Technical Appendix 11.5: Cumulative and In-Combination Mortality.

MachairWind Offshore Ornithology

ScottishPower Renewables (SPR)

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1.0 Introduction

1.1 Project Summary

1. Machairwind Limited ('the Applicant') is proposing the development of the MachairWind Windfarm ('the Project'), an offshore windfarm, located on the west coast of Scotland approximately 15 kilometres (km) to the northwest of Islay and approximately 12.4 km west of Colonsay at the closest points (**Figure 1**).

2. The Offshore Project will comprise up to 144 wind turbine generators (WTGs) with fixed-bottom foundations. The area within which the WTGs and associated infrastructure will be located is the Windfarm Development Area (WDA). The WDA covers an area of 448 km^2.

1.2 Purpose of this report

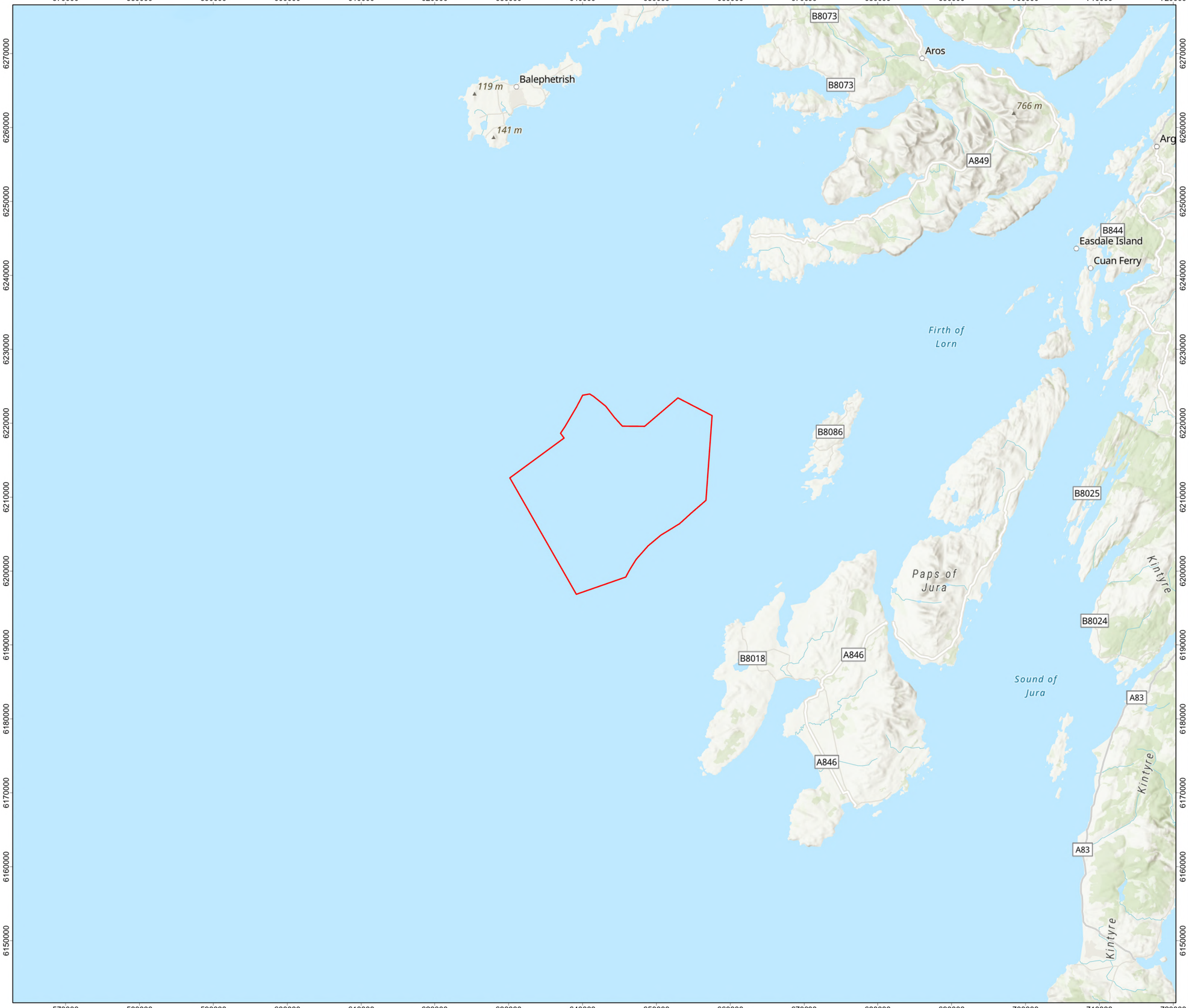
3. This **Technical Appendix 11.5: Cumulative and In-Combination Mortality** report provides collated collision and displacement mortalities, estimated for the WDA-alone and from other offshore windfarms. These collated mortalities are used to inform the cumulative effects assessment (CEA) and in-combination assessments for the Environmental Impact Assessment (EIA) process and the Habitats Regulations Appraisal (HRA) presented in **Chapter 11 Offshore Ornithology** of the Environmental Impact Assessment Report (EIAR) and the Report to Inform the Appropriate Assessment (RIAA), respectively.

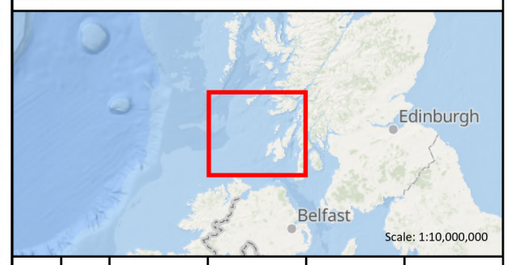
4. **Section 2.0** of this technical appendix describes the methods used to collate data for the cumulative and in-combination assessments; subsections provide information on the purpose of these assessments, spatial considerations and project lists for quantitative as well as qualitative assessments.

5. Full details of WDA-alone collision and displacement mortalities are presented in **Technical Appendix 11.3: Collision Risk Modelling** and **Technical Appendix 11.4: Displacement**, respectively. **Section 3.0** of this technical appendix provides collision and displacement mortalities estimated for the WDA-alone as well as mortalities collated from other offshore windfarms for the cumulative assessment.

6. **Section 4.0** of this technical appendix provides collision and displacement mortality for the WDA-alone and from other offshore windfarms, apportioned to Special Protection Area (SPA) populations for the in-combination assessment. WDA-alone collision and displacement estimates were apportioned to SPAs using apportioning weightings calculated for each SPA population for the breeding and non-breeding season (for full details refer to **Technical Appendix 11.6: Apportioning for HRA**). The focus on impacts to SPA populations is only relevant to the RIAA and not to the EIAR.

7. NatureScot and Marine Directorate – Licensing Operations Team (MD-LOT) advice and guidance were followed at all stages.





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NOT TO BE USED FOR NAVIGATION

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Name: MachairWind Windfarm Development Area

2.0 Methods

2.1 Purpose of cumulative and in-combination assessment

8. The purpose of the cumulative (EIA) and in-combination assessment (HRA) is to assess which other plans and projects impact the same species-specific regional populations (for the EIA) or SPA populations (for the HRA) that are also potentially impacted by the Project. To do this, it is necessary to add predicted mortalities (i.e. collision / displacement mortality) estimated for the WDA-alone to the predicted mortalities (collision / displacement) from other plans and projects.

9. There are three key methodological steps involved to identify and collate predicted mortalities for the cumulative and in-combination assessment:

   1) For the WDA-alone, list the populations (regional or SPA) impacted in the breeding and non-breeding seasons;

   2) List other projects and plans that are potentially impacting the same regional or SPA populations; and,

   3) Add the predicted mortalities from each cumulative / in-combination project to the predicted mortality estimates for the WDA-alone.

10. These steps are detailed separately for the EIA cumulative assessment (**Section 2.4**) and the HRA in-combination assessment (**Section 2.5**).

11. The list of collated mortalities are presented for the cumulative assessment (**Section 3.0**) and the in-combination assessment (**Section 4.0**).

2.2 Spatial considerations

2.2.1 Western BDMPS

12. With regards to project selection for the cumulative and in-combination assessments, NatureScot advised that projects within the Western Biologically Defined Minimum Population Scale (BDMPS, Furness, 2015) should be included:

   1) '*we are content with projects in the western BDMPS being taken forward for cumulative assessment but highlight that Welsh, English and Irish sites will still need to be considered'* (NatureScot email dated 18 December 2025).

   2) '*Cumulative and in-combination project list*'…'*we would expect projects (wholly or partially) within the Western BDMPS to be included within the in-combination assessment, this should include sites that are within Scottish, Welsh, English, Irish (Northern and Republic) and Manx waters*' (NatureScot email dated 22 January 2026).

13. The definition of the western BDMPS varies slightly between species (**Table 1**), but these broadly cover the same region.

Table 1: Summary of Biologically Defined Minimum Population Scale (BDMPS, Furness, 2015) regions that are applicable for each species.

BDMPS Region	Species included in BDMPS region
UK Western waters & Channel	Kittiwake; Fulmar
UK West of Scotland waters	Great black-backed gull; Great northern diver
UK Western waters	Herring gull; Gannet; Common tern; Arctic tern; Guillemot; Razorbill; Puffin

14. For the cumulative and in-combination assessments, the approach to identifying other projects that are in the species-specific Western BDMPS are outlined separately for the breeding season (**Section 2.2.2**) and the non-breeding season (**Section 2.2.3**). Projects in the Western BDMPS (note the Western BDMPS regions were extended to include Irish windfarms) included Scottish, English, Welsh, Isle of Man, Northern Ireland and the Republic of Ireland windfarms.

2.2.2 Breeding season

2.2.2.1 Cumulative assessment

15. Offshore windfarms in the species appropriate Western BDMPS (**Table 1**) for which quantitative information on collision and displacement impacts to seabirds were available, within foraging range of all breeding colonies (SPA and non-SPA colonies) that formed the regional population were included in the cumulative assessment.

16. The regional population comprised all colonies within the species-specific foraging range from the WDA; details of regional breeding adult populations within foraging range of the WDA are provided in **Annex 11.2M: Regional Breeding Adult Population Estimates.** For the EIA, regional breeding adult populations were adjusted to account for all age classes and non-breeders (e.g. birds on sabbatical), full details are provided in the EIAR.

2.2.2.2 In-combination assessment

17. Offshore windfarms in the species appropriate Western BDMPS (**Table 1**) for which quantitative information on collision and displacement impacts to seabirds were available, that were within foraging range of SPAs with breeding season impacts from the Project, were included in the in-combination assessment.

18. Only SPAs (including Republic of Ireland SPAs) designated for breeding seabirds within species-specific foraging range of the WDA were screened in; a list of SPAs within foraging range of the WDA for each species are provided in **Technical Appendix 11.6: Apportioning for HRA**. For the in-combination assessment of breeding season impacts, only offshore windfarms within foraging range of SPAs screened in for the Project were included.

19. Details of SPA adult populations within foraging range of the WDA are provided in **Annex 11.2M: Regional Breeding Adult Population Estimates.** Since SPA populations are defined in terms of breeding birds (i.e. non-sabbatical adults) only the estimated non-sabbatical adult mortalities from each offshore windfarm contributed to the in-combination totals for each SPA (i.e. mortalities were adjusted to correspond to breeding adults only).

2.2.3 Non-breeding season

2.2.3.1 Cumulative assessment

20. Non-breeding season collision and displacement mortality recorded at offshore windfarms in the species appropriate Western BDMPS (**Table 1**) were included in the cumulative assessment.

21. In the non-breeding season, the proportion that a species-specific breeding regional population (**Section 2.2.2.1**) contributed to the Western BDMPS population was calculated (by dividing the breeding regional population by the Western BDMPS population presented in Furness, 2015). Non-breeding season mortality recorded at offshore windfarms in the Western BDMPS was multiplied by the contributing proportion, full details of calculations are provided in the EIAR.

22. The exception to this was guillemot and herring gull, NatureScot advised in their response to the Scoping Report (22 November 2024) that these species largely remain in the vicinity of their breeding colonies in the non-breeding season. Therefore, it follows that only offshore windfarms within foraging range of guillemot and herring gull colonies forming the Project regional populations are included in the cumulative totals. Due to the relatively short foraging ranges of these species (mean maximum foraging range + 1SD for guillemot = 95.2 km, herring gull = 85.6 km; NatureScot Guidance Note 3[1]), there were no other offshore windfarms close enough to the Project regional populations to include in the cumulative total.

2.2.3.2 In-combination assessment

23. Non-breeding season collision and displacement mortality recorded at offshore windfarms in the species appropriate Western BDMPS (**Table 1**) were included in the in-combination assessment. Similarly, only SPAs (including Republic of Ireland SPAs) within the BDMPS were screened in.

24. The exception to this was guillemot, for which following NatureScot guidance, only SPAs within foraging range of the WDA were considered in the non-breeding assessment (i.e. the same approach used for the breeding season), and offshore windfarms included in the in-combination total were only those also within foraging range of these SPAs.

2.3 Data source of projects considered for cumulative and in-combination assessment

25. A list of offshore windfarms in the western BDMPS to be considered for the cumulative and in-combination assessments were derived from The Crown Estate[2], Crown Estate Scotland[3] and 4C Offshore[4] websites.

26. A dual approach to the cumulative and in-combination assessment was developed, where (a) consented projects and projects for which an application had been submitted prior to 15 January 2026 were assessed quantitatively and, (b) projects for which a Scoping Opinion had been adopted (as of 15 January 2026) were assessed qualitatively. Details of each approach are given below.

27. Although there is a theoretical potential for projects other than offshore windfarms to contribute to cumulative and in-combination effects, these are typically of much smaller scale, not found in offshore locations and are not assessed using the same quantitative methods (e.g. collision risk mortality). Therefore, only offshore windfarms have been assessed here.

28. The first step was to list all offshore windfarms which had been consented and those offshore windfarms for which a Scoping Opinion had been adopted. Additionally, other offshore windfarms that were earlier in the planning process, and had not yet had a Scoping Opinion adopted, were also listed. Therefore, the list comprised offshore windfarms that:

- Have a seabed option agreement;
- Have submitted a Scoping Report;

[1] NatureScot Guidance Note Number 3 (Version 1: January 2023): Guidance Note 3: Guidance to support Offshore Wind applications: Marine Birds - Identifying theoretical connectivity with breeding site Special Protection Areas using breeding season foraging ranges | NatureScot

[2] The Crown Estate: Wind Site Agreements (England, Wales & NI), The Crown Estate | The Crown Estate Open Data Portal

[3] Crown Estate Scotland: Offshore Wind (Crown Estate Scotland) | Crown Estate Scotland Spatial Hub

[4] 4C Offshore, Global Offshore Renewables Map: Global Offshore Renewables Map | 4C Offshore

- Have a Scoping Opinion;
- Have submitted an application;
- Have been consented;
- Are under construction; or
- Are operational.

29. In assessment of cumulative and in-combination impacts, a three-tiered system has been used, in relation to the certainty associated with project impacts and whether or not the Project will actually be consented and built. This three-tiered system has been adapted from advice on cumulative effects assessment for nationally significant infrastructure projects from the Planning Inspectorate[5].

30. The definition of each of the three tiers is explained below:

TIER 1 Tier 1 projects include those offshore windfarms**:** • which are operational; • which are under construction; • which are consented; • for which an application has been submitted**.**
Tier 2 Tier 2 projects include those offshore windfarms: • for which a Scoping Opinion has been adopted.
Tier 3 Tier 3 projects include those offshore windfarms: • for which a Scoping Report has been submitted; • for which a seabed option agreement is in place but are yet to submit a Scoping Report.

[5] Planning Inspectorate: Nationally Significant Infrastructure Projects: Advice on Cumulative Effects Assessment - GOV.UK

2.4 Methods for EIA cumulative assessment

2.4.1 Seasonal mortalities included in cumulative assessment

31. Collision and/or displacement mortalities from each offshore windfarm identified for inclusion in the cumulative effects assessment for the breeding and non-breeding seasons (for breeding and non-breeding spatial considerations, refer to **Section 2.2.2.1** and **Section 2.2.3.1** respectively) were added to WDA-alone mortalities to obtain total cumulative annual collision and displacement mortalities.

32. Tables presented in **Section 3.0** listing cumulative mortality for each species specify if each offshore windfarm is included in the cumulative assessment for connectivity in the breeding season and/or the non-breeding season.

2.4.2 Project list for cumulative assessment

33. **Table 2** lists all offshore windfarms included in the cumulative effects assessment, under each of the three tiers (refer to **Section 2.3**).

Table 2: Summary list of offshore windfarms within the Western BDMPS region that are included in the cumulative effects assessment with the Project

Offshore Windfarm	Jurisdiction	Current project status	Data sources for cumulative assessment	
			Displacement data source	Collision data source
Tier 1 – application submitted, consented, under construction, operational				
Arklow Bank 2	Republic of Ireland	Consent application submitted	Arklow Bank Wind Park 2 Technical Appendix 12.03 Offshore Ornithology Monthly Seabird Abundance	Arklow Bank Wind Park 2 Environmental Impact Assessment Report. Volume II, Chapter 12: Offshore Ornithology
Awel y Mor	Wales	Consented	Morecambe Offshore Windfarm: Volume 9: Offshore Ornithology Technical Note 1 (EIA)	
Burbo Bank	England	Operational	Morecambe Offshore Windfarm: Volume 9: Offshore Ornithology Technical Note 1 (EIA)	
Burbo Bank Extension	England	Operational	Morecambe Offshore Windfarm: Volume 9: Offshore Ornithology Technical Note 1 (EIA)	
Codling	Republic of Ireland	Consent application submitted	Codling Wind Park Environmental Impact Assessment Report Volume 4. Appendix 10.04 Offshore Ornithology Displacement	Codling Wind Park Environmental Impact Assessment Report Volume 3. Chapter 10 Ornithology
Dublin Array	Republic of Ireland	Consent application submitted	Dublin Array EIAR Volume 3: Offshore Infrastructure Assessment Chapters. Chapter 5: Offshore and Intertidal Ecology	
Erebus Floating Wind Demo	Wales	Consented	Morecambe Offshore Windfarm: Volume 9: Offshore Ornithology Technical Note 1 (EIA)	
Gwynt y Mor	Wales	Operational	Morecambe Offshore Windfarm: Volume 9: Offshore Ornithology Technical Note 1 (EIA)	

Offshore Windfarm	Jurisdiction	Current project status	Data sources for cumulative assessment	
			Displacement data source	Collision data source
Mona	Wales	Consented	Morecambe Offshore Windfarm: Volume 9: Offshore Ornithology Technical Note 1 (EIA)	
Mooir Vannin	Isle of Man	Consent application submitted	Mooir Vannin Generation Project: Environmental Impact Statement. Volume 2, Chapter 3: Offshore and Intertidal Ornithology	
Morecambe	England	Consented	Morecambe Offshore Windfarm: Volume 9: Offshore Ornithology Technical Note 1 (EIA)	
Morgan	England	Consented	Morecambe Offshore Windfarm: Volume 9: Offshore Ornithology Technical Note 1 (EIA)	
North Irish Sea Array (NISA)	Republic of Ireland	Consent application submitted	North Irish Sea Array Offshore Wind Farm Environmental Impact Assessment Report. Volume 3: Offshore Chapters. Chapter 15 Offshore Ornithology	
Oriel	Republic of Ireland	Consent application submitted	Oriel Wind Farm Project Environmental Impact Assessment Report. Chapter 11: Offshore Ornithology	
Ormonde	England	Operational	Morecambe Offshore Windfarm: Volume 9: Offshore Ornithology Technical Note 1 (EIA)	
Rampion	England	Operational	Rampion Offshore Wind Farm ES Section 11 – Marine Ornithology	
Rampion 2	England	Consented	Rampion 2 Wind Farm Category 6: Environmental Statement. Volume 2, Chapter 12: Offshore and intertidal ornithology	
Rhyl Flats	Wales	Operational	Morecambe Offshore Windfarm: Volume 9: Offshore Ornithology Technical Note 1 (EIA)	
Robin Rigg	England	Operational	Morecambe Offshore Windfarm: Volume 9: Offshore Ornithology Technical Note 1 (EIA)	
Twin Hub	England	Consented	Morecambe Offshore Windfarm: Volume 9: Offshore Ornithology Technical Note 1 (EIA)	
Walney (1,2)	England	Operational	Morecambe Offshore Windfarm: Volume 9: Offshore Ornithology Technical Note 1 (EIA)	
Walney Extension (3,4)	England	Operational	Morecambe Offshore Windfarm: Volume 9: Offshore Ornithology Technical Note 1 (EIA)	
West of Duddon Sands	England	Operational	Morecambe Offshore Windfarm: Volume 9: Offshore Ornithology Technical Note 1 (EIA)	
West of Orkney	Scotland	Consented	West of Orkney Windfarm Offshore Ornithology Additional Information Appendix 7 – EIA: Cumulative mortalities at regional population scales	West of Orkney Windfarm Offshore Ornithology Additional Information Appendix 3 – HRA and EIA: Collision Risk Modelling Technical Report

Offshore Windfarm	Jurisdiction	Current project status	Data sources for cumulative assessment	
			Displacement data source	Collision data source
White Cross	England	Consented	Morecambe Offshore Windfarm: Volume 9: Offshore Ornithology Technical Note 1 (EIA)	
Tier 2 – Scoping Opinion adopted				
Havbredey	Scotland	Scoping Opinion	Havbredey Offshore Wind Farm: Offshore Scoping Report	
North Channel Wind 1	Northern Ireland	Scoping Opinion	North Channel Wind 1 and 2 Projects: Offshore EIA Scoping Report	
North Channel Wind 2	Northern Ireland	Scoping Opinion	North Channel Wind 1 and 2 Projects: Offshore EIA Scoping Report	
Spiorad na Mara	Scotland	Scoping Opinion	Spiorad na Mara Offshore Windfarm: Scoping Report	
Talisk Offshore Wind Project	Scotland	Scoping Opinion	Talisk Floating Offshore Wind Farm: Offshore Scoping Report	
Tier 3 – Scoping Report submitted or Seabed Option Agreement				
Malin Sea Wind	Scotland	Seabed Option Agreement	N/A	

2.4.3 Quantitative cumulative assessment

34. For the cumulative assessment, quantitative information on potential collision and displacement mortalities was obtained for offshore windfarms listed under Tier 1 (**Table 2**) wherever possible from project applications. For some older projects no information could be found. For other older Irish Sea projects (e.g. operational offshore windfarms in the UK Irish Sea, inc. Burbo Bank, Ormonde, etc.) full impact assessments considering all observed seabird species were not provided in their planning applications. Therefore, the only quantified mortality estimates available for projects on the west coast of the UK, were ones calculated jointly by the Mona, Morgan and Morecambe offshore windfarms using publicly available data sources and submitted by those projects as part of their cumulative and in-combination assessments.

35. The 25 offshore windfarms listed under Tier 1 (**Table 2**) were included in a quantitative assessment of cumulative mortalities (where data were obtained).

36. For the WDA-alone, quantitative collision and displacement mortality is presented in **Technical Appendix 11.3: Collision Risk Modelling** and **Technical Appendix 11.4: Displacement** respectively.

2.4.4 Qualitative cumulative assessment

37. For the cumulative assessment, offshore windfarms listed under Tier 2 (**Table 2**, i.e. projects for which a Scoping Opinion had been adopted but that had not yet submitted an application) have the potential to add to cumulative mortality along with potential mortality from the WDA-alone plus other offshore windfarms listed under Tier 1. A qualitative approach to assess cumulative effects for these Tier 2 offshore windfarms was used.

38. A total of 5 offshore windfarms had an adopted Scoping Opinion but had not submitted an application (as of 15 January 2026) and are listed under Tier 2. A summary of species assessed in the Scoping Opinion for each Tier 2 offshore windfarm is presented in **Section 2.7**.

39. If constructed, the Malin Sea Wind offshore windfarm listed under Tier 3 would be expected to add cumulative effects to regional seabird populations potentially impacted by the Project. However, there is limited or no information on which seabird populations could be impacted by Malin or if this project will reach determination. Consequently, it is not possible to use the very limited available information for the Tier 3 Malin project in a quantitative or qualitative assessment.

2.5 Methods for HRA in-combination assessment

2.5.1 Screening for impact threshold

40. WDA-alone mortality estimates are presented, for each species apportioned to SPAs within foraging range (breeding season) and SPAs within the western BDMPS region (non-breeding season), in **Technical Appendix 11.6: Apportioning for HRA**. If the annual sum of apportioned mortality due to the WDA-alone was less than 0.2 birds then, following NatureScot guidance (response to the Scoping Opinion, 22 November 2024), no in-combination assessment for that SPA is required. This numerical threshold was used as an initial screening tool. Only SPAs for which WDA-alone annual mortality was predicted to be greater than or equal to 0.2 birds were screened into the in-combination assessment presented in **Section 4.0**.

2.5.2 Seasonal mortalities included for in-combination assessment

41. For each SPA screened into the in-combination assessment (see above **Section 2.5.1**), collision and/or displacement mortalities from each offshore windfarm identified for inclusion in the in-combination assessment for the breeding and non-breeding seasons (for breeding and non-breeding spatial considerations, refer to **Section 2.2.2.2** and **Section 2.2.3.2** respectively) were added to WDA-alone mortalities to obtain total in-combination annual collision and displacement mortalities.

42. Tables presented in **Section 4.0** listing in-combination mortality specify for each species and screened in SPA if each offshore windfarm is included in the in-combination assessment for connectivity in the breeding season and/or the non-breeding season.

43. **Table 3** lists all offshore windfarms included in the in-combination impact assessments, under each of the three tiers (refer to **Section 2.3**), according to the stage of the planning process/development the project is at.

Table 3: Summary list of offshore windfarms within the Western BDMPS region that are included in the in-combination impact assessments with the Project.

Offshore Windfarm	Jurisdiction	Current project status	Data source of in-combination mortality estimates
Tier 1 – application submitted, consented, under construction, operational			
Arklow Bank 2	Republic of Ireland	Consent application submitted	Arklow Bank Wind Park 2 Natura Impact Statement: Stage 2 Appraisal To Inform An Appropriate Assessment Of Implications On European Sites
Awel y Mor	Wales	Consented	Morecambe Offshore Windfarm: Volume 4

Offshore Windfarm	Jurisdiction	Current project status	Data source of in-combination mortality estimates
			Report to Inform Appropriate Assessment
Burbo Bank	England	Operational	Morecambe Offshore Windfarm: Volume 4 Report to Inform Appropriate Assessment
Burbo Bank Extension	England	Operational	Morecambe Offshore Windfarm: Volume 4 Report to Inform Appropriate Assessment
Codling	Republic of Ireland	Consent application submitted	Codling Wind Park: Natura Impact Statement Volume 5 Assessment of Implications for Special Protection Areas - Part 2
Dublin Array	Republic of Ireland	Consent application submitted	Dublin Array: Part 4: Habitats Directive Assessment Volume 4: Applicant's Natura Impact Statement
Erebus Floating Wind Demo	Wales	Consented	Erebus: Offshore Ornithology 11.2 Technical Appendix - Apportioning
Gwynt y Mor	Wales	Operational	Morecambe Offshore Windfarm: Volume 4 Report to Inform Appropriate Assessment
Mona	Wales	Consented	Mona Offshore Wind Project HRA Stage 2 Information to Support an Appropriate Assessment Part Three: Special Protection Areas and Ramsar sites Assessments
Mooir Vannin	Isle of Man	Consent application submitted	No information available for in-combination assessment on SPAs
Morecambe	England	Consented	Morecambe Offshore Windfarm: Volume 4 Report to Inform Appropriate Assessment
Morgan	England	Consented	Morgan Offshore Wind Project: Generation Assets HRA Stage 2 information to support an appropriate assessment Part Three: Special Protection Areas (SPA) and Ramsar Site assessments
North Irish Sea Array (NISA)	Republic of Ireland	Consent application submitted	North Irish Sea Array Offshore Wind Farm Natura Impact Statement Volume 1 Main Report
Oriel	Republic of Ireland	Consent application submitted	Oriel Wind Farm Project Natura Impact Statement
Ormonde	England	Operational	Morecambe Offshore Windfarm: Volume 4 Report to Inform Appropriate Assessment
Rampion	England	Operational	No information available
Rampion 2	England	Consented	Rampion 2 Wind Farm Category 5: Reports. Report to Inform Appropriate Assessment
Rhyl Flats	Wales	Operational	Morecambe Offshore Windfarm: Volume 4 Report to Inform Appropriate Assessment

Offshore Windfarm	Jurisdiction	Current project status	Data source of in-combination mortality estimates
Robin Rigg	England	Operational	Morecambe Offshore Windfarm: Volume 4 Report to Inform Appropriate Assessment
Twin Hub	England	Consented	Morecambe Offshore Windfarm: Volume 4 Report to Inform Appropriate Assessment
Walney (1,2)	England	Operational	Morecambe Offshore Windfarm: Volume 4 Report to Inform Appropriate Assessment
Walney Extension (3,4)	England	Operational	Morecambe Offshore Windfarm: Volume 4 Report to Inform Appropriate Assessment
West of Duddon Sands	England	Operational	Morecambe Offshore Windfarm: Volume 4 Report to Inform Appropriate Assessment
West of Orkney	Scotland	Consented	West of Orkney Windfarm Offshore Ornithology Additional Information Addendum to the Report to Inform Appropriate Assessment: HRA Stage 2 - SPA Appropriate Assessment
White Cross	England	Consented	White Cross Offshore Windfarm Environmental Statement Chapter 13: Offshore Ornithology
Tier 2 – Scoping Opinion adopted			
Havbredey	Scotland	Scoping Opinion	Havbredey Offshore Wind Farm: Offshore Scoping Report
North Channel Wind 1	Northern Ireland	Scoping Opinion	North Channel Wind 1 and 2 Projects: Offshore EIA Scoping Report
North Channel Wind 2	Northern Ireland	Scoping Opinion	North Channel Wind 1 and 2 Projects: Offshore EIA Scoping Report
Spiorad na Mara	Scotland	Scoping Opinion	Spiorad na Mara Offshore Windfarm: Scoping Report
Talisk Offshore Wind Project	Scotland	Scoping Opinion	Talisk Floating Offshore Wind Farm: Offshore Scoping Report
Tier 3 – Scoping Report submitted or Seabed Option Agreement			
Malin Sea Wind	Scotland	Seabed Option Agreement	N/A

2.5.3 Quantitative in-combination assessment

44. For the in-combination assessment, quantitative information on potential collision and displacement mortalities was obtained for offshore windfarms listed under Tier 1 (**Table 3**) wherever possible from project applications and information to inform Appropriate Assessments. For some older projects no information could be found. For other older Irish Sea projects (e.g. operational offshore windfarms in the UK Irish Sea, inc. Burbo Bank, Ormonde, etc.) full impact assessments considering all observed seabird species were not provided in their planning applications. Therefore, the only quantified mortality impact estimates available for projects on the west coast of the UK, were ones calculated jointly by

the Mona, Morgan and Morecambe offshore windfarms using publicly available data sources and submitted by those projects as part of their cumulative and in-combination assessments.

45. The 25 offshore windfarms listed under Tier 1 (**Table 3**) were included in a quantitative assessment of in-combination mortalities (where data were obtained).

46. The WDA-alone annual collision mortalities (refer to **Technical Appendix 11.3: Collision Risk Modelling**) and/or displacement mortalities (**Technical Appendix 11.4: Displacement**) were apportioned to SPAs using the NatureScot apportioning method[6] presented in **Technical Appendix 11.6: Apportioning for HRA** and then added to the in-combination total for each SPA (**Section 4.0**).

2.5.4 Qualitative in-combination assessment

47. Offshore windfarms listed under Tier 2 (**Table 3**, i.e. projects for which a Scoping Opinion had been adopted but that had not yet submitted an application) have the potential to add to in-combination mortality along with potential mortality from the WDA-alone plus other offshore windfarms listed under Tier 1. A qualitative approach to assessing cumulative and in-combination impacts for these Tier 2 offshore windfarms was used.

48. A total of 5 offshore windfarms had an adopted Scoping Opinion but had not submitted an application (as of 15 January 2026) are listed under Tier 2. A summary of species assessed in the Scoping Opinion for each Tier 2 offshore windfarm is presented in **Section 2.7**

49. If constructed, the Malin Sea Wind offshore windfarm listed under Tier 3 would be expected to add in-combination effects to SPA seabird populations potentially impacted by the Project. However, there is limited or no information on which seabird populations could be impacted by Malin or if this project will reach determination. Consequently, it is not possible to use the very limited available information for the Tier 3 Malin project in a quantitative or qualitative assessment.

2.6 Obtaining Mortalities for other Offshore Windfarms

50. The collision and abundance estimates collated for other offshore windfarms were primarily obtained from recent submissions made by these projects.

51. Offshore windfarm applications, which included a collation of other projects' estimated seabird mortalities, were located through searches of the Planning Inspectorate website[7] for English and Welsh offshore windfarms, An Coimisiún Pleanála[8] for Republic of Ireland offshore windfarms and the Marine Directorate[9] site for Scottish ones, as well as project websites themselves.

52. The estimated seabird mortalities presented in these documents varied in format and hence adjustments have been required to obtain a common currency (for example in some assessments displacement is presented as mortalities only, while in others the abundances are also provided).

53. The mortality for other windfarms apportioned to each SPA was obtained from the relevant project's assessments, where available, noting that not all windfarm assessments considered all potential screened in SPAs and therefore some values could not be obtained.

[6] https://www.nature.scot/doc/interim-guidance-apportioning-impacts-marine-renewable-developments-breeding-seabird-populations#Example+Table+1-01

[7] https://national-infrastructure-consenting.planninginspectorate.gov.uk/

[8] https://www.pleanala.ie/en-ie/Map-Search

[9] https://marine.gov.scot/marine-licence-applications

2.7 Summary of Scoping Reports for Tier 2 Offshore Windfarms

54. A summary of offshore windfarms for which a Scoping Opinion had been adopted, that were included in the qualitative cumulative and in-combination assessment is presented below (**Table 4**).

2.7.1 Havbredey

55. The Havbredey Offshore Wind Farm Offshore EIA Scoping Report (Havbredey, 2025) identified the following species as being recorded in high abundance in the project area: kittiwake, puffin, guillemot, razorbill, fulmar and gannet. SPAs identified in the scoping report are identified in **Table 4**.

2.7.2 North Channel Wind 1

56. The North Channel Wind 1 Offshore Wind Farm Scoping Report (North Channel Wind / RPS, 2023) identified the following species as being present in high abundance in the project area: fulmar, Manx shearwater, herring gull, common guillemot, kittiwake, gannet and razorbill. SPAs identified in the scoping report are identified in **Table 4**.

2.7.3 North Channel Wind 2

57. The North Channel Wind 2 Offshore Wind Farm Scoping Report (North Channel Wind / RPS, 2023) identified the following species as being present in high abundance in the project area: fulmar, Manx shearwater, herring gull, common guillemot, kittiwake, gannet and razorbill. SPAs identified in the scoping report are identified in **Table 4**.

2.7.4 Spiorad na Mara

58. The Spiorad na Mara Offshore Wind Farm Scoping Report (Spiorad na Mara, 2023) identified the following species as being present in high abundance in the project area: fulmar, puffin, common guillemot, razorbill, gannet, European shag, kittiwake. SPAs identified in the scoping report are identified in **Table 4**.

2.7.5 Talisk Offshore Wind Project

59. The Talisk Offshore Wind Farm Scoping Report (Magnora Offshore Wind, 2025) identified the following species as being key species within the project area: kittiwake, great black-backed gull, herring gull, common guillemot, razorbill, puffin, fulmar, gannet and storm petrel. SPAs identified in the scoping report are identified in **Table 4**.

Table 4: List of offshore windfarms included in qualitative cumulative and in-combination impact assessments with the Project. Y = Yes offshore windfarm is included.

SPA + qualifying feature	Havbredey	North Channel Wind 1	North Channel Wind 2	Spiorad na Mara	Talisk
Ailsa Craig					
Kittiwake		Y	Y		
Guillemot		Y	Y		
Gannet	Y	Y	Y	Y	
Herring gull		Y	Y		
Canna and Sanday SPA					

SPA + qualifying feature	Havbredey	North Channel Wind 1	North Channel Wind 2	Spiorad na Mara	Talisk
Puffin	Y			Y	Y
Guillemot				Y	
Kittiwake				Y	Y
Manx shearwater	Y				
Cape Wrath SPA					
Puffin	Y			Y	Y
Kittiwake	Y			Y	Y
Guillemot	Y			Y	Y
Fulmar	Y				Y
Razorbill	Y			Y	Y
Copeland Islands SPA					
Manx Shearwater		Y	Y	Y	Y
Flannan Islands SPA					
Kittiwake	Y			Y	Y
Guillemot					Y
Razorbill				Y	
Puffin				Y	
Fulmar	Y				Y
Handa SPA					
Kittiwake	Y			Y	Y
Razorbill				Y	
Guillemot	Y			Y	Y
Fulmar	Y				Y
Mingulay and Berneray SPA					
Kittiwake	Y			Y	Y
Puffin	Y			Y	Y
Fulmar				Y	Y
North Rona and Sula Sgeir SPA					
Kittiwake	Y			Y	Y
Guillemot	Y			Y	Y
Puffin				Y	
Great black-backed gull	Y				Y
Fulmar	Y				Y
Gannet	Y			Y	Y
Razorbill	Y			Y	Y

SPA + qualifying feature	Havbredey	North Channel Wind 1	North Channel Wind 2	Spiorad na Mara	Talisk
North Colonsay and Western Cliffs SPA					
Kittiwake	Y			Y	Y
Rum SPA					
Kittiwake	Y			Y	Y
Manx shearwater					Y
Guillemot				Y	
Shiant Isles SPA					
Kittiwake	Y			Y	Y
Guillemot				Y	Y
Fulmar	Y				Y
Puffin	Y			Y	Y
Razorbill	Y			Y	Y
Skomer, Skokholm and the Seas off Pembrokeshire/ Sgomer, Sgogwm a Moroedd Penfro SPA					
Razorbill				Y	
Puffin				Y	
Seas Off St Kilda SPA					
Puffin	Y			Y	Y
Guillemot				Y	Y
European storm petrel	Y				Y
Fulmar	Y				Y
Gannet	Y			Y	Y
St Kilda SPA					
Kittiwake	Y			Y	Y
Guillemot				Y	Y
European storm petrel					Y
Fulmar	Y				Y
Gannet	Y			Y	Y
Puffin	Y			Y	Y
Razorbill				Y	Y
Sule Skerry SPA					
Guillemot	Y			Y	Y
Puffin	Y			Y	Y
Gannet	Y			Y	Y

SPA + qualifying feature	Havbredey	North Channel Wind 1	North Channel Wind 2	Spiorad na Mara	Talisk
European storm petrel					Y

3.0 Cumulative Assessment: Results

3.1 Great northern diver

60. **Table 5** lists two offshore windfarms included in the quantitative cumulative assessment (**Section 2.4.3**) that are located in the UK West of Scotland waters BDMPS (**Table 1**). Estimated great northern diver displacement mortalities for the WDA-alone in the non-breeding season (this species is not present in UK waters during the breeding season) are also presented. Information was not available from Robin Rigg or West of Orkney Offshore Wind Farm to add to the cumulative assessment.

61. Total annual displacement mortality for great northern diver in the non-breeding season for the WDA-alone was estimated to be less than one bird per annum, for both lower and upper impact scenarios.

Table 5: Great northern diver cumulative displacement mortality. Grey cells indicate no data available

For the WDA-alone, displacement mortality is presented in Technical Appendix 11.4: Displacement.

For cumulative projects, data sources are presented in Table 2.

Cumulative Project (Tier 1)	Non-breeding season included in cumulative assessment? Yes/No	Lower Displacement (50% x 5%)		Upper Displacement (80% x 5%)	
		Non-breeding	Annual	Non-breeding	Annual
WDA-alone	**Yes**	**0.4**	**0.4**	**0.6**	**0.6**
Robin Rigg	Yes	Not assessed			
West of Orkney	Yes	Not assessed			
Annual total			**0.4**		**0.6**

3.2 Arctic tern

62. **Table 6** presents the estimated Arctic tern collision and displacement mortalities for the WDA-alone and all other offshore windfarms in the UK Western Waters BDMPS (**Table 1**) included in the cumulative assessment for the breeding season (**Section 2.2.2.1**) and/or non-breeding season (**Section 2.2.3.1**), where information was available.

63. Arctic tern collision mortalities were generally slightly lower than displacement mortalities. Total cumulative annual collision plus displacement mortality from all offshore windfarms was estimated to be 4 and 6 mortalities per annum, for lower and upper impact scenarios, respectively.

Table 6: Arctic tern cumulative collision and displacement mortality. Grey cells indicate no data available

For the WDA-alone, collision and displacement mortality is presented in Technical Appendix 11.3: Collision Risk Modelling and Technical Appendix 11.4: Displacement respectively.

For cumulative projects, data sources of estimated collision and displacement mortality are presented in Table 2

Cumulative Project (Tier 1)	Season included in cumulative assessment? Yes/No		Collisions[a]				Lower Displacement (30% x 3%)				Upper Displacement (50% x 3%)				Total Annual Mortality	
	Breeding	Non-breeding	Breeding	Autumn	Spring	Annual	Breeding	Autumn	Spring	Annual	Breeding	Autumn	Spring	Annual	Collisions plus Lower Displacement	Collisions plus Upper Displacement
WDA-alone	**Yes**	**Yes**	**0.593**	**0.016**	**0.005**	**0.614**	**0.8**	**0.3**	**0.8**	**1.9**	**1.4**	**0.5**	**1.4**	**3.3**	**2.5**	**3.9**
Arklow Bank 2	No	Yes	5.3	0.1	0.7	0.8 [C]	Not assessed								0.8[C]	0.8[C]
Awel y Mor	No	Yes	Not assessed				Not assessed								Not assessed	
Burbo Bank	No	Yes	No information				Not assessed								Not assessed	
Burbo Bank Extension	No	Yes	Not assessed				Not assessed								Not assessed	
Codling	No	Yes	Not assessed				Not assessed								Not assessed	
Dublin Array	No	Yes	0.24	0.03		0.03[C]	Not assessed								0.03[C]	0.03[C]
Erebus Floating Wind Demo	No	Yes	Not assessed				Not assessed								Not assessed	
Gwynt y Mor	No	Yes	No information				Not assessed								Not assessed	
Mona	No	Yes	Not assessed				Not assessed								Not assessed	
Mooir Vannin	No	Yes	Not assessed				Not assessed								Not assessed	

Cumulative Project (Tier 1)	Season included in cumulative assessment? Yes/No		Collisions[a]				Lower Displacement (30% x 3%)				Upper Displacement (50% x 3%)				Total Annual Mortality	
	Breeding	Non-breeding	Breeding	Autumn	Spring	Annual	Breeding	Autumn	Spring	Annual	Breeding	Autumn	Spring	Annual	Collisions plus Lower Displacement	Collisions plus Upper Displacement
Morecambe	No	Yes	0.35	0.02		0.02[C]	Not assessed								0.02[C]	0.02[C]
Morgan	No	Yes	Not assessed				Not assessed								Not assessed	
North Irish Sea Array (NISA)	No	Yes	0.1			0[C]	Not assessed								0[C]	0[C]
Oriel	No	Yes	Not assessed				Not assessed								Not assessed	
Ormonde	No	Yes	Not assessed				Not assessed								Not assessed	
Rhyl Flats	No	Yes	No information				Not assessed								Not assessed	
Robin Rigg	No	Yes	Not assessed				Not assessed								Not assessed	
Twin Hub	No	Yes	No information				Not assessed								Not assessed	
Walney (1,2)	No	Yes	Not assessed				Not assessed								Not assessed	
Walney Extension (3,4)	No	Yes	Not assessed				Not assessed								Not assessed	
West of Duddon Sands	No	Yes	Not assessed				Not assessed								Not assessed	
West of Orkney[b]	No	Yes	0.43	0.00	0.00	0[C]	1.1	0.4	0.0	0.4[C]	1.9	0.7	0.1	0.8[C]	0.4[C]	0.8[C]
White Cross	No	Yes				<0.1	Not assessed								<0.1	<0.1
Annual total						**1.6**				**2.3**				**4.1**	**3.9**	**5.7**

Cumulative Project (Tier 1)	Season included in cumulative assessment? Yes/No		Collisions[a]				Lower Displacement (30% x 3%)				Upper Displacement (50% x 3%)				Total Annual Mortality	
	Breeding	Non-breeding	Breeding	Autumn	Spring	Annual	Breeding	Autumn	Spring	Annual	Breeding	Autumn	Spring	Annual	Collisions plus Lower Displacement	Collisions plus Upper Displacement

[a] For cumulative projects, collision mortality is presented in the representative cumulative project assessment (**Table 2**).

[b] For West of Orkney, displacement mortality (including upper, 50% displacement x 3% mortality and lower, 30% displacement x 1% mortality) is presented in the project assessment (**Table 2**).

[c] Annual mortality includes non-breeding season mortality only.

3.3 Common tern

64. **Table 7** presents the estimated common tern collision and displacement mortalities for the WDA-alone and all other offshore windfarms in the UK Western waters BDMPS (**Table 1**) included in the cumulative assessment for the breeding season (**Section 2.2.2.1**) and/or non-breeding season (**Section 2.2.3.1**), where information was available.

65. Common tern collision mortalities were generally higher than displacement mortalities. Total cumulative annual collision plus displacement mortality from all offshore windfarms was estimated to be 11 mortalities per annum, for lower and upper impact scenarios, respectively.

Table 7: Common tern cumulative collision and displacement mortality. Gret cells indicate no data available

For the WDA-alone, collision and displacement mortality is presented in Technical Appendix 11.3: Collision Risk Modelling and Technical Appendix 11.4: Displacement respectively.

For cumulative projects, data sources of estimated collision mortality estimates are presented in Table 2

Cumulative Project (Tier 1)	Season included in cumulative assessment? Yes/No		Collisions[a]				Lower Displacement (30% x 3%)				Upper Displacement (50% x 3%)				Total annual mortality	
	Breeding	Non-breeding	Breeding	Autumn	Spring	Annual	Breeding	Autumn	Spring	Annual	Breeding	Autumn	Spring	Annual	Collisions plus Lower Displacement	Collisions plus Upper Displacement
WDA-alone	**Yes**	**Yes**	**0.328**	**0.016**	**0.026**	**0.37**	**0.6**	**0.6**	**0.0**	**1.2**	**0.9**	**0.9**	**0.0**	**1.8**	**1.6**	**2.2**
Arklow Bank 2	No	Yes	7.2	0.9	0.6	1.5[b]	Not assessed								1.5[b]	1.5[b]
Awel y Mor	No	Yes	Not assessed				Not assessed								Not assessed	
Burbo Bank	No	Yes	No information				Not assessed								Not assessed	
Burbo Bank Extension	No	Yes	6	3		3[b]	Not assessed								3.0[b]	3.0[b]
Codling	No	Yes	0.02	2.1	0.15	2.25[b]	Not assessed								2.25[b]	2.25[b]
Dublin Array	No	Yes	0.8	1.7	0.5	2.2[b]	Not assessed								2.2[b]	2.2[b]
Erebus Floating Wind Demo	No	Yes	Not assessed				Not assessed								Not assessed	
Gwynt y Mor	No	Yes	No information				Not assessed								Not assessed	
Mooir Vannin	No	Yes	Not assessed				Not assessed								Not assessed	
Mona	No	Yes	Not assessed				Not assessed								Not assessed	
Morecambe	No	Yes	0.08	0.14		0.14[b]	Not assessed								0.14[b]	0.14[b]
Morgan	No	Yes	Not assessed				Not assessed								Not assessed	

Cumulative Project (Tier 1)	Season included in cumulative assessment? Yes/No		Collisions[a]				Lower Displacement (30% x 3%)				Upper Displacement (50% x 3%)				Total annual mortality	
	Breeding	Non-breeding	Breeding	Autumn	Spring	Annual	Breeding	Autumn	Spring	Annual	Breeding	Autumn	Spring	Annual	Collisions plus Lower Displacement	Collisions plus Upper Displacement
North Irish Sea Array (NISA)	No	Yes	0.7			0[b]	Not assessed								0[b]	0[b]
Oriel	No	Yes	Not assessed				Not assessed								Not assessed	
Ormonde	No	Yes	Not assessed				Not assessed								Not assessed	
Rhyl Flats	No	Yes	No information				Not assessed								Not assessed	
Robin Rigg	No	Yes	Not assessed				Not assessed								Not assessed	
Twin Hub	No	Yes	No information				Not assessed								Not assessed	
Walney (1,2)	No	Yes	No information				Not assessed								Not assessed	
Walney Extension (3,4)	No	Yes	Not assessed				Not assessed								Not assessed	
West of Duddon Sands	No	Yes	Not assessed				Not assessed								Not assessed	
West of Orkney	No	Yes	Not assessed				Not assessed								Not assessed	
White Cross	No	Yes				<0.1	Not assessed								<0.1	<0.1
Annual total						**9.6**				**1.2**				**1.8**	**10.8**	**11.4**

[a] For cumulative projects, collision mortality is presented in the representative cumulative project assessment (**Table 2**).

[b] Annual mortality includes non-breeding season mortality only.

3.4 Kittiwake

66. **Table 8** presents the estimated kittiwake collision and displacement mortalities for the WDA-alone and all other offshore windfarms in the UK Western waters & Channel BDMPS (**Table 1**) included in the cumulative assessment for the breeding season (**Section 2.2.2.1**) and/or non-breeding season (**Section 2.2.3.1**), where information was available.

67. NatureScot advise that displacement impacts should be considered for kittiwake (NatureScot Guidance Note 8) whereas Natural England advise that kittiwake displacement do not need to be included in impact assessments (Parker et al., 2022). Therefore, displacement was only considered for offshore windfarms in Scotland.

68. Kittiwake collision mortalities were generally higher than displacement mortalities for Scottish offshore windfarms (**Table 8**). Total cumulative annual collision mortality from all offshore windfarms was estimated to be 1,066 collisions per annum and cumulative annual displacement mortality was estimated to be 41 and 122 mortalities per annum, for lower and upper impact scenarios, respectively.

Table 8: Kittiwake cumulative collision and displacement mortality. Grey cells indicate no data available.

For the WDA-alone, collision and displacement mortality is presented in Technical Appendix 11.3: Collision Risk Modelling and Technical Appendix 11.4: Displacement respectively.

For cumulative projects, data sources of estimated collision and displacement mortality are presented in Table 2

Cumulative Project (Tier 1)	Season included in cumulative assessment? Yes/No		Collisions[a]				Lower Displacement (30% x 1%)[b]				Upper Displacement (30% x 3%)[b]				Total annual mortality	
	Breeding	Non-breeding	Breeding	Autumn	Spring	Annual	Breeding	Autumn	Spring	Annual	Breeding	Autumn	Spring	Annual	Collisions plus Lower Displacement	Collisions plus Upper Displacement
WDA-alone	**Yes**	**Yes**	**48.71**	**86.92**	**36.44**	**172.07**	**3.7**	**17.0**	**10.5**	**31.2**	**11.0**	**50.9**	**31.4**	**93.3**	**203.3**	**265.4**
Arklow Bank 2	Yes	Yes	18.8	47.3	142.9	209.1	Not assessed								209.1	209.1
Awel y Mor	Yes	Yes	11.7	8.3	15.3	35.3	Not assessed								35.3	35.3
Burbo Bank	Yes	Yes	0.7	0.7	0.4	1.8	Not assessed								1.8	1.8
Burbo Bank Extension	Yes	Yes				23	Not assessed								23.0	23.0
Codling	Yes	Yes	4.2	9.8	4.2	18.2	Not assessed								18.2	18.2
Dublin Array	Yes	Yes	13.6	10.5	5.5	29.6	Not assessed								29.6	29.6
Erebus Floating Wind Demo	Yes	Yes	0.5	24.6	12.5	37.7	Not assessed								37.7	37.7
Gwynt y Mor	Yes	Yes	11.8	10.8	6.8	29.4	Not assessed								29.4	29.4
Mona	Yes	Yes	15.5	8.4	8.7	32.7	Not assessed								32.7	32.7

Cumulative Project (Tier 1)	Season included in cumulative assessment? Yes/No		Collisions[a]				Lower Displacement (30% x 1%)[b]				Upper Displacement (30% x 3%)[b]				Total annual mortality	
	Breeding	Non-breeding	Breeding	Autumn	Spring	Annual	Breeding	Autumn	Spring	Annual	Breeding	Autumn	Spring	Annual	Collisions plus Lower Displacement	Collisions plus Upper Displacement
Mooir Vannin	Yes	Yes	11.1	16.5	19.3	46.9	Not assessed								46.9	46.9
Morecambe	Yes	Yes	16.3	8.5	0.6	25.4	Not assessed								25.4	25.4
Morgan	Yes	Yes	16.4	18.3	5.3	40	Not assessed								40.0	40.0
North Irish Sea Array (NISA)	Yes	Yes	5.4	6.5	7.4	19.3	Not assessed								19.3	19.3
Oriel	Yes	Yes	1.5	13.5		15.0	Not assessed								15.0	15.0
Ormonde	Yes	Yes				3.3	Not assessed								3.3	3.3
Rampion	No	Yes				77.4	Not assessed								77.4	77.4
Rampion 2	No	Yes	1.2	9.8	17.2	27.0[c]	Not assessed								27.0	27.0
Rhyl Flats	Yes	Yes	1.3	1.2	0.7	3.3	Not assessed								3.3	3.3
Robin Rigg	Yes	Yes	1.3	1.3	0.7	3.3	0.06	0.08	0.09	0.24	0.19	0.25	0.27	0.71	3.5	4.0
Twin Hub	Yes	Yes				9.7	Not assessed								9.7	9.7
Walney (1,2)	Yes	Yes	1.8	1.9	1.2	4.8	Not assessed								4.8	4.8
Walney Extension (3,4)	Yes	Yes	18.8	86.4	15.2	120.4	Not assessed								120.4	120.4
West of Duddon Sands	Yes	Yes	4	4.2	2.6	10.7	Not assessed								10.7	10.7

Cumulative Project (Tier 1)	Season included in cumulative assessment? Yes/No		Collisions[a]				Lower Displacement (30% x 1%)[b]				Upper Displacement (30% x 3%)[b]				Total annual mortality	
	Breeding	Non-breeding	Breeding	Autumn	Spring	Annual	Breeding	Autumn	Spring	Annual	Breeding	Autumn	Spring	Annual	Collisions plus Lower Displacement	Collisions plus Upper Displacement
West of Orkney	Yes	Yes	17.85	16.31	21.87	56.04	3.3	2.4	3.7	9.4	10.0	7.2	11.0	28.2	65.5	84.2
White Cross	Yes	Yes	3.7	1.8	9.3	14.8	Not assessed								14.8	14.8
Annual total						**1,066.0**				**40.9**				**122.2**	**1,106.9**	**1,188.2**

[a] For cumulative projects, collision mortality is presented in the representative cumulative project assessment (**Table 2**).

[b] For cumulative projects, displacement mortality values are calculated (30% displacement and 1%/3% for lower/upper scenarios respectively) from abundance values as reported in data source (**Table 2**).

[c] Annual mortality includes non-breeding season mortality only.

3.5 Great black backed gull

69. **Table 9** presents the estimated great black-backed gull collision mortalities for the WDA-alone and two other offshore windfarms located in the UK West of Scotland waters BDMPS (**Table 1**) included in the cumulative assessment for the breeding season (**Section 2.2.2.1**) and/or non-breeding season (**Section 2.2.3.1**).

70. Great black-backed gull collision mortalities, for all offshore windfarms included in the cumulative assessment, were estimated to be 20 collisions per annum.

Table 9: Great black-backed gull cumulative collision mortality.

For the WDA-alone, collision mortality is presented in Technical Appendix 11.3: Collision Risk Modelling.

For cumulative projects, data sources of estimated collision mortality are presented in Table 2.

Cumulative Project (Tier 1)	Season included in cumulative assessment? Yes/No		Collision		
	Breeding	Non-breeding	Breeding	Non-breeding	Annual
WDA-alone	**Yes**	**Yes**	**0.21**	**6.24**	**6.45**
Robin Rigg	No	Yes	1.5	2.5	2.5[a]
West of Orkney	No	Yes	0.81	11.13	11.13[a]
Annual Total					**20.1**
[a] Annual mortality includes non-breeding season mortality only.					

3.6 Herring gull

71. **Table 10** presents the estimated herring gull collision mortalities for the WDA-alone. There are no other offshore windfarms within herring gull foraging range to add to the cumulative assessment.

72. Herring gull collision mortalities, for the WDA-alone was estimated to be 8 collisions per annum.

Table 10: Herring gull cumulative collision mortality. Grey cells indicate no data available.

For the WDA-alone, collision mortality is presented in Technical Appendix 11.3: Collision Risk Modelling.

For cumulative projects, data sources are presented in Table 2.

Cumulative Project (Tier 1)	Season included in cumulative assessment? Yes/No		Collision		
	Breeding	Non-breeding	Breeding	Non-breeding	Annual
WDA-alone	Yes	Yes	0.34	7.68	8.02
Annual Total					8.02

3.7 Guillemot

73. **Table 11** presents the estimated guillemot displacement mortalities for the WDA-alone. There are no other offshore windfarms within guillemot foraging range to add to the cumulative assessment.

74. Guillemot displacement mortality for the WDA-alone was estimated to be 659 and 1,326 mortalities per annum, for lower and upper impact scenarios, respectively.

Table 11: Guillemot cumulative displacement mortality

For the WDA-alone, displacement mortality is presented in Technical Appendix 11.4: Displacement.

For cumulative projects, data sources are presented in Table 2.

Cumulative Project (Tier 1)	Season included in cumulative assessment? Yes/No		Lower Displacement (60% x 3/1%)			Upper Displacement (60% x5/3%)		
	Breeding	Non-breeding	Breeding	Non-breeding	Annual	Breeding	Non-breeding	Annual
WDA-alone	Yes	Yes	487.7	171.2	658.9	812.9	513.6	1,326.5
Annual total					658.9			1,326.5

3.8 Razorbill

75. **Table 12** presents the estimated razorbill displacement mortalities for the WDA-alone and all other offshore windfarms in the UK Western waters BDMPS (**Table 1**) included in the cumulative assessment for the breeding season (**Section 2.2.2.1**) and/or non-breeding season (**Section 2.2.3.1**), where information was available.

76. Total razorbill displacement mortality from all offshore windfarms included in the cumulative assessment was estimated to be 394 and 1,118 mortalities per annum, for lower and upper impact scenarios, respectively.

Table 12: Razorbill cumulative displacement mortality. Grey cells indicate no data available

For the WDA-alone, displacement mortality is presented in Technical Appendix 11.4: Displacement.

For cumulative projects, data sources of estimated displacement mortality are presented in Table 2.

Cumulative Project (Tier 1)	Season included in cumulative assessment? Yes/No		Lower Displacement (60% x 3/1%)[a]					Upper Displacement (60% x5/3%)[a]				
	Breeding	Non-breeding	Breeding	Autumn	Winter	Spring	Annual	Breeding	Autumn	Winter	Spring	Annual
WDA-alone	**Yes**	**Yes**	**47.4**	**18.6**	**31.2**	**41.7**	**138.9**	**79.1**	**55.7**	**93.6**	**125.1**	**353.5**
Arklow Bank 2	No	Yes	3.8	13.9	12.4	22.3	48.6[b]	6.3	41.7	37.3	66.8	145.8[b]
Awel y Mor	No	Yes	2.5	0.4	0.9	2.0	3.3[b]	4.2	1.2	2.7	6.0	9.9[b]
Burbo Bank	No	Yes	0.1	0.0	0.1	0.1	0.2[b]	0.1	0.1	0.2	0.2	0.5[b]
Burbo Bank Extension	No	Yes	1.2		0.2		0.2[b]	1.9		0.5		0.5[b]
Codling	No	Yes	12.2	26.2	3.8	2.5	32.5[b]	20.3	78.5	11.5	7.4	97.4[b]
Dublin Array	No	Yes	19.2	12.4	1.7	2.9	17.0[b]	32.0	37.3	5.1	8.6	51.0[b]
Erebus Floating Wind Demo	No	Yes	3.5	10.2	6.4	5.4	22.0[b]	5.8	30.7	19.2	16.1	66.0[b]
Gwynt y Mor	No	Yes	0.2	0.1	0.2	0.2	0.5[b]	0.4	0.4	0.6	0.7	1.7[b]
Mona	No	Yes	1.5	0.5	2.5	11.5	14.5[b]	2.5	1.6	7.6	34.6	43.8[b]
Mooir Vannin	Yes	Yes	1.4	3.9	1.3	7.2	13.8	2.3	11.8	3.8	21.5	39.4
Morecambe	No	Yes	4.5	4.2	3.9	2.3	10.4[b]	7.6	12.5	11.7	6.9	31.1[b]

Cumulative Project (Tier 1)	Season included in cumulative assessment? Yes/No		Lower Displacement (60% x 3/1%)[a]					Upper Displacement (60% x5/3%)[a]				
	Breeding	Non-breeding	Breeding	Autumn	Winter	Spring	Annual	Breeding	Autumn	Winter	Spring	Annual
Morgan	No	Yes	0.6	1.5	7.0	2.0	10.5[b]	1.1	4.6	21.1	5.9	31.6[b]
North Irish Sea Array (NISA)	No	Yes	3.0	20.2	2.9	12.5	35.6[b]	5.0	60.7	8.7	37.4	106.8[b]
Oriel	No	Yes	6.4	5.8	3.1	5.2	14.1[b]	10.6	17.3	9.2	15.5	42.0[b]
Ormonde	No	Yes	3.1	0.0	0.0	0.1	0.1[b]	5.2	0.1	0.1	0.2	0.4[b]
Rhyl Flats	No	Yes	0.1	0.0	0.1	0.1	0.2[b]	0.1	0.1	0.2	0.2	0.5[b]
Robin Rigg	No	Yes	1.1	0.1	0.1	0.1	0.3[b]	1.9	0.2	0.3	0.3	0.8[b]
Twin Hub	No	Yes	0.2		0.3		0.3[b]	0.4		1.0		1.0[b]
Walney (1,2)	No	Yes	0.2	0.2	0.2	0.2	0.6[b]	0.4	0.5	0.6	0.7	1.8[b]
Walney Extension (3,4)	No	Yes	1.4	5.2	18.4	0.0	23.6[b]	2.3	15.7	55.2	0.0	70.9[b]
West of Duddon Sands	No	Yes					1.2[c]					3.6[c]
West of Orkney	No	Yes	2.5	0.7	0.1	0.8	1.6[b]	4.2	2.0	0.3	2.4	4.7[b]
White Cross	No	Yes	0.7	0.2	2.2	2.1	4.5[b]	1.2	0.7	6.5	6.2	13.4[b]
Annual total							**394.5**					**1,118.1**

[a] For cumulative projects, displacement mortality values are calculated (breeding season = 60% displacement and 3%/5% for lower/upper scenarios respectively and non-breeding season = 60% displacement and 1%/3% for lower/upper scenarios respectively) from abundance values as reported in data source (**Table 2**).

Cumulative Project (Tier 1)	Season included in cumulative assessment? Yes/No		Lower Displacement (60% x 3/1%)[a]					Upper Displacement (60% x5/3%)[a]				
	Breeding	Non-breeding	Breeding	Autumn	Winter	Spring	Annual	Breeding	Autumn	Winter	Spring	Annual

[b] Annual mortality includes non-breeding season mortality only.

[c] Annual displacement mortality from West of Duddon Sands Offshore Wind Farm is calculated using 60% displacement and 1%/3% mortality for lower/upper scenarios respectively from abundance values as reported in data source (**Table 2**).

3.9 Puffin

77. **Table 13** presents the estimated puffin displacement mortalities for the WDA-alone and all other offshore windfarms in the UK Western Waters BDMPS (**Table 1**) included in the cumulative assessment for the breeding season (**Section 2.2.2.1**) and/or non-breeding season (**Section 2.2.3.1**), where information was available.

78. Total puffin displacement mortality from all offshore windfarms included in the cumulative assessment was estimated to be 168 and 310 mortalities per annum, for lower and upper impact scenarios, respectively.

Table 13: Puffin cumulative displacement mortality. Grey cells indicate no data available.

For the WDA-alone, displacement mortality is presented in Technical Appendix 11.4: Displacement.

For cumulative projects, data sources of estimated displacement mortality are presented in Table 2.

Cumulative Project (Tier 1)	Season included in cumulative assessment? Yes/No		Lower Displacement (60% x 3/1%)[a]			Upper Displacement (60% x5/3%)[a]		
	Breeding	Non-breeding	Breeding	Non-breeding	Annual	Breeding	Non-breeding	Annual
WDA-alone	**Yes**	**Yes**	**17.5**	**7.2**	**24.7**	**29.1**	**21.5**	**50.6**
Arklow Bank 2	Yes	Yes	Puffin not assessed					
Awel y Mor	Yes	Yes	0.1	<0.01	0.1	0.2	>0.01	0.2
Burbo Bank	Yes	Yes	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Burbo Bank Extension	Yes	Yes	0.2	0.0	0.2	0.3	0.0	0.3
Codling	Yes	Yes	1.7	0.3	2.0	2.8	1.0	3.8
Dublin Array	Yes	Yes	Puffin not assessed					
Erebus Floating Wind Demo	Yes	Yes	25.5	1.0	26.5	42.5	2.9	45.4
Gwynt y Mor	Yes	Yes	<0.01	<0.01	<0.01	0.1	<0.01	0.1
Mona	Yes	Yes	0.3	0.1	0.4	0.5	0.4	0.9
Mooir Vannin	Yes	Yes	1.6	0.1	1.7	2.6	0.2	2.8
Morecambe	Yes	Yes	0.7	0.1	0.8	1.2	0.4	1.6
Morgan	Yes	Yes	0.2	<0.01	0.2	0.3	0.1	0.4
North Irish Sea Array (NISA)	Yes	Yes	0.2	0.1	0.3	0.4	0.2	0.6
Oriel	Yes	Yes	Puffin not assessed					
Ormonde	Yes	Yes	<0.01	0.0	<0.01	<0.01	0.0	<0.01

Cumulative Project (Tier 1)	Season included in cumulative assessment? Yes/No		Lower Displacement (60% x 3/1%)[a]			Upper Displacement (60% x5/3%)[a]		
	Breeding	Non-breeding	Breeding	Non-breeding	Annual	Breeding	Non-breeding	Annual
Rhyl Flats	Yes	Yes	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Robin Rigg	Yes	Yes	0.0	0.0	0.0	0.0	0.0	0.0
Twin Hub	Yes	Yes	No information					
Walney (1,2)	Yes	Yes	0.1	<0.01	0.1	0.1	<0.01	0.1
Walney Extension (3,4)	Yes	Yes	1.0	0.7	1.7	1.6	2.1	3.7
West of Duddon Sands	Yes	Yes	1.1	0.2	1.3	1.8	0.6	2.4
West of Orkney	Yes	Yes	94.9	12.8	107.7	158.2	38.4	196.6
White Cross	No	Yes	0.9	0.2	0.2[b]	1.5	0.6	0.6[b]
Annual total					**167.9**			**310.1**

[a] For cumulative projects, displacement mortality values are calculated (breeding season = 60% displacement and 3%/5% for lower/upper scenarios respectively and non-breeding season = 60% displacement and 1%/3% for lower/upper scenarios respectively) from abundance values as reported in data source (**Table 2**).

[b] Annual mortality includes non-breeding season mortality only.

3.10 Fulmar

79. **Table 14** presents the estimated fulmar displacement mortalities for the WDA-alone and all other offshore windfarms in the UK Western Waters & Channel BDMPS (**Table 1**) included in the cumulative assessment for the breeding season (**Section 2.2.2.1**) and/or non-breeding season (**Section 2.2.3.1**).

80. Collision mortality was available from Mona Offshore Wind Farm and displacement mortality was available from West of Orkney Wind Farm, information from other windfarms was not available to add to the cumulative assessment.

81. Total fulmar displacement mortality from all offshore windfarms included in the cumulative assessment was estimated to be 16 and 48 mortalities per annum, for lower and upper impact scenarios, respectively.

Table 14: Fulmar collision and displacement mortality. Grey cells indicate no data available

For the WDA-alone, displacement mortality is presented in Technical Appendix 11.4: Displacement.

For cumulative projects, data sources of estimated displacement mortality are presented in Table 2

Cumulative Project (Tier 1)	Season included in cumulative assessment? Yes/No		Collisions					Lower Displacement (20% x 1%)					Upper Displacement (20% x 3%)					Total annual mortality	
	Breeding	Non-breeding	Breeding	Autumn	Spring	Winter	Annual	Breeding	Autumn	Spring	Winter	Annual	Breeding	Autumn	Spring	Winter	Annual	Collisions plus Lower Displacement	Collisions plus Upper Displacement
WDA-alone	**Yes**	**Yes**	**Not assessed**					**0.2**	**0.1**	**0.3**	**0.1**	**0.7**	**0.5**	**0.3**	**0.8**	**0.3**	**1.9**	**0.7**	**0.9**
Arklow Bank 2	Yes	Yes	Not assessed					Not assessed					Not assessed						
Awel y Mor	Yes	Yes	Not assessed					Not assessed					Not assessed						
Burbo Bank	Yes	Yes	No information					No information					No information						
Burbo Bank Extension	Yes	Yes	Not assessed					Not assessed					Not assessed						
Codling	Yes	Yes	Not assessed					Not assessed					Not assessed						
Dublin Array	Yes	Yes	Not assessed					Not assessed					Not assessed						
Erebus Floating Wind Demo	Yes	Yes	Negligible					Negligible					Negligible						
Gwynt y Mor	Yes	Yes	No information					No information					No information						
Mona[a]	Yes	Yes	0.32		0.03	0.01	0.36	Not assessed					Not assessed						
Mooir Vannin	Yes	Yes	Not assessed					Not assessed					Not assessed						
Morecambe	Yes	Yes	Not assessed					Not assessed					Not assessed						
Morgan	Yes	Yes	Negligible					Negligible					Negligible						

Cumulative Project (Tier 1)	Season included in cumulative assessment? Yes/No		Collisions					Lower Displacement (20% x 1%)					Upper Displacement (20% x 3%)					Total annual mortality	
	Breeding	Non-breeding	Breeding	Autumn	Spring	Winter	Annual	Breeding	Autumn	Spring	Winter	Annual	Breeding	Autumn	Spring	Winter	Annual	Collisions plus Lower Displacement	Collisions plus Upper Displacement
North Irish Sea Array (NISA)	Yes	Yes	Not assessed					Not assessed					Not assessed						
Oriel	Yes	Yes	Not assessed					Not assessed					Not assessed						
Ormonde	Yes	Yes	Not assessed					Not assessed					Not assessed						
Rampion	Yes	Yes	Not assessed					Not assessed					Not assessed						
Rampion Extension	Yes	Yes	Not assessed					Not assessed					Not assessed						
Rhyl Flats	Yes	Yes	No information					No information					No information						
Robin Rigg	Yes	Yes	Not assessed					Not assessed					Not assessed						
Twin Hub	Yes	Yes	No information					No information					No information						
Walney (1,2)	Yes	Yes	Not assessed					Not assessed					Not assessed						
Walney Extension (3,4)	Yes	Yes	Not assessed					Not assessed					Not assessed						
West of Duddon Sands	Yes	Yes	Not assessed					Not assessed					Not assessed						
West of Orkney[b]	Yes	Yes	Not assessed					3.1	4.9	5.7	1.6	15.3	9.2	14.6	17.2	4.9	45.9	15.3	45.9
White Cross	Yes	Yes	Not assessed					Not assessed					Not assessed						
Annual total							**0.36**					**16.0**					**47.8**	**16.4**	**48.2**

[a] For Mona Offshore Wind Farm, collision mortality is presented in the Mona Offshore Wind Farm assessment (**Table 2**).

[b] For West of Orkney Offshore Wind Farm, displacement mortality (including upper, 20% displacement x 3% mortality and lower, 20% displacement x 1% mortality) is presented in the West of Orkney Offshore Wind Farm assessment (**Table 2**).

3.11 Gannet

82. **Table 15** presents the estimated gannet collision and displacement mortalities for the WDA-alone and all other offshore windfarms in the UK Western Waters BDMPS (**Table 1**) included in the cumulative assessment for the breeding season (**Section 2.2.2.1**) and/or non-breeding season (**Section 2.2.3.1**), where information was available.

83. Gannet collision mortalities were generally higher than displacement mortalities, although not for all offshore windfarms (**Table 15: Gannet cumulative collision and displacement mortality. Grey cells** indicate no data available

84. Total cumulative annual collision plus displacement mortality from all offshore windfarms was estimated to be 304 and 461 mortalities per annum, for lower and upper impact scenarios, respectively.

Table 15: Gannet cumulative collision and displacement mortality. Grey cells indicate no data available

For the WDA-alone, collision and displacement mortality is presented in Technical Appendix 11.3: Collision Risk Modelling and Technical Appendix 11.4: Displacement respectively.

For cumulative projects, data sources of estimated collision and displacement mortality are presented in Table 2

Cumulative Project (Tier 1)	Season included in cumulative assessment? Yes/No		Collisions[a]				Lower Displacement (70% x 1%)[b]				Upper Displacement (70% x 3%)[b]				Total annual mortality	
	Breeding	Non-breeding	Breeding	Autumn	Spring	Annual	Breeding	Autumn	Spring	Annual	Breeding	Autumn	Spring	Annual	Collisions plus Lower Displacement	Collisions plus Upper Displacement
WDA-alone	**Yes**	**Yes**	**13.42**	**0.25**	**0.55**	**14.22**	**3.0**	**1.1**	**1.0**	**5.1**	**8.9**	**3.2**	**2.9**	**15.0**	**19.3**	**29.2**
Arklow Bank 2	Yes	Yes	0.6	0.3	0.1	1	0.63	0.28	0.21	1.12	1.89	0.84	0.63	3.36	2.1	4.4
Awel y Mor	Yes	Yes	10.9	2.5		13.4	2.30	1.41		3.71	6.89	4.22		11.11	17.1	24.5
Burbo Bank	Yes	Yes	0.36	0.06	0.06	0.5	0.04	0.04	0.02	0.10	0.13	0.11	0.06	0.30	0.6	0.8
Burbo Bank Extension	Yes	Yes				12.4	4.54	0.15	0.18	4.87	13.61	0.46	0.53	14.60	17.3	27.0
Codling	Yes	Yes	0.4	0.1	0.3	0.8	0.74	0.39	0.74	1.87	2.21	1.16	2.21	5.58	2.7	6.4
Dublin Array	Yes	Yes	3.2	0.1	0.1	3.4	4.90	0.15	0.19	5.24	14.70	0.44	0.57	15.71	8.6	19.1
Erebus Floating Wind Demo	Yes	Yes	3.4	0.6	0.6	4.6	1.57	2.34	0.70	4.61	4.70	7.01	2.10	13.82	9.2	18.4
Gwynt y Mor	Yes	Yes	7.3	1.2	1	9.5	0.19	0.14	0.09	0.42	0.57	0.42	0.27	1.26	9.9	10.8
Mona	Yes	Yes	4.7	0.5	0.4	5.6	1.76	0.41	0.20	2.37	5.27	1.22	0.59	7.08	8.0	12.7
Mooir Vannin	Yes	Yes	14.3	2.1	0.1	16.6	2.23	1.12	0.14	3.49	6.69	3.37	0.43	10.49	20.1	27.1
Morecambe	Yes	Yes	4.1	0.07	0	4.2	3.79	0.87	0.06	4.72	11.36	2.60	0.17	14.13	8.9	18.3

Cumulative Project (Tier 1)	Season included in cumulative assessment? Yes/No		Collisions[a]				Lower Displacement (70% x 1%)[b]				Upper Displacement (70% x 3%)[b]				Total annual mortality	
	Breeding	Non-breeding	Breeding	Autumn	Spring	Annual	Breeding	Autumn	Spring	Annual	Breeding	Autumn	Spring	Annual	Collisions plus Lower Displacement	Collisions plus Upper Displacement
Morgan	Yes	Yes	0.4	0.1	0	0.5	1.08	0.46	0.25	1.79	3.23	1.37	0.74	5.34	2.3	5.8
North Irish Sea Array (NISA)	Yes	Yes	3.4	1	0.1	4.5	2.13	1.86	0.09	4.08	6.38	5.57	0.27	12.22	8.6	16.7
Oriel	Yes	Yes	5.1	5.1		10.2	1.72	2.35	0.30	4.37	5.17	7.06	0.90	13.13	14.6	23.3
Ormonde	Yes	Yes				6.7	1.39	0.04	0.02	1.45	4.18	0.13	0.06	4.37	8.2	11.1
Rhyl Flats	Yes	Yes	1	0.2	0.4	1.6	0.06	0.04	0.03	0.13	0.17	0.13	0.08	0.38	1.7	2.0
Robin Rigg	Yes	Yes	0.7	0.1	0.1	0.9	0.08	0.05	0.03	0.16	0.23	0.15	0.08	0.46	1.1	1.4
Twin Hub	Yes	Yes				26.1	1.71	1.07		2.78	5.12	3.21		8.33	28.9	34.4
Walney (1,2)	Yes	Yes	1.9	0.3	0.3	2.5	0.25	0.18	0.11	0.54	0.76	0.55	0.32	1.63	3.0	4.1
Walney Extension (3,4)	Yes	Yes	16.3	16.6	1	33.9	1.05	1.81	0.17	3.03	3.15	5.44	0.50	9.09	36.9	43.0
West of Duddon Sands	Yes	Yes	2	0.3	0.3	2.6	3.02	0.13	0.08	3.22	9.05	0.38	0.23	9.66	5.8	12.3
West of Orkney[c]	Yes	Yes	35.3	7.73	2.04	45.06	5.96	9.58	0.98	16.52	17.89	28.73	2.93	49.55	61.6	94.6
White Cross	Yes	Yes	4.4	1.7	0	6.1	1.67	0.53	0.99	3.19	5.02	1.60	2.96	9.58	9.3	15.7
Annual total						**225.4**				**78.9**				**236.2**	**304.3**	**461.5**

[a] For cumulative projects, collision mortality is presented in the representative cumulative project assessment (**Table 2**).

Cumulative Project (Tier 1)	Season included in cumulative assessment? Yes/No		Collisions[a]				Lower Displacement (70% x 1%)[b]				Upper Displacement (70% x 3%)[b]				Total annual mortality	
	Breeding	Non-breeding	Breeding	Autumn	Spring	Annual	Breeding	Autumn	Spring	Annual	Breeding	Autumn	Spring	Annual	Collisions plus Lower Displacement	Collisions plus Upper Displacement

[b] For all cumulative projects except West of Orkney, displacement mortality values are calculated (70% displacement and 1%/3% for lower/upper scenarios respectively) from abundance values as reported in data source (**Table 2**).
[c] For the West of Orkney project, displacement mortality (calculated using 70% displacement and 1%/3% for lower/upper scenarios respectively) is presented in the West of Orkney assessment (**Table 2**).

4.0 In-combination Assessment: Results

4.1 Kittiwake

85. **Table 16** presents the list of SPAs designated for breeding kittiwake located in the UK Western waters and Channel BDMPS (**Table 1**) that have connectivity with the WDA and with in-combination offshore windfarms in the breeding season (**Section 2.2.2.2**) and/or non-breeding season (**Section 2.2.3.2**).

86. **Table 16** only lists SPAs that were screened into the in-combination assessment (refer to **Section 2.5.1**), i.e. SPAs are included where WDA-alone annual mortality is greater than or equal to 0.2 birds (refer to **Technical Appendix 11.6: Apportioning for HRA**).

87. NatureScot advise that displacement impacts should be considered for kittiwake (NatureScot Guidance Note 8) whereas Natural England advise that kittiwake displacement do not need to be included in impact assessments (Parker et al., 2022). Therefore, displacement was only considered for offshore windfarms in Scotland.

88. Total in-combination annual collision plus displacement mortality from all offshore windfarms was highest at North Colonsay and Western Cliffs SPA (estimated to be 14 and 16 mortalities per annum, for lower and upper impact scenarios, respectively) followed by Cape Wrath SPA (estimated to be 10 and 12 mortalities per annum, for lower and upper impact scenarios, respectively).

Table 16: Kittiwake in-combination collisions and displacement mortality. Grey cells indicate no data available. Special Protection Areas included for in-combination assessment are highlighted in yellow.

For the WDA-alone, collision and displacement mortality (refer to Technical Appendix 11.3: Collision Risk Modelling and Technical Appendix 11.4: Displacement respectively) was apportioned to SPAs using apportioning rates presented in Technical Appendix 11.6: Apportioning for HRA.

For in-combination projects, data sources of estimated collision and displacement mortality are presented in Table 3.

SPA / In-combination project	Season included for in-combination assessment? Yes/No		Collisions[a]				Lower Displacement (30% x 1%)[a]				Upper Displacement (30% x 3%)[a]				Total annual mortality	
	Breeding	Non-breeding	Breeding	Autumn	Spring	Annual	Breeding	Autumn	Spring	Annual	Breeding	Autumn	Spring	Annual	Collisions & Lower Displacement	Collisions & Upper Displacement
Ailsa Craig SPA																
WDA-alone	Yes	Yes	**0.083**	**0.056**	**0.041**	**0.180**	**0.006**	**0.011**	**0.012**	**0.029**	**0.019**	**0.033**	**0.036**	**0.087**	**0.21**	**0.27**
Morecambe	Yes	Yes	0.04	0.01	0	0.05	Not assessed								0.05	0.05
Morgan	Yes	Yes				0.1	Not assessed								0.1	0.1
Dublin Array	Yes	Yes		1	1	2	0.003	0.007	0.003	0.010	0.01	0.02	0.01	0.03	2.01	2.03
Annual total for Ailsa Craig SPA						**2.33**				**0.04**				**0.12**	**2.37**	**2.45**
Canna and Sanday SPA																
WDA-alone	Yes	Yes	**0.318**	**0.094**	**0.069**	**0.481**	**0.024**	**0.018**	**0.020**	**0.062**	**0.072**	**0.055**	**0.060**	**0.176**	**0.54**	**0.67**
West of Orkney	Yes	Yes				0.01				0.003				0.01	0.01	0.02
Annual total for Canna and Sanday SPA						**0.49**				**0.07**				**0.20**	**0.56**	**0.69**
Cape Wrath SPA																
WDA-alone	No	Yes	**0.000**	**1.184**	**0.872**	**2.056**	**0.000**	**0.231**	**0.251**	**0.483**	**0.000**	**0.693**	**0.752**	**1.445**	**2.54**	**3.50**

SPA / In-combination project	Season included for in-combination assessment? Yes/No		Collisions[a]				Lower Displacement (30% x 1%)[a]				Upper Displacement (30% x 3%)[a]				Total annual mortality	
	Breeding	Non-breeding	Breeding	Autumn	Spring	Annual	Breeding	Autumn	Spring	Annual	Breeding	Autumn	Spring	Annual	Collisions & Lower Displacement	Collisions & Upper Displacement
Awel y Mor	No	Yes		0.1	0.3	0.4	Not assessed								0.4	0.4
Burbo Extension	No	Yes		0	0	0	Not assessed								0	0
Erebus Floating Wind Demo	No	Yes		0.3	0.3	0.6	Not assessed								0.6	0.6
Mona	No	Yes				0.8	Not assessed								0.8	0.8
Morecambe	No	Yes	0	0.12	0.02	0.13	Not assessed								0.13	0.13
Morgan	No	Yes		0.3	0.3	0.6	Not assessed								0.6	0.6
Ormonde	No	Yes		0	0	0	Not assessed								0	0
Twin Hub	No	Yes		0	0.1	0.1	Not assessed								0.1	0.1
Walney extension (3,4)	No	Yes		0.8	1.1	1.9	Not assessed								1.9	1.9
White Cross	No	Yes		0	0.3	0.3	Not assessed								0.3	0.3
West of Orkney	Yes	Yes				2.11				0.39				1.18	2.5	3.3
Annual total for Cape Wrath SPA						**9.00**				**0.88**				**2.62**	**9.87**	**11.62**
Flannan Isles SPA																
WDA-alone	Yes	Yes	**0.028**	**0.159**	**0.117**	**0.305**	**0.002**	**0.031**	**0.034**	**0.067**	**0.006**	**0.093**	**0.101**	**0.201**	**0.37**	**0.51**
West of Orkney	Yes	Yes				0.01				0.003				0.01	0.01	0.02
Annual total for Flannan Isles SPA						**0.31**				**0.07**				**0.21**	**0.38**	**0.53**
Handa SPA																
WDA-alone	Yes	Yes	**0.135**	**0.214**	**0.158**	**0.507**	**0.010**	**0.042**	**0.045**	**0.098**	**0.030**	**0.125**	**0.136**	**0.292**	**0.60**	**0.80**
Morecambe	No	Yes	0	0.02	0	0.02	Not assessed								0.02	0.02

SPA / In-combination project	Season included for in-combination assessment? Yes/No		Collisions[a]				Lower Displacement (30% x 1%)[a]				Upper Displacement (30% x 3%)[a]				Total annual mortality	
	Breeding	Non-breeding	Breeding	Autumn	Spring	Annual	Breeding	Autumn	Spring	Annual	Breeding	Autumn	Spring	Annual	Collisions & Lower Displacement	Collisions & Upper Displacement
West of Orkney	Yes	Yes				0.43				0.08				0.24	0.5	0.7
Annual total for Handa SPA						**0.96**				**0.18**				**0.53**	**1.14**	**1.49**
Horn Head to Fanad Head SPA																
WDA-alone	Yes	No	**0.390**	**0.000**	**0.000**	**0.390**	**0.030**	**0.000**	**0.000**	**0.030**	**0.088**	**0.000**	**0.000**	**0.088**	**0.42**	**0.48**
Annual total for Horn Head to Fanad Head SPA						**0.39**				**0.02**				**0.07**	**0.42**	**0.46**
Mingulay and Berneray SPA																
WDA-alone	Yes	Yes	**0.521**	**0.255**	**0.188**	**0.964**	**0.040**	**0.050**	**0.054**	**0.144**	**0.118**	**0.149**	**0.162**	**0.429**	**1.11**	**1.39**
West of Orkney	Yes	Yes				0.01				0.003				0.01	0.01	0.02
Annual total for Mingulay and Berneray SPA						**0.97**				**0.15**				**0.44**	**1.12**	**1.41**
North Colonsay and Western Cliffs SPA																
WDA-alone	Yes	Yes	**11.267**	**0.637**	**0.469**	**12.373**	**0.856**	**0.124**	**0.135**	**1.115**	**2.544**	**0.373**	**0.404**	**3.321**	**13.49**	**15.69**
Mona	Yes	Yes				0.6	Not assessed								0.6	0.6
Morecambe	Yes	Yes	0	0.06	0.01	0.07	Not assessed								0.1	0.1
West of Orkney	No	Yes				0.01				0				0	0.01	0.01
Annual total for North Colonsay and Western Cliffs SPA						**13.05**				**1.12**				**3.32**	**14.17**	**16.37**
North Rona and Sula Sgeir SPA																
WDA-alone	No	Yes	**0.000**	**0.143**	**0.106**	**0.249**	**0.000**	**0.028**	**0.030**	**0.058**	**0.000**	**0.084**	**0.091**	**0.175**	**0.31**	**0.42**
West of Orkney	Yes	Yes				0.04				0.007				0.02	0.05	0.1
Annual total for North Rona and Sula Sgeir SPA						**0.29**				**0.07**				**0.19**	**0.35**	**0.48**

SPA / In-combination project	Season included for in-combination assessment? Yes/No		Collisions[a]				Lower Displacement (30% x 1%)[a]				Upper Displacement (30% x 3%)[a]				Total annual mortality	
	Breeding	Non-breeding	Breeding	Autumn	Spring	Annual	Breeding	Autumn	Spring	Annual	Breeding	Autumn	Spring	Annual	Collisions & Lower Displacement	Collisions & Upper Displacement
Rathlin Island SPA																
WDA-alone	Yes	Yes	**4.753**	**0.906**	**0.668**	**6.328**	**0.361**	**0.177**	**0.192**	**0.731**	**1.073**	**0.531**	**0.576**	**2.180**	**7.06**	**8.51**
Morecambe	Yes	Yes	0.96	0.09	0.01	1.06	Not assessed								1.1	1.1
Annual total for Rathlin Island SPA						**7.39**				**0.73**				**2.18**	**8.12**	**9.57**
Rum SPA																
WDA-alone	Yes	Yes	**0.199**	**0.090**	**0.066**	**0.356**	**0.015**	**0.018**	**0.019**	**0.052**	**0.045**	**0.053**	**0.057**	**0.155**	**0.41**	**0.51**
West of Orkney	Yes	Yes				0.01				0				0	0.01	0.01
Annual total for Rum SPA						**0.37**				**0.05**				**0.16**	**0.42**	**0.52**
Shiant Isles SPA																
WDA-alone	Yes	Yes	**0.065**	**0.063**	**0.046**	**0.174**	**0.005**	**0.012**	**0.013**	**0.031**	**0.015**	**0.037**	**0.040**	**0.091**	**0.20**	**0.27**
West of Orkney	Yes	Yes				0.02				0.003				0.01	0.02	0.03
Annual total for Shiant Isles SPA						**0.19**				**0.03**				**0.10**	**0.23**	**0.30**
Skomer, Skokholm and the Seas off Pembrokeshire SPA/ Sgomer, Sgogwm a Moroedd Penfro																
WDA-alone	No	Yes	**0.000**	**0.120**	**0.088**	**0.208**	**0.000**	**0.023**	**0.025**	**0.049**	**0.000**	**0.070**	**0.076**	**0.146**	**0.26**	**0.35**
Morcambe			0.05	0.01	0.01	0.07									0.1	0.1
Annual total for Skomer, Skokholm and the Seas off Pembrokeshire SPA						**0.28**				**0.05**				**0.15**	**0.33**	**0.42**
St Kilda SPA																
WDA-alone	Yes	Yes	**0.035**	**0.110**	**0.081**	**0.225**	**0.003**	**0.021**	**0.023**	**0.047**	**0.008**	**0.064**	**0.070**	**0.142**	**0.27**	**0.37**

SPA / In-combination project	Season included for in-combination assessment? Yes/No		Collisions[a]				Lower Displacement (30% x 1%)[a]				Upper Displacement (30% x 3%)[a]				Total annual mortality	
	Breeding	Non-breeding	Breeding	Autumn	Spring	Annual	Breeding	Autumn	Spring	Annual	Breeding	Autumn	Spring	Annual	Collisions & Lower Displacement	Collisions & Upper Displacement
Annual total for St Kilda SPA						**0.23**				**0.05**				**0.14**	**0.27**	**0.37**

[a] For in-combination projects, collision and displacement mortalities are presented in the representative project assessment (refer to data source in **Table 3**).

4.2 Guillemot

89. **Table 17** presents the list of SPAs designated for breeding guillemot located in the UK Western Waters BDMPS (**Table 1**) that have connectivity with the WDA in the breeding season (**Section 2.2.2.2**) and non-breeding season (**Section 2.2.3.2**).

90. Project lower and upper displacement mortality recorded for WDA-alone during the breeding season was apportioned to North Colonsay and Western Cliffs SPA and Rathlin Island SPA because both of these SPAs are within foraging range from the WDA (refer to **Technical Appendix 11.6: Apportioning for HRA**). As guillemots largely remain in the vicinity of their breeding colony in the non-breeding season (advised by NatureScot in their response to the Scoping Opinion (22 November 2024)), Project mortality recorded during the non-breeding season was also apportioned to the same two SPAs.

91. There are no other offshore windfarms within guillemot foraging range to North Colonsay and Western Cliffs SPA and Rathlin Island SPA to add to the in-combination assessment.

92. WDA-alone annual displacement mortality was highest for Rathlin Island SPA (estimated to be 175 and 385 mortalities per annum, for lower and upper impact scenarios, respectively) compared with North Colonsay and Western Cliffs SPA (estimated to be 121 and 222 mortalities per annum, for lower and upper impact scenarios, respectively).

Table 17: Guillemot in-combination displacement estimates. Grey cells indicate no data available. Special Protection Areas included for in-combination assessment are highlighted in yellow.

For the WDA-alone, displacement mortality (refer to Technical Appendix 11.4: Displacement respectively) was apportioned to SPAs using apportioning rates presented in Technical Appendix 11.6: Apportioning for HRA.

SPA / In-combination project	Season included for in-combination assessment? Yes/No		Lower Displacement (60% x 3%breeding / 1% non-breeding)			Upper Displacement (60% x 5% breeding / 3% non-breeding)		
	Breeding	Non-breeding	Breeding	Non-breeding	Annual	Breeding	Non-breeding	Annual
North Colonsay and Western Cliffs SPA								
WDA-alone	Yes	Yes	**105.47**	**15.41**	**120.88**	**175.8**	**46.22**	**222.02**
Annual total for North Colonsay and Western Cliffs SPA					**120.88**			**222.02**
Rathlin Island SPA								
WDA-alone	Yes	Yes	**106.01**	**69.34**	**175.35**	**176.7**	**208.02**	**384.72**
Annual total for Rathlin Island SPA					**175.35**			**384.72**

4.3 Razorbill

93. **Table 18** presents the list of SPAs designated for breeding razorbill located in the UK Western Waters BDMPS (**Table 1**) that have connectivity with the WDA and with in-combination offshore windfarms in the breeding season (**Section 2.2.2.2**) and/or non-breeding season (**Section 2.2.3.2**).

94. **Table 18** only includes SPAs that were screened into the in-combination assessment (refer to **Section 2.5.1**), i.e. SPAs are included where WDA-alone annual mortality is greater than or equal to 0.2 birds (refer to **Technical Appendix 11.6: Apportioning for HRA**).

95. Total in-combination annual displacement mortality from all offshore windfarms was highest at Rathlin Island SPA (estimated to be 25 and 47 mortalities per annum, for lower and upper impact scenarios, respectively), followed by Mingulay and Berneray SPA (estimated to be 11 and 23 mortalities per annum, for lower and upper impact scenarios, respectively).

Table 18: Razorbill in-combination displacement estimates. Grey cells indicate no data available. Special Protection Areas included for in-combination assessment are highlighted in yellow.

For the WDA-alone, displacement mortality (refer to Technical Appendix 11.4: Displacement respectively) was apportioned to SPAs using apportioning rates presented in Technical Appendix 11.6: Apportioning for HRA.

For in-combination projects, data sources of estimated displacement mortality are presented in Table 3.

SPA / In-combination project	Season included for in-combination assessment? Yes/No		Lower Displacement (60% x 3/1%)[a]					Upper Displacement (60% x 5/3%)[a]				
	Breeding	Non-breeding	Breeding	Autumn	Spring	Winter	Annual	Breeding	Autumn	Spring	Winter	Annual
Cape Wrath SPA												
WDA-alone	No	Yes	**0.00**	**0.13**	**0.28**	**0.15**	**0.56**	**0.00**	**0.38**	**0.84**	**0.46**	**1.68**
Awel y Mor	No	Yes					0					0
Burbo Bank Extension	No	Yes					0					0
Dublin Array	No	Yes	0.00	0.08	0.02	0.02	0.12	0.00	0.25	0.06	0.06	0.36
Erebus Floating Wind Demo	No	Yes					0.10 – 0.31					0.31 – 0.51
Mona	No	Yes					0.07 – 0.22					0.22 – 0.36
Morecambe	No	Yes					0.07 – 0.20					0.20 – 0.33
Morgan	No	Yes					0.02 – 0.05					0.05 – 0.09
Ormonde	No	Yes					0.01 – 0.02					0.02 – 0.03
Robin Rigg	No	Yes					0					0
Twin Hub	No	Yes					0					0
Walney (1,2)	No	Yes					0					0
Walney Extension (3,4)	No	Yes					0.10 – 0.31					0.31 – 0.51

SPA / In-combination project	Season included for in-combination assessment? Yes/No		Lower Displacement (60% x 3/1%)[a]					Upper Displacement (60% x 5/3%)[a]				
	Breeding	Non-breeding	Breeding	Autumn	Spring	Winter	Annual	Breeding	Autumn	Spring	Winter	Annual
West of Duddon Sands	No	Yes					0.01 – 0.02					0.02 – 0.03
White Cross	No	Yes					0.02 – 0.07					0.07 – 0.12
West of Orkney	Yes	Yes					0.14 – 0.41					0.41 – 0.69
Annual total for Cape Wrath SPA							**2.28**					**4.71**
Flannan Isles SPA												
WDA-alone	No	Yes	**0.00**	**0.06**	**0.14**	**0.08**	**0.28**	**0.00**	**0.19**	**0.42**	**0.23**	**0.84**
West of Orkney	No	Yes					0					0
Annual total for Flannan Isles SPA							**0.28**					**0.84**
Handa SPA												
WDA-alone	No	Yes	**0.00**	**0.31**	**0.7**	**0.38**	**1.38**	**0.00**	**0.93**	**2.09**	**1.13**	**4.15**
Awel y Mor	No	Yes					0					0
Burbo Bank Extension	No	Yes					0.01 – 0.02					0.02 – 0.03
Dublin Array	No	Yes	0.00	0.20	0.05	0.05	0.30	0.00	0.60	0.14	0.14	0.89
Erebus Floating Wind Demo	No	Yes					0.25 – 0.74					0.74 – 1.23
Mona	No	Yes					0.18 – 0.54					0.54 – 0.90
Morecambe	No	Yes					0.16 – 0.47					0.47 – 0.78
Morgan	No	Yes					0.04 – 0.13					0.13 – 0.21
Ormonde	No	Yes					0.01 – 0.04					0.04 – 0.06
Robin Rigg	No	Yes					0.01 – 0.02					0.02 – 0.03
Twin Hub	No	Yes					0.01 – 0.02					0.02 – 0.03

SPA / In-combination project	Season included for in-combination assessment? Yes/No		Lower Displacement (60% x 3/1%)[a]					Upper Displacement (60% x 5/3%)[a]				
	Breeding	Non-breeding	Breeding	Autumn	Spring	Winter	Annual	Breeding	Autumn	Spring	Winter	Annual
Walney (1,2)	No	Yes					0					0
Walney Extension (3,4)	No	Yes					0.25 – 0.76					0.76 – 1.26
West of Duddon Sands	No	Yes					0.01 – 0.04					0.04 – 0.06
White Cross	No	Yes					0.07 – 0.20					0.20 – 0.33
West of Orkney	Yes	Yes					0.11 – 0.34					0.34 – 0.57
Annual total for Handa SPA							**4.97**					**10.53**
Mingulay and Berneray SPA												
WDA-alone	Yes	Yes	**2.64**	**0.61**	**1.36**	**0.74**	**5.35**	**4.41**	**1.82**	**4.08**	**2.22**	**12.53**
Awel y Mor	No	Yes					0					0
Burbo Bank Extension	No	Yes					0.01 – 0.04					0.04 – 0.06
Dublin Array	No	Yes	0.00	0.40	0.09	0.09	0.60	0.00	1.19	0.28	0.28	1.75
Erebus Floating Wind Demo	No	Yes					0.47 – 1.42					1.42 – 2.37
Mona	No	Yes					0.35 – 1.06					1.06 – 1.77
Morecambe	No	Yes	0.00	0.14	0.08	0.10	0.31	0.00	0.41	0.23	0.29	0.94
Morgan	No	Yes					0.08 – 0.23					0.23 – 0.39
Ormonde	No	Yes					0.02 – 0.07					0.07 – 0.12
Robin Rigg	No	Yes					0.01 – 0.02					0.02 – 0.03
Twin Hub	No	Yes					0.01 – 0.02					0.02 – 0.03
Walney (1,2)	No	Yes					0					0
Walney Extension (3,4)	No	Yes					0.49 – 1.48					1.48 – 2.46

SPA / In-combination project	Season included for in-combination assessment? Yes/No		Lower Displacement (60% x 3/1%)[a]					Upper Displacement (60% x 5/3%)[a]				
	Breeding	Non-breeding	Breeding	Autumn	Spring	Winter	Annual	Breeding	Autumn	Spring	Winter	Annual
West of Duddon Sands	No	Yes					0.02 – 0.07					0.07 – 0.12
White Cross	No	Yes					0.13 – 0.38					0.38 – 0.63
West of Orkney	No	Yes					0					0
Annual total for Mingulay and Berneray SPA							**11.03**					**23.19**
North Rona and Sula Sgeir SPA												
WDA-alone	No	Yes	**0.00**	**0.07**	**0.15**	**0.08**	**0.30**	**0.00**	**0.2**	**0.44**	**0.24**	**0.87**
West of Orkney	Yes	Yes					0.003					0.01
Annual total for North Rona and Sula Sgeir SPA							**0.30**					**0.88**
Rathlin Island SPA												
WDA-alone	Yes	Yes	**12.20**	**0.92**	**2.07**	**1.13**	**16.32**	**20.36**	**2.77**	**6.22**	**3.38**	**32.72**
Awel y Mor	No	Yes					0					0
Burbo Bank Extension	No	Yes					0.02 – 0.05					0.05 – 0.09
Dublin Array	No	Yes	0.00	0.03	0.03	0.05	0.11	0.00	0.09	0.09	0.15	0.33
Erebus Floating Wind Demo	No	Yes					0.72 – 2.16					2.16 – 3.60
Mona	No	Yes					0.53 – 1.60					1.60 – 2.67
Morecambe	No	Yes					0.46 – 1.39					1.39 – 2.31
Morgan	No	Yes					0.11 – 0.34					0.34 – 0.57
Ormonde	No	Yes					0.03 – 0.09					0.09 – 0.15
Robin Rigg	No	Yes					0.01 – 0.04					0.04 – 0.06
Twin Hub	No	Yes					0.01 – 0.04					0.04 – 0.06

SPA / In-combination project	Season included for in-combination assessment? Yes/No		Lower Displacement (60% x 3/1%)[a]					Upper Displacement (60% x 5/3%)[a]				
	Breeding	Non-breeding	Breeding	Autumn	Spring	Winter	Annual	Breeding	Autumn	Spring	Winter	Annual
Walney (1,2)	No	Yes					0					0
Walney Extension (3,4)	No	Yes					0.74 – 2.23					2.23 – 3.72
West of Duddon Sands	No	Yes					0.04 – 0.11					0.11 – 0.18
White Cross	No	Yes					0.19 – 0.56					0.56 – 0.93
West of Orkney	No	Yes					0					0
Annual total for Rathlin Island SPA							**25.03**					**47.39**
Shiant Isles SPA												
WDA-alone	No	Yes	**0**	**0.26**	**0.57**	**0.31**	**1.14**	**0**	**0.76**	**1.72**	**0.93**	**3.41**
Awel y Mor	No	Yes					0					0
Burbo Bank Extension	No	Yes					0.01 – 0.02					0.02 – 0.03
Dublin Array	No	Yes	0.00	0.17	0.04	0.04	0.24	0.00	0.50	0.12	0.12	0.73
Erebus Floating Wind Demo	No	Yes					0.20 – 0.61					0.61 – 1.02
Mona	No	Yes					0.15 – 0.45					0.45 – 0.75
Morecambe	No	Yes					0.13 – 0.40					0.40 – 0.66
Morgan	No	Yes					0.03 – 0.09					0.09 – 0.15
Ormonde	No	Yes					0.01 – 0.04					0.04 – 0.06
Robin Rigg	No	Yes					0.01 – 0.02					0.02 – 0.03
Twin Hub	No	Yes					0.01 – 0.02					0.02 – 0.03
Walney (1,2)	No	Yes					0					0
Walney Extension (3,4)	No	Yes					0.21 – 0.63					0.63 – 1.05

SPA / In-combination project	Season included for in-combination assessment? Yes/No		Lower Displacement (60% x 3/1%)[a]					Upper Displacement (60% x 5/3%)[a]				
	Breeding	Non-breeding	Breeding	Autumn	Spring	Winter	Annual	Breeding	Autumn	Spring	Winter	Annual
West of Duddon Sands	No	Yes					0.01 – 0.04					0.04 – 0.06
White Cross	No	Yes					0.05 – 0.14					0.14 – 0.24
West of Orkney	No	Yes					0.04 – 0.11					0.11 – 0.18
Annual total for Shiant Isles SPA							**3.94**					**8.40**
Skomer, Skokholm and the Seas off Pembrokeshire SPA/ Sgomer, Sgogwm a Moroedd Penfro												
WDA-alone	No	Yes	**0**	**0.36**	**0.81**	**0.33**	**1.50**	**0**	**1.08**	**2.42**	**0.99**	**4.49**
Awel y mor	No	Yes					0.05 - 0.16					0.16 - 0.27
Burbo Bank	No	Yes					0					0
Burbo Bank Extension	No	Yes					0.01 - 0.02					0.02 – 0.03
Erebus	Yes	Yes					1.41 – 4.23					4.23 – 7.05
Gwynt y mor	No	Yes					0.01 – 0.04					0.04 – 0.06
Llyr	No	Yes					0.36 – 1.08					1.08 – 1.80
Mona	No	Yes					0.26 – 0.77					0.77 – 1.29
Morecambe	No	Yes	0	0.08	0.04	0.04	0.16	0	0.23	0.13	0.13	0.49
Morgan	No	Yes					0.14 – 0.43					0.43 – 0.72
Ormonde	No	Yes					0					0
Robin Rigg	No	Yes					0.01 – 0.02					0.02 – 0.03
Twin Hub	Yes	Yes					0.01 – 0.02					0.02 – 0.03
Walney (1,2)	No	Yes					0.01 – 0.04					0..04 – 0.06
Walney Extension (3,4)	No	Yes					0.31 – 0.92					0.92 – 1.53

SPA / In-combination project	Season included for in-combination assessment? Yes/No		Lower Displacement (60% x 3/1%)[a]					Upper Displacement (60% x 5/3%)[a]				
	Breeding	Non-breeding	Breeding	Autumn	Spring	Winter	Annual	Breeding	Autumn	Spring	Winter	Annual
West of Duddon Sands	No	Yes					0.02 – 0.05					0.05 – 0.09
West of Orkney	No	Yes					0.02 – 0.07					0.07 – 0.12
White Cross	Yes	Yes					0.28 - 0.85					0.85 – 1.41
Annual total for Skomer, Skokholm and the Seas off Pembrokeshire SPA/ Sgomer, Sgogwm a Moroedd Penfro							**10.36**					**19.47**
St Kilda SPA												
WDA-alone	No	Yes	**0**	**0.1**	**0.23**	**0.12**	**0.46**	**0**	**0.31**	**0.69**	**0.37**	**1.37**
West of Orkney	No	Yes					0					0
Annual total for St Kilda SPA							**0.46**					**1.37**

[a] For in-combination projects, displacement mortality values are calculated (breeding season = 60% displacement and 3%/5% for lower/upper scenarios respectively; non-breeding season = 60% displacement and 1%/3% for lower/upper scenarios respectively) from abundance values as reported in data source (**Table 3**). For projects where only an annual abundance value was available, the breeding and non-breeding mortality range is presented for lower and upper displacement, but for the purpose of calculating the total annual mortality for the SPA, the higher mortality value is included.

4.4 Puffin

96. **Table 19** presents the list of SPAs designated for breeding puffin located in the UK Western Waters BDMPS (**Table 1**) that have connectivity with the WDA and with in-combination offshore windfarms in the breeding season (**Section 2.2.2.2**) and/or non-breeding season (**Section 2.2.3.2**).

97. **Table 19** only includes SPAs that were screened into the in-combination assessment (refer to **Section 2.5.1**), i.e. SPAs are included where WDA-alone annual mortality is greater than or equal to 0.2 birds (refer to **Technical Appendix 11.6: Apportioning for HRA**).

98. Total in-combination annual displacement mortality from all offshore windfarms was highest at Sule Skerry and Sule Stack SPA (estimated to be 49 and 82 mortalities per annum, for lower and upper impact scenarios, respectively), followed by St Kilda SPA (estimated to be 3 and 7 mortalities per annum, for lower and upper impact scenarios, respectively).

Table 19: Puffin in-combination displacement estimates. Grey cells indicate no data available. Special Protection Areas included for in-combination assessment are highlighted in yellow.

For the WDA-alone, displacement mortality (refer to Technical Appendix 11.4: Displacement respectively) was apportioned to SPAs using apportioning rates presented in Technical Appendix 11.6: Apportioning for HRA.

For in-combination projects, data sources of estimated displacement mortality are presented in Table 3.

SPA / In-combination project	Season included for in-combination assessment? Yes/No		Lower Displacement (60% x 3/1%)[a]			Upper Displacement (60% x 5/3%)[a]		
	Breeding	Non-breeding	Breeding	Non-breeding	Annual	Breeding	Non-breeding	Annual
Canna and Sanday SPA								
WDA-alone	Yes	Yes	**0.466**	**0.008**	**0.474**	**0.775**	**0.024**	**0.800**
West of Orkney[b]	Yes	Yes			0			0
Annual total for Canna and Sanday SPA					**0.47**			**0.80**
Flannan Isles SPA								
WDA-alone	Yes	Yes	**0.730**	**0.133**	**0.863**	**1.214**	**0.396**	**1.611**
Morecambe	No	Yes	0	0.002	0.002	0	0.007	0.007
West of Orkney[b]	Yes	Yes			0			0.01
Annual total for Flannan Isles SPA					**0.87**			**1.63**
Mingulay and Berneray SPA								
WDA-alone	Yes	Yes	**0.247**	**0.027**	**0.273**	**0.410**	**0.079**	**0.490**
Annual total for Mingulay and Berneray SPA					**0.27**			**0.49**
Rathlin Island SPA								
WDA-alone	Yes	Yes	**0.247**	**0.006**	**0.253**	**0.411**	**0.018**	**0.429**
Morecambe	Yes	Yes	0.004	0	0.004	0.006	0	0.006

SPA / In-combination project	Season included for in-combination assessment? Yes/No		Lower Displacement (60% x 3/1%)[a]			Upper Displacement (60% x 5/3%)[a]		
	Breeding	Non-breeding	Breeding	Non-breeding	Annual	Breeding	Non-breeding	Annual
Annual total for Rathlin Island SPA					**0.26**			**0.43**
Shiant Isles SPA								
WDA-alone	Yes	Yes	**1.611**	**0.555**	**2.166**	**2.679**	**1.656**	**4.335**
Morecambe	No	Yes	0	0.01	0.01	0	0.03	0.03
West of Orkney[b]	Yes	Yes			0.01			0.02
Annual total for Shiant Isles SPA					**2.18**			**4.38**
Skomer, Skokholm and the Seas off Pembrokeshire SPA								
WDA-alone	No	Yes	**0.000**	**0.205**	**0.205**	**0.000**	**0.613**	**0.613**
Codling	Yes	Yes			0.31 – 0.92			0.92 – 1.53
Morecambe	Yes	Yes	0.38	0	0.38	0.63	0.01	0.64
Annual total for Skomer, Skokholm and the Seas off Pembrokeshire SPA					**1.50**			**2.78**
St Kilda SPA								
WDA-alone	Yes	Yes	**1.756**	**1.211**	**2.967**	**2.920**	**3.615**	**6.536**
Morecambe	No	Yes	0	0.02	0.02	0	0.06	0.06
West of Orkney[b]	Yes	Yes			0.02			0.05
Annual total for St Kilda SPA					**3.01**			**6.65**
Sule Skerry and Sule Stack SPA								
WDA-alone	No	Yes	**0.000**	**0.506**	**0.506**	**0.000**	**1.511**	**1.511**
Morecambe	No	Yes	0	0.01	0.01	0	0.03	0.03
West of Orkney[b]	Yes	Yes			48.5			80.9

SPA / In-combination project	Season included for in-combination assessment? Yes/No		Lower Displacement (60% x 3/1%)[a]			Upper Displacement (60% x 5/3%)[a]		
	Breeding	Non-breeding	Breeding	Non-breeding	Annual	Breeding	Non-breeding	Annual
Annual total for Sule Skerry and Sule Stack SPA					**49.10**			**82.44**

[a] For in-combination projects (except West of Orkney Offshore Wind Farm), displacement mortality values are calculated (breeding season = 60% displacement and 3%/5% for lower/upper scenarios respectively and non-breeding season = 60% displacement and 1%/3% for lower/upper scenarios respectively) from abundance values as reported in data source (**Table 3**).

[b] For West of Orkney Offshore Wind Farm, displacement mortality (including upper, 60% displacement x 5/3% mortality and lower, 60% displacement x 3/1% mortality)is presented in the West of Orkney Offshore Wind Farm assessment (**Table 3**).

4.5 Fulmar

99. **Table 20** presents St Kilda SPA designated for breeding fulmar located in the UK Western waters and Channel BDMPS (**Table 1**) that has connectivity with the WDA and with the West of Orkney Offshore Wind Farm in the breeding season (**Section 2.2.2.2**) and the non-breeding season (**Section 2.2.3.2**).

100. St Kilda SPA is the only SPA screened into the in-combination assessment for fulmar (refer to **Section 2.5.1**). WDA-alone annual mortality apportioned to all other SPAs designated for breeding fulmar within foraging range from the WDA (breeding season) and in the Western Waters and Channel BDMPS (non-breeding season) was less than 0.2 birds (refer to **Technical Appendix 11.6: Apportioning for HRA**).

101. In-combination mortality data was available for fulmar from the West of Orkney Offshore Wind Farm. NatureScot have only relatively recently requested that fulmar should be assessed for displacement mortality in offshore windfarm applications, therefore there are no other data available for fulmar from other offshore windfarms to include in the in-combination assessment. Total in-combination annual displacement mortality for St Kilda SPA was estimated to be less than one bird per annum, for lower and upper impact scenarios.

Table 20: Fulmar in-combination lower and upper displacement estimates.

For the WDA-alone, displacement mortality (refer to Technical Appendix 11.4: Displacement respectively) was apportioned to SPAs using apportioning rates presented in Technical Appendix 11.6: Apportioning for HRA.

For in-combination projects, data sources of estimated collision and displacement mortality are presented in Table 3.

SPA / In-combination project	Season included for in-combination assessment? Yes/No		Annual Lower Displacement (20% x 1%)[a]					Annual Upper Displacement (20% x 3%)[a]				
	Breeding	Non-breeding	Breeding	Autumn	Spring	Winter	Annual	Breeding	Autumn	Spring	Winter	Annual
St Kilda SPA												
WDA-alone	Yes	Yes	**0.011**	**0.02**	**0.05**	**0.02**	**0.09**	**0.028**	**0.05**	**0.13**	**0.05**	**0.253**
West of Orkney	Yes	Yes					0.144					0.433
Annual total for St Kilda SPA							**0.24**					**0.69**

[a] For West of Orkney Offshore Wind Farm, displacement mortality (including upper, 20% displacement x 3% mortality and lower, 20% displacement x 1% mortality) is presented in the West of Orkney Offshore Wind Farm assessment (**Table 3**).

4.6 Gannet

102. **Table 21** presents the list of SPAs designated for breeding gannet located in the UK Western Waters BDMPS (**Table 1**) that have connectivity with the WDA and with in-combination offshore windfarms in the breeding season (**Section 2.2.2.2**) and/or non-breeding season (**Section 2.2.3.2**).

103. **Table 21** only includes SPAs that were screened into the in-combination assessment (refer to **Section 2.5.1**), i.e. SPAs are included where WDA-alone annual mortality is greater than or equal to 0.2 birds (refer to **Technical Appendix 11.6: Apportioning for HRA**).

104. Total in-combination annual collision plus displacement mortality from all offshore windfarms was highest at Ailsa Craig SPA (estimated to be 23 and 36 mortalities per annum, for lower and upper impact scenarios, respectively), followed by St Kilda SPA (estimated to be 3 and 6 mortalities per annum, for lower and upper impact scenarios, respectively).

Table 21: Gannet in-combination collision and displacement estimates. Grey cells indicate no data available. Special Protection Areas included for in-combination assessment are highlighted in yellow.

For the WDA-alone, collision and displacement mortality (refer to Technical Appendix 11.3: Collision Risk Modelling and Technical Appendix 11.4: Displacement respectively) was apportioned to SPAs using apportioning rates presented in Technical Appendix 11.6: Apportioning for HRA.

For in-combination projects, data sources of estimated collision and displacement mortality are presented in Table 3.

SPA / In-combination project	Season included for in-combination assessment? Yes/No		Collisions[a]				Lower Displacement (70% x 1%)				Upper Displacement (70% x 3%)				Total annual mortality	
	Breeding	Non-breeding	Breeding	Autumn	Spring	Annual	Breeding	Autumn	Spring	Annual	Breeding	Autumn	Spring	Annual	Collisions & Lower Displacement	Collisions & Upper Displacement
Ailsa Craig SPA																
WDA-alone	Yes	Yes	**3.67**	**0.025**	**0.045**	**3.74**	**0.82**	**0.11**	**0.08**	**1.01**	**2.44**	**0.32**	**0.24**	**2.99**	**4.75**	**6.73**
Awel y Mor	Yes	Yes				1.8									1.8	1.8
Burbo Extension	Yes	Yes				1.1									1.1	1.1
Erebus	Yes	Yes				0.4									0.4	0.4
Mona[c]	Yes	Yes				0.8	1.0	0.0	0.0	1.0	3.0	0.0	0.0	3.0	1.8	3.8
Morecambe[b]	Yes	Yes	0.83	0.01	0	0.84	3.8	0.9	0.1	4.7	11.4	2.6	0.2	14.1	5.6	15.0
Morgan	Yes	Yes				0.8									0.8	0.8
Ormonde	Yes	Yes				1									1.0	1.0
Twin Hub	Yes	Yes				0.3									0.3	0.3
Walney Extension (3,4)	Yes	Yes				4.6									4.6	4.6
White Cross	Yes	Yes				0.1									0.1	0.1

SPA / In-combination project	Season included for in-combination assessment? Yes/No		Collisions[a]				Lower Displacement (70% x 1%)				Upper Displacement (70% x 3%)				Total annual mortality	
	Breeding	Non-breeding	Breeding	Autumn	Spring	Annual	Breeding	Autumn	Spring	Annual	Breeding	Autumn	Spring	Annual	Collisions & Lower Displacement	Collisions & Upper Displacement
West of Orkney	Yes	Yes				0.5									0.5	0.5
Annual total for Ailsa Craig SPA						**15.98**				**6.72**				**20.12**	**22.70**	**36.10**
Grassholm SPA																
WDA-alone	Yes	Yes	**0.18**	**0.036**	**0.065**	**0.28**	**0.04**	**0.16**	**0.12**	**0.32**	**0.12**	**0.46**	**0.34**	**0.92**	**0.60**	**1.21**
Mona[c]	Yes	Yes					0.3	0.0	0.0	0.3	0.9	0.0	0.0	0.9	0.3	0.9
Morecambe[b]	Yes	Yes	0	0	0	0	0.0	0.01	0.0	0.0	0.0	0.04	0.0	0.04	0.01	0.04
Annual total for Grassholm SPA						**0.28**				**0.63**				**1.86**	**0.92**	**2.14**
North Rona and Sula Sgeir SPA																
WDA-alone	Yes	Yes	**0.14**	**0.008**	**0.015**	**0.16**	**0.03**	**0.03**	**0.03**	**0.09**	**0.09**	**0.10**	**0.08**	**0.27**	**0.25**	**0.43**
Mona	No	Yes					0			0	0			0	0	0
Morecambe[b]	No	Yes	0	0	0	0	0.0	0.03	0.0	0.03	0.0	0.1	0.0	0.1	0.03	0.1
Annual total for North Rona and Sula Sgeir SPA						**0.16**				**0.12**				**0.35**	**0.28**	**0.52**
St Kilda SPA																
WDA-alone	Yes	Yes	**2.14**	**0.049**	**0.099**	**2.29**	**0.48**	**0.22**	**0.18**	**0.88**	**1.42**	**0.63**	**0.52**	**2.57**	**3.17**	**4.86**
Mona[c]	Yes	Yes					0.1			0.1	0.3			0.3	0.1	0.3
Morecambe[b]	No	Yes	0	0.03	0	0.03	0	0.2	0.01	0.2	0	0.5	0.02	0.5	0.2	0.6
Annual total for St Kilda SPA						**2.32**				**1.16**				**3.40**	**3.47**	**5.71**
Sule Skerry and Sule Stack SPA																
WDA-alone	Yes	Yes	**0.1**	**0.004**	**0.008**	**0.11**	**0.02**	**0.02**	**0.01**	**0.05**	**0.07**	**0.05**	**0.04**	**0.16**	**0.16**	**0.26**

SPA / In-combination project	Season included for in-combination assessment? Yes/No		Collisions[a]				Lower Displacement (70% x 1%)				Upper Displacement (70% x 3%)				Total annual mortality	
	Breeding	Non-breeding	Breeding	Autumn	Spring	Annual	Breeding	Autumn	Spring	Annual	Breeding	Autumn	Spring	Annual	Collisions & Lower Displacement	Collisions & Upper Displacement
Morecambe[b]	No	Yes	**0**	**0**	**0**	**0**	**0**	**0.01**	**0**	**0.01**	**0**	**0.04**	**0**	**0.04**	**0.01**	**0.04**
Annual total for Sule Skerry and Sule Stack SPA						**0.11**				**0.06**				**0.20**	**0.18**	**0.31**

[a] For in-combination projects, collision mortality is presented in the representative in-combination project assessment (**Table 3**).

[b] For Morecambe Offshore Wind Farm, displacement mortality values are calculated (70% displacement and 1%/3% for lower/upper scenarios respectively) from abundance values as reported in data source (**Table 3**).

[c] For Mona Offshore Wind Farm, displacement mortality is presented in the representative in-combination project assessment (**Table 3**).

5.0 References

Furness, R. W. (2015). Non-breeding season populations of seabirds in UK waters: Population sizes for Biologically Defined Minimum Population Scales (BDMPS). Natural England Commissioned Reports, 164.

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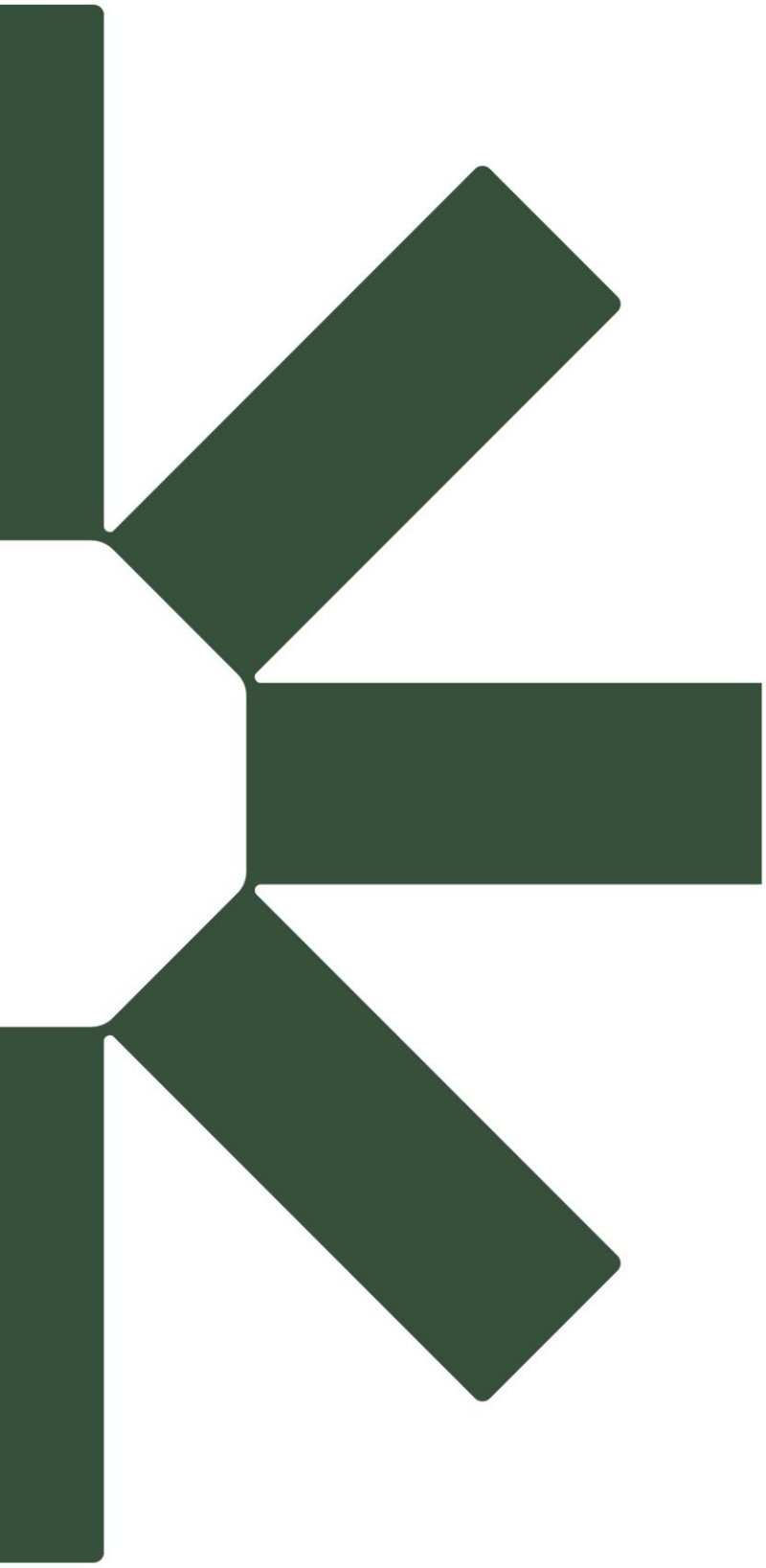

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