

Part 4: Habitats Directive Assessment Volume 5: Appendices Appendix C: Apportioning Appendix

Kish Offshore Wind Ltd.

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## Natura Impact Statement: Apportioning Appendix

Dublin Array Offshore Wind Farm





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Revision	Date	Status	Author:	Checked by:	Approved by:
1.0	30/10/2024	Issued to Client	КС	FL	JM





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## Kish Offshore Wind Ltd. Acronyms



Term	Definition
AA	Appropriate assessment
AON	Apparently occupied nests
AOS	Apparently occupied sites
BDMPS	Biologically defined minimum population size
CRM	Collision risk modelling
DAS	Digital aerial survey
IND	Individual
JNCC	Joint Nature Conservation Committee
КM	Kilometre
LAT	Lowest astronomical tide
MMFR	Mean max foraging range
NIS	Natura Impact Statement
NPWS	National Parks and Wildlife Service
OWF	Offshore wind farm
SD	Standard deviation
SMP	Seabird Monitoring Programme
SNCB	Statutory nature conservation body
SPA	Special protection area
UK	United Kingdom





#### 1 Introduction

#### 1.1 Project Background

1.1.1 Dublin Array Offshore Wind Farm (Dublin Array) is a proposed offshore wind farm (OWF) on the Kish and Bray Banks. The Kish and Bray Banks are located approximately 10 kilometres (km) off the east coast of Ireland, immediately south of Dublin city, off the coast of counties Dublin and Wicklow. The OWF will be located within an area of approximately 54 km<sup>2</sup>, in water depths ranging from 2 metres to 50 metres lowest astronomical tide (LAT). This technical annex has been produced to support the Natura Impact Statement (NIS; Part 4) and considers the proportion of collision and displacement induced mortalities from Dublin Array that will be attributed to each screened-in designated site.

#### 1.2 Document purpose

- 1.2.1 This document outlines the apportioning methodology used within the NIS. The key methodologies introduced within this report relate to the process of apportioning impacts to designated sites and how adults were accounted for within the assessment. In addition, this appendix presents species specific seasonal definitions and SPA colony counts for all relevant sites. For details of the technical baseline (Volume 4, Appendix 4.3.6-1) and the methodologies used in the collision risk modelling (Volume 4, Appendix 4.3.6-4) and displacement assessment (Volume 4, Appendix 4.3.6-6), refer to the relevant appendices.
- 1.2.2 Apportioning is the process by which the mortalities calculated for Dublin Array are predicted to impact specific colonies. This allows an assessment to determine the level of impact Dublin Array will have on individual colonies (specifically designated sites, where population maintenance may be a key conservation objective), as well as more widely across regional or national populations.
- 1.2.3 There is currently limited advice regarding the process for undertaking apportioning assessments within the Republic of Ireland. In light of this, this note provides the methodology for the breeding and non-breeding season apportioning process proposed to be undertaken for the Dublin Array ornithological assessment. The methodology used within this assessment is based on the NatureScot (formerly known as Scottish Natural Heritage) interim guidance, which is used as precedent to apportion impacts for United Kingdom (UK) OWF assessments (Nature Scot, 2018).





#### 2 Methodology

#### 2.1 Species and Relevant Colonies

- 2.1.1 Table 2-1 presents the seabird species for which apportioning was undertaken along with the relevant impact pathway assessed for each species. These species are protected as features of designated breeding colonies (special protection areas; SPAs). Each species has been apportioned to the designated sites within species-specific breeding season foraging ranges from Dublin Array, defined as the mean max foraging range (MMFR)+ 1 standard deviation (SD) presented in Woodward *et al.* (2019) (Table 2-1). Note the Interim Guidance from NatureScot (2018) calls for the use of MMFRs presented in Thaxter *et al.* (2012), however, this has been superseded by Woodward *et al.* (2019).
- 2.1.2 A list of designated sites within MMFR + 1SD of the Proposed Development (Offshore) were identified within the appropriate assessment (Habitats Directive Assessments, Part 3: SISAA). This list was then used to inform the sites considered in the apportioning assessment presented in this Technical Report. See Table 2-1 for the full list of designated sites and qualifying interests considered for apportioning.
- 2.1.3 The colony counts for each of the designated sites were derived from the Joint Nature Conservation Committee (JNCC) Seabird Monitoring Programme (SMP) database (JNCC, 2020), Cummins *et al.* (2019), Burnell *et al.* (2023) and Keogh and Lauder (2021). Colony counts are recorded as individuals (IND), apparently occupied nests (AON) or apparently occupied sites (AOS); all counts recorded as AON or AOS were treated as equivalent to pairs and were doubled to give the count as IND.

#### 2.2 Definition of Seasons

- 2.2.1 Seabirds will be affected by the impacts of OWF developments differently throughout the year due to their presence or absence at their nesting sites. Their location at different times of the year will determine if they have connectivity to Dublin Array. Apportioning impacts from Dublin Array is to be undertaken using the interim guidance from NatureScot (2018). This guidance recognises two defined seasons for seabirds: the breeding and non-breeding season. Certain species may have multiple defined seasons within the non-breeding season, including postbreeding, pre-breeding, and winter seasons (Table 2-1). The interim guidance suggests using the defined seasons found in Furness (2015). Each season will be assessed separately, as seabird ecology and location at each stage will impact the likelihood that each species is affected by Dublin Array.
- 2.2.2 Breeding adults are limited in the distance and number of days over which they can forage, as they need to return regularly to the nest site. Therefore, it can be expected that a high proportion of the adult birds that are potentially affected by an OWF will come from colonies that are within foraging range of the development. The apportioning methodology during the breeding season is discussed further in Section 2.3.





- 2.2.3 Outside of the breeding season, the population of birds contains a mix of individuals from Irish breeding colonies and from colonies further afield. Therefore, apportionment for Dublin Array during the non-breeding seasons will be undertaken by calculating the proportion of birds that each colony population contributes to the non-breeding regional population. The apportioning methodology during the non-breeding season is discussed further in Section 2.4.
- 2.2.4 This approach is used within other well-established OWF industries, including the UK, and it is agreed to be the best current practice by UK Statutory Nature Conservation Bodies (SNCBs).

#### 2.3 Breeding Season Methodology

- 2.3.1 The NatureScot (2018) guidance calculates the percentage of affected breeding adults that are associated with each colony based on the following parameters:
  - The population size of each colony (Colony population sizes);
  - The distance from each colony (geometric centre) to Dublin Array (geometric centre); and
  - The proportion of sea within the mean-maximum foraging range (MMF) or mean-maximum foraging range +1 SD of the colony, as published by Woodward *et al.* (2019) (Proportion of sea within foraging range).
- 2.3.2 These parameters fit into Equation 1 which helps calculate the percentage of affected breeding adults that are associated with each colony.

Equation 1. Equation to calculate the percentage of affected breeding adults that are associated with each colony.

$$Weight = \left(\frac{Colony \ Population}{Sum \ of \ Populations}\right) \times \left(\frac{Sum \ of \ Distance^2}{Colony \ Distance^2}\right) \times \left(\frac{\frac{1}{Colony \ Sea \ Proportion}}{Sum \ of \ \frac{1}{Sea \ Proportions}}\right)$$





Table 2-1 Species included in the apportioning assessment, based on their connectivity to Dublin Array.

Species	Sensitivity Risk to OWF	MMFR (km) (Woodward <i>et al.,</i> 2019)	Foraging Range SD (km)	MMFR +1 SD (km)	Breeding season (Migration-free breeding season) (Furness, 2015)	Non-breeding season (Migration-free non-breeding season) (Furness, 2015)
Guillemot	Displacement	73.2	80.5	153.7	March – July	August - February
Razorbill	Displacement	88.7	75.9	164.6	April – July	August - March
Gannet	Collision; Displacement	315.2	194.2	509.4	March – September	October - February
Kittiwake	Collision; Displacement	156.1	144.5	300.6	March-August (May-July)	September – February (August – April)
Herring Gull	Collision	58.8	26.8	85.6	March – August	September – February
Lesser Black-backed gull	Collision	127.0	109.0	236.0	April – August	September – March
Common Tern	Collision	18.0	8.9	26.9	May – August	September – April
Roseate Tern	Collision	12.6	10.6	23.2	May – August	September – April
Shag	Displacement	13.2	10.5	23.7	February – August	September - January
Manx shearwater	Displacement	1,346.8	1,018.7	2,365.5	April – August	September – March





Basis for Colony Inclusion

- 2.3.3 The NatureScot guidance (NatureScot, 2018) uses colonies within each species' MMFR for the apportioning calculations. However, it is worth noting that in the UK, stakeholders have recently expected that designated sites should be screened in based on the MMFR +1SD presented in Woodward *et al.* (2019).
- 2.3.4 Based on these expectations, the apportioning assessment may be expected to consider screening in sites that are within +1SD of the MMFR (Woodward *et al.*, 2019) for Irish projects. However, Dublin Array does not deem it appropriate to include all colonies (designated and non-designated) within MMFR +1SD within the apportioning, as this would dilute the predicted impacts to colonies closer to the Dublin Array site. In reality, most impacts are likely to affect the colonies that are closest to Dublin Array, and diluting these impacts by apportioning impacts to more distant colonies would be unrealistic.
- 2.3.5 However, when apportioning impacts, designated sites must be considered even if they are located beyond the mean-maximum foraging range due to their protected status. Dublin Array, therefore, proposes an apportioning that includes all colonies within MMFR (both designated and non-designated), as well as any designated colonies within MMFR +1SD.
- 2.3.6 This strategy presents a precautionary approach, as all designated sites up to the MMFR +1SD are included. In addition, by only including non-designated sites up to MMFR without +1SD, the impacts will be apportioned to the smaller number of colonies that are more likely to receive impacts due to their proximity to Dublin Array.
- 2.3.7 An exception to the described apportioning methodology is for shag at Lambay Island SPA, which has been included on a precautionary basis. It is located 19.3km from the array and 25.8km from the ECC. This is beyond the MMFR+1SD for shag (13.2±10.5km; Woodward *et al.*, 2019). Nevertheless, shag have been observed in tracking data within the area of Dublin Array (Newton et al., 2010). Therefore, shag has been screened in on a precautionary basis for Lambay Island, as tracking data demonstrates shag connectivity with Dublin Array.
- 2.3.8 Additionally, despite their large foraging ranges, Manx shearwater impacts have only been apportioned to four sites. This is based on reviews of available tracking data. This approach will result in precautionary assessment of Manx shearwater at the four sites which have been screened in for assessment, as a higher proportion of potential mortalities will be apportioned to these sites which would otherwise be apportioned to other colonies with MMFR.

#### Colony population sizes

2.3.9 Colony sizes were based on data provided in the Cummins *et al.* (2019) National Parks and Wildlife Service (NPWS) report, the SMP Database (JNCC, 2020), Burnell *et al.* (2023) and Keogh and Lauder (2021). The most recent colony count was used based on the currently available data. All counts were converted into the number of individual breeding adults. For example, if the count unit was AON, then this total was multiplied by two, to determine the number of breeding adults from each colony.





Distance from colony to Dublin Array

2.3.10 Colony distance from Dublin Array was calculated using ArcGIS. This distance was measured from geometric centre of the colony to geometric centre of Dublin Array, as per the NatureScot (2018) apportioning guidance. The distances were calculated around land, as all species assessed forage over sea.

#### Proportion of sea within foraging range

2.3.11 The area of suitable foraging habitat within the sea for each species from each colony was calculated as follows. For each species, ArcGIS was used to draw a buffer around each colony that equals their mean-maximum foraging range +1SD. The foraging area used for all species only considered the sea area where foraging takes place. Therefore, any land, estuaries, or freshwater bodies of water were excluded. This new resulting area was used to calculate the proportion of at-sea foraging range for each species. The proportion of at-sea foraging range was calculated by dividing the new area by the original foraging range buffer circle (radius equalling foraging range) that was drawn around each colony.

#### Apportioning Impacts

2.3.12 In order to calculate the proportion of consequent mortalities that would be attributed to each SPA, the NatureScot (2018) apportioning tool specifies that the number of breeding adults (as opposed to individuals which are calculated by collision risk modelling (CRM) and displacement) that are impacted by the OWF be used for the calculation. The proportion of adults in the population during the breeding season are presented in Table 2-2 and were derived from Furness (2015). The rates presented in Furness (2015) were considered to be the most accurate information available to represent the population age structure because only a small number of individuals of each species could be positively aged within site-specific surveys for Dublin Array. The species age proportions within Furness (2015) are robust because they use evidenced age-specific demographic rates (survival and productivity) to model the stable age distribution of the population.

#### Sabbaticals

2.3.13 During the breeding season some adults will take a 'sabbatical' and not breed. There are several factors that may influence a sabbatical year, including (i) making an adaptive decision to conserve energy in a given year to improve survival probability, or (ii) constraints such as insufficient food availability or loss of a breeding partner. If these non-breeding birds are not accounted for, the breeding colony population size would be overestimated. Therefore, impacts assigned to 'sabbatical birds' were removed from the assessment as per Marine Scotland guidance (Marine Scotland 2017a;b). This is also in line with assessments undertaken for the Crown Estate leasing round 4 (NIRAS, 2022).





2.3.14 During the breeding season impacts are apportioned to breeding adults only. Immatures and sabbaticals are not included in this assessment. These sabbatical rates used in this assessment are taken from NatureScot (2018) guidance and which have been presented in other recent OWF applications in Ireland and the UK to calculate the rate of sabbatical adults for each species. Table 2-2 presents the sabbatical rates used within this assessment. Sabbatical rates were not applied for all the assessed species, namely the tern species, due to limited available data. Therefore, assessments presented for these species are considered precautionary as sabbaticals have not been removed and therefore a higher proportion of potential mortalities will be apportioned to each of the breeding colonies.

		Adult Proportion		
Species	Adult proportion	Sabbatical rate	Adult proportion excluding sabbaticals	Adult survival rate
Guillemot	0.57	0.07	0.53	0.94
Razorbill	0.57	0.07	0.53	0.90
Gannet	0.55	0.10	0.50	0.92
Kittiwake	0.53	0.10	0.48	0.85
Roseate tern	0.57	-	-	0.86
Common tern	0.60	-	-	0.88
Herring gull	0.48	0.35	0.31	0.83
Lesser black- backed gull	0.60	0.34	0.39	0.89
Shag	0.43	-	-	0.86
Manx shearwater	0.54	-	-	0.87

Table 2-2 Demographic data used for the breeding season apportioning of impacts for the NIS derived from Furness (2015).

#### 2.4 Non-breeding season Methodology

2.4.1 While impacts for seabirds during the breeding season can be attributed to individuals nesting at specific colonies, seabirds disperse widely during the non-breeding season. Consequently, birds from a wider range of colonies (outside of the breeding season mean-maximum foraging range) are expected to be present, and therefore a considerably lower percentage of birds can be attributed to any particular breeding colony.



<sup>2.3.15</sup> The weighting, as calculated by Equation 1, was then applied to the predicted breeding season moralities (after juveniles and sabbaticals are removed). This provides a resultant proportion of mortalities for each colony.



- 2.4.2 The apportionment process considers regional populations of birds present in the nonbreeding season (full details on how these are calculated are provided in Volume 4, Appendix 4.3.6-1 of the EIAR, which is an appendix to the offshore and intertidal ornithology Environmental Impact Assessment Report (Volume 3: 3.6)). Sites which are within the relevant regional population area (Volume 4: appendix 4.3.6-1) were considered for each species. Only sites where the SPA population exceeded 1% of the regional population were screened in as any sites smaller than this would have very few impacts apportioned to it.
- 2.4.3 Notably for common tern and Roseate tern, only sites within breeding season foraging range were considered as these species are only present in UK waters in the breeding season and when migrating to and from breeding sites. For shag, sites outside of breeding season foraging range were also excluded as available evidence suggests shag do not range far from breeding sites outside of the breeding season (Furness, 2015).
- 2.4.4 The non-breeding season apportioning approach will use the following data:
  - Defined seasons taken from Furness (2015);
  - SPA populations of breeding adults from Furness (2015) for UK sites, and the most recent SPA breeding adult population size taken from Cummins *et al.* (2019) or the SMP;
  - Non-breeding season population sizes (UK BDMPS equivalent) calculated as described in the Technical Baseline (Volume 4: appendix 4.3.6-1); and
  - Proportions of SPA adult population remaining in relevant regions during the non-breeding bio-seasons. However, where there is a lack of information for specific colonies on the proportion of adults that remain in the region during the non-breeding bio-seasons, this will be assumed to be 100% unless a reasonable assumption can be made.
- 2.4.5 Proportions of mortality impacts attributed for each relevant designated site will be then calculated using Equation 2:

Equation 2 Equation to calculate the proportions of mortality impacts during the non-breeding season. (Designated site population size × Proportion of population that remain during season) Regional population size





#### 3 Results

#### 3.1 Breeding season

3.1.1 The tables below present the results of the apportioning assessment during the breeding season, calculated as per Equation 1. These tables present the designated sites with weightings greater than zero. The full list of sites and their weightings are presented in Annex A.

#### Guillemot

3.1.2 The weightings for apportioning breeding season guillemot are presented in Table 3-1. The full list of sites and their associated weightings for guillemot are presented in Annex A.1.

Site	Colony count	Distance Around Coast to Site (km)	Sea Area (%)	Proportional Weight of Site
Ireland's Eye SPA	4,410 (2015)	22.5	45.92	0.106
Lambay Island SPA	59,983 (2015)	31.5	46.56	0.730
Saltee Island SPA	25,851 (2015)	143.6	61.87	0.011
Non- designated Sites	-	-	-	0.152

#### Table 3-1 Apportioning of breeding guillemot mortalities to sites.

#### Razorbill

3.1.3 The weightings for apportioning breeding season razorbill are presented in Table 3-2. The full list of sites and their associated weightings for razorbill are presented in Annex A.1.

Site	Colony count	Distance Around Coast to Site (km)	Sea Area (%)	Proportional Weight of Site
Ireland's Eye SPA	1,600 (2015)	22.5	45.80	0.245
Lambay Island SPA	7,353 (2015)	31.5	46.38	0.569
Saltee Island SPA	5,669 (2015)	143.6	61.47	0.018
Non- designated Sites	-	-	-	0.168





#### Gannet

3.1.4 The weightings for apportioning breeding season gannet are presented in Table 3-3. The full list of sites and their associated weightings for gannet are presented in Annex A.3.

Site	Colony count	Distance Around Coast to Site (km)	Sea Area (%)	Proportional Weight of Site
Saltee Islands SPA	9,444 (2013/2014)	143.6	52.99	0.049
Grassholm SPA	72,022 (2015)	173.1	51.40	0.264
Ailsa Craig SPA	66,452 (2014)	241.7	39.20	0.164
Non- designated sites	-	-	-	0.523

#### Table 3-3 Apportioning of breeding gannet mortalities to sites.

#### Kittiwake

3.1.5 The weightings for apportioning breeding season kittiwake are presented in Table 3-4. The full list of sites and their associated weightings for kittiwake are presented in Annex A.4.

Table 3-4 Apportioning	of breeding kittiwake	mortalities to sites.
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Site	Colony count	Distance Around Coast to Site (km)	Sea Area (%)	Proportional Weight of Site
Howth Head Coast SPA	3,546 (2018)	18.6	34.85	0.315
Ireland's Eye SPA	802 (2016)	22.5	34.16	0.050
Lambay Island SPA	6,640 (2015)	31.5	33.88	0.212
Wicklow Head SPA	1,348 (2022)	31.9	38.70	0.037
Saltee Islands SPA	2,076 (2015)	143.6	49.91	0.002
Skomer, Skokholm and the Seas off Pembrokeshire / Sgomer Sgogwm a Moroedd Penfro SPA	2,878 (2021)	176.0	49.15	0.002
Ailsa Craig SPA	980 (2021)	241.7	35.33	0.001





Site	Colony count	Distance Around Coast to Site (km)	Sea Area (%)	Proportional Weight of Site
Non- designated Sites	-	-	-	0.381

#### Herring Gull

3.1.6 The weightings for apportioning breeding season herring gull are presented in Table 3-5. The full list of sites and their associated weightings for herring gull are presented in Annex A.5.

Site	Colony count	Distance Around Coast to Site (km)	Sea Area (%)	Proportional Weight of Site
Ireland's Eye SPA	796 (2016)	22.5	53.40	0.187
Lambay Island SPA	1,812 (2015)	32.5	55.39	0.210
St Patrick's Island (Skerries Islands SPA)	20 (2010)	42.5	50.53	0.001
Non- designated Sites	-	-	-	0.595

#### Table 3-5 Apportioning of breeding herring gull mortalities to sites.

#### Lesser Black-backed Gull

3.1.7 The weightings for apportioning breeding season lesser black-backed gull are presented in Table 3-6. The full list of sites and their associated weightings for lesser black-backed gull are presented in Annex A.6.

Table 3-6 Apportioning of breeding lesser black-backed gull mortalities to sites.

Site	Colony count	Distance Around Coast to Site (km)	Sea Area (%)	Proportional Weight of Site
Lambay Island SPA	690 (2015-2018)	31.5	37.35	0.551
Saltee Islands SPA	262 (2014)	143.6	54.50	0.007
Non- designated sites	-	-	-	0.442





#### Common Tern

3.1.8 The weightings for apportioning breeding season common tern are presented in Table 3-7. The full list of sites and their associated weightings for common tern are presented in Annex A.7.

Site	Colony count	Distance Around Coast to Site (km)	Sea Area (%)	Proportional Weight of Site
Lamb Island and Maiden Rock	30 (2017)	12.7	52.17	0.060
Dublin Port	988 (2016)	22.7	34.87	0.934
Dun Laoghaire 1	4 (2012)	16.1	45.11	0.006
Non- designated Sites	-	-	-	0.006

Table 3-7 Apportioning of breeding common tern mortalities to sites.

#### Roseate Tern

3.1.9 Only the Dalkey Island SPA is designated for Roseate tern and within foraging range, however Roseate terns are no longer breeding at this site. Potential collisions within the breeding season have been assessed as the passage population of 5,797 (see Section 3.2) as Roseate tern are known to arrive to Dalkey Island SPA before the commencement of the defined migration season (arriving mostly late July to September). See Section 3.2 for further details.

#### Shag

3.1.10 The weightings for apportioning breeding season shag are presented in Table 3-8. The full list of sites and their associated weightings for shag are presented in Annex A.8.

Site	Colony count	Distance Around Coast to Site (km)	Sea Area (%)	Proportional Weight of Site
Lambay Island SPA <sup>1</sup>	938 (2015)	31.5	75.00	0.336
Non- designated sites	-	-	-	0.664

 Table 3-8 Apportioning of breeding shag mortalities to sites.

#### Manx Shearwater

3.1.11 The weightings for apportioning breeding season Manx shearwater are presented in Table 3-9.The full list of sites and their associated weightings for Manx shearwater are presented in AnnexA.9. Only the screened in designated sites have been included on a precautionary basis.



<sup>&</sup>lt;sup>1</sup> Not within MMF+1SD, included based on BirdWatch Ireland feedback and available tracking data



Table 3-9 Apportioning of breeding Manx shearwater mortalities to sites.

Site	Colony count	Distance Around Coast to Site (km)	Sea Area (%)	Proportional Weight of Site
Glannau Aberdaron ac Ynys Enlli/ Aberdaron Coast and Bardsey Island SPA	41,350	74.9	89.59	0.190
Skomer, Skokholm and the Seas off Pembrokeshire / Sgomer Sgogwm a Moroedd Penfro SPA	910,312	176.0	93.29	0.728
Copeland Islands SPA	9,700	160.2	94.85	0.010
Rum SPA	577,788	441.9	90.14	0.072
Non- designated sites	-	-	-	-

#### 3.2 Non-breeding season

3.2.1 This section presents the results of the apportioning assessment during the non-breeding season, calculated as per Equation 2.

#### Guillemot

3.2.2 The weightings for apportioning non-breeding season guillemot are presented in Table 3-10.

Table 3-10 Apportioning of non-breeding guillemot mortalities to sites.

Site	Colony Size	Regional Population Size (Agreed BDMPS)	Proportional Weight of Colony in the Non- breeding Season (%)
Ireland's Eye SPA	4,410 (2015)	1,332,623	0.331
Lambay Island SPA	59,983 (2015)	1,332,623	4.501
Saltee Islands SPA	25,851 (2015)	1,332,623	1.940
Cape Wrath SPA	54,718 (2015)	1,332,623	4.106
Flannan Isles SPA	19,614 (2015)	1,332,623	1.472





**APEM**Group

Site	Colony Size	Regional Population Size (Agreed BDMPS)	Proportional Weight of Colony in the Non- breeding Season (%)
Handa SPA	75,986 (2015)	1,332,623	5.702
Mingulay and Berneray SPA	59,983 (2015)	1,332,623	2.030
North Colonsay and Western Cliffs SPA	27,054 (2015)	1,332,623	2.026
Rathlin Island SPA	27,000 (2015)	1,332,623	13.117
Skomer, Skokholm and the Seas off Pembrokeshire SPA	174,796 (2015)	1,332,623	2.446
St Kilda SPA	174,796 (2015)	1,332,623	2.356
Sule Skerry and Sule Stack SPA	25,851 (2015)	1,332,623	1.146

#### Razorbill

3.2.3 The weightings for apportioning non-breeding season razorbill are presented in Table 3-11.

Table 3-11 Apportioning of non-breeding razorbill mortalities to sites.

Size	Colony Size	Regional Population Size (Agreed BDMPS)	Proportional Weight of Colony in the pre- breeding Season (%)	Proportional Weight of Colony in the winter Season (%)	Proportional Weight of Colony in the post-breeding Season (%)
Ireland's Eye SPA	1,600 (2015)	632,453 (pre- and pos- breeding), 366,961 (winter)	0.253	0.436	0.253
Lambay Island SPA	7,353 (2015)	632,453 (pre- and pos- breeding), 366,961 (winter)	1.163	2.004	1.163
Saltee Islands SPA	6,519 (2015)	632,453 (pre- and pos- breeding), 366,961 (winter)	1.031	1.776	1.031
Cape Wrath SPA	4,180 (2015)	632,453 (pre- and pos- breeding),	0.661	1.139	0.661

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Size	Colony Size	Regional Population Size (Agreed BDMPS)	Proportional Weight of Colony in the pre- breeding Season (%)	Proportional Weight of Colony in the winter Season (%)	Proportional Weight of Colony in the post-breeding Season (%)
		366,961 (winter)			
Handa SPA	10,330 (2015)	632,453 (pre- and pos- breeding), 366,961 (winter)	1.633	2.815	1.633
Mingulay and Berneray SPA	7,353 (2015)	632,453 (pre- and pos- breeding), 366,961 (winter)	3.197	5.511	3.197
Rathlin Island SPA	20,222 (2015)	632,453 (pre- and pos- breeding), 366,961 (winter)	4.868	8.389	4.868
Shiant Isles SPA	30,786 (2015)	632,453 (pre- and pos- breeding), 366,961 (winter)	1.343	2.315	1.343
Skomer, Skokholm and the Seas off Pembrokeshire SPA	30,786 (2015)	632,453 (pre- and pos- breeding), 366,961 (winter)	1.898	3.271	1.898

#### Gannet

3.2.4 The weightings for apportioning non-breeding season gannet are presented in Table 3-12.

Table 3-12 Apportioning of non-breeding gannet mortalities to sites.

Site	Colony Size	Regional Population Size (Agreed BDMPS)	Proportional Weight of Colony in the pre- breeding Season (%)	Proportional Weight of Colony in the post- breeding Season (%)
Ailsa Craig SPA	54,260 (2015)	643,917 (pre- breeding), 535,183 (pos- breeding)	10.320	12.417
Grassholm SPA	78,584 (2015)	643,917 (pre- breeding),	11.185	13.457





Site	Colony Size	Regional Population Size (Agreed BDMPS)	Proportional Weight of Colony in the pre- breeding Season (%)	Proportional Weight of Colony in the post- breeding Season (%)
		535,183 (pos-		
		breeding)		
		643,917 (pre-		
Saltee Islands	0 111 (2012 2011)	breeding),	1 467	1 765
SPA	9,444 (2013-2014)	535,183 (pos-	1.407	1.705
		breeding)		

#### Kittiwake

3.2.5 The weightings for apportioning non-breeding season kittiwake are presented in Table 3-13.

Site	Colony Size	Regional Population Size (Agreed BDMPS)	Proportional Weight of Colony in the pre- breeding Season (%)	Proportional Weight of Colony in the post- breeding Season (%)
Saltee Islands SPA	2,076 (2015- 2018)	713,137 (pre- breeding), 933,197 (post- breeding)	0.291	0.222
Wicklow Head SPA	1,348 (2022)	713,137 (pre- breeding), 933,197 (post- breeding)	0.189	0.144
Howth Head Coast SPA	3,546 (2015- 2018)	713,137 (pre- breeding), 933,197 (post- breeding)	0.497	0.380
Ireland's Eye SPA	802 (2016)	713,137 (pre- breeding), 933,197 (post- breeding)	0.112	0.086
Lambay Island SPA	6,640 (2015)	713,137 (pre- breeding), 933,197 (post- breeding)	0.931	0.712
Ailsa Craig SPA	980 (2021)	713,137 (pre- breeding), 933,197 (post- breeding)	0.137	0.105
Skomer, Skokholm and the Seas off Pembrokeshire /	2,878 (2021)	713,137 (pre- breeding), 933,197 (post- breeding)	0.404	0.308

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Site	Colony Size	Regional Population Size (Agreed BDMPS)	Proportional Weight of Colony in the pre- breeding Season (%)	Proportional Weight of Colony in the post- breeding Season (%)
Sgomer, Sgogwm a Moroedd Penfro SPA				
Helvick Head to Ballyqyin SPA	130 (2018)	713,137 (pre- breeding), 933,197 (post- breeding)	0.018	0.014
Old Head of Kinsale SPA	1,422 (2015)	713,137 (pre- breeding), 933,197 (post- breeding)	0.199	0.152
Cape Wrath SPA	20,688 (2015)	713,137 (pre- breeding), 933,197 (post- breeding)	2.901	2.217
North Colonsay and Western Cliffs SPA	11,126 (2015)	713,137 (pre- breeding), 933,197 (post- breeding)	1.560	1.192
Rathlin Island SPA	15,844 (2015)	713,137 (pre- breeding), 933,197 (post- breeding)	2.222	1.698

#### Herring Gull

3.2.6 The weightings for apportioning non-breeding season herring gull are presented in Table 3-14.

Table 3-14 Apportioning of non-breeding herring gull mortalities to sites.

Site	Colony Size	Regional Population Size (Agreed BDMPS)	Proportional Weight of Colony in the Non- breeding Season (%)
Ireland's Eye SPA	796 (2016)	187,094	0.425
Lambay Island SPA	1,812 (2015)	187,094	0.968
Skerries Island SPA	20 (2010)	187,094	0.011
Morecambe Bay and Duddon Estuary SPA	3,468 (2015)	187,094	1.854

#### Lesser Black-backed Gull

3.2.7 The weightings for apportioning non-breeding season lesser black-backed gull are presented in Table 3-15.







Table 3-15 Apportioning of non-breeding lesser black-backed gull mortalities to sites.

Size	Colony Size	Regional Population Size (Agreed BDMPS)	Proportional Weight of Colony in the pre- breeding Season (%)	Proportional Weight of Colony in the winter Season (%)	Proportional Weight of Colony in the post-breeding Season (%)
Lambay Island SPA	690 (2015- 2018)	172,234 (pre- and post- breeding), 52,385 (winter)	0.401	1.317	0.401
Saltee Islands SPA	262 (2014)	172,234 (pre- and post- breeding), 52,385 (winter)	0.152	0.500	0.152
Isles of Scilly SPA	6,800 (2015)	172,234 (pre- and post- breeding), 52,385 (winter)	3.948	12.981	3.948
Morecambe Bay and Duddon Estuary SPA	9,974 (2015)	172,234 (pre- and post- breeding), 52,385 (winter)	5.791	19.040	5.791
Ribble and Alt Estuaries SPA	16,534 (2015)	172,234 (pre- and post- breeding), 52,385 (winter)	9.600	31.562	9.600
Skomer Skokholm and the Seas off Pembrokeshire SPA	19,280 (2015)	172,234 (pre- and post- breeding), 52,385 (winter)	11.194	36.804	11.194

#### Great black-backed gull

3.2.8 The weightings for apportioning non-breeding season lesser black-backed gull are presented in Table 3-16.

#### Table 3-16: Apportioning of non-breeding great-black-backed gull mortalities to sites

Site	Colony Size	Regional Population Size (Agreed BDMPS)	Proportional Weight of Colony in the Non- breeding Season (%)
Isles of Scilly SPA	1,802 (2015)	53,406	3.374

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#### Common Tern

3.2.9 The weightings for apportioning non-breeding season common tern are presented in Table 3-17.

- 1 (LUN), J E. / - MUNUMUNUME OF TRUE NUMERAUTE ANTIHINDE ANTIHINDE ANTIHINDE ANTIHINDE ANTIHINDE ANTIHINDE	Table 3-17 Apportioning	of non-breeding	common tern	mortalities to sites.
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Site	Colony Size	Regional Population Size (Agreed BDMPS)	Proportional Weight of Colony in the pre- breeding Season (%)	Proportional Weight of Colony in the post- breeding Season (%)
South Dublin Bay and River Tolka Estuary SPA	988 (2016)	74,000	1.335	1.335
Dalkey Islands SPA	30 (2017)	74,000	0.041	0.041

#### Roseate Tern

- 3.2.1 Dalkey Island SPA and South Dublin Bay and River Tolka SPA are both designated for Roseate tern for post-breeding / pre-migration (passage) as terns associated with the roosting at these SPAs are thought to feed during the day in the wider Dublin Bay area. Evening observations of terns arriving to the roosting areas indicated that most terns flew in from an easterly and south-easterly direction, therefore it was expected that they were feeding in the shallow waters of the Kish/Bray and Burford Banks (Merne *et al.* 2008). Unlike common tern, there are no Roseate tern breeding colonies within foraging range. Therefore, all of the potential collisions were attributed to the passage population as they are known to come to this site earlier than the defined migration season (mostly late July to September).
- 3.2.2 It is expected that the same populations of terns use both Dalkey Bay SPA and South Dublin Bay and River Tolka SPA during staging / passage, this is further confirmed as both sites have the same citation counts (2,000 individuals). An adaption of the BDMPS estimate was used to define the passage population. The most recent regional population estimate (original BDMPS estimate of 6,358 individuals) was derived from the most recently available counts for the two Irish breeding colonies, which were estimated at 1,704 pairs at Rockabill in 2021 (BWI, 2021), and 273 pairs at Lady's Island Lake in 2020 (Irish Times, 2020). However, the majority of individuals passing through will have come from Rockabill (based on migration pathways, with terns migrating from breeding colonies south during the autumn), therefore only the population (adults and juveniles) from Rockabill were included in this assessment (the adapted BDMPS value of 5,797 individuals) on a precautionary basis.





Table 3-18 Apportioning of non-breeding Roseate tern mortalities to sites.

Site	Passage Population Size	Proportional Weight of Colony in the Non- breeding Season (%)
Dalkey Island SPA / South Dublin Bay and River Tolka SPA	5,797 (2021)	100.0

#### Shag

3.2.3 The weightings for apportioning non-breeding season shag are presented in Table 3-19.

Table	3-19	Apportioning	of non-	breeding	shag	mortalities to	sites.
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Site	Colony Size	Regional Population Size (Agreed BDMPS)	Proportional Weight of Colony in the Non- breeding Season (%)
Lambay Island SPA	938 (2015)	13,075	7.174

#### Manx Shearwater

3.2.4 The weightings for apportioning non-breeding season Manx shearwater are presented in Table 3-19.

#### Table 3-20 Apportioning of non-breeding Manx shearwater mortalities to sites.

Site	Colony Size	Regional Population Size (Agreed BDMPS)	Proportional Weight of Colony in the Post- breeding Season (%)	Proportional Weight of Colony in the Pre-breeding Season (%)
Glannau Aberdaron ac Ynys Enlli/ Aberdaron Coast and Bardsey Island SPA	41,350 (2015)	1,576,784	2.622	2.622
Skomer, Skokholm the Seas off Pembrokeshire / Sgomer, Sgogwm a Moroedd Penfro SPA	910,312 (2018)	1,576,784	57.732	57.732
Copeland Islands SPA	9,700 (2022)	1,576,784	0.615	0.615





Site	Colony Size	Regional Population Size (Agreed BDMPS)	Proportional Weight of Colony in the Post- breeding Season (%)	Proportional Weight of Colony in the Pre-breeding Season (%)
Rum SPA	577,788 (2021)	1,576,784	36.634	36.643





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# Annex A – SPA and non-SPA breeding season apportioning results.

Kish Offshore Wind Ltd. Dublin Array Offshore Wind Farm



## A SPA and non-SPA breeding season apportioning results

### A.1 Guillemot

Table 4-1 Apportionment of guillemot to designated and non-designated sites during the breeding season.

Site	Colony count	Distance Around Coast to Site (km)	Sea Area (%)	Resulting Weight	Proportional Weight of Site		
Designated Sites							
Ireland's Eye	4,410 (2015)	22.5	45.92	0.40	0.106		
Lambay	59,983 (2015)	31.5	46.56	2.72	0.730		
Great Saltee Island	25,851 (2015)	143.6	61.87	0.04	0.011		
Non-designated Sites							
Bray Head	1,413 (2015)	12.0	48.51	0.42	0.114		
Howth Head	871 (2015)	18.6	46.44	0.11	0.030		
Wicklow Head	737 (2021)	31.9	51.45	0.03	0.008		





## A.2 Razorbill

Table 4-2 Apportionment of razorbill to designated and non-designated sites during the breeding season.

Site	Colony count	Distance Around Coast to Site (km)	Sea Area (%)	Resulting Weight	Proportional Weight of Site		
Designated Sites							
Ireland's Eye	1,600 (2015)	22.5	45.80	1.30	0.245		
Lambay	7,353 (2015)	31.5	46.38	3.03	0.569		
Great Saltee Island	5,669 (2015)	143.6	61.47	0.08	0.016		
Little Saltee Island	850 (2015)	141.1	61.09	0.01	0.002		
Non-designated Sites							
Bray Head	150 (2010)	12.0	46.88	0.42	0.079		
Howth Head	279 (2015)	18.6	46.26	0.33	0.062		
Wicklow Head	184 (2021)	31.9	49.46	0.07	0.013		
South Stack Cliffs RSPB	1,378 (2021)	83.4	54.27	0.07	0.013		
Abraham's Bosom	83 (2016)	83.5	54.25	0.00	0.001		
Gogarth	18 (2016)	84.5	54.28	0.00	0.000		





## A.3 Gannet

Table 4-3 Apportionment of gannet to designated and non-designated sites during the breeding season.

Site	Colony count	Distance Around Coast to Site (km)	Sea Area (%)	Resulting Weight	Proportional Weight of Site		
Designated Sites							
Great Saltee Island	9,444 (2013/2014)	143.6	52.99	0.05	0.049		
Grassholm	72,022 (2015)	173.1	51.40	0.26	0.264		
Ailsa Craig	66,452 (2014)	241.7	39.20	0.16	0.164		
Non-designated Sites							
Ireland's Eye	700 (2015)	22.5	35.24	0.22	0.221		
Lambay	1,852 (2015)	31.5	35.06	0.30	0.301		
Middle Mouse	42 (2022)	103.9	30.61	0.00	0.001		



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## A.4 Kittiwake

Table 1 1 Apportionment	of kittiwaka ta	docignated an	d non decignated c	sitor during the h	rooding coscon
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		0	0	0	0

Site	Colony count	Distance Around Coast to Site (km)	Sea Area (%)	Resulting Weight	Proportional Weight of Site
Designated Sites					
Howth Head	3,546 (2018)	18.6	34.85	5.97	0.315
Ireland's Eye	802 (2016)	22.5	34.16	0.94	0.050
Lambay	6,640 (2015)	31.5	33.88	4.03	0.212
Wicklow Head	1,348 (2022)	31.9	38.70	0.70	0.037
Great Saltee Island	2,076 (2015)	143.6	49.91	0.04	0.002
Skomer	2,878 (2021)	176.0	49.15	0.04	0.002
Helvick Head 1	130 (2018)	208.5	53.44	0.00	0.000
Ailsa Craig	980 (2021)	241.7	35.33	0.01	0.001
Old Head of Kinsale	1,422 (2015)	290.8	69.67	0.00	0.000
Non-designated Sites					
Bray Head	1,746 (2015)	12.0	36.65	6.76	0.356
Rockabill	330 (2021)	42.2	32.75	0.12	0.006
South Stack Cliffs RSPB	20 (2021)	83.4	32.29	0.00	0.000
Bardsey Island	242 (2019)	93.2	35.96	0.02	0.001
Carreg y Llam	1,228 (2021)	102.8	33.39	0.07	0.004
Maggy's Leap 1 / Donnard Cove	152 (2017)	108.2	30.88	0.01	0.000

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Site	Colony count	Distance Around Coast to Site (km)	Sea Area (%)	Resulting Weight	Proportional Weight of Site
Trwyn Cilan	56 (2016)	109.0	34.56	0.00	0.000
Maggy's Leap to Newcastle 1	1,160 (2019)	109.8	30.84	0.06	0.003
St Tudwal's Island East	620 (2016)	115.0	34.02	0.03	0.001
Calf of Man	26 (2013)	118.6	29.51	0.00	0.000
Port St Mary – Sound	1,106 (2017)	121.7	29.22	0.05	0.003
Ynys Moelfre	312 (2016)	122.2	29.23	0.01	0.001
Puffin Island	254 (2023)	135.1	28.80	0.01	0.001
Glen Maye – Peel	108 (2017)	137.2	28.91	0.00	0.000
Great Orme	1,796 (2021)	145.1	27.71	0.06	0.003
Little Orme	648 (2021)	150.2	27.23	0.02	0.001
New Quay Head	664 (2018)	155.0	36.66	0.02	0.001





## A.5 Herring Gull

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	of ficting guilto	ucsignated and non	ucoignated oneo	auting the biccung season.
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Site	Colony count	Distance Around Coast to Site (km)	Sea Area (%)	Resulting Weight	Proportional Weight of Site		
Designated Sites							
Ireland's Eye	796 (2016)	22.5	53.40	0.19	0.190		
Lambay	1,812 (2015)	32.5	55.39	0.21	0.214		
St Patricks Island	20 (2010)	42.5	50.53	0.00	0.001		
Non-designated Sites							
Bray Head	4 (2015)	12.0	53.96	0.00	0.003		
Bray Town	124 (2021)	12.0	53.96	0.10	0.104		
Dalkey Island	38 (2016)	12.3	53.50	0.03	0.031		
Howth Head	18 (2015)	18.6	54.27	0.01	0.006		
Howth (urban)	920 (2021)	22.1	52.99	0.22	0.230		
Dublin City South	36 (2021)	28.2	41.40	0.01	0.007		
Wicklow Head	14 (2022)	31.9	58.08	0.00	0.002		
Skerries Town	498 (2021)	45.0	48.77	0.03	0.036		
Balbriggan Town	2,970 (2021)	49.7	44.19	0.17	0.176		





## A.6 Lesser Black-backed Gull

Table 4-6 Apportionment of lesser black-backed gull to designated and non-designated sites during the breeding season.

Site	Colony count	Distance Around Coast to Site (km)	Sea Area (%)	Resulting Weight	Proportional Weight of Site	
Designated Sites						
Lambay	690 (2015-2018)	31.5	37.35	3.49	0.551	
Great Saltee Island	262 (2014)	143.6	54.50	0.04	0.007	
Non-designated Sites						
Dalkey Island	70 (2016)	12.3	39.77	2.19	0.345	
Ireland's Eye	10 (2015)	22.5	38.18	0.10	0.015	
Dublin City South	10 (2002)	28.2	37.16	0.06	0.010	
St Patricks Island	2 (2010)	42.3	36.78	0.01	0.001	
South Stack Cliffs RSPB	8 (2022)	83.4	36.47	0.01	0.001	
Gogarth	6 (2016)	84.5	36.32	0.00	0.001	
Porth Diana	12 (2016)	86.9	36.64	0.01	0.001	
Rhoscolyn Beacon	12 (2016)	88.4	37.09	0.01	0.001	
Ynys Traws	28 (2016)	89.2	37.04	0.02	0.003	
The Skerries RSPB	244 (2022)	92.5	34.86	0.15	0.024	
Bardsey Island	328 (2019)	93.2	44.46	0.16	0.025	
Porth y Bribys	2 (2001)	94.0	35.06	0.00	0.000	
Pant yr Eglwys	2 (2016)	94.2	35.02	0.00	0.000	





Site	Colony count	Distance Around Coast to Site (km)	Sea Area (%)	Resulting Weight	Proportional Weight of Site
Valley Wetlands RSPB	2 (2019)	94.9	36.18	0.00	0.000
West Mouse	2 (2016)	95.7	34.66	0.00	0.000
Ynysoedd Gwylan (Fawr and Bach Total)	4 (2011)	97.8	43.26	0.00	0.000
Carreg Chwislen	2 (2000)	100.1	43.00	0.00	0.000
Bodorgan Head	6 (2018)	100.9	36.63	0.00	0.000
Ynys yr Adar	2 (2018)	103.0	36.72	0.00	0.000
Middle Mouse	6 (2016)	103.9	34.01	0.00	0.000
Porth Llanlleiana	4 (2016)	105.0	33.93	0.00	0.000
East Mouse	2 (2016)	110.5	32.92	0.00	0.000
Porth Ceiriad East	2 (2016)	112.5	41.73	0.00	0.000
Caernarfon (urban)	34 (2019)	113.6	35.54	0.01	0.002
St Tudwal's Island West	76 (2016)	114.0	41.36	0.03	0.004
Trwyn Yr Wylfa 1	12 (2016)	114.3	41.53	0.00	0.001
St Tudwal's Island East	12 (2016)	115.0	40.92	0.00	0.001
Calf of Man	54 (2017)	118.6	34.43	0.02	0.003
Kitterland	2 (2017)	120.3	34.36	0.00	0.000
Ynys Moelfre	8 (2016)	122.2	32.78	0.00	0.000
Lady's Island Lake	2 (2012)	124.5	53.43	0.00	0.000





## A.7 Common Tern

Table 4-7 Apportionment of common tern to designated and non-designated sites during the breeding season.

Site	Colony count	Distance Around Coast to Site (km)	Sea Area (%)	Resulting Weight	Proportional Weight of Site		
Designated Sites							
Lamb Island and Maiden Rock	30 (2017)	12.7	52.17	0.05	0.060		
Dublin Port	988 (2016)	22.7	34.87	0.72	0.934		
Non-designated Sites							
Dun Laoghaire 1	4 (2012)	16.1	45.11	0.00	0.006		



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## A.8 Shag

Table 4-8 Apportionment of shag to designated and non-designated sites during the breeding season.

Site	Colony count	Distance Around Coast to Site (km)	Sea Area (%)	Resulting Weight	Proportional Weight of Site		
Designated Sites							
Lambay	938 (2015)	31.5	75.00	0.30	0.336		
Non-designated Sites							
Bray Head	126 (2010)	12.0	52.23	0.40	0.448		
Howth Head	72 (2015)	18.6	61.65	0.08	0.090		
Ireland's Eye	146 (2015)	22.5	60.88	0.11	0.126		





## A.9 Manx Shearwater

Table 4-9 Apportionment of Manx shearwater to designated and non-designated sites during the breeding season.

Site	Colony count	Distance Around Coast to Site (km)	Sea Area (%)	Resulting Weight	Proportional Weight of Site
Designated Sites					
Glannau Aberdaron ac Ynys Enlli/ Aberdaron Coast and Bardsey Island SPA	41,350	74.9	89.59	0.32	0.190
Skomer, Skokholm and the Seas off Pembrokeshire / Sgomer Sgogwm a Moroedd Penfro SPA	910,312	176.0	93.29	1.21	0.728
Copeland Islands SPA	9,700	160.2	90.14	0.02	0.010
Rum SPA	577,788	441.9	94.85	0.12	0.072

#### Non-designated Sites

N/A





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