Partners in UK offshore wind

MORGAN OFFSHORE WIND PROJECT: GENERATION ASSETS

Displacement Rates Clarification Note

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Image of an offshore wind farm

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Glossary

Term	Meaning
Applicant	Morgan Offshore Wind Limited.
Avoidance	Probability that a bird takes successful evasive action to avoid collision with a turbine.
Biologically Defined Minimum Population Scales	Seasonal subdivision of bird population size. The rationale behind these subdivisions is that the likely origin of a bird in a particular location depends on the time of year.
Disturbance sensitivity	Disturbance by wind farm structures, ship and helicopter traffic factor used scores from 1 (limited escape behaviour and a very short flight distance when approached), to 5 (strong escape behaviour, at a large response distance).
Development Consent Order (DCO)	An order made under the Planning Act 2008 granting development consent for a Nationally Significant Infrastructure Project (NSIP).
Morgan Array Area	The area within which the wind turbines, foundations, inter-array cables, interconnector cables, scour protection, cable protection and offshore substation platforms (OSPs) forming part of the Morgan Offshore Wind Project: Generation Assets will be located.
Morgan Offshore Wind Project: Generation Assets	This is the name given to the Morgan Generation Assets project as a whole (includes all infrastructure and activities associated with the project construction, operations and maintenance, and decommissioning).
Parameter	Parameters are the input elements of a model that together affect the output of a model. In collision risk models, examples of parameters are the number of wind turbines and the length of the bird.
Season	Bird behaviour and abundance is recognised to differ across a calendar year, with particular months recognised as being part of different seasons. The biologically defined minimum population scales (BDMPS) seasons used in this report are based on those in Furness (2015), hereafter referred to as seasons. Separate seasons are recognised in this technical report in order to establish the level of importance any seabird species has within the study area during any particular period of time.

Acronyms

Acronym	Description
AEOI	Adverse Effect on Integrity
BDMPS	Biologically Defined Minimum Population Scales
EWG	Expert Working Group
HRA	Habitats Regulations Assessment
ImpUDis	Improving understanding of distributional change for relevant seabird species
JNCC	Joint Nature Conservation Committee
LSE	Likely Significant Effect
NRW	Natural Resources Wales
OWF	Offshore Wind Farm
SNCB	Statutory Nature Conservation Body
SPA	Special Protected Area

Units

Unit	Description
%	Percentage
SD	Standard Deviation
km	Kilometres

1 DISPLACEMENT RATES CLARIFICATION NOTE

1.1 Introduction

1.1.1.1 This document has been prepared in response to Relevant Representations received from Natural England (RR-026; comment number B33, B34, B35, B47, B48) and Natural Resources Wales (NRW) (RR-027; comment number 26, 27 and 34) (see Table 1.1). These comments focussed on the displacement and mortality rates used to inform assessments of displacement on relevant qualifying features of designated sites in HRA Stage 2 information to support an appropriate assessment Part Three: Special Protection Areas and Ramsar Site assessments (APP-098).

1.1.1.2 As part of the Applicant's response to Natural England's and NRW's Relevant Representations (RR-026 and RR-027 respectively), it was stated that a document would be submitted at Deadline 1, which considered the implications on the conclusions reached in HRA Stage 2 information to support an appropriate assessment Part Three: Special Protection Areas and Ramsar Site assessments (APP-098) of incorporating additional displacement and mortality rates.

1.1.1.3 This clarification note considers the implications of incorporating additional displacement and mortality rates for those qualifying features of designated sites that may be impacted by displacement that were considered in HRA Stage 2 information to support an appropriate assessment Part Three: Special Protection Areas and Ramsar Site assessments (APP-098).

1.1.1.4 This exercise has been undertaken to illustrate that the use of those alternative rates, where higher, do not change the conclusions of HRA Stage 2 information to support an appropriate assessment Part Three: Special Protection Areas and Ramsar Site assessments (APP-098), in relation to the conclusions of no adverse effect on integrity.

Table 1.1: Relevant representations received from relevant consultees

Consultee	Relevant representation comment number	Relevant representation comment	Relevant representation recommendation
Natural England (RR-026)	B33	The Applicant presents evidence relating to displacement of auks to justify the consideration of 50% displacement rates and 1% mortality rates in the assessment, drawing on APEM (2002) and MacArthur Green (2023). Natural England do not agree with the Applicant's interpretation of this evidence, and especially that it supports a claim that auks are not displaced by OWFs. We highlight that the Beatrice OWF study was principally focussed on auk responses to individual turbines i.e. those auks that were not displaced rather than those that were, and did not assess avoidance of the array as a whole in a way that is compatible with the impact assessment methodology. I.e., test for a reduction in abundance/density within the array and 2km buffer. However, while abundance increased in the post operational period over the whole study area, the proportion of the auk population within the array area (generally) decreased, indicative of a displacement effect.	With respect to recent literature of relevance to the assessment of displacement impacts on auks Natural England would highlight that a recent study in the German North Sea suggested that displacement of auks could be occurring at much greater distances from OWFs (up to 19.5 km) than are currently considered by best practice impact assessments (Peschko *et al*, 2024). Natural England reiterate that our advice remains evidence based, and we take a complete view of that evidence in forming our guidance and advice. We question the characterisation of our advice as being "precautionary" compared to the Applicants "more evidence based" approach. An apparently limited or selective appraisal of relevant evidence has been made. Further, we suggest that some questionable and misleading conclusions have been drawn from the Applicants review. Natural England therefore advise that SNCB guidance is followed throughout the assessments so we can provide our advice into the Examination.

Consultee	Relevant representation comment number	Relevant representation comment	Relevant representation recommendation
	B34	Natural England do not consider there to be any convincing evidence that is broadly supportive of auk displacement from OWFs being a short-term effect, or that birds will habituate to them. Natural England do accept that there is a large degree of uncertainty regarding displacement rates and effects. We would highlight our proposal to the Offshore Renewables Joint Industry Project (ORJIP), subsequently accepted and now being contracted, for a project to help address this, Improving understanding of distributional change for relevant seabird species (ImpUDis), though unfortunately this will not report during the Examination of this project.	Although we hope that new evidence will reduce uncertainty with respect to displacement effects and impact assessment, at present, SNCB guidance remains unchanged. Natural England are not persuaded that the Applicant presents any evidence that challenges the validity of that guidance.
	B35	“The EWG recommended the use of a 30-70% displacement rate range and a 1-10% displacement rate range. NatureScot advise a 30% displacement rate and 1% to 3% mortality rate for kittiwake in both the breeding and nonbreeding season (Nature Scot, 2023) and when following joint SNCB guidance (JNCC et al., 2022) a 10-30% displacement rate range would be used. In light of this guidance and additional evidence stated, for the purpose of this assessment, precautionary rates of 50% (range 30% to 70%) for displacement and 1% (range 1% to 10%) for mortality have been used for the operations and maintenance phase of the Morgan Generation Assets. Given that the displacement rate used for the	We do not consider this an accurate reflection of the EWG advice. Natural England and NRW advised that displacement was not assessed for kittiwake. Therefore Natural England will not review or consider the findings of the displacement assessment for kittiwake.

Consultee	Relevant representation comment number	Relevant representation comment	Relevant representation recommendation
		construction phase is a 50% reduction from the operational phase displacement rate, the rate used for kittiwake during the construction phase is 25% (range 15% to 35%) as agreed with the SNCBs in the second EWG (held on 13/07/2022)."	
	B47	In the Applicants 'Assessment of potential Adverse Effect on Integrity - Integrity test: Step 1' they propose preferred "evidence-based" displacement and mortality rates. Furthermore, the apportioned impacts from displacement and resulting increases to baseline mortality presented and assessed in the Step 1 assessment of the HRA Stage 2 ISSA Part 3 (SPAs and Ramsars) are based solely on the Applicant's preferred displacement (50%) and mortality (1%) rates. Natural England do not consider this approach to be appropriate. We continue to advocate for a range based approach to displacement assessments to capture the very high levels of uncertainty in potential rates of both displacement and mortality. We would highlight that this approach is evidence-based and consider that it better reflects the relatively data poor nature of offshore impact assessment.	Natural England advise that the project fully considers the SNCB advised ranges of displacement and mortality rates in all assessments.
	B48	The Applicant presents an evidence review to justify the consideration of a 50% displacement rate to calculate impacts for assessment against baseline mortality in the Step 1 integrity test. Natural England are not persuaded that the evidence presented is sufficient to justify the Applicants position and highlight that a comprehensive evidence review has not been undertaken. Further, we suggest that the interpretation of some evidence is questionable. E.g., the Applicant concludes that evidence gathered at Beatrice OWF suggests "these species are not displaced by offshore wind farms". Natural England strongly disagree with this interpretation of the evidence, see our previous comment, NE Ref: B33. The Applicant goes on to state, "evidence suggests that although auk species are somewhat sensitive to displacement, the effects are short-term, and studies indicate auk habituation to offshore windfarms." Natural England consider it to be quite clear	Natural England advise that a range of displacement rates should be considered (30-70%) throughout the assessments.

Consultee	Relevant representation comment number	Relevant representation comment	Relevant representation recommendation
		that there is insufficient evidence to draw any broadly applicable conclusions relating to habituation of auks to OWFs over time and would urge restraint in making unsubstantiated claims relating to birds potentially being habituated to OWFs in the region. Finally, we note that some recent studies that do not present such an optimistic view of auk displacement impacts have not been considered. E.g., Peschko *et al* (2024) found displacement impacts could be occurring over much greater distances (~20km) than are considered by best practice impact assessments in English waters (2km).	
Natural Resources Wales (RR-027)	26	The apportioned impacts from displacement and resulting % increases to baseline mortality presented and assessed in the Step 1 assessment of the HRA Stage 2 ISSA Part 3 (SPAs and Ramsars) [APP-098] are based on the Applicant's considered appropriate % displacement and % mortality rates only.	To account for uncertainty in displacement and mortality rates we recommend that apportioned impacts and associated increases in baseline mortality across the range of SNCB advised % displacement and % mortality are also presented and considered in the assessments.
	27	The Applicant has chosen to support their assessment on auk displacement by referencing Trinder *et al*. (2024) but has fundamentally misunderstood the conclusions of the study. The study did not assess macro-avoidance in a way that is compatible with impact assessment methodology, i.e., testing for a reduction in abundance/density within the array and 2km buffer. While the study did show abundance increased in the post-operational period over the whole study area, the proportion of the auk population within the array area showed a decrease, indicative of a displacement effect. Therefore, the statement made by the Applicant in paragraph 15.3.9 of AP-098 that "The abundance of both guillemot and razorbill increased significantly from the pre-construction period into the post-construction period. This would suggest that these species are not displaced by offshore wind farms…" is incorrect.	NRW advise that it would be beneficial if the Applicant critically review a wider scope of evidence for points they are trying to emphasise and present the full study conclusions in their assessments and reference appropriately, rather than selectively appraise the limited scope of evidence that has been presented.
	34	Additionally, the predicted impacts are based solely on the Applicant's preferred ranges of % displacement and % mortality rates for displacement and no consideration has been made of the ranges of predicted displacement impacts as advised by the	We again note that the apportioned collision predictions based on the full SNCB input parameters should be provided.

Consultee	Relevant representation comment number	Relevant representation comment	Relevant representation recommendation
		SNCBs. It is also unclear as to the input parameters (particularly avoidance rates and flight speeds) that the apportioned collision predictions are based on.	

2 METHODOLOGY

2.1.1.1 HRA Stage 2 information to support an appropriate assessment Part Three: Special Protection Areas and Ramsar Site assessments (APP-098) presented a two step process for assessment. The first step presented a high-level assessment which calculated the potential impact of the Morgan Generation Assets on each SPA and compared this to the baseline mortality for the relevant SPA population of a feature. The second step presented a detailed assessment for those SPAs for which the predicted impact, from either the Morgan Generation Assets alone or in-combination with other plans and projects surpassed defined thresholds. The following Step 1 criteria were used to identify features for inclusion in Step 2:

- Where the predicted impact represented less than a 0.05% increase in the baseline mortality of the SPA population, from the Morgan Generation Assets alone, the SPA was discounted from further consideration and a conclusion of no adverse effect reached.
- Where the predicted impact for the Morgan Generation Assets alone represented more than a 1% increase in the baseline mortality of the affected population, the feature was progressed to Step 2 of HRA Stage 2 information to support an appropriate assessment Part Three: Special Protection Areas and Ramsar Site assessments (APP-098).
- Where the predicted impact for the Morgan Generation Assets alone represented more than a 0.05% increase in the baseline mortality of the affected population but less than a 1% increase, consideration was given to the existing in-combination impact on that feature.
  - Where the in-combination impact represented less than a 1% increase in the baseline mortality of the affected population, a conclusion of no adverse effect was reached.
  - Where the in-combination impact represented more than a 1% increase in the baseline mortality of the affected population the feature was progressed to Step 2 of HRA Stage 2 information to support an appropriate assessment Part Three: Special Protection Areas and Ramsar Site assessments (APP-098).

2.1.1.2 The impacts incorporated into HRA Stage 2 information to support an appropriate assessment Part Three: Special Protection Areas and Ramsar Site assessments (APP-098) for those features vulnerable to displacement were calculated using evidence-based displacement rates, following JNCC *et al.* (2022) guidance. This report repeats the assessment approach applied in HRA Stage 2 information to support an appropriate assessment Part Three: Special Protection Areas and Ramsar Site assessments (APP-098) utilising those rates incorporated into the Secretary of State's HRA as part of the Sheringham Shoal Extension and Dudgeon Extension offshore wind farms and Hornsea Four offshore wind farm decision for guillemot, razorbill and gannet. Whilst not explicitly considered in the Secretary of State's HRA for the aforementioned projects, these rates are also considered applicable to the other species incorporated into the displacement assessments for the Morgan Generation Assets (see paragraph 2.1.1.6).

2.1.1.3 This report therefore repeats Step 1 and assesses all SPAs for which the criteria identified above are met in Step 2 incorporating both displacement impacts alone and, where relevant, displacement and collision impacts combined, applying these alternative rates. In Step 1, collision risk estimates are calculated applying the

parameters recommended by the EWG, following the approach taken in HRA Stage 2 information to support an appropriate assessment Part Three: Special Protection Areas and Ramsar Site assessments (APP-098). In Step 2, a range of collision risk estimates are presented, incorporating the parameters recommended by the EWG and the Applicant. These parameters can be found in Volume 4, Annex 5.3 Offshore ornithology collision risk modelling technical report (APP-055).

2.1.1.4 In Step 2, the impact of the Morgan Generation Assets alone and the Morgan Generation Assets in-combination with other plans and projects is considered, where the relevant criteria are met. The in-combination assessment follows the methodology applied in HRA Stage 2 information to support an appropriate assessment Part Three: Special Protection Areas and Ramsar Site assessments (APP-098).

2.1.1.5 The assessments undertaken for gannet by the Applicant in HRA Stage 2 information to support an appropriate assessment Part Three: Special Protection Areas and Ramsar Site assessments (APP-098) use displacement and mortality rates identical to those applied by the Secretary of State for the aforementioned projects and therefore gannet is not included in this report.

2.1.1.6 The Secretary of State's HRAs for the aforementioned projects consider displacement impacts on guillemot, razorbill and gannet. Kittiwake, Manx shearwater and fulmar are species of less concern in relation to displacement impacts as illustrated in section 5 and Table 1 of JNCC *et al.* (2022) which identify species of divers and seaducks, guillemot, razorbill and puffin as priority species for displacement assessments, and the vulnerability of each species to displacement defined in Wade *et al.* (2016). It is therefore considered appropriate to apply the upper displacement rate in the range recommended by the EWG alongside the mortality rate defined for guillemot and razorbill in the Secretary of State's HRA as part of the Sheringham Shoal Extension and Dudgeon Extension offshore wind farms and Hornsea Four offshore wind farm decision. A comparison of these displacement and mortality rates is provided in Table 2.1.

Table 2.1: Displacement and mortality rates used in HRA Stage 2 information to support an appropriate assessment Part Three: Special Protection Areas and Ramsar Site assessments (APP-098) and in this clarification note.

Species	Displacement rate (%)		Mortality rate (%)	
	HRA Stage 2 information to support an appropriate assessment Part Three: Special Protection Areas and Ramsar Site assessments (APP-098)	Secretary of State's HRAs as part of the Sheringham Shoal Extension and Dudgeon Extension and Hornsea Four	HRA Stage 2 information to support an appropriate assessment Part Three: Special Protection Areas and Ramsar Site assessments (APP-098)	Secretary of State's HRAs as part of the Sheringham Shoal Extension and Dudgeon Extension and Hornsea Four
Kittiwake	50	70	1	2
Guillemot	50	70	1	2
Razorbill	50	70	1	2
Fulmar	10	10	1	2
Manx shearwater	50	70	1	2

2.2 ISAA Step 1

2.2.1 Kittiwake

2.2.1.1 Step 1 of HRA Stage 2 information to support an appropriate assessment Part Three: Special Protection Areas and Ramsar Site assessments (APP-098) identified that the in-combination impact calculated for the Ireland's Eye SPA and Cape Wrath SPA exceeded a 1% increase in the baseline mortality of the SPA population. These two SPAs were therefore assessed in Step 2 of HRA Stage 2 information to support an appropriate assessment Part Three: Special Protection Areas and Ramsar Site assessments (APP-098) and are therefore not presented in the tables below or considered further in this section.

2.2.1.2 The apportioned impact for all other SPAs for which LSE was identified in HRA Stage 1 Screening Report (APP-099) has been calculated and compared to the baseline mortality of kittiwake at the SPA (Table 2.2).

Table 2.2: Predicted impact of the Morgan Generation Assets on SPAs at which kittiwake is a qualifying feature for which LSE was identified in HRA Stage 1 Screening Report (APP-099).

SPA	Displacement rate = 70% Mortality rate = 2%		Conclusion reached in HRA Stage 2 information to support an appropriate assessment Part Three: Special Protection Areas and Ramsar Site assessments (APP-098)
	Predicted impact (collision plus displacement)	% of baseline mortality	
Lambay Island	0.7	0.07	No AEOI - Increase in baseline mortality associated with the Morgan Generation Assets alone did not surpass a 0.05% increase in baseline mortality.
Howth Head Coast	0.5	0.10	No AEOI – Increase in baseline mortality associated with the Morgan Generation Assets alone surpassed a 0.05% increase in baseline mortality however the in-combination effect did not exceed the 1% baseline mortality threshold.
Ailsa Craig	0.1	0.06	No AEOI - Increase in baseline mortality associated with the Morgan Generation Assets alone did not surpass a 0.05% increase in baseline mortality.
Wicklow Head	0.1	0.05	
Rathlin Island	1.4	0.04	
Flamborough and Filey Coast	1.4	0.01	
Skomer, Skokholm and the Seas off Pembrokeshire / Sgomer, Sgogwm a moroedd Benfro	0.1	0.03	
North Colonsay and Western Cliffs	0.6	0.06	
Saltee Islands	0.1	0.04	
Buchan Ness to Collieston Coast	0.5	0.01	
Troup, Pennan and Lion's Heads	0.5	0.02	
East Caithness Cliffs	1.5	0.02	
West Westray	0.4	0.05	

2.2.1.3 An increase in the baseline mortality of the SPA population of over 0.05% due to impacts from the Morgan Generation Assets alone is therefore identified for:

- Lambay Island SPA
- Howth Head Coast SPA
- Ailsa Craig SPA
- Wicklow Head SPA
- North Colonsay and Western Cliffs SPA

- West Westray SPA.

2.2.1.4 The in-combination impacts on these SPAs are now considered (Table 2.3) with any impact exceeding a 1% increase in baseline mortality progressed to Step 2.

Table 2.3: Predicted in-combination impact on SPAs at which kittiwake is a qualifying feature for which the impact from the Morgan Generation Assets represents more than a 0.05% increase in baseline mortality.

SPA	In-combination impact (no. of birds)			Increase in baseline mortality (%)
	Displacement	Collision	Total	
Lambay Island	3.3	3.7	7.0	0.72
Howth Head Coast	2.6	2.7	5.3	1.03
Ailsa Craig	0.4	0.7	1.1	0.74
Wicklow Head	0.5	0.7	1.2	0.59
North Colonsay and Western Cliffs	1.9	3.4	5.3	0.54
West Westray	3.2	1.7	4.4	0.54

2.2.1.5 An increase in baseline mortality of over 1% is therefore identified for the Howth Head Coast SPA which is progressed to Step 2.

2.2.2 Guillemot

2.2.2.1 Step 1 of HRA Stage 2 information to support an appropriate assessment Part Three: Special Protection Areas and Ramsar Site assessments (APP-098) identified that the in-combination impact calculated for the Flannan Isles SPA exceeded a 1% increase in the baseline mortality of the SPA population. This SPA was therefore assessed in Step 2 of HRA Stage 2 information to support an appropriate assessment Part Three: Special Protection Areas and Ramsar Site assessments (APP-098) and is therefore not considered further in this section.

2.2.2.2 The apportioned impact for all other SPAs for which LSE was identified in HRA Stage 1 Screening Report (APP-099) has been calculated and compared to the baseline mortality of guillemot at the SPA (Table 2.4).

Table 2.4: Predicted impact of the Morgan Generation Assets on SPAs at which guillemot is a qualifying feature for which LSE was identified in HRA Stage 1 Screening Report (APP-099).

SPA	Displacement rate = 70% Mortality rate = 2%		Conclusion reached in HRA Stage 2 information to support an appropriate assessment Part Three: Special Protection Areas and Ramsar Site assessments (APP-098)
	Predicted impact	% of baseline mortality	
Lambay Island	3.1	0.06	No AEOI - Increase in baseline mortality associated with the Morgan Generation Assets alone did not surpass a 0.05% increase in baseline mortality.
Rathlin Island	8.2	0.07	
Skomer, Skokholm and the Seas off Pembrokeshire / Sgomer, Sgogwm a moroedd Benfro	1.4	0.05	
North Colonsay and Western Cliffs	1.3	0.08	
Saltee Islands	1.1	0.05	
Mingulay and Berneray	1.2	0.04	
Handa	3.4	0.07	
St Kilda	1.4	0.11	
Cape Wrath	2.4	0.08	
Sule Skerry and Sule Stack	0.7	0.09	

2.2.2.3 An increase in the baseline mortality of the SPA population of over 0.05% due to impacts from the Morgan Generation Assets alone is therefore identified for:

- Lambay Island SPA
- Rathlin Island SPA
- Skomer, Skokholm and the Seas off Pembrokeshire / Sgomer, Sgogwm a moroedd Benfro SPA
- North Colonsay and Western Cliffs SPA
- Saltee Islands SPA
- Handa SPA
- St Kilda SPA
- Cape Wrath SPA
- Sule Skerry and Sule Stack SPA.

2.2.2.4 The in-combination impacts on these SPAs are now considered (Table 2.5) with any impact exceeding a 1% increase in baseline mortality progressed to Step 2.

Table 2.5: Predicted in-combination impact on SPAs at which guillemot is a qualifying feature for which the impact from the Morgan Generation Assets represents more than a 0.05% increase in baseline mortality.

SPA	In-combination impact (no. of birds)	Increase in baseline mortality (%)
Lambay Island	46.3	0.95
Rathlin Island	121.5	0.99
Skomer, Skokholm and the Seas off Pembrokeshire / Sgomer, Sgogwm a moroedd Benfro	129.2	4.87
North Colonsay and Western Cliffs	18.8	1.23
Saltee Islands	16.3	0.77
Handa	51.5	1.09
St Kilda	20.7	1.67
Cape Wrath	38.9	1.25
Sule Skerry and Sule Stack	112.2	15.25

2.2.2.5 An increase in baseline mortality of over 1% is therefore identified for the following SPAs which are progressed to Step 2:

- Skomer, Skokholm and the Seas off Pembrokeshire / Sgomer, Sgogwm a moroedd Benfro SPA
- North Colonsay and Western Cliffs SPA
- Handa SPA
- St Kilda SPA
- Cape Wrath SPA
- Sule Skerry and Sule Stack SPA

2.2.3 Razorbill

2.2.3.1 No SPAs at which razorbill is a qualifying feature for which LSE was identified in HRA Stage 1 Screening Report (APP-099) were progressed to Step 2 of HRA Stage 2 information to support an appropriate assessment Part Three: Special Protection Areas and Ramsar Site assessments (APP-098). The apportioned impact to each of these SPAs has been calculated and compared to the baseline mortality of razorbill at the SPA (Table 2.4).

Table 2.6: Predicted impact of the Morgan Generation Assets on SPAs at which razorbill is a qualifying feature for which LSE was identified in HRA Stage 1 Screening Report (APP-099).

SPA	Displacement rate = 70% Mortality rate = 2%		Conclusion reached in HRA Stage 2 information to support an appropriate assessment Part Three: Special Protection Areas and Ramsar Site assessments (APP-098)
	Predicted impact	% of baseline mortality	
Lambay Island	0.4	0.03	No AEOI - Increase in baseline mortality associated with the Morgan Generation Assets alone did not surpass a 0.05% increase in baseline mortality.
Rathlin Island	1.0	0.02	
Skomer, Skokholm and the Seas off Pembrokeshire / Sgomer, Sgogwm a moroedd Benfro	0.3	0.02	
Saltee Islands	0.3	0.04	
Mingulay and Berneray	0.7	0.02	
The Shiant Isles	0.3	0.02	
Handa	0.3	0.03	

2.2.3.2 The impact from the Morgan Generation Assets apportioned to each SPA represents less than a 0.05% increase in baseline mortality for all SPAs for which LSE was identified in HRA Stage 1 Screening Report (APP-099). No adverse effect on the integrity of these SPAs is therefore concluded, consistent with the conclusion reached in HRA Stage 2 information to support an appropriate assessment Part Three: Special Protection Areas and Ramsar Site assessments (APP-098).

2.2.4 Fulmar

2.2.4.1 No SPAs at which fulmar is a qualifying feature for which LSE was identified in HRA Stage 1 Screening Report (APP-099) were progressed to Step 2 of HRA Stage 2 information to support an appropriate assessment Part Three: Special Protection Areas and Ramsar Site assessments (APP-098). The apportioned impact to what is for this species a single SPAs, St Kilda, has been calculated and compared to the baseline mortality of fulmar at the SPA (Table 2.4).

Table 2.7: Predicted impact of the Morgan Generation Assets on the SPA at which fulmar is a qualifying feature for which LSE was identified in HRA Stage 1 Screening Report (APP-099).

SPA	Displacement rate = 10%, Mortality rate = 10%		Conclusion reached in HRA Stage 2 information to support an appropriate assessment Part Three: Special Protection Areas and Ramsar Site assessments (APP-098)
	Predicted impact	% of baseline mortality	
St Kilda	0.2	0.01	No AEOI - Increase in baseline mortality associated with the Morgan Generation Assets alone did not surpass a 0.05% increase in baseline mortality.

2.2.4.2 The impact from the Morgan Generation Assets apportioned to the St Kilda SPA represents less than a 0.05% increase in baseline mortality. No adverse effect on the integrity of the St Kilda SPA is therefore concluded, consistent with the conclusion reached in HRA Stage 2 information to support an appropriate assessment Part Three: Special Protection Areas and Ramsar Site assessments (APP-098).

2.2.5 Manx shearwater

2.2.5.1 No SPAs at which Manx shearwater is a qualifying feature for which LSE was identified HRA Stage 1 Screening Report (APP-099) were progressed to Step 2 of HRA Stage 2 information to support an appropriate assessment Part Three: Special Protection Areas and Ramsar Site assessments (APP-098). The apportioned impact to each of these SPAs has been calculated and compared to the baseline mortality of Manx shearwater at the SPA (Table 2.4).

Table 2.8: Predicted impact of the Morgan Generation Assets on SPAs at which Manx shearwater is a qualifying feature for which LSE was identified in HRA Stage 1 Screening Report (APP-099).

SPA	Displacement rate = 70% Mortality rate = 2%		Conclusion reached in HRA Stage 2 information to support an appropriate assessment Part Three: Special Protection Areas and Ramsar Site assessments (APP-098)
	Predicted impact	% of baseline mortality	
Copeland Islands	0.7	0.05	No AEOI - Increase in baseline mortality associated with the Morgan Generation Assets alone did not surpass a 0.05% increase in baseline mortality.
Glannau Aberdaron ac Ynys Enlli/Aberdaron Coast and Bardsey Island	1.8	0.03	
Skomer, Skokholm and the Seas off Pembrokeshire / Sgomer, Sgogwm a moroedd Benfro	18.9	0.02	
Rum	3.5	<0.01	
Isles of Scilly	<0.1	<0.01	
St Kilda	0.1	0.01	

2.2.5.2 An increase in the baseline mortality of the SPA population of over 0.05% due to impacts from the Morgan Generation Assets alone is therefore identified for the Copeland Islands SPA. The in-combination impact on this SPA is now considered (Table 2.9) with any impact exceeding a 1% increase in baseline mortality progressed to Step 2.

Table 2.9: Predicted in-combination impact on SPAs at which Manx shearwater is a qualifying feature for which the impact from the Morgan Generation Assets represents more than a 0.05% increase in baseline mortality.

SPA	In-combination impact (no. of birds)	Increase in baseline mortality (%)
Copeland Islands	7.4	0.58

2.2.5.3 The predicted in-combination impact for Manx shearwater at the Copeland Islands SPA represents less than a 1% increase in the baseline mortality of the SPA population. No adverse effect on the integrity of the Copeland Islands SPA is therefore concluded, consistent with the conclusion reached in HRA Stage 2 information to support an appropriate assessment Part Three: Special Protection Areas and Ramsar Site assessments (APP-098).

3 ISAA STEP 2

3.1 Approach to assessment

3.1.1.1 The assessment approach in the following SPA feature-specific sections follows that applied in HRA Stage 2 information to support an appropriate assessment Part Three: Special Protection Areas and Ramsar Site assessments (APP-098) using three in-combination scenarios. This process is described in Section 1.6.3 of HRA Stage 2 information to support an appropriate assessment Part Three: Special Protection Areas and Ramsar Site assessments (APP-098).

3.2 SPAs and features for consideration

3.2.1.1 Based on the exercise conducted in section 2.2, the following SPAs and associated features have been identified as requiring further consideration in Step 2 of the ISAA process:

- Kittiwake at the Howth Head Coast SPA
- Guillemot at the Skomer, Skokholm and the Seas off Pembrokeshire / Sgomer, Sgogwm a moroedd Benfro SPA
- Guillemot at the North Colonsay and Western Cliffs SPA
- Guillemot at the Handa SPA
- Guillemot at the St Kilda SPA
- Guillemot at the Cape Wrath SPA
- Guillemot at the Sule Skerry and Sule Stack SPA.

3.2.1.2 In addition, the following SPAs and associated features were included in HRA Stage 2 information to support an appropriate assessment Part Three: Special Protection Areas and Ramsar Site assessments (APP-098) as the 1% baseline mortality threshold was surpassed when applying the Applicant's evidence-based displacement and mortality rates:

- Kittiwake at the Ireland's Eye SPA and North-west Irish Sea SPA
- Kittiwake at the Cape Wrath SPA
- Guillemot at the Flannan Isles SPA.

3.2.1.3 This clarification note repeats these assessments but applying the Secretary of State's displacement and mortality rates.

3.2.1.4 For all of the SPA feature combinations identified above, there is no impact of using the Secretary of State's displacement and mortality rates on Scenario 1 of the in-combination assessment which considered the impact of the Morgan Generation Assets and Morgan and Morecambe Transmission Assets. The conclusions reached in HRA Stage 2 information to support an appropriate assessment Part Three: Special Protection Areas and Ramsar Site assessments (APP-098) in relation to Scenario 1 of the in-combination assessments for these SPAs therefore remains valid and is not discussed further in this report.

3.2.1.5 The following sections provide assessments for each SPA feature drawing on the information presented for similar SPAs in HRA Stage 2 information to support an

appropriate assessment Part Three: Special Protection Areas and Ramsar Site assessments (APP-098).

3.3 Kittiwake

3.3.1 Ireland's Eye SPA and North-west Irish Sea SPA

3.3.1.1 An assessment for kittiwake at the Ireland's Eye SPA and North-west Irish Sea SPA was included in HRA Stage 2 information to support an appropriate assessment Part Three: Special Protection Areas and Ramsar Site assessments (APP-098). This assessment is repeated utilising the displacement impacts calculated in this report. Please refer to quoted tables in HRA Stage 2 information to support an appropriate assessment Part Three: Special Protection Areas and Ramsar Site assessments (APP-098) for a full breakdown of relevant in-combination impacts.

3.3.1.2 The North-west Irish Sea SPA is designated to protect important areas utilised by species breeding at adjacent breeding SPAs as well as the wintering areas of a number of other species. In relation to kittiwake this includes the following SPAs: Lambay Island SPA, Ireland's Eye SPA and Howth Head Coast SPA. Whilst the assessments focus on the Ireland's Eye SPA, the conclusions reached for the kittiwake population at this SPA are also considered applicable to the North-west Irish Sea SPA.

Scenario 2: Morgan Generation Assets together with the Morecambe Offshore Windfarm Generation Assets and the Morgan and Morecambe Offshore Wind Farms: Transmission Assets

3.3.1.3 The total population of birds present at the Morgan Generation Assets and Morecambe Generation Assets apportioned to the kittiwake population at the Ireland's Eye SPA and North-west Irish Sea SPA is 61.4 birds (see Table 1.79 of HRA Stage 2 information to support an appropriate assessment Part Three: Special Protection Areas and Ramsar Site assessments (APP-098)). When applying a displacement rate of 70% and mortality rate of 2%, the displacement mortality associated with Scenario 2 is 0.9 birds/annum. When combined with collision impacts apportioned to this SPA (see Table 1.61 of HRA Stage 2 information to support an appropriate assessment Part Three: Special Protection Areas and Ramsar Site assessments (APP-098)) this provides a combined in-combination impact of 1.0 to 1.3 birds/annum[1]. This represents a 0.74 to 0.99% increase in the baseline mortality of the kittiwake population at the SPA.

3.3.1.4 Based on the approach taken in the integrity test: Step 1 (see paragraph 2.1.1.1) this is not considered to represent an adverse effect on the site integrity of the kittiwake feature of the Ireland's Eye SPA and North-west Irish Sea SPA.

Scenario 3: Tier 1, Tier 2 and Tier 3: Morgan Generation Assets together with the Morgan and Morecambe Offshore Wind Farms: Transmission Assets and other relevant projects and plans

3.3.1.5 The total population of birds present at the Morgan Generation Assets and other projects apportioned to the kittiwake population at the Ireland's Eye SPA and North-west Irish Sea SPA is 116.0 birds (see Table 1.79 of HRA Stage 2 information to

[1] Range reflects the collision risk estimates reflecting the EWG and Applicant's recommended modelling parameters

support an appropriate assessment Part Three: Special Protection Areas and Ramsar Site assessments (APP-098)). When applying a displacement rate of 70% and mortality rate of 2%, the displacement mortality associated with Scenario 3 is 1.6 birds/annum. When combined with collision impacts apportioned to this SPA (see Table 1.61 of HRA Stage 2 information to support an appropriate assessment Part Three: Special Protection Areas and Ramsar Site assessments (APP-098)) this provides a combined in-combination impact of 2.1 to 3.3 birds/annum. This represents a 1.58 to 2.47% increase in the baseline mortality of the kittiwake population at the SPA.

3.3.1.6 As discussed in HRA Stage 2 information to support an appropriate assessment Part Three: Special Protection Areas and Ramsar Site assessments (APP-098) there are a number of reasons why the predicted impact presented above is considered to represent an over-estimate (see paragraphs 1.6.3.50 to 1.6.3.54 and 1.6.3.121 to 1.6.3.123 of HRA Stage 2 information to support an appropriate assessment Part Three: Special Protection Areas and Ramsar Site assessments (APP-098)). When these elements of the assessment are taken into account it is considered that the collision total associated with the Morgan Generation Assets in-combination with other projects will not surpass the 1% baseline mortality threshold of the kittiwake population at the SPA. Following the methodology applied in the integrity test: Step 1 it is therefore considered that there is no AEOI of the Ireland's Eye SPA and North-west Irish Sea SPA as a result of in-combination combined displacement and collision impacts on kittiwake.

3.3.2 Cape Wrath SPA

3.3.2.1 An assessment for kittiwake at the Cape Wrath SPA was included in HRA Stage 2 information to support an appropriate assessment Part Three: Special Protection Areas and Ramsar Site assessments (APP-098). This assessment is repeated utilising the displacement impacts calculated in this report. Please refer to quoted tables in HRA Stage 2 information to support an appropriate assessment Part Three: Special Protection Areas and Ramsar Site assessments (APP-098) for a full breakdown of relevant in-combination impacts.

Scenario 2: Morgan Generation Assets together with the Morecambe Offshore Windfarm Generation Assets and the Morgan and Morecambe Offshore Wind Farms: Transmission Assets

3.3.2.2 The total population of birds present at the Morgan Generation Assets and Morecambe Generation Assets apportioned to the kittiwake population at the Cape Wrath SPA is 83.2 birds (see Table 1.83 of HRA Stage 2 information to support an appropriate assessment Part Three: Special Protection Areas and Ramsar Site assessments (APP-098)). When applying a displacement rate of 70% and mortality rate of 2%, the displacement mortality associated with Scenario 2 is 1.2 birds/annum. When combined with collision impacts apportioned to this SPA (see Table 1.66 of HRA Stage 2 information to support an appropriate assessment Part Three: Special Protection Areas and Ramsar Site assessments (APP-098)) this provides a combined in-combination impact of 1.4 to 2.0 birds/annum. This represents a 0.13 to 0.19% increase in the baseline mortality of the kittiwake population at the SPA.

3.3.2.3 Based on the approach taken in the integrity test: Step 1 this is not considered to represent an adverse effect on the site integrity of the kittiwake feature of the Ireland's Eye SPA and North-west Irish Sea SPA.

Scenario 3: Tier 1, Tier 2 and Tier 3: Morgan Generation Assets together with the Morgan and Morecambe Offshore Wind Farms: Transmission Assets and other relevant projects and plans

3.3.2.4 The total population of birds present at the Morgan Generation Assets and other projects apportioned to the kittiwake population at the Cape Wrath SPA is 410.9 birds (see Table 1.83 of HRA Stage 2 information to support an appropriate assessment Part Three: Special Protection Areas and Ramsar Site assessments (APP-098)). When applying a displacement rate of 70% and mortality rate of 2%, the displacement mortality associated with Scenario 3 is 5.8 birds/annum. When combined with collision impacts apportioned to this SPA (see Table 1.66 of HRA Stage 2 information to support an appropriate assessment Part Three: Special Protection Areas and Ramsar Site assessments (APP-098)) this provides a combined in-combination impact of 9.0 to 16.6 birds/annum. This represents a 0.85 to 1.57% increase in the baseline mortality of the kittiwake population at the SPA.

3.3.2.5 As discussed in HRA Stage 2 information to support an appropriate assessment Part Three: Special Protection Areas and Ramsar Site assessments (APP-098) there are a number of reasons why the predicted impact presented above is considered to represent an over-estimate (see paragraphs 1.6.3.66 to 1.6.3.70 and 1.6.3.134 to 1.6.3.136 of HRA Stage 2 information to support an appropriate assessment Part Three: Special Protection Areas and Ramsar Site assessments (APP-098)). When these elements of the assessment are taken into account it is considered that the collision total associated with the Morgan Generation Assets in-combination with other projects will not surpass the 1% baseline mortality threshold of the kittiwake population at the SPA. Following the methodology applied in the integrity test: Step 1 it is therefore considered that there is no AEOI of the Cape Wrath SPA as a result of in-combination combined displacement and collision impacts on kittiwake.

3.3.3 Howth Head Coast SPA

3.3.3.1 An assessment for the kittiwake feature of the Howth Head Coast SPA was not required in HRA Stage 2 information to support an appropriate assessment Part Three: Special Protection Areas and Ramsar Site assessments (APP-098) as the predicted impact did not meet relevant assessment criteria. As these criteria have been met in this report a full assessment is provided.

3.3.3.2 Based on the mean-maximum foraging range +1SD of kittiwake (Woodward et al., 2019) from the Howth Head Coast SPA, there are numerous projects within foraging range of kittiwake from the SPA during the breeding season. In the non-breeding season, there are additional projects within the BDMPS of relevance to the species (Furness, 2015).

3.3.3.3 Table 3.1 presents the seasonal abundance values for use in displacement analyses and collision risk estimates to be considered in-combination. For displacement, population estimates represent the number of kittiwake from the Howth Head Coast SPA.

3.3.3.4 Apportioning values for the breeding season have been taken from project-specific documentation, where available. If unavailable an apportioning value from the nearest project for which an apportioning value is available has been applied. In the non-breeding season, apportioning values calculated using information from Furness (2015) has been applied to collision risk estimates from all projects.

Table 3.1: Cumulative abundance for kittiwake at the Howth Head Coast SPA for projects considered in-combination in relation to disturbance and displacement from projects.

Project	Seasonal apportioning values			Seasonal abundance values			Seasonal apportioned collision values (99.79% avoidance rate) (collision risk estimates calculated using a 99.28% avoidance rate shown in brackets in total row)		
	Breeding	**Post-breeding**	**Pre-breeding**	**Breeding**	**Post-breeding**	**Pre-breeding**	**Breeding**	**Post-breeding**	**Pre-breeding**
Awel y Môr	0.020	0.002	0.002	9.5	0.3	0.8	0.1	0.0	0.0
Burbo Bank Extension	0.027	0.002	0.002	35.2	0.4	0.3	0.2	0.0	0.0
Erebus	0.033	0.002	0.002	0.1	3.1	1.0	0.0	0.0	0.0
Mona Offshore Wind Project	0.018	0.002	0.002	6.4	0.9	1.8	0.0	0.0	0.0
Morecambe Offshore Wind Farm: Generation Assets	0.027	0.002	0.002	70.1	3.9	1.1	0.1	0.0	0.0
Morgan Generation Assets	0.027	0.002	0.002	13.5	1.8	1.6	0.0	0.0	0.0
Ormonde	0.027	0.002	0.002	1.6	Unavailable		0.0	0.0	0.0
Rampion	No connectivity	0.002	0.002	-	0.7	0.8	-	0.0	0.0
Rampion 2	No connectivity	0.002	0.002	-	0.1	0.6	-	0.0	0.0
Robin Rigg	0.027	0.002	0.002	4.3	Unavailable		Unavailable		
Twinhub	No connectivity	0.002	0.002	-	0.2	0.0	-	0.0	0.0

Project	Seasonal apportioning values			Seasonal abundance values			Seasonal apportioned collision values (99.79% avoidance rate) (collision risk estimates calculated using a 99.28% avoidance rate shown in brackets in total row)		
	Breeding	**Post-breeding**	**Pre-breeding**	**Breeding**	**Post-breeding**	**Pre-breeding**	**Breeding**	**Post-breeding**	**Pre-breeding**
Walney 3 & 4	0.027	0.002	0.002	4.3	1.0	0.7	0.2	0.0	0.0
West of Duddon Sands	0.027	0.002	0.002	12.1	Unavailable		Unavailable		
West of Orkney	No connectivity	0.002	0.002	-	0.0	2.5	0.0	0.0	0.0
White Cross	0.033	0.002	0.002	1.2	0.1	0.9	0.0	0.0	0.0
Annual totals									
Scenario 2				**92.1**			**0.1 (0.7)**		
Scenario 3				**183.0**			**0.7 (2.7)**		

Scenario 1: Morgan Generation Assets together with the Morgan and Morecambe Offshore Wind Farms: Transmission Assets

3.3.3.5 Connectivity was identified between the Howth Head Coast SPA and the Morgan and Morecambe Offshore Wind Farms: Transmission Assets in the non-breeding season only. The screening report for the Morgan and Morecambe Offshore Wind Farms: Transmission Assets concluded that the area affected by the project would represent a negligible proportion of the area available to seabirds in the non-breeding season with many species migrating to areas outside of the Irish Sea. It is considered highly unlikely that the project area will provide a material contribution to any existing impact in the non-breeding season and therefore LSE is discounted for any SPA for which potential connectivity has been identified in the non-breeding seasons only. There is therefore considered to be no change to the assessments conducted in the Integrity test: Step 1 for the Morgan Generation Assets alone and a conclusion of no adverse effect on the integrity of the guillemot feature of the Howth Head Coast SPA is reached.

Scenario 2: Morgan Generation Assets together with the Morecambe Offshore Windfarm Generation Assets and the Morgan and Morecambe Offshore Wind Farms: Transmission Assets

3.3.3.6 When using a displacement rate of 70% and mortality rate of 2%, the displacement mortality associated with Scenario 2 is 1.3 birds/annum. When combined with collision impacts this provides a combined in-combination impact of 1.4 to 2.0 birds/annum. This represents a 0.28 to 0.38% increase in the baseline mortality of the kittiwake population at the SPA.

3.3.3.7 Based on the approach taken in the integrity test: Step 1 this is not considered to represent an adverse effect on the site integrity of the kittiwake feature of the Howth Head Coast SPA.

Scenario 3: Tier 1, Tier 2 and Tier 3: Morgan Generation Assets together with the Morgan and Morecambe Offshore Wind Farms: Transmission Assets and other relevant projects and plans

3.3.3.8 The total population of birds present at the Morgan Generation Assets and other projects apportioned to the kittiwake population at the Howth Head Coast SPA is 183.0 birds (Table 3.1). When applying a displacement rate of 70% and mortality rate of 2%, the displacement mortality associated with Scenario 3 is 2.6 birds/annum. When combined with collision impacts this provides a combined in-combination impact 3.3 to 5.3 birds/annum. This represents a 0.64 to 1.03% increase in the baseline mortality of the kittiwake population at the SPA.

3.3.3.9 As discussed in HRA Stage 2 information to support an appropriate assessment Part Three: Special Protection Areas and Ramsar Site assessments (APP-098) for the assessments for kittiwake at the Ireland's Eye SPA and North-west Irish Sea SPA and Cape Wrath SPA, there are a number of reasons why the predicted impact presented above is considered to represent an over-estimate (see paragraphs 1.6.3.50 to 1.6.3.54, 1.6.3.66 to 1.6.3.70, 1.6.3.121 to 1.6.3.123 and 1.6.3.134 to 1.6.3.136 of HRA Stage 2 information to support an appropriate assessment Part Three: Special Protection Areas and Ramsar Site assessments (APP-098)). When these elements of the assessment are taken into account it is considered that the total impact associated with the Morgan

Generation Assets in-combination with other projects will not surpass the 1% baseline mortality threshold of the kittiwake population at the SPA. Following the methodology applied in the integrity test: Step 1 it is therefore considered that there is no AEOI of the Howth Head Coast SPA as a result of in-combination combined displacement and collision impacts on kittiwake.

3.4 Guillemot

3.4.1 Flannan Isles SPA

3.4.1.1 An assessment for guillemot at the Flannan Isles SPA was included in HRA Stage 2 information to support an appropriate assessment Part Three: Special Protection Areas and Ramsar Site assessments (APP-098). This assessment is repeated utilising the displacement impacts calculated in this report. Please refer to quoted tables in HRA Stage 2 information to support an appropriate assessment Part Three: Special Protection Areas and Ramsar Site assessments (APP-098) for a full breakdown of relevant in-combination impacts.

Scenario 2: Morgan Generation Assets together with the Morecambe Offshore Windfarm Generation Assets and the Morgan and Morecambe Offshore Wind Farms: Transmission Assets

3.4.1.2 The total population of birds present at the Morgan Generation Assets and Morecambe Generation Assets apportioned to the guillemot population at the Flannan Isles SPA is 187.6 birds (see Table 1.54 of HRA Stage 2 information to support an appropriate assessment Part Three: Special Protection Areas and Ramsar Site assessments (APP-098)). When applying a displacement rate of 70% and mortality rate of 2%, the displacement mortality associated with Scenario 2 is 2.6 birds/annum. This represents a 0.57% increase in the baseline mortality of the guillemot population at the SPA. This is not considered to represent an adverse effect on the site integrity of the guillemot feature of the Flannan Isles SPA.

Scenario 3: Tier 1, Tier 2 and Tier 3: Morgan Generation Assets together with the Morgan and Morecambe Offshore Wind Farms: Transmission Assets and other relevant projects and plans

3.4.1.3 The total population of birds present at the Morgan Generation Assets and other projects apportioned to the guillemot population at the Flannan Isles SPA is 910.1 birds (see Table 1.54 of HRA Stage 2 information to support an appropriate assessment Part Three: Special Protection Areas and Ramsar Site assessments (APP-098)). When applying a displacement rate of 70% and mortality rate of 2%, the displacement mortality associated with Scenario 2 is 13.0 birds/annum. This represents a 2.81% increase in the baseline mortality of the guillemot population at the SPA.

3.4.1.4 The Flannan Isles SPA is located over 450 km from the closest project considered in the in-combination assessment. The current approach to apportioning in the non-breeding season assumes that birds within the BDMPS areas defined in Furness (2015) are equally distributed. This therefore assumes that birds from northern Scotland are as likely to occur in the Celtic Sea as birds from colonies in the Celtic Sea. Recent work, tracking guillemot populations at Colonsay, Treshnish, Whinnyfold and the Isle of May during the non-breeding

season has provided information on the non-breeding season movements and distribution of guillemot from these colonies (Buckingham *et al*., 2022). Although the locations highlighted in Buckingham *et al*. (2022) are broadly comparable with previous ring recovery data they provide much more detail on non-breeding movements. Buckingham *et al.* (2022) recorded more northerly core distributions in guillemots during moult and mid-winter, and distributions were more constrained than in previous studies indicating that the assumption of equal distribution throughout the BDMPS areas defined by Furness (2015) represent considerable over-estimates in areas of sea located away from the colony of interest.

3.4.1.5 Birds from Colonsay, which is located to the south of the Flannan Isles, showed some connectivity with the Irish Sea in August but then very little for the rest of the non-breeding season. The core colony distributions for birds from the Treshnish Isles, which is also located to the south of the Flannan Isles but to the north of Colonsay were outwith the Irish Sea. As the Flannan Isles are located to the north of Treshnish it is considered unlikely that birds from this SPA will show any appreciable connectivity with the Irish Sea and the in-combination impact is therefore significantly lower than predicted in this report. It should be noted that the Buckingham *et al*. (2022) study tracks breeding birds, which, from the colonies from which birds were tracked, appear to show limited connectivity with the Irish Sea, whereas site-specific surveys undertaken to characterise the baseline at the Morgan Generation Assets also include non-breeding birds (immature and sabbatical birds) and breeding birds from local colonies (although note these are limited in number in the Irish Sea.

3.4.1.6 In addition, it should be noted that NatureScot (2023) identifies guillemot as an exception to the approach applied in HRA Stage 1 Screening Report (APP-099) to identify connectivity in the non-breeding season (i.e. the use of the BDMPS areas in Furness (2015)) instead advising that connectivity in the non-breeding season should be identified between a project and any SPA found within the mean maximum foraging range plus 1 standard deviation for guillemot. This is based on studies such as Buckingham *et al*. (2022), which, as discussed above identified that in the non-breeding season guillemot largely remain in the broad vicinity of their breeding colonies. If this approach were to be applied there would be no connectivity between the Flannan Isles SPA and the Morgan Generation Assets and therefore the Morgan Generation Assets would not contribute to any in-combination impact.

3.4.1.7 Based on that information it is considered that the displacement mortality for guillemot will not surpass the 1% threshold of baseline mortality for the SPA population. Based on the approach taken in the integrity test: Step 1 this is not considered to represent an adverse effect on the site integrity of the guillemot feature of the Flannan Isles SPA.

3.4.2 Skomer, Skokholm and the Seas off Pembrokeshire / Sgomer, Sgogwm a moroedd Benfro SPA

3.4.2.1 An assessment for the guillemot feature of the Skomer, Skokholm and the Seas off Pembrokeshire / Sgomer, Sgogwm a moroedd Benfro SPA was not required in HRA Stage 2 information to support an appropriate assessment Part Three: Special Protection Areas and Ramsar Site assessments (APP-098) as the predicted impact did not meet relevant assessment criteria. As these criteria have been met in this report a full assessment is provided.

3.4.2.2 Based on the mean-maximum foraging range +1SD of guillemot (Woodward et al., 2019) from the Skomer, Skokholm and the Seas off Pembrokeshire / Sgomer, Sgogwm a moroedd Benfro SPA, the Erebus and White Cross projects are within foraging range of guillemot from the SPA during the breeding season. In the non-breeding season, there are numerous projects within the BDMPS of relevance to the species (Furness, 2015).

3.4.2.3 Table 3.2 presents the seasonal population estimates for each project. These values represent the number of guillemot from the Skomer, Skokholm and the Seas off Pembrokeshire / Sgomer, Sgogwm a moroedd Benfro SPA. Apportioning values for the breeding season have been taken from project-specific documentation, where available. If unavailable an apportioning value from the nearest project for which an apportioning value is available has been applied. In the non-breeding season, apportioning values calculated using information from Furness (2015) has been applied to collision risk estimates from all projects.

Table 3.2: Cumulative abundance for guillemot at the Skomer, Skokholm and the Seas off Pembrokeshire / Sgomer, Sgogwm a moroedd Benfro SPA for projects considered in-combination in relation to disturbance and displacement from projects.

Project	Seasonal apportioning values		Seasonal abundance values	
	Breeding	**Non-breeding**	**Breeding**	**Non-breeding**
Awel y Môr	No connectivity	0.026	-	75.2
Burbo Bank Extension	No connectivity	0.026	-	40.2
Erebus	0.754	0.026	5,278.8	729.8
Mona Offshore Wind Project	No connectivity	0.026	-	96.7
Morecambe Offshore Wind Farm: Generation Assets	No connectivity	0.026	-	196.9
Morgan Generation Assets	No connectivity	0.026	-	98.5
Twinhub	No connectivity	0.026	-	5.6
Walney 3 & 4	No connectivity	0.026	-	49.6
West of Orkney	No connectivity	0.026	-	113.1
White Cross	0.754	0.026	2,491.2	27.3
Annual totals				
Scenario 2			**295.4**	
Scenario 3			**9,203.0**	

Scenario 1: Morgan Generation Assets together with the Morgan and Morecambe Offshore Wind Farms: Transmission Assets

3.4.2.4 Connectivity was identified between the Skomer, Skokholm and the Seas off Pembrokeshire / Sgomer, Sgogwm a moroedd Benfro SPA and the Morgan and Morecambe Offshore Wind Farms: Transmission Assets in the non-breeding

season only. The screening report for the Morgan and Morecambe Offshore Wind Farms: Transmission Assets concluded that the area affected by the project would represent a negligible proportion of the area available to seabirds in the non-breeding season with many species migrating to areas outside of the Irish Sea. It is considered highly unlikely that the project area will provide a material contribution to any existing impact in the non-breeding season and therefore LSE is discounted for any SPA for which potential connectivity has been identified in the non-breeding seasons only. There is therefore considered to be no change to the assessments conducted in the Integrity test: Step 1 for the Morgan Generation Assets alone and a conclusion of no adverse effect on the integrity of the guillemot feature of the Skomer, Skokholm and the Seas off Pembrokeshire / Sgomer, Sgogwm a moroedd Benfro SPA is reached.

Scenario 2: Morgan Generation Assets together with the Morecambe Offshore Windfarm Generation Assets and the Morgan and Morecambe Offshore Wind Farms: Transmission Assets

3.4.2.5 When using a displacement rate of 70% and mortality rate of 2%, the displacement mortality associated with Scenario 2 is 4.1 birds/annum. This represents a 0.15% increase in the baseline mortality of the guillemot population at the SPA. This is not considered to represent an adverse effect on the site integrity of the guillemot feature of the Skomer, Skokholm and the Seas off Pembrokeshire / Sgomer, Sgogwm a moroedd Benfro SPA.

Scenario 3: Tier 1, Tier 2 and Tier 3: Morgan Generation Assets together with the Morgan and Morecambe Offshore Wind Farms: Transmission Assets and other relevant projects and plans

3.4.2.6 When using a displacement rate of 70% and mortality rate of 2%, the displacement mortality associated with Scenario 3 is 129.2 birds/annum. This represents a 4.87% increase in the baseline mortality of the guillemot population at the SPA. The majority of the predicted impact comes from the Erebus and White Cross projects (approximately 92%) with the Morgan Generation Assets contributing approximately 1.5% of the total in-combination impact.

3.4.2.7 The current approach to apportioning in the non-breeding season assumes that birds within the BDMPS areas defined in Furness (2015) are equally distributed. This therefore assumes that birds from northern Scotland (e.g. St Kilda, Handa, etc.) are as likely to occur in the Irish Sea as birds from colonies in the Celtic Sea (e.g. Skomer and Skokholm). Recent work, tracking guillemot populations at Colonsay, Treshnish, Whinnyfold and the Isle of May during the non-breeding season has provided information on the non-breeding season movements and distribution of guillemot from these colonies (Buckingham *et al.,* 2022).. The areas within which birds from the colonies are distributed during the non-breeding season are significantly more constrained than the BDMPS areas defined in Furness (2015). Although birds from the Skomer, Skokholm and the Seas off Pembrokeshire / Sgomer, Sgogwm a moroedd Benfro SPA were not tracked as part of this study it is a reasonable assumption that the non-breeding distribution of these birds is also more constrained than the assumption of equal distribution throughout the BDMPS areas defined by Furness (2015). The apportioning values calculated from the populations presented in Furness (2015) would therefore represent considerable over-estimates for colonies that are distant from the project(s) of interest. Following this logic would mean that the

contribution of the Morgan Generation Assets to the Skomer, Skokholm and the Seas off Pembrokeshire / Sgomer, Sgogwm a moroedd Benfro SPA is negligible.

3.4.2.8 The most recent assessment for guillemot at the Skomer, Skokholm and the Seas off Pembrokeshire / Sgomer, Sgogwm a moroedd Benfro SPA in relation to impacts associated with an offshore wind farm is for the Erebus offshore wind farm. This project was granted consent with Natural Resources Wales concluding that, despite a number of methodological disagreements, there was no adverse effect on the integrity of the SPA as a result of impacts on the guillemot feature of the SPA (Natural Resources Wales, 2022). That assessment considered the majority of projects incorporated into the in-combination assessment conducted for the Morgan Generation Assets with additional projects incorporated since the Erebus assessments representing only a negligible increase in the total in-combination impact. This includes the Mona, Morgan, Morecambe, West of Orkney and White Cross projects which, using a 70% displacement rate and 2% mortality rate, contribute an impact of 7.5 birds/annum representing a 0.28% increase in baseline mortality of the SPA population.

3.4.2.9 It is therefore concluded that there is no potential for an adverse effect on the site integrity of the guillemot feature of the Skomer, Skokholm and the Seas off Pembrokeshire / Sgomer, Sgogwm a moroedd Benfro SPA as a result of in-combination displacement impacts on guillemot.

3.4.3 Scottish SPAs

3.4.3.1 This section assesses the impact of the three in-combination scenarios on the following Scottish SPAs:

- North Colonsay and Western Cliffs SPA
- Handa SPA
- St Kilda SPA
- Cape Wrath SPA
- Sule Skerry and Sule Stack SPA

3.4.3.2 Assessments for the guillemot feature of these SPAs were not required in HRA Stage 2 information to support an appropriate assessment Part Three: Special Protection Areas and Ramsar Site assessments (APP-098) as the predicted impact did not meet relevant assessment criteria. As these criteria have been met in this report a full assessment is provided.

3.4.3.3 Based on the mean-maximum foraging range + 1SD of guillemot (Woodward et al., 2019) from these SPAs, there are no projects within foraging range of guillemot during the breeding season for all SPAs except the Cape Wrath SPA, Handa SPA and Sule Skerry and Sule Stack SPA for which the West of Orkney offshore wind farm is within foraging range. In the non-breeding season, there are numerous projects within the BDMPS of relevance to the species (Furness, 2015).

3.4.3.4 Table 3.3 presents the total seasonal population estimates for each SPA. These values represent the number of guillemot from each SPA with apportioning based on the apportioning values calculated using data from Furness (2015).

Tables presenting apportioning values and apportioned population estimates for all projects are provided in Appendix A.

Table 3.3: Cumulative abundance for guillemot at Scottish SPA for all projects considered in-combination in relation to disturbance and displacement from projects.

SPA	Total seasonal in-combination abundance values	
	Breeding	**Non-breeding**
Scenario 2		
North Colonsay and Western Cliffs	0	271.9
Handa	0	726.8
St Kilda	0	300.4
Cape Wrath	0	523.4
Sule Skerry and Sule Stack	0	146.0
Scenario 3		
North Colonsay and Western Cliffs	0	1,318.7
Handa	92.5	3,525.7
St Kilda	0	1,456.9
Cape Wrath	197.7	2,736.6
Sule Skerry and Sule Stack	7,290.9	708.3

Scenario 1: Morgan Generation Assets together with the Morgan and Morecambe Offshore Wind Farms: Transmission Assets

3.4.3.5 Connectivity was identified between all SPAs and the Morgan and Morecambe Offshore Wind Farms: Transmission Assets in the non-breeding season only. The screening report for the Morgan and Morecambe Offshore Wind Farms: Transmission Assets concluded that the area affected by the project would represent a negligible proportion of the area available to seabirds in the non-breeding season with many species migrating to areas outside of the Irish Sea. It is considered highly unlikely that the project area will provide a material contribution to any existing impact in the non-breeding season and therefore LSE is discounted for any SPA for which potential connectivity has been identified in the non-breeding seasons only. There is therefore considered to be no change to the assessments conducted in the Integrity test: Step 1 for the Morgan Generation Assets alone and a conclusion of no adverse effect on the integrity of the guillemot feature of any Scottish SPAs is reached.

Scenario 2: Morgan Generation Assets together with the Morecambe Offshore Windfarm Generation Assets and the Morgan and Morecambe Offshore Wind Farms: Transmission Assets

3.4.3.6 When using a displacement rate of 70% and mortality rate of 2%, the displacement mortality associated with Scenario 2 for each SPA is presented in Table 3.4. The estimated impacts represent less than a 1% increase in the baseline mortality of the relevant SPA population for all SPAs. This is not

considered to represent an adverse effect on the site integrity of the guillemot feature of the any of these SPAs.

Table 3.4: Increase in baseline mortality associated with Scenario 2 in-combination impacts for Scottish SPAs.

SPA	Displacement mortality (birds/annum)	Increase in baseline mortality of SPA population (%)
North Colonsay and Western Cliffs	3.8	0.25
Handa	10.2	0.22
St Kilda	4.2	0.34
Cape Wrath	7.3	0.24
Sule Skerry and Sule Stack	2.0	0.28

Scenario 3: Tier 1, Tier 2 and Tier 3: Morgan Generation Assets together with the Morgan and Morecambe Offshore Wind Farms: Transmission Assets and other relevant projects and plans

3.4.3.7 When using a displacement rate of 70% and mortality rate of 2%, the displacement mortality associated with Scenario 3 for each SPA is presented inTable 3.5. In addition to those projects identified in Table 3.3, underwater collision impacts from the Morlais project have been apportioned to the guillemot populations at each SPA. These impacts are incorporated into the totals presented in Table 3.5. In all cases the predicted impact represents more than a 1% increase in the baseline mortality of the relevant SPA population.

Table 3.5: Increase in baseline mortality associated with Scenario 3 in-combination impacts for Scottish SPAs.

SPA	Displacement mortality (birds/annum)	Increase in baseline mortality of SPA population (%)
North Colonsay and Western Cliffs	18.8	1.23
Handa	51.5	1.09
St Kilda	20.7	1.67
Cape Wrath	38.9	1.25
Sule Skerry and Sule Stack	112.2	15.25

3.4.3.8 The closest of the SPAs included in Table 3.5 to the projects considered as part of Scenario 3 of the in-combination assessment is the North Colonsay and Western Cliffs SPAs. All of the other SPAs are located further north.

3.4.3.9 The current approach to apportioning in the non-breeding season assumes that birds within the BDMPS areas defined in Furness (2015) are equally distributed. This therefore assumes that birds from northern Scotland are as likely to occur in the Celtic Sea as birds from colonies in the Celtic Sea. Recent work, tracking guillemot populations at Colonsay, Treshnish, Whinnyfold and the Isle of May during the non-breeding season has provided information on the non-breeding season movements and distribution of guillemot from these colonies (Buckingham *et al.,* 2022). Although the locations highlighted in Buckingham *et*

al. (2022) are broadly comparable with previous ring recovery data they provide much more detail on non-breeding movements. Buckingham *et al.* (2022) recorded more northerly core distributions in guillemots during moult and mid-winter, and distributions were more constrained than in previous studies indicating that the assumption of equal distribution throughout the BDMPS areas defined by Furness (2015) represent considerable over-estimates in areas of sea located away from the colony of interest.

3.4.3.10 Birds from Colonsay showed some connectivity with the Irish Sea in August but then very little for the rest of the non-breeding season. The core colony distributions for birds from the Treshnish Isles, which is located to the south of all other SPAs in Table 3.5 but to the north of Colonsay were outwith the Irish Sea. As the Handa SPA, St Kilda SPA, Cape Wrath SPA and Sule Skerry and Sule Stack SPA are located to the north of Treshnish it is considered unlikely that birds from this SPA will show any appreciable connectivity with the Irish Sea and the in-combination impact is therefore significantly lower than predicted in this report. It should be noted that the Buckingham *et al.* (2022) study tracks breeding birds, which, from the colonies from which birds were tracked, appear to show limited connectivity with the Irish Sea, whereas site-specific surveys undertaken to characterise the baseline at the Morgan Generation Assets also include non-breeding birds (immature and sabbatical birds) and breeding birds from local colonies (although note these are limited in number in the Irish Sea.

3.4.3.11 The only SPAs for which there is connectivity with an offshore wind farm in the breeding season are the Cape Wrath SPA, Handa SPA and Sule Skerry and Sule Stack SPA. For all the three of these SPAs the only project in foraging range is the West of Orkney offshore wind farm. The contribution of the West of Orkney wind farm to the overall in-combination impact is negligible for both the Cape Wrath SPA and Handa SPA. However, for the Sule Skerry and Sule Stack SPA, the West of Orkney offshore wind farm contributes over 91% of the in-combination impact. Based on the information presented above it is however considered that the West of Orkney offshore wind farm is the only project that will contribute to the in-combination impact with no connectivity between guillemot from the Sule Skerry and Sule Stack SPA and projects in English or Welsh waters.

3.4.3.12 It should be noted that NatureScot (2023) identifies guillemot as an exception to the approach applied in this report to identify connectivity in the non-breeding season (i.e. the use of the BDMPS areas in Furness (2015) instead advising that connectivity in the non-breeding season should be identified between a project and any SPA found within the mean maximum foraging range plus 1 standard deviation for guillemot. This is based on studies such as Buckingham *et al*. 2022, which identified that in the non-breeding season guillemot largely remain in the broad vicinity of their breeding colonies. If this approach were to be applied there would be no connectivity between all of the SPAs considered in this section and the Morgan Generation Assets and therefore the Morgan Generation Assets would not contribute to any in-combination impact.

3.4.3.13 Based on the information presented it is considered that the in-combination impact predicted for all Scottish SPAs considered in this section is a significant over-estimate and that the contribution of the Morgan Generation Assets to any in-combination impact is negligible, if not zero. It is therefore considered that there is no adverse effect on the site integrity of the guillemot feature of any of the SPAs considered in this section.

4 CONCLUSION

4.1.1.1 Table 4.1 summarises the conclusions reached for each species when applying the displacement and mortality rates used by the Secretary of State for the HRAs for previous offshore wind farms. The kittiwake feature of the Howth Head Coast SPA and guillemot feature of the Skomer, Skokholm and the Seas off Pembrokeshire / Sgomer, Sgogwm a moroedd Benfro SPA and a number of Scottish SPAs were progressed to Step 2 of the ISAA process when applying the displacement rates associated with the Secretary of State's previous HRA decisions. These SPAs were not progressed to Step 2 of HRA Stage 2 information to support an appropriate assessment Part Three: Special Protection Areas and Ramsar Site assessments. A Step 2 assessment has been conducted in this report and for all SPAs has concluded no adverse effect on the integrity of the relevant SPA.

Table 4.1: Summary of the conclusions reached in HRA Stage 2 information to support an appropriate assessment Part Three: Special Protection Areas and Ramsar Site assessments and this report.

SPA	Qualifying feature	Conclusions	
		HRA Stage 2 information to support an appropriate assessment Part Three: Special Protection Areas and Ramsar Site assessments	Displacement Rates Clarification Note (this report)
Ireland's Eye SPA and North-west Irish Sea	Kittiwake	In-combination impact represents more than a 1% increase in baseline mortality, SPA progressed to Step 2. Step 2 concludes no adverse effect.	In-combination impact represents more than a 1% increase in baseline mortality, SPA progressed to Step 2. Step 2 concludes no AEoI
Cape Wrath	Kittiwake	In-combination impact represents more than a 1% increase in baseline mortality, SPA progressed to Step 2. Step 2 concludes no adverse effect.	In-combination impact represents more than a 1% increase in baseline mortality, SPA progressed to Step 2. Step 2 concludes no AEoI
Lambay Island	Kittiwake	No adverse effect concluded in Step 1, impact of the Morgan Generation Assets alone represents less than a 0.05% increase in baseline mortality of SPA population.	No adverse effect concluded in Step 1, impact of the Morgan Generation Assets alone represents less than a 0.05% increase in baseline mortality of SPA population.
Howth Head Coast	Kittiwake		In-combination impact represents more than a 1% increase in baseline mortality, SPA progressed to Step 2. Step 2 concludes no AEoI
Ailsa Craig	Kittiwake		No adverse effect concluded in Step 1, impact of the Morgan Generation Assets alone Represents less than a 0.05% increase in baseline mortality of SPA population.
Wicklow Head	Kittiwake		
Rathlin Island	Kittiwake		
Flamborough and Filey Coast	Kittiwake		
Skomer, Skokholm and the Seas off Pembrokeshire / Sgomer, Sgogwm a moroedd Benfro	Kittiwake		
North Colonsay and Western Cliffs	Kittiwake		
Saltee Islands	Kittiwake		

SPA	Qualifying feature	Conclusions	
		HRA Stage 2 information to support an appropriate assessment Part Three: Special Protection Areas and Ramsar Site assessments	Displacement Rates Clarification Note (this report)
Buchan Ness to Collieston Coast	Kittiwake	No adverse effect concluded in Step 1, impact of the Morgan Generation Assets alone represents less than a 0.05% increase in baseline mortality of SPA population.	No adverse effect concluded in Step 1, impact of the Morgan Generation Assets alone Represents less than a 0.05% increase in baseline mortality of SPA population.
Troup, Pennan and Lion's Heads	Kittiwake		
East Caithness Cliffs	Kittiwake		
West Westray	Kittiwake		
Flannan Isles	Guillemot	In-combination impact represents more than a 1% increase in baseline mortality, SPA progressed to Step 2. Step 2 concludes no adverse effect.	In-combination impact represents more than a 1% increase in baseline mortality, SPA progressed to Step 2. Step 2 concludes no AEoI
Lambay Island	Guillemot	No adverse effect concluded in Step 1, impact of the Morgan Generation Assets alone represents less than a 0.05% increase in baseline mortality of SPA population.	No adverse effect concluded in Step 1, impact of the Morgan Generation Assets alone represents less than a 0.05% increase in baseline mortality of SPA population.
Rathlin Island	Guillemot		
Skomer, Skokholm and the Seas off Pembrokeshire / Sgomer, Sgogwm a moroedd Benfro	Guillemot		In-combination impact represents more than a 1% increase in baseline mortality, SPA progressed to Step 2. Step 2 concludes no AEoI.
North Colonsay and Western Cliffs	Guillemot		
Saltee Islands	Guillemot		No adverse effect concluded in Step 1, impact of the Morgan Generation Assets alone represents less than a 0.05% increase in baseline mortality of SPA population.
Mingulay and Berneray	Guillemot		
Handa	Guillemot		In-combination impact represents more than a 1% increase in baseline mortality, SPA progressed to Step 2. Step 2 concludes no AEoI.
St Kilda	Guillemot		
Cape Wrath	Guillemot		
Sule Skerry and Sule Stack	Guillemot		

SPA	Qualifying feature	Conclusions	
		HRA Stage 2 information to support an appropriate assessment Part Three: Special Protection Areas and Ramsar Site assessments	Displacement Rates Clarification Note (this report)
Lambay Island	Razorbill	No adverse effect concluded in Step 1, impact of the Morgan Generation Assets alone represents less than a 0.05% increase in baseline mortality of SPA population.	No adverse effect concluded in Step 1, impact of the Morgan Generation Assets alone represents less than a 0.05% increase in baseline mortality of SPA population.
Rathlin Island	Razorbill		
Skomer, Skokholm and the Seas off Pembrokeshire / Sgomer, Sgogwm a moroedd Benfro	Razorbill		
Saltee Islands	Razorbill		
Mingulay and Berneray	Razorbill		
The Shiant Isles	Razorbill		
Handa	Razorbill		
St Kilda	Fulmar		
Copeland Islands	Manx shearwater		
Glannau Aberdaron ac Ynys Enlli/Aberdaron Coast and Bardsey Island	Manx shearwater		
Skomer, Skokholm and the Seas off Pembrokeshire / Sgomer, Sgogwm a moroedd Benfro	Manx shearwater		
Rum	Manx shearwater		
Isles of Scilly	Manx shearwater		
St Kilda	Manx shearwater		

5 REFERENCES

Buckingham, L., Bogdanova, M. I., Green, J. A., Dunn, R. E., Wanless, S., Bennett, S., Bevan, R. M., Call, A., Canham, M., Corse, C. J., Harris, M. P., Heward, C. J., Jardine, D. C., Lennon, J., Parnaby, D., Redfern, C. P. F., Scott, L., Swann, R. L., Ward, R. M., Weston, E. D., Furness, R. W. and Daunt, F. 2022a . Interspecific variation in non-breeding aggregation: a multi-colony tracking study of two sympatric seabirds. Marine Ecology Progress Series 684, pp. 181–197.

Furness, R.W. (2015). Non-breeding season populations of seabirds in UK waters. [Online]. Available at: http://publications.naturalengland.org.uk/publication/6427568802627584 (Accessed May 2015).

JNCC, Natural Resources Wales, Department of Agriculture, Environment and Rural Affairs/Northern Ireland Environment Agency, Natural England and Scottish Natural Heritage, (2022). Joint SNCB Interim Displacement Advice Note. [Online]. Available at: https://data.jncc.gov.uk/data/9aecb87c-80c5-4cfb-9102-39f0228dcc9a/joint-sncb-interim-displacement-advice-note-2022.pdf (Accessed September 2023).

Natural Resources Wales (2022). Marine Advice Memo. [Online]. Available at: https://publicregister.naturalresources.wales/. (Accessed July 2024).

NatureScot (2023). Guidance Note 4: Guidance to Support Offshore Wind Applications: Ornithology - Determining Connectivity of Marine Birds with Marine Special Protection Areas and Breeding Seabirds from Colony SPAs in the Non-Breeding Season. Available at: https://www.nature.scot/doc/guidance-note-4-guidance-support-offshore-wind-applications-ornithology-determining-connectivity#7.+Determining+connectivity+for+non-breeding+seabirds (Accessed: September 2024).

Wade, H.M., Masden E.M., Jackson, A.C. and Furness, R.W. (2016) Incorporating data uncertainty when estimating potential vulnerability of Scottish seabirds to marine renewable energy developments. Marine Policy, 70, 108-113.

Woodward, I, Thaxter, C.B., Owen, E. and Cook, A.S.C.P. (2019) Desk-based revision of seabird foraging ranges used for HRA screening. BTO Report 724 for The Crown Estate.

Appendix A: Cumulative abundances for Scottish SPAs at which guillemot is a qualifying feature

Table A.1: Cumulative abundance for guillemot at the North Colonsay and Western Cliffs SPA for projects considered in-combination in relation to disturbance and displacement from projects.

Project	Seasonal apportioning values		Seasonal abundance values	
	Breeding	**Non-breeding**	**Breeding**	**Non-breeding**
Awel y Môr	No connectivity	0.024	-	69.2
Burbo Bank Extension	No connectivity	0.024	-	37.0
Erebus	No connectivity	0.024	-	671.6
Mona Offshore Wind Project	No connectivity	0.024	-	89.0
Morecambe Offshore Wind Farm: Generation Assets	No connectivity	0.024	-	181.2
Morgan Generation Assets	No connectivity	0.024	-	90.6
Twinhub	No connectivity	0.024	-	5.2
Walney 3 & 4	No connectivity	0.024	-	45.7
West of Orkney	No connectivity	0.024	-	104.1
White Cross	No connectivity	0.024	-	25.1
Annual totals				
Scenario 2			**271.9**	
Scenario 3			**1,318.7**	

Table A.2: Cumulative abundance for guillemot at the Handa SPA for projects considered in-combination in relation to disturbance and displacement from projects.

Project	Seasonal apportioning values		Seasonal abundance values	
	Breeding	**Non-breeding**	**Breeding**	**Non-breeding**
Awel y Môr	No connectivity	0.063	-	185.0
Burbo Bank Extension	No connectivity	0.063	-	98.9
Erebus	No connectivity	0.063	-	1,795.6
Mona Offshore Wind Project	No connectivity	0.063	-	238.0
Morecambe Offshore Wind Farm: Generation Assets	No connectivity	0.063	-	484.6
Morgan Generation Assets	No connectivity	0.063	-	242.3
Twinhub	No connectivity	0.063	-	13.8
Walney 3 & 4	No connectivity	0.063	-	122.1
West of Orkney	0.012	0.063	92.5	278.4
White Cross	No connectivity	0.063	-	67.1
Annual totals				
Scenario 2			**726.8**	
Scenario 3			**3,618.2**	

Table A.3: Cumulative abundance for guillemot at the St Kilda SPA for projects considered in-combination in relation to disturbance and displacement from projects.

Project	Seasonal apportioning values		Seasonal abundance values	
	Breeding	**Non-breeding**	**Breeding**	**Non-breeding**
Awel y Môr	No connectivity	0.026	-	76.4
Burbo Bank Extension	No connectivity	0.026	-	40.9
Erebus	No connectivity	0.026	-	742.0
Mona Offshore Wind Project	No connectivity	0.026	-	98.3
Morecambe Offshore Wind Farm: Generation Assets	No connectivity	0.026	-	200.2
Morgan Generation Assets	No connectivity	0.026	-	100.1
Twinhub	No connectivity	0.026	-	5.7
Walney 3 & 4	No connectivity	0.026	-	50.5
West of Orkney	No connectivity	0.026	-	115.0
White Cross	No connectivity	0.026	-	27.7
Annual totals				
Scenario 2			**300.4**	
Scenario 3			**1,456.9**	

Table A.4: Cumulative abundance for guillemot at the Cape Wrath SPA for projects considered in-combination in relation to disturbance and displacement from projects.

Project	Seasonal apportioning values		Seasonal abundance values	
	Breeding	**Non-breeding**	**Breeding**	**Non-breeding**
Awel y Môr	No connectivity	0.046	-	133.2
Burbo Bank Extension	No connectivity	0.046	-	71.2
Erebus	No connectivity	0.046	-	1,293.0
Mona Offshore Wind Project	No connectivity	0.046	-	171.4
Morecambe Offshore Wind Farm: Generation Assets	No connectivity	0.046	-	348.9
Morgan Generation Assets	No connectivity	0.046	-	174.5
Twinhub	No connectivity	0.046	-	9.9
Walney 3 & 4	No connectivity	0.046	-	87.9
West of Orkney	No connectivity	0.046	197.7	200.4
White Cross	No connectivity	0.046	-	48.3
Annual totals				
Scenario 2			**523.4**	
Scenario 3			**2,736.6**	

Table A.5: Cumulative abundance for guillemot at the Sule Skerry and Sule Stack SPA for projects considered in-combination in relation to disturbance and displacement from projects.

Project	Seasonal apportioning values		Seasonal abundance values	
	Breeding	**Non-breeding**	**Breeding**	**Non-breeding**
Awel y Môr	No connectivity	0.013	-	37.2
Burbo Bank Extension	No connectivity	0.013	-	19.9
Erebus	No connectivity	0.013	-	360.8
Mona Offshore Wind Project	No connectivity	0.013	-	47.8
Morecambe Offshore Wind Farm: Generation Assets	No connectivity	0.013	-	97.4
Morgan Generation Assets	No connectivity	0.013	-	48.7
Twinhub	No connectivity	0.013	-	2.8
Walney 3 & 4	No connectivity	0.013	-	24.5
West of Orkney	0.915	0.013	7,290.9	55.9
White Cross	No connectivity	0.013	-	13.5
Annual totals				
Scenario 2			**146.0**	
Scenario 3			**7,999.2**	

Appendix B: Displacement matrices for SPAs (ISAA Step 1)

B.1. Kittiwake

Table B.1: Predicted kittiwake displacement mortality at the Lambay Island SPA.

Kittiwake (Lambay Island)		Mortality rate (%)												
		1	2	5	10	20	30	40	50	60	70	80	90	100
Displacement rate (%)	10	0	0	0	0	1	1	2	2	3	3	4	4	5
	15	0	0	0	1	1	2	3	4	4	5	6	7	7
	20	0	0	0	1	2	3	4	5	6	7	8	9	10
	30	0	0	1	1	3	4	6	7	9	10	12	13	15
	35	0	0	1	2	3	5	7	8	10	12	14	15	17
	40	0	0	1	2	4	6	8	10	12	14	16	17	19
	50	0	0	1	2	5	7	10	12	15	17	19	22	24
	60	0	1	1	3	6	9	12	15	17	20	23	26	29
	70	0	1	2	3	7	10	14	17	20	24	27	31	34
	80	0	1	2	4	8	12	16	19	23	27	31	35	39
	90	0	1	2	4	9	13	17	22	26	31	35	39	44
	100	0	1	2	5	10	15	19	24	29	34	39	44	49

Table B.2: Predicted kittiwake displacement mortality at the Ireland's Eye SPA.

Kittiwake (Ireland's Eye)		Mortality rate (%)												
		1	2	5	10	20	30	40	50	60	70	80	90	100
Displacement rate (%)	10	0	0	0	0	0	1	1	1	1	2	2	2	2
	15	0	0	0	0	1	1	1	2	2	2	3	3	3
	20	0	0	0	0	1	1	2	2	3	3	4	4	5
	30	0	0	0	1	1	2	3	3	4	5	6	6	7
	35	0	0	0	1	2	2	3	4	5	6	6	7	8
	40	0	0	0	1	2	3	4	5	6	6	7	8	9
	50	0	0	1	1	2	3	5	6	7	8	9	10	11
	60	0	0	1	1	3	4	6	7	8	10	11	12	14
	70	0	0	1	2	3	5	6	8	10	11	13	14	16
	80	0	0	1	2	4	6	7	9	11	13	15	17	18
	90	0	0	1	2	4	6	8	10	12	14	17	19	21
	100	0	0	1	2	5	7	9	11	14	16	18	21	23

Table B.3: Predicted kittiwake displacement mortality at the Howth Head Coast SPA.

Kittiwake (Howth Head Coast)		Mortality rate (%)												
		1	2	5	10	20	30	40	50	60	70	80	90	100
Displacement rate (%)	10	0	0	0	0	1	1	1	2	2	3	3	3	4
	15	0	0	0	1	1	2	2	3	3	4	4	5	5
	20	0	0	0	1	1	2	3	4	4	5	6	7	7
	30	0	0	1	1	2	3	4	5	7	8	9	10	11
	35	0	0	1	1	3	4	5	6	8	9	10	11	13
	40	0	0	1	1	3	4	6	7	9	10	12	13	14
	50	0	0	1	2	4	5	7	9	11	13	14	16	18
	60	0	0	1	2	4	7	9	11	13	15	17	20	22
	70	0	1	1	3	5	8	10	13	15	18	20	23	25
	80	0	1	1	3	6	9	12	14	17	20	23	26	29
	90	0	1	2	3	7	10	13	16	20	23	26	29	33
	100	0	1	2	4	7	11	14	18	22	25	29	33	36

Table B.4: Predicted kittiwake displacement mortality at the Ailsa Craig SPA.

Kittiwake (Aisla Craig)		Mortality rate (%)												
		1	2	5	10	20	30	40	50	60	70	80	90	100
Displacement rate (%)	10	0	0	0	0	0	0	0	0	0	0	0	1	1
	15	0	0	0	0	0	0	0	0	1	1	1	1	1
	20	0	0	0	0	0	0	0	1	1	1	1	1	1
	30	0	0	0	0	0	1	1	1	1	1	1	2	2
	35	0	0	0	0	0	1	1	1	1	1	2	2	2
	40	0	0	0	0	0	1	1	1	1	2	2	2	2
	50	0	0	0	0	1	1	1	2	2	2	2	3	3
	60	0	0	0	0	1	1	1	2	2	3	3	3	4
	70	0	0	0	0	1	1	2	2	3	3	3	4	4
	80	0	0	0	0	1	1	2	2	3	3	4	4	5
	90	0	0	0	1	1	2	2	3	3	4	4	5	5
	100	0	0	0	1	1	2	2	3	4	4	5	5	6

Table B.5: Predicted kittiwake displacement mortality at the Wicklow Head SPA.

Kittiwake (Wicklow Head)		Mortality rate (%)												
		1	2	5	10	20	30	40	50	60	70	80	90	100
Displacement rate (%)	10	0	0	0	0	0	0	0	0	0	1	1	1	1
	15	0	0	0	0	0	0	0	1	1	1	1	1	1
	20	0	0	0	0	0	0	1	1	1	1	1	1	2
	30	0	0	0	0	0	1	1	1	1	2	2	2	2
	35	0	0	0	0	1	1	1	1	2	2	2	2	3
	40	0	0	0	0	1	1	1	2	2	2	2	3	3
	50	0	0	0	0	1	1	2	2	2	3	3	3	4
	60	0	0	0	0	1	1	2	2	3	3	4	4	5
	70	0	0	0	1	1	2	2	3	3	4	4	5	5
	80	0	0	0	1	1	2	2	3	4	4	5	6	6
	90	0	0	0	1	1	2	3	3	4	5	6	6	7
	100	0	0	0	1	2	2	3	4	5	5	6	7	8

Table B.6: Predicted kittiwake displacement mortality at the Rathlin Island SPA.

Kittiwake (Rathlin Island)		Mortality rate (%)												
		1	2	5	10	20	30	40	50	60	70	80	90	100
Displacement rate (%)	10	0	0	1	1	2	3	4	5	6	7	8	9	10
	15	0	0	1	2	3	5	6	8	9	11	12	14	15
	20	0	0	1	2	4	6	8	10	12	14	16	18	20
	30	0	1	2	3	6	9	12	15	18	21	24	27	30
	35	0	1	2	4	7	11	14	18	21	25	28	32	35
	40	0	1	2	4	8	12	16	20	24	28	32	36	40
	50	1	1	3	5	10	15	20	25	30	35	40	45	50
	60	1	1	3	6	12	18	24	30	36	42	48	54	61
	70	1	1	4	7	14	21	28	35	42	49	57	64	71
	80	1	2	4	8	16	24	32	40	48	57	65	73	81
	90	1	2	5	9	18	27	36	45	54	64	73	82	91
	100	1	2	5	10	20	30	40	50	61	71	81	91	101

Table B.7: Predicted kittiwake displacement mortality at the Skomer, Skokholm and the Seas off Pembrokeshire SPA.

Kittiwake (Skomer, Skokholm and the Seas off Pembrokeshire)		Mortality rate (%)												
		1	2	5	10	20	30	40	50	60	70	80	90	100
Displacement rate (%)	10	0	0	0	0	0	0	0	1	1	1	1	1	1
	15	0	0	0	0	0	0	1	1	1	1	1	1	2
	20	0	0	0	0	0	1	1	1	1	1	2	2	2
	30	0	0	0	0	1	1	1	2	2	2	2	3	3
	35	0	0	0	0	1	1	1	2	2	3	3	3	4
	40	0	0	0	0	1	1	2	2	2	3	3	4	4
	50	0	0	0	1	1	2	2	3	3	4	4	5	5
	60	0	0	0	1	1	2	2	3	4	4	5	6	6
	70	0	0	0	1	1	2	3	4	4	5	6	6	7
	80	0	0	0	1	2	2	3	4	5	6	7	7	8
	90	0	0	0	1	2	3	4	5	6	6	7	8	9
	100	0	0	1	1	2	3	4	5	6	7	8	9	10

Table B.8: Predicted kittiwake displacement at the North Colonsay and Western Cliffs SPA.

Kittiwake (North Colonsay and Western Cliffs)		Mortality rate (%)												
		1	2	5	10	20	30	40	50	60	70	80	90	100
Displacement rate (%)	10	0	0	0	0	1	1	2	2	2	3	3	4	4
	15	0	0	0	1	1	2	2	3	4	4	5	5	6
	20	0	0	0	1	2	2	3	4	5	6	7	7	8
	30	0	0	1	1	2	4	5	6	7	9	10	11	12
	35	0	0	1	1	3	4	6	7	9	10	11	13	14
	40	0	0	1	2	3	5	7	8	10	11	13	15	16
	50	0	0	1	2	4	6	8	10	12	14	16	18	20
	60	0	0	1	2	5	7	10	12	15	17	20	22	24
	70	0	1	1	3	6	9	11	14	17	20	23	26	29
	80	0	1	2	3	7	10	13	16	20	23	26	29	33
	90	0	1	2	4	7	11	15	18	22	26	29	33	37
	100	0	1	2	4	8	12	16	20	24	29	33	37	41

Table B.9: Predicted kittiwake displacement mortality at the Saltee Islands SPA.

Kittiwake (Saltee Islands)		Mortality rate (%)												
		1	2	5	10	20	30	40	50	60	70	80	90	100
Displacement rate (%)	10	0	0	0	0	0	0	0	0	0	1	1	1	1
	15	0	0	0	0	0	0	0	1	1	1	1	1	1
	20	0	0	0	0	0	0	1	1	1	1	1	1	2
	30	0	0	0	0	0	1	1	1	1	2	2	2	2
	35	0	0	0	0	1	1	1	1	2	2	2	3	3
	40	0	0	0	0	1	1	1	2	2	2	3	3	3
	50	0	0	0	0	1	1	2	2	2	3	3	4	4
	60	0	0	0	0	1	1	2	2	3	3	4	4	5
	70	0	0	0	1	1	2	2	3	3	4	5	5	6
	80	0	0	0	1	1	2	3	3	4	5	5	6	7
	90	0	0	0	1	1	2	3	4	4	5	6	7	7
	100	0	0	0	1	2	2	3	4	5	6	7	7	8

Table B.10: Predicted kittiwake displacement at the Buchan Ness to Collieston Coast SPA.

Kittiwake (Buchan Ness to Collieston Coast)		Mortality rate (%)												
		1	2	5	10	20	30	40	50	60	70	80	90	100
Displacement rate (%)	10	0	0	0	0	1	1	1	2	2	2	3	3	3
	15	0	0	0	0	1	1	2	2	3	3	4	4	5
	20	0	0	0	1	1	2	3	3	4	5	5	6	7
	30	0	0	0	1	2	3	4	5	6	7	8	9	10
	35	0	0	1	1	2	3	5	6	7	8	9	10	11
	40	0	0	1	1	3	4	5	7	8	9	10	12	13
	50	0	0	1	2	3	5	7	8	10	11	13	15	16
	60	0	0	1	2	4	6	8	10	12	14	16	18	20
	70	0	0	1	2	5	7	9	11	14	16	18	21	23
	80	0	1	1	3	5	8	10	13	16	18	21	24	26
	90	0	1	1	3	6	9	12	15	18	21	24	27	29
	100	0	1	2	3	7	10	13	16	20	23	26	29	33

Table B.11: Predicted kittiwake displacement mortality at the Cape Wrath SPA.

Kittiwake (Cape Wrath)		Mortality rate (%)												
		1	2	5	10	20	30	40	50	60	70	80	90	100
Displacement rate (%)	10	0	0	0	1	2	2	3	4	5	5	6	7	8
	15	0	0	1	1	2	3	5	6	7	8	9	10	11
	20	0	0	1	2	3	5	6	8	9	11	12	14	15
	30	0	0	1	2	5	7	9	11	14	16	18	20	23
	35	0	1	1	3	5	8	11	13	16	19	21	24	27
	40	0	1	2	3	6	9	12	15	18	21	24	27	30
	50	0	1	2	4	8	11	15	19	23	27	30	34	38
	60	0	1	2	5	9	14	18	23	27	32	36	41	45
	70	1	1	3	5	11	16	21	27	32	37	42	48	53
	80	1	1	3	6	12	18	24	30	36	42	48	55	61
	90	1	1	3	7	14	20	27	34	41	48	55	61	68
	100	1	2	4	8	15	23	30	38	45	53	61	68	76

Table B.12: Predicted kittiwake displacement mortality at the East Caithness Cliffs SPA.

Kittiwake (East Caithness Cliffs)		Mortality rate (%)												
		1	2	5	10	20	30	40	50	60	70	80	90	100
Displacement rate (%)	10	0	0	1	1	2	3	4	5	6	7	8	9	11
	15	0	0	1	2	3	5	6	8	9	11	13	14	16
	20	0	0	1	2	4	6	8	11	13	15	17	19	21
	30	0	1	2	3	6	9	13	16	19	22	25	28	32
	35	0	1	2	4	7	11	15	18	22	26	30	33	37
	40	0	1	2	4	8	13	17	21	25	30	34	38	42
	50	1	1	3	5	11	16	21	26	32	37	42	47	53
	60	1	1	3	6	13	19	25	32	38	44	51	57	63
	70	1	1	4	7	15	22	30	37	44	52	59	66	74
	80	1	2	4	8	17	25	34	42	51	59	68	76	84
	90	1	2	5	9	19	28	38	47	57	66	76	85	95
	100	1	2	5	11	21	32	42	53	63	74	84	95	106

Table B.13: Predicted kittiwake displacement mortality at the Flamborough and Filey Coast SPA.

Kittiwake (Flamborough and Filey Coast)		Mortality rate (%)												
		1	2	5	10	20	30	40	50	60	70	80	90	100
Displacement rate (%)	10	0	0	0	1	2	3	4	5	6	7	8	9	10
	15	0	0	1	1	3	4	6	7	9	10	12	13	15
	20	0	0	1	2	4	6	8	10	12	14	16	18	20
	30	0	1	1	3	6	9	12	15	18	21	24	27	29
	35	0	1	2	3	7	10	14	17	21	24	28	31	34
	40	0	1	2	4	8	12	16	20	24	28	31	35	39
	50	0	1	2	5	10	15	20	25	29	34	39	44	49
	60	1	1	3	6	12	18	24	29	35	41	47	53	59
	70	1	1	3	7	14	21	28	34	41	48	55	62	69
	80	1	2	4	8	16	24	31	39	47	55	63	71	79
	90	1	2	4	9	18	27	35	44	53	62	71	80	88
	100	1	2	5	10	20	29	39	49	59	69	79	88	98

Table B.14: Predicted kittiwake displacement mortality Troup, Pennan and Lion's Heads SPA.

Kittiwake (Troup, Pennan and Lion's Heads)		Mortality rate (%)												
		1	2	5	10	20	30	40	50	60	70	80	90	100
Displacement rate (%)	10	0	0	0	0	1	1	2	2	2	3	3	4	4
	15	0	0	0	1	1	2	2	3	4	4	5	5	6
	20	0	0	0	1	2	2	3	4	5	5	6	7	8
	30	0	0	1	1	2	4	5	6	7	8	9	11	12
	35	0	0	1	1	3	4	5	7	8	10	11	12	14
	40	0	0	1	2	3	5	6	8	9	11	12	14	16
	50	0	0	1	2	4	6	8	10	12	14	16	18	19
	60	0	0	1	2	5	7	9	12	14	16	19	21	23
	70	0	1	1	3	5	8	11	14	16	19	22	25	27
	80	0	1	2	3	6	9	12	16	19	22	25	28	31
	90	0	1	2	4	7	11	14	18	21	25	28	32	35
	100	0	1	2	4	8	12	16	19	23	27	31	35	39

Table B.15: Predicted kittiwake displacement mortality at the West Westray SPA.

Kittiwake (West Westray)		Mortality rate (%)												
		1	2	5	10	20	30	40	50	60	70	80	90	100
Displacement rate (%)	10	0	0	0	0	1	1	1	2	2	2	3	3	3
	15	0	0	0	0	1	1	2	2	3	3	4	4	5
	20	0	0	0	1	1	2	3	3	4	4	5	6	6
	30	0	0	0	1	2	3	4	5	6	7	8	8	9
	35	0	0	1	1	2	3	4	6	7	8	9	10	11
	40	0	0	1	1	3	4	5	6	8	9	10	11	13
	50	0	0	1	2	3	5	6	8	9	11	13	14	16
	60	0	0	1	2	4	6	8	9	11	13	15	17	19
	70	0	0	1	2	4	7	9	11	13	15	18	20	22
	80	0	1	1	3	5	8	10	13	15	18	20	23	25
	90	0	1	1	3	6	8	11	14	17	20	23	25	28
	100	0	1	2	3	6	9	13	16	19	22	25	28	31

B.2. Manx shearwater

Table B.16: Predicted Manx shearwater displacement mortality at the Copeland Islands SPA.

Manx shearwater (Copeland Islands)		Mortality rate (%)												
		1	2	5	10	20	30	40	50	60	70	80	90	100
Displacement rate (%)	10	0	0	0	0	1	1	2	2	3	3	4	4	5
	15	0	0	0	1	1	2	3	4	4	5	6	7	7
	20	0	0	0	1	2	3	4	5	6	7	8	9	10
	30	0	0	1	1	3	4	6	7	9	10	12	13	15
	35	0	0	1	2	3	5	7	9	10	12	14	16	17
	40	0	0	1	2	4	6	8	10	12	14	16	18	20
	50	0	0	1	2	5	7	10	12	15	17	20	22	25
	60	0	1	1	3	6	9	12	15	18	21	24	27	30
	70	0	1	2	3	7	10	14	17	21	24	28	31	35
	80	0	1	2	4	8	12	16	20	24	28	32	35	39
	90	0	1	2	4	9	13	18	22	27	31	35	40	44
	100	0	1	2	5	10	15	20	25	30	35	39	44	49

Table B.17: Predicted Manx shearwater displacement mortality at the Glannau Aberdaron ac Ynys Enlli/ Aberdaron Coast and Bardsey Island SPA.

Manx shearwater (Glannau Aberdaron ac Ynys Enlli/ Aberdaron Coast and Bardsey Island)		Mortality rate (%)												
		1	2	5	10	20	30	40	50	60	70	80	90	100
Displacement rate (%)	10	0	0	1	1	3	4	5	6	8	9	10	11	13
	15	0	0	1	2	4	6	8	9	11	13	15	17	19
	20	0	1	1	3	5	8	10	13	15	18	20	23	25
	30	0	1	2	4	8	11	15	19	23	26	30	34	38
	35	0	1	2	4	9	13	18	22	26	31	35	40	44
	40	1	1	3	5	10	15	20	25	30	35	40	45	50
	50	1	1	3	6	13	19	25	31	38	44	50	57	63
	60	1	2	4	8	15	23	30	38	45	53	60	68	75
	70	1	2	4	9	18	26	35	44	53	62	70	79	88
	80	1	2	5	10	20	30	40	50	60	70	80	91	101
	90	1	2	6	11	23	34	45	57	68	79	91	102	113
	100	1	3	6	13	25	38	50	63	75	88	101	113	126

Table B.18: Predicted Manx shearwater displacement mortality at the Skomer, Skokholm and the seas off Pembrokeshire / Sgomer, Sgogwm a moroedd Benfro SPA.

Manx shearwater (Skomer, Skokholm and the seas off Pembrokeshire / Sgomer, Sgogwm a moroedd Benfro)		Mortality rate (%)												
		1	2	5	10	20	30	40	50	60	70	80	90	100
Displacement rate (%)	10	1	3	7	13	27	40	54	67	81	94	108	121	135
	15	2	4	10	20	40	61	81	101	121	141	162	182	202
	20	3	5	13	27	54	81	108	135	162	189	215	242	269
	30	4	8	20	40	81	121	162	202	242	283	323	364	404
	35	5	9	24	47	94	141	189	236	283	330	377	424	471
	40	5	11	27	54	108	162	215	269	323	377	431	485	539
	50	7	13	34	67	135	202	269	337	404	471	539	606	673
	60	8	16	40	81	162	242	323	404	485	566	646	727	808
	70	9	19	47	94	189	283	377	471	566	660	754	848	943
	80	11	22	54	108	215	323	431	539	646	754	862	970	1077
	90	12	24	61	121	242	364	485	606	727	848	970	1091	1212
	100	13	27	67	135	269	404	539	673	808	943	1077	1212	1347

Table B.19: Predicted Manx shearwater displacement mortality at the Isles of Scilly SPA.

Manx shearwater (Isles of Scilly)		Mortality rate (%)												
		1	2	5	10	20	30	40	50	60	70	80	90	100
Displacement rate (%)	10	0	0	0	0	0	0	0	0	0	0	0	0	0
	15	0	0	0	0	0	0	0	0	0	0	0	0	0
	20	0	0	0	0	0	0	0	0	0	0	0	0	0
	30	0	0	0	0	0	0	0	0	0	0	0	0	0
	35	0	0	0	0	0	0	0	0	0	0	0	0	0
	40	0	0	0	0	0	0	0	0	0	0	0	0	0
	50	0	0	0	0	0	0	0	0	0	0	0	0	0
	60	0	0	0	0	0	0	0	0	0	0	0	0	0
	70	0	0	0	0	0	0	0	0	0	0	0	0	1
	80	0	0	0	0	0	0	0	0	0	0	0	1	1
	90	0	0	0	0	0	0	0	0	0	0	1	1	1
	100	0	0	0	0	0	0	0	0	0	1	1	1	1

Table B.20: Predicted Manx shearwater displacement mortality at the St Kilda SPA.

Manx shearwater (St Kilda)		Mortality rate (%)												
		1	2	5	10	20	30	40	50	60	70	80	90	100
Displacement rate (%)	10	0	0	0	0	0	0	0	0	0	1	1	1	1
	15	0	0	0	0	0	0	0	1	1	1	1	1	1
	20	0	0	0	0	0	0	1	1	1	1	1	1	2
	30	0	0	0	0	0	1	1	1	1	2	2	2	2
	35	0	0	0	0	1	1	1	1	2	2	2	2	3
	40	0	0	0	0	1	1	1	2	2	2	3	3	3
	50	0	0	0	0	1	1	2	2	2	3	3	4	4
	60	0	0	0	0	1	1	2	2	3	3	4	4	5
	70	0	0	0	1	1	2	2	3	3	4	4	5	6
	80	0	0	0	1	1	2	3	3	4	4	5	6	6
	90	0	0	0	1	1	2	3	4	4	5	6	6	7
	100	0	0	0	1	2	2	3	4	5	6	6	7	8

Table B.21: Predicted Manx shearwater displacement mortality at the Rum SPA.

Manx shearwater (Rum)		Mortality rate (%)												
		1	2	5	10	20	30	40	50	60	70	80	90	100
Displacement rate (%)	10	0	0	1	2	5	7	10	12	15	17	20	22	25
	15	0	1	2	4	7	11	15	19	22	26	30	34	37
	20	0	1	2	5	10	15	20	25	30	35	40	45	50
	30	1	1	4	7	15	22	30	37	45	52	60	67	75
	35	1	2	4	9	17	26	35	43	52	61	70	78	87
	40	1	2	5	10	20	30	40	50	60	70	79	89	99
	50	1	2	6	12	25	37	50	62	75	87	99	112	124
	60	1	3	7	15	30	45	60	75	89	104	119	134	149
	70	2	3	9	17	35	52	70	87	104	122	139	156	174
	80	2	4	10	20	40	60	79	99	119	139	159	179	199
	90	2	4	11	22	45	67	89	112	134	156	179	201	224
	100	2	5	12	25	50	75	99	124	149	174	199	224	248

B.3. Fulmar

Table B.22: Predicted fulmar displacement mortality at the St Kilda SPA.

Fulmar (St. Kilda)		Mortality rate (%)												
		1	2	5	10	20	30	40	50	60	70	80	90	100
Displacement rate (%)	10	0	0	0	0	0	1	1	1	1	1	2	2	2
	15	0	0	0	0	1	1	1	1	2	2	2	3	3
	20	0	0	0	0	1	1	2	2	2	3	3	3	4
	30	0	0	0	1	1	2	2	3	3	4	5	5	6
	35	0	0	0	1	1	2	3	3	4	5	5	6	7
	40	0	0	0	1	2	2	3	4	5	5	6	7	8
	50	0	0	0	1	2	3	4	5	6	7	8	9	10
	60	0	0	1	1	2	3	5	6	7	8	9	10	12
	70	0	0	1	1	3	4	5	7	8	10	11	12	14
	80	0	0	1	2	3	5	6	8	9	11	12	14	16
	90	0	0	1	2	3	5	7	9	10	12	14	16	17
	100	0	0	1	2	4	6	8	10	12	14	16	17	19

B.4. Guillemot

Table B.23: Predicted guillemot displacement mortality at the Mingulay and Berneray SPA.

Guillemot (Mingulay and Berneray)		Mortality rate (%)												
		1	2	5	10	20	30	40	50	60	70	80	90	100
Displacement rate (%)	10	0	0	0	1	2	3	3	4	5	6	7	8	9
	15	0	0	1	1	3	4	5	6	8	9	10	12	13
	20	0	0	1	2	3	5	7	9	10	12	14	16	17
	30	0	1	1	3	5	8	10	13	16	18	21	23	26
	35	0	1	2	3	6	9	12	15	18	21	24	27	30
	40	0	1	2	3	7	10	14	17	21	24	28	31	35
	50	0	1	2	4	9	13	17	22	26	30	35	39	43
	60	1	1	3	5	10	16	21	26	31	36	41	47	52
	70	1	1	3	6	12	18	24	30	36	42	48	54	60
	80	1	1	3	7	14	21	28	35	41	48	55	62	69
	90	1	2	4	8	16	23	31	39	47	54	62	70	78
	100	1	2	4	9	17	26	35	43	52	60	69	78	86

Table B.24: Predicted guillemot displacement mortality at the Handa SPA.

Guillemot (Handa)		Mortality rate (%)												
		1	2	5	10	20	30	40	50	60	70	80	90	100
Displacement rate (%)	10	0	0	1	2	5	7	10	12	15	17	19	22	24
	15	0	1	2	4	7	11	15	18	22	25	29	33	36
	20	0	1	2	5	10	15	19	24	29	34	39	44	48
	30	1	1	4	7	15	22	29	36	44	51	58	65	73
	35	1	2	4	8	17	25	34	42	51	59	68	76	85
	40	1	2	5	10	19	29	39	48	58	68	78	87	97
	50	1	2	6	12	24	36	48	61	73	85	97	109	121
	60	1	3	7	15	29	44	58	73	87	102	116	131	145
	70	2	3	8	17	34	51	68	85	102	119	136	153	170
	80	2	4	10	19	39	58	78	97	116	136	155	174	194
	90	2	4	11	22	44	65	87	109	131	153	174	196	218
	100	2	5	12	24	48	73	97	121	145	170	194	218	242

Table B.25: Predicted guillemot displacement mortality at the Cape Wrath SPA.

Guillemot (Cape Wrath)		Mortality rate (%)												
		1	2	5	10	20	30	40	50	60	70	80	90	100
Displacement rate (%)	10	0	0	1	2	3	5	7	9	10	12	14	16	17
	15	0	1	1	3	5	8	10	13	16	18	21	24	26
	20	0	1	2	3	7	10	14	17	21	24	28	31	35
	30	1	1	3	5	10	16	21	26	31	37	42	47	52
	35	1	1	3	6	12	18	24	31	37	43	49	55	61
	40	1	1	3	7	14	21	28	35	42	49	56	63	70
	50	1	2	4	9	17	26	35	44	52	61	70	79	87
	60	1	2	5	10	21	31	42	52	63	73	84	94	105
	70	1	2	6	12	24	37	49	61	73	85	98	110	122
	80	1	3	7	14	28	42	56	70	84	98	112	126	140
	90	2	3	8	16	31	47	63	79	94	110	126	141	157
	100	2	3	9	17	35	52	70	87	105	122	140	157	174

Table B.26: Predicted guillemot displacement mortality at the Flannan Isles SPA.

Guillemot (Flannan Isles)		Mortality rate (%)												
		1	2	5	10	20	30	40	50	60	70	80	90	100
Displacement rate (%)	10	0	0	0	1	1	2	3	3	4	4	5	6	6
	15	0	0	0	1	2	3	4	5	6	7	8	8	9
	20	0	0	1	1	3	4	5	6	8	9	10	11	13
	30	0	0	1	2	4	6	8	9	11	13	15	17	19
	35	0	0	1	2	4	7	9	11	13	15	18	20	22
	40	0	1	1	3	5	8	10	13	15	18	20	23	25
	50	0	1	2	3	6	9	13	16	19	22	25	28	31
	60	0	1	2	4	8	11	15	19	23	26	30	34	38
	70	0	1	2	4	9	13	18	22	26	31	35	39	44
	80	1	1	3	5	10	15	20	25	30	35	40	45	50
	90	1	1	3	6	11	17	23	28	34	39	45	51	56
	100	1	1	3	6	13	19	25	31	38	44	50	56	63

Table B.27: Predicted guillemot displacement mortality at the Rathlin Island SPA.

Guillemot (Rathlin Island)		Mortality rate (%)												
		1	2	5	10	20	30	40	50	60	70	80	90	100
Displacement rate (%)	10	1	1	3	6	12	18	23	29	35	41	47	53	59
	15	1	2	4	9	18	26	35	44	53	62	70	79	88
	20	1	2	6	12	23	35	47	59	70	82	94	106	117
	30	2	4	9	18	35	53	70	88	106	123	141	158	176
	35	2	4	10	21	41	62	82	103	123	144	164	185	205
	40	2	5	12	23	47	70	94	117	141	164	188	211	235
	50	3	6	15	29	59	88	117	147	176	205	235	264	293
	60	4	7	18	35	70	106	141	176	211	246	282	317	352
	70	4	8	21	41	82	123	164	205	246	287	329	370	411
	80	5	9	23	47	94	141	188	235	282	329	375	422	469
	90	5	11	26	53	106	158	211	264	317	370	422	475	528
	100	6	12	29	59	117	176	235	293	352	411	469	528	587

Table B.28: Predicted guillemot displacement mortality at the North Colonsay and Western Cliffs SPA.

Guillemot (North Colonsay and Western Cliffs)		Mortality rate (%)												
		1	2	5	10	20	30	40	50	60	70	80	90	100
Displacement rate (%)	10	0	0	0	1	2	3	4	5	5	6	7	8	9
	15	0	0	1	1	3	4	5	7	8	10	11	12	14
	20	0	0	1	2	4	5	7	9	11	13	14	16	18
	30	0	1	1	3	5	8	11	14	16	19	22	24	27
	35	0	1	2	3	6	10	13	16	19	22	25	29	32
	40	0	1	2	4	7	11	14	18	22	25	29	33	36
	50	0	1	2	5	9	14	18	23	27	32	36	41	45
	60	1	1	3	5	11	16	22	27	33	38	43	49	54
	70	1	1	3	6	13	19	25	32	38	44	51	57	63
	80	1	1	4	7	14	22	29	36	43	51	58	65	72
	90	1	2	4	8	16	24	33	41	49	57	65	73	82
	100	1	2	5	9	18	27	36	45	54	63	72	82	91

Table B.29: Predicted guillemot displacement mortality at the Sule Skerry and Sule Stack SPA.

Guillemot (Sule Skerry and Sule Stack)		Mortality rate (%)												
		1	2	5	10	20	30	40	50	60	70	80	90	100
Displacement rate (%)	10	0	0	0	0	1	1	2	2	3	3	4	4	5
	15	0	0	0	1	1	2	3	4	4	5	6	7	7
	20	0	0	0	1	2	3	4	5	6	7	8	9	10
	30	0	0	1	1	3	4	6	7	9	10	12	13	15
	35	0	0	1	2	3	5	7	9	10	12	14	15	17
	40	0	0	1	2	4	6	8	10	12	14	16	18	19
	50	0	0	1	2	5	7	10	12	15	17	19	22	24
	60	0	1	1	3	6	9	12	15	18	20	23	26	29
	70	0	1	2	3	7	10	14	17	20	24	27	31	34
	80	0	1	2	4	8	12	16	19	23	27	31	35	39
	90	0	1	2	4	9	13	18	22	26	31	35	39	44
	100	0	1	2	5	10	15	19	24	29	34	39	44	49

Table B.30: Predicted guillemot displacement mortality at the Skomer, Skokholm and the seas off Pembrokeshire / Sgomer, Sgogwm a moroedd Benfro SPA.

Guillemot (Skomer, Skokholm and the seas off Pembrokeshire / Sgomer, Sgogwm a moroedd Benfro)		Mortality rate (%)												
		1	2	5	10	20	30	40	50	60	70	80	90	100
Displacement rate (%)	10	0	0	0	1	2	3	4	5	6	7	8	9	10
	15	0	0	1	1	3	4	6	7	9	10	12	13	15
	20	0	0	1	2	4	6	8	10	12	14	16	18	20
	30	0	1	1	3	6	9	12	15	18	21	24	27	30
	35	0	1	2	3	7	10	14	17	21	24	28	31	34
	40	0	1	2	4	8	12	16	20	24	28	32	35	39
	50	0	1	2	5	10	15	20	25	30	34	39	44	49
	60	1	1	3	6	12	18	24	30	35	41	47	53	59
	70	1	1	3	7	14	21	28	34	41	48	55	62	69
	80	1	2	4	8	16	24	32	39	47	55	63	71	79
	90	1	2	4	9	18	27	35	44	53	62	71	80	89
	100	1	2	5	10	20	30	39	49	59	69	79	89	98

Table B.31: Predicted guillemot displacement mortality at the St Kilda SPA.

Guillemot (St Kilda)		Mortality rate (%)												
		1	2	5	10	20	30	40	50	60	70	80	90	100
Displacement rate (%)	10	0	0	1	1	2	3	4	5	6	7	8	9	10
	15	0	0	1	2	3	5	6	8	9	11	12	14	15
	20	0	0	1	2	4	6	8	10	12	14	16	18	20
	30	0	1	2	3	6	9	12	15	18	21	24	27	30
	35	0	1	2	4	7	11	14	18	21	25	28	32	35
	40	0	1	2	4	8	12	16	20	24	28	32	36	40
	50	1	1	3	5	10	15	20	25	30	35	40	45	50
	60	1	1	3	6	12	18	24	30	36	42	48	54	60
	70	1	1	4	7	14	21	28	35	42	49	56	63	70
	80	1	2	4	8	16	24	32	40	48	56	64	72	80
	90	1	2	5	9	18	27	36	45	54	63	72	81	90
	100	1	2	5	10	20	30	40	50	60	70	80	90	100

Table B.32: Predicted guillemot displacement mortality at the Lambay Island SPA.

Guillemot (Lambay Islands)		Mortality rate (%)												
		1	2	5	10	20	30	40	50	60	70	80	90	100
Displacement rate (%)	10	0	0	1	2	4	7	9	11	13	16	18	20	22
	15	0	1	2	3	7	10	13	17	20	23	27	30	34
	20	0	1	2	4	9	13	18	22	27	31	36	40	45
	30	1	1	3	7	13	20	27	34	40	47	54	60	67
	35	1	2	4	8	16	23	31	39	47	55	63	70	78
	40	1	2	4	9	18	27	36	45	54	63	72	81	89
	50	1	2	6	11	22	34	45	56	67	78	89	101	112
	60	1	3	7	13	27	40	54	67	81	94	107	121	134
	70	2	3	8	16	31	47	63	78	94	110	125	141	157
	80	2	4	9	18	36	54	72	89	107	125	143	161	179
	90	2	4	10	20	40	60	81	101	121	141	161	181	201
	100	2	4	11	22	45	67	89	112	134	157	179	201	224

Table B.33: Predicted guillemot displacement mortality at the Saltee Islands SPA.

Guillemot (Saltee Islands)		Mortality rate (%)												
		1	2	5	10	20	30	40	50	60	70	80	90	100
Displacement rate (%)	10	0	0	0	1	2	2	3	4	5	6	6	7	8
	15	0	0	1	1	2	4	5	6	7	8	9	11	12
	20	0	0	1	2	3	5	6	8	9	11	13	14	16
	30	0	0	1	2	5	7	9	12	14	17	19	21	24
	35	0	1	1	3	6	8	11	14	17	19	22	25	28
	40	0	1	2	3	6	9	13	16	19	22	25	28	32
	50	0	1	2	4	8	12	16	20	24	28	32	36	39
	60	0	1	2	5	9	14	19	24	28	33	38	43	47
	70	1	1	3	6	11	17	22	28	33	39	44	50	55
	80	1	1	3	6	13	19	25	32	38	44	51	57	63
	90	1	1	4	7	14	21	28	36	43	50	57	64	71
	100	1	2	4	8	16	24	32	39	47	55	63	71	79

B.5. Razorbill

Table B.34: Predicted razorbill displacement mortality at the Handa SPA.

Razorbill (Handa)		Mortality rate (%)												
		1	2	5	10	20	30	40	50	60	70	80	90	100
Displacement rate (%)	10	0	0	0	0	0	1	1	1	1	2	2	2	2
	15	0	0	0	0	1	1	1	2	2	3	3	3	4
	20	0	0	0	0	1	1	2	2	3	3	4	4	5
	30	0	0	0	1	1	2	3	4	4	5	6	6	7
	35	0	0	0	1	2	3	3	4	5	6	7	8	8
	40	0	0	0	1	2	3	4	5	6	7	8	9	10
	50	0	0	1	1	2	4	5	6	7	8	10	11	12
	60	0	0	1	1	3	4	6	7	9	10	11	13	14
	70	0	0	1	2	3	5	7	8	10	12	13	15	17
	80	0	0	1	2	4	6	8	10	11	13	15	17	19
	90	0	0	1	2	4	6	9	11	13	15	17	19	21
	100	0	0	1	2	5	7	10	12	14	17	19	21	24

Table B.35: Predicted razorbill displacement mortality at the Mingulay and Berneray SPA.

Razorbill (Mingulay and Berneray)		Mortality rate (%)												
		1	2	5	10	20	30	40	50	60	70	80	90	100
Displacement rate (%)	10	0	0	0	0	1	1	2	2	3	3	4	4	5
	15	0	0	0	1	1	2	3	4	4	5	6	6	7
	20	0	0	0	1	2	3	4	5	6	7	7	8	9
	30	0	0	1	1	3	4	6	7	8	10	11	13	14
	35	0	0	1	2	3	5	7	8	10	11	13	15	16
	40	0	0	1	2	4	6	7	9	11	13	15	17	19
	50	0	0	1	2	5	7	9	12	14	16	19	21	23
	60	0	1	1	3	6	8	11	14	17	20	22	25	28
	70	0	1	2	3	7	10	13	16	20	23	26	29	33
	80	0	1	2	4	7	11	15	19	22	26	30	34	37
	90	0	1	2	4	8	13	17	21	25	29	34	38	42
	100	0	1	2	5	9	14	19	23	28	33	37	42	47

Table B.36: Predicted razorbill displacement mortality at the Rathlin Island SPA.

Razorbill (Rathlin Island)		Mortality rate (%)												
		1	2	5	10	20	30	40	50	60	70	80	90	100
Displacement rate (%)	10	0	0	0	1	1	2	3	4	4	5	6	6	7
	15	0	0	1	1	2	3	4	5	6	7	9	10	11
	20	0	0	1	1	3	4	6	7	9	10	11	13	14
	30	0	0	1	2	4	6	9	11	13	15	17	19	21
	35	0	0	1	2	5	7	10	12	15	17	20	22	25
	40	0	1	1	3	6	9	11	14	17	20	23	26	28
	50	0	1	2	4	7	11	14	18	21	25	28	32	36
	60	0	1	2	4	9	13	17	21	26	30	34	38	43
	70	0	1	2	5	10	15	20	25	30	35	40	45	50
	80	1	1	3	6	11	17	23	28	34	40	46	51	57
	90	1	1	3	6	13	19	26	32	38	45	51	58	64
	100	1	1	4	7	14	21	28	36	43	50	57	64	71

Table B.37: Predicted razorbill displacement mortality at the Shiant Isles SPA.

Razorbill (The Shiant Isles)		Mortality rate (%)												
		1	2	5	10	20	30	40	50	60	70	80	90	100
Displacement rate (%)	10	0	0	0	0	0	1	1	1	1	1	2	2	2
	15	0	0	0	0	1	1	1	1	2	2	2	3	3
	20	0	0	0	0	1	1	2	2	2	3	3	4	4
	30	0	0	0	1	1	2	2	3	4	4	5	5	6
	35	0	0	0	1	1	2	3	3	4	5	5	6	7
	40	0	0	0	1	2	2	3	4	5	5	6	7	8
	50	0	0	0	1	2	3	4	5	6	7	8	9	10
	60	0	0	1	1	2	4	5	6	7	8	9	11	12
	70	0	0	1	1	3	4	5	7	8	10	11	12	14
	80	0	0	1	2	3	5	6	8	9	11	13	14	16
	90	0	0	1	2	4	5	7	9	11	12	14	16	18
	100	0	0	1	2	4	6	8	10	12	14	16	18	20

Table B.38: Predicted razorbill displacement mortality at the Skomer, Skokholm and the seas off Pembrokeshire / Sgomer, Sgogwm a moroedd Benfro SPA.

Razorbill (Skomer, Skokholm and the seas off Pembrokeshire / Sgomer, Sgogwm a moroedd Benfro)		Mortality rate (%)												
		1	2	5	10	20	30	40	50	60	70	80	90	100
Displacement rate (%)	10	0	0	0	0	0	1	1	1	1	2	2	2	2
	15	0	0	0	0	1	1	1	2	2	2	3	3	4
	20	0	0	0	0	1	1	2	2	3	3	4	4	5
	30	0	0	0	1	1	2	3	4	4	5	6	6	7
	35	0	0	0	1	2	2	3	4	5	6	7	7	8
	40	0	0	0	1	2	3	4	5	6	7	8	8	9
	50	0	0	1	1	2	4	5	6	7	8	9	11	12
	60	0	0	1	1	3	4	6	7	8	10	11	13	14
	70	0	0	1	2	3	5	7	8	10	12	13	15	17
	80	0	0	1	2	4	6	8	9	11	13	15	17	19
	90	0	0	1	2	4	6	8	11	13	15	17	19	21
	100	0	0	1	2	5	7	9	12	14	17	19	21	24

Table B.39: Predicted razorbill displacement mortality at the Lambay Island SPA.

Razorbill (Lambay Island)		Mortality rate (%)												
		1	2	5	10	20	30	40	50	60	70	80	90	100
Displacement rate (%)	10	0	0	0	0	1	1	1	1	2	2	2	2	3
	15	0	0	0	0	1	1	2	2	2	3	3	3	4
	20	0	0	0	1	1	2	2	3	3	4	4	5	5
	30	0	0	0	1	2	2	3	4	5	5	6	7	8
	35	0	0	0	1	2	3	4	4	5	6	7	8	9
	40	0	0	1	1	2	3	4	5	6	7	8	9	10
	50	0	0	1	1	3	4	5	6	8	9	10	11	13
	60	0	0	1	2	3	5	6	8	9	11	12	14	15
	70	0	0	1	2	4	5	7	9	11	12	14	16	18
	80	0	0	1	2	4	6	8	10	12	14	16	18	20
	90	0	0	1	2	5	7	9	11	14	16	18	21	23
	100	0	1	1	3	5	8	10	13	15	18	20	23	25

Appendix C: Cumulative displacement matrices for SPAs (Scenario 2)

C.1. Kittiwake

Table C. 1: Predicted cumulative displacement mortality for kittiwake at the Ireland's Eye SPA.

Kittiwake (Ireland's Eye)		Mortality rate (%)												
		1	2	5	10	20	30	40	50	60	70	80	90	100
Displacement rate (%)	10	0	0	0	1	1	2	2	3	4	4	5	6	6
	15	0	0	0	1	2	3	4	5	6	6	7	8	9
	20	0	0	1	1	2	4	5	6	7	9	10	11	12
	30	0	0	1	2	4	6	7	9	11	13	15	17	18
	35	0	0	1	2	4	6	9	11	13	15	17	19	21
	40	0	0	1	2	5	7	10	12	15	17	20	22	25
	50	0	1	2	3	6	9	12	15	18	21	25	28	31
	60	0	1	2	4	7	11	15	18	22	26	29	33	37
	70	0	1	2	4	9	13	17	21	26	30	34	39	43
	80	0	1	2	5	10	15	20	25	29	34	39	44	49
	90	1	1	3	6	11	17	22	28	33	39	44	50	55
	100	1	1	3	6	12	18	25	31	37	43	49	55	61

Table C.2: Predicted cumulative displacement mortality for kittiwake at the Cape Wrath SPA.

Kittiwake (Cape Wrath)		Mortality rate (%)												
		1	2	5	10	20	30	40	50	60	70	80	90	100
Displacement rate (%)	10	0	0	0	1	2	2	3	4	5	6	7	7	8
	15	0	0	1	1	2	4	5	6	7	9	10	11	12
	20	0	0	1	2	3	5	7	8	10	12	13	15	17
	30	0	0	1	2	5	7	10	12	15	17	20	22	25
	35	0	1	1	3	6	9	12	15	17	20	23	26	29
	40	0	1	2	3	7	10	13	17	20	23	27	30	33
	50	0	1	2	4	8	12	17	21	25	29	33	37	42
	60	0	1	2	5	10	15	20	25	30	35	40	45	50
	70	1	1	3	6	12	17	23	29	35	41	47	52	58
	80	1	1	3	7	13	20	27	33	40	47	53	60	67
	90	1	1	4	7	15	22	30	37	45	52	60	67	75
	100	1	2	4	8	17	25	33	42	50	58	67	75	83

Table C. 3: Predicted cumulative displacement mortality for kittiwake at the Howth Head Coast SPA.

Kittiwake (Howth Head Coast)		Mortality rate (%)												
		1	2	5	10	20	30	40	50	60	70	80	90	100
Displacement rate (%)	10	0	0	0	1	2	3	4	5	6	6	7	8	9
	15	0	0	1	1	3	4	6	7	8	10	11	12	14
	20	0	0	1	2	4	6	7	9	11	13	15	17	18
	30	0	1	1	3	6	8	11	14	17	19	22	25	28
	35	0	1	2	3	6	10	13	16	19	23	26	29	32
	40	0	1	2	4	7	11	15	18	22	26	29	33	37
	50	0	1	2	5	9	14	18	23	28	32	37	41	46
	60	1	1	3	6	11	17	22	28	33	39	44	50	55
	70	1	1	3	6	13	19	26	32	39	45	52	58	64
	80	1	1	4	7	15	22	29	37	44	52	59	66	74
	90	1	2	4	8	17	25	33	41	50	58	66	75	83
	100	1	2	5	9	18	28	37	46	55	64	74	83	92

C.2. Guillemot

Table C.4: Predicted cumulative displacement mortality for guillemot at the Flannan Isles SPA.

Guillemot (Flannan Isles)		Mortality rate (%)												
		1	2	5	10	20	30	40	50	60	70	80	90	100
Displacement rate (%)	10	0	0	1	2	4	6	8	9	11	13	15	17	19
	15	0	1	1	3	6	8	11	14	17	20	23	25	28
	20	0	1	2	4	8	11	15	19	23	26	30	34	38
	30	1	1	3	6	11	17	23	28	34	39	45	51	56
	35	1	1	3	7	13	20	26	33	39	46	53	59	66
	40	1	2	4	8	15	23	30	38	45	53	60	68	75
	50	1	2	5	9	19	28	38	47	56	66	75	84	94
	60	1	2	6	11	23	34	45	56	68	79	90	101	113
	70	1	3	7	13	26	39	53	66	79	92	105	118	131
	80	2	3	8	15	30	45	60	75	90	105	120	135	150
	90	2	3	8	17	34	51	68	84	101	118	135	152	169
	100	2	4	9	19	38	56	75	94	113	131	150	169	188

Table C.5: Predicted cumulative displacement mortality for guillemot at the Skomer, Skokholm and the seas off Pembrokeshire / Sgomer, Sgogwm a moroedd Benfro SPA.

Guillemot (Skomer, Skokholm and Seas off Pembrokeshire)		Mortality rate (%)												
		1	2	5	10	20	30	40	50	60	70	80	90	100
Displacement rate (%)	10	0	1	1	3	6	9	12	15	18	21	24	27	30
	15	0	1	2	4	9	13	18	22	27	31	35	40	44
	20	1	1	3	6	12	18	24	30	35	41	47	53	59
	30	1	2	4	9	18	27	35	44	53	62	71	80	89
	35	1	2	5	10	21	31	41	52	62	72	83	93	103
	40	1	2	6	12	24	35	47	59	71	83	95	106	118
	50	1	3	7	15	30	44	59	74	89	103	118	133	148
	60	2	4	9	18	35	53	71	89	106	124	142	160	177
	70	2	4	10	21	41	62	83	103	124	145	165	186	207
	80	2	5	12	24	47	71	95	118	142	165	189	213	236
	90	3	5	13	27	53	80	106	133	160	186	213	239	266
	100	3	6	15	30	59	89	118	148	177	207	236	266	295

Table C.6: Predicted cumulative displacement mortality for guillemot at the North Colonsay and Western Cliffs SPA.

Guillemot (North Colonsay and Western Cliffs)		Mortality rate (%)												
		1	2	5	10	20	30	40	50	60	70	80	90	100
Displacement rate (%)	10	0	1	1	3	5	8	11	14	16	19	22	24	27
	15	0	1	2	4	8	12	16	20	24	29	33	37	41
	20	1	1	3	5	11	16	22	27	33	38	43	49	54
	30	1	2	4	8	16	24	33	41	49	57	65	73	82
	35	1	2	5	10	19	29	38	48	57	67	76	86	95
	40	1	2	5	11	22	33	43	54	65	76	87	98	109
	50	1	3	7	14	27	41	54	68	82	95	109	122	136
	60	2	3	8	16	33	49	65	82	98	114	130	147	163
	70	2	4	10	19	38	57	76	95	114	133	152	171	190
	80	2	4	11	22	43	65	87	109	130	152	174	196	217
	90	2	5	12	24	49	73	98	122	147	171	196	220	245
	100	3	5	14	27	54	82	109	136	163	190	217	245	272

Table C.7: Predicted cumulative displacement mortality for guillemot at the Handa SPA.

Guillemot (Handa)		Mortality rate (%)												
		1	2	5	10	20	30	40	50	60	70	80	90	100
Displacement rate (%)	10	1	1	4	7	15	22	29	36	44	51	58	65	73
	15	1	2	5	11	22	33	44	55	65	76	87	98	109
	20	1	3	7	15	29	44	58	73	87	102	116	131	145
	30	2	4	11	22	44	65	87	109	131	153	174	196	218
	35	3	5	13	25	51	76	102	127	153	178	204	229	254
	40	3	6	15	29	58	87	116	145	174	204	233	262	291
	50	4	7	18	36	73	109	145	182	218	254	291	327	363
	60	4	9	22	44	87	131	174	218	262	305	349	392	436
	70	5	10	25	51	102	153	204	254	305	356	407	458	509
	80	6	12	29	58	116	174	233	291	349	407	465	523	581
	90	7	13	33	65	131	196	262	327	392	458	523	589	654
	100	7	15	36	73	145	218	291	363	436	509	581	654	727

Table C.8: Predicted cumulative displacement mortality for guillemot at the St Kilda SPA.

Guillemot (St Kilda)		Mortality rate (%)												
		1	2	5	10	20	30	40	50	60	70	80	90	100
Displacement rate (%)	10	0	1	2	3	6	9	12	15	18	21	24	27	30
	15	0	1	2	5	9	14	18	23	27	32	36	41	45
	20	1	1	3	6	12	18	24	30	36	42	48	54	60
	30	1	2	5	9	18	27	36	45	54	63	72	81	90
	35	1	2	5	11	21	32	42	53	63	74	84	95	105
	40	1	2	6	12	24	36	48	60	72	84	96	108	120
	50	2	3	8	15	30	45	60	75	90	105	120	135	150
	60	2	4	9	18	36	54	72	90	108	126	144	162	180
	70	2	4	11	21	42	63	84	105	126	147	168	189	210
	80	2	5	12	24	48	72	96	120	144	168	192	216	240
	90	3	5	14	27	54	81	108	135	162	189	216	243	270
	100	3	6	15	30	60	90	120	150	180	210	240	270	300

Table C.9: Predicted cumulative displacement mortality for guillemot at the Cape Wrath SPA.

Guillemot (Cape Wrath)		Mortality rate (%)												
		1	2	5	10	20	30	40	50	60	70	80	90	100
Displacement rate (%)	10	1	1	3	5	10	16	21	26	31	37	42	47	52
	15	1	2	4	8	16	24	31	39	47	55	63	71	79
	20	1	2	5	10	21	31	42	52	63	73	84	94	105
	30	2	3	8	16	31	47	63	79	94	110	126	141	157
	35	2	4	9	18	37	55	73	92	110	128	147	165	183
	40	2	4	10	21	42	63	84	105	126	147	167	188	209
	50	3	5	13	26	52	79	105	131	157	183	209	236	262
	60	3	6	16	31	63	94	126	157	188	220	251	283	314
	70	4	7	18	37	73	110	147	183	220	256	293	330	366
	80	4	8	21	42	84	126	167	209	251	293	335	377	419
	90	5	9	24	47	94	141	188	236	283	330	377	424	471
	100	5	10	26	52	105	157	209	262	314	366	419	471	523

Table C.10: Predicted cumulative displacement mortality for guillemot at the Sule Skerry and Sule Stack SPA .

Guillemot (Sule Skerry and Sule Stack)		Mortality rate (%)												
		1	2	5	10	20	30	40	50	60	70	80	90	100
Displacement rate (%)	10	0	0	1	1	3	4	6	7	9	10	12	13	15
	15	0	0	1	2	4	7	9	11	13	15	18	20	22
	20	0	1	1	3	6	9	12	15	18	20	23	26	29
	30	0	1	2	4	9	13	18	22	26	31	35	39	44
	35	1	1	3	5	10	15	20	26	31	36	41	46	51
	40	1	1	3	6	12	18	23	29	35	41	47	53	58
	50	1	1	4	7	15	22	29	37	44	51	58	66	73
	60	1	2	4	9	18	26	35	44	53	61	70	79	88
	70	1	2	5	10	20	31	41	51	61	72	82	92	102
	80	1	2	6	12	23	35	47	58	70	82	93	105	117
	90	1	3	7	13	26	39	53	66	79	92	105	118	131
	100	1	3	7	15	29	44	58	73	88	102	117	131	146

Appendix D: Cumulative displacement matrices for SPAs (Scenario 3)

D.1. Kittiwake

Table D.1: Predicted cumulative displacement mortality for kittiwake at the Ireland's Eye SPA.

Kittiwake (Ireland's Eye)		Mortality rate (%)												
		1	2	5	10	20	30	40	50	60	70	80	90	100
Displacement rate (%)	10	0	0	1	1	2	3	5	6	7	8	9	10	12
	15	0	0	1	2	3	5	7	9	10	12	14	16	17
	20	0	0	1	2	5	7	9	12	14	16	19	21	23
	30	0	1	2	3	7	10	14	17	21	24	28	31	35
	35	0	1	2	4	8	12	16	20	24	28	32	37	41
	40	0	1	2	5	9	14	19	23	28	32	37	42	46
	50	1	1	3	6	12	17	23	29	35	41	46	52	58
	60	1	1	3	7	14	21	28	35	42	49	56	63	70
	70	1	2	4	8	16	24	32	41	49	57	65	73	81
	80	1	2	5	9	19	28	37	46	56	65	74	84	93
	90	1	2	5	10	21	31	42	52	63	73	84	94	104
	100	1	2	6	12	23	35	46	58	70	81	93	104	116

Table D.2: Predicted cumulative displacement mortality for kittiwake at the Cape Wrath SPA.

Kittiwake (Cape Wrath)		Mortality rate (%)												
		1	2	5	10	20	30	40	50	60	70	80	90	100
Displacement rate (%)	10	0	1	2	4	8	12	16	21	25	29	33	37	41
	15	1	1	3	6	12	18	25	31	37	43	49	55	62
	20	1	2	4	8	16	25	33	41	49	58	66	74	82
	30	1	2	6	12	25	37	49	62	74	86	99	111	123
	35	1	3	7	14	29	43	58	72	86	101	115	129	144
	40	2	3	8	16	33	49	66	82	99	115	131	148	164
	50	2	4	10	21	41	62	82	103	123	144	164	185	205
	60	2	5	12	25	49	74	99	123	148	173	197	222	247
	70	3	6	14	29	58	86	115	144	173	201	230	259	288
	80	3	7	16	33	66	99	131	164	197	230	263	296	329
	90	4	7	18	37	74	111	148	185	222	259	296	333	370
	100	4	8	21	41	82	123	164	205	247	288	329	370	411

Table D.3: Predicted cumulative displacement mortality for kittiwake at the Howth Head Coast SPA.

Kittiwake (Howth Head Coast)		Mortality rate (%)												
		1	2	5	10	20	30	40	50	60	70	80	90	100
Displacement rate (%)	10	0	0	1	2	4	5	7	9	11	13	15	16	18
	15	0	1	1	3	5	8	11	14	16	19	22	25	27
	20	0	1	2	4	7	11	15	18	22	26	29	33	37
	30	1	1	3	5	11	16	22	27	33	38	44	49	55
	35	1	1	3	6	13	19	26	32	38	45	51	58	64
	40	1	1	4	7	15	22	29	37	44	51	59	66	73
	50	1	2	5	9	18	27	37	46	55	64	73	82	91
	60	1	2	5	11	22	33	44	55	66	77	88	99	110
	70	1	3	6	13	26	38	51	64	77	90	102	115	128
	80	1	3	7	15	29	44	59	73	88	102	117	132	146
	90	2	3	8	16	33	49	66	82	99	115	132	148	165
	100	2	4	9	18	37	55	73	91	110	128	146	165	183

D.2. Guillemot

Table D.4: Predicted cumulative displacement mortality for guillemot at the Flannan Isles SPA.

Guillemot (Flannan Isles)		Mortality rate (%)												
		1	2	5	10	20	30	40	50	60	70	80	90	100
Displacement rate (%)	10	1	2	5	9	18	27	36	46	55	64	73	82	91
	15	1	3	7	14	27	41	55	68	82	96	109	123	137
	20	2	4	9	18	36	55	73	91	109	127	146	164	182
	30	3	5	14	27	55	82	109	137	164	191	218	246	273
	35	3	6	16	32	64	96	127	159	191	223	255	287	319
	40	4	7	18	36	73	109	146	182	218	255	291	328	364
	50	5	9	23	46	91	137	182	228	273	319	364	410	455
	60	5	11	27	55	109	164	218	273	328	382	437	491	546
	70	6	13	32	64	127	191	255	319	382	446	510	573	637
	80	7	15	36	73	146	218	291	364	437	510	582	655	728
	90	8	16	41	82	164	246	328	410	491	573	655	737	819
	100	9	18	46	91	182	273	364	455	546	637	728	819	910

Table D.5: Predicted cumulative displacement mortality for guillemot at the Skomer, Skokholm and the seas off Pembrokeshire / Sgomer, Sgogwm a moroedd Benfro SPA.

Guillemot (Skomer, Skokholm and the Seas off Pembrokeshire)		Mortality rate (%)												
		1	2	5	10	20	30	40	50	60	70	80	90	100
Displacement rate (%)	10	9	18	46	92	184	276	368	460	552	644	736	828	920
	15	14	28	69	138	276	414	552	690	828	966	1104	1242	1380
	20	18	37	92	184	368	552	736	920	1104	1288	1472	1657	1841
	30	28	55	138	276	552	828	1104	1380	1657	1933	2209	2485	2761
	35	32	64	161	322	644	966	1288	1611	1933	2255	2577	2899	3221
	40	37	74	184	368	736	1104	1472	1841	2209	2577	2945	3313	3681
	50	46	92	230	460	920	1380	1841	2301	2761	3221	3681	4141	4601
	60	55	110	276	552	1104	1657	2209	2761	3313	3865	4417	4970	5522
	70	64	129	322	644	1288	1933	2577	3221	3865	4509	5154	5798	6442
	80	74	147	368	736	1472	2209	2945	3681	4417	5154	5890	6626	7362
	90	83	166	414	828	1657	2485	3313	4141	4970	5798	6626	7454	8283
	100	92	184	460	920	1841	2761	3681	4601	5522	6442	7362	8283	9203

Table D.6: Predicted cumulative displacement mortality for guillemot at the North Colonsay and Western Cliffs SPA.

Guillemot (North Colonsay and Western Cliffs)		Mortality rate (%)												
		1	2	5	10	20	30	40	50	60	70	80	90	100
Displacement rate (%)	10	1	3	7	13	26	40	53	66	79	92	105	119	132
	15	2	4	10	20	40	59	79	99	119	138	158	178	198
	20	3	5	13	26	53	79	105	132	158	185	211	237	264
	30	4	8	20	40	79	119	158	198	237	277	316	356	396
	35	5	9	23	46	92	138	185	231	277	323	369	415	462
	40	5	11	26	53	105	158	211	264	316	369	422	475	527
	50	7	13	33	66	132	198	264	330	396	462	527	593	659
	60	8	16	40	79	158	237	316	396	475	554	633	712	791
	70	9	18	46	92	185	277	369	462	554	646	738	831	923
	80	11	21	53	105	211	316	422	527	633	738	844	949	1055
	90	12	24	59	119	237	356	475	593	712	831	949	1068	1187
	100	13	26	66	132	264	396	527	659	791	923	1055	1187	1319

Table D.7: Predicted cumulative displacement mortality for guillemot at the Handa SPA.

Guillemot (Handa)		Mortality rate (%)												
		1	2	5	10	20	30	40	50	60	70	80	90	100
Displacement rate (%)	10	4	7	18	36	72	109	145	181	217	253	289	326	362
	15	5	11	27	54	109	163	217	271	326	380	434	488	543
	20	7	14	36	72	145	217	289	362	434	507	579	651	724
	30	11	22	54	109	217	326	434	543	651	760	868	977	1085
	35	13	25	63	127	253	380	507	633	760	886	1013	1140	1266
	40	14	29	72	145	289	434	579	724	868	1013	1158	1303	1447
	50	18	36	90	181	362	543	724	905	1085	1266	1447	1628	1809
	60	22	43	109	217	434	651	868	1085	1303	1520	1737	1954	2171
	70	25	51	127	253	507	760	1013	1266	1520	1773	2026	2279	2533
	80	29	58	145	289	579	868	1158	1447	1737	2026	2316	2605	2895
	90	33	65	163	326	651	977	1303	1628	1954	2279	2605	2931	3256
	100	36	72	181	362	724	1085	1447	1809	2171	2533	2895	3256	3618

Table D.8: Predicted cumulative displacement mortality for guillemot at the St Kilda SPA.

Guillemot (St Kilda)		Mortality rate (%)												
		1	2	5	10	20	30	40	50	60	70	80	90	100
Displacement rate (%)	10	1	3	7	15	29	44	58	73	87	102	117	131	146
	15	2	4	11	22	44	66	87	109	131	153	175	197	219
	20	3	6	15	29	58	87	117	146	175	204	233	262	291
	30	4	9	22	44	87	131	175	219	262	306	350	393	437
	35	5	10	25	51	102	153	204	255	306	357	408	459	510
	40	6	12	29	58	117	175	233	291	350	408	466	524	583
	50	7	15	36	73	146	219	291	364	437	510	583	656	728
	60	9	17	44	87	175	262	350	437	524	612	699	787	874
	70	10	20	51	102	204	306	408	510	612	714	816	918	1020
	80	12	23	58	117	233	350	466	583	699	816	932	1049	1166
	90	13	26	66	131	262	393	524	656	787	918	1049	1180	1311
	100	15	29	73	146	291	437	583	728	874	1020	1166	1311	1457

Table D.9: Predicted cumulative displacement mortality for guillemot at the Cape Wrath SPA.

Guillemot (Cape Wrath)		Mortality rate (%)												
		1	2	5	10	20	30	40	50	60	70	80	90	100
Displacement rate (%)	10	3	5	14	27	55	82	109	137	164	192	219	246	274
	15	4	8	21	41	82	123	164	205	246	287	328	369	410
	20	5	11	27	55	109	164	219	274	328	383	438	493	547
	30	8	16	41	82	164	246	328	410	493	575	657	739	821
	35	10	19	48	96	192	287	383	479	575	670	766	862	958
	40	11	22	55	109	219	328	438	547	657	766	876	985	1095
	50	14	27	68	137	274	410	547	684	821	958	1095	1231	1368
	60	16	33	82	164	328	493	657	821	985	1149	1314	1478	1642
	70	19	38	96	192	383	575	766	958	1149	1341	1532	1724	1916
	80	22	44	109	219	438	657	876	1095	1314	1532	1751	1970	2189
	90	25	49	123	246	493	739	985	1231	1478	1724	1970	2217	2463
	100	27	55	137	274	547	821	1095	1368	1642	1916	2189	2463	2737

Table D.10: Predicted cumulative displacement mortality for guillemot at the Sule Skerry and Sule Stack SPA.

Guillemot (Sule Skerry and Sule Stack)		Mortality rate (%)												
		1	2	5	10	20	30	40	50	60	70	80	90	100
Displacement rate (%)	10	8	16	40	80	160	240	320	400	480	560	640	720	800
	15	12	24	60	120	240	360	480	600	720	840	960	1080	1200
	20	16	32	80	160	320	480	640	800	960	1120	1280	1440	1600
	30	24	48	120	240	480	720	960	1200	1440	1680	1920	2160	2400
	35	28	56	140	280	560	840	1120	1400	1680	1960	2240	2520	2800
	40	32	64	160	320	640	960	1280	1600	1920	2240	2560	2880	3200
	50	40	80	200	400	800	1200	1600	2000	2400	2800	3200	3600	4000
	60	48	96	240	480	960	1440	1920	2400	2880	3360	3840	4320	4800
	70	56	112	280	560	1120	1680	2240	2800	3360	3920	4480	5040	5599
	80	64	128	320	640	1280	1920	2560	3200	3840	4480	5119	5759	6399
	90	72	144	360	720	1440	2160	2880	3600	4320	5040	5759	6479	7199
	100	80	160	400	800	1600	2400	3200	4000	4800	5599	6399	7199	7999