affected

2.3.3 Clarifications to the potential disturbance from underwater noise impacts from all noisy activities (including vessels)

65. This section only applies to harbour porpoise, bottlenose dolphin and harbour seal, where a quantified in-combination assessment approach for the potential disturbance from all underwater noise sources was not provided. For grey seal, however, such a quantified in-combination assessment was already provided in Table 9.46 in the RIAA (APP-027).

66. **Table 2.18** lists all noisy activities that could coincide with piling at the Project, including piling and construction activities at other OWFs which are likely to coincide with construction of the Project, as well as any other potential noisy activities (for details see Appendix 11.4 Marine Mammal CEA Project Screening (APP-068). The Applicant would also like to highlight that the other noisy activities such as geophysical surveys, seismic surveys, aggregate extraction, dredging and UXO clearance are indicative as there is no certainty when these projects may occur. Such activities would need to be licensed separately and Applicants would need to assess impacts from other plans and projects in their own marine licence applications.

67. Therefore, taking this indicative approach determines the associated potential magnitude of an in-combination effect from the listed noisy activities should they all occur at the same time. This table is an expanded version of Table 9.14 (for harbour porpoise), Table 9.29 (for bottlenose dolphin) and Table 9.60 (for harbour seal) within the RIAA (APP-027).

68. **Table 2.18** presents the percentage of the relevant affected MU or SAC reference population that could potentially be at risk of an in-combination disturbance effect. This takes into account all piling and other OWF construction activities, as well as other indicative noisy activities (i.e. seismic, geophysical, UXO clearance and aggregates and dredging).

69. The assessment in **Table 2.18** indicates a potential of LSE of disturbance to harbour porpoise and bottlenose dolphin designated sites. However, for all three species, a large proportion of the number of individuals potentially

disturbed is from piling at both the Project and other OWFs without any mitigation applied. These activities have been further investigated through population modelling and the resultant assessment of effect indicates that there would be no potential for a population level effect (as stated in paragraphs 3428, 3613 and 3614 of the RIAA (APP-027)).

70. All activities are included as a worst-case and precautionary approach, however, none were currently consented or applied for at the agreed cut off time for updates to information (6 months prior to submission). Therefore, their inclusion represents a currently unrealistic future prediction of activities. Another factor to take into account is that not all activities are likely to occur at the same time and does not include any mitigation. Additionally, the distance between the Project and the SACs is relatively far (closest is the North Anglesey Marine SAC (49km) and furthest is the Bristol Channel Approaches SAC (234km) (see RIAA (APP-027)).

71. For harbour porpoise and bottlenose dolphin, a large proportion of the number of individuals potentially disturbed would be from the piling at both the Project and other OWFs without any mitigation in place. These activities have been further investigated through population modelling and showed that the potential for disturbance from underwater noise from piling has been assessed as insignificant based on an average annual population decrease of less than 1% population level effect over both the first six years and 25 year modelled periods. **Table 2.19** presents the same assessment as **Table 2.18** but uses the population modelling results to showcase the difference in the potential for AEoI, compared to those in **Table 2.18**.

72. Taking into account the distance between the OWF to the designated sites, it is unlikely for a potential LSE on the reference population, therefore no AEoI on any SAC from in-combination effects of underwater noise from other noisy activities.

Table 2.18 Quantitative assessment for all overlapping piling and construction at other OWFs, as well as other industry noisy activities with the potential for in-combination disturbance effects for marine mammals, based on data from other Projects' published PEIRs and ESs only (activities in grey are indicative only; no formal application has been made)

Impact	Number of individuals		
	Harbour porpoise	Bottlenose dolphin	Harbour seal*
Worst-case disturbance from the Project (piling)	3,442.5	56.3	0.000020
Piling at other offshore wind farms	9,233.8	51.0	0.0018
Construction activities at other OWFs	146.7	35.5	-
Geophysical surveys	*613.9*	*7.4*	*0.0000042*
Aggregates and dredging	0.035	-	-
Seismic surveys	*872.6*	*15.8*	*0.000053*
UXO clearance	*1,134.2*	*1.6*	*0.0000081*
Total number of individuals *(without indicative activities)*	**15,439.6** *12,818.8*	**167.6** *142.8*	**0.0019** *0.0018*
Percentage of MU/SAC *(without indicative activities)*	**24.7% of the CIS MU** *20.5% of the CIS MU*	**114.0% of the Cardigan Bay SAC; 57.2% of the IS MU** *97.1% of the Cardigan Bay SAC; 48.7% of the IS MU*	**0.0018% of the Strangford Lough SAC** *0.0018% of the Strangford Lough SAC*

**based on Table 9.59 in the RIAA (APP-027). Numbers are based on the Strangford Lough SAC relative densities (Carter et al., 2022).*

Table 2.19 Illustrative assessment for all overlapping piling and construction activities at other OWFs, as well as other industry noisy activities with the potential for in-combination disturbance effects for harbour porpoise, bottlenose dolphin and harbour seal based on population modelling results (activities in grey are indicative only; no formal application has been made)

Impact	Number of individuals		
	Harbour porpoise	**Bottlenose dolphin**	**Harbour seal[#]**
Worst-case disturbance from the Project (piling) and piling at other projects*	0.74% reduction in the CIS MU population**	2.03% reduction in the IS MU population** 4.9% reduction in the Cardigan Bay SAC population**	0% change in Strangford Lough SAC population**
Construction activities at other OWFs	146.7	35.5	-
Geophysical surveys	*613.9*	*7.4*	*0.0000042*
Aggregates and dredging	0.035	-	-
Seismic surveys	*872.6*	*15.8*	*0.000053*
UXO clearance	*1,134.2*	*1.6*	*0.0000081*
Total number of individuals *(without indicative activities)*	**2,767.4** *146.7*	**60.3** *35.5*	**0.00007** *0*
Percentage of MU/SAC *(without indicative activities)*	**4.4% of the CIS MU** *0.2% of the CIS MU*	**41.0% of the Cardigan Bay SAC; 20.6% of the IS MU** *24.1% of the Cardigan Bay SAC; 12.1% of the IS MU*	**0.00007% of the Strangford Lough SAC** *0% of the Strangford Lough SAC*

[#]based on Table 9.59 in the RIAA (APP-027). Numbers are based on the Strangford Lough SAC relative densities (Carter et al., 2022).

Worst-case disturbance has been presented as the median ratio of unimpacted: impacted population change over 25 years taken from the tables and figures in **Section 2.1.2 or in Section 9 in RIAA (APP-027).*

***The percentages were not added to the calculations and are for illustrative purposes only as no value was assigned to it.*

73. In response to NE's comment (D60) in relation to the in-combination assessments for disturbance from underwater noise from piling, the Applicant has provided a quantified assessment for each marine mammal receptor. The Applicant believes that this quantified assessment may not accurately represent disturbed animals due the indicative nature of most activities. The most representative method using iPCoD has not changed the assessment conclusion in the RIAA (APP-027).

3 References

Jitlal, M., Burthe, S., Freeman S. and Daunt, F. (2017) Testing and Validating Metrics of Change Produced by Population Viability Analysis (PVA) Final report to Marine Scotland Science September 2017 Scottish Marine and Freshwater Science Vol 8 No 23

JNCC (2010). Statutory nature conservation agency protocol for minimising the risk of injury to marine mammals from piling noise. August 2010.

JNCC (2023) JNCC guidance for the use of Passive Acoustic Monitoring in UK waters for minimising the risk of injury to marine mammals from offshore activities. Decmber 2023. https://data.jncc.gov.uk/data/fb7d345b-ec24-4c60-aba2-894e50375e33/jncc-pam-guidance-in-uk-waters.pdf (Accessed January 2024)

NRW. (2023). PS016 NRW's Position on Assessing the effects of Hearing Injury from Underwater Noise on Marine Mammals. Position statement. May 2023.

Russell, D.J.F. (2016), *Movements of Grey Seal That Haul out on the UK Coast of the Southern North Sea.*, No. OESEA-14-17, Department of Energy and Climate Change, p. 18.

Sinclair, R., Booth, C., Harwood, J. & Sparling, C. (2019). Helpfile for the interim PCoD v5 model. March 2019.

Southall B L, Bowles A E, Ellison W T, Finneran J J, Gentry R L, Green Jr. C R, Kastak D, Ketten D R, Miller J H, Nachtigall P E, Richardson W J, Thomas J A, Tyack P L (2007). Marine mammal noise exposure criteria: Initial scientific recommendations. *Aquatic Mammals*, 33 (4), pp 411-509.