APPENDIX 5

OFFSHORE ORNITHOLOGY BASELINE TECHNICAL REPORT

Sceirde Rocks Offshore Wind Farm Technical Appendix 11-1: Offshore Ornithology Baseline

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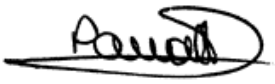
	Diane Pavat		
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Acronyms and abbreviations

Term	Definition
AOB	Apparently Occupied Burrow
AON	Apparently Occupied Nest
AOS	Apparently Occupied Site
ASL	Above Sea Level
BDMPS	Biologically Defined Minimum Population Scales
CRM	Collision Risk Modelling
CI	Confidence Interval
CL	Confidence Limit
CV	Coefficient of Variation
DAS	Digital Aerial Survey
EIA	Environmental Impact Assessment
GPS	Global Positioning System
MSP	Mean Seasonal Peak
NIS	Natura Impact Statement
SPA	Special Protection Area

1 Introduction

1 The Sceirde Rocks Offshore Wind Farm project (hereafter 'Sceirde Rocks' or 'the Project') is a proposed offshore wind farm, located along the south coast of County Galway, in west Ireland. The Offshore Array Area covers 37.28km^2 and is defined as the location where the wind turbines and offshore substations will be located.

2 This Technical Appendix serves as a baseline characterisation of offshore ornithology features and describes on-site populations of seabirds required for ornithological impact modelling: collision risk and displacement assessment, as addressed in Technical Appendix 11-2: Displacement Matrices Technical Report, and Technical Appendix 11-4: Offshore Ornithology Collision Risk Modelling Report.

3 In October 2021, GIG commissioned HiDef Aerial Surveying Ltd (hereafter 'HiDef') to undertake a programme of high-resolution digital video aerial surveys (DAS) of marine megafauna (EIAR Chapter 12: Marine Mammals and Other Megafauna), ornithological and human activity in support of the development proposal. The survey design consisted of 1km-spaced transects within the Offshore Array Area plus a 2km surrounding buffer, as well as 2km-spaced transects extending out to 10km around the originally defined site area (the survey area, see HiDef (2024) for more details on the original site area and 10km buffer) (Figure 1). The Offshore Array Area, Offshore Array Area plus a 2km buffer and the Offshore Array Area plus a 4km equated to 37.28km^2, 100.30km^2 and 184.12km^2, respectively. See Section 2.1 for more details on the DAS methodology.

4 The design-based density and abundance estimates were estimated for the Offshore Array Area (for the Collision Risk Modelling (CRM)) and Offshore Array Area plus 2km buffer (for the displacement assessment). For two diver species, red-throated diver (*Gavia stellata*) and great northern diver (*Gavia immer*), the design-based density and abundance estimates were calculated for the Offshore Array Area plus 4km buffer (for the displacement assessment), based on guidance available in SNCB (2022).

5 Key species addressed in the CRM and displacement assessments for the proposed Project are based on the number of records during the survey period (Annex A and HiDef, 2024), their vulnerability to collision and displacement effects (Furness *et al.,* 2013) and whether they are qualifying features of nearby seabird colonies (e.g., Inishmore Special Protection Area (SPA)). The species scoped into assessment are presented in Table 1.

Figure 1 Proposed Project Offshore Array Area, showing the 2km, 4km and 10km buffers and analysed transects

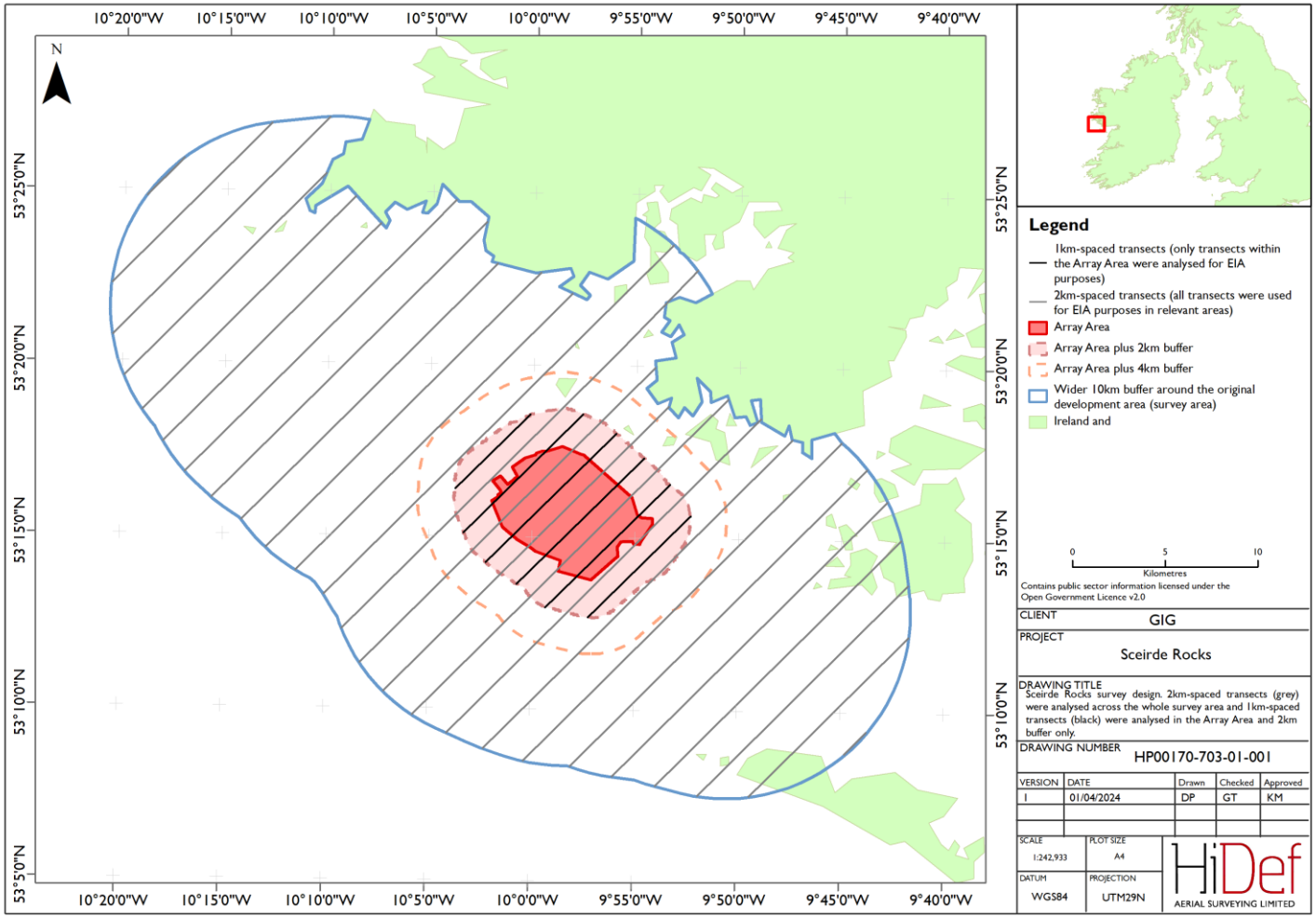

Table 1 Species scoped in for impact modelling

Species	Scientific name	Collision risk	Displacement
Red-throated diver	*Gavia stellata*	✖	✓
Great northern diver	*Gavia immer*	✖	✓
Manx shearwater	*Puffinus puffinus*	✖	✓
Northern gannet (hereafter 'gannet')	*Morus bassanus*	✓	✓
European shag (hereafter 'shag')	*Gulosus aristotelis*	✖	✓
Black-legged kittiwake (hereafter 'kittiwake')	*Rissa tridactyla*	✓	✓
Common gull	*Larus canus*	✓	✖
Great black-backed gull	*Larus marinus*	✓	✖
Herring gull	*Larus argentatus*	✓	✖
Lesser black-backed gull	*Larus fuscus*	✓	✖
Common tern	*Sterna hirundo*	✓	✓
Arctic tern	*Sterna paradisaea*	✓	✓
Common guillemot (hereafter 'guillemot')	*Uria aalge*	✖	✓
Razorbill	*Alca torda*	✖	✓
Atlantic puffin (hereafter 'puffin')	*Fratercula arctica*	✖	✓

2 Methods

2.1 Digital aerial surveys

6 A series of strip transects were flown on a monthly basis between October 2021 and September 2023. The DAS survey design consisted of 32 strip transects over the original development area and a 10km surrounding buffer, extending roughly northeast to southwest, perpendicular to the depth contours along the coast to ensure each transect sampled a similar range of habitats (primarily relating to water depth) to reduce the variation in seabird abundance estimates between transects. The survey design consisted of 12 1km-spaced transects across the Offshore Array Area (37.28km^2) and a surrounding 2km buffer, creating an overall area of 100.30km^2 and achieving approximately 25% coverage, while eight 2km-spaced transects were flown over the entire 4km and 10km buffers, achieving approximately 15% and 12.5% coverage, for the 4km and 10km buffers respectively (Figure 1).

7 Surveys were flown using an aircraft equipped with four HiDef Gen II digital video cameras with sensors set to a resolution of 2cm Ground Sample Distance. Each camera sampled a strip of 125m width, separated from the next camera by ~25m, providing a combined sampled width of 500m within a 575m overall strip. Data from two out of the four cameras were processed with the remaining unprocessed data archived.

8 The surveys were flown along the transect pattern shown in Figure 1 at a height of approximately 500 – 550m (~1,650 – 1,800ft) above sea level (ASL). Flying at this height ensures that there is no risk of flushing species that are easily disturbed by aircraft noise. Thaxter *et al.* (2016) recommends a minimum flight altitude of 460 – 500m ASL for marine bird surveys.

9 Position data for the aircraft was captured from a Garmin Global Positioning System (GPS) Map 296 receiver with differential GPS enabled to give 1m accuracy for the positions and recording updates in location at one second intervals for later matching to seabird observations.

10 More detail on the DAS methodology and flown surveys can be found in the Two-year DAS report (HiDef, 2024).

2.2 Data treatment

11 All data within the original development area and a 10km surrounding buffer (the survey area) were collated across the two years of surveys. These data were trimmed to the Offshore Array Area and Offshore Array Area plus 2km and 4km buffer prior to analysis. The total number of individuals per species detected in each survey flight for the Offshore Array Area and Offshore Array Area plus 2km and 4km buffer are presented in Annex A.

12 Records identified to species level (possible, probable and definite) were separated out from records of individuals identified to species group level, and the following analyses undertaken on both datasets (see next paragraph explanations). All confidence levels of species identifications were used in analysis.

13 Apportioning of 'unidentified' birds to species level was included for calculating density and population estimates. The number of unidentified birds in each species group were assigned to species where appropriate, based on their respective abundance ratios. For example, if identified guillemots and razorbills occurred in a 4:1 ratio, then 80% of unidentified birds considered to be possibly either of those species would be assigned to guillemot and 20% assigned to razorbill.

14 More detail on the treatment of the data for the proposed Project can be found in the Two-year DAS report (HiDef, 2024).

15 Density and population estimates presented per survey are provided to help inform baseline characterisation for the proposed Project, as set out for each species of interest for assessment in Section 3 and for all recorded species during the survey period in Annex B. The required information for impact modelling is set out in Table 2. Note that the proportion of birds in each age class can only be provided based on moults and was conducted where possible on species which show seasonal variation in plumage.

16 In March 2022, two surveys were flown to overcome the missed survey of February 2022. Therefore, March Survey 01 (S01) 2022 (flown on 01/03/2022) will be used in impact analyses as February 2022 and March S02 2022 (flown on 19/03/2022) will be used in impact analyses as March 2022.

Table 2 Required information from Digital Aerial Survey (DAS) for impact analyses

Output	Source area	Seabird subset	Requirement
Displacement	Offshore Array Area + 2km buffer for all species and Offshore Array Area + 4km buffer for red-throated diver and great northern diver (per SNCB, 2022)	All birds (sitting and flying)	Mean Seasonal Peak (MSP) population estimates
Collision risk	Offshore Array Area	Flying birds	Monthly densities of flying birds
Age-class analysis	Offshore Array Area + 2km buffer	All birds (sitting and flying)	Proportion of birds in each age class

2.2.1 Design-based density and population estimates

17 Density and population estimates were calculated using a design-based approach. Each strip transect was treated as a statistically independent random sample from the site. The length and breadth (i.e. the width of the field of view of the camera) of each transect were multiplied to give the transect area; dividing the number of observations for each species on each transect by the transect area gave a point estimate of the density of that species for the transect.

18 The 1km-spaced transects flown were used to derive density and population estimates for the Offshore Array Area and the Offshore Array Area plus 2km buffer following the aforementioned approach. To determine density and population estimates for the Offshore Array Area plus 4km buffer, estimates for the Offshore Array Area only and 4km buffer only were calculated separately and combined to produce estimates for the full Offshore Array Area plus 4km buffer. The Offshore Array Area estimates were derived using 1km-spaced transects and the 4km buffer estimates were derived using the 2km-spaced transects. This approach was taken as the 1km-spaced transects did not cover the full 4km buffer (Figure 1).

19 The density of seabirds within the areas (and hence the population size), the standard deviation (SD), the 95% Confidence Limits (CLs), and Coefficient of Variation (CV) were then estimated using a non-parametric block bootstrap method with replacement (Buckland *et al.,* 2001), to ensure equal transect effort was sampled across each bootstrap iteration.

20 Data were processed in the R programming language (version 4.3.1; R Core team, 2023). The code can be provided on request. More detail on this approach can be found in the Two-year DAS report (HiDef, 2024).

2.2.2 Availability bias

21 In wildlife surveys, a proportion of seabirds that spend any time underwater, especially while feeding, will not be detectable at the surface. This 'availability bias' leads to an under-estimate of their abundance during surveys. Within the original development area and a 10km surrounding buffer, availability bias corrections were only applied to observations of guillemot, razorbill and puffin due to a lack of available dive duration data for other species. Following Barlow *et al.* (1988) the probability that an animal is available at the surface is calculated as:

$$\Pr(being\ visible) = \frac{(s+t)}{(s+d)}$$

Where *s* is the average time spent at the surface, *t* is the window of time that the animal is within view and *d* is the average time below the surface. In the case of digital video surveys, the value of *t* is negligibly small and is treated as zero.

22 For guillemot and razorbill, data obtained during the breeding season using data loggers on birds in the Isle of May were used to estimate availability bias. Thaxter *et al.* (2010) gives mean times for these species engaged in flying, feeding and underwater per trip during the chick-rearing period. Thus, the proportion of time that guillemot and razorbill are available at the surface (Pr(visible)) was estimated at 0.7595 and 0.8182, respectively.

23 For puffin, the results from a study using data loggers on birds in Petit Manan Island, Maine, USA reported in Spencer (2012) were used. The results show that across all seasons puffin spend 14.16% of daylight time underwater. This infers that the proportion of time that puffin were available at the surface (Pr(visible)) was 0.8584.

24 The full method for applying a correction factor to account for availability bias is set out in the Two-year DAS report (HiDef, 2024). Absolute population estimates, "adjusted" for availability bias, are presented in Sections 3.13, 3.14 and 3.15 of this report, and will be the estimates taken forward for use during Environmental Impact Assessment (EIA) and Natura Impact Statement (NIS). They are used to calculate the MSP required for analysis of displacement impact for the relevant species (Table 2).

2.2.3 Mean seasonal peaks (MSP)

25 To calculate the MSPs needed for the assessment of displacement, seasonal definitions were based on Furness (2015), as set out in

26 Table 3. Common gull seasons are not defined by Furness (2015) and in the absence of guidance for Irish developments, seasonality for the species was set to follow NatureScot season definitions (2020).

27 For both tern species, there is considerable overlap between the start of the autumn migration period and the end of the breeding season, as defined in Furness (2015). Therefore, it was decided, as a

precautionary measure, to further detail the seasonal breakdown for this species group, as peak numbers could be as local breeding birds from nearby SPA or migrating birds from further afield.

Table 3 Seasons used for determination of Mean Seasonal Peaks (MSP) (Furness, 2015)

Species	Breeding season	Non-breeding season		
		Post-breeding migration (autumn)	Winter period	Return migration (spring)
Red-throated diver	Mar - Aug	Sep - Nov	Dec - Jan	Feb
Great northern diver	-	Sep - May		
Manx shearwater	Apr - Aug	Sep - Oct	-	Mar
Gannet	Mar - Sep	Oct - Nov	-	Dec - Feb
Shag	Feb - Aug	Sep - Jan		
Kittiwake	Mar - Aug	Sep - Dec	-	Jan - Feb
Common gull*	Apr - Aug	Sep – Mar		
Great black-backed gull	Mar - Aug	Sep - Feb		
Herring gull	Mar - Aug	Sep - Feb		
Lesser black-backed gull	Apr - Aug	Sep - Oct	Nov - Feb	Mar
Common tern	May - Aug	Sep	-	Apr
Arctic tern	May - Aug	Sep	-	Apr
Guillemot	Mar - Jul	Aug - Feb		
Razorbill	Apr - Jul	Aug - Oct	Nov - Dec	Jan - Mar
Puffin	Apr - Aug	Sep - Mar		

**NatureScot (2020)*

28 MSP population estimates calculated for each species in the breeding and non-breeding seasons (

29 Table 3) were taken as an average of the peak monthly estimates in each of the two years of the relevant season, for the Offshore Array Area plus 2km buffer for all species and the Offshore Array Area plus 4km buffer for red-throated diver and great northern diver.

30 For example, the MSP population estimate for kittiwake in the breeding season was calculated as the average of the peak abundance estimate of kittiwake in the breeding season in Year 1 (2021/22) and the peak abundance estimate in the breeding season in Year 2 (2022/23). To calculate the Confidence Intervals (CIs) for each MSP, a truncated normal distribution was characterised for each of the peak

months using the abundance estimate and its associated SD, with the lower bound of the distribution fixed at zero. A total of 1,000 random samples from these distributions were drawn, with the selected peak months samples pooled to create a single distribution for the MSP. The 0.025 and 0.975 quantiles of this distribution were then obtained, which serve as estimates of upper and lower CIs. MSPs and CIs were always rounded up to the nearest bird.

31 Where seasons started or ended halfway through the month (for the tern species), the 15th was used as a mid-month cut off and surveys were assigned to a season based on the date that the survey was flown.

32 In some cases, the start or end date of the survey period fell partway through a season, meaning that the full season was not covered. When this occurred, seasons which were partially surveyed were treated the same as those which the survey period covered fully. Therefore, in some cases, three seasons were used to calculate the MSPs despite the two-year survey period. For example, to calculate the MSP for kittiwake post-breeding season, three peaks from October 2020, September to October 2021 and September 2022 were used.

33 For the three auk species (guillemot, razorbill and puffin), the MSPs relate to absolute estimates of abundance and have been adjusted for availability bias to account for birds likely to be diving at the time of survey (as discussed in Section 2.2.2).

2.2.4 Age proportions

34 To assess the proportion of birds in each age class (adult, immature, juvenile), the average number of birds recorded in each class that it was possible to age was calculated across all surveys that occurred in each season (as defined in

35 Table 3). For example, if there were four surveys in the breeding season in Year 1 (2021/22) and four surveys in the breeding season in Year 2 (2022/23), then the average number of aged adult birds was calculated across eight surveys. This was conducted using all data within the Offshore Array Area plus 2km buffer. Birds that could not be aged were not included in the calculations.

36 The resulting percentage in each age class was calculated as a proportion of the sum of the average number in each age class and is presented for species where aging was possible (namely flying birds) for kittiwake, common gull, great black-backed gull, herring gull, lesser black-backed gull and gannet. In DAS footage, it is only possible to age large auks when adults are in the presence of juveniles during post-breeding dispersal. For these species, any age data is unlikely to be representative of the true population therefore age class data are not presented for guillemot, or razorbill. It is not possible to age puffin from DAS footage.

3 Results

3.1 Red-throated diver

37 In Ireland, red-throated divers are considered an Amber list species and are listed as Least Concern under the IUCN Red list of threatened species (Gilbert *et al.,* 2021; IUCN, 2024). Ireland is the most southern area of this species global breeding range, and there is a very small breeding population of between three and six pairs of red-throated divers in Ireland (Crowe, *et al.,* 2021). The species is widespread in inshore coastal waters during the winter season, showing a preference for shallow, sandy bays (Hutchinson, 1989; Balmer *et al.,* 2013).

38 Red-throated divers are considered sensitive to displacement effects from offshore wind projects and therefore population estimates for all birds within the Offshore Array Area plus 4km buffer and MSP estimates are required for input into the assessment of displacement analysis as per SNCB guidance (2022) (Technical Appendix 11-2: Displacement Matrices Technical Report).

39 No red-throated divers were recorded within the Offshore Array Area or in the Offshore Array Area plus 4km buffer within analysed transects flown during baseline surveys (Annex A,), therefore population estimates of red-throated diver were zero birds across all surveys. The species will therefore be assessed qualitatively in the EIA.

40 Within the wider 10km buffer around the original development area (survey area), a total of 22 red-throated divers were recorded in Year 1, with two birds recorded in Year 2 (Table 4). All birds were recorded outside the 4km buffer around the Offshore Array Area, out to 10km from the Offshore Array Area. Most observations were made between October and April in both years, during the non-breeding season, with birds typically distributed in coastal waters, inshore of the Offshore Array Area (Figure 2).

41 Within the wider 10km buffer around the original development area (survey area), peak population estimates were recorded in March S01 2022 in Year 1 with 115 birds (95% CI 0 – 311) and in January and April 2023 in Year 2 with 9 birds (95% CI 0 – 25 in January 2023 and 0 – 24 in April 2023).

Table 4 Number of red-throated divers detected within the analysed transects and during each survey assigned to species level in the wider 10km buffer around the original development area (survey area) between October 2021 and September 2023.

Oct–21	Nov-21	Dec-21	Jan-22	Mar-S01-22	Mar-S02-22	Apr-22	May-22	Jun-22	Jul-22	Aug-22	Sep-22
0	1	1	0	14	1	3	0	1	0	0	1
Oct–22	**Nov-22**	**Dec-22**	**Jan-23**	**Feb 23**	**Mar 23**	**Apr-23**	**May-23**	**Jun-23**	**Jul-23**	**Aug-23**	**Sep-23**
0	0	0	1	0	0	1	0	0	0	0	0

Figure 2 Distribution of red-throated divers within the survey area (wider 10km buffer around the original development area)

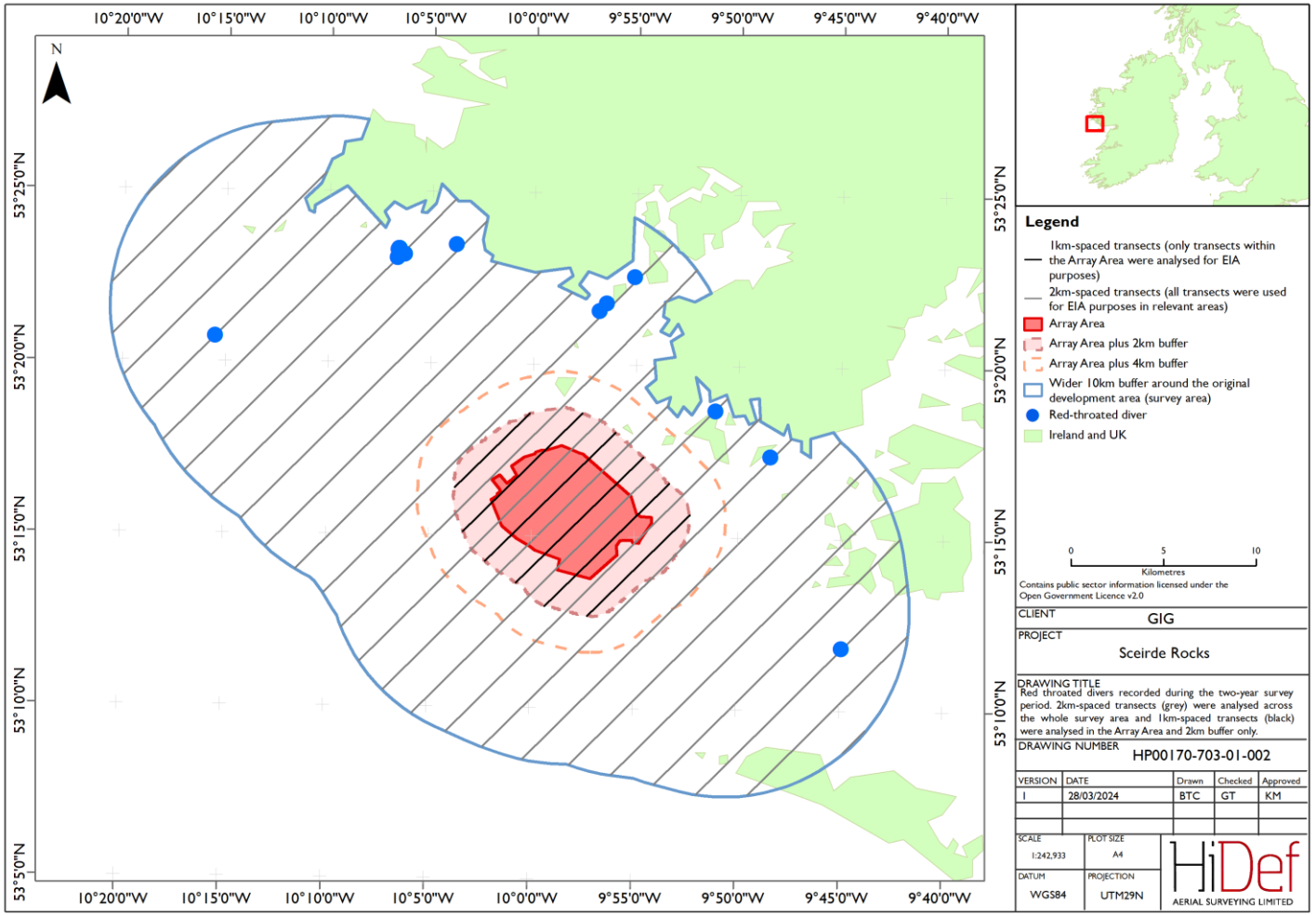

Table 5 **Monthly population estimates of all red-throated divers (flying and sitting) beyond the 4km buffer within the wider 10km buffer around the original development area between October 2021 and September 2023. Note that only analysed transects were included (i.e., 1km-spaced transects in the Offshore Array Area and 2km-spaced transects in the wider 10km surrounding buffer).**

Survey date	Population estimate	Lower 95% confidence limit	Upper 95% confidence limit	Standard deviation	CV (%)
28 October 2021	0	0	0	0	-
27 November 2021	32	0	89	25	78.12
10 December 2021	9	0	25	8	88.89
21 January 2022	0	0	0	0	-
01 March 2022	115	0	311	95	82.61
19 March 2022	8	0	25	8	100.00
01 April 2022	24	0	63	17	70.83
27 May 2022	0	0	0	0	-
18 June 2022	9	0	25	9	100.00
11 July 2022	0	0	0	0	-
06 August 2022	0	0	0	0	-
01 September 2022	40	0	94	25	62.50
17 October 2022	0	0	0	0	-
29 November 2022	0	0	0	0	-
22 December 2022	0	0	0	0	-
19 January 2023	9	0	25	8	88.89
09 February 2023	0	0	0	0	-
04 March 2023	0	0	0	0	-
18 April 2023	9	0	24	8	88.89
02 May 2023	0	0	0	0	-
03 June 2023	0	0	0	0	-
19 July 2023	0	0	0	0	-
17 August 2023	0	0	0	0	-
16 September 2023	0	0	0	0	-

3.2 Great northern diver

42 In Ireland, great northern divers are considered an Amber list species and are listed as Least Concern under the IUCN Red list of threatened species (Gilbert *et al.,* 2021; IUCN, 2024). Great northern divers are common, winter visitors to Ireland, and are widespread in inshore, coastal waters, particularly off the north-west coast (Hutchinson, 1989; Balmer *et al.,* 2013).

43 Great northern divers are considered sensitive to displacement effects from offshore wind projects and therefore population estimates for all birds within the Offshore Array Area plus 4km buffer and MSP estimates are provided for input into the assessment of displacement analysis (Technical Appendix 11-2: Displacement Matrices Technical Report). The non-breeding season is defined as September to May (Furness, 2015;

44 Table 3).

45 Population estimates for the Offshore Array Area ranged from 0 birds (95% CI 0 – 0) to 12 birds (95% CI 4 – 27) on baseline surveys, with peaks of 12 birds in December 2022 and April 2023 (Table 6).

46 Population estimates for great northern diver in the Offshore Array Area plus 4km buffer ranged from 0 birds (95% CI 0 – 0; e.g., December 2021) to 54 birds (95% CI 0 – 112) in April 2023 (Table 7). Following the methodology described in Section 2.2.3, MSP could only be calculated for the non-breeding season and equated to 53 birds (95% CI 5 – 80) (Table 8). However, this MSP was calculated using the three peaks of 52, 54 and 0 recorded in April 2022, April 2023 and September 2023. The peak of 0 recorded in September 2023 is based on only one month and is considerably lower than the other two peaks recorded in 2022 and 2023. Therefore, it was decided that the MSP to bring forward to assessment will be calculated using solely the peaks recorded in April 2022 and 2023, to apply a precautionary approach during the assessment. As such, the great northern diver MSP to bring forward for assessment for the non-breeding season equates to 53 (95% CI 38 - 69).

Table 6 Monthly population estimates of all great northern divers (flying and sitting) within the Offshore Array Area between October 2021 and September 2023.

Survey date	Population estimate	Lower 95% confidence limit	Upper 95% confidence limit	Standard deviation	CV (%)
28 October 2021	5	0	12	4	86.51
27 November 2021	5	0	13	4	85.18
10 December 2021	0	0	0	0	-
21 January 2022	0	0	0	0	-
01 March 2022*	4	0	12	4	86.43
19 March 2022	0	0	0	0	-
01 April 2022	10	0	28	9	84.39
27 May 2022	4	0	14	4	102.79
18 June 2022	0	0	0	0	-
11 July 2022	0	0	0	0	-
06 August 2022	0	0	0	0	-
01 September 2022	0	0	0	0	-
17 October 2022	0	0	0	0	-
29 November 2022	0	0	0	0	-
22 December 2022	12	4	21	5	38.99
19 January 2023	9	0	19	5	58.57
09 February 2023	9	0	19	5	56.18
04 March 2023	8	0	16	5	57.14
18 April 2023	12	0	27	8	60.36
02 May 2023	4	0	12	4	97.23
03 June 2023	0	0	0	0	-
19 July 2023	0	0	0	0	-
17 August 2023	0	0	0	0	-
16 September 2023	0	0	0	0	-

**Used to represent February 2022 in impact analyses*

3.2.1 Input abundance for displacement

Table 7 Monthly population estimates of all great northern divers (flying and sitting) within the Offshore Array Area plus 4km buffer between October 2021 and September 2023.

Survey date	Population estimate	Lower 95% confidence limit	Upper 95% confidence limit	Standard deviation	CV (%)
28 October 2021	22	0	60	16	70.56
27 November 2021	5	0	13	4	80.00
10 December 2021	0	0	0	0	-
21 January 2022	25	0	57	16	64.00
01 March 2022*	44	9	90	19	41.91
19 March 2022	33	8	63	15	45.45
01 April 2022	52	9	109	21	38.70
27 May 2022	4	0	14	4	100.00
18 June 2022	0	0	0	0	-
11 July 2022	0	0	0	0	-
06 August 2022	0	0	0	0	-
01 September 2022	0	0	0	0	-
17 October 2022	0	0	0	0	-
29 November 2022	0	0	0	0	-
22 December 2022	45	12	84	16	35.14
19 January 2023	26	0	57	12	43.00
09 February 2023	26	0	56	12	43.00
04 March 2023	42	8	86	17	39.91
18 April 2023	54	0	112	23	41.62
02 May 2023	44	9	84	17	37.48
03 June 2023	0	0	0	0	-
19 July 2023	0	0	0	0	-
17 August 2023	0	0	0	0	-
16 September 2023	0	0	0	0	-

**Used to represent February 2022 in impact analyses*

Table 8 **Mean seasonal peak population estimate of all great northern divers (flying and sitting) in the non-breeding season within the Offshore Array Area plus 4km buffer.**

Season	Population estimate	Lower 95% confidence limit	Upper 95% confidence limit
Non-breeding season	53	38	69

3.3 Manx shearwater

47 In Ireland, Manx shearwaters are considered an Amber list species and are listed as Least Concern under the IUCN Red list of threatened species (Gilbert *et al.,* 2021; IUCN, 2024). Manx shearwaters spend most of the year at sea and return to land, on islands, solely to breed in burrows and boulders (JNCC, 2021a).

48 The Irish population of Manx shearwater in Ireland represents 15% of the British Isles populations and equated to approximately 134,220 Apparently Occupied Sites (AOSs), as recorded in the last Seabirds Count census (2015-2020). The census estimated an overall increase of the Irish population of 265% compared to the Seabird 2000 census, where numbers were under-estimated (Burnell *et al.,* 2023).

49 Manx shearwater is a common local breeder and passage migrant regularly recorded around Ireland between March and October. The species is known to be present in important concentrations during the breeding and post-breeding season in Ireland, especially around the key colonies on the Blasket Islands, the Skelligs, Puffin Island, Cruagh and Copeland Island. Manx shearwaters typically winter off the south American coast (Mackey and Giménez, 2000). Commonly, in summer, the species uses the continental shelf, with hotspots in the Irish Sea and in offshore waters to the west of Ireland (Rogan *et al.,* 2018).

50 Manx shearwaters were considered in the displacement assessment, and therefore population estimates for all birds within the Offshore Array Area plus 2km buffer and MSP estimates are provided for input into the assessment of displacement analysis (Technical Appendix 11-2: Displacement Matrices Technical Report).

51 Maximum population estimates for the Offshore Array Area ranged from 10 birds (95% CI 0 – 25) in the return migration season to 485 birds (95% CI 132 – 971) in the breeding season (Table 9). No birds were recorded in the Offshore Array Area during the post-breeding migration season.

52 Population estimates for Manx shearwater in the Offshore Array Area plus 2km buffer ranged from 0 birds (95% CI 0 – 0; e.g., October 2021) to 10,735 birds (95% CI 1,807 – 25,517) in May 2022 (Table 10). The MSP calculated for the breeding season was the greatest across all seasons, with an estimated population of 6,013 birds (95% CI 537 – 16,070), while MSPs for both migration seasons were estimated to be below 30 birds (Table 11).

Table 9 Monthly population estimates of all Manx shearwaters (flying and sitting) within the Offshore Array Area between October 2021 and September 2023.

Survey date	Population estimate	Lower 95% confidence limit	Upper 95% confidence limit	Standard deviation	CV (%)
28 October 2021	0	0	0	0	-
27 November 2021	0	0	0	0	-
10 December 2021	0	0	0	0	-
21 January 2022	0	0	0	0	-
01 March 2022*	0	0	0	0	-
19 March 2022	10	0	25	7	72.04
01 April 2022	0	0	0	0	-
27 May 2022	485	132	971	218	44.79
18 June 2022	13	0	29	8	63.55
11 July 2022	24	4	48	11	45.89
06 August 2022	0	0	0	0	-
01 September 2022	0	0	0	0	-
17 October 2022	0	0	0	0	-
29 November 2022	0	0	0	0	-
22 December 2022	0	0	0	0	-
19 January 2023	0	0	0	0	-
09 February 2023	0	0	0	0	-
04 March 2023	0	0	0	0	-
18 April 2023	20	0	43	11	53.20
02 May 2023	240	96	385	76	31.49
03 June 2023	388	12	1031	322	83.02
19 July 2023	28	7	57	14	48.95
17 August 2023	8	0	19	5	63.62
16 September 2023	0	0	0	0	-

**Used to represent February 2022 in impact analyses*

3.3.1 Input abundance for displacement

Table 10 Monthly population estimates of all Manx shearwaters (flying and sitting) within the Offshore Array Area plus 2km buffer between October 2021 and September 2023.

Survey date	Population estimate	Lower 95% confidence limit	Upper 95% confidence limit	Standard deviation	CV (%)
28 October 2021	0	0	0	0	-
27 November 2021	0	0	0	0	-
10 December 2021	0	0	0	0	-
21 January 2022	0	0	0	0	-
01 March 2022*	0	0	0	0	-
19 March 2022	55	23	96	19	33.66
01 April 2022	22	0	45	12	51.08
27 May 2022	10,735	1,807	25,517	7,054	65.71
18 June 2022	148	83	218	35	23.30
11 July 2022	1,767	537	3,193	692	39.16
06 August 2022	12	0	24	6	48.48
01 September 2022	29	0	76	23	77.98
17 October 2022	0	0	0	0	-
29 November 2022	0	0	0	0	-
22 December 2022	0	0	0	0	-
19 January 2023	0	0	0	0	-
09 February 2023	0	0	0	0	-
04 March 2023	0	0	0	0	-
18 April 2023	36	5	75	19	52.06
02 May 2023	1,290	532	2,396	485	37.52
03 June 2023	1,151	129	2,547	619	53.77
19 July 2023	130	57	217	43	33.22
17 August 2023	41	16	70	14	33.95
16 September 2023	0	0	0	0	-

**Used to represent February 2022 in impact analyses*

Table 11 Mean seasonal peak population estimates of all Manx shearwaters (flying and sitting) in each season within the Offshore Array Area plus 2km buffer between October 2021 and September 2023.

Season	Population estimate	Lower 95% confidence limit	Upper 95% confidence limit
Breeding season	6,013	537	16,070
Post-breeding migration	10	1	45
Return migration	28	5	55

3.4 Gannet

53 In Ireland, gannets are considered an Amber list species and are listed as Least Concern under the IUCN Red list of threatened species (Gilbert *et al.,* 2021; IUCN, 2024). Most breeding colonies are found on remote islands and stacks with the largest Irish colony located on Little Skellig (JNCC, 2021b).

54 In the last Gannet Census (2013-2014), 48,032 Apparently Occupied Nests / Sites (AONs/AOSs) were recorded, which represents a 33% increase since the previous Gannet Census of 2003-2005 (JNCC, 2021b). .

55 Gannet is a common breeding species in Ireland, nesting on mainland cliffs and islands. The species is present around Irish coasts in highest numbers during the summer, although high densities can also be observed close to colonies in late winter, as birds return from wintering grounds off Spain and Africa in February and March (Mackey and Giménez, 2000)..

56 Gannets were amongst the species the most impacted by the recent highly pathogenic avian influenza (HPAI) outbreaks. During the 2021-2022 season, cases of the H5N1 strain were found on numerous gannets starting mid- to late August until the beginning of September on Clare Island, Lambay, Great Saltee, Ireland's Eye and mostly in Little Skellig and Bull Rock colonies (Giralt Paradell *et al.,* 2023; Lane *et al.,* 2024).

57 Gannets are considered sensitive to both collision and displacement impacts from offshore wind projects. Therefore, density estimates for flying birds within the Offshore Array Area are provided for input into CRM (Technical Appendix 11-4: Offshore Ornithology Collision Risk Modelling Report), while population estimates for all birds within the Offshore Array Area plus 2km buffer and MSP estimates are provided for input into the assessment of displacement (Technical Appendix 11-2: Displacement Matrices Technical Report).

58 The percentage of gannets aged on baseline surveys within the Offshore Array Area plus 2km buffer is presented in Table 12. In the breeding season, 58% of aged birds were immature, while in the autumn and spring migration periods, all aged birds were adults.

59 Maximum population estimates for the Offshore Array Area ranged from 4 birds (95% CI 0 – 12) in the return migration season to 29 birds (95% CI 11 – 49) in the breeding season (Table 13). No birds were recorded during the post-breeding migration season in the Offshore Array Area.

60 Within the Offshore Array Area, the density of flying gannets (Table 14), ranged from 0.00 birds/km^2 (e.g., October 2021) to 0.43 birds/km^2 (95% CI 0.10 – 0.85; May 2022). Peak densities of flying gannets were calculated for May 2022 in Year 1 and September 2023 in Year 2. Mean monthly densities are presented in Table 15 for CRM input.

61 Population estimates for gannets in the Offshore Array Area plus 2km buffer ranged between 0 birds (95% CI 0 – 0; e.g., October 2021) and 136 birds (95% CI 12 – 352) in November 2021 (Table 16). The MSP calculated for the breeding and post-breeding migration seasons were similar, with 73 birds (95% CI 18 – 132) and 72 birds (95% CI 7 – 203), respectively. The MSP for the return migration season was 6 birds (95% CI 1 – 18) (Table 17).

Table 12 Percentage of aged gannets (n = 85) in each age class averaged across all surveys in each season within the Offshore Array Area plus 2km buffer.

Season	Adult (%)	Immature (%)	Juvenile (%)
Breeding season	34.00	58.00	8.00
Post-breeding migration	100.00	0.00	0.00
Return migration	100.00	0.00	0.00

Table 13 Monthly population estimates of all gannets (flying and sitting) within the Offshore Array Area between October 2021 and September 2023.

Survey date	Population estimate	Lower 95% confidence limit	Upper 95% confidence limit	Standard deviation	CV (%)
28 October 2021	0	0	0	0	-
27 November 2021	0	0	0	0	-
10 December 2021	0	0	0	0	-
21 January 2022	0	0	0	0	-
01 March 2022*	0	0	0	0	-
19 March 2022	0	0	0	0	-
01 April 2022	5	0	14	5	87.03
27 May 2022	29	11	49	11	36.29
18 June 2022	8	0	19	5	61.87
11 July 2022	0	0	0	0	0.00
06 August 2022	4	0	12	4	90.37
01 September 2022	0	0	0	0	-
17 October 2022	0	0	0	0	-
29 November 2022	0	0	0	0	-
22 December 2022	4	0	12	4	87.57
19 January 2023	0	0	0	0	-
09 February 2023	0	0	0	0	-
04 March 2023	0	0	0	0	-
18 April 2023	8	0	16	5	55.96
02 May 2023	5	0	12	4	88.20
03 June 2023	4	0	12	4	94.00
19 July 2023	0	0	0	0	-
17 August 2023	9	0	24	8	90.73
16 September 2023	13	0	29	8	61.97

**Used to represent February 2022 in impact analyses*

3.4.1 Input densities for Collision Risk Modelling (CRM)

Table 14 Monthly density estimates of flying gannets within the Offshore Array Area between October 2021 and September 2023.

Survey date	Density estimate (n/km²)	Lower 95% confidence limit (n/km²)	Upper 95% confidence limit (n/km²)	Standard deviation (n/km²)	CV (%)
28 October 2021	0.00	0.00	0.00	0.00	-
27 November 2021	0.00	0.00	0.00	0.00	-
10 December 2021	0.00	0.00	0.00	0.00	-
21 January 2022	0.00	0.00	0.00	0.00	-
01 March 2022*	0.00	0.00	0.00	0.00	-
19 March 2022	0.00	0.00	0.00	0.00	-
01 April 2022	0.13	0.00	0.37	0.11	103.18
27 May 2022	0.43	0.10	0.85	0.19	49.91
18 June 2022	0.22	0.00	0.50	0.13	60.97
11 July 2022	0.00	0.00	0.00	0.00	-
06 August 2022	0.11	0.00	0.31	0.10	97.55
01 September 2022	0.00	0.00	0.00	0.00	-
17 October 2022	0.00	0.00	0.00	0.00	-
29 November 2022	0.00	0.00	0.00	0.00	-
22 December 2022	0.11	0.00	0.31	0.10	97.55
19 January 2023	0.00	0.00	0.00	0.00	-
09 February 2023	0.00	0.00	0.00	0.00	-
04 March 2023	0.00	0.00	0.00	0.00	-
18 April 2023	0.00	0.00	0.00	0.00	-
02 May 2023	0.11	0.00	0.32	0.09	97.55
03 June 2023	0.11	0.00	0.32	0.10	97.55
19 July 2023	0.00	0.00	0.00	0.00	-
17 August 2023	0.21	0.00	0.63	0.20	102.20
16 September 2023	0.33	0.00	0.75	0.20	65.04

**Used to represent February 2022 in impact analyses*

Table 15 Gannet mean monthly flying bird densities recorded within the Offshore Array Area for CRM input.

Monthly densities (n/km^2)	Monthly mean	
	Density	SD
January	0.00	0.00
February	0.00	0.00
March	0.00	0.00
April	0.07	0.08
May	0.27	0.15
June	0.17	0.12
July	0.00	0.00
August	0.16	0.15
September	0.17	0.14
October	0.00	0.00
November	0.00	0.00
December	0.06	0.07

3.4.2 Input abundance for displacement

Table 16 Monthly population estimates of all gannets (flying and sitting) within the Offshore Array Area plus 2km buffer between October 2021 and September 2023.

Survey date	Population estimate	Lower 95% confidence limit	Upper 95% confidence limit	Standard deviation	CV (%)
28 October 2021	0	0	0	0	-
27 November 2021	136	12	352	91	66.62
10 December 2021	0	0	0	0	-
21 January 2022	0	0	0	0	-
01 March 2022*	0	0	0	0	-
19 March 2022	0	0	0	0	-
01 April 2022	10	0	22	6	62.88
27 May 2022	37	12	65	14	36.49
18 June 2022	13	4	25	6	47.15
11 July 2022	0	0	0	0	-
06 August 2022	4	0	12	4	93.60
01 September 2022	5	0	13	4	91.89
17 October 2022	0	0	0	0	-
29 November 2022	8	0	24	8	98.25
22 December 2022	12	0	28	8	67.56
19 January 2023	0	0	0	0	-
09 February 2023	5	0	13	4	94.65
04 March 2023	0	0	0	0	-
18 April 2023	13	0	25	7	51.95
02 May 2023	13	4	24	6	46.06
03 June 2023	28	8	56	13	45.81
19 July 2023	0	0	0	0	-
17 August 2023	108	35	193	40	37.24
16 September 2023	20	4	38	9	42.47

**Used to represent February 2022 in impact analyses*

Table 17 **Mean seasonal peak population estimates of all gannets (flying and sitting) in each season within the Offshore Array Area plus 2km buffer between October 2021 and September 2023.**

Season	Population estimate	Lower 95% confidence limit	Upper 95% confidence limit
Breeding season	73	18	132
Post-breeding migration	72	7	203
Return migration	6	1	18

3.5 Shag

62 In Ireland, shags are considered an Amber list species and are listed as Least Concern under the IUCN Red list of threatened species (Gilbert *et al*., 2021; IUCN, 2024). Shags are endemic to the northeast Atlantic and Mediterranean and are considered an inshore species with a relatively small foraging range. The species feeds around sandy and rocky substrates and nests primarily on mainland cliffs or islands (JNCC, 2021c).

63 The recent Seabirds Count census (2015-2021) recorded 4,748 AONs and an overall increase of 40% of the Irish population since the previous Seabird 2000 census (Burnell *et al*., 2023). Shags are widespread in inshore waters around Ireland in both winter and summer months (Hutchinson, 1989; Balmer *et al.,* 2013).

64 Shags were considered for the displacement assessment and therefore population estimates for all birds within the Offshore Array Area plus 2km buffer and MSP estimates are provided for input into the assessment of displacement (Technical Appendix 11-2: Displacement Matrices Technical Report).

65 Maximum population estimates for the Offshore Array Area ranged from 16 birds (95% CI 0 – 35) in the non-breeding season to 29 birds (95% CI 4 – 63) in the breeding season (Table 18).

66 Population estimates for shags in the Offshore Array Area plus 2km buffer ranged from 0 birds (95% CI 0 – 0; e.g., October 2021) to 56 birds (95% CI 26 – 91) in December 2022 (Table 19). The MSP for the breeding and non-breeding seasons were estimated to be 31 birds (95% CI 4 – 69) and 29 birds (95% CI 6 – 57), respectively (Table 20).

Table 18 Monthly population estimates of all shags (flying and sitting) within the Offshore Array Area between October 2021 and September 2023.

Survey date	Population estimate	Lower 95% confidence limit	Upper 95% confidence limit	Standard deviation	CV (%)
28 October 2021	0	0	0	0	-
27 November 2021	0	0	0	0	-
10 December 2021	16	0	35	9	55.93
21 January 2022	5	0	12	4	91.84
01 March 2022*	29	4	63	17	57.97
19 March 2022	0	0	0	0	-
01 April 2022	5	0	14	4	87.46
27 May 2022	17	4	31	8	44.43
18 June 2022	0	0	0	0	-
11 July 2022	5	0	12	4	91.35
06 August 2022	8	0	16	5	58.76
01 September 2022	0	0	0	0	-
17 October 2022	0	0	0	0	-
29 November 2022	13	0	36	12	89.73
22 December 2022	16	4	31	8	46.74
19 January 2023	8	0	16	5	56.62
09 February 2023	13	0	30	8	61.99
04 March 2023	20	0	59	18	89.61
18 April 2023	16	0	40	11	68.11
02 May 2023	9	0	18	5	57.03
03 June 2023	4	0	12	4	91.41
19 July 2023	5	0	12	4	87.05
17 August 2023	5	0	12	4	89.39
16 September 2023	4	0	12	4	91.15

**Used to represent February 2022 in impact analyses*

3.5.1 Input abundance for displacement

Table 19 Monthly population estimates of all shags (flying and sitting) within the Offshore Array Area plus 2km buffer between October 2021 and September 2023.

Survey date	Population estimate	Lower 95% confidence limit	Upper 95% confidence limit	Standard deviation	CV (%)
28 October 2021	0	0	0	0	-
27 November 2021	0	0	0	0	-
10 December 2021	16	0	38	10	63.22
21 January 2022	4	0	12	4	90.11
01 March 2022*	41	12	82	19	45.53
19 March 2022	0	0	0	0	-
01 April 2022	5	0	14	5	91.52
27 May 2022	20	4	37	9	42.30
18 June 2022	9	0	20	5	60.95
11 July 2022	9	0	20	6	60.92
06 August 2022	13	0	24	6	48.06
01 September 2022	0	0	0	0	-
17 October 2022	5	0	13	4	96.23
29 November 2022	17	0	42	12	73.63
22 December 2022	56	26	91	17	30.03
19 January 2023	40	4	97	26	64.19
09 February 2023	17	4	35	9	50.77
04 March 2023	21	0	59	19	91.18
18 April 2023	20	0	45	13	61.82
02 May 2023	9	0	20	5	59.49
03 June 2023	5	0	12	4	89.26
19 July 2023	9	0	20	5	61.37
17 August 2023	4	0	12	4	89.53
16 September 2023	15	4	27	7	41.01

**Used to represent February 2022 in impact analyses*

Table 20 **Mean seasonal peak population estimates of all shags (flying and sitting) in each season within the Offshore Array Area plus 2km buffer between October 2021 and September 2023.**

Season	Population estimate	Lower 95% confidence limit	Upper 95% confidence limit
Breeding season	31	4	69
Non-breeding season	29	6	57

3.6 Kittiwake

67 In Ireland, kittiwakes are considered a Red list species and are listed as Vulnerable under the IUCN Red list of threatened species (Gilbert *et al*., 2021; IUCN, 2024). Kittiwakes nest on vertical rocky sea cliffs, and occasionally on man-made structures such as buildings, bridges and oil rigs. The species has a more coastal distribution during the breeding season, feeding on small pelagic shoaling fish and is oceanic outside of the breeding season, spending the winter in the Bay of Biscay and in the North Atlantic, with some birds reaching north American coasts (JNCC, 2021d).

68 The Seabirds Count census (2015-2021) recorded 24,723 AONs which was an overall decrease of 36% of the Irish population since the previous Seabird 2000 census (Burnell *et al*., 2023). (). Strong declines were recorded at several key colonies, including west coast colonies such as Horn Head, Cliffs of Moher and Clare Island (Cummins *et al.,* 2019).

69 Kittiwakes are regularly encountered in coastal waters and over shelf, slope and deepwater habitats. High densities on the Irish shelf have been previously recorded during the winter. During the autumn, higher numbers are often recorded in shelf waters of the Celtic Sea and the continental slope (Mackey and Giménez, 2000; Rogan *et al*., 2018).

70 Kittiwakes are considered sensitive to collision impacts from offshore wind projects. Kittiwake was also included in the displacement assessment. Therefore, density estimates for flying birds within the Offshore Array Area are provided for input into CRM (Technical Appendix 11-4: Offshore Ornithology Collision Risk Modelling Report), while population estimates for all birds within the Offshore Array Area plus 2km buffer and MSP estimates are provided for input into the assessment of displacement (Technical Appendix 11-2: Displacement Matrices Technical Report).

71 Within the Offshore Array Area plus 2km buffer and across all seasons, the majority of birds recorded on baseline surveys were aged as adults, with a similar proportion of immature birds recorded during the breeding season and return migration season (Table 21).

72 Maximum population estimates for the Offshore Array Area ranged from 40 birds (95% CI 12 – 68) in the post-breeding migration season, to 52 birds (95% CI 4 – 124) in the breeding season and 76 birds (95% CI 16 – 143) in the return migration season (Table 22).

73 Within the Offshore Array Area, flying kittiwakes were recorded in varying densities (Table 23), ranging between 0.00 birds/km^2 (e.g. January 2022) and 1.07 birds/km^2 (95% CI 0.31 – 1.89; December 2021). Peak densities of flying kittiwakes were calculated for December 2021 in Year 1 and November 2022 in Year 2. Mean monthly densities are presented in Table 24 for CRM input.

74 Population estimates for all kittiwakes in the Offshore Array Area plus 2km buffer ranged between 0 birds (95% CI 0 – 0) in September 2022 and 189 birds (95% CI 70 – 331) in February 2023 (Table 25). The MSP for the return migration season was the highest with 144 birds (95% CI 37 – 258), with 93 birds (95% CI 51 – 136) estimated in the breeding season and 80 birds (95% CI 34 – 127) in the post-breeding migration period (Table 26).

Table 21 Percentage of aged kittiwakes (n = 241) in each age class averaged across all surveys in each season.

Season	Adult (%)	Immature (%)	Juvenile (%)
Breeding season	91.95	6.90	1.15
Post-breeding migration	82.52	0.97	16.50
Return migration	94.12	5.88	0.00

Table 22 Monthly population estimates of all kittiwakes (flying and sitting) within the Offshore Array Area between October 2021 and September 2023.

Survey date	Population estimate	Lower 95% confidence limit	Upper 95% confidence limit	Standard deviation	CV (%)
28 October 2021	8	0	24	8	93.21
27 November 2021	17	4	33	8	46.96
10 December 2021	40	12	68	16	37.76
21 January 2022	0	0	0	0	-
01 March 2022*	76	16	143	32	41.64
19 March 2022	20	4	43	11	50.80
01 April 2022	5	0	14	5	87.48
27 May 2022	20	8	34	7	34.40
18 June 2022	13	0	28	8	60.45
11 July 2022	41	8	76	17	41.36
06 August 2022	0	0	0	0	-
01 September 2022	0	0	0	0	-
17 October 2022	0	0	0	0	-
29 November 2022	36	15	60	13	33.90
22 December 2022	4	0	12	4	90.09
19 January 2023	9	0	24	8	87.30
09 February 2023	24	4	56	14	58.04
04 March 2023	13	0	29	8	59.75
18 April 2023	24	4	47	12	47.67
02 May 2023	21	4	44	11	51.24
03 June 2023	52	4	124	35	67.61
19 July 2023	17	0	36	10	56.13
17 August 2023	13	0	28	8	61.70
16 September 2023	4	0	12	4	90.64

**Used to represent February 2022 in impact analyses*

3.6.1 Input densities for Collision Risk Modelling (CRM)

Table 23 Monthly density estimates of flying kittiwakes within the Offshore Array Area between October 2021 and September 2023.

Survey date	Density estimate (n/km²)	Lower 95% confidence limit (n/km²)	Upper 95% confidence limit (n/km²)	Standard deviation (n/km²)	CV (%)
28 October 2021	0.21	0.00	0.62	0.19	102.20
27 November 2021	0.46	0.11	0.91	0.21	46.66
10 December 2021	1.07	0.31	1.89	0.40	40.12
21 January 2022	0.00	0.00	0.00	0.00	-
01 March 2022*	0.55	0.10	1.06	0.25	48.78
19 March 2022	0.32	0.00	0.74	0.20	67.07
01 April 2022	0.12	0.00	0.36	0.11	111.78
27 May 2022	0.53	0.19	0.90	0.19	35.43
18 June 2022	0.32	0.00	0.74	0.19	67.07
11 July 2022	0.31	0.00	0.74	0.20	69.23
06 August 2022	0.00	0.00	0.00	0.00	-
01 September 2022	0.00	0.00	0.00	0.00	-
17 October 2022	0.00	0.00	0.00	0.00	-
29 November 2022	0.64	0.19	1.18	0.27	46.11
22 December 2022	0.10	0.00	0.30	0.09	107.31
19 January 2023	0.00	0.00	0.00	0.00	-
09 February 2023	0.43	0.10	0.84	0.20	49.91
04 March 2023	0.11	0.00	0.31	0.10	97.55
18 April 2023	0.42	0.00	1.03	0.28	70.26
02 May 2023	0.44	0.00	1.06	0.29	67.07
03 June 2023	0.30	0.00	0.71	0.19	71.54
19 July 2023	0.21	0.00	0.62	0.19	89.43
17 August 2023	0.11	0.00	0.32	0.10	97.55
16 September 2023	0.10	0.00	0.31	0.09	107.31

**Used to represent February 2022 in impact analyses*

Table 24 Kittiwake mean monthly flying bird densities recorded within the Offshore Array Area for CRM input.

Monthly densities (n/km^2)	Monthly mean	
	Density	SD
January	0.00	0.00
February	0.49	0.23
March	0.22	0.15
April	0.27	0.21
May	0.49	0.24
June	0.31	0.19
July	0.26	0.19
August	0.06	0.07
September	0.05	0.06
October	0.11	0.13
November	0.55	0.24
December	0.59	0.29

3.6.2 Input abundance for displacement

Table 25 Monthly population estimates of all kittiwakes (flying and sitting) within the Offshore Array Area plus 2km buffer between October 2021 and September 2023.

Survey date	Population estimate	Lower 95% confidence limit	Upper 95% confidence limit	Standard deviation	CV (%)
28 October 2021	77	8	166	41	53.29
27 November 2021	93	32	169	36	38.21
10 December 2021	124	77	173	25	19.99
21 January 2022	5	0	13	4	93.66
01 March 2022*	98	23	191	44	44.93
19 March 2022	45	12	87	20	43.47
01 April 2022	19	0	53	15	77.72
27 May 2022	25	8	43	9	36.31
18 June 2022	24	0	51	13	53.12
11 July 2022	97	60	140	21	21.50
06 August 2022	12	0	24	6	49.84
01 September 2022	0	0	0	0	-
17 October 2022	70	16	146	34	48.72
29 November 2022	85	44	125	22	24.85
22 December 2022	33	12	55	11	33.47
19 January 2023	48	20	77	15	30.58
09 February 2023	189	70	331	69	36.52
04 March 2023	16	0	35	9	53.87
18 April 2023	74	40	108	18	24.18
02 May 2023	37	9	75	17	45.53
03 June 2023	79	20	167	40	49.92
19 July 2023	88	49	132	22	24.50
17 August 2023	29	12	46	10	32.53
16 September 2023	29	8	52	11	38.15

**Used to represent February 2022 in impact analyses*

Table 26 Mean seasonal peak population estimates of all kittiwakes (flying and sitting) in each season within the Offshore Array Area plus 2km buffer between October 2021 and September 2023.

Season	Population estimate	Lower 95% confidence limit	Upper 95% confidence limit
Breeding season	93	51	136
Post-breeding migration	80	34	127
Return migration	144	37	258

3.7 Common gull

75 In Ireland, common gulls are considered an Amber list species and are listed as Least Concern under the IUCN Red list of threatened species (Gilbert *et al*., 2021; IUCN, 2024). Common gulls breed both on the coastline and inland, wintering on estuaries and at sea (JNCC, 2021e).

76 The Seabirds Count census (2015-2021), recorded 1,983 AONs, which was an overall increase of 89% of the Irish population since the Seabird 2000 census. The majority of breeding pairs (72%) were recorded in coastal locations, with a smaller inland breeding population (Burnell *et al*., 2023).

77 The species is typically found in coastal waters in the Irish Sea, with low densities observed in western Irish coastal locations and offshore (Mackey and Giménez, 2000; Rogan *et al*., 2018).

78 Common gulls are considered sensitive to collision with turbines, therefore density estimates of flying birds within the Offshore Array Area are provided for input into CRM (Technical Appendix 11-4: Offshore Ornithology Collision Risk Modelling Report).

79 Within the Offshore Array Area plus 2km buffer, two thirds of common gulls aged on baseline surveys were recorded as adults in both the breeding and non-breeding seasons, although the sample size was small (Table 27).

80 Maximum population estimates for the Offshore Array Area ranged between 4 birds (95% CI 0 – 12) in the breeding season and 9 birds (95% CI 0 – 16) in the non-breeding season (Table 28).

81 Within the Offshore Array Area, flying common gulls were only recorded during two surveys (December 2022 and March 2023), with densities equating 0.10 birds/km^2 (95% CI 0.00 – 0.31; December 2022) and 0.11 birds/km^2 (95% CI 0.00 – 0.32; March 2023) (Table 29). Mean monthly densities are presented in Table 30 for CRM input.

Table 27 Percentage of aged common gulls (n = 18) in each age class averaged across all surveys in each season within the Offshore Array Area plus 2km buffer.

Season	Adult (%)	Immature (%)	Juvenile (%)
Breeding season	66.67	33.33	0.00
Non-breeding season	66.67	33.33	0.00

Table 28 Monthly population estimates of all common gulls (flying and sitting) within the Offshore Array Area between October 2021 and September 2023.

Survey date	Population estimate	Lower 95% confidence limit	Upper 95% confidence limit	Standard deviation	CV (%)
28 October 2021	0	0	0	0	-
27 November 2021	0	0	0	0	-
10 December 2021	0	0	0	0	-
21 January 2022	0	0	0	0	-
01 March 2022*	0	0	0	0	-
19 March 2022	0	0	0	0	-
01 April 2022	0	0	0	0	-
27 May 2022	0	0	0	0	-
18 June 2022	0	0	0	0	-
11 July 2022	0	0	0	0	-
06 August 2022	0	0	0	0	-
01 September 2022	0	0	0	0	-
17 October 2022	0	0	0	0	-
29 November 2022	0	0	0	0	-
22 December 2022	5	0	12	4	92.60
19 January 2023	0	0	0	0	-
09 February 2023	0	0	0	0	-
04 March 2023	9	0	16	5	54.17
18 April 2023	0	0	0	0	-
02 May 2023	4	0	12	4	89.80
03 June 2023	0	0	0	0	-
19 July 2023	0	0	0	0	-
17 August 2023	0	0	0	0	-
16 September 2023	0	0	0	0	-

**Used to represent February 2022 in impact analyses*

3.7.1 Input densities for Collision Risk Modelling (CRM)

Table 29 Monthly density estimates of flying common gulls within the Offshore Array Area between October 2021 and September 2023.

Survey date	Density estimate (n/km²)	Lower 95% confidence limit (n/km²)	Upper 95% confidence limit (n/km²)	Standard deviation (n/km²)	CV (%)
28 October 2021	0.00	0.00	0.00	0.00	-
27 November 2021	0.00	0.00	0.00	0.00	-
10 December 2021	0.00	0.00	0.00	0.00	-
21 January 2022	0.00	0.00	0.00	0.00	-
01 March 2022*	0.00	0.00	0.00	0.00	-
19 March 2022	0.00	0.00	0.00	0.00	-
01 April 2022	0.00	0.00	0.00	0.00	-
27 May 2022	0.00	0.00	0.00	0.00	-
18 June 2022	0.00	0.00	0.00	0.00	-
11 July 2022	0.00	0.00	0.00	0.00	-
06 August 2022	0.00	0.00	0.00	0.00	-
01 September 2022	0.00	0.00	0.00	0.00	-
17 October 2022	0.00	0.00	0.00	0.00	-
29 November 2022	0.00	0.00	0.00	0.00	-
22 December 2022	0.10	0.00	0.31	0.09	107.31
19 January 2023	0.00	0.00	0.00	0.00	-
09 February 2023	0.00	0.00	0.00	0.00	-
04 March 2023	0.11	0.00	0.32	0.10	97.55
18 April 2023	0.00	0.00	0.00	0.00	-
02 May 2023	0.00	0.00	0.00	0.00	-
03 June 2023	0.00	0.00	0.00	0.00	-
19 July 2023	0.00	0.00	0.00	0.00	-
17 August 2023	0.00	0.00	0.00	0.00	-
16 September 2023	0.00	0.00	0.00	0.00	-

**Used to represent February 2022 in impact analyses*

Table 30 Common gull mean monthly flying bird densities recorded within the Offshore Array Area for CRM input.

Monthly densities (n/km^2)	Monthly mean	
	Density	SD
January	0.00	0.00
February	0.00	0.00
March	0.06	0.07
April	0.00	0.00
May	0.00	0.00
June	0.00	0.00
July	0.00	0.00
August	0.00	0.00
September	0.00	0.00
October	0.00	0.00
November	0.00	0.00
December	0.05	0.07

3.8 Great black-backed gull

82 In Ireland, great black-backed gulls are considered a Green list species and are listed as Least Concern under the IUCN Red list of threatened species (Gilbert *et al.*, 2021; IUCN, 2024). Great black-backed gull is a coastal resident breeding species, nesting almost exclusively in coastal habitats but can also be occasionally found nesting inland, at freshwater sites or in urban areas, such as rooftops (JNCC, 2021f).

83 The Seabirds Count census (2015-2021) recorded 2,825 AONs which was an overall increase of 28% of the Irish population since the Seabird 2000 census (Burnell *et al.*, 2023).

84 Great black-backed gulls are widespread around the coast of Ireland across all seasons. Higher numbers in winter may be due to an influx of birds from more northern countries. In Irish waters, the species is generally recorded in the east and south, primarily in continental shelf and coastal waters. Fewer birds use more offshore waters to the west of Ireland (Mackey and Giménez, 2000; Rogan *et al.*, 2018).

85 Great black-backed gulls are considered sensitive to collision with turbines, therefore density estimates of flying birds within the Offshore Array Area are provided for input into CRM (Technical Appendix 11-4: Offshore Ornithology Collision Risk Modelling Report).

86 Within the Offshore Array Area plus 2km buffer during the breeding season all aged birds were recorded as adults while in the non-breeding season just over three quarters of aged birds were adults (76.92%), although the sample size was small (Table 31).

87 Maximum population estimates for the Offshore Array Area ranged between 5 birds (95% CI 0 – 15) in the breeding season and 12 birds (95% CI 0 – 28) in the non-breeding season (Table 32).

88 Within the Offshore Array Area, flying great black-backed gulls were recorded during nine surveys, with densities ranging between 0.11 birds/km^2 (95% CI 0.00 – 0.31; December 2021, July, November 2022, January and August 2023) and 0.33 birds/km^2 (95% CI 0.00 – 0.74; October 2021) (Table 33). Mean monthly densities are presented in Table 34 for CRM input.

Table 31 Percentage of aged great black-backed gulls (n = 24) in each age class averaged across all surveys in each season within the Offshore Array Area plus 2km buffer.

Season	Adult (%)	Immature (%)	Juvenile (%)
Breeding season	100.00	0.00	0.00
Non-breeding season	76.92	23.08	0.00

Table 32 Monthly population estimates of all great black-backed gulls (flying and sitting) within the Offshore Array Area between October 2021 and September 2023.

Survey date	Population estimate	Lower 95% confidence limit	Upper 95% confidence limit	Standard deviation	CV (%)
28 October 2021	12	0	28	8	60.16
27 November 2021	0	0	0	0	-
10 December 2021	5	0	12	4	87.50
21 January 2022	9	0	24	8	88.96
01 March 2022*	5	0	12	4	88.88
19 March 2022	0	0	0	0	-
01 April 2022	5	0	14	5	88.45
27 May 2022	0	0	0	0	-
18 June 2022	0	0	0	0	-
11 July 2022	4	0	12	4	93.32
06 August 2022	0	0	0	0	-
01 September 2022	0	0	0	0	-
17 October 2022	0	0	0	0	-
29 November 2022	4	0	12	4	87.41
22 December 2022	4	0	12	4	89.16
19 January 2023	5	0	12	4	88.92
09 February 2023	5	0	15	4	90.18
04 March 2023	5	0	12	4	86.34
18 April 2023	4	0	12	4	85.33
02 May 2023	4	0	12	4	89.22
03 June 2023	5	0	15	5	100.07
19 July 2023	0	0	0	0	-
17 August 2023	5	0	12	4	86.98
16 September 2023	0	0	0	0	-

**Used to represent February 2022 in impact analyses*

3.8.1 Input densities for Collision Risk Modelling (CRM)

Table 33 Monthly density estimates of flying great black-backed gulls within the Offshore Array Area between October 2021 and September 2023.

Survey date	Density estimate (n/km²)	Lower 95% confidence limit (n/km²)	Upper 95% confidence limit (n/km²)	Standard deviation (n/km²)	CV (%)
28 October 2021	0.33	0.00	0.74	0.21	65.04
27 November 2021	0.00	0.00	0.00	0.00	-
10 December 2021	0.11	0.00	0.31	0.11	97.55
21 January 2022	0.22	0.00	0.63	0.21	97.55
01 March 2022*	0.00	0.00	0.00	0.00	-
19 March 2022	0.00	0.00	0.00	0.00	-
01 April 2022	0.00	0.00	0.00	0.00	-
27 May 2022	0.00	0.00	0.00	0.00	-
18 June 2022	0.00	0.00	0.00	0.00	-
11 July 2022	0.11	0.00	0.31	0.11	97.55
06 August 2022	0.00	0.00	0.00	0.00	-
01 September 2022	0.00	0.00	0.00	0.00	-
17 October 2022	0.00	0.00	0.00	0.00	-
29 November 2022	0.11	0.00	0.31	0.11	97.55
22 December 2022	0.00	0.00	0.00	0.00	-
19 January 2023	0.11	0.00	0.31	0.11	97.55
09 February 2023	0.00	0.00	0.00	0.00	-
04 March 2023	0.00	0.00	0.00	0.00	-
18 April 2023	0.00	0.00	0.00	0.00	-
02 May 2023	0.11	0.00	0.32	0.11	97.55
03 June 2023	0.11	0.00	0.32	0.11	97.55
19 July 2023	0.00	0.00	0.00	0.00	-
17 August 2023	0.11	0.00	0.31	0.11	97.55
16 September 2023	0.00	0.00	0.00	0.00	-

**Used to represent February 2022 in impact analyses*

Table 34 Great black-backed gull mean monthly flying bird densities recorded within the Offshore Array Area for CRM input.

Monthly densities (n/km^2)	Monthly mean	
	Density	SD
January	0.17	0.15
February	0.00	0.00
March	0.00	0.00
April	0.00	0.00
May	0.06	0.07
June	0.06	0.08
July	0.06	0.07
August	0.06	0.07
September	0.00	0.00
October	0.17	0.14
November	0.06	0.07
December	0.06	0.07

3.9 Herring gull

89 In Ireland, herring gulls are considered an Amber list species and are listed as Least Concern under the IUCN Red list of threatened species (Gilbert *et al*., 2021; IUCN, 2024). The species nests on rocky coastlines, sand dunes or urban areas. A small proportion will also nest inland, close to lake islands and moorlands. Herring gulls are opportunistic feeders. Outside of the breeding season, herring gulls are common around coastlines and in inshore waters (JNCC, 2021g).

90 The Seabirds Count census (2015-2021) recorded 9,702 AONs at natural nest sites, which was an overall increase of 94% of the Irish population since the Seabird 2000 census. A further 8,943 AONs were estimated in urban areas, giving a combined estimated urban and natural population of 18,645 AONs (Burnell *et al*., 2023).

91 Around Ireland, herring gulls are mainly recorded in coastal waters throughout the year, although birds are also found further offshore over shallow, shelf waters throughout the year. Few birds use more offshore waters to the west of Ireland (Mackey and Giménez, 2000; Rogan *et al*., 2018).

92 Herring gull are considered sensitive to collision with turbines, therefore density estimates of flying birds within the Offshore Array Area are provided for input into CRM (Technical Appendix 11-4: Offshore Ornithology Collision Risk Modelling Report).

93 Within the Offshore Array Area plus 2km buffer the majority of birds were aged as adults in both the breeding and non-breeding seasons although the sample size was small(Table 35).

94 Maximum population estimates for the Offshore Array Area ranged between 9 birds (95% CI 0 – 24) in the non-breeding season and 33 birds (95% CI 0 – 63) in the breeding season (Table 36).

95 Within the Offshore Array Area, flying herring gulls were recorded on seven surveys , with densities ranging between 0.10 birds/km^2 (95% CI 0.00 – 0.31; October 2022) and 0.55 birds/km^2 (95% CI 0.00 – 1.17; April 2023) (Table 37). Mean monthly densities are presented in Table 38 for CRM input.

Table 35 Percentage of aged herring gulls (n = 36) in each age class averaged across all surveys in each season within the Offshore Array Area plus 2km buffer.

Season	Adult (%)	Immature (%)	Juvenile (%)
Breeding season	70.59	29.41	0.00
Non-breeding season	84.21	10.53	5.26

Table 36 Monthly population estimates of all herring gulls (flying and sitting) within the Offshore Array Area between October 2021 and September 2023.

Survey date	Population estimate	Lower 95% confidence limit	Upper 95% confidence limit	Standard deviation	CV (%)
28 October 2021	0	0	0	0	-
27 November 2021	0	0	0	0	-
10 December 2021	0	0	0	0	-
21 January 2022	5	0	12	4	88.84
01 March 2022*	0	0	0	0	-
19 March 2022	0	0	0	0	-
01 April 2022	0	0	0	0	-
27 May 2022	8	0	19	5	56.08
18 June 2022	0	0	0	0	-
11 July 2022	0	0	0	0	-
06 August 2022	5	0	12	4	87.22
01 September 2022	9	0	24	8	89.47
17 October 2022	5	0	12	4	90.27
29 November 2022	4	0	12	4	93.20
22 December 2022	0	0	0	0	-
19 January 2023	5	0	12	4	93.23
09 February 2023	0	0	0	0	-
04 March 2023	0	0	0	0	-
18 April 2023	33	4	63	15	46.37
02 May 2023	5	0	12	4	90.86
03 June 2023	0	0	0	0	-
19 July 2023	0	0	0	0	-
17 August 2023	0	0	0	0	-
16 September 2023	0	0	0	0	-

**Used to represent February 2022 in impact analyses*

3.9.1 Input densities for Collision Risk Modelling (CRM)

Table 37 Monthly density estimates of flying herring gulls within the Offshore Array Area between October 2021 and September 2023.

Survey date	Density estimate (n/km²)	Lower 95% confidence limit (n/km²)	Upper 95% confidence limit (n/km²)	Standard deviation (n/km²)	CV (%)
28 October 2021	0.00	0.00	0.00	0.00	-
27 November 2021	0.00	0.00	0.00	0.00	-
10 December 2021	0.00	0.00	0.00	0.00	-
21 January 2022	0.11	0.00	0.31	0.11	97.55
01 March 2022*	0.00	0.00	0.00	0.00	-
19 March 2022	0.00	0.00	0.00	0.00	-
01 April 2022	0.00	0.00	0.00	0.00	-
27 May 2022	0.11	0.00	0.31	0.11	97.55
18 June 2022	0.00	0.00	0.00	0.00	-
11 July 2022	0.00	0.00	0.00	0.00	-
06 August 2022	0.00	0.00	0.00	0.00	-
01 September 2022	0.00	0.00	0.00	0.00	-
17 October 2022	0.10	0.00	0.31	0.11	107.31
29 November 2022	0.11	0.00	0.31	0.11	97.55
22 December 2022	0.00	0.00	0.00	0.00	-
19 January 2023	0.11	0.00	0.32	0.11	97.55
09 February 2023	0.00	0.00	0.00	0.00	-
04 March 2023	0.00	0.00	0.00	0.00	-
18 April 2023	0.55	0.00	1.17	0.32	58.53
02 May 2023	0.11	0.00	0.31	0.11	97.55
03 June 2023	0.00	0.00	0.00	0.00	-
19 July 2023	0.00	0.00	0.00	0.00	-
17 August 2023	0.00	0.00	0.00	0.00	-
16 September 2023	0.00	0.00	0.00	0.00	-

**Used to represent February 2022 in impact analyses*

Table 38 Herring gull mean monthly flying bird densities recorded within the Offshore Array Area for CRM input.

Monthly densities (n/km^2)	Monthly mean	
	Density	SD
January	0.11	0.10
February	0.00	0.00
March	0.00	0.00
April	0.28	0.21
May	0.11	0.10
June	0.00	0.00
July	0.00	0.00
August	0.00	0.00
September	0.00	0.00
October	0.05	0.06
November	0.06	0.07
December	0.00	0.00

3.10 Lesser black-backed gull

96 In Ireland, lesser black-backed gulls are considered an Amber list species and are listed as Least Concern under the IUCN Red list of threatened species (Gilbert *et al*., 2021; IUCN, 2024). Over the years, lesser black-backed gulls have become less migratory in Europe than they used to be. The species nests colonially on rocky coastlines, sand dunes or urban areas. A small proportion will also nest inland, close to lake islands and moorlands. Lesser black-backed gulls are opportunistic feeders (JNCC, 2021h).

97 The Seabirds Count census (2015-2021) recorded 7,471 AONs at natural nest sites, which was an overall increase of 163% of the Irish population since the Seabird 2000 census. A further 2,497 AONs were estimated in urban areas, giving a combined estimated urban and natural population of 9,968 AONs (Burnell *et al*., 2023).

98 Outside of the breeding season, most lesser black-backed gulls migrate to the Iberian peninsula and northwest Africa, although an increasing number of lesser black-backed gulls now winter in Ireland and the south of the UK. The species is mainly coastal throughout the year but has been recorded further offshore between January and September. In Irish waters, the species is generally recorded in the east and south, primarily in continental shelf and coastal waters. Fewer birds use more offshore waters to the west of Ireland (Mackey and Giménez, 2000; Rogan *et al*., 2018).

99 Lesser black-backed gulls are considered sensitive to collision with turbines, therefore density estimates of flying birds within the Offshore Array Area are provided for input into CRM (Technical Appendix 11-4: Offshore Ornithology Collision Risk Modelling Report).

100 Within the Offshore Array Area plus 2km buffer all birds aged on baseline surveys were recorded as adults, although the sample size was small (Table 39).

101 Maximum population estimates for the Offshore Array Area ranged between 5 birds (95% CI 0 – 12) in the return migration season and 17 birds (95% CI 8 – 26) in the breeding season (Table 40). No birds were recorded during the post-breeding migration and winter periods.

102 Within the Offshore Array Area, flying lesser black-backed gulls were only recorded on five surveys, with densities ranging between 0.10 birds/km^2 (95% CI 0.00 – 0.31; April 2023) and 0.22 birds/km^2 (95% CI 0.00 – 0.49; July 2022) (Table 41). Mean monthly densities are presented in Table 42 for CRM input.

Table 39 Percentage of aged lesser black-backed gulls (n = 19) in each age class averaged across all surveys in each season within the Offshore Array Area plus 2km buffer.

Season	Adult (%)	Immature (%)	Juvenile (%)
Breeding season	100	0.00	0.00
Post-breeding migration	0.00	0.00	0.00
Migration-free winter season	0.00	0.00	0.00
Return migration	100	0.00	0.00

Table 40 Monthly population estimates of all lesser black-backed gulls (flying and sitting) within the Offshore Array Area between October 2021 and September 2023.

Survey date	Population estimate	Lower 95% confidence limit	Upper 95% confidence limit	Standard deviation	CV (%)
28 October 2021	0	0	0	0	-
27 November 2021	0	0	0	0	-
10 December 2021	0	0	0	0	-
21 January 2022	0	0	0	0	-
01 March 2022*	0	0	0	0	-
19 March 2022	5	0	12	4	82.02
01 April 2022	0	0	0	0	-
27 May 2022	8	0	16	5	57.18
18 June 2022	4	0	12	4	90.79
11 July 2022	17	8	26	6	31.42
06 August 2022	0	0	0	0	-
01 September 2022	0	0	0	0	-
17 October 2022	0	0	0	0	-
29 November 2022	0	0	0	0	-
22 December 2022	0	0	0	0	-
19 January 2023	0	0	0	0	-
09 February 2023	0	0	0	0	-
04 March 2023	0	0	0	0	-
18 April 2023	12	4	22	5	41.41
02 May 2023	0	0	0	0	-
03 June 2023	0	0	0	0	-
19 July 2023	8	0	24	8	90.03
17 August 2023	0	0	0	0	-
16 September 2023	0	0	0	0	-

**Used to represent February 2022 in impact analyses*

3.10.1 Input densities for Collision Risk Modelling (CRM)

Table 41 Monthly density estimates of flying lesser black-backed gulls within the Offshore Array Area between October 2021 and September 2023.

Survey date	Density estimate (n/km²)	Lower 95% confidence limit (n/km²)	Upper 95% confidence limit (n/km²)	Standard deviation (n/km²)	CV (%)
28 October 2021	0.00	0.00	0.00	0.00	-
27 November 2021	0.00	0.00	0.00	0.00	-
10 December 2021	0.00	0.00	0.00	0.00	-
21 January 2022	0.00	0.00	0.00	0.00	-
01 March 2022*	0.00	0.00	0.00	0.00	-
19 March 2022	0.11	0.00	0.31	0.11	97.55
01 April 2022	0.00	0.00	0.00	0.00	-
27 May 2022	0.21	0.00	0.47	0.13	63.88
18 June 2022	0.00	0.00	0.00	0.00	-
11 July 2022	0.22	0.00	0.49	0.13	60.97
06 August 2022	0.00	0.00	0.00	0.00	-
01 September 2022	0.00	0.00	0.00	0.00	-
17 October 2022	0.00	0.00	0.00	0.00	-
29 November 2022	0.00	0.00	0.00	0.00	-
22 December 2022	0.00	0.00	0.00	0.00	-
19 January 2023	0.00	0.00	0.00	0.00	-
09 February 2023	0.00	0.00	0.00	0.00	-
04 March 2023	0.00	0.00	0.00	0.00	-
18 April 2023	0.10	0.00	0.31	0.11	107.31
02 May 2023	0.00	0.00	0.00	0.00	-
03 June 2023	0.00	0.00	0.00	0.00	-
19 July 2023	0.21	0.00	0.62	0.21	102.20
17 August 2023	0.00	0.00	0.00	0.00	-
16 September 2023	0.00	0.00	0.00	0.00	-

**Used to represent February 2022 in impact analyses*

Table 42 Lesser black-backed gull mean monthly flying bird densities recorded within the Offshore Array Area for CRM input.

Monthly densities (n/km^2)	Monthly mean	
	Density	SD
January	0.00	0.00
February	0.00	0.00
March	0.06	0.07
April	0.05	0.06
May	0.11	0.08
June	0.00	0.00
July	0.22	0.16
August	0.00	0.00
September	0.00	0.00
October	0.00	0.00
November	0.00	0.00
December	0.00	0.00

3.11 Common tern

103 In Ireland, common terns are considered an Amber list species and are listed as Least Concern under the IUCN Red list of threatened species (Gilbert *et al*., 2021; IUCN, 2024). Common tern is a ground nesting species, which breeds on coastlines and inland on lakes, reservoirs or along large river valleys (JNCC, 2021i).

104 This increase is further confirmed by The Seabirds Count census (2015-2021) recorded 4,728 AONs which was an overall increase of 91% of the Irish population since the Seabird 2000 census (Burnell *et al*., 2023). It is considered that conservation efforts at the Rockabill and Lady's Island Lake colonies have played an essential role in the strong increase of the Irish population (Cummins *et al.,* 2019).

105 Common terns are summer visitors, breeding in coastal and inland locations. Although the species is mainly found in coastal waters in the Irish Sea, low densities have also been recorded on ESAS surveys in coastal waters off the west of Ireland during the breeding and post-breeding seasons (Mackey and Giménez, 2000; Pollock *et al.,* 1997).

106 Despite avoiding HPAI contamination in 2022, tern species were particularly hit by the H5N1 strain during the 2023 breeding season in Ireland. The HPAI hit particularly the tern colonies located on the Irish east coast at Lady's Island Lake, Rockabill and Kilcoole Beach and is thought to have been brought by breeding black-headed gulls (Bird Watch Ireland, 2023).

107 Common terns are considered sensitive to both collision and displacement impacts from offshore wind projects. Therefore, density estimates for flying birds within the Offshore Array Area are provided for input into CRM (Technical Appendix 11-4: Offshore Ornithology Collision Risk Modelling Report), while population estimates for all birds within the Offshore Array Area plus 2km buffer and MSP estimates are provided for input into the assessment of displacement (Technical Appendix 11-2: Displacement Matrices Technical Report).

108 Maximum population estimates for the Offshore Array Area equated to 22 birds (95% CI 0 – 54) in the breeding season, while no birds were recorded for the post-breeding or return migration periods (Table 43).

109 Within the Offshore Array Area, the density of flying common terns were recorded in varying densities, ranged between 0.00 birds/km^2 (e.g., October 2021) and 0.57 birds/km^2 (95% CI 0.00 – 1.42; July 2023) (Table 44). Peak densities of flying common terns were calculated for August 2022 in Year 1 and July 2023 in Year 2. Mean monthly densities are presented in Table 45 for CRM input.

110 Population estimates for all common terns in the Offshore Array Area plus 2km buffer ranged between 0 birds (95% CI 0 – 0) (e.g., October 2021) and 74 birds (95% CI 15 – 144) in July 2023 (Table 46). The MSP calculated for the breeding season equated to 48 birds (95% CI 7 – 100). No birds were recorded during the post-breeding or return migration periods (Table 47).

Table 43 Monthly population estimates of all common terns (flying and sitting) within the Offshore Array Area between October 2021 and September 2023.

Survey date	Population estimate	Lower 95% confidence limit	Upper 95% confidence limit	Standard deviation	CV (%)
28 October 2021	0	0	0	0	-
27 November 2021	0	0	0	0	-
10 December 2021	0	0	0	0	-
21 January 2022	0	0	0	0	-
01 March 2022*	0	0	0	0	-
19 March 2022	0	0	0	0	-
01 April 2022	0	0	0	0	-
27 May 2022	0	0	0	0	-
18 June 2022	6	0	13	4	64.61
11 July 2022	0	0	0	0	-
06 August 2022	8	0	23	7	90.27
01 September 2022	0	0	0	0	-
17 October 2022	0	0	0	0	-
29 November 2022	0	0	0	0	-
22 December 2022	0	0	0	0	-
19 January 2023	0	0	0	0	-
09 February 2023	0	0	0	0	-
04 March 2023	0	0	0	0	-
18 April 2023	0	0	0	0	-
02 May 2023	0	0	0	0	-
03 June 2023	0	0	0	0	-
19 July 2023	22	0	54	15	68.60
17 August 2023	0	0	0	0	-
16 September 2023	0	0	0	0	-

**Used to represent February 2022 in impact analyses*

3.11.1 Input densities for Collision Risk Modelling (CRM)

Table 44 Monthly density estimates of flying common terns within the Offshore Array Area between October 2021 and September 2023.

Survey date	Density estimate (n/km²)	Lower 95% confidence limit (n/km²)	Upper 95% confidence limit (n/km²)	Standard deviation (n/km²)	CV (%)
28 October 2021	0.00	0.00	0.00	0.00	-
27 November 2021	0.00	0.00	0.00	0.00	-
10 December 2021	0.00	0.00	0.00	0.00	-
21 January 2022	0.00	0.00	0.00	0.00	-
01 March 2022*	0.00	0.00	0.00	0.00	-
19 March 2022	0.00	0.00	0.00	0.00	-
01 April 2022	0.00	0.00	0.00	0.00	-
27 May 2022	0.00	0.00	0.00	0.00	-
18 June 2022	0.14	0.00	0.36	0.09	76.65
11 July 2022	0.00	0.00	0.00	0.00	-
06 August 2022	0.22	0.00	0.62	0.20	97.55
01 September 2022	0.00	0.00	0.00	0.00	-
17 October 2022	0.00	0.00	0.00	0.00	-
29 November 2022	0.00	0.00	0.00	0.00	-
22 December 2022	0.00	0.00	0.00	0.00	-
19 January 2023	0.00	0.00	0.00	0.00	-
09 February 2023	0.00	0.00	0.00	0.00	-
04 March 2023	0.00	0.00	0.00	0.00	-
18 April 2023	0.00	0.00	0.00	0.00	-
02 May 2023	0.00	0.00	0.00	0.00	-
03 June 2023	0.00	0.00	0.00	0.00	-
19 July 2023	0.57	0.00	1.42	0.40	70.60
17 August 2023	0.00	0.00	0.00	0.00	-
16 September 2023	0.00	0.00	0.00	0.00	-

**Used to represent February 2022 in impact analyses*

Table 45 Common tern mean monthly flying bird densities recorded within the Offshore Array Area for CRM input.

Monthly densities (n/km^2)	Monthly mean	
	Density	SD
January	0.00	0.00
February	0.00	0.00
March	0.00	0.00
April	0.00	0.00
May	0.00	0.00
June	0.07	0.07
July	0.29	0.28
August	0.11	0.14
September	0.00	0.00
October	0.00	0.00
November	0.00	0.00
December	0.00	0.00

3.11.2 Input abundance for displacement

Table 46 Monthly population estimates of all common terns (flying and sitting) within the Offshore Array Area plus 2km buffer between October 2021 and September 2023.

Survey date	Population estimate	Lower 95% confidence limit	Upper 95% confidence limit	Standard deviation	CV (%)
28 October 2021	0	0	0	0	-
27 November 2021	0	0	0	0	-
10 December 2021	0	0	0	0	-
21 January 2022	0	0	0	0	-
01 March 2022*	0	0	0	0	-
19 March 2022	0	0	0	0	-
01 April 2022	0	0	0	0	-
27 May 2022	11	0	27	7	67.64
18 June 2022	13	4	26	7	47.00
11 July 2022	22	0	59	16	72.83
06 August 2022	9	0	25	8	92.94
01 September 2022	0	0	0	0	-
17 October 2022	0	0	0	0	-
29 November 2022	0	0	0	0	-
22 December 2022	0	0	0	0	-
19 January 2023	0	0	0	0	-
09 February 2023	0	0	0	0	-
04 March 2023	0	0	0	0	-
18 April 2023	0	0	0	0	-
02 May 2023	0	0	0	0	-
03 June 2023	8	0	19	6	71.11
19 July 2023	74	15	144	33	44.64
17 August 2023	0	0	0	0	-
16 September 2023	0	0	0	0	-

**Used to represent February 2022 in impact analyses*

Table 47 Mean seasonal peak population estimates of all common terns (flying and sitting) in each season within the Offshore Array Area plus 2km buffer between October 2021 and September 2023.

Season	Population estimate	Lower 95% confidence limit	Upper 95% confidence limit
Breeding season	48	7	100
Post-breeding migration	0	0	0
Return migration	0	0	0

3.12 Arctic tern

111 In Ireland, Arctic terns are considered an Amber list species and are listed as Least Concern under the IUCN Red list of threatened species (Gilbert *et al*., 2021; IUCN, 2024). Arctic tern is a ground nesting species which heavily depends on sandeels as a prey source. In Ireland, the largest colonies are found at Rockabill and Lady's Island, on the east coast (JNCC, 2021j).

112 The Seabirds Count census (2015-2021) recorded 2,708 AONs which was an overall decrease of 1% of the Irish population since the Seabird 2000 census (Burnell *et al*., 2023).

113 Arctic terns are only recorded in Irish waters during the summer months. Previous surveys have recorded high densities in coastal waters around Irish west coast breeding colonies (Mackey and Giménez, 2000).

114 Despite avoiding HPAI contamination in 2022, tern species were particularly hit by the H5N1 strain during the 2023 breeding season in Ireland. The HPAI hit particularly the east coast tern colonies located at Lady's Island Lake, Rockabill and Kilcoole Beach and is thought to have been brought by breeding black-headed gulls (Bird Watch Ireland, 2023).

115 Arctic terns are considered sensitive to both collision and displacement impacts from offshore wind projects. Therefore, density estimates for flying birds within the Offshore Array Area are provided for input into CRM (Technical Appendix 11-4: Offshore Ornithology Collision Risk Modelling Report), while population estimates for all birds within the Offshore Array Area plus 2km buffer and MSP estimates are provided for input into the assessment of displacement (Technical Appendix 11-2: Displacement Matrices Technical Report).

116 Maximum population estimates for the Offshore Array Area equated to 12 birds (95% CI 0 – 28) in the breeding season (Table 48), with no birds recorded in the post-breeding or return migration periods.

117 Within the Offshore Array Area, the density of flying Arctic terns , ranging between 0.00 birds/km^2 (e.g., October 2021) and 0.32 birds/km^2 (95% CI 0.00 – 0.77; June 2023) (Table 49). Peak densities of flying Arctic terns were calculated for June 2022 in Year 1 and June 2023 in Year 2. Mean monthly densities are presented in Table 50 for CRM input.

118 Population estimates for all Arctic terns in the Offshore Array Area plus 2km buffer ranged between 0 birds (95% CI 0 – 0, e.g., October 2021) and 78 birds (95% CI 12 – 187) in May 2023 (Table 51). The MSP calculated for the breeding season equated 58 birds (95% CI 6 – 140). No birds were recorded in the post-breeding or return migration periods (Table 52).

Table 48 Monthly population estimates of all Arctic terns (flying and sitting) within the Offshore Array Area between October 2021 and September 2023.

Survey date	Population estimate	Lower 95% confidence limit	Upper 95% confidence limit	Standard deviation	CV (%)
28 October 2021	0	0	0	0	-
27 November 2021	0	0	0	0	-
10 December 2021	0	0	0	0	-
21 January 2022	0	0	0	0	-
01 March 2022*	0	0	0	0	-
19 March 2022	0	0	0	0	-
01 April 2022	0	0	0	0	-
27 May 2022	0	0	0	0	-
18 June 2022	11	0	32	10	91.73
11 July 2022	0	0	0	0	-
06 August 2022	0	0	0	0	-
01 September 2022	0	0	0	0	-
17 October 2022	0	0	0	0	-
29 November 2022	0	0	0	0	-
22 December 2022	0	0	0	0	-
19 January 2023	0	0	0	0	-
09 February 2023	0	0	0	0	-
04 March 2023	0	0	0	0	-
18 April 2023	0	0	0	0	-
02 May 2023	0	0	0	0	-
03 June 2023	12	0	28	8	62.95
19 July 2023	12	0	28	8	67.82
17 August 2023	0	0	0	0	-
16 September 2023	0	0	0	0	-

**Used to represent February 2022 in impact analyses*

3.12.1 Input densities for Collision Risk Modelling (CRM)

Table 49 Monthly density estimates of flying Arctic terns within the Offshore Array Area between October 2021 and September 2023.

Survey date	Density estimate (n/km²)	Lower 95% confidence limit (n/km²)	Upper 95% confidence limit (n/km²)	Standard deviation (n/km²)	CV (%)
28 October 2021	0.00	0.00	0.00	0.00	-
27 November 2021	0.00	0.00	0.00	0.00	-
10 December 2021	0.00	0.00	0.00	0.00	-
21 January 2022	0.00	0.00	0.00	0.00	-
01 March 2022*	0.00	0.00	0.00	0.00	-
19 March 2022	0.00	0.00	0.00	0.00	-
01 April 2022	0.00	0.00	0.00	0.00	-
27 May 2022	0.00	0.00	0.00	0.00	-
18 June 2022	0.29	0.00	0.84	0.26	92.51
11 July 2022	0.00	0.00	0.00	0.00	-
06 August 2022	0.00	0.00	0.00	0.00	-
01 September 2022	0.00	0.00	0.00	0.00	-
17 October 2022	0.00	0.00	0.00	0.00	-
29 November 2022	0.00	0.00	0.00	0.00	-
22 December 2022	0.00	0.00	0.00	0.00	-
19 January 2023	0.00	0.00	0.00	0.00	-
09 February 2023	0.00	0.00	0.00	0.00	-
04 March 2023	0.00	0.00	0.00	0.00	-
18 April 2023	0.00	0.00	0.00	0.00	-
02 May 2023	0.00	0.00	0.00	0.00	-
03 June 2023	0.32	0.00	0.77	0.20	67.07
19 July 2023	0.28	0.00	0.78	0.21	76.65
17 August 2023	0.00	0.00	0.00	0.00	-
16 September 2023	0.00	0.00	0.00	0.00	-

**Used to represent February 2022 in impact analyses*

Table 50 Arctic tern mean monthly flying bird densities recorded within the Offshore Array Area for CRM input.

Monthly densities (n/km^2)	Monthly mean	
	Density	SD
January	0.00	0.00
February	0.00	0.00
March	0.00	0.00
April	0.00	0.00
May	0.00	0.00
June	0.31	0.24
July	0.14	0.15
August	0.00	0.00
September	0.00	0.00
October	0.00	0.00
November	0.00	0.00
December	0.00	0.00

3.12.2 Input abundance for displacement

Table 51 Monthly population estimates of all Arctic terns (flying and sitting) within the Offshore Array Area plus 2km buffer between October 2021 and September 2023.

Survey date	Population estimate	Lower 95% confidence limit	Upper 95% confidence limit	Standard deviation	CV (%)
28 October 2021	0	0	0	0	-
27 November 2021	0	0	0	0	-
10 December 2021	0	0	0	0	-
21 January 2022	0	0	0	0	-
01 March 2022*	0	0	0	0	-
19 March 2022	0	0	0	0	-
01 April 2022	0	0	0	0	-
27 May 2022	37	0	108	30	82.21
18 June 2022	20	4	42	10	51.53
11 July 2022	35	0	94	25	69.01
06 August 2022	0	0	0	0	-
01 September 2022	0	0	0	0	-
17 October 2022	0	0	0	0	-
29 November 2022	0	0	0	0	-
22 December 2022	0	0	0	0	-
19 January 2023	0	0	0	0	-
09 February 2023	0	0	0	0	-
04 March 2023	0	0	0	0	-
18 April 2023	0	0	0	0	-
02 May 2023	78	12	187	49	61.99
03 June 2023	30	4	64	16	54.19
19 July 2023	39	15	70	15	36.23
17 August 2023	0	0	0	0	-
16 September 2023	0	0	0	0	-

**Used to represent February 2022 in impact analyses*

Table 52 Mean seasonal peak population estimates of all Arctic terns (flying and sitting) in each season within the Offshore Array Area plus 2km buffer between October 2021 and September 2023.

Season	Population estimate	Lower 95% confidence limit	Upper 95% confidence limit
Breeding season	58	6	140
Post-breeding migration	0	0	0
Return migration	0	0	0

3.13 Guillemot

119 In Ireland, guillemots are considered an Amber list species and are listed as Least Concern under the IUCN Red list of threatened species (Gilbert *et al*., 2021; IUCN, 2024). It is the subspecies *U. a. albionis* that can be found in Ireland, a subspecies smaller and browner mantled than those found in Scotland and in northern England. Guillemots typically breed in small ledges or cracks of rocky cliffs and are gregarious with colonial breeding (JNCC, 2021k).

120 The Seabirds Count census (2015-2021) recorded 178,090 individuals which was an overall increase of 28% of the Irish population since the Seabird 2000 census (Burnell *et al*., 2023).

121 In Irish waters, guillemots are found in high densities in shallow waters over the continental shelf, especially during the breeding and post-breeding seasons. There is a decrease in numbers during the autumn and winter, particularly in the Irish Sea, with higher densities recorded in southern and western Irish waters at this time (Mackey and Giménez, 2000; Rogan *et al*., 2018).

122 Guillemots are considered sensitive to displacement effects from offshore wind projects and therefore absolute population estimates for all birds within the Offshore Array Area plus 2km buffer and MSP estimates are provided for input into the assessment of displacement (Technical Appendix 11-2: Displacement Matrices Technical Report).

123 Maximum absolute population estimates for the Offshore Array Area ranged from 163 birds (95% CI 42 – 309) in the non-breeding season to 508 birds (95% CI 151 – 912) in the breeding season (Table 53).

124 Absolute population estimates for guillemot in the Offshore Array Area plus 2km buffer varied (Table 54), ranging from 43 birds (95% CI 17 – 76) in January 2022 to 3,695 birds (95% CI 1,592 – 6,550) in May 2023. The MSP calculated for the breeding season was much higher than that for the non-breeding season, estimated at 3,216 birds (95% CI 1,359 – 5,080) and 309 birds (95% CI 84 – 544), respectively (Table 55).

Table 53 Absolute monthly population estimates of all guillemots (flying and sitting) within the Offshore Array Area between October 2021 and September 2023.

Survey date	Population estimate	Lower 95% confidence limit	Upper 95% confidence limit	Standard deviation	CV (%)
28 October 2021	12	0	25	7	58.33
27 November 2021	22	0	54	11	50.00
10 December 2021	12	0	32	11	91.67
21 January 2022	12	0	25	7	58.33
01 March 2022*	163	42	309	70	42.94
19 March 2022	16	0	47	14	87.50
01 April 2022	246	122	402	65	26.42
27 May 2022	148	49	291	49	33.11
18 June 2022	31	9	61	13	41.94
11 July 2022	124	26	253	51	41.13
06 August 2022	112	16	237	59	52.68
01 September 2022	101	47	169	29	28.71
17 October 2022	26	11	46	11	42.31
29 November 2022	16	5	32	8	50.00
22 December 2022	36	11	66	16	44.44
19 January 2023	43	4	92	20	46.51
09 February 2023	21	11	32	7	33.33
04 March 2023	37	5	81	15	40.54
18 April 2023	291	186	424	55	18.90
02 May 2023	508	151	912	194	38.19
03 June 2023	294	122	530	91	30.95
19 July 2023	75	51	95	12	16.00
17 August 2023	49	16	88	20	40.82
16 September 2023	63	16	124	28	44.44

**Used to represent February 2022 in impact analyses*

3.13.1 Input abundance for displacement

Table 54 Absolute monthly population estimates of all guillemots (flying and sitting) within the Offshore Array Area plus 2km buffer between October 2021 and September 2023.

Survey date	Population estimate	Lower 95% confidence limit	Upper 95% confidence limit	Standard deviation	CV (%)
28 October 2021	125	59	207	38	30.40
27 November 2021	253	68	476	107	42.29
10 December 2021	53	16	92	20	37.74
21 January 2022	43	17	76	16	37.21
01 March 2022*	312	159	475	76	24.36
19 March 2022	295	172	433	61	20.68
01 April 2022	569	262	968	173	30.40
27 May 2022	614	368	938	124	20.20
18 June 2022	110	51	173	23	20.91
11 July 2022	2,736	1,898	3,687	428	15.64
06 August 2022	178	62	328	70	39.33
01 September 2022	496	241	813	141	28.43
17 October 2022	75	42	113	18	24.00
29 November 2022	54	30	79	13	24.07
22 December 2022	87	55	124	18	20.69
19 January 2023	307	196	415	55	17.92
09 February 2023	186	120	250	31	16.67
04 March 2023	63	24	117	18	28.57
18 April 2023	451	302	622	76	16.85
02 May 2023	3,695	1,592	6,550	1,248	33.78
03 June 2023	970	527	1,440	180	18.56
19 July 2023	237	134	361	54	22.78
17 August 2023	117	61	176	32	27.35
16 September 2023	112	50	175	31	27.68

**Used to represent February 2022 in impact analyses*

Table 55 Mean seasonal peak absolute population estimates of all guillemots (flying and sitting) in each season within the Offshore Array Area plus 2km buffer between October 2021 and September 2023.

Season	Population estimate	Lower 95% confidence limit	Upper 95% confidence limit
Breeding season	3,216	1,359	5,080
Non-breeding season	309	84	544

3.14 Razorbill

125 In Ireland, razorbills are considered a Red list species and are listed as Least Concern under the IUCN Red list of threatened species (Gilbert *et al*., 2021; IUCN, 2024). Razorbills typically breed in small ledges or cracks of rocky cliffs. Those breeding in the British Isles usually winter in the European Atlantic coast from southwest Norway to Iberia and north Africa and western Mediterranean. Immature birds are known to move further away than adults, to Greenland and the Azores (JNCC, 2021l).

126 In the last Republic of Ireland Census (2015-2018), approximately 33,700 individuals were recorded, which represents a 23% increase since the last Seabird 2000 census of 1998-2002 (JNCC, 2021l). This increase is further confirmed by The Seabirds Count census (2015-2021) recorded 32,904 individuals which was an overall increase of 19% of the Irish population since the Seabird 2000 census (Burnell *et al*., 2023).

127 In Irish waters, razorbills are mostly restricted to nearshore coastal and shelf waters, and are found in high densities in the Irish Sea and close to coastal breeding colonies. Razorbills occur in greater densities off the eastern Irish coast during summer and in western Irish waters during winter (Mackey and Giménez, 2000; Rogan *et al*., 2018).

128 Razorbills are considered sensitive to displacement effects from offshore wind projects and therefore absolute population estimates for all birds within the Offshore Array Area plus 2km buffer and MSP estimates are provided for input into the assessment of displacement (Technical Appendix 11-2: Displacement Matrices Technical Report).

129 Maximum absolute population estimates for the Offshore Array Area ranged from 10 birds (0 – 29) in the post-breeding migration season, to 22 birds (95% CI 0 – 60) in the breeding season, 29 birds (95% CI 6 – 65) in the return migration season and 55 birds (95% CI 10 – 115) in the migration-free winter season (Table 56).

130 Absolute population estimates for razorbill in the Offshore Array Area plus 2km buffer ranged from 0 birds (95% CI 0 – 0; e.g. January 2022) to 270 birds (95% CI 103 – 470) in July 2022 (Table 57). The MSP calculated for the breeding season was estimated at 220 birds (95% CI 62 – 385), while the MSP for the post-breeding migration period was much lower, at 11 birds (95% CI 2 – 27). In the winter period, the MSP was estimated at 191 birds (95% CI 32 – 379), while the MSP for the return migration period was estimated at 79 birds (95% CI 29 – 130) (Table 58).

Table 56 Absolute monthly population estimates of all razorbills (flying and sitting) within the Offshore Array Area between October 2021 and September 2023.

Survey date	Population estimate	Lower 95% confidence limit	Upper 95% confidence limit	Standard deviation	CV (%)
28 October 2021	0	0	0	0	-
27 November 2021	6	0	16	5	83.33
10 December 2021	24	0	73	23	95.83
21 January 2022	0	0	0	0	-
01 March 2022*	28	5	55	13	46.43
19 March 2022	18	0	46	13	72.22
01 April 2022	0	0	0	0	-
27 May 2022	6	0	15	5	83.33
18 June 2022	0	0	0	0	-
11 July 2022	10	0	27	6	60.00
06 August 2022	0	0	0	0	-
01 September 2022	0	0	0	0	-
17 October 2022	0	0	0	0	-
29 November 2022	55	10	115	28	50.91
22 December 2022	6	0	15	5	83.33
19 January 2023	29	6	65	17	58.62
09 February 2023	20	0	57	18	90.00
04 March 2023	0	0	0	0	-
18 April 2023	15	0	35	10	66.67
02 May 2023	20	0	46	11	55.00
03 June 2023	22	0	60	20	90.91
19 July 2023	0	0	0	0	-
17 August 2023	10	0	29	10	100.00
16 September 2023	0	0	0	0	-

**Used to represent February 2022 in impact analyses*

3.14.1 Input abundance for displacement

Table 57 Absolute monthly population estimates of all razorbills (flying and sitting) within the Offshore Array Area plus 2km buffer between October 2021 and September 2023.

Survey date	Population estimate	Lower 95% confidence limit	Upper 95% confidence limit	Standard deviation	CV (%)
28 October 2021	6	0	16	5	83.33
27 November 2021	191	0	420	102	53.40
10 December 2021	24	0	72	23	95.83
21 January 2022	0	0	0	0	-
01 March 2022*	68	22	115	26	38.24
19 March 2022	18	0	48	15	83.33
01 April 2022	0	0	0	0	0.00
27 May 2022	16	1	31	7	43.75
18 June 2022	0	0	0	0	-
11 July 2022	270	103	470	85	31.48
06 August 2022	11	0	31	10	90.91
01 September 2022	5	0	15	5	100.00
17 October 2022	0	0	0	0	-
29 November 2022	98	23	178	40	40.82
22 December 2022	191	49	351	79	41.36
19 January 2023	89	40	136	26	29.21
09 February 2023	54	0	117	27	50.00
04 March 2023	0	0	0	0	-
18 April 2023	16	0	38	11	68.75
02 May 2023	169	50	306	56	33.14
03 June 2023	42	0	112	23	54.76
19 July 2023	0	0	0	0	-
17 August 2023	10	0	29	10	100.00
16 September 2023	16	0	49	16	100.00

**Used to represent February 2022 in impact analyses*

Table 58 Mean seasonal peak absolute population estimates of all razorbills (flying and sitting) in each season within the Offshore Array Area plus 2km buffer between October 2021 and September 2023.

Season	Population estimate	Lower 95% confidence limit	Upper 95% confidence limit
Breeding season	220	62	385
Post-breeding migration	11	2	27
Winter period	191	32	379
Return migration	79	29	130

3.15 Puffin

131 In Ireland, puffins are considered a Red list species and are listed as Vulnerable in the world and Endangered in Europe under the IUCN Red list of threatened species (Gilbert *et al*., 2021; IUCN, 2024). Puffins are pelagic seabirds, mostly feeding on sandeels, sprat and herring caught by underwater pursuit (JNCC, 2021m). The species nests underground in burrows. Puffins have been shown to disperse widely from their breeding colonies into the North Atlantic after the breeding season (Harris and Wanless, 2011).

132 The Seabirds Count census (2015-2021) recorded 14,232 Apparently Occupied Burrows (AOBs), which was an overall decrease of the Irish population of 26% compared to the Seabird 2000 census (Burnell *et al*., 2023).

133 In Irish waters, puffins were recorded in moderate to high densities during the breeding season, particularly off the west coast around the Cliffs of Moher. Between April and September, puffins are widespread over the continental shelf and in coastal waters around Ireland, while in the non-breeding season the species is recorded in much lower numbers (Mackey and Giménez, 2000; Rogan *et al*., 2018).

134 Puffins are considered sensitive to displacement effects from offshore wind projects and therefore absolute population estimates for all birds within the Offshore Array Area plus 2km buffer and MSP estimates are provided for input into the assessment of displacement analysis (Technical Appendix 11-2: Displacement Matrices Technical Report).

135 Maximum absolute population estimates for the Offshore Array Area ranged from 14 birds (95% CI 0 – 42) in the non-breeding season to 37 birds (95% CI 5 – 78) in the breeding season (Table 59).

136 Absolute population estimates for puffins in the Offshore Array Area plus 2km buffer were relatively low compared to other species (Table 60), ranging from 0 birds (95% CI 0 – 0; e.g., November 2021) to 88 birds (95% CI 27 – 168) in May 2022. The MSP calculated for the breeding season was higher than that for the non-breeding season, estimated at 76 birds (95% CI 20 – 135) and 9 birds (95% CI 1 – 38), respectively (Table 61).

Table 59 Absolute monthly absolute population estimates of all puffins (flying and sitting) within the Offshore Array Area between October 2021 and September 2023.

Survey date	Population estimate	Lower 95% confidence limit	Upper 95% confidence limit	Standard deviation	CV (%)
28 October 2021	0	0	0	0	-
27 November 2021	0	0	0	0	-
10 December 2021	0	0	0	0	-
21 January 2022	0	0	0	0	-
01 March 2022*	0	0	0	0	-
19 March 2022	0	0	0	0	-
01 April 2022	6	0	17	6	100.00
27 May 2022	37	5	78	18	48.65
18 June 2022	0	0	0	0	-
11 July 2022	0	0	0	0	-
06 August 2022	0	0	0	0	-
01 September 2022	14	0	42	13	92.86
17 October 2022	0	0	0	0	-
29 November 2022	0	0	0	0	-
22 December 2022	0	0	0	0	-
19 January 2023	0	0	0	0	-
09 February 2023	0	0	0	0	-
04 March 2023	0	0	0	0	-
18 April 2023	0	0	0	0	-
02 May 2023	6	0	14	5	83.33
03 June 2023	24	5	51	13	54.17
19 July 2023	0	0	0	0	-
17 August 2023	0	0	0	0	-
16 September 2023	0	0	0	0	-

**Used to represent February 2022 in impact analyses*

3.15.1 Input abundance for displacement

Table 60 Absolute monthly population estimates of all puffins (flying and sitting) within the Offshore Array Area plus 2km buffer between October 2021 and September 2023.

Survey date	Population estimate	Lower 95% confidence limit	Upper 95% confidence limit	Standard deviation	CV (%)
28 October 2021	6	0	14	5	83.33
27 November 2021	0	0	0	0	-
10 December 2021	0	0	0	0	-
21 January 2022	0	0	0	0	-
01 March 2022*	0	0	0	0	-
19 March 2022	6	0	15	5	83.33
01 April 2022	22	0	47	12	54.55
27 May 2022	88	27	168	31	35.23
18 June 2022	15	0	41	10	66.67
11 July 2022	0	0	0	0	-
06 August 2022	24	0	70	22	91.67
01 September 2022	20	0	56	19	95.00
17 October 2022	0	0	0	0	-
29 November 2022	0	0	0	0	-
22 December 2022	0	0	0	0	-
19 January 2023	0	0	0	0	-
09 February 2023	0	0	0	0	-
04 March 2023	0	0	0	0	-
18 April 2023	0	0	0	0	-
02 May 2023	7	0	17	5	71.43
03 June 2023	51	22	86	17	33.33
19 July 2023	64	33	99	19	29.69
17 August 2023	0	0	0	0	-
16 September 2023	0	0	0	0	-

**Used to represent February 2022 in impact analyses*

Table 61 Mean seasonal peak absolute population estimates of all puffins (flying and sitting) in each season within the Offshore Array Area plus 2km buffer between October 2021 and September 2023.

Season	Population estimate	Lower 95% confidence limit	Upper 95% confidence limit
Breeding season	76	20	135
Non-breeding season	9	1	38

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5 Annex A – Raw counts

137 Annex A presents raw counts of each species scoped in for impact assessment as well as all the other species recorded during the two-year survey period within the Offshore Array Area (Section **Error! Reference source not found.**), the Offshore Array Area plus 2km buffer (Section 5.2) and the Offshore Array Area plus 4km buffer (Section 5.3).

5.1 Offshore Array Area

Table 62 Number of observations for each species detected during each survey within the Offshore Array Area between October 2021 and September 2022 (Year 1).

Species	Months												Total Year 1
	Oct–21	Nov-21	Dec-21	Jan-22	Mar-S01-22	Mar-S02-22	Apr-22	May-22	Jun-22	Jul-22	Aug-22	Sep-22	
Species scoped in for assessment													
Red-throated diver	0	0	0	0	0	0	0	0	0	0	0	0	0
Great northern diver	1	1	0	0	1	0	2	1	0	0	0	0	6
Manx shearwater	0	0	0	0	0	2	0	116	3	6	0	0	127
Gannet	0	0	0	0	0	0	1	7	2	0	1	0	11
Shag	0	0	4	1	7	0	1	4	0	1	2	0	20
Kittiwake	2	4	10	0	19	5	1	5	3	10	0	0	59
Common gull	0	0	0	0	0	0	0	0	0	0	0	0	0
Great black-backed gull	3	0	1	2	1	0	1	0	0	1	0	0	9
Herring gull	0	0	0	1	0	0	0	2	0	0	1	2	6
Lesser black-backed gull	0	0	0	0	0	1	0	2	1	3	0	0	7
Common tern	0	0	0	0	0	0	0	0	1	0	1	0	2

Species	Months												Total Year 1
	Oct–21	Nov-21	Dec-21	Jan-22	Mar-S01-22	Mar-S02-22	Apr-22	May-22	Jun-22	Jul-22	Aug-22	Sep-22	
Arctic tern	0	0	0	0	0	0	0	0	2	0	0	0	2
Guillemot	2	4	2	2	27	3	40	31	6	24	21	19	181
Razorbill	0	1	5	0	5	3	0	1	0	2	0	0	17
Puffin	0	0	0	0	0	0	1	6	0	0	0	3	10
Total	**8**	**10**	**22**	**6**	**60**	**14**	**47**	**175**	**18**	**47**	**26**	**24**	**457**
Other recorded species													
Black guillemot	0	1	0	1	0	0	0	0	0	0	0	0	2
Cormorant	0	0	0	0	0	0	0	0	0	0	1	1	2
Cory's shearwater	0	0	0	0	0	0	0	0	0	0	0	0	0
Eider	0	0	0	0	7	0	0	0	0	0	0	0	7
European storm petrel	0	0	0	0	0	0	0	0	0	0	0	0	0
Fulmar	0	0	0	0	0	0	0	0	1	2	0	3	6
Great shearwater	0	0	0	0	0	0	0	0	0	0	0	0	0
Little gull	0	0	0	0	0	0	0	0	0	0	0	0	0
Oystercatcher	0	1	0	0	0	0	0	0	0	0	0	1	2
Total	**0**	**2**	**0**	**1**	**7**	**0**	**0**	**0**	**1**	**2**	**1**	**5**	**19**

Table 63 Number of observations for each species detected during each survey within the Offshore Array Area between October 2022 and September 2023 (Year 2).

Species	Months												Total Year 2
	Oct–22	Nov-22	Dec-22	Jan-23	Feb-23	Mar-23	Apr-23	May-23	Jun-23	Jul-23	Aug-23	Sep-23	
Species scoped in for assessment													
Red-throated diver	0	0	0	0	0	0	0	0	0	0	0	0	0
Great northern diver	0	0	2	2	2	2	3	1	0	0	0	0	12
Manx shearwater	0	0	0	0	0	0	5	60	88	7	2	0	162
Gannet	0	0	1	0	0	0	2	1	1	0	2	3	10
Shag	0	3	3	2	3	5	4	2	1	1	1	1	26
Kittiwake	0	9	1	2	6	3	6	5	12	4	3	1	52
Common gull	0	0	1	0	0	2	0	1	0	0	0	0	4
Great black-backed gull	0	1	1	1	1	1	1	1	1	0	1	0	9
Herring gull	1	1	0	1	0	0	8	1	0	0	0	0	12
Lesser black-backed gull	0	0	0	0	0	0	3	0	0	2	0	0	5
Common tern	0	0	0	0	0	0	0	0	0	4	0	0	4
Arctic tern	0	0	0	0	0	0	0	0	1	2	0	0	3
Guillemot	5	3	6	7	4	8	56	96	57	13	9	12	276
Razorbill	0	11	1	5	4	0	3	4	4	0	2	0	34

Species	Months												Total Year 2
	Oct–22	Nov-22	Dec-22	Jan-23	Feb-23	Mar-23	Apr-23	May-23	Jun-23	Jul-23	Aug-23	Sep-23	
Puffin	0	0	0	0	0	0	0	1	1	0	0	0	2
Total	**6**	**28**	**16**	**20**	**20**	**21**	**91**	**173**	**166**	**33**	**20**	**17**	**611**
Other recorded species													
Black guillemot	0	0	0	0	0	0	0	0	0	0	0	0	0
Cormorant	0	0	1	1	0	0	0	0	3	0	0	1	6
Cory's shearwater	0	0	0	0	0	0	0	0	0	0	71	0	71
Eider	0	0	0	0	0	24	7	0	0	0	0	0	31
European storm petrel	0	0	0	0	0	0	0	1	0	0	0	0	1
Fulmar	0	0	0	0	0	0	1	0	0	0	2	0	3
Great shearwater	0	0	0	0	0	0	0	0	0	0	3	0	3
Little gull	0	0	0	0	0	0	0	0	0	3	0	0	3
Oystercatcher	0	0	0	0	0	0	0	0	0	4	0	0	4
Total	**0**	**0**	**1**	**1**	**0**	**24**	**8**	**1**	**3**	**7**	**76**	**1**	**122**

5.2 Offshore Array Area plus 2km buffer

Table 64 Number of observations for each species detected during each survey within the Offshore Array Area plus 2km buffer between October 2021 and September 2022 (Year 1).

Species	Months												Total Year 1
	Oct–21	Nov-21	Dec-21	Jan-22	Mar-S01-22	Mar-S02-22	Apr-22	May-22	Jun-22	Jul-22	Aug-22	Sep-22	
Species scoped in for assessment													
Red-throated diver	0	0	0	0	0	0	0	0	0	0	0	0	0
Great northern diver	1	1	2	1	1	1	5	1	0	0	0	0	13
Manx shearwater	0	0	0	0	0	13	5	2,638	33	435	3	7	3,134
Gannet	0	32	0	0	0	0	2	9	3	0	1	1	48
Shag	0	0	4	1	10	0	1	5	2	2	3	0	28
Kittiwake	19	22	31	1	24	11	4	6	6	24	3	0	151
Common gull	0	5	0	0	0	0	0	0	0	2	0	1	8
Great black-backed gull	3	0	1	2	1	1	1	1	1	3	0	0	14
Herring gull	0	0	2	2	0	0	0	2	0	0	2	2	10
Lesser black-backed gull	0	0	0	0	0	1	0	4	1	6	0	0	12
Common tern	0	0	0	0	0	0	0	1	2	3	1	0	7

Species	Months												Total Year 1
	Oct–21	Nov-21	Dec-21	Jan-22	Mar-S01-22	Mar-S02-22	Apr-22	May-22	Jun-22	Jul-22	Aug-22	Sep-22	
Arctic tern	0	0	0	0	0	0	0	2	3	5	0	0	10
Guillemot	22	48	10	8	55	56	94	114	21	510	34	94	1,066
Razorbill	1	38	5	0	13	3	0	3	0	53	2	1	119
Puffin	1	0	0	0	0	1	3	12	3	0	4	3	27
Total	**47**	**146**	**55**	**15**	**104**	**87**	**115**	**2,798**	**75**	**1,043**	**53**	**109**	**4,647**
Other recorded species													
Black guillemot	0	1	0	1	0	0	0	0	0	0	0	0	2
Cormorant	0	0	0	0	0	0	0	0	0	0	1	1	2
Cory's shearwater	0	0	0	0	0	0	0	0	0	0	0	0	0
Curlew	0	0	0	0	1	0	0	0	0	0	0	0	1
Eider	0	10	0	0	7	0	2	0	0	0	0	0	19
European storm petrel	0	0	0	0	0	0	0	0	0	2	7	0	9
Fulmar	0	0	7	0	0	3	0	2	1	2	2	3	20
Great shearwater	0	0	0	0	0	0	0	0	0	0	0	0	0
Little gull	0	0	0	0	0	0	0	0	0	0	0	0	0
Oystercatcher	0	1	0	0	0	0	0	0	0	0	0	1	2
Sandwich tern	0	0	0	0	0	0	0	1	0	0	0	0	1
Sooty shearwater	0	0	0	0	0	0	0	0	0	0	0	0	0

Species	Months												Total Year 1
	Oct–21	Nov-21	Dec-21	Jan-22	Mar-S01-22	Mar-S02-22	Apr-22	May-22	Jun-22	Jul-22	Aug-22	Sep-22	
Whimbrel	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	**0**	**12**	**7**	**1**	**8**	**3**	**2**	**3**	**1**	**4**	**10**	**5**	**56**

Table 65 Number of observations for each species presented in this technical appendix detected during each survey within the Offshore Array Area plus 2km buffer between October 2022 and September 2023 (Year 2).

Species	Months												Total Year 2
	Oct–22	Nov-22	Dec-22	Jan-23	Feb-23	Mar-23	Apr-23	May-23	Jun-23	Jul-23	Aug-23	Sep-23	
Species scoped in for assessment													
Red-throated diver	0	0	0	0	0	0	0	0	0	0	0	0	0
Great northern diver	0	0	4	3	6	7	3	4	0	0	0	0	27
Manx shearwater	0	0	0	0	0	0	9	310	261	26	10	0	616
Gannet	0	2	3	0	1	0	3	3	7	0	27	5	51
Shag	1	4	12	10	4	5	5	2	1	2	1	3	50
Kittiwake	17	21	8	12	46	4	18	9	18	22	7	7	189
Common gull	1	0	1	4	0	3	4	1	1	0	0	0	15
Great black-backed gull	1	1	2	2	1	1	1	1	2	0	1	0	13
Herring gull	7	1	3	2	0	0	11	1	5	0	0	1	31
Lesser black-backed gull	0	0	0	0	0	0	3	2	9	2	2	0	18
Common tern	0	0	0	0	0	0	0	0	1	15	0	0	16
Arctic tern	0	0	0	0	0	0	0	1	4	8	0	0	13
Guillemot	13	10	15	51	35	13	87	675	195	45	22	20	1,181
Razorbill	0	20	35	15	11	0	3	32	9	0	2	4	131

Species	Months												Total Year 2
	Oct–22	Nov-22	Dec-22	Jan-23	Feb-23	Mar-23	Apr-23	May-23	Jun-23	Jul-23	Aug-23	Sep-23	
Puffin	0	0	0	0	0	0	0	1	5	8	0	0	14
Total	**40**	**59**	**83**	**99**	**104**	**33**	**147**	**1,042**	**518**	**128**	**72**	**40**	**2,365**
Other recorded species													
Black guillemot	0	0	0	0	1	1	0	1	0	0	0	0	3
Cormorant	0	0	2	1	0	0	0	0	3	1	0	1	8
Cory's shearwater	0	0	0	0	0	0	0	0	0	0	218	0	218
Curlew	0	0	0	0	0	0	0	0	0	1	0	0	1
Eider	0	0	0	0	0	24	7	0	0	0	0	0	31
European storm petrel	0	0	0	0	0	0	0	1	1	1	3	0	6
Fulmar	0	0	0	0	0	0	1	1	4	2	5	0	13
Great shearwater	0	0	0	0	0	0	0	0	0	0	22	0	22
Little gull	0	0	0	0	0	0	0	0	0	3	0	0	3
Oystercatcher	0	0	0	0	0	0	0	0	0	4	0	0	4
Sandwich tern	0	0	0	0	0	0	0	0	1	0	0	0	1
Sooty shearwater	0	0	0	0	0	0	0	0	0	0	1	0	1
Whimbrel	0	0	0	0	0	0	0	13	0	0	0	0	13
Total	**0**	**0**	**2**	**1**	**1**	**25**	**8**	**16**	**9**	**12**	**249**	**1**	**324**

5.3 Offshore Array Area plus 4km buffer

Table 66 Number of observations for each species presented in this Technical Appendix detected during each survey within the Offshore Array Area plus 4km buffer between October 2021 and September 2022 (Year 1). Note that the observations presented here are for numbers recorded on the 1km-spaced transects within the Offshore Array Area added to the numbers recorded on the 2km-spaced transects recorded in the 4km buffer.

Species	Months												Total Year 1
	Oct–21	Nov-21	Dec-21	Jan-22	Mar-S01-22	Mar-S02-22	Apr-22	May-22	Jun-22	Jul-22	Aug-22	Sep-22	
Species scoped in for assessment													
Red-throated diver	0	0	0	0	0	0	0	0	0	0	0	0	0
Great northern diver	3	1	0	3	6	4	7	1	0	0	0	0	25
Manx shearwater	0	0	0	0	2	11	8	3,531	24	729	30	0	4,335
Gannet	0	5	1	0	0	1	2	9	2	0	1	3	24
Shag	2	1	4	1	13	1	1	5	1	1	2	0	32
Kittiwake	3	17	24	2	30	9	4	9	5	35	8	0	146
Common gull	1	2	0	0	2	0	0	0	0	2	0	3	10
Great black-backed gull	3	1	2	3	5	0	1	1	0	17	6	1	40
Herring gull	2	1	0	4	0	0	0	5	0	66	5	2	85
Lesser black-backed gull	0	0	0	0	0	1	0	5	1	23	1	1	32

Species	Months												Total Year 1
	Oct–21	Nov-21	Dec-21	Jan-22	Mar-S01-22	Mar-S02-22	Apr-22	May-22	Jun-22	Jul-22	Aug-22	Sep-22	
Common tern	0	0	0	0	0	0	0	1	2	6	2	0	11
Arctic tern	0	0	0	0	0	0	0	2	4	7	0	0	13
Guillemot	75	44	8	6	54	62	61	111	26	506	75	108	1,136
Razorbill	0	61	5	1	17	6	0	3	0	61	2	0	156
Puffin	2	0	0	0	0	0	2	14	0	0	0	3	21
Total	**91**	**133**	**44**	**20**	**129**	**95**	**86**	**3,697**	**65**	**1,453**	**132**	**121**	**6,066**
Other recorded species													
Black guillemot	0	1	0	1	0	1	0	0	0	0	0	0	3
Black-headed gull	0	0	0	0	0	0	0	0	0	1	0	0	1
Cormorant	0	0	0	0	0	0	0	0	0	0	1	1	2
Cory's shearwater	0	0	0	0	0	0	0	0	0	0	0	0	0
Curlew	0	0	0	0	1	0	0	0	0	0	0	0	1
Eider	0	0	0	0	7	0	0	0	0	0	0	0	7
European storm petrel	0	0	0	0	0	0	0	1	0	3	0	0	4
Fulmar	0	0	7	0	0	2	1	1	3	4	1	4	23
Great shearwater	0	0	0	0	0	0	0	0	0	0	0	0	0
Little gull	0	0	0	0	0	0	0	0	0	0	0	0	0
Little tern	0	0	0	0	0	0	0	0	0	0	0	0	0

Species	Months												Total Year 1
	Oct–21	Nov-21	Dec-21	Jan-22	Mar-S01-22	Mar-S02-22	Apr-22	May-22	Jun-22	Jul-22	Aug-22	Sep-22	
Oystercatcher	0	2	5	0	0	0	0	0	0	0	0	1	8
Sandwich tern	0	0	0	0	0	0	0	1	0	5	0	0	6
Whimbrel	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	**0**	**3**	**12**	**1**	**8**	**3**	**1**	**3**	**3**	**13**	**2**	**6**	**55**

Table 67 **Number of observations for each species presented in this Technical Appendix detected during each survey within the Offshore Array Area plus 4km buffer between October 2022 and September 2023 (Year 2). Note that the observations presented here are for numbers recorded on the 1km-spaced transects within the Offshore Array Area added to the numbers recorded on the 2km-spaced transects recorded in the 4km buffer.**

Species	Months												Total Year 2
	Oct–22	Nov-22	Dec-22	Jan-23	Feb-23	Mar-23	Apr-23	May-23	Jun-23	Jul-23	Aug-23	Sep-23	
Species scoped in for assessment													
Red-throated diver	0	0	0	0	0	0	0	0	0	0	0	0	0
Great northern diver	0	0	6	4	4	6	8	5	0	0	0	0	33
Manx shearwater	0	0	0	0	0	0	16	443	105	28	19	1	612
Gannet	1	0	3	0	2	1	4	6	5	0	17	3	42
Shag	0	5	9	3	3	5	5	2	1	4	2	2	41
Kittiwake	3	24	4	8	47	4	11	16	19	24	7	4	171
Common gull	1	0	2	1	0	3	3	1	1	1	0	0	13
Great black-backed gull	1	1	2	1	1	1	2	25	1	0	1	1	37
Herring gull	8	4	4	2	2	6	14	2	3	1	3	1	50
Lesser black-backed gull	0	0	0	0	0	0	9	3	6	2	0	0	20
Common tern	0	0	0	0	0	0	0	0	0	20	0	0	20
Arctic tern	0	0	0	0	0	0	0	1	2	10	0	0	13

Species	Months												Total Year 2
	Oct–22	Nov-22	Dec-22	Jan-23	Feb-23	Mar-23	Apr-23	May-23	Jun-23	Jul-23	Aug-23	Sep-23	
Guillemot	31	13	34	37	38	11	112	702	330	38	28	28	1,402
Razorbill	0	36	23	10	18	0	4	27	12	1	2	4	137
Puffin	0	0	0	0	0	0	1	3	12	43	0	0	59
Total	**45**	**83**	**87**	**66**	**115**	**37**	**189**	**1,236**	**497**	**172**	**79**	**44**	**2,650**
Other recorded species													
Black guillemot	0	0	0	0	2	1	0	0	0	0	0	0	3
Black-headed gull	0	0	0	0	0	0	0	0	0	0	1	0	1
Cormorant	0	0	2	1	1	0	0	0	4	1	0	1	10
Cory's shearwater	0	0	0	0	0	0	0	0	0	0	217	0	217
Curlew	0	0	0	0	0	0	0	0	0	0	0	0	0
Eider	0	0	0	0	0	24	7	0	0	0	0	0	31
European storm petrel	0	0	0	0	0	0	0	1	1	1	2	0	5
Fulmar	0	0	0	0	0	0	2	2	4	0	5	0	13
Great shearwater	0	0	0	0	0	0	0	0	0	0	10	0	10
Little gull	0	0	0	0	0	0	0	0	0	4	0	0	4
Little tern	0	0	0	0	0	0	0	0	0	1	0	0	1
Oystercatcher	0	0	0	0	0	0	0	0	0	4	0	0	4
Sandwich tern	0	0	0	0	0	0	1	0	1	0	0	0	2
Whimbrel	0	0	0	0	0	0	1	13	0	0	0	0	14

Species	Months												Total Year 2
	Oct–22	Nov-22	Dec-22	Jan-23	Feb-23	Mar-23	Apr-23	May-23	Jun-23	Jul-23	Aug-23	Sep-23	
Total	**0**	**0**	**2**	**1**	**3**	**25**	**11**	**16**	**10**	**11**	**235**	**1**	**315**

6 Annex B – Density and population estimates for all species

138 Annex B presents the density, total estimated population, upper and lower 95% CLs (UCL, LCL), SD and CV for each species recorded within the Offshore Array Area (Section **Error! Reference source not found.**) and the Offshore Array Area plus a 4km buffer (Section 0) during the two-year survey period.

6.1 Offshore Array Area

6.1.1 Species scoped in for assessment

Table 68 Apportioned density and population estimates of Manx shearwater recorded in the Offshore Array Area during the two-year survey period (n= number, LCL= Lower 95% Confidence Limit, UCL= Upper 95% Confidence Limit)

Survey date	Density estimate (n/km²)	LCL (n/km²)	UCL (n/km²)	Population estimate (n)	LCL (n)	UCL (n)	SD (n)	CV (%)
28 October 2021	0.00	0.00	0.00	0	0	0	0	-
27 November 2021	0.00	0.00	0.00	0	0	0	0	-
10 December 2021	0.00	0.00	0.00	0	0	0	0	-
21 January 2022	0.00	0.00	0.00	0	0	0	0	-
01 March 2022	0.00	0.00	0.00	0	0	0	0	-
19 March 2022	0.26	0.00	0.67	10	0	25	7	72.04
01 April 2022	0.00	0.00	0.00	0	0	0	0	-
27 May 2022	13.00	3.54	26.04	485	132	971	218	44.79
18 June 2022	0.32	0.00	0.75	13	0	29	8	63.55
11 July 2022	0.64	0.11	1.27	24	4	48	11	45.89
06 August 2022	0.00	0.00	0.00	0	0	0	0	-
01 September 2022	0.00	0.00	0.00	0	0	0	0	-
17 October 2022	0.00	0.00	0.00	0	0	0	0	-
29 November 2022	0.00	0.00	0.00	0	0	0	0	-

Survey date	Density estimate (n/km²)	LCL (n/km²)	UCL (n/km²)	Population estimate (n)	LCL (n)	UCL (n)	SD (n)	CV (%)
22 December 2022	0.00	0.00	0.00	0	0	0	0	-
19 January 2023	0.00	0.00	0.00	0	0	0	0	-
09 February 2023	0.00	0.00	0.00	0	0	0	0	-
04 March 2023	0.00	0.00	0.00	0	0	0	0	-
18 April 2023	0.52	0.00	1.14	20	0	43	11	53.20
02 May 2023	6.42	2.56	10.32	240	96	385	76	31.49
03 June 2023	10.39	0.31	27.65	388	12	1,031	322	83.02
19 July 2023	0.73	0.19	1.53	28	7	57	14	48.95
17 August 2023	0.21	0.00	0.50	8	0	19	5	63.62
16 September 2023	0.00	0.00	0.00	0	0	0	0	-

Table 69 Apportioned density and population estimates of gannet recorded in the Offshore Array Area during the two-year survey period (n= number, LCL= Lower 95% Confidence Limit, UCL= Upper 95% Confidence Limit)

Survey date	Density estimate (n/km²)	LCL (n/km²)	UCL (n/km²)	Population estimate (n)	LCL (n)	UCL (n)	SD (n)	CV (%)
28 October 2021	0.00	0.00	0.00	0	0	0	0	-
27 November 2021	0.00	0.00	0.00	0	0	0	0	-
10 December 2021	0.00	0.00	0.00	0	0	0	0	-
21 January 2022	0.00	0.00	0.00	0	0	0	0	-
01 March 2022	0.00	0.00	0.00	0	0	0	0	-
19 March 2022	0.00	0.00	0.00	0	0	0	0	-
01 April 2022	0.13	0.00	0.37	5	0	14	5	87.03
27 May 2022	0.75	0.28	1.31	29	11	49	11	36.29
18 June 2022	0.21	0.00	0.50	8	0	19	5	61.87
11 July 2022	0.00	0.00	0.00	0	0	0	0	-
06 August 2022	0.10	0.00	0.31	4	0	12	4	90.37
01 September 2022	0.00	0.00	0.00	0	0	0	0	-
17 October 2022	0.00	0.00	0.00	0	0	0	0	-
29 November 2022	0.00	0.00	0.00	0	0	0	0	-
22 December 2022	0.10	0.00	0.31	4	0	12	4	87.57
19 January 2023	0.00	0.00	0.00	0	0	0	0	-
09 February 2023	0.00	0.00	0.00	0	0	0	0	-

Survey date	Density estimate (n/km²)	LCL (n/km²)	UCL (n/km²)	Population estimate (n)	LCL (n)	UCL (n)	SD (n)	CV (%)
04 March 2023	0.00	0.00	0.00	0	0	0	0	-
18 April 2023	0.21	0.00	0.42	8	0	16	5	55.96
02 May 2023	0.11	0.00	0.31	5	0	12	4	88.20
03 June 2023	0.10	0.00	0.32	4	0	12	4	94.00
19 July 2023	0.00	0.00	0.00	0	0	0	0	-
17 August 2023	0.22	0.00	0.64	9	0	24	8	90.73
16 September 2023	0.33	0.00	0.76	13	0	29	8	61.97

Table 70 Apportioned density and population estimates of shag recorded in the Offshore Array Area during the two-year survey period (n= number, LCL= Lower 95% Confidence Limit, UCL= Upper 95% Confidence Limit)

Survey date	Density estimate (n/km²)	LCL (n/km²)	UCL (n/km²)	Population estimate (n)	LCL (n)	UCL (n)	SD (n)	CV (%)
28 October 2021	0.00	0.00	0.00	0	0	0	0	-
27 November 2021	0.00	0.00	0.00	0	0	0	0	-
10 December 2021	0.43	0.00	0.93	16	0	35	9	55.93
21 January 2022	0.11	0.00	0.32	5	0	12	4	91.84
01 March 2022	0.76	0.10	1.68	29	4	63	17	57.97
19 March 2022	0.00	0.00	0.00	0	0	0	0	-
01 April 2022	0.12	0.00	0.37	5	0	14	4	87.46
27 May 2022	0.43	0.10	0.81	17	4	31	8	44.43
18 June 2022	0.00	0.00	0.00	0	0	0	0	-
11 July 2022	0.11	0.00	0.31	5	0	12	4	91.35
06 August 2022	0.21	0.00	0.43	8	0	16	5	58.76
01 September 2022	0.00	0.00	0.00	0	0	0	0	-
17 October 2022	0.00	0.00	0.00	0	0	0	0	-
29 November 2022	0.33	0.00	0.95	13	0	36	12	89.73
22 December 2022	0.41	0.09	0.83	16	4	31	8	46.74
19 January 2023	0.21	0.00	0.43	8	0	16	5	56.62
09 February 2023	0.32	0.00	0.78	13	0	30	8	61.99

Survey date	Density estimate (n/km²)	LCL (n/km²)	UCL (n/km²)	Population estimate (n)	LCL (n)	UCL (n)	SD (n)	CV (%)
04 March 2023	0.53	0.00	1.57	20	0	59	18	89.61
18 April 2023	0.43	0.00	1.05	16	0	40	11	68.11
02 May 2023	0.22	0.00	0.47	9	0	18	5	57.03
03 June 2023	0.11	0.00	0.32	4	0	12	4	91.41
19 July 2023	0.11	0.00	0.31	5	0	12	4	87.05
17 August 2023	0.11	0.00	0.32	5	0	12	4	89.39
16 September 2023	0.10	0.00	0.31	4	0	12	4	91.15

Table 71 Apportioned density and population estimates of common gull recorded in the Offshore Array Area during the two-year survey period (n= number, LCL= Lower 95% Confidence Limit, UCL= Upper 95% Confidence Limit)

Survey date	Density estimate (n/km²)	LCL (n/km²)	UCL (n/km²)	Population estimate (n)	LCL (n)	UCL (n)	SD (n)	CV (%)
28 October 2021	0.00	0.00	0.00	0	0	0	0	-
27 November 2021	0.00	0.00	0.00	0	0	0	0	-
10 December 2021	0.00	0.00	0.00	0	0	0	0	-
21 January 2022	0.00	0.00	0.00	0	0	0	0	-
01 March 2022	0.00	0.00	0.00	0	0	0	0	-
19 March 2022	0.00	0.00	0.00	0	0	0	0	-
01 April 2022	0.00	0.00	0.00	0	0	0	0	-
27 May 2022	0.00	0.00	0.00	0	0	0	0	-
18 June 2022	0.00	0.00	0.00	0	0	0	0	-
11 July 2022	0.00	0.00	0.00	0	0	0	0	-
06 August 2022	0.00	0.00	0.00	0	0	0	0	-
01 September 2022	0.00	0.00	0.00	0	0	0	0	-
17 October 2022	0.00	0.00	0.00	0	0	0	0	-
29 November 2022	0.00	0.00	0.00	0	0	0	0	-
22 December 2022	0.11	0.00	0.31	5	0	12	4	92.60
19 January 2023	0.00	0.00	0.00	0	0	0	0	-
09 February 2023	0.00	0.00	0.00	0	0	0	0	-

Survey date	Density estimate (n/km²)	LCL (n/km²)	UCL (n/km²)	Population estimate (n)	LCL (n)	UCL (n)	SD (n)	CV (%)
04 March 2023	0.22	0.00	0.42	9	0	16	5	54.17
18 April 2023	0.00	0.00	0.00	0	0	0	0	-
02 May 2023	0.11	0.00	0.31	4	0	12	4	89.80
03 June 2023	0.00	0.00	0.00	0	0	0	0	-
19 July 2023	0.00	0.00	0.00	0	0	0	0	-
17 August 2023	0.00	0.00	0.00	0	0	0	0	-
16 September 2023	0.00	0.00	0.00	0	0	0	0	-

Table 72 Apportioned density and population estimates of great black-backed gull recorded in the Offshore Array Area during the two-year survey period (n= number, LCL= Lower 95% Confidence Limit, UCL= Upper 95% Confidence Limit)

Survey date	Density estimate (n/km²)	LCL (n/km²)	UCL (n/km²)	Population estimate (n)	LCL (n)	UCL (n)	SD (n)	CV (%)
28 October 2021	0.31	0.00	0.73	12	0	28	8	60.16
27 November 2021	0.00	0.00	0.00	0	0	0	0	-
10 December 2021	0.11	0.00	0.32	5	0	12	4	87.50
21 January 2022	0.22	0.00	0.62	9	0	24	8	88.96
01 March 2022	0.11	0.00	0.31	5	0	12	4	88.88
19 March 2022	0.00	0.00	0.00	0	0	0	0	-
01 April 2022	0.12	0.00	0.37	5	0	14	5	88.45
27 May 2022	0.00	0.00	0.00	0	0	0	0	-
18 June 2022	0.00	0.00	0.00	0	0	0	0	-
11 July 2022	0.10	0.00	0.31	4	0	12	4	93.32
06 August 2022	0.00	0.00	0.00	0	0	0	0	-
01 September 2022	0.00	0.00	0.00	0	0	0	0	-
17 October 2022	0.00	0.00	0.00	0	0	0	0	-
29 November 2022	0.10	0.00	0.30	4	0	12	4	87.41
22 December 2022	0.10	0.00	0.30	4	0	12	4	89.16
19 January 2023	0.11	0.00	0.32	5	0	12	4	88.92
09 February 2023	0.11	0.00	0.38	5	0	15	4	90.18

Survey date	Density estimate (n/km²)	LCL (n/km²)	UCL (n/km²)	Population estimate (n)	LCL (n)	UCL (n)	SD (n)	CV (%)
04 March 2023	0.11	0.00	0.31	5	0	12	4	86.34
18 April 2023	0.11	0.00	0.31	4	0	12	4	85.33
02 May 2023	0.11	0.00	0.31	4	0	12	4	89.22
03 June 2023	0.11	0.00	0.38	5	0	15	5	100.07
19 July 2023	0.00	0.00	0.00	0	0	0	0	-
17 August 2023	0.11	0.00	0.32	5	0	12	4	86.98
16 September 2023	0.00	0.00	0.00	0	0	0	0	-

Table 73 Apportioned density and population estimates of herring gull recorded in the Offshore Array Area during the two-year survey period (n= number, LCL= Lower 95% Confidence Limit, UCL= Upper 95% Confidence Limit)

Survey date	Density estimate (n/km²)	LCL (n/km²)	UCL (n/km²)	Population estimate (n)	LCL (n)	UCL (n)	SD (n)	CV (%)
28 October 2021	0.00	0.00	0.00	0	0	0	0	-
27 November 2021	0.00	0.00	0.00	0	0	0	0	-
10 December 2021	0.00	0.00	0.00	0	0	0	0	-
21 January 2022	0.11	0.00	0.31	5	0	12	4	88.84
01 March 2022	0.00	0.00	0.00	0	0	0	0	-
19 March 2022	0.00	0.00	0.00	0	0	0	0	-
01 April 2022	0.00	0.00	0.00	0	0	0	0	-
27 May 2022	0.21	0.00	0.49	8	0	19	5	56.08
18 June 2022	0.00	0.00	0.00	0	0	0	0	-
11 July 2022	0.00	0.00	0.00	0	0	0	0	-
06 August 2022	0.11	0.00	0.31	5	0	12	4	87.22
01 September 2022	0.22	0.00	0.63	9	0	24	8	89.47
17 October 2022	0.11	0.00	0.32	5	0	12	4	90.27
29 November 2022	0.10	0.00	0.31	4	0	12	4	93.20
22 December 2022	0.00	0.00	0.00	0	0	0	0	-
19 January 2023	0.11	0.00	0.32	5	0	12	4	93.23
09 February 2023	0.00	0.00	0.00	0	0	0	0	-

Survey date	Density estimate (n/km²)	LCL (n/km²)	UCL (n/km²)	Population estimate (n)	LCL (n)	UCL (n)	SD (n)	CV (%)
04 March 2023	0.00	0.00	0.00	0	0	0	0	-
18 April 2023	0.87	0.10	1.67	33	4	63	15	46.37
02 May 2023	0.11	0.00	0.32	5	0	12	4	90.86
03 June 2023	0.00	0.00	0.00	0	0	0	0	-
19 July 2023	0.00	0.00	0.00	0	0	0	0	-
17 August 2023	0.00	0.00	0.00	0	0	0	0	-
16 September 2023	0.00	0.00	0.00	0	0	0	0	-

Table 74 Apportioned density and population estimates of lesser black-backed gull recorded in the Offshore Array Area during the two-year survey period (n= number, LCL= Lower 95% Confidence Limit, UCL= Upper 95% Confidence Limit)

Survey date	Density estimate (n/km²)	LCL (n/km²)	UCL (n/km²)	Population estimate (n)	LCL (n)	UCL (n)	SD (n)	CV (%)
28 October 2021	0.00	0.00	0.00	0	0	0	0	-
27 November 2021	0.00	0.00	0.00	0	0	0	0	-
10 December 2021	0.00	0.00	0.00	0	0	0	0	-
21 January 2022	0.00	0.00	0.00	0	0	0	0	-
01 March 2022	0.00	0.00	0.00	0	0	0	0	-
19 March 2022	0.12	0.00	0.32	5	0	12	4	82.02
01 April 2022	0.00	0.00	0.00	0	0	0	0	-
27 May 2022	0.21	0.00	0.42	8	0	16	5	57.18
18 June 2022	0.11	0.00	0.32	4	0	12	4	90.79
11 July 2022	0.43	0.19	0.69	17	8	26	6	31.42
06 August 2022	0.00	0.00	0.00	0	0	0	0	-
01 September 2022	0.00	0.00	0.00	0	0	0	0	-
17 October 2022	0.00	0.00	0.00	0	0	0	0	-
29 November 2022	0.00	0.00	0.00	0	0	0	0	-
22 December 2022	0.00	0.00	0.00	0	0	0	0	-
19 January 2023	0.00	0.00	0.00	0	0	0	0	-
09 February 2023	0.00	0.00	0.00	0	0	0	0	-

Survey date	Density estimate (n/km²)	LCL (n/km²)	UCL (n/km²)	Population estimate (n)	LCL (n)	UCL (n)	SD (n)	CV (%)
04 March 2023	0.00	0.00	0.00	0	0	0	0	-
18 April 2023	0.32	0.10	0.56	12	4	22	5	41.41
02 May 2023	0.00	0.00	0.00	0	0	0	0	-
03 June 2023	0.00	0.00	0.00	0	0	0	0	-
19 July 2023	0.21	0.00	0.63	8	0	24	8	90.03
17 August 2023	0.00	0.00	0.00	0	0	0	0	-
16 September 2023	0.00	0.00	0.00	0	0	0	0	-

Table 75 Apportioned density and population estimates of common tern recorded in the Offshore Array Area during the two-year survey period (n= number, LCL= Lower 95% Confidence Limit, UCL= Upper 95% Confidence Limit)

Survey date	Density estimate (n/km²)	LCL (n/km²)	UCL (n/km²)	Population estimate (n)	LCL (n)	UCL (n)	SD (n)	CV (%)
28 October 2021	0.00	0.00	0.00	0	0	0	0	-
27 November 2021	0.00	0.00	0.00	0	0	0	0	-
10 December 2021	0.00	0.00	0.00	0	0	0	0	-
21 January 2022	0.00	0.00	0.00	0	0	0	0	-
01 March 2022	0.00	0.00	0.00	0	0	0	0	-
19 March 2022	0.00	0.00	0.00	0	0	0	0	-
01 April 2022	0.00	0.00	0.00	0	0	0	0	-
27 May 2022	0.00	0.00	0.00	0	0	0	0	-
18 June 2022	0.14	0.00	0.33	6	0	13	4	64.61
11 July 2022	0.00	0.00	0.00	0	0	0	0	-
06 August 2022	0.21	0.00	0.61	8	0	23	7	90.27
01 September 2022	0.00	0.00	0.00	0	0	0	0	-
17 October 2022	0.00	0.00	0.00	0	0	0	0	-
29 November 2022	0.00	0.00	0.00	0	0	0	0	-
22 December 2022	0.00	0.00	0.00	0	0	0	0	-
19 January 2023	0.00	0.00	0.00	0	0	0	0	-
09 February 2023	0.00	0.00	0.00	0	0	0	0	-

Survey date	Density estimate (n/km²)	LCL (n/km²)	UCL (n/km²)	Population estimate (n)	LCL (n)	UCL (n)	SD (n)	CV (%)
04 March 2023	0.00	0.00	0.00	0	0	0	0	-
18 April 2023	0.00	0.00	0.00	0	0	0	0	-
02 May 2023	0.00	0.00	0.00	0	0	0	0	-
03 June 2023	0.00	0.00	0.00	0	0	0	0	-
19 July 2023	0.58	0.00	1.43	22	0	54	15	68.60
17 August 2023	0.00	0.00	0.00	0	0	0	0	-
16 September 2023	0.00	0.00	0.00	0	0	0	0	-

Table 76 Apportioned density and population estimates of Arctic tern recorded in the Offshore Array Area during the two-year survey period (n= number, LCL= Lower 95% Confidence Limit, UCL= Upper 95% Confidence Limit)

Survey date	Density estimate (n/km²)	LCL (n/km²)	UCL (n/km²)	Population estimate (n)	LCL (n)	UCL (n)	SD (n)	CV (%)
28 October 2021	0.00	0.00	0.00	0	0	0	0	-
27 November 2021	0.00	0.00	0.00	0	0	0	0	-
10 December 2021	0.00	0.00	0.00	0	0	0	0	-
21 January 2022	0.00	0.00	0.00	0	0	0	0	-
01 March 2022	0.00	0.00	0.00	0	0	0	0	-
19 March 2022	0.00	0.00	0.00	0	0	0	0	-
01 April 2022	0.00	0.00	0.00	0	0	0	0	-
27 May 2022	0.00	0.00	0.00	0	0	0	0	-
18 June 2022	0.28	0.00	0.84	11	0	32	10	91.73
11 July 2022	0.00	0.00	0.00	0	0	0	0	-
06 August 2022	0.00	0.00	0.00	0	0	0	0	-
01 September 2022	0.00	0.00	0.00	0	0	0	0	-
17 October 2022	0.00	0.00	0.00	0	0	0	0	-
29 November 2022	0.00	0.00	0.00	0	0	0	0	-
22 December 2022	0.00	0.00	0.00	0	0	0	0	-
19 January 2023	0.00	0.00	0.00	0	0	0	0	-
09 February 2023	0.00	0.00	0.00	0	0	0	0	-

Survey date	Density estimate (n/km²)	LCL (n/km²)	UCL (n/km²)	Population estimate (n)	LCL (n)	UCL (n)	SD (n)	CV (%)
04 March 2023	0.00	0.00	0.00	0	0	0	0	-
18 April 2023	0.00	0.00	0.00	0	0	0	0	-
02 May 2023	0.00	0.00	0.00	0	0	0	0	-
03 June 2023	0.31	0.00	0.73	12	0	28	8	62.95
19 July 2023	0.3	0.00	0.75	12	0	28	8	67.82
17 August 2023	0.00	0.00	0.00	0	0	0	0	-
16 September 2023	0.00	0.00	0.00	0	0	0	0	-

Table 77 Absolute apportioned density and population estimates of guillemot recorded in the Offshore Array Area during the two-year survey period (n= number, LCL= Lower 95% Confidence Limit, UCL= Upper 95% Confidence Limit)

Survey date	Density estimate (n/km²)	LCL (n/km²)	UCL (n/km²)	Population estimate (n)	LCL (n)	UCL (n)	SD (n)	CV (%)
28 October 2021	0.29	0.00	0.65	12	0	25	7	58.33
27 November 2021	0.56	0.00	1.40	22	0	54	11	50.00
10 December 2021	0.29	0.00	0.83	12	0	32	11	91.67
21 January 2022	0.29	0.00	0.65	12	0	25	7	58.33
01 March 2022	4.34	1.12	8.27	163	42	309	70	42.94
19 March 2022	0.42	0.00	1.25	16	0	47	14	87.50
01 April 2022	6.53	3.28	10.76	246	122	402	65	26.42
27 May 2022	3.96	1.30	7.76	148	49	291	49	33.11
18 June 2022	0.81	0.24	1.61	31	9	61	13	41.94
11 July 2022	3.28	0.70	6.74	124	26	253	51	41.13
06 August 2022	2.96	0.41	6.33	112	16	237	59	52.68
01 September 2022	2.68	1.24	4.48	101	47	169	29	28.71
17 October 2022	0.70	0.25	1.22	26	11	46	11	42.31
29 November 2022	0.42	0.13	0.82	16	5	32	8	50.00
22 December 2022	0.95	0.26	1.75	36	11	66	16	44.44
19 January 2023	1.11	0.08	2.45	43	4	92	20	46.51
09 February 2023	0.55	0.26	0.83	21	11	32	7	33.33

Survey date	Density estimate (n/km²)	LCL (n/km²)	UCL (n/km²)	Population estimate (n)	LCL (n)	UCL (n)	SD (n)	CV (%)
04 March 2023	0.97	0.13	2.14	37	5	81	15	40.54
18 April 2023	7.79	4.95	11.35	291	186	424	55	18.90
02 May 2023	13.60	4.06	24.44	508	151	912	194	38.19
03 June 2023	7.82	3.25	14.21	294	122	530	91	30.95
19 July 2023	1.97	1.37	2.54	75	51	95	12	16.00
17 August 2023	1.29	0.41	2.33	49	16	88	20	40.82
16 September 2023	1.69	0.39	3.29	63	16	124	28	44.44

Table 78 Absolute apportioned density and population estimates of razorbill recorded in the Offshore Array Area during the two-year survey period (n= number, LCL= Lower 95% Confidence Limit, UCL= Upper 95% Confidence Limit)

Survey date	Density estimate (n/km²)	LCL (n/km²)	UCL (n/km²)	Population estimate (n)	LCL (n)	UCL (n)	SD (n)	CV (%)
28 October 2021	0.00	0.00	0.00	0	0	0	0	-
27 November 2021	0.15	0.00	0.42	6	0	16	5	83.33
10 December 2021	0.65	0.00	1.96	24	0	73	23	95.83
21 January 2022	0.00	0.00	0.00	0	0	0	0	-
01 March 2022	0.75	0.12	1.47	28	5	55	13	46.43
19 March 2022	0.46	0.00	1.25	18	0	46	13	72.22
01 April 2022	0.00	0.00	0.00	0	0	0	0	-
27 May 2022	0.13	0.00	0.38	6	0	15	5	83.33
18 June 2022	0.00	0.00	0.00	0	0	0	0	-
11 July 2022	0.24	0.00	0.71	10	0	27	6	60.00
06 August 2022	0.00	0.00	0.00	0	0	0	0	-
01 September 2022	0.00	0.00	0.00	0	0	0	0	-
17 October 2022	0.00	0.00	0.00	0	0	0	0	-
29 November 2022	1.44	0.23	3.08	55	10	115	28	50.91
22 December 2022	0.15	0.00	0.39	6	0	15	5	83.33
19 January 2023	0.76	0.16	1.72	29	6	65	17	58.62
09 February 2023	0.51	0.00	1.53	20	0	57	18	90.00

Survey date	Density estimate (n/km²)	LCL (n/km²)	UCL (n/km²)	Population estimate (n)	LCL (n)	UCL (n)	SD (n)	CV (%)
04 March 2023	0.00	0.00	0.00	0	0	0	0	-
18 April 2023	0.38	0.00	0.94	15	0	35	10	66.67
02 May 2023	0.52	0.00	1.23	20	0	46	11	55.00
03 June 2023	0.57	0.00	1.59	22	0	60	20	90.91
19 July 2023	0.00	0.00	0.00	0	0	0	0	-
17 August 2023	0.26	0.00	0.77	10	0	29	10	100.00
16 September 2023	0.00	0.00	0.00	0	0	0	0	-

Table 79 Absolute apportioned density and population estimates of puffin recorded in the Offshore Array Area during the two-year survey period (n= number, LCL= Lower 95% Confidence Limit, UCL= Upper 95% Confidence Limit)

Survey date	Density estimate (n/km²)	LCL (n/km²)	UCL (n/km²)	Population estimate (n)	LCL (n)	UCL (n)	SD (n)	CV (%)
28 October 2021	0.00	0.00	0.00	0	0	0	0	-
27 November 2021	0.00	0.00	0.00	0	0	0	0	-
10 December 2021	0.00	0.00	0.00	0	0	0	0	-
21 January 2022	0.00	0.00	0.00	0	0	0	0	-
01 March 2022	0.00	0.00	0.00	0	0	0	0	-
19 March 2022	0.00	0.00	0.00	0	0	0	0	-
01 April 2022	0.15	0.00	0.44	6	0	17	6	100.00
27 May 2022	0.95	0.12	2.06	37	5	78	18	48.65
18 June 2022	0.00	0.00	0.00	0	0	0	0	-
11 July 2022	0.00	0.00	0.00	0	0	0	0	-
06 August 2022	0.00	0.00	0.00	0	0	0	0	-
01 September 2022	0.37	0.00	1.10	14	0	42	13	92.86
17 October 2022	0.00	0.00	0.00	0	0	0	0	-
29 November 2022	0.00	0.00	0.00	0	0	0	0	-
22 December 2022	0.00	0.00	0.00	0	0	0	0	-
19 January 2023	0.00	0.00	0.00	0	0	0	0	-
09 February 2023	0.00	0.00	0.00	0	0	0	0	-

Survey date	Density estimate (n/km²)	LCL (n/km²)	UCL (n/km²)	Population estimate (n)	LCL (n)	UCL (n)	SD (n)	CV (%)
04 March 2023	0.00	0.00	0.00	0	0	0	0	-
18 April 2023	0.00	0.00	0.00	0	0	0	0	-
02 May 2023	0.13	0.00	0.35	6	0	14	5	83.33
03 June 2023	0.64	0.12	1.37	24	5	51	13	54.17
19 July 2023	0.00	0.00	0.00	0	0	0	0	-
17 August 2023	0.00	0.00	0.00	0	0	0	0	-
16 September 2023	0.00	0.00	0.00	0	0	0	0	-

6.1.2 Other recorded species

6.1.2.1 Seabird species

Table 80 Apportioned density and population estimates of black guillemot recorded in the Offshore Array Area during the two-year survey period (n= number, LCL= Lower 95% Confidence Limit, UCL= Upper 95% Confidence Limit)

Survey date	Density estimate (n/km²)	LCL (n/km²)	UCL (n/km²)	Population estimate (n)	LCL (n)	UCL (n)	SD (n)	CV (%)
28 October 2021	0.00	0.00	0.00	0	0	0	0	-
27 November 2021	0.12	0.00	0.33	5	0	13	4	87.56
10 December 2021	0.00	0.00	0.00	0	0	0	0	-
21 January 2022	0.11	0.00	0.31	5	0	12	4	87.20
01 March 2022	0.00	0.00	0.00	0	0	0	0	-
19 March 2022	0.00	0.00	0.00	0	0	0	0	-
01 April 2022	0.00	0.00	0.00	0	0	0	0	-
27 May 2022	0.00	0.00	0.00	0	0	0	0	-
18 June 2022	0.00	0.00	0.00	0	0	0	0	-
11 July 2022	0.00	0.00	0.00	0	0	0	0	-
06 August 2022	0.00	0.00	0.00	0	0	0	0	-
01 September 2022	0.00	0.00	0.00	0	0	0	0	-
17 October 2022	0.00	0.00	0.00	0	0	0	0	-
29 November 2022	0.00	0.00	0.00	0	0	0	0	-
22 December 2022	0.00	0.00	0.00	0	0	0	0	-

Survey date	Density estimate (n/km²)	LCL (n/km²)	UCL (n/km²)	Population estimate (n)	LCL (n)	UCL (n)	SD (n)	CV (%)
19 January 2023	0.00	0.00	0.00	0	0	0	0	-
09 February 2023	0.00	0.00	0.00	0	0	0	0	-
04 March 2023	0.00	0.00	0.00	0	0	0	0	-
18 April 2023	0.00	0.00	0.00	0	0	0	0	-
02 May 2023	0.00	0.00	0.00	0	0	0	0	-
03 June 2023	0.00	0.00	0.00	0	0	0	0	-
19 July 2023	0.00	0.00	0.00	0	0	0	0	-
17 August 2023	0.00	0.00	0.00	0	0	0	0	-
16 September 2023	0.00	0.00	0.00	0	0	0	0	-

Table 81 Apportioned density and population estimates of great cormorant recorded in the Offshore Array Area during the two-year survey period (n= number, LCL= Lower 95% Confidence Limit, UCL= Upper 95% Confidence Limit)

Survey date	Density estimate (n/km²)	LCL (n/km²)	UCL (n/km²)	Population estimate (n)	LCL (n)	UCL (n)	SD (n)	CV (%)
28 October 2021	0.00	0.00	0.00	0	0	0	0	-
27 November 2021	0.00	0.00	0.00	0	0	0	0	-
10 December 2021	0.00	0.00	0.00	0	0	0	0	-
21 January 2022	0.00	0.00	0.00	0	0	0	0	-
01 March 2022	0.00	0.00	0.00	0	0	0	0	-
19 March 2022	0.00	0.00	0.00	0	0	0	0	-
01 April 2022	0.00	0.00	0.00	0	0	0	0	-
27 May 2022	0.00	0.00	0.00	0	0	0	0	-
18 June 2022	0.00	0.00	0.00	0	0	0	0	-
11 July 2022	0.00	0.00	0.00	0	0	0	0	-
06 August 2022	0.11	0.00	0.32	5	0	12	4	85.66
01 September 2022	0.12	0.00	0.31	5	0	12	4	83.25
17 October 2022	0.00	0.00	0.00	0	0	0	0	-
29 November 2022	0.00	0.00	0.00	0	0	0	0	-
22 December 2022	0.21	0.00	0.41	8	0	16	5	52.89
19 January 2023	0.11	0.00	0.32	5	0	12	4	90.77
09 February 2023	0.00	0.00	0.00	0	0	0	0	-

Survey date	Density estimate (n/km²)	LCL (n/km²)	UCL (n/km²)	Population estimate (n)	LCL (n)	UCL (n)	SD (n)	CV (%)
04 March 2023	0.00	0.00	0.00	0	0	0	0	-
18 April 2023	0.00	0.00	0.00	0	0	0	0	-
02 May 2023	0.00	0.00	0.00	0	0	0	0	-
03 June 2023	0.32	0.00	0.95	12	0	36	11	91.38
19 July 2023	0.00	0.00	0.00	0	0	0	0	-
17 August 2023	0.00	0.00	0.00	0	0	0	0	-
16 September 2023	0.11	0.00	0.31	4	0	12	4	90.00

Table 82 Apportioned density and population estimates of Cory's shearwater recorded in the Offshore Array Area during the two-year survey period (n= number, LCL= Lower 95% Confidence Limit, UCL= Upper 95% Confidence Limit)

Survey date	Density estimate (n/km²)	LCL (n/km²)	UCL (n/km²)	Population estimate (n)	LCL (n)	UCL (n)	SD (n)	CV (%)
28 October 2021	0.00	0.00	0.00	0	0	0	0	-
27 November 2021	0.00	0.00	0.00	0	0	0	0	-
10 December 2021	0.00	0.00	0.00	0	0	0	0	-
21 January 2022	0.00	0.00	0.00	0	0	0	0	-
01 March 2022	0.00	0.00	0.00	0	0	0	0	-
19 March 2022	0.00	0.00	0.00	0	0	0	0	-
01 April 2022	0.00	0.00	0.00	0	0	0	0	-
27 May 2022	0.00	0.00	0.00	0	0	0	0	-
18 June 2022	0.00	0.00	0.00	0	0	0	0	-
11 July 2022	0.00	0.00	0.00	0	0	0	0	-
06 August 2022	0.00	0.00	0.00	0	0	0	0	-
01 September 2022	0.00	0.00	0.00	0	0	0	0	-
17 October 2022	0.00	0.00	0.00	0	0	0	0	-
29 November 2022	0.00	0.00	0.00	0	0	0	0	-
22 December 2022	0.00	0.00	0.00	0	0	0	0	-
19 January 2023	0.00	0.00	0.00	0	0	0	0	-
09 February 2023	0.00	0.00	0.00	0	0	0	0	-

Survey date	Density estimate (n/km²)	LCL (n/km²)	UCL (n/km²)	Population estimate (n)	LCL (n)	UCL (n)	SD (n)	CV (%)
04 March 2023	0.00	0.00	0.00	0	0	0	0	-
18 April 2023	0.00	0.00	0.00	0	0	0	0	-
02 May 2023	0.00	0.00	0.00	0	0	0	0	-
03 June 2023	0.00	0.00	0.00	0	0	0	0	-
19 July 2023	0.00	0.00	0.00	0	0	0	0	-
17 August 2023	7.62	4.49	10.80	285	168	403	61	21.13
16 September 2023	0.00	0.00	0.00	0	0	0	0	-

Table 83 Apportioned density and population estimates of common eider recorded in the Offshore Array Area during the two-year survey period (n= number, LCL= Lower 95% Confidence Limit, UCL= Upper 95% Confidence Limit)

Survey date	Density estimate (n/km²)	LCL (n/km²)	UCL (n/km²)	Population estimate (n)	LCL (n)	UCL (n)	SD (n)	CV (%)
28 October 2021	0.00	0.00	0.00	0	0	0	0	-
27 November 2021	0.00	0.00	0.00	0	0	0	0	-
10 December 2021	0.00	0.00	0.00	0	0	0	0	-
21 January 2022	0.00	0.00	0.00	0	0	0	0	-
01 March 2022	0.79	0.00	2.21	30	0	83	25	85.17
19 March 2022	0.00	0.00	0.00	0	0	0	0	-
01 April 2022	0.00	0.00	0.00	0	0	0	0	-
27 May 2022	0.00	0.00	0.00	0	0	0	0	-
18 June 2022	0.00	0.00	0.00	0	0	0	0	-
11 July 2022	0.00	0.00	0.00	0	0	0	0	-
06 August 2022	0.00	0.00	0.00	0	0	0	0	-
01 September 2022	0.00	0.00	0.00	0	0	0	0	-
17 October 2022	0.00	0.00	0.00	0	0	0	0	-
29 November 2022	0.00	0.00	0.00	0	0	0	0	-
22 December 2022	0.00	0.00	0.00	0	0	0	0	-
19 January 2023	0.00	0.00	0.00	0	0	0	0	-
09 February 2023	0.00	0.00	0.00	0	0	0	0	-

Survey date	Density estimate (n/km²)	LCL (n/km²)	UCL (n/km²)	Population estimate (n)	LCL (n)	UCL (n)	SD (n)	CV (%)
04 March 2023	2.64	0.00	6.04	99	0	226	61	61.68
18 April 2023	0.75	0.00	1.97	28	0	74	22	75.77
02 May 2023	0.00	0.00	0.00	0	0	0	0	-
03 June 2023	0.00	0.00	0.00	0	0	0	0	-
19 July 2023	0.00	0.00	0.00	0	0	0	0	-
17 August 2023	0.00	0.00	0.00	0	0	0	0	-
16 September 2023	0.00	0.00	0.00	0	0	0	0	-

Table 84 Apportioned density and population estimates of European storm petrel recorded in the Offshore Array Area during the two-year survey period (n= number, LCL= Lower 95% Confidence Limit, UCL= Upper 95% Confidence Limit)

Survey date	Density estimate (n/km²)	LCL (n/km²)	UCL (n/km²)	Population estimate (n)	LCL (n)	UCL (n)	SD (n)	CV (%)
28 October 2021	0.00	0.00	0.00	0	0	0	0	-
27 November 2021	0.00	0.00	0.00	0	0	0	0	-
10 December 2021	0.00	0.00	0.00	0	0	0	0	-
21 January 2022	0.00	0.00	0.00	0	0	0	0	-
01 March 2022	0.00	0.00	0.00	0	0	0	0	-
19 March 2022	0.00	0.00	0.00	0	0	0	0	-
01 April 2022	0.00	0.00	0.00	0	0	0	0	-
27 May 2022	0.00	0.00	0.00	0	0	0	0	-
18 June 2022	0.00	0.00	0.00	0	0	0	0	-
11 July 2022	0.00	0.00	0.00	0	0	0	0	-
06 August 2022	0.00	0.00	0.00	0	0	0	0	-
01 September 2022	0.00	0.00	0.00	0	0	0	0	-
17 October 2022	0.00	0.00	0.00	0	0	0	0	-
29 November 2022	0.00	0.00	0.00	0	0	0	0	-
22 December 2022	0.00	0.00	0.00	0	0	0	0	-
19 January 2023	0.00	0.00	0.00	0	0	0	0	-
09 February 2023	0.00	0.00	0.00	0	0	0	0	-

Survey date	Density estimate (n/km²)	LCL (n/km²)	UCL (n/km²)	Population estimate (n)	LCL (n)	UCL (n)	SD (n)	CV (%)
04 March 2023	0.00	0.00	0.00	0	0	0	0	-
18 April 2023	0.00	0.00	0.00	0	0	0	0	-
02 May 2023	0.11	0.00	0.31	4	0	12	4	91.10
03 June 2023	0.00	0.00	0.00	0	0	0	0	-
19 July 2023	0.00	0.00	0.00	0	0	0	0	-
17 August 2023	0.00	0.00	0.00	0	0	0	0	-
16 September 2023	0.00	0.00	0.00	0	0	0	0	-

Table 85 Apportioned density and population estimates of northern fulmar recorded in the Offshore Array Area during the two-year survey period (n= number, LCL= Lower 95% Confidence Limit, UCL= Upper 95% Confidence Limit)

Survey date	Density estimate (n/km²)	LCL (n/km²)	UCL (n/km²)	Population estimate (n)	LCL (n)	UCL (n)	SD (n)	CV (%)
28 October 2021	0.00	0.00	0.00	0	0	0	0	-
27 November 2021	0.00	0.00	0.00	0	0	0	0	-
10 December 2021	0.00	0.00	0.00	0	0	0	0	-
21 January 2022	0.00	0.00	0.00	0	0	0	0	-
01 March 2022	0.00	0.00	0.00	0	0	0	0	-
19 March 2022	0.00	0.00	0.00	0	0	0	0	-
01 April 2022	0.00	0.00	0.00	0	0	0	0	-
27 May 2022	0.00	0.00	0.00	0	0	0	0	-
18 June 2022	0.11	0.00	0.32	5	0	12	4	90.67
11 July 2022	0.43	0.09	0.88	16	4	33	8	48.90
06 August 2022	0.00	0.00	0.00	0	0	0	0	-
01 September 2022	0.33	0.00	0.78	13	0	30	8	63.55
17 October 2022	0.00	0.00	0.00	0	0	0	0	-
29 November 2022	0.00	0.00	0.00	0	0	0	0	-
22 December 2022	0.00	0.00	0.00	0	0	0	0	-
19 January 2023	0.00	0.00	0.00	0	0	0	0	-
09 February 2023	0.00	0.00	0.00	0	0	0	0	-

Survey date	Density estimate (n/km²)	LCL (n/km²)	UCL (n/km²)	Population estimate (n)	LCL (n)	UCL (n)	SD (n)	CV (%)
04 March 2023	0.00	0.00	0.00	0	0	0	0	-
18 April 2023	0.11	0.00	0.31	4	0	12	4	87.72
02 May 2023	0.00	0.00	0.00	0	0	0	0	-
03 June 2023	0.00	0.00	0.00	0	0	0	0	-
19 July 2023	0.00	0.00	0.00	0	0	0	0	-
17 August 2023	0.22	0.00	0.63	9	0	24	8	87.22
16 September 2023	0.00	0.00	0.00	0	0	0	0	-

Table 86 Apportioned density and population estimates of great shearwater recorded in the Offshore Array Area during the two-year survey period (n= number, LCL= Lower 95% Confidence Limit, UCL= Upper 95% Confidence Limit)

Survey date	Density estimate (n/km²)	LCL (n/km²)	UCL (n/km²)	Population estimate (n)	LCL (n)	UCL (n)	SD (n)	CV (%)
28 October 2021	0.00	0.00	0.00	0	0	0	0	-
27 November 2021	0.00	0.00	0.00	0	0	0	0	-
10 December 2021	0.00	0.00	0.00	0	0	0	0	-
21 January 2022	0.00	0.00	0.00	0	0	0	0	-
01 March 2022	0.00	0.00	0.00	0	0	0	0	-
19 March 2022	0.00	0.00	0.00	0	0	0	0	-
01 April 2022	0.00	0.00	0.00	0	0	0	0	-
27 May 2022	0.00	0.00	0.00	0	0	0	0	-
18 June 2022	0.00	0.00	0.00	0	0	0	0	-
11 July 2022	0.00	0.00	0.00	0	0	0	0	-
06 August 2022	0.00	0.00	0.00	0	0	0	0	-
01 September 2022	0.00	0.00	0.00	0	0	0	0	-
17 October 2022	0.00	0.00	0.00	0	0	0	0	-
29 November 2022	0.00	0.00	0.00	0	0	0	0	-
22 December 2022	0.00	0.00	0.00	0	0	0	0	-
19 January 2023	0.00	0.00	0.00	0	0	0	0	-
09 February 2023	0.00	0.00	0.00	0	0	0	0	-

Survey date	Density estimate (n/km²)	LCL (n/km²)	UCL (n/km²)	Population estimate (n)	LCL (n)	UCL (n)	SD (n)	CV (%)
04 March 2023	0.00	0.00	0.00	0	0	0	0	-
18 April 2023	0.00	0.00	0.00	0	0	0	0	-
02 May 2023	0.00	0.00	0.00	0	0	0	0	-
03 June 2023	0.00	0.00	0.00	0	0	0	0	-
19 July 2023	0.00	0.00	0.00	0	0	0	0	-
17 August 2023	0.32	0.00	0.81	13	0	31	8	65.82
16 September 2023	0.00	0.00	0.00	0	0	0	0	-

Table 87 Apportioned density and population estimates of little gull recorded in the Offshore Array Area during the two-year survey period (n= number, LCL= Lower 95% Confidence Limit, UCL= Upper 95% Confidence Limit)

Survey date	Density estimate (n/km²)	LCL (n/km²)	UCL (n/km²)	Population estimate (n)	LCL (n)	UCL (n)	SD (n)	CV (%)
28 October 2021	0.00	0.00	0.00	0	0	0	0	-
27 November 2021	0.00	0.00	0.00	0	0	0	0	-
10 December 2021	0.00	0.00	0.00	0	0	0	0	-
21 January 2022	0.00	0.00	0.00	0	0	0	0	-
01 March 2022	0.00	0.00	0.00	0	0	0	0	-
19 March 2022	0.00	0.00	0.00	0	0	0	0	-
01 April 2022	0.00	0.00	0.00	0	0	0	0	-
27 May 2022	0.00	0.00	0.00	0	0	0	0	-
18 June 2022	0.00	0.00	0.00	0	0	0	0	-
11 July 2022	0.00	0.00	0.00	0	0	0	0	-
06 August 2022	0.00	0.00	0.00	0	0	0	0	-
01 September 2022	0.00	0.00	0.00	0	0	0	0	-
17 October 2022	0.00	0.00	0.00	0	0	0	0	-
29 November 2022	0.00	0.00	0.00	0	0	0	0	-
22 December 2022	0.00	0.00	0.00	0	0	0	0	-
19 January 2023	0.00	0.00	0.00	0	0	0	0	-
09 February 2023	0.00	0.00	0.00	0	0	0	0	-

Survey date	Density estimate (n/km²)	LCL (n/km²)	UCL (n/km²)	Population estimate (n)	LCL (n)	UCL (n)	SD (n)	CV (%)
04 March 2023	0.00	0.00	0.00	0	0	0	0	-
18 April 2023	0.00	0.00	0.00	0	0	0	0	-
02 May 2023	0.00	0.00	0.00	0	0	0	0	-
03 June 2023	0.00	0.00	0.00	0	0	0	0	-
19 July 2023	0.33	0.00	0.75	13	0	28	8	61.47
17 August 2023	0.00	0.00	0.00	0	0	0	0	-
16 September 2023	0.00	0.00	0.00	0	0	0	0	-

6.1.2.2 Non-seabird species

Table 88 Apportioned density and population estimates of oystercatcher recorded in the Offshore Array Area during the two-year survey period (n= number, LCL= Lower 95% Confidence Limit, UCL= Upper 95% Confidence Limit)

Survey date	Density estimate (n/km²)	LCL (n/km²)	UCL (n/km²)	Population estimate (n)	LCL (n)	UCL (n)	SD (n)	CV (%)
28 October 2021	0.00	0.00	0.00	0	0	0	0	-
27 November 2021	0.11	0.00	0.33	5	0	13	4	91.06
10 December 2021	0.00	0.00	0.00	0	0	0	0	-
21 January 2022	0.00	0.00	0.00	0	0	0	0	-
01 March 2022	0.00	0.00	0.00	0	0	0	0	-
19 March 2022	0.00	0.00	0.00	0	0	0	0	-
01 April 2022	0.00	0.00	0.00	0	0	0	0	-
27 May 2022	0.00	0.00	0.00	0	0	0	0	-
18 June 2022	0.00	0.00	0.00	0	0	0	0	-
11 July 2022	0.00	0.00	0.00	0	0	0	0	-
06 August 2022	0.00	0.00	0.00	0	0	0	0	-
01 September 2022	0.10	0.00	0.31	4	0	12	4	88.09
17 October 2022	0.00	0.00	0.00	0	0	0	0	-
29 November 2022	0.00	0.00	0.00	0	0	0	0	-
22 December 2022	0.00	0.00	0.00	0	0	0	0	-
19 January 2023	0.00	0.00	0.00	0	0	0	0	-

Survey date	Density estimate (n/km²)	LCL (n/km²)	UCL (n/km²)	Population estimate (n)	LCL (n)	UCL (n)	SD (n)	CV (%)
09 February 2023	0.00	0.00	0.00	0	0	0	0	-
04 March 2023	0.00	0.00	0.00	0	0	0	0	-
18 April 2023	0.00	0.00	0.00	0	0	0	0	-
02 May 2023	0.00	0.00	0.00	0	0	0	0	-
03 June 2023	0.00	0.00	0.00	0	0	0	0	-
19 July 2023	0.41	0.00	1.25	16	0	47	14	90.09
17 August 2023	0.00	0.00	0.00	0	0	0	0	-
16 September 2023	0.00	0.00	0.00	0	0	0	0	-

6.2 Offshore Array Area plus 4km buffer

6.2.1 Species scoped in for assessment

Table 89 Apportioned density and population estimates of Manx shearwater recorded in the Offshore Array Area plus 4km buffer during the two-year survey period (n= number, LCL= Lower 95% Confidence Limit, UCL= Upper 95% Confidence Limit)

Survey date	Density estimate (n/km²)	LCL (n/km²)	UCL (n/km²)	Population estimate (n)	LCL (n)	UCL (n)	SD (n)	CV (%)
28 October 2021	0.00	0.00	0.00	0	0	0	0	-
27 November 2021	0.00	0.00	0.00	0	0	0	0	-
10 December 2021	0.00	0.00	0.00	0	0	0	0	-
21 January 2022	0.00	0.00	0.00	0	0	0	0	-
01 March 2022	0.09	0.00	0.26	16	0	48	15	93.75
19 March 2022	0.46	0.14	0.88	85	25	161	31	36.24
01 April 2022	0.35	0.14	0.59	65	25	109	22	33.85
27 May 2022	153.11	13.47	315.91	28,093	2,471	57,965	14,081	50.12
18 June 2022	1.03	0.38	1.82	189	70	334	62	32.55
11 July 2022	31.77	10.56	54.17	5,829	1,938	9,939	2,070	35.50
06 August 2022	1.36	0.13	3.50	250	24	642	198	79.20
01 September 2022	0.00	0.00	0.00	0	0	0	0	-
17 October 2022	0.00	0.00	0.00	0	0	0	0	-
29 November 2022	0.00	0.00	0.00	0	0	0	0	-

Survey date	Density estimate (n/km²)	LCL (n/km²)	UCL (n/km²)	Population estimate (n)	LCL (n)	UCL (n)	SD (n)	CV (%)
22 December 2022	0.00	0.00	0.00	0	0	0	0	-
19 January 2023	0.00	0.00	0.00	0	0	0	0	-
09 February 2023	0.00	0.00	0.00	0	0	0	0	-
04 March 2023	0.00	0.00	0.00	0	0	0	0	-
18 April 2023	0.59	0.00	1.47	109	0	270	65	59.58
02 May 2023	18.31	4.83	33.47	3,359	887	6,142	1,318	39.21
03 June 2023	3.05	0.33	7.46	560	60	1,368	331	59.08
19 July 2023	1.32	0.32	2.72	242	58	500	106	43.77
17 August 2023	0.79	0.26	1.50	145	48	275	56	38.09
16 September 2023	0.05	0.00	0.14	9	0	25	8	88.89

Table 90 Apportioned density and population estimates of gannet recorded in the Offshore Array Area plus 4km buffer during the two-year survey period (n= number, LCL= Lower 95% Confidence Limit, UCL= Upper 95% Confidence Limit)

Survey date	Density estimate (n/km²)	LCL (n/km²)	UCL (n/km²)	Population estimate (n)	LCL (n)	UCL (n)	SD (n)	CV (%)
28 October 2021	0.00	0.00	0.00	0	0	0	0	-
27 November 2021	0.23	0.04	0.50	43	8	92	23	53.49
10 December 2021	0.05	0.00	0.13	9	0	24	8	88.89
21 January 2022	0.00	0.00	0.00	0	0	0	0	-
01 March 2022	0.00	0.00	0.00	0	0	0	0	-
19 March 2022	0.04	0.00	0.13	8	0	24	8	100.00
01 April 2022	0.07	0.00	0.21	13	0	38	9	66.17
27 May 2022	0.25	0.06	0.49	46	11	89	16	33.82
18 June 2022	0.04	0.00	0.10	8	0	19	5	62.50
11 July 2022	0.00	0.00	0.00	0	0	0	0	-
06 August 2022	0.02	0.00	0.07	4	0	12	4	100.00
01 September 2022	0.13	0.00	0.29	24	0	54	13	54.17
17 October 2022	0.05	0.00	0.13	9	0	24	8	88.89
29 November 2022	0.00	0.00	0.00	0	0	0	0	-
22 December 2022	0.11	0.00	0.30	21	0	55	13	60.23
19 January 2023	0.00	0.00	0.00	0	0	0	0	-
09 February 2023	0.09	0.00	0.18	16	0	33	9	56.25

Survey date	Density estimate (n/km²)	LCL (n/km²)	UCL (n/km²)	Population estimate (n)	LCL (n)	UCL (n)	SD (n)	CV (%)
04 March 2023	0.05	0.00	0.13	9	0	24	8	88.89
18 April 2023	0.13	0.00	0.27	24	0	49	11	42.90
02 May 2023	0.25	0.09	0.44	46	16	81	15	31.65
03 June 2023	0.20	0.00	0.46	36	0	84	20	53.93
19 July 2023	0.00	0.00	0.00	0	0	0	0	-
17 August 2023	0.72	0.14	1.41	133	25	258	54	40.30
16 September 2023	0.07	0.00	0.16	13	0	29	8	61.54

Table 91 Apportioned density and population estimates of shag recorded in the Offshore Array Area plus 4km buffer during the two-year survey period (n= number, LCL= Lower 95% Confidence Limit, UCL= Upper 95% Confidence Limit)

Survey date	Density estimate (n/km²)	LCL (n/km²)	UCL (n/km²)	Population estimate (n)	LCL (n)	UCL (n)	SD (n)	CV (%)
28 October 2021	0.09	0.00	0.22	17	0	40	11	64.71
27 November 2021	0.05	0.00	0.14	9	0	25	8	88.89
10 December 2021	0.09	0.00	0.19	16	0	35	9	56.25
21 January 2022	0.03	0.00	0.07	5	0	12	4	80.00
01 March 2022	0.43	0.07	1.00	79	12	183	37	45.87
19 March 2022	0.05	0.00	0.13	9	0	24	7	77.78
01 April 2022	0.03	0.00	0.08	5	0	14	4	80.00
27 May 2022	0.14	0.02	0.31	26	4	56	12	43.51
18 June 2022	0.05	0.00	0.14	9	0	25	8	88.89
11 July 2022	0.03	0.00	0.07	5	0	12	4	80.00
06 August 2022	0.04	0.00	0.09	8	0	16	5	62.50
01 September 2022	0.00	0.00	0.00	0	0	0	0	-
17 October 2022	0.00	0.00	0.00	0	0	0	0	-
29 November 2022	0.16	0.00	0.52	30	0	95	21	69.36
22 December 2022	0.36	0.02	0.84	66	4	154	34	51.45
19 January 2023	0.09	0.00	0.22	16	0	40	10	58.96
09 February 2023	0.07	0.00	0.16	13	0	30	8	61.54

Survey date	Density estimate (n/km²)	LCL (n/km²)	UCL (n/km²)	Population estimate (n)	LCL (n)	UCL (n)	SD (n)	CV (%)
04 March 2023	0.11	0.00	0.32	20	0	59	18	90.00
18 April 2023	0.14	0.00	0.35	25	0	65	14	54.41
02 May 2023	0.05	0.00	0.10	9	0	18	5	55.56
03 June 2023	0.02	0.00	0.07	4	0	12	4	100.00
19 July 2023	0.16	0.00	0.35	30	0	65	15	48.53
17 August 2023	0.08	0.00	0.20	14	0	36	9	63.89
16 September 2023	0.07	0.00	0.20	12	0	37	9	74.54

Table 92 Apportioned density and population estimates of kittiwake recorded in the Offshore Array Area plus 4km buffer during the two-year survey period (n= number, LCL= Lower 95% Confidence Limit, UCL= Upper 95% Confidence Limit)

Survey date	Density estimate (n/km²)	LCL (n/km²)	UCL (n/km²)	Population estimate (n)	LCL (n)	UCL (n)	SD (n)	CV (%)
28 October 2021	0.09	0.00	0.26	17	0	48	12	66.55
27 November 2021	0.73	0.20	1.48	134	36	271	57	42.22
10 December 2021	0.84	0.45	1.22	155	83	223	28	17.55
21 January 2022	0.09	0.00	0.22	17	0	41	12	70.59
01 March 2022	0.91	0.21	1.79	167	38	328	53	31.62
19 March 2022	0.29	0.02	0.66	53	4	122	25	46.41
01 April 2022	0.20	0.00	0.49	37	0	90	22	58.34
27 May 2022	0.29	0.04	0.63	53	8	115	25	45.36
18 June 2022	0.21	0.00	0.51	38	0	93	20	51.84
11 July 2022	1.45	0.59	2.55	266	108	467	80	30.01
06 August 2022	0.36	0.12	0.64	66	22	118	27	40.91
01 September 2022	0.00	0.00	0.00	0	0	0	0	-
17 October 2022	0.13	0.00	0.32	24	0	59	17	70.83
29 November 2022	0.87	0.49	1.30	160	89	238	30	18.17
22 December 2022	0.16	0.00	0.47	30	0	86	25	81.10
19 January 2023	0.32	0.09	0.59	58	16	109	20	33.96
09 February 2023	1.92	0.64	3.46	352	117	634	126	35.73

Survey date	Density estimate (n/km²)	LCL (n/km²)	UCL (n/km²)	Population estimate (n)	LCL (n)	UCL (n)	SD (n)	CV (%)
04 March 2023	0.12	0.00	0.29	22	0	53	11	48.32
18 April 2023	0.36	0.02	0.77	66	4	141	27	40.66
02 May 2023	0.60	0.24	1.07	111	44	197	32	27.94
03 June 2023	0.63	0.10	1.42	116	19	261	49	41.47
19 July 2023	0.99	0.34	1.85	182	62	339	64	35.05
17 August 2023	0.28	0.03	0.58	51	6	107	22	42.24
16 September 2023	0.16	0.00	0.34	29	0	62	14	46.90

Table 93 Apportioned density and population estimates of common gull recorded in the Offshore Array Area plus 4km buffer during the two-year survey period (n= number, LCL= Lower 95% Confidence Limit, UCL= Upper 95% Confidence Limit)

Survey date	Density estimate (n/km²)	LCL (n/km²)	UCL (n/km²)	Population estimate (n)	LCL (n)	UCL (n)	SD (n)	CV (%)
28 October 2021	0.04	0.00	0.13	8	0	24	8	100.00
27 November 2021	0.09	0.00	0.21	17	0	38	10	58.82
10 December 2021	0.00	0.00	0.00	0	0	0	0	-
21 January 2022	0.00	0.00	0.00	0	0	0	0	-
01 March 2022	0.09	0.00	0.18	17	0	33	9	52.94
19 March 2022	0.00	0.00	0.00	0	0	0	0	-
01 April 2022	0.00	0.00	0.00	0	0	0	0	-
27 May 2022	0.00	0.00	0.00	0	0	0	0	-
18 June 2022	0.00	0.00	0.00	0	0	0	0	-
11 July 2022	0.11	0.00	0.35	20	0	65	19	95.00
06 August 2022	0.00	0.00	0.00	0	0	0	0	-
01 September 2022	0.22	0.00	0.44	41	0	81	20	48.78
17 October 2022	0.05	0.00	0.14	9	0	25	8	88.89
29 November 2022	0.00	0.00	0.00	0	0	0	0	-
22 December 2022	0.08	0.00	0.20	14	0	37	9	63.89
19 January 2023	0.09	0.00	0.26	16	0	47	14	87.50
09 February 2023	0.00	0.00	0.00	0	0	0	0	-

Survey date	Density estimate (n/km²)	LCL (n/km²)	UCL (n/km²)	Population estimate (n)	LCL (n)	UCL (n)	SD (n)	CV (%)
04 March 2023	0.10	0.00	0.22	18	0	41	11	57.20
18 April 2023	0.14	0.00	0.40	25	0	74	25	100.00
02 May 2023	0.02	0.00	0.07	4	0	12	4	100.00
03 June 2023	0.05	0.00	0.14	10	0	25	8	80.00
19 July 2023	0.05	0.00	0.13	9	0	24	8	88.89
17 August 2023	0.00	0.00	0.00	0	0	0	0	-
16 September 2023	0.00	0.00	0.00	0	0	0	0	-

Table 94 **Apportioned density and population estimates of great black-backed gull recorded in the Offshore Array Area plus 4km buffer during the two-year survey period (n= number, LCL= Lower 95% Confidence Limit, UCL= Upper 95% Confidence Limit)**

Survey date	Density estimate (n/km²)	LCL (n/km²)	UCL (n/km²)	Population estimate (n)	LCL (n)	UCL (n)	SD (n)	CV (%)
28 October 2021	0.07	0.00	0.15	12	0	28	8	66.67
27 November 2021	0.05	0.00	0.16	9	0	30	9	100.00
10 December 2021	0.07	0.00	0.23	13	0	43	10	75.76
21 January 2022	0.10	0.00	0.27	18	0	49	12	62.85
01 March 2022	0.22	0.00	0.59	40	0	108	30	73.19
19 March 2022	0.00	0.00	0.00	0	0	0	0	-
01 April 2022	0.03	0.00	0.08	5	0	14	5	100.00
27 May 2022	0.05	0.00	0.14	9	0	25	8	88.89
18 June 2022	0.00	0.00	0.00	0	0	0	0	-
11 July 2022	0.73	0.00	2.09	134	0	384	113	83.64
06 August 2022	0.54	0.00	1.56	99	0	287	86	86.87
01 September 2022	0.05	0.00	0.13	9	0	24	8	88.89
17 October 2022	0.05	0.00	0.14	9	0	25	8	88.89
29 November 2022	0.02	0.00	0.07	4	0	12	4	100.00
22 December 2022	0.07	0.00	0.20	12	0	37	9	74.54
19 January 2023	0.03	0.00	0.07	5	0	12	4	80.00

Survey date	Density estimate (n/km²)	LCL (n/km²)	UCL (n/km²)	Population estimate (n)	LCL (n)	UCL (n)	SD (n)	CV (%)
09 February 2023	0.03	0.00	0.08	5	0	15	4	80.00
04 March 2023	0.03	0.00	0.07	5	0	12	4	80.00
18 April 2023	0.07	0.00	0.20	12	0	36	9	74.54
02 May 2023	1.06	0.00	3.19	194	0	586	177	90.75
03 June 2023	0.03	0.00	0.08	5	0	15	5	100.00
19 July 2023	0.00	0.00	0.00	0	0	0	0	-
17 August 2023	0.03	0.00	0.07	5	0	12	4	80.00
16 September 2023	0.04	0.00	0.14	8	0	25	8	100.00

Table 95 Apportioned density and population estimates of herring gull recorded in the Offshore Array Area plus 4km buffer during the two-year survey period (n= number, LCL= Lower 95% Confidence Limit, UCL= Upper 95% Confidence Limit)

Survey date	Density estimate (n/km²)	LCL (n/km²)	UCL (n/km²)	Population estimate (n)	LCL (n)	UCL (n)	SD (n)	CV (%)
28 October 2021	0.09	0.00	0.21	17	0	39	10	58.82
27 November 2021	0.05	0.00	0.14	9	0	25	8	88.89
10 December 2021	0.00	0.00	0.00	0	0	0	0	-
21 January 2022	0.16	0.00	0.38	29	0	70	18	60.22
01 March 2022*	0.00	0.00	0.00	0	0	0	0	-
19 March 2022	0.00	0.00	0.00	0	0	0	0	-
01 April 2022	0.00	0.00	0.00	0	0	0	0	-
27 May 2022	0.19	0.00	0.50	34	0	91	23	66.36
18 June 2022	0.00	0.00	0.00	0	0	0	0	-
11 July 2022	2.86	0.04	8.39	525	8	1,540	477	90.86
06 August 2022	0.21	0.00	0.59	39	0	108	30	75.06
01 September 2022	0.05	0.00	0.13	9	0	24	8	88.89
17 October 2022	0.32	0.00	0.84	59	0	154	40	66.45
29 November 2022	0.16	0.00	0.41	29	0	76	19	63.58
22 December 2022	0.18	0.04	0.35	33	8	64	15	45.45
19 January 2023	0.07	0.00	0.20	13	0	36	9	68.80
09 February 2023	0.09	0.00	0.24	17	0	44	12	70.59

Survey date	Density estimate (n/km²)	LCL (n/km²)	UCL (n/km²)	Population estimate (n)	LCL (n)	UCL (n)	SD (n)	CV (%)
04 March 2023	0.26	0.00	0.68	48	0	125	36	75.00
18 April 2023	0.44	0.02	1.01	81	4	186	38	45.88
02 May 2023	0.07	0.00	0.20	13	0	37	9	68.80
03 June 2023	0.14	0.00	0.27	25	0	49	12	48.00
19 July 2023	0.04	0.00	0.13	8	0	24	8	100.00
17 August 2023	0.14	0.00	0.34	25	0	63	17	68.00
16 September 2023	0.05	0.00	0.13	9	0	24	7	77.78

Table 96 Apportioned density and population estimates of lesser black-backed gull recorded in the Offshore Array Area plus 4km buffer during the two-year survey period (n= number, LCL= Lower 95% Confidence Limit, UCL= Upper 95% Confidence Limit)

Survey date	Density estimate (n/km²)	LCL (n/km²)	UCL (n/km²)	Population estimate (n)	LCL (n)	UCL (n)	SD (n)	CV (%)
28 October 2021	0.00	0.00	0.00	0	0	0	0	-
27 November 2021	0.00	0.00	0.00	0	0	0	0	-
10 December 2021	0.00	0.00	0.00	0	0	0	0	-
21 January 2022	0.00	0.00	0.00	0	0	0	0	-
01 March 2022	0.00	0.00	0.00	0	0	0	0	-
19 March 2022	0.03	0.00	0.07	5	0	12	4	80.00
01 April 2022	0.00	0.00	0.00	0	0	0	0	-
27 May 2022	0.18	0.00	0.44	33	0	80	17	50.80
18 June 2022	0.02	0.00	0.07	4	0	12	4	100.00
11 July 2022	0.98	0.17	2.11	180	32	387	86	47.34
06 August 2022	0.04	0.00	0.13	8	0	24	7	87.50
01 September 2022	0.05	0.00	0.13	9	0	24	8	88.89
17 October 2022	0.00	0.00	0.00	0	0	0	0	-
29 November 2022	0.00	0.00	0.00	0	0	0	0	-
22 December 2022	0.00	0.00	0.00	0	0	0	0	-
19 January 2023	0.00	0.00	0.00	0	0	0	0	-

Survey date	Density estimate (n/km²)	LCL (n/km²)	UCL (n/km²)	Population estimate (n)	LCL (n)	UCL (n)	SD (n)	CV (%)
09 February 2023	0.00	0.00	0.00	0	0	0	0	-
04 March 2023	0.00	0.00	0.00	0	0	0	0	-
18 April 2023	0.34	0.07	0.71	62	12	131	28	44.29
02 May 2023	0.13	0.00	0.34	24	0	63	17	70.83
03 June 2023	0.26	0.04	0.57	48	7	105	26	54.17
19 July 2023	0.04	0.00	0.13	8	0	24	8	100.00
17 August 2023	0.00	0.00	0.00	0	0	0	0	-
16 September 2023	0.00	0.00	0.00	0	0	0	0	-

Table 97 Apportioned density and population estimates of common tern recorded in the Offshore Array Area plus 4km buffer during the two-year survey period (n= number, LCL= Lower 95% Confidence Limit, UCL= Upper 95% Confidence Limit)

Survey date	Density estimate (n/km²)	LCL (n/km²)	UCL (n/km²)	Population estimate (n)	LCL (n)	UCL (n)	SD (n)	CV (%)
28 October 2021	0.00	0.00	0.00	0	0	0	0	-
27 November 2021	0.00	0.00	0.00	0	0	0	0	-
10 December 2021	0.00	0.00	0.00	0	0	0	0	-
21 January 2022	0.00	0.00	0.00	0	0	0	0	-
01 March 2022	0.00	0.00	0.00	0	0	0	0	-
19 March 2022	0.00	0.00	0.00	0	0	0	0	-
01 April 2022	0.00	0.00	0.00	0	0	0	0	-
27 May 2022	0.05	0.00	0.13	9	0	24	8	88.89
18 June 2022	0.13	0.00	0.28	23	0	51	11	46.83
11 July 2022	0.45	0.11	0.87	82	21	160	35	42.68
06 August 2022	0.09	0.00	0.29	17	0	54	12	67.07
01 September 2022	0.00	0.00	0.00	0	0	0	0	-
17 October 2022	0.00	0.00	0.00	0	0	0	0	-
29 November 2022	0.00	0.00	0.00	0	0	0	0	-
22 December 2022	0.00	0.00	0.00	0	0	0	0	-
19 January 2023	0.00	0.00	0.00	0	0	0	0	-
09 February 2023	0.00	0.00	0.00	0	0	0	0	-

Survey date	Density estimate (n/km²)	LCL (n/km²)	UCL (n/km²)	Population estimate (n)	LCL (n)	UCL (n)	SD (n)	CV (%)
04 March 2023	0.00	0.00	0.00	0	0	0	0	-
18 April 2023	0.00	0.00	0.00	0	0	0	0	-
02 May 2023	0.00	0.00	0.00	0	0	0	0	-
03 June 2023	0.00	0.00	0.00	0	0	0	0	-
19 July 2023	1.06	0.00	2.69	194	0	493	124	63.87
17 August 2023	0.00	0.00	0.00	0	0	0	0	-
16 September 2023	0.00	0.00	0.00	0	0	0	0	-

Table 98 Apportioned density and population estimates of Arctic tern recorded in the Offshore Array Area plus 4km buffer during the two-year survey period (n= number, LCL= Lower 95% Confidence Limit, UCL= Upper 95% Confidence Limit)

Survey date	Density estimate (n/km²)	LCL (n/km²)	UCL (n/km²)	Population estimate (n)	LCL (n)	UCL (n)	SD (n)	CV (%)
28 October 2021	0.00	0.00	0.00	0	0	0	0	-
27 November 2021	0.00	0.00	0.00	0	0	0	0	-
10 December 2021	0.00	0.00	0.00	0	0	0	0	-
21 January 2022	0.00	0.00	0.00	0	0	0	0	-
01 March 2022	0.00	0.00	0.00	0	0	0	0	-
19 March 2022	0.00	0.00	0.00	0	0	0	0	-
01 April 2022	0.00	0.00	0.00	0	0	0	0	-
27 May 2022	0.44	0.00	1.05	81	0	193	52	64.20
18 June 2022	0.24	0.04	0.54	44	7	99	19	42.88
11 July 2022	0.51	0.03	1.30	94	5	239	65	69.15
06 August 2022	0.00	0.00	0.00	0	0	0	0	-
01 September 2022	0.00	0.00	0.00	0	0	0	0	-
17 October 2022	0.00	0.00	0.00	0	0	0	0	-
29 November 2022	0.00	0.00	0.00	0	0	0	0	-
22 December 2022	0.00	0.00	0.00	0	0	0	0	-
19 January 2023	0.00	0.00	0.00	0	0	0	0	-
09 February 2023	0.00	0.00	0.00	0	0	0	0	-

Survey date	Density estimate (n/km²)	LCL (n/km²)	UCL (n/km²)	Population estimate (n)	LCL (n)	UCL (n)	SD (n)	CV (%)
04 March 2023	0.00	0.00	0.00	0	0	0	0	-
18 April 2023	0.00	0.00	0.00	0	0	0	0	-
02 May 2023	0.14	0.00	0.31	25	0	57	16	64.00
03 June 2023	0.20	0.00	0.46	37	0	84	17	45.95
19 July 2023	0.52	0.00	1.35	95	0	247	63	65.80
17 August 2023	0.00	0.00	0.00	0	0	0	0	-
16 September 2023	0.00	0.00	0.00	0	0	0	0	-

Table 99 Absolute apportioned density and population estimates of guillemot recorded in the Offshore Array Area plus 4km buffer during the two-year survey period (n= number, LCL= Lower 95% Confidence Limit, UCL= Upper 95% Confidence Limit)

Survey date	Density estimate (n/km²)	LCL (n/km²)	UCL (n/km²)	Population estimate (n)	LCL (n)	UCL (n)	SD (n)	CV (%)
28 October 2021	4.29	1.70	7.43	789	312	1,363	278	35.23
27 November 2021	2.61	0.43	5.20	479	80	954	211	44.05
10 December 2021	0.42	0.05	0.97	76	11	179	39	51.32
21 January 2022	0.29	0.00	0.59	54	0	109	22	40.74
01 March 2022	2.53	0.53	5.05	463	96	926	154	33.26
19 March 2022	3.53	2.15	5.21	646	394	957	132	20.43
01 April 2022	2.50	1.18	4.20	459	219	772	86	18.74
27 May 2022	5.65	3.21	8.33	1,036	589	1,528	177	17.08
18 June 2022	1.25	0.37	2.24	230	69	410	63	27.39
11 July 2022	28.95	13.98	46.24	5,314	2,566	8,484	1,470	27.66
06 August 2022	3.73	1.41	7.20	683	259	1,321	240	35.14
01 September 2022	5.68	2.23	10.35	1,043	409	1,899	350	33.56
17 October 2022	1.70	0.67	2.92	311	124	536	101	32.48
29 November 2022	0.67	0.03	1.55	124	5	284	67	54.03
22 December 2022	1.90	0.22	4.02	349	41	736	174	49.86
19 January 2023	2.24	0.95	3.89	412	174	712	120	29.13
09 February 2023	2.08	1.20	3.03	380	220	556	79	20.79

Survey date	Density estimate (n/km²)	LCL (n/km²)	UCL (n/km²)	Population estimate (n)	LCL (n)	UCL (n)	SD (n)	CV (%)
04 March 2023	0.44	0.09	0.90	81	16	166	25	30.86
18 April 2023	4.86	1.92	8.45	892	353	1,552	246	27.58
02 May 2023	38.77	10.07	72.38	7,114	1,849	13,281	2,773	38.98
03 June 2023	17.15	4.50	37.06	3,147	827	6,801	1,439	45.73
19 July 2023	1.88	0.74	3.38	345	136	619	109	31.59
17 August 2023	1.41	0.54	2.53	258	99	465	79	30.62
16 September 2023	1.26	0.49	2.22	230	90	408	52	22.61

Table 100 Absolute apportioned density and population estimates of razorbill recorded in the Offshore Array Area plus 4km buffer during the two-year survey period (n= number, LCL= Lower 95% Confidence Limit, UCL= Upper 95% Confidence Limit)

Survey date	Density estimate (n/km²)	LCL (n/km²)	UCL (n/km²)	Population estimate (n)	LCL (n)	UCL (n)	SD (n)	CV (%)
28 October 2021	0.00	0.00	0.00	0	0	0	0	-
27 November 2021	3.49	0.21	7.66	640	39	1,406	346	54.06
10 December 2021	0.13	0.00	0.40	24	0	73	23	95.83
21 January 2022	0.06	0.00	0.16	11	0	29	10	90.91
01 March 2022	0.84	0.16	1.88	155	28	345	75	48.39
19 March 2022	0.27	0.00	0.72	50	0	133	29	58.00
01 April 2022	0.00	0.00	0.00	0	0	0	0	-
27 May 2022	0.15	0.01	0.34	27	1	62	13	48.15
18 June 2022	0.00	0.00	0.00	0	0	0	0	-
11 July 2022	3.86	1.78	6.46	707	328	1,186	186	26.31
06 August 2022	0.12	0.00	0.42	22	0	76	21	95.45
01 September 2022	0.00	0.00	0.00	0	0	0	0	-
17 October 2022	0.00	0.00	0.00	0	0	0	0	-
29 November 2022	1.67	0.16	3.96	308	29	727	161	52.27
22 December 2022	1.30	0.32	2.81	238	57	516	120	50.42
19 January 2023	0.46	0.06	0.98	84	11	180	33	39.29
09 February 2023	0.87	0.00	2.22	160	0	407	96	60.00

Survey date	Density estimate (n/km²)	LCL (n/km²)	UCL (n/km²)	Population estimate (n)	LCL (n)	UCL (n)	SD (n)	CV (%)
04 March 2023	0.00	0.00	0.00	0	0	0	0	-
18 April 2023	0.13	0.00	0.39	26	0	71	16	61.54
02 May 2023	1.46	0.20	3.12	268	35	573	123	45.90
03 June 2023	0.51	0.01	1.32	95	1	242	42	44.21
19 July 2023	0.09	0.00	0.22	16	0	40	12	75.00
17 August 2023	0.05	0.00	0.16	10	0	29	10	100.00
16 September 2023	0.18	0.00	0.52	33	0	95	28	84.85

Table 101 Absolute apportioned density and population estimates of puffin recorded in the Offshore Array Area plus 4km buffer during the two-year survey period (n= number, LCL= Lower 95% Confidence Limit, UCL= Upper 95% Confidence Limit).

Survey date	Density estimate (n/km²)	LCL (n/km²)	UCL (n/km²)	Population estimate (n)	LCL (n)	UCL (n)	SD (n)	CV (%)
28 October 2021	0.16	0.00	0.35	29	0	64	15	51.72
27 November 2021	0.00	0.00	0.00	0	0	0	0	-
10 December 2021	0.00	0.00	0.00	0	0	0	0	-
21 January 2022	0.00	0.00	0.00	0	0	0	0	-
01 March 2022	0.00	0.00	0.00	0	0	0	0	-
19 March 2022	0.00	0.00	0.00	0	0	0	0	-
01 April 2022	0.14	0.00	0.40	26	0	73	19	73.08
27 May 2022	0.72	0.08	1.63	132	14	297	61	46.21
18 June 2022	0.00	0.00	0.00	0	0	0	0	-
11 July 2022	0.00	0.00	0.00	0	0	0	0	-
06 August 2022	0.00	0.00	0.00	0	0	0	0	-
01 September 2022	0.08	0.00	0.23	14	0	42	13	92.86
17 October 2022	0.00	0.00	0.00	0	0	0	0	-
29 November 2022	0.00	0.00	0.00	0	0	0	0	-
22 December 2022	0.00	0.00	0.00	0	0	0	0	-
19 January 2023	0.00	0.00	0.00	0	0	0	0	-
09 February 2023	0.00	0.00	0.00	0	0	0	0	-

Survey date	Density estimate (n/km²)	LCL (n/km²)	UCL (n/km²)	Population estimate (n)	LCL (n)	UCL (n)	SD (n)	CV (%)
04 March 2023	0.00	0.00	0.00	0	0	0	0	-
18 April 2023	0.06	0.00	0.15	10	0	28	9	90.00
02 May 2023	0.17	0.00	0.40	31	0	73	17	54.84
03 June 2023	0.85	0.21	1.73	157	38	317	50	31.85
19 July 2023	2.47	0.51	5.59	453	94	1,026	258	56.95
17 August 2023	0.00	0.00	0.00	0	0	0	0	-
16 September 2023	0.00	0.00	0.00	0	0	0	0	-

6.2.2 Other recorded species

6.2.2.1 Seabird species

Table 102 Apportioned density and population estimates of black guillemot recorded in the Offshore Array Area plus 4km buffer during the two-year survey period (n= number, LCL= Lower 95% Confidence Limit, UCL= Upper 95% Confidence Limit)

Survey date	Density estimate (n/km²)	LCL (n/km²)	UCL (n/km²)	Population estimate (n)	LCL (n)	UCL (n)	SD (n)	CV (%)
28 October 2021	0.00	0.00	0.00	0	0	0	0	-
27 November 2021	0.03	0.00	0.07	5	0	13	4	80.00
10 December 2021	0.00	0.00	0.00	0	0	0	0	-
21 January 2022	0.03	0.00	0.07	5	0	12	4	80.00
01 March 2022	0.00	0.00	0.00	0	0	0	0	-
19 March 2022	0.05	0.00	0.14	9	0	25	8	88.89
01 April 2022	0.00	0.00	0.00	0	0	0	0	-
27 May 2022	0.00	0.00	0.00	0	0	0	0	-
18 June 2022	0.00	0.00	0.00	0	0	0	0	-
11 July 2022	0.00	0.00	0.00	0	0	0	0	-
06 August 2022	0.00	0.00	0.00	0	0	0	0	-
01 September 2022	0.00	0.00	0.00	0	0	0	0	-
17 October 2022	0.00	0.00	0.00	0	0	0	0	-
29 November 2022	0.00	0.00	0.00	0	0	0	0	-
22 December 2022	0.00	0.00	0.00	0	0	0	0	-

Survey date	Density estimate (n/km²)	LCL (n/km²)	UCL (n/km²)	Population estimate (n)	LCL (n)	UCL (n)	SD (n)	CV (%)
19 January 2023	0.00	0.00	0.00	0	0	0	0	-
09 February 2023	0.09	0.00	0.22	17	0	40	10	58.82
04 March 2023	0.05	0.00	0.14	9	0	25	8	88.89
18 April 2023	0.00	0.00	0.00	0	0	0	0	-
02 May 2023	0.00	0.00	0.00	0	0	0	0	-
03 June 2023	0.00	0.00	0.00	0	0	0	0	-
19 July 2023	0.00	0.00	0.00	0	0	0	0	-
17 August 2023	0.00	0.00	0.00	0	0	0	0	-
16 September 2023	0.00	0.00	0.00	0	0	0	0	-

Table 103 Apportioned density and population estimates of black-headed gull recorded in the Offshore Array Area plus 4km buffer during the two-year survey period (n= number, LCL= Lower 95% Confidence Limit, UCL= Upper 95% Confidence Limit)

Survey date	Density estimate (n/km²)	LCL (n/km²)	UCL (n/km²)	Population estimate (n)	LCL (n)	UCL (n)	SD (n)	CV (%)
28 October 2021	0.00	0.00	0.00	0	0	0	0	-
27 November 2021	0.00	0.00	0.00	0	0	0	0	-
10 December 2021	0.00	0.00	0.00	0	0	0	0	-
21 January 2022	0.00	0.00	0.00	0	0	0	0	-
01 March 2022	0.00	0.00	0.00	0	0	0	0	-
19 March 2022	0.00	0.00	0.00	0	0	0	0	-
01 April 2022	0.00	0.00	0.00	0	0	0	0	-
27 May 2022	0.00	0.00	0.00	0	0	0	0	-
18 June 2022	0.00	0.00	0.00	0	0	0	0	-
11 July 2022	0.05	0.00	0.15	10	0	28	9	90.00
06 August 2022	0.00	0.00	0.00	0	0	0	0	-
01 September 2022	0.00	0.00	0.00	0	0	0	0	-
17 October 2022	0.00	0.00	0.00	0	0	0	0	-
29 November 2022	0.00	0.00	0.00	0	0	0	0	-
22 December 2022	0.00	0.00	0.00	0	0	0	0	-
19 January 2023	0.00	0.00	0.00	0	0	0	0	-
09 February 2023	0.00	0.00	0.00	0	0	0	0	-

Survey date	Density estimate (n/km²)	LCL (n/km²)	UCL (n/km²)	Population estimate (n)	LCL (n)	UCL (n)	SD (n)	CV (%)
04 March 2023	0.00	0.00	0.00	0	0	0	0	-
18 April 2023	0.00	0.00	0.00	0	0	0	0	-
02 May 2023	0.00	0.00	0.00	0	0	0	0	-
03 June 2023	0.00	0.00	0.00	0	0	0	0	-
19 July 2023	0.00	0.00	0.00	0	0	0	0	-
17 August 2023	0.07	0.00	0.17	12	0	32	9	75.00
16 September 2023	0.00	0.00	0.00	0	0	0	0	-

Table 104 Apportioned density and population estimates of great cormorant recorded in the Offshore Array Area plus 4km buffer during the two-year survey period (n= number, LCL= Lower 95% Confidence Limit, UCL= Upper 95% Confidence Limit)

Survey date	Density estimate (n/km²)	LCL (n/km²)	UCL (n/km²)	Population estimate (n)	LCL (n)	UCL (n)	SD (n)	CV (%)
28 October 2021	0.00	0.00	0.00	0	0	0	0	-
27 November 2021	0.00	0.00	0.00	0	0	0	0	-
10 December 2021	0.00	0.00	0.00	0	0	0	0	-
21 January 2022	0.00	0.00	0.00	0	0	0	0	-
01 March 2022	0.00	0.00	0.00	0	0	0	0	-
19 March 2022	0.00	0.00	0.00	0	0	0	0	-
01 April 2022	0.00	0.00	0.00	0	0	0	0	-
27 May 2022	0.00	0.00	0.00	0	0	0	0	-
18 June 2022	0.00	0.00	0.00	0	0	0	0	-
11 July 2022	0.00	0.00	0.00	0	0	0	0	-
06 August 2022	0.03	0.00	0.07	5	0	12	4	80.00
01 September 2022	0.03	0.00	0.07	5	0	12	4	80.00
17 October 2022	0.00	0.00	0.00	0	0	0	0	-
29 November 2022	0.00	0.00	0.00	0	0	0	0	-
22 December 2022	0.09	0.00	0.22	17	0	40	10	55.49
19 January 2023	0.03	0.00	0.07	5	0	12	4	80.00
09 February 2023	0.05	0.00	0.14	9	0	25	8	88.89

Survey date	Density estimate (n/km²)	LCL (n/km²)	UCL (n/km²)	Population estimate (n)	LCL (n)	UCL (n)	SD (n)	CV (%)
04 March 2023	0.00	0.00	0.00	0	0	0	0	-
18 April 2023	0.00	0.00	0.00	0	0	0	0	-
02 May 2023	0.00	0.00	0.00	0	0	0	0	-
03 June 2023	0.11	0.00	0.33	20	0	61	14	68.01
19 July 2023	0.05	0.00	0.13	9	0	24	8	88.89
17 August 2023	0.00	0.00	0.00	0	0	0	0	-
16 September 2023	0.02	0.00	0.07	4	0	12	4	100.00

Table 105 Apportioned density and population estimates of Cory's shearwater recorded in the Offshore Array Area plus 4km buffer during the two-year survey period (n= number, LCL= Lower 95% Confidence Limit, UCL= Upper 95% Confidence Limit)

Survey date	Density estimate (n/km²)	LCL (n/km²)	UCL (n/km²)	Population estimate (n)	LCL (n)	UCL (n)	SD (n)	CV (%)
28 October 2021	0	0	0	0	0	0	0	-
27 November 2021	0	0	0	0	0	0	0	-
10 December 2021	0	0	0	0	0	0	0	-
21 January 2022	0	0	0	0	0	0	0	-
01 March 2022	0	0	0	0	0	0	0	-
19 March 2022	0	0	0	0	0	0	0	-
01 April 2022	0	0	0	0	0	0	0	-
27 May 2022	0	0	0	0	0	0	0	-
18 June 2022	0	0	0	0	0	0	0	-
11 July 2022	0	0	0	0	0	0	0	-
06 August 2022	0	0	0	0	0	0	0	-
01 September 2022	0	0	0	0	0	0	0	-
17 October 2022	0	0	0	0	0	0	0	-
29 November 2022	0	0	0	0	0	0	0	-
22 December 2022	0	0	0	0	0	0	0	-
19 January 2023	0	0	0	0	0	0	0	-
09 February 2023	0	0	0	0	0	0	0	-

Survey date	Density estimate (n/km²)	LCL (n/km²)	UCL (n/km²)	Population estimate (n)	LCL (n)	UCL (n)	SD (n)	CV (%)
04 March 2023	0	0	0	0	0	0	0	-
18 April 2023	0	0	0	0	0	0	0	-
02 May 2023	0	0	0	0	0	0	0	-
03 June 2023	0	0	0	0	0	0	0	-
19 July 2023	0	0	0	0	0	0	0	-
17 August 2023	8.09	4.35	13.54	1,484	798	2,484	408	27.47
16 September 2023	0	0	0	0	0	0	0	-

139 Cory's shearwater were only observed during August 2023 in high numbers. The data was further explored and no unusual distributions, such as large clusters, within the data that could impact the estimate were found. Furthermore, the estimated number of Cory's shearwater aligns with the high number of observations reported by various sources (BirdWatch Galway, 2023; Isle of Scilly Bird Group, 2023; Rare Bird Alert, 2023).

Table 106 Apportioned density and population estimates of common eider recorded in the Offshore Array Area plus 4km buffer during the two-year survey period (n= number, LCL= Lower 95% Confidence Limit, UCL= Upper 95% Confidence Limit)

Survey date	Density estimate (n/km²)	LCL (n/km²)	UCL (n/km²)	Population estimate (n)	LCL (n)	UCL (n)	SD (n)	CV (%)
28 October 2021	0.00	0.00	0.00	0	0	0	0	-
27 November 2021	0.00	0.00	0.00	0	0	0	0	-
10 December 2021	0.00	0.00	0.00	0	0	0	0	-
21 January 2022	0.00	0.00	0.00	0	0	0	0	-
01 March 2022	0.16	0.00	0.45	30	0	83	25	83.33
19 March 2022	0.00	0.00	0.00	0	0	0	0	-
01 April 2022	0.00	0.00	0.00	0	0	0	0	-
27 May 2022	0.00	0.00	0.00	0	0	0	0	-
18 June 2022	0.00	0.00	0.00	0	0	0	0	-
11 July 2022	0.00	0.00	0.00	0	0	0	0	-
06 August 2022	0.00	0.00	0.00	0	0	0	0	-
01 September 2022	0.00	0.00	0.00	0	0	0	0	-
17 October 2022	0.00	0.00	0.00	0	0	0	0	-
29 November 2022	0.00	0.00	0.00	0	0	0	0	-
22 December 2022	0.00	0.00	0.00	0	0	0	0	-
19 January 2023	0.00	0.00	0.00	0	0	0	0	-
09 February 2023	0.00	0.00	0.00	0	0	0	0	-

Survey date	Density estimate (n/km²)	LCL (n/km²)	UCL (n/km²)	Population estimate (n)	LCL (n)	UCL (n)	SD (n)	CV (%)
04 March 2023	0.54	0.00	1.23	99	0	226	61	61.62
18 April 2023	0.15	0.00	0.40	28	0	74	22	78.57
02 May 2023	0.00	0.00	0.00	0	0	0	0	-
03 June 2023	0.00	0.00	0.00	0	0	0	0	-
19 July 2023	0.00	0.00	0.00	0	0	0	0	-
17 August 2023	0.00	0.00	0.00	0	0	0	0	-
16 September 2023	0.00	0.00	0.00	0	0	0	0	-

Table 107 Apportioned density and population estimates of European storm petrel recorded in the Offshore Array Area plus 4km buffer during the two-year survey period (n= number, LCL= Lower 95% Confidence Limit, UCL= Upper 95% Confidence Limit)

Survey date	Density estimate (n/km²)	LCL (n/km²)	UCL (n/km²)	Population estimate (n)	LCL (n)	UCL (n)	SD (n)	CV (%)
28 October 2021	0.00	0.00	0.00	0	0	0	0	-
27 November 2021	0.00	0.00	0.00	0	0	0	0	-
10 December 2021	0.00	0.00	0.00	0	0	0	0	-
21 January 2022	0.00	0.00	0.00	0	0	0	0	-
01 March 2022	0.00	0.00	0.00	0	0	0	0	-
19 March 2022	0.00	0.00	0.00	0	0	0	0	-
01 April 2022	0.00	0.00	0.00	0	0	0	0	-
27 May 2022	0.05	0.00	0.14	9	0	25	8	88.89
18 June 2022	0.00	0.00	0.00	0	0	0	0	-
11 July 2022	0.14	0.00	0.39	25	0	72	22	88.00
06 August 2022	0.00	0.00	0.00	0	0	0	0	-
01 September 2022	0.00	0.00	0.00	0	0	0	0	-
17 October 2022	0.00	0.00	0.00	0	0	0	0	-
29 November 2022	0.00	0.00	0.00	0	0	0	0	-
22 December 2022	0.00	0.00	0.00	0	0	0	0	-
19 January 2023	0.00	0.00	0.00	0	0	0	0	-

Survey date	Density estimate (n/km²)	LCL (n/km²)	UCL (n/km²)	Population estimate (n)	LCL (n)	UCL (n)	SD (n)	CV (%)
09 February 2023	0.00	0.00	0.00	0	0	0	0	-
04 March 2023	0.00	0.00	0.00	0	0	0	0	-
18 April 2023	0.00	0.00	0.00	0	0	0	0	-
02 May 2023	0.02	0.00	0.07	4	0	12	4	100.00
03 June 2023	0.05	0.00	0.14	9	0	25	8	88.89
19 July 2023	0.04	0.00	0.13	8	0	24	8	100.00
17 August 2023	0.09	0.00	0.22	17	0	41	11	64.71
16 September 2023	0.00	0.00	0.00	0	0	0	0	-

Table 108 Apportioned density and population estimates of northern fulmar recorded in the Offshore Array Area plus 4km buffer during the two-year survey period (n= number, LCL= Lower 95% Confidence Limit, UCL= Upper 95% Confidence Limit)

Survey date	Density estimate (n/km²)	LCL (n/km²)	UCL (n/km²)	Population estimate (n)	LCL (n)	UCL (n)	SD (n)	CV (%)
28 October 2021	0.00	0.00	0.00	0	0	0	0	-
27 November 2021	0.00	0.00	0.00	0	0	0	0	-
10 December 2021	0.31	0.13	0.52	57	24	95	19	33.33
21 January 2022	0.00	0.00	0.00	0	0	0	0	-
01 March 2022	0.00	0.00	0.00	0	0	0	0	-
19 March 2022	0.09	0.00	0.26	17	0	48	14	82.35
01 April 2022	0.05	0.00	0.14	9	0	25	8	88.89
27 May 2022	0.05	0.00	0.14	9	0	25	8	88.89
18 June 2022	0.12	0.00	0.28	22	0	52	13	57.50
11 July 2022	0.18	0.02	0.40	33	4	73	14	41.22
06 August 2022	0.04	0.00	0.14	8	0	25	8	100.00
01 September 2022	0.12	0.00	0.30	22	0	55	12	51.43
17 October 2022	0.00	0.00	0.00	0	0	0	0	-
29 November 2022	0.00	0.00	0.00	0	0	0	0	-
22 December 2022	0.00	0.00	0.00	0	0	0	0	-
19 January 2023	0.00	0.00	0.00	0	0	0	0	-
09 February 2023	0.00	0.00	0.00	0	0	0	0	-

Survey date	Density estimate (n/km²)	LCL (n/km²)	UCL (n/km²)	Population estimate (n)	LCL (n)	UCL (n)	SD (n)	CV (%)
04 March 2023	0.00	0.00	0.00	0	0	0	0	-
18 April 2023	0.11	0.00	0.33	21	0	60	16	73.92
02 May 2023	0.09	0.00	0.22	17	0	41	11	64.71
03 June 2023	0.17	0.00	0.48	31	0	88	25	80.65
19 July 2023	0.00	0.00	0.00	0	0	0	0	-
17 August 2023	0.19	0.00	0.43	34	0	79	17	47.43
16 September 2023	0.00	0.00	0.00	0	0	0	0	-

Table 109 Apportioned density and population estimates of great shearwater recorded in the Offshore Array Area plus 4km buffer during the two-year survey period (n= number, LCL= Lower 95% Confidence Limit, UCL= Upper 95% Confidence Limit)

Survey date	Density estimate (n/km²)	LCL (n/km²)	UCL (n/km²)	Population estimate (n)	LCL (n)	UCL (n)	SD (n)	CV (%)
28 October 2021	0.00	0.00	0.00	0	0	0	0	-
27 November 2021	0.00	0.00	0.00	0	0	0	0	-
10 December 2021	0.00	0.00	0.00	0	0	0	0	-
21 January 2022	0.00	0.00	0.00	0	0	0	0	-
01 March 2022	0.00	0.00	0.00	0	0	0	0	-
19 March 2022	0.00	0.00	0.00	0	0	0	0	-
01 April 2022	0.00	0.00	0.00	0	0	0	0	-
27 May 2022	0.00	0.00	0.00	0	0	0	0	-
18 June 2022	0.00	0.00	0.00	0	0	0	0	-
11 July 2022	0.00	0.00	0.00	0	0	0	0	-
06 August 2022	0.00	0.00	0.00	0	0	0	0	-
01 September 2022	0.00	0.00	0.00	0	0	0	0	-
17 October 2022	0.00	0.00	0.00	0	0	0	0	-
29 November 2022	0.00	0.00	0.00	0	0	0	0	-
22 December 2022	0.00	0.00	0.00	0	0	0	0	-
19 January 2023	0.00	0.00	0.00	0	0	0	0	-
09 February 2023	0.00	0.00	0.00	0	0	0	0	-

Survey date	Density estimate (n/km²)	LCL (n/km²)	UCL (n/km²)	Population estimate (n)	LCL (n)	UCL (n)	SD (n)	CV (%)
04 March 2023	0.00	0.00	0.00	0	0	0	0	-
18 April 2023	0.00	0.00	0.00	0	0	0	0	-
02 May 2023	0.00	0.00	0.00	0	0	0	0	-
03 June 2023	0.00	0.00	0.00	0	0	0	0	-
19 July 2023	0.00	0.00	0.00	0	0	0	0	-
17 August 2023	0.39	0.09	0.73	71	17	134	25	34.30
16 September 2023	0.00	0.00	0.00	0	0	0	0	-

Table 110 Apportioned density and population estimates of little gull recorded in the Offshore Array Area plus 4km buffer during the two-year survey period (n= number, LCL= Lower 95% Confidence Limit, UCL= Upper 95% Confidence Limit)

Survey date	Density estimate (n/km²)	LCL (n/km²)	UCL (n/km²)	Population estimate (n)	LCL (n)	UCL (n)	SD (n)	CV (%)
28 October 2021	0.00	0.00	0.00	0	0	0	0	-
27 November 2021	0.00	0.00	0.00	0	0	0	0	-
10 December 2021	0.00	0.00	0.00	0	0	0	0	-
21 January 2022	0.00	0.00	0.00	0	0	0	0	-
01 March 2022	0.00	0.00	0.00	0	0	0	0	-
19 March 2022	0.00	0.00	0.00	0	0	0	0	-
01 April 2022	0.00	0.00	0.00	0	0	0	0	-
27 May 2022	0.00	0.00	0.00	0	0	0	0	-
18 June 2022	0.00	0.00	0.00	0	0	0	0	-
11 July 2022	0.00	0.00	0.00	0	0	0	0	-
06 August 2022	0.00	0.00	0.00	0	0	0	0	-
01 September 2022	0.00	0.00	0.00	0	0	0	0	-
17 October 2022	0.00	0.00	0.00	0	0	0	0	-
29 November 2022	0.00	0.00	0.00	0	0	0	0	-
22 December 2022	0.00	0.00	0.00	0	0	0	0	-
19 January 2023	0.00	0.00	0.00	0	0	0	0	-
09 February 2023	0.00	0.00	0.00	0	0	0	0	-

Survey date	Density estimate (n/km²)	LCL (n/km²)	UCL (n/km²)	Population estimate (n)	LCL (n)	UCL (n)	SD (n)	CV (%)
04 March 2023	0.00	0.00	0.00	0	0	0	0	-
18 April 2023	0.00	0.00	0.00	0	0	0	0	-
02 May 2023	0.00	0.00	0.00	0	0	0	0	-
03 June 2023	0.00	0.00	0.00	0	0	0	0	-
19 July 2023	0.11	0.00	0.29	21	0	53	12	53.87
17 August 2023	0.00	0.00	0.00	0	0	0	0	-
16 September 2023	0.00	0.00	0.00	0	0	0	0	-

Table 111 Apportioned density and population estimates of little tern recorded in the Offshore Array Area plus 4km buffer during the two-year survey period (n= number, LCL= Lower 95% Confidence Limit, UCL= Upper 95% Confidence Limit)

Survey date	Density estimate (n/km²)	LCL (n/km²)	UCL (n/km²)	Population estimate (n)	LCL (n)	UCL (n)	SD (n)	CV (%)
28 October 2021	0.00	0.00	0.00	0	0	0	0	-
27 November 2021	0.00	0.00	0.00	0	0	0	0	-
10 December 2021	0.00	0.00	0.00	0	0	0	0	-
21 January 2022	0.00	0.00	0.00	0	0	0	0	-
01 March 2022	0.00	0.00	0.00	0	0	0	0	-
19 March 2022	0.00	0.00	0.00	0	0	0	0	-
01 April 2022	0.00	0.00	0.00	0	0	0	0	-
27 May 2022	0.00	0.00	0.00	0	0	0	0	-
18 June 2022	0.00	0.00	0.00	0	0	0	0	-
11 July 2022	0.00	0.00	0.00	0	0	0	0	-
06 August 2022	0.00	0.00	0.00	0	0	0	0	-
01 September 2022	0.00	0.00	0.00	0	0	0	0	-
17 October 2022	0.00	0.00	0.00	0	0	0	0	-
29 November 2022	0.00	0.00	0.00	0	0	0	0	-
22 December 2022	0.00	0.00	0.00	0	0	0	0	-
19 January 2023	0.00	0.00	0.00	0	0	0	0	-
09 February 2023	0.00	0.00	0.00	0	0	0	0	-

Survey date	Density estimate (n/km²)	LCL (n/km²)	UCL (n/km²)	Population estimate (n)	LCL (n)	UCL (n)	SD (n)	CV (%)
04 March 2023	0.00	0.00	0.00	0	0	0	0	-
18 April 2023	0.00	0.00	0.00	0	0	0	0	-
02 May 2023	0.00	0.00	0.00	0	0	0	0	-
03 June 2023	0.00	0.00	0.00	0	0	0	0	-
19 July 2023	0.04	0.00	0.13	8	0	24	8	100.00
17 August 2023	0.00	0.00	0.00	0	0	0	0	-
16 September 2023	0.00	0.00	0.00	0	0	0	0	-

Table 112 Apportioned density and population estimates of Sandwich tern recorded in the Offshore Array Area plus 4km buffer during the two-year survey period (n= number, LCL= Lower 95% Confidence Limit, UCL= Upper 95% Confidence Limit)

Survey date	Density estimate (n/km²)	LCL (n/km²)	UCL (n/km²)	Population estimate (n)	LCL (n)	UCL (n)	SD (n)	CV (%)
28 October 2021	0.00	0.00	0.00	0	0	0	0	-
27 November 2021	0.00	0.00	0.00	0	0	0	0	-
10 December 2021	0.00	0.00	0.00	0	0	0	0	-
21 January 2022	0.00	0.00	0.00	0	0	0	0	-
01 March 2022	0.00	0.00	0.00	0	0	0	0	-
19 March 2022	0.00	0.00	0.00	0	0	0	0	-
01 April 2022	0.00	0.00	0.00	0	0	0	0	-
27 May 2022	0.04	0.00	0.14	8	0	25	8	100.00
18 June 2022	0.00	0.00	0.00	0	0	0	0	-
11 July 2022	0.35	0.00	0.90	65	0	166	44	67.69
06 August 2022	0.00	0.00	0.00	0	0	0	0	-
01 September 2022	0.00	0.00	0.00	0	0	0	0	-
17 October 2022	0.00	0.00	0.00	0	0	0	0	-
29 November 2022	0.00	0.00	0.00	0	0	0	0	-
22 December 2022	0.00	0.00	0.00	0	0	0	0	-
19 January 2023	0.00	0.00	0.00	0	0	0	0	-
09 February 2023	0.00	0.00	0.00	0	0	0	0	-

Survey date	Density estimate (n/km²)	LCL (n/km²)	UCL (n/km²)	Population estimate (n)	LCL (n)	UCL (n)	SD (n)	CV (%)
04 March 2023	0.00	0.00	0.00	0	0	0	0	-
18 April 2023	0.05	0.00	0.14	9	0	25	8	88.89
02 May 2023	0.00	0.00	0.00	0	0	0	0	-
03 June 2023	0.04	0.00	0.14	8	0	25	8	100.00
19 July 2023	0.00	0.00	0.00	0	0	0	0	-
17 August 2023	0.00	0.00	0.00	0	0	0	0	-
16 September 2023	0.00	0.00	0.00	0	0	0	0	-

6.2.2.2 Non-seabird species

Table 113 Apportioned density and population estimates of curlew recorded in the Offshore Array Area plus 4km buffer during the two-year survey period (n= number, LCL= Lower 95% Confidence Limit, UCL= Upper 95% Confidence Limit)

Survey date	Density estimate (n/km²)	LCL (n/km²)	UCL (n/km²)	Population estimate (n)	LCL (n)	UCL (n)	SD (n)	CV (%)
28 October 2021	0	0	0	0	0	0	0	-
27 November 2021	0	0	0	0	0	0	0	-
10 December 2021	0	0	0	0	0	0	0	-
21 January 2022	0	0	0	0	0	0	0	-
01 March 2022	0.04	0	0.14	8	0	25	8	100.00
19 March 2022	0	0	0	0	0	0	0	-
01 April 2022	0	0	0	0	0	0	0	-
27 May 2022	0	0	0	0	0	0	0	-
18 June 2022	0	0	0	0	0	0	0	-
11 July 2022	0	0	0	0	0	0	0	-
06 August 2022	0	0	0	0	0	0	0	-
01 September 2022	0	0	0	0	0	0	0	-
17 October 2022	0	0	0	0	0	0	0	-
29 November 2022	0	0	0	0	0	0	0	-
22 December 2022	0	0	0	0	0	0	0	-
19 January 2023	0	0	0	0	0	0	0	-

Survey date	Density estimate (n/km²)	LCL (n/km²)	UCL (n/km²)	Population estimate (n)	LCL (n)	UCL (n)	SD (n)	CV (%)
09 February 2023	0	0	0	0	0	0	0	-
04 March 2023	0	0	0	0	0	0	0	-
18 April 2023	0	0	0	0	0	0	0	-
02 May 2023	0	0	0	0	0	0	0	-
03 June 2023	0	0	0	0	0	0	0	-
19 July 2023	0	0	0	0	0	0	0	-
17 August 2023	0	0	0	0	0	0	0	-
16 September 2023	0	0	0	0	0	0	0	-

Table 114 Apportioned density and population estimates of oystercatcher recorded in the Offshore Array Area plus 4km buffer during the two-year survey period (n= number, LCL= Lower 95% Confidence Limit, UCL= Upper 95% Confidence Limit)

Survey date	Density estimate (n/km²)	LCL (n/km²)	UCL (n/km²)	Population estimate (n)	LCL (n)	UCL (n)	SD (n)	CV (%)
28 October 2021	0.00	0.00	0.00	0	0	0	0	-
27 November 2021	0.07	0.00	0.21	13	0	38	10	75.76
10 December 2021	0.22	0.00	0.66	41	0	121	39	95.12
21 January 2022	0.00	0.00	0.00	0	0	0	0	-
01 March 2022	0.00	0.00	0.00	0	0	0	0	-
19 March 2022	0.00	0.00	0.00	0	0	0	0	-
01 April 2022	0.00	0.00	0.00	0	0	0	0	-
27 May 2022	0.00	0.00	0.00	0	0	0	0	-
18 June 2022	0.00	0.00	0.00	0	0	0	0	-
11 July 2022	0.00	0.00	0.00	0	0	0	0	-
06 August 2022	0.00	0.00	0.00	0	0	0	0	-
01 September 2022	0.02	0.00	0.07	4	0	12	4	100.00
17 October 2022	0.00	0.00	0.00	0	0	0	0	-
29 November 2022	0.00	0.00	0.00	0	0	0	0	-
22 December 2022	0.00	0.00	0.00	0	0	0	0	-
19 January 2023	0.00	0.00	0.00	0	0	0	0	-
09 February 2023	0.00	0.00	0.00	0	0	0	0	-

Survey date	Density estimate (n/km²)	LCL (n/km²)	UCL (n/km²)	Population estimate (n)	LCL (n)	UCL (n)	SD (n)	CV (%)
04 March 2023	0.00	0.00	0.00	0	0	0	0	-
18 April 2023	0.00	0.00	0.00	0	0	0	0	-
02 May 2023	0.00	0.00	0.00	0	0	0	0	-
03 June 2023	0.00	0.00	0.00	0	0	0	0	-
19 July 2023	0.09	0.00	0.26	16	0	47	14	87.50
17 August 2023	0.00	0.00	0.00	0	0	0	0	-
16 September 2023	0.00	0.00	0.00	0	0	0	0	-

Table 115 Apportioned density and population estimates of whimbrel recorded in the Offshore Array Area plus 4km buffer during the two-year survey period (n= number, LCL= Lower 95% Confidence Limit, UCL= Upper 95% Confidence Limit)

Survey date	Density estimate (n/km²)	LCL (n/km²)	UCL (n/km²)	Population estimate (n)	LCL (n)	UCL (n)	SD (n)	CV (%)
28 October 2021	0.00	0.00	0.00	0	0	0	0	-
27 November 2021	0.00	0.00	0.00	0	0	0	0	-
10 December 2021	0.00	0.00	0.00	0	0	0	0	-
21 January 2022	0.00	0.00	0.00	0	0	0	0	-
01 March 2022	0.00	0.00	0.00	0	0	0	0	-
19 March 2022	0.00	0.00	0.00	0	0	0	0	-
01 April 2022	0.00	0.00	0.00	0	0	0	0	-
27 May 2022	0.00	0.00	0.00	0	0	0	0	-
18 June 2022	0.00	0.00	0.00	0	0	0	0	-
11 July 2022	0.00	0.00	0.00	0	0	0	0	-
06 August 2022	0.00	0.00	0.00	0	0	0	0	-
01 September 2022	0.00	0.00	0.00	0	0	0	0	-
17 October 2022	0.00	0.00	0.00	0	0	0	0	-
29 November 2022	0.00	0.00	0.00	0	0	0	0	-
22 December 2022	0.00	0.00	0.00	0	0	0	0	-
19 January 2023	0.00	0.00	0.00	0	0	0	0	-
09 February 2023	0.00	0.00	0.00	0	0	0	0	-

Survey date	Density estimate (n/km²)	LCL (n/km²)	UCL (n/km²)	Population estimate (n)	LCL (n)	UCL (n)	SD (n)	CV (%)
04 March 2023	0.00	0.00	0.00	0	0	0	0	-
18 April 2023	0.09	0.00	0.21	17	0	39	11	64.71
02 May 2023	0.58	0.00	1.73	107	0	317	105	98.13
03 June 2023	0.00	0.00	0.00	0	0	0	0	-
19 July 2023	0.00	0.00	0.00	0	0	0	0	-
17 August 2023	0.00	0.00	0.00	0	0	0	0	-
16 September 2023	0.00	0.00	0.00	0	0	0	0	-