



Awel y Môr Offshore Wind Farm

Offshore Ornithology Clarification Note

Marine Licence Submission 1

Date: 25 November 2022

Revision: A

Document Reference: ML-1.3



REVISION	DATE	STATUS/ REASON FOR ISSUE	AUTHOR	CHECKED BY	APPROVED BY
A	November 2022	ML Deadline 1	APEM	GoBe / RWE	RWE

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1 Background

- 1 This Clarification Note has been produced by Awel y Môr Offshore Wind Farm Limited (the Applicant) in response to the comments received from Joint Nature Conservation Committee (JNCC) within their Marine License response in relation to offshore ornithological data. The specific response received from JNCC on this matter being as follows:
 - ▲ *“The annual displacement matrices for Manx shearwater for both the array area and the array areas plus 2km buffer have not been included. Please provide these tables.”;*
 - ▲ *“It is not clear how the impact values assessed have been translated into a relative harvest for use within the PVA tool. Please provide calculations as to how these relative harvest values have been calculated.”;*
 - ▲ *“We would find it useful to include graphs of population size over the years of impact, counterfactual of growth rate and counterfactual of population size, including confidence intervals.” and*
 - ▲ *“Full apportioning calculations for all SPAs and designated features should be presented in this annex. Please provide these calculations.”*
- 2 In response to these requests this clarification note has been drafted to provide these additional data sources, in order to provide greater clarity in the assessment process for AyM and confidence in the conclusion of no significant effect from the project alone or cumulatively with other plans and projects with respect to offshore ornithology receptors.

2 Manx Shearwater Displacement Matrices

- 3 As presented within Volume 4, Annex 4.2: Offshore Ornithology Displacement (document reference 6.4.4.2), displacement matrices were produced for AyM for the key species agreed with stakeholders through the Expert Topic Groups (ETGs) which may be sensitive to disturbance and displacement from AyM (see Volume 4, Annex 4.5: Offshore Ornithology Scoping and Consultation Responses (document reference 6.4.4.5) for agreement on species requiring disturbance and displacement assessment for AyM). Seasonal displacement matrices were produced and presented within the displacement annex for Manx shearwater, however as noted annual matrices were not presented, which are now provided in Table 1 and Table 2 below.
- 4 Further details on disturbance and displacement analysis is provided in Volume 4, Annex 4.2: Offshore Ornithology Displacement (document reference 6.4.4.2) and subsequent disturbance and displacement assessments undertaken for AyM are presented within Volume 2, Chapter 4: Offshore Ornithology (document reference 6.2.4).

Table 1: Manx shearwater annual displacement matrix (based on an abundance of 228 individuals for AyM array area).

DISPLACEMENT (%)	MORTALITY RATES (%)															
	0	1	2	3	4	5	10	20	30	40	50	60	70	80	90	100
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1	0	0	0	0	0	0	0	0	1	1	1	1	2	2	2	2
10	0	0	0	1	1	1	2	5	7	9	11	14	16	18	20	23
20	0	0	1	1	2	2	5	9	14	18	23	27	32	36	41	46
30	0	1	1	2	3	3	7	14	20	27	34	41	48	55	61	68
40	0	1	2	3	4	5	9	18	27	36	46	55	64	73	82	91
50	0	1	2	3	5	6	11	23	34	46	57	68	80	91	102	114
60	0	1	3	4	5	7	14	27	41	55	68	82	96	109	123	137
70	0	2	3	5	6	8	16	32	48	64	80	96	111	127	143	159
80	0	2	4	5	7	9	18	36	55	73	91	109	127	146	164	182
90	0	2	4	6	8	10	20	41	61	82	102	123	143	164	184	205
100	0	2	5	7	9	11	23	46	68	91	114	137	159	182	205	228

Table 2: Manx shearwater annual displacement matrix (based on an abundance of 417 individuals for AyM array area plus 2 km buffer).

DISPLACEMENT (%)	MORTALITY RATES (%)															
	0	1	2	3	4	5	10	20	30	40	50	60	70	80	90	100
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1	0	0	0	0	0	0	0	1	1	2	2	3	3	3	4	4
10	0	0	1	1	2	2	4	8	13	17	21	25	29	33	38	42
20	0	1	2	3	3	4	8	17	25	33	42	50	58	67	75	83
30	0	1	3	4	5	6	13	25	38	50	63	75	88	100	113	125
40	0	2	3	5	7	8	17	33	50	67	83	100	117	133	150	167
50	0	2	4	6	8	10	21	42	63	83	104	125	146	167	188	209
60	0	3	5	8	10	13	25	50	75	100	125	150	175	200	225	250
70	0	3	6	9	12	15	29	58	88	117	146	175	204	234	263	292
80	0	3	7	10	13	17	33	67	100	133	167	200	234	267	300	334
90	0	4	8	11	15	19	38	75	113	150	188	225	263	300	338	375
100	0	4	8	13	17	21	42	83	125	167	209	250	292	334	375	417

3 Population Viability Analysis (PVA)

Additional Information

3.1 Background

- 5 As detailed within Volume 4, Annex 4.6: Offshore Ornithology Population Viability Analysis (document reference 6.4.4.6) it was agreed with Natural Resources Wales, Natural England and JNCC through the ETGs that further analysis would be undertaken for great black-backed gull. In relation to the PVA, JNCC requested further information be provided in relation to how predicted impacts were translated into relative harvest values and presentation of the graphical outputs of the seabird PVA tool.
- 6 With respect to derivation of relative harvest values, the impact on adult survival rate for each population scale was used to model the potential population levels effects from AyM. As a precautionary measure, it was assumed all impacts were against adult birds, due to difficulty in apportioning individual predicted mortalities to an age category. The change in the adult survival rate was calculated based on the increase in population mortality and subsequent reduction in survival rate caused by the additional predicted impacts from AyM.
- 7 With respect to the graphical outputs from the PVA modelling undertaken for AyM these are presented in the figures below for the three different regional population scales assessed against for great black-backed gull. With respect to the scenario coding for the PVA outputs presented below, the resulting predicted impacts on the population modelled (additional mortalities per annum) for each scenario code is provided in Table 3.

Table 3: Predicted impact scenario coding.

SCENARIO CODE	PREDICTED IMPACT (INDIVIDUALS PER ANNUM)
A	50
B	55
C	60
D	65
E	70
F	75
G	80
H	85
I	90
J	95

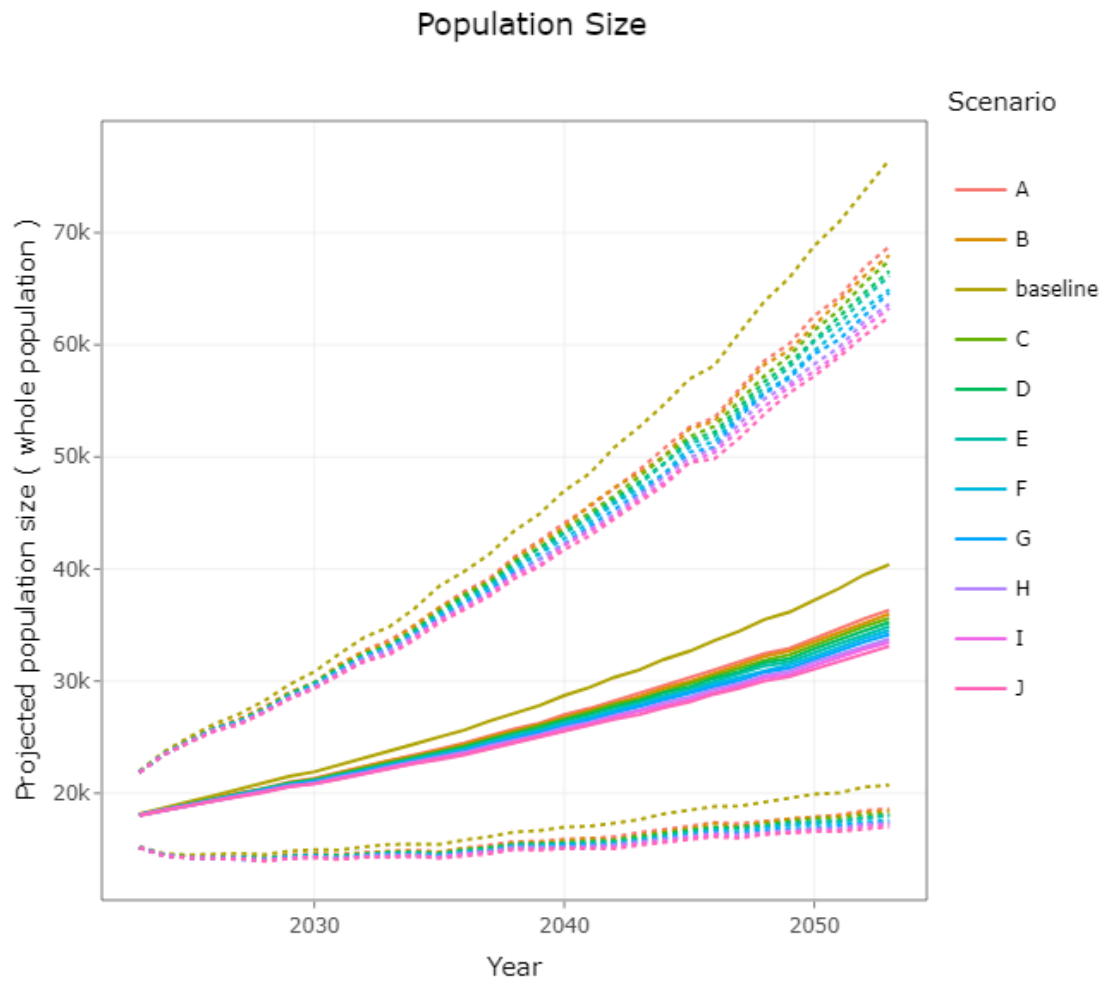


Figure 1: South-western regional population scale. projected population size across the lifetime of the project.

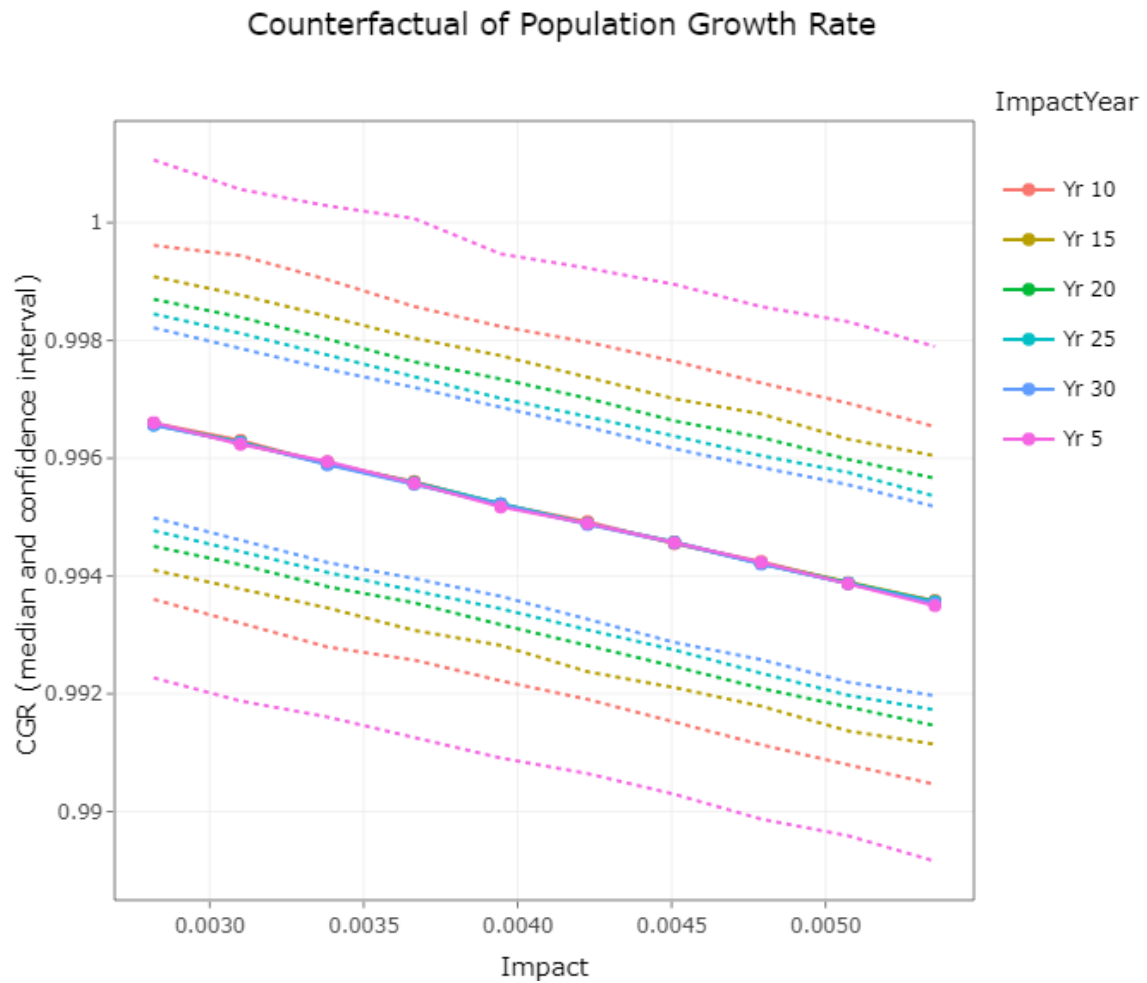


Figure 2: Change in counterfactual of population growth rate over project's lifespan for the South-western regional population scale.

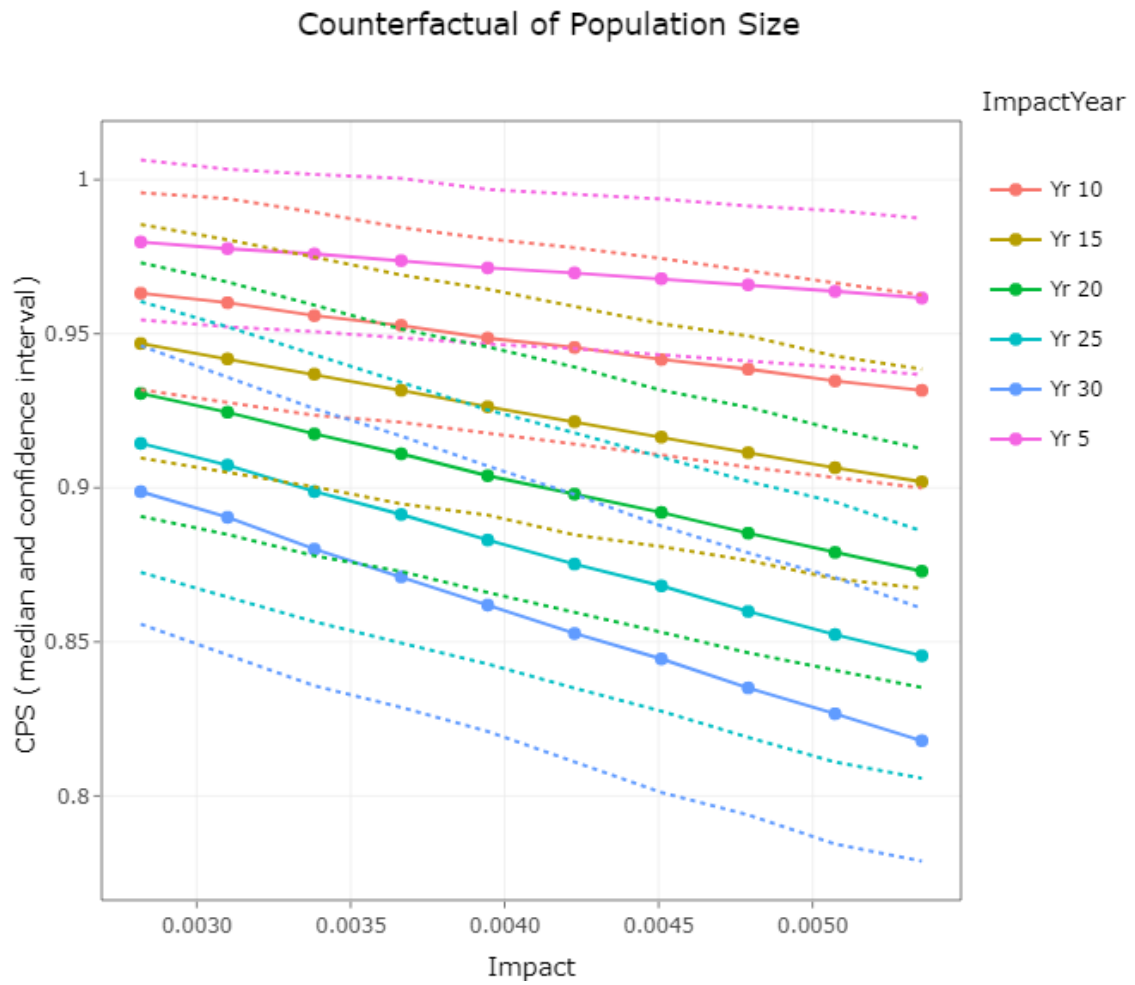


Figure 3: Change in counterfactual of population size over project's lifespan for the South-western regional population scale.

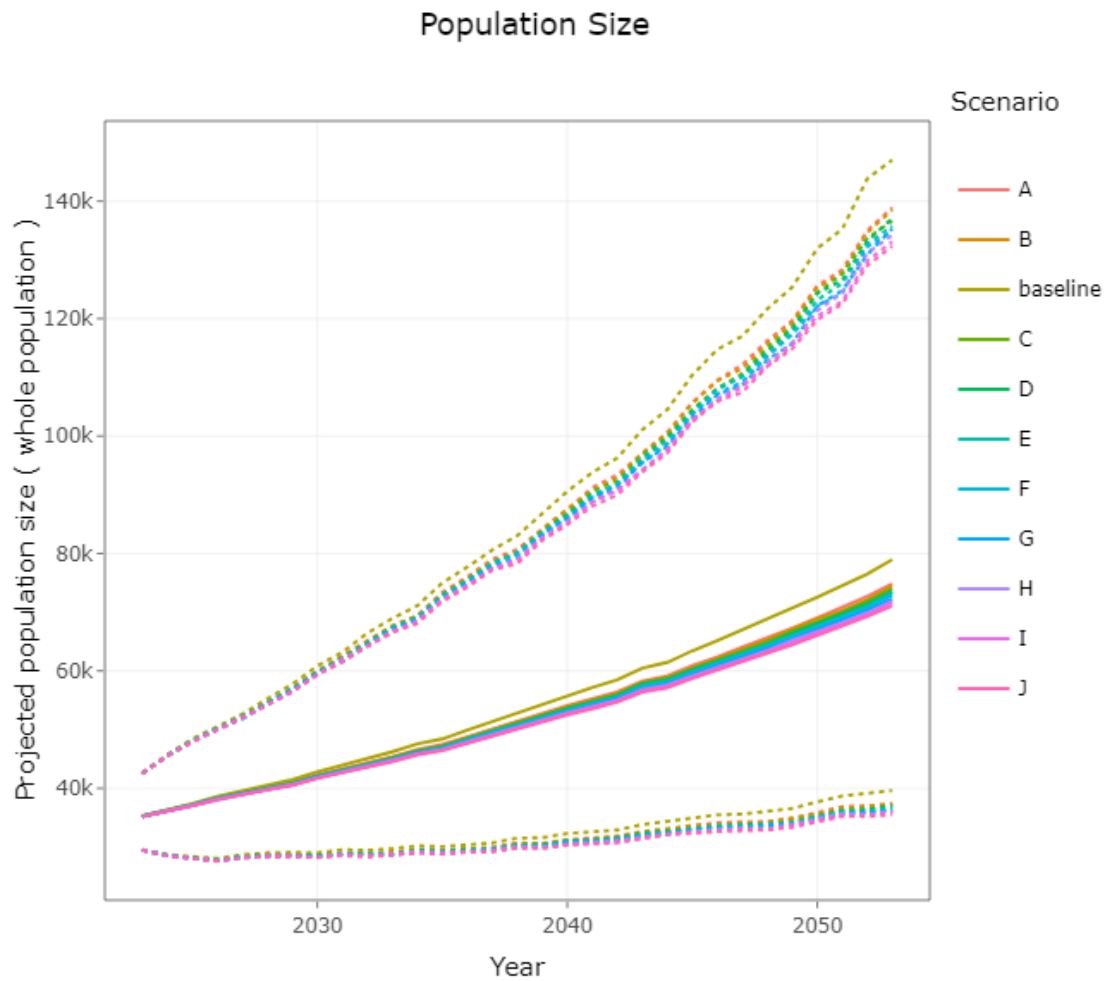


Figure 4: Western-Scotland regional population scale. projected population size across the lifetime of the project.

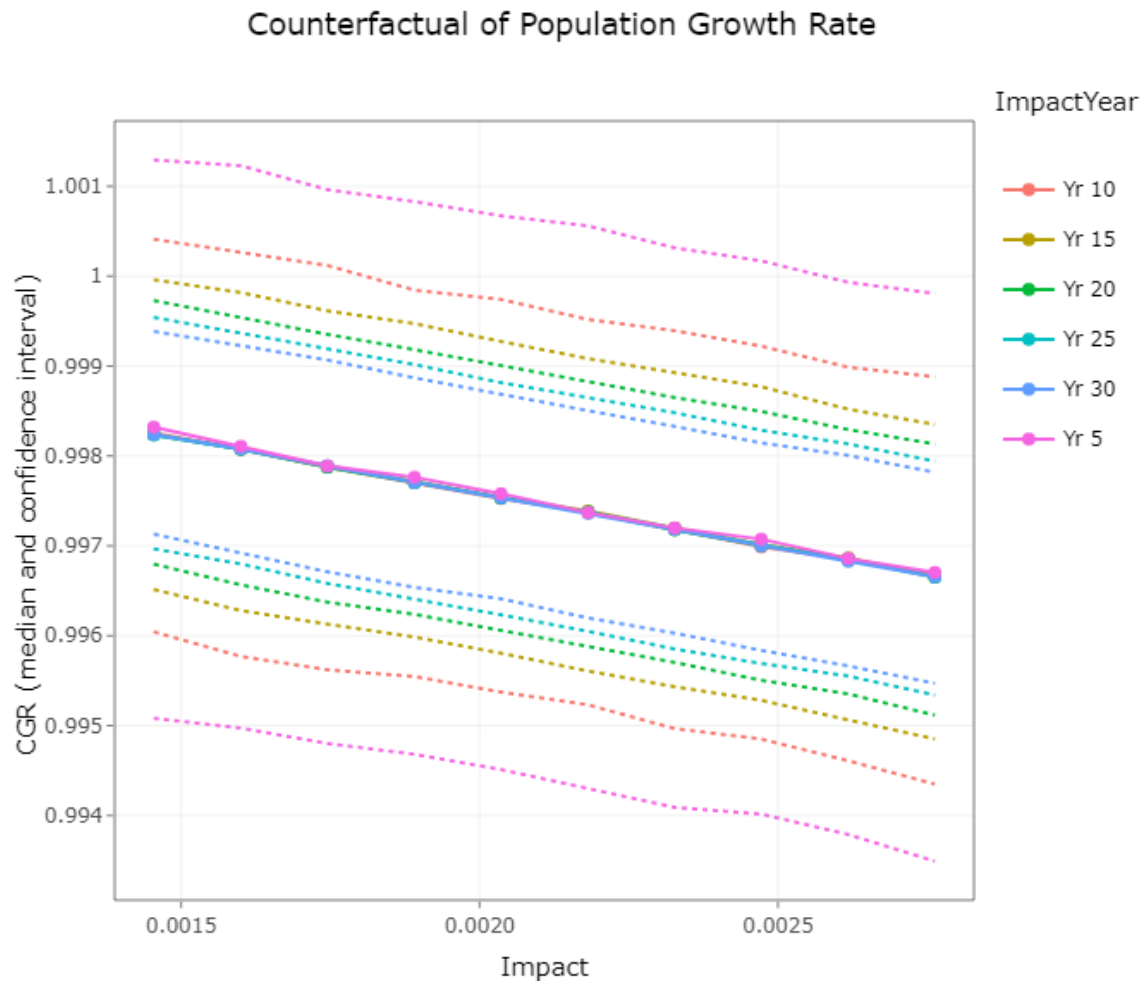


Figure 5: Change in counterfactual of population growth rate over project's lifespan for the Western-Scotland regional population scale.

Counterfactual of Population Size

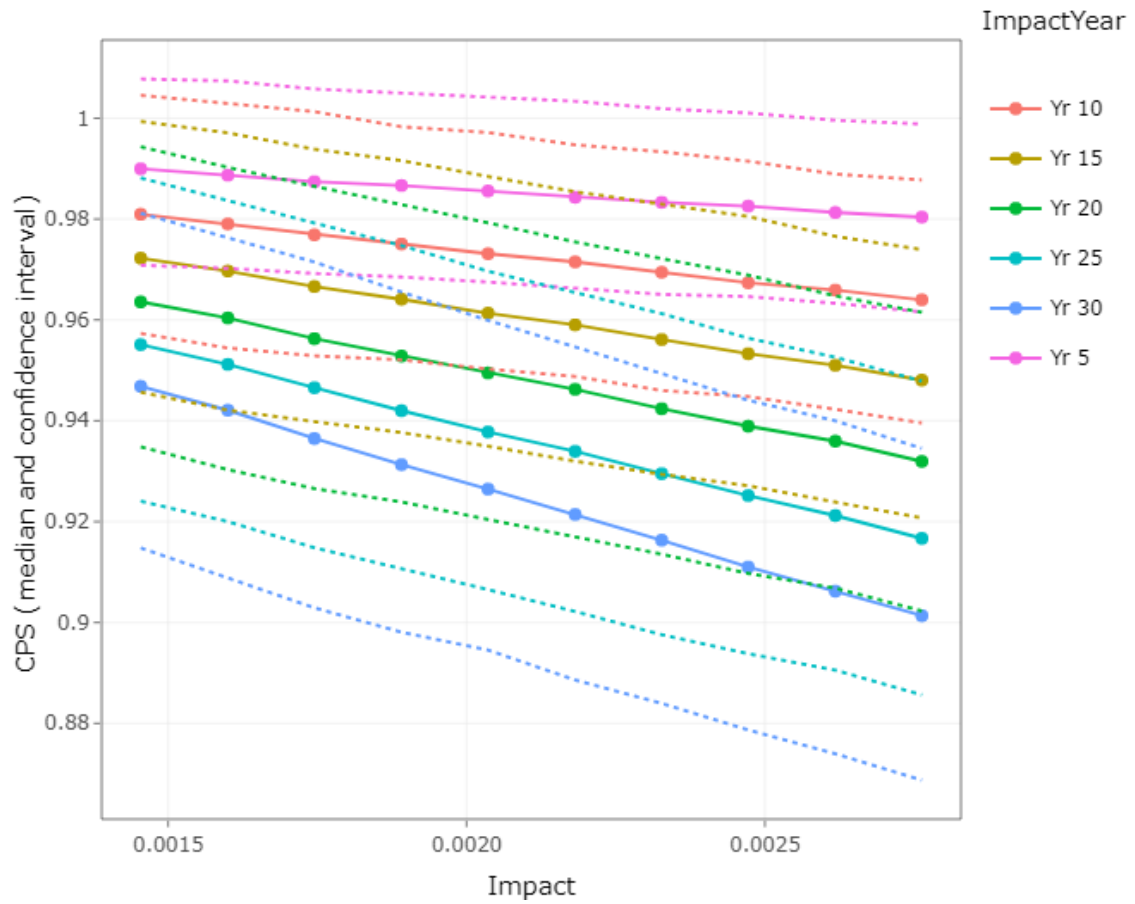


Figure 6: Change in counterfactual of population size over project's lifespan for the South-western regional population scale.

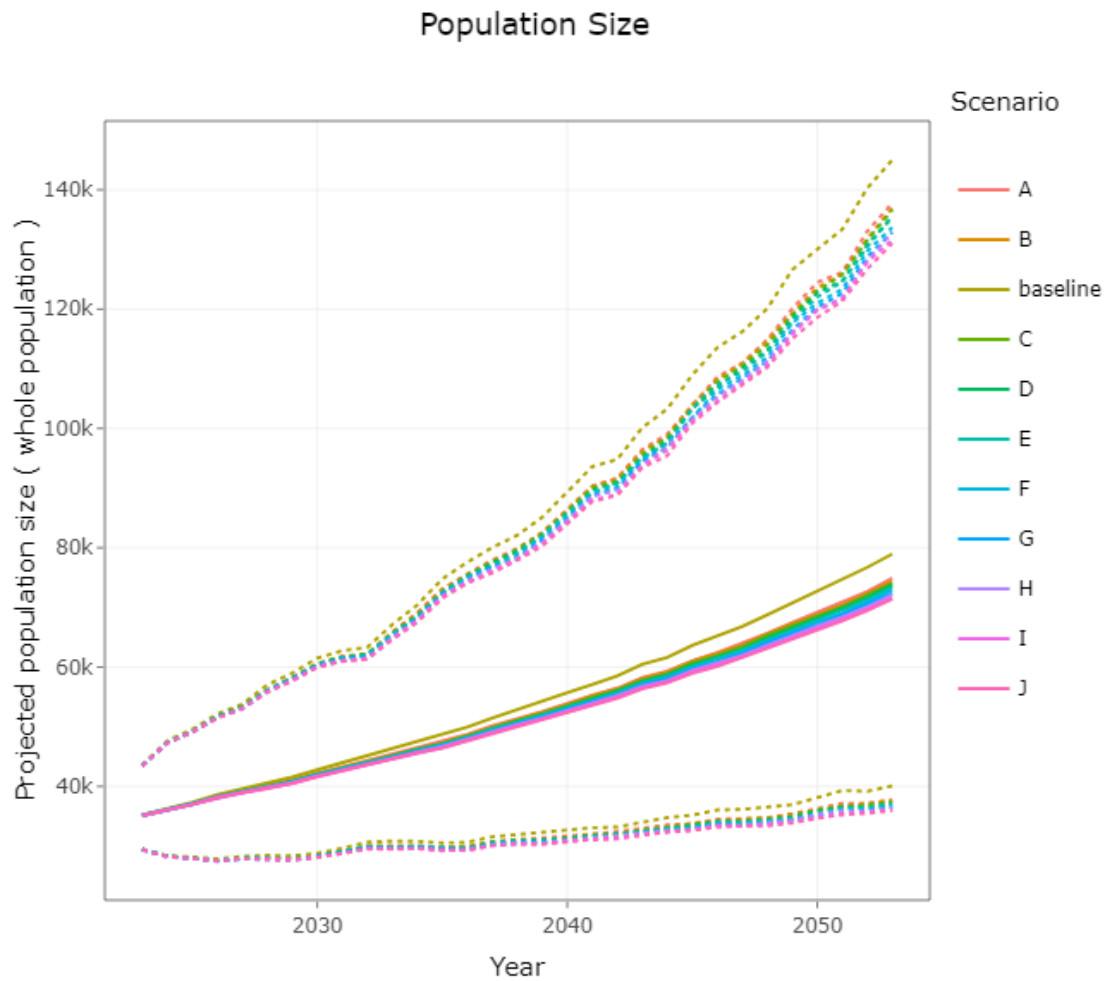


Figure 7: Western-combined regional population scale. projected population size across the lifetime of the project.

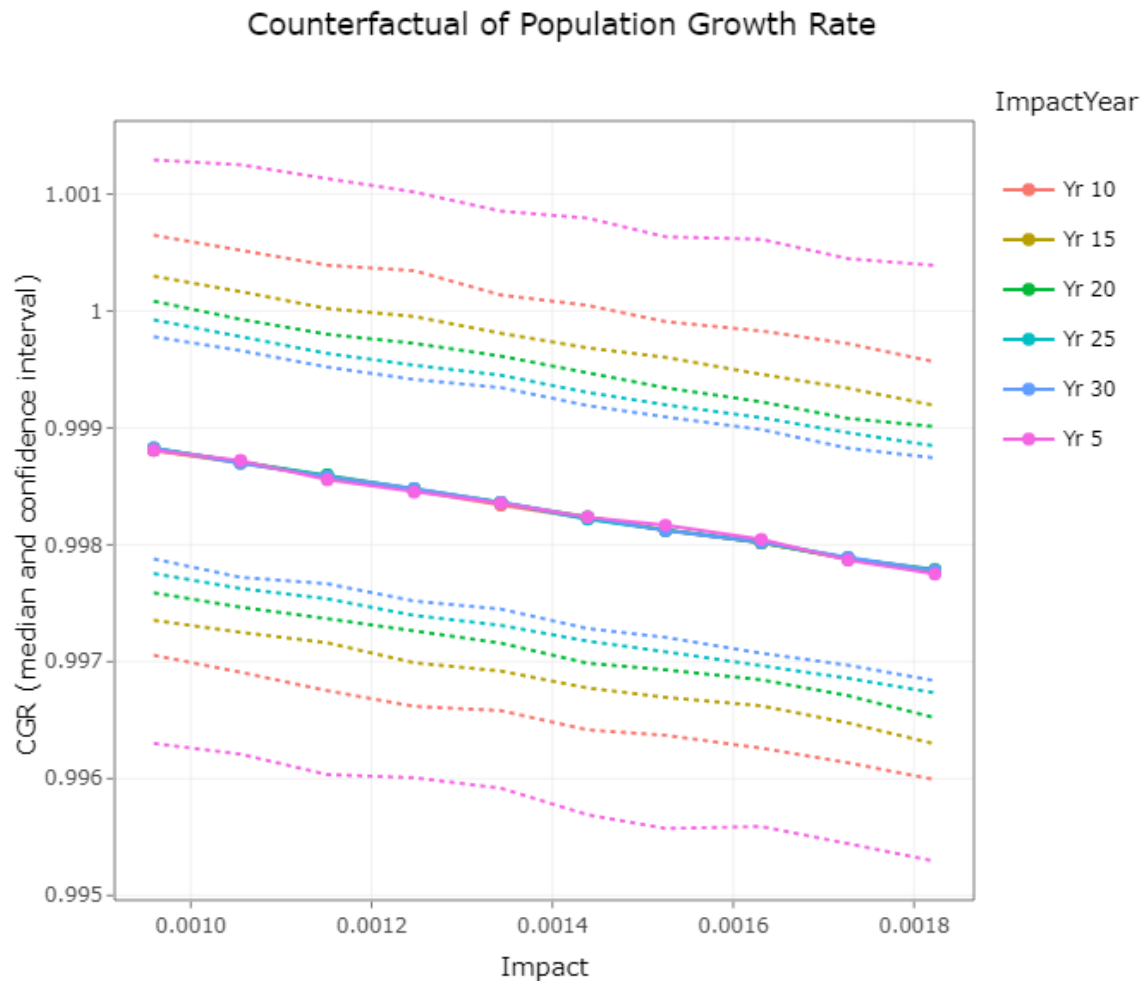


Figure 8: Change in counterfactual of population growth rate over project's lifespan for the Western-combined regional population scale.

Counterfactual of Population Size

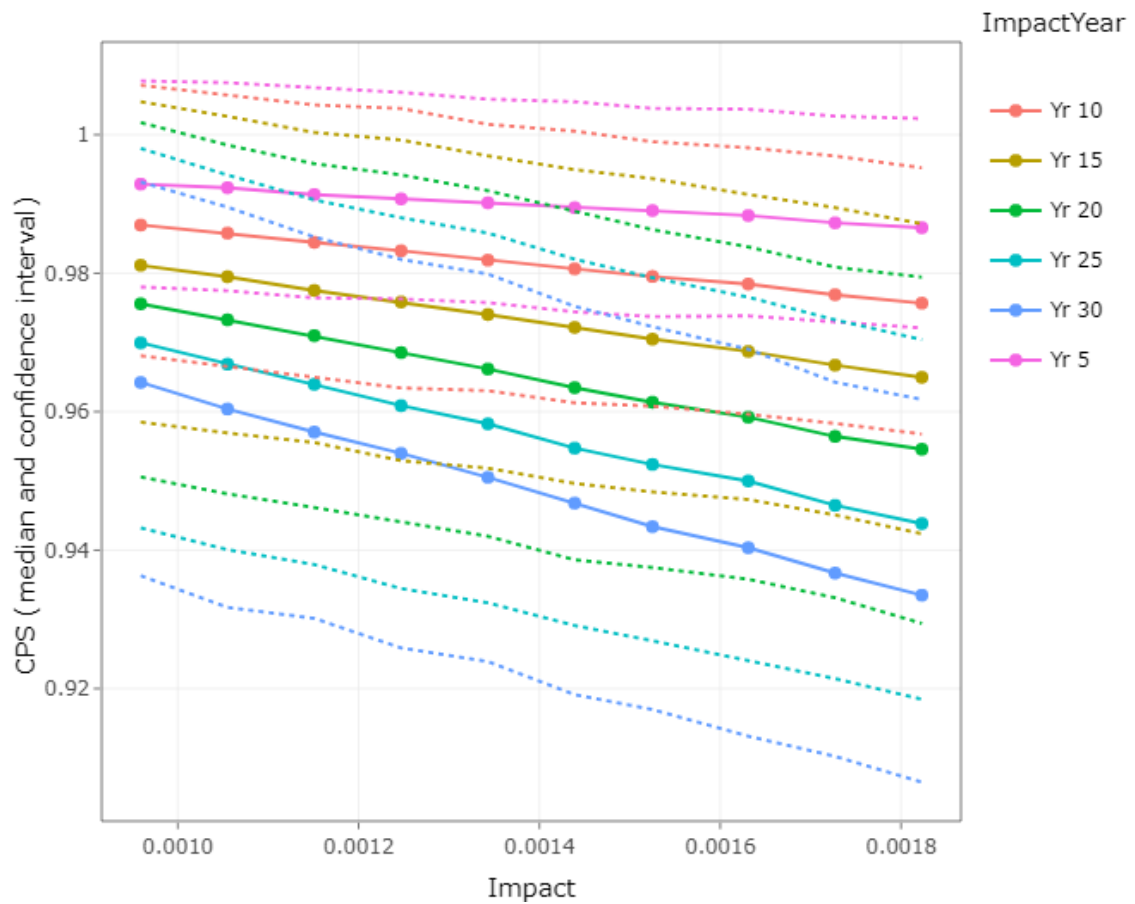


Figure 9: Change in counterfactual of population size over project's lifespan for the South-western regional population scale.

4 Apportionment Calculations

- 8 In order to provide the methods of how for AyM predicted impacts were apportioned to individual colonies with connectivity during the breeding season, a worked example using gannet was provided in Report to Inform Appropriate Assessment, Annex 5: Ornithology Apportioning Note (document reference 5.2.5). As detailed above JNCC have requested that the apportionment tables for all remaining species also be provided, which are presented in the tables below.

Table 4: Breeding kittiwake collision risk apportionment.

COLONY (DATE OF COUNT)	COUNT OF ADULT BIRDS ON COLONY	DISTANCE FROM COLONY TO DEVELOPMENT	PROPORTION OF FORAGE RANGE AS SEA	1/P(SEA)	RESULTING WEIGHT FOR COLONY	PROPORTIONAL WEIGHT OF COLONY	PREDICTED MORTALITIES APPORTIONED TO COLONY
St Tudwal's Island East (2016)	620	122	0.481	2.077	0.019	0.003	0.0
Trwyn Cilan (2016)	56	117	0.448	2.233	0.002	0.000	0.0
Bardsey Island (SPA) (2019)	242	106	0.509	1.964	0.009	0.001	0.0
Carreg y Llam (2019)	1,254	74	0.524	1.908	0.094	0.015	0.1
Penlas, Anglesey (Gwyn.) (1992)	424	70	0.580	1.724	0.032	0.005	0.0
South Stack Cliffs RSPB (2019)	22	69	0.580	1.724	0.002	0.000	0.0
Middle Mouse (2002)	104	44	0.573	1.747	0.020	0.003	0.0
Ynys Moelfre (2016)	312	32	0.542	1.844	0.121	0.019	0.1
Puffin Island (Wales) (SPA) (2019)	626	24	0.516	1.937	0.455	0.072	0.5
Great Orme (2019)	1,708	15	0.492	2.032	3.334	0.530	3.5
Little Orme (2019)	648	15	0.475	2.106	1.311	0.209	1.4
Morecambe Gas Platform (2020)	1,112	50	0.369	2.710	0.260	0.041	0.3

COLONY (DATE OF COUNT)	COUNT OF ADULT BIRDS ON COLONY	DISTANCE FROM COLONY TO DEVELOPMENT	PROPORTION OF FORAGE RANGE AS SEA	1/P(SEA)	RESULTING WEIGHT FOR COLONY	PROPORTIONAL WEIGHT OF COLONY	PREDICTED MORTALITIES APPORTIONED TO COLONY
St Bees Head RSPB (2019/20)	1,365	115	0.353	2.830	0.063	0.010	0.1
Balcary Point 1 (2018)	228	152	0.319	3.138	0.007	0.001	0.0
Meikle Ross (2000)	14	148	0.366	2.729	0.000	0.000	0.0
Big Scar (2018)	38	147	0.467	2.139	0.001	0.000	0.0
Mull of Galloway RSPB (2019)	216	148	0.494	2.024	0.004	0.001	0.0
Lythe Mead to Carrick-Kee (2015)	678	148	0.494	2.024	0.014	0.002	0.0
Port Mona (2000)	60	153	0.493	2.030	0.001	0.000	0.0
Rockabill (SPA) (2018)	266	149	0.458	2.182	0.006	0.001	0.0
Lambay (SPA) (2015)	6,640	148	0.466	2.144	0.140	0.022	0.1
Ireland's Eye (SPA) (2015)	3,220	152	0.458	2.183	0.066	0.010	0.1
Howth Head (SPA) (2015)	6,162	151	0.462	2.165	0.126	0.020	0.1
Bray Head (2010)	2,946	155	0.474	2.111	0.056	0.009	0.1
Wicklow Head (SPA) (2019)	1,546	162	0.372	2.690	0.034	0.005	0.0
Ramsey - Port Mooar (2017)	156	103	0.474	2.108	0.007	0.001	0.0
Port St Mary - Sound (2017)	1,080	93	0.518	1.932	0.052	0.008	0.1

COLONY (DATE OF COUNT)	COUNT OF ADULT BIRDS ON COLONY	DISTANCE FROM COLONY TO DEVELOPMENT	PROPORTION OF FORAGE RANGE AS SEA	1/P(SEA)	RESULTING WEIGHT FOR COLONY	PROPORTIONAL WEIGHT OF COLONY	PREDICTED MORTALITIES APPORTIONED TO COLONY
Calf of Man (2013)	26	95	0.522	1.917	0.001	0.000	0.0
Glen Maye - Peel (2017)	108	102	0.514	1.945	0.004	0.001	0.0
Ailsa Craig (2019)	600	231	0.357	2.801	0.007	0.001	0.0
Skomer (2018)	2,472	223	0.462	2.163	0.023	0.004	0.0
Great Saltee Island (NPWS 2015-2018)	2,076	253	0.491	2.038	0.014	0.002	0.0
SUM	37,025	3,766	15.104	69.300	6.288	1.000	6.5

Table 5: Breeding herring gull collision risk apportionment.

COLONY (DATE OF COUNT)	COUNT OF ADULT BIRDS ON COLONY	DISTANCE FROM COLONY TO DEVELOPMENT	PROPORTION OF FORAGE RANGE AS SEA	1/P(SEA)	RESULTING WEIGHT FOR COLONY	PROPORTIONAL WEIGHT OF COLONY	PREDICTED MORTALITIES APPORTIONED TO COLONY
Llyn Conwy (2003)	8	52	0.266	3.764	0.002	0.001	0.0
Llyn Elsi (2017)	72	43	0.339	2.949	0.017	0.012	0.0
Llyn Brenig (2016)	88	45	0.245	4.088	0.026	0.019	0.0
Morfa Dinlle (2018)	2	55	0.508	1.969	0.000	0.000	0.0
Caernarfon (urban) (2019)	204	50	0.494	2.022	0.024	0.017	0.0
Ynys yr Adar (2018)	6	58	0.566	1.766	0.000	0.000	0.0
Pant yr Eglwys (2016)	16	53	0.815	1.227	0.001	0.001	0.0
The Skerries RSPB (2019)	1,330	56	0.841	1.189	0.075	0.053	0.0
Porth Llanlleiana (2016)	36	45	0.798	1.253	0.003	0.002	0.0
Middle Mouse (2016)	128	44	0.804	1.244	0.012	0.009	0.0
Porth Wen (2002)	16	42	0.790	1.265	0.002	0.001	0.0
Trwynbychan to Porthllechog (2016)	6	41	0.786	1.273	0.001	0.000	0.0
Bull Bay (2016)	4	40	0.775	1.290	0.000	0.000	0.0
East Mouse (2016)	82	38	0.768	1.303	0.011	0.008	0.0

COLONY (DATE OF COUNT)	COUNT OF ADULT BIRDS ON COLONY	DISTANCE FROM COLONY TO DEVELOPMENT	PROPORTION OF FORAGE RANGE AS SEA	1/P(SEA)	RESULTING WEIGHT FOR COLONY	PROPORTIONAL WEIGHT OF COLONY	PREDICTED MORTALITIES APPORTIONED TO COLONY
Point Lynas Bay (2016)	30	35	0.745	1.342	0.005	0.003	0.0
Lynas to Freshwater Bay (2016)	2	35	0.750	1.334	0.000	0.000	0.0
Freshwater Bay (2016)	4	34	0.740	1.351	0.001	0.000	0.0
Ynys Dulas (2016)	68	33	0.713	1.402	0.013	0.009	0.0
Bryntirion (2016)	4	33	0.688	1.453	0.001	0.001	0.0
Moelfre Cliffs (2016)	2	33	0.681	1.468	0.000	0.000	0.0
Ynys Moelfre (2016)	360	32	0.680	1.471	0.077	0.055	0.0
Bychan to Benllech (2016)	30	33	0.661	1.512	0.006	0.004	0.0
St Davids (2016)	64	33	0.633	1.580	0.014	0.010	0.0
Bwrdd Arthur to Fedw Fawr (2016)	82	29	0.609	1.641	0.024	0.017	0.0
Fedw Fawr to Trwyn Du (2016)	14	27	0.602	1.660	0.005	0.003	0.0
Puffin Island (Wales) (2017)	944	24	0.582	1.719	0.417	0.299	0.1
Beaumaris (urban) (2019)	86	31	0.550	1.820	0.024	0.017	0.0
Bangor Buildings (2019)	82	35	0.525	1.905	0.019	0.014	0.0

COLONY (DATE OF COUNT)	COUNT OF ADULT BIRDS ON COLONY	DISTANCE FROM COLONY TO DEVELOPMENT	PROPORTION OF FORAGE RANGE AS SEA	1/P(SEA)	RESULTING WEIGHT FOR COLONY	PROPORTIONAL WEIGHT OF COLONY	PREDICTED MORTALITIES APPORTIONED TO COLONY
Conwy Town (urban) (2019)	178	21	0.477	2.096	0.125	0.090	0.0
Conwy Mountain (2000)	4	20	0.488	2.047	0.003	0.002	0.0
Deganwy Town (urban) (2019)	14	19	0.499	2.004	0.012	0.008	0.0
Llandudno Town (urban) (2019)	98	16	0.522	1.917	0.109	0.078	0.0
Colwyn Bay Town (urban) (2019)	48	19	0.446	2.244	0.044	0.032	0.0
West Quarry (2017)	48	21	0.421	2.374	0.038	0.027	0.0
SUM	6,172	1,875	25.944	96.119	1.397	1.000	0.4

Table 6: Breeding lesser black-backed gull collision risk apportionment.

COLONY (DATE OF COUNT)	COUNT OF ADULT BIRDS ON COLONY	DISTANCE FROM COLONY TO DEVELOPMENT	PROPORTION OF FORAGE RANGE AS SEA	1/P(SEA)	RESULTING WEIGHT FOR COLONY	PROPORTIONAL WEIGHT OF COLONY	PREDICTED MORTALITIES APPORTIONED TO COLONY
Ailsa Craig (2019)	378	231	0.368	2.719	0.001	0.001	0.0
Lambay (2010)	952	148	0.358	2.790	0.008	0.005	0.0
Gogarath (2016)	6	68	0.719	1.392	0.000	0.000	0.0
South Stack Cliffs RSPB (2019)	12	69	0.718	1.394	0.000	0.000	0.0
Porth Diana (2016)	12	74	0.710	1.408	0.000	0.000	0.0
Rhoscolyn Beacon (2016)	12	78	0.701	1.427	0.000	0.000	0.0
The Skerries RSPB (2019)	230	56	0.718	1.392	0.007	0.004	0.0
Ynys Traws (2016)	28	79	0.701	1.427	0.000	0.000	0.0
Pant yr Eglwys (2016)	2	53	0.712	1.404	0.000	0.000	0.0
Valley Wetlands RSPB (2019)	2	75	0.700	1.428	0.000	0.000	0.0
Bodorgan Head (2018)	6	63	0.669	1.496	0.000	0.000	0.0
Porth Llanlleiana (2016)	4	45	0.702	1.424	0.000	0.000	0.0
Middle Mouse (2016)	6	44	0.704	1.421	0.000	0.000	0.0
Ynys yr Adar (2018)	2	58	0.655	1.526	0.000	0.000	0.0

COLONY (DATE OF COUNT)	COUNT OF ADULT BIRDS ON COLONY	DISTANCE FROM COLONY TO DEVELOPMENT	PROPORTION OF FORAGE RANGE AS SEA	1/P(SEA)	RESULTING WEIGHT FOR COLONY	PROPORTIONAL WEIGHT OF COLONY	PREDICTED MORTALITIES APPORTIONED TO COLONY
East Mouse (2016)	2	38	0.689	1.452	0.000	0.000	0.0
Caernarfon (urban) (2019)	34	50	0.631	1.584	0.001	0.001	0.0
Ynys Moelfre (2016)	8	32	0.654	1.530	0.001	0.000	0.0
Fedw Fawr to Trwyn Du (2016)	2	27	0.608	1.643	0.000	0.000	0.0
Puffin Island (2017)	1,052	24	0.587	1.704	0.207	0.120	0.0
Llyn Trwsfynydd Rese (2018)	158	62	0.486	2.058	0.006	0.003	0.0
Llyn Conwy (2000)	2	52	0.476	2.100	0.000	0.000	0.0
Llandudno Town (urban) (2019)	4	16	0.518	1.932	0.002	0.001	0.0
Llyn Elsi (2017)	24	43	0.496	2.015	0.002	0.001	0.0
West Quarry (2017)	6	21	0.454	2.203	0.002	0.001	0.0
East Quarry (2002)	2	21	0.454	2.203	0.001	0.000	0.0
Llyn Brenig (2016)	36	45	0.414	2.415	0.003	0.002	0.0
Kinmel Bay (urban) (2019)	2	24	0.382	2.621	0.001	0.000	0.0
Rhyl (urban) (2019)	8	26	0.371	2.696	0.002	0.001	0.0
Prestatyn (urban) (2019)	6	28	0.355	2.814	0.001	0.001	0.0

COLONY (DATE OF COUNT)	COUNT OF ADULT BIRDS ON COLONY	DISTANCE FROM COLONY TO DEVELOPMENT	PROPORTION OF FORAGE RANGE AS SEA	1/P(SEA)	RESULTING WEIGHT FOR COLONY	PROPORTIONAL WEIGHT OF COLONY	PREDICTED MORTALITIES APPORTIONED TO COLONY
Walney Urban Gulls (2019)	22	78	0.387	2.586	0.001	0.000	0.0
South Walney (Morecambe Bay SPA) (2019-2020)	771	76	0.374	2.677	0.024	0.014	0.0
Chapel Island (Morecambe Bay SPA) (2018)	44	93	0.341	2.933	0.001	0.001	0.0
Fleetwood Town (2019)	18	71	0.331	3.025	0.001	0.000	0.0
Liverpool 2 (urban) (2019)	10	52	0.268	3.733	0.001	0.001	0.0
Liverpool 3 (urban) (2019)	12	52	0.268	3.733	0.001	0.001	0.0
Liverpool 1 (urban) (2019)	8	54	0.261	3.833	0.001	0.000	0.0
Ribble Estuary (2021)	8,978	63	0.288	3.473	0.523	0.304	0.0
West wall to W&SW of Weston Point (2020)	290	69	0.205	4.889	0.020	0.012	0.0
Askam-in-Furness (urban) (2019)	76	89	0.373	2.680	0.002	0.001	0.0
Bardsey Island (2019)	328	108	0.577	1.733	0.003	0.002	0.0
Belmont Reservoir 1 (2019-2020)	3	87	0.199	5.035	0.000	0.000	0.0
Calf of Man (2017)	54	95	0.682	1.467	0.001	0.000	0.0

COLONY (DATE OF COUNT)	COUNT OF ADULT BIRDS ON COLONY	DISTANCE FROM COLONY TO DEVELOPMENT	PROPORTION OF FORAGE RANGE AS SEA	1/P(SEA)	RESULTING WEIGHT FOR COLONY	PROPORTIONAL WEIGHT OF COLONY	PREDICTED MORTALITIES APPORTIONED TO COLONY
Carreg Chwislen (2000)	2	111	0.574	1.744	0.000	0.000	0.0
Centre and Island (urban) (2010)	2,250	81	0.380	2.634	0.060	0.035	0.0
Cleator Moor (urban) (2013)	16	119	0.386	2.589	0.000	0.000	0.0
Conwy RSPB (2019)	2	21	0.468	2.138	0.001	0.000	0.0
Dhoon - Laxey Bay (2017)	2	96	0.607	1.648	0.000	0.000	0.0
Douglas Town (2017)	6	90	0.639	1.566	0.000	0.000	0.0
Ebolion (2000)	8	106	0.577	1.734	0.000	0.000	0.0
Furness General Hospital (2019)	18	84	0.376	2.662	0.000	0.000	0.0
Gayton Sands (2019)	6	49	0.273	3.657	0.001	0.000	0.0
Greenside Quarry or Kendal Fell Quarry (2009)	52	117	0.270	3.704	0.001	0.001	0.0
Gronant Beach 1 (2013)	2	30	0.346	2.894	0.000	0.000	0.0
Haverigg Prison (urban) (2019)	150	87	0.396	2.525	0.003	0.002	0.0
Haverigg Town (2013)	8	88	0.391	2.559	0.000	0.000	0.0

COLONY (DATE OF COUNT)	COUNT OF ADULT BIRDS ON COLONY	DISTANCE FROM COLONY TO DEVELOPMENT	PROPORTION OF FORAGE RANGE AS SEA	1/P(SEA)	RESULTING WEIGHT FOR COLONY	PROPORTIONAL WEIGHT OF COLONY	PREDICTED MORTALITIES APPORTIONED TO COLONY
Hen Holme and Lady Holme (2009)	6	115	0.299	3.344	0.000	0.000	0.0
Hensingham (2018)	46	122	0.387	2.585	0.001	0.000	0.0
Heysham Power Station 1 (2000)	70	85	0.316	3.162	0.002	0.001	0.0
Hodbarrow RSPB (2017)	2	88	0.385	2.596	0.000	0.000	0.0
Kitterland (2017)	2	95	0.681	1.468	0.000	0.000	0.0
Langden Head (Bowland Fells SPA) (2018)	11,146	93	0.265	3.774	0.324	0.188	0.0
Layton Industrial Estate (2001)	10	64	0.327	3.055	0.000	0.000	0.0
Llyn Coed-Y-Dinas 1 (2018)	2	101	0.193	5.172	0.000	0.000	0.0
Millom (urban) (2013)	26	89	0.386	2.593	0.001	0.000	0.0
Morecambe Town (2000)	2	90	0.308	3.244	0.000	0.000	0.0
Netherton Factory Roofs (2019)	2	53	0.273	3.658	0.000	0.000	0.0
Park Road Ind. Est. (2019)	194	84	0.380	2.634	0.005	0.003	0.0
Peel - Glen Mooar (2017)	2	112	0.656	1.523	0.000	0.000	0.0

COLONY (DATE OF COUNT)	COUNT OF ADULT BIRDS ON COLONY	DISTANCE FROM COLONY TO DEVELOPMENT	PROPORTION OF FORAGE RANGE AS SEA	1/P(SEA)	RESULTING WEIGHT FOR COLONY	PROPORTIONAL WEIGHT OF COLONY	PREDICTED MORTALITIES APPORTIONED TO COLONY
Pen y Cil (2000)	4	105	0.565	1.769	0.000	0.000	0.0
Phurt - Ramsey (2017)	2	111	0.576	1.736	0.000	0.000	0.0
Point of Ayre Gravel Pits (2017)	2	113	0.572	1.749	0.000	0.000	0.0
Port Mooar - Dhoon (2017)	2	99	0.587	1.703	0.000	0.000	0.0
Porth Ceiriad East (2016)	2	122	0.486	2.056	0.000	0.000	0.0
Porth y Bribys (2001)	2	55	0.708	1.413	0.000	0.000	0.0
Rampside Gas Terminal (2019)	658	80	0.372	2.689	0.018	0.011	0.0
Ridding Bay (2009)	2	106	0.316	3.166	0.000	0.000	0.0
Salterhall Quarry (2018)	36	121	0.365	2.740	0.000	0.000	0.0
Sellafield BNFL (2009)	300	108	0.409	2.443	0.004	0.002	0.0
Silver Holme (2005)	2	108	0.313	3.191	0.000	0.000	0.0
St Tudwal's Island East (2016)	12	123	0.500	1.999	0.000	0.000	0.0
St Tudwal's Island West (2016)	76	122	0.507	1.973	0.001	0.000	0.0
Stickle Tarn (2006)	2	119	0.317	3.157	0.000	0.000	0.0

COLONY (DATE OF COUNT)	COUNT OF ADULT BIRDS ON COLONY	DISTANCE FROM COLONY TO DEVELOPMENT	PROPORTION OF FORAGE RANGE AS SEA	1/P(SEA)	RESULTING WEIGHT FOR COLONY	PROPORTIONAL WEIGHT OF COLONY	PREDICTED MORTALITIES APPORTIONED TO COLONY
Stocks Reservoir 1 (2021)	2	108	0.220	4.540	0.000	0.000	0.0
Tarnbrook Fell (Bowland Fells SPA) (2018)	18,108	100	0.255	3.917	0.472	0.274	0.0
Trwyn Penrhyn (2000)	10	107	0.547	1.828	0.000	0.000	0.0
Ulverston (urban) (2013)	6	92	0.351	2.851	0.000	0.000	0.0
West Mouse (2016)	2	53	0.703	1.423	0.000	0.000	0.0
Whitehaven Town Centre (2018)	60	122	0.385	2.596	0.001	0.000	0.0
Ynys Piod (2000)	12	101	0.577	1.732	0.000	0.000	0.0
Ynysoedd Gwylan (Fawr and Bach Total) (2011)	4	106	0.563	1.775	0.000	0.000	0.0
SUM	46,950	7,188	41.996	218.719	1.721	1.000	0.2

Table 7: Gannet breeding bio-season apportioned abundance for the array area plus 2 km buffer.

COLONY (DATE OF COUNT)	COUNT OF ADULT BIRDS ON COLONY	DISTANCE FROM COLONY TO DEVELOPMENT	PROPORTION OF FORAGE RANGE AS SEA	1/P(SEA)	RESULTING WEIGHT FOR COLONY	PROPORTIONAL WEIGHT OF COLONY	APPORTIONED ABUDANCE (ARRAY AREA PLUS 2 KM BUFFER)
Grassholm (2015)	72,022	227	0.492	2.031	0.260	0.367	121
Great Saltee Island (2004)	4,892	253	0.479	2.088	0.015	0.021	7
Ireland's Eye (2015)	690	152	0.310	3.228	0.009	0.012	4
Lambay (2015)	1,852	148	0.302	3.312	0.026	0.036	12
Big Scar (2014)	4,752	147	0.282	3.546	0.071	0.101	33
Ailsa Craig (2014)	66,452	231	0.349	2.867	0.327	0.462	152
SUM	150,660	1,158	2.214	17.072	0.707	1.000	328

Table 8: Guillemot breeding bio-season apportioned abundance for the array area plus 2 km buffer.

COLONY (DATE OF COUNT)	COUNT OF ADULT BIRDS ON COLONY	DISTANCE FROM COLONY TO DEVELOPMENT	PROPORTION OF FORAGE RANGE AS SEA	1/P(SEA)	RESULTING WEIGHT FOR COLONY	PROPORTIONAL WEIGHT OF COLONY	APPORTIONED ABUNDANCE (ARRAY AREA PLUS 2 KM BUFFER)
Abraham's Bosom (2016)	315	70	0.766	1.306	0.004	0.002	3
South Stack Cliffs RSPB (2019)	6,292	69	0.668	1.498	0.097	0.047	74
Gogarth (2016)	7	68	0.776	1.288	0.000	0.000	0
Middle Mouse (2016)	5,550	44	0.741	1.349	0.189	0.093	145
Puffin Island (2019)	3,606	24	0.560	1.786	0.547	0.268	420
Great Orme (2019)	1,843	15	0.537	1.861	0.746	0.365	572
Little Orme (2019)	348	15	0.493	2.028	0.153	0.075	118
Lambay (2015)	59,983	148	0.467	2.142	0.287	0.140	220
Ireland's Eye (2015)	4,410	152	0.455	2.197	0.021	0.010	16
SUM	82,354	605	5.464	15.454	2.044	1.000	1,569

Table 9: Razorbill breeding bio-season apportioned abundance for the array area plus 2 km buffer.

COLONY (DATE OF COUNT)	COUNT OF ADULT BIRDS ON COLONY	DISTANCE FROM COLONY TO DEVELOPMENT	PROPORTION OF FORAGE RANGE AS SEA	1/P(SEA)	RESULTING WEIGHT FOR COLONY	PROPORTIONAL WEIGHT OF COLONY	APPORTIONED ABUNDANCE (ARRAY AREA PLUS 2 KM BUFFER)
Carreg y Llam (2019)	519	74	0.637	1.569	0.041	0.028	4
Abraham's Bosom (2016)	83	70	0.784	1.275	0.006	0.004	1
South Stack Cliffs RSPB (2019)	1,192	69	0.398	2.515	0.174	0.116	16
Gogarth (2016)	18	68	0.794	1.260	0.001	0.001	0
Pant yr Eglwys (2001)	28	53	0.612	1.634	0.005	0.003	0
The Skerries RSPB (2017)	3	56	0.836	1.197	0.000	0.000	0
Porth Llanlleiana (2016)	2	45	0.538	1.859	0.001	0.000	0
Middle Mouse (2016)	455	44	0.772	1.296	0.084	0.056	8
Bwrdd Arthur to Fedw Fawr (2016)	14	29	0.556	1.797	0.008	0.006	1
Puffin Island (2019)	434	24	0.765	1.307	0.272	0.182	26
Great Orme (2019)	255	15	0.526	1.901	0.595	0.399	56
Little Orme (2019)	24	15	0.483	2.071	0.061	0.041	6
Marine Drive (2017)	56	88	0.762	1.313	0.003	0.002	0
Lambay (2015)	7,353	148	0.462	2.163	0.201	0.134	19

COLONY (DATE OF COUNT)	COUNT OF ADULT BIRDS ON COLONY	DISTANCE FROM COLONY TO DEVELOPMENT	PROPORTION OF FORAGE RANGE AS SEA	1/P(SEA)	RESULTING WEIGHT FOR COLONY	PROPORTIONAL WEIGHT OF COLONY	APPORTIONED ABUDANCE (ARRAY AREA PLUS 2 KM BUFFER)
Ireland's Eye (2015)	1,600	152	0.458	2.183	0.042	0.028	4
SUM	12,036	950	9.383	25.340	1.494	1.000	140

Table 10: Puffin breeding bio-season apportioned abundance for the array area plus 2 km buffer.

COLONY (DATE OF COUNT)	COUNT OF ADULT BIRDS ON COLONY	DISTANCE FROM COLONY TO DEVELOPMENT	PROPORTION OF FORAGE RANGE AS SEA	1/P(SEA)	RESULTING WEIGHT FOR COLONY	PROPORTIONAL WEIGHT OF COLONY	APPORTIONED ABUDANCE (ARRAY AREA PLUS 2 KM BUFFER)
Bardsey Island (2019)	282	106	0.558	1.791	0.015	0.018	0
Ynysodd Gwylan (Fawr and Bach Total) (2019)	1,238	102	0.562	1.779	0.073	0.084	1
South Stack Cliffs RSPB (2019)	15	69	0.786	1.272	0.001	0.002	0
The Skerries RSPB (2019)	1,204	56	0.856	1.168	0.154	0.178	2
Puffin Island (2019)	29	24	0.545	1.833	0.032	0.037	1
St Bees Head RSPB (2019/20)	3	115	0.669	1.495	0.000	0.000	0
Ramsey - Port Mooar (1999)	37	103	0.776	1.288	0.002	0.002	0
Glen Maye - Peel (2017)	16	102	0.610	1.639	0.001	0.001	0
Port St Mary - Sound (1999)	29	93	0.558	1.791	0.002	0.002	0
Calf of Man (1990)	25	95	0.621	1.609	0.002	0.002	0
Lambay (2015)	144	148	0.339	2.950	0.007	0.008	0
Skomer (SMP 2018)	30,895	223	0.481	2.078	0.443	0.513	7
Skokholm (SMP 2019)	7,447	230	0.483	2.069	0.100	0.116	2

COLONY (DATE OF COUNT)	COUNT OF ADULT BIRDS ON COLONY	DISTANCE FROM COLONY TO DEVELOPMENT	PROPORTION OF FORAGE RANGE AS SEA	1/P(SEA)	RESULTING WEIGHT FOR COLONY	PROPORTIONAL WEIGHT OF COLONY	APPORTIONED ABUDANCE (ARRAY AREA PLUS 2 KM BUFFER)
Rathlin Island RSPB (West Light Seabird Centre and Nature Reserve) (SMP 2016)	8	264	0.486	2.059	0.000	0.000	0
Rathlin Island (SMP 2011)	1,390	262	0.482	2.074	0.014	0.017	0
Great Saltee Island (SMP 1999)	1,522	253	0.518	1.931	0.016	0.018	0
Little Saltee (SMP 2000)	300	250	0.510	1.963	0.003	0.004	0
SUM	44,584	2,495	9.842	30.789	0.865	1.000	14

Table 11: Manx Shearwater breeding bio-season apportioned abundance for the array area plus 2 km buffer.

COLONY (DATE OF COUNT)	COUNT OF ADULT BIRDS ON COLONY	DISTANCE FROM COLONY TO DEVELOPMENT	PROPORTION OF FORAGE RANGE AS SEA	1/P(SEA)	RESULTING WEIGHT FOR COLONY	PROPORTIONAL WEIGHT OF COLONY	APPORTIONED ABUNDANCE (ARRAY AREA PLUS 2 KM BUFFER)
Calf of Man (2014)	848	95	0.611	1.638	0.018	0.004	0
Bardsey Island (2001)	32,366	106	0.601	1.663	0.575	0.127	3
Big Copeland Island (2007)	2,812	177	0.677	1.478	0.016	0.004	0
Lighthouse Island (2007)	6,888	179	0.676	1.480	0.038	0.008	0
Ramsey Island RSPB (2016)	9,592	210	0.603	1.659	0.043	0.010	0
Skomer (2018)	699,326	223	0.611	1.637	2.762	0.611	16
Midland Island (2018)	33,096	226	0.604	1.656	0.129	0.028	1
Skokholm (2018)	177,890	230	0.600	1.668	0.673	0.149	4
Ailsa Craig (2018)	40	232	0.656	1.524	0.000	0.000	0
Sanda Islands (2006)	600	238	0.683	1.463	0.002	0.000	0
Little Saltee (2001)	200	250	0.648	1.543	0.001	0.000	0
Great Saltee Island (2002)	300	253	0.649	1.542	0.001	0.000	0
Inchmarnock (West) (2002)	2	293	0.673	1.487	0.000	0.000	0

COLONY (DATE OF COUNT)	COUNT OF ADULT BIRDS ON COLONY	DISTANCE FROM COLONY TO DEVELOPMENT	PROPORTION OF FORAGE RANGE AS SEA	1/P(SEA)	RESULTING WEIGHT FOR COLONY	PROPORTIONAL WEIGHT OF COLONY	APPORTIONED ABUDANCE (ARRAY AREA PLUS 2 KM BUFFER)
Lundy (2017)	11,008	302	0.569	1.758	0.025	0.006	0
Soa (2013)	2	374	0.709	1.411	0.000	0.000	0
Lunga and Sgeir a' Chaisteil (2018)	3,984	396	0.709	1.410	0.004	0.001	0
Bryher (2015)	78	434	0.616	1.623	0.000	0.000	0
St Helen's (2019)	112	434	0.616	1.622	0.000	0.000	0
Round Island (2015)	156	434	0.614	1.629	0.000	0.000	0
Shipman Head (2015)	78	435	0.617	1.622	0.000	0.000	0
St Martin's (2015)	52	435	0.611	1.636	0.000	0.000	0
Tresco (2015)	92	437	0.616	1.623	0.000	0.000	0
Great Ganilly (2015)	2	438	0.612	1.634	0.000	0.000	0
Gugh (2019)	84	440	0.617	1.620	0.000	0.000	0
St Agnes (2019)	54	441	0.615	1.626	0.000	0.000	0
Eigg (1999)	500	444	0.705	1.419	0.000	0.000	0
Annet (2015)	458	445	0.618	1.619	0.000	0.000	0
Rum (2001)	240,000	454	0.706	1.416	0.198	0.044	1

COLONY (DATE OF COUNT)	COUNT OF ADULT BIRDS ON COLONY	DISTANCE FROM COLONY TO DEVELOPMENT	PROPORTION OF FORAGE RANGE AS SEA	1/P(SEA)	RESULTING WEIGHT FOR COLONY	PROPORTIONAL WEIGHT OF COLONY	APPORTIONED ABUDANCE (ARRAY AREA PLUS 2 KM BUFFER)
Canna and Sanday (2001)	4	460	0.709	1.410	0.000	0.000	0
Deenish (2000)	702	536	0.764	1.308	0.000	0.000	0
Scariff - Shearwaters (2000)	3,920	539	0.763	1.310	0.002	0.000	0
Great Skellig (whole island) (2001)	1,476	553	0.777	1.286	0.001	0.000	0
Puffin Island Whole (2000)	12,658	554	0.770	1.298	0.006	0.001	0
Dun (1999)	444	570	0.776	1.289	0.000	0.000	0
Hirta (1999)	6,886	573	0.782	1.279	0.003	0.001	0
Inishnabro (2000)	11,222	584	0.783	1.278	0.005	0.001	0
Inishvickillane (2001)	1,286	585	0.779	1.283	0.001	0.000	0
Inishtooskert (2000)	19,392	588	0.782	1.279	0.009	0.002	0
Great Blasket - Shearwaters (2001)	7,168	588	0.775	1.290	0.003	0.001	0
Inishshark (2001)	102	627	0.791	1.265	0.000	0.000	0
High Island (2015)	1,636	635	0.791	1.264	0.001	0.000	0
Sark (1999)	10	635	0.478	2.092	0.000	0.000	0

COLONY (DATE OF COUNT)	COUNT OF ADULT BIRDS ON COLONY	DISTANCE FROM COLONY TO DEVELOPMENT	PROPORTION OF FORAGE RANGE AS SEA	1/P(SEA)	RESULTING WEIGHT FOR COLONY	PROPORTIONAL WEIGHT OF COLONY	APPORTIONED ABUDANCE (ARRAY AREA PLUS 2 KM BUFFER)
Cruagh (2001)	6,572	636	0.793	1.261	0.002	0.001	0
Jethou (1999)	10	656	0.484	2.067	0.000	0.000	0
Lamb Hoga (2002)	14	995	0.607	1.648	0.000	0.000	0
Isle of May (2015)	2	1,082	0.416	2.407	0.000	0.000	0
SUM	1,294,124	20,451	30.660	70.422	4.521	1.000	26



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