Arklow Bank Wind Park 2

Environmental Impact Assessment Report

Volume III, Appendix 12.12: Offshore Ornithology Technical Report - Kittiwake Collision Risk Modelling at ABWP1 (RFI March 2026)

sse Renewables

Arklow Bank Wind Park 2

Appendix 12.12 Offshore Ornithology Technical Report

ABWP1 Collision Risk Modelling for Kittiwake (RFI March 2026)

Date:	10 March 2026
Tel:	0141 342 5404
Web:	www.macarthurgreen.com
Address:	93 South Woodside Road |Glasgow | G20 6NT

Document Quality Record

Version	Date	Status	Author	Reviewed by	Approved by
1.0	10/03/2026	Final External (RFI March 2026)	SLR	GoBe Consultants	Sure Partners Limited

CONTENTS

LIST OF TABLES

GLOSSARY

Term	Meaning
Arklow Bank Wind Park 1 (ABWP1)	Arklow Bank Wind Park 1 consists of seven wind turbines, offshore export cable and inter-array cables. Arklow Bank Wind Park 1 has a capacity of 25.2 MW. Arklow Bank Wind Park 1 was constructed in 2003/04 and is owned and operated by Arklow Energy Limited.
Arklow Bank Wind Park 2 – Offshore Infrastructure	"The Proposed Development", Arklow Bank Wind Park 2 Offshore Infrastructure: This includes all elements under the existing Maritime Area Consent.
Arklow Bank Wind Park 2 (ABWP2) (The Project)	Arklow Bank Wind Park 2 (ABWP2) (The Project) is the onshore and offshore infrastructure. This EIAR is being prepared for the Offshore Infrastructure. Consents for the Onshore Grid Infrastructure (Planning Reference 310090) and Operational and Maintenance Facility (Planning Reference 211316) has been granted on 26th May 2022 and 20th July 2022, respectively. • Arklow Bank Wind Park 2 Offshore Infrastructure: This includes all elements to be consented in accordance with the Maritime Area Consent. This is the subject of this EIAR and will be referred to as 'the Proposed Development' in the EIAR. • Arklow Bank Wind Park 2 Onshore Grid Infrastructure: This relates to the onshore grid infrastructure for which planning permission has been granted. • Arklow Bank Wind Park 2 Operational and Maintenance Facility (OMF): This includes the onshore and nearshore infrastructure at the OMF, for which planning permission has been granted. • Arklow Bank Wind Park 2 EirGrid Upgrade Works: any non-contestable grid upgrade works, consent to be sought and works to be completed by EirGrid
Array Area	The Array Area is the area within which the Wind Turbine Generators (WTGs), the Offshore Substation Platforms (OSPs), and associated cables (export, inter- array and interconnector cabling) and foundations will be installed.
Nocturnal Activity Factor	Nocturnal Activity Factors indicate the amount of flight activity at night as a proportion of daytime flight activity. These factors were derived from reviews of seabird activity reported in Garthe and Hüppop (2004) which ranked species from 1 to 5 (1 low, 5 high) for relative nocturnal activity. These rates were subsequently modified for the purposes of CRM into 1 = 0%, 2 = 25%, 3 = 50%, 4 = 75% and 5 = 100% flying activity at night. For example, a nocturnal activity factor of 2 assumes that on average, nocturnal activity is around 25% of daytime level.

ACRONYMS

Term	Meaning
ABWP1	Arklow Bank Wind Park 1
ABWP2	Arklow Bank Wind Park 2
CRM	Collision Risk Model/Modelling
CWP	Codling Wind Park

Term	Meaning
DA	Dublin Array
EIA	Environmental Impact Assessment
JNCC	Joint Nature Conservation Committee
LAT	Lowest Astronomical Tide
MARA	Maritime Area Regulatory Authority
MHW	Mean High Water
MSL	Mean Sea Level
NAF	Nocturnal Activity Factor
OMF	Operations and Maintenance Facility
OSP	Offshore Substation Platforms
PCH	Potential Collision Height
RPM	Revolutions Per Minute
SNCB	Statutory Nature Conservation Bodies
WTG	Wind Turbine Generator
UK	United Kingdom

UNITS

Unit	Description
Birds/km2	Birds per square kilometre (density)
m	Metre (distance)
m/s	Metres per second (speed)

1 OFFSHORE ORNITHOLOGY TECHNICAL REPORT: ABWP1 COLLISION RISK MODELLING FOR KITTIWAKE

1.1 Introduction

1. This report provides estimates of the kittiwake collision risks for the existing seven Wind Turbine Generators (WTG) which comprise the Arklow Bank Wind Park 1 (ABWP1).
2. The owner and operator of the ABWP1, Arklow Energy Limited has commenced pre-application consultation (Case Reference OC27.321635) with the appropriate local authorities to decommission ABWP1, which has reached the end of its operating life.
3. The ABWP1 team has begun engaging with the Maritime Area Regulatory Authority (MARA) and is working closely with An Coimisiún Pleanála to agree on the details of the decommissioning and removal works. Based on the fact that the ABWP1 team has commenced the pre-application process for decommissioning we expect ABWP1 to be fully decommissioned before commencement of operation of ABWP2. Therefore ABWP1 by this time will no longer present a collision risk to birds and the potential impacts from these turbines, which hitherto were assumed to be part of the baseline for ABWP2, will no longer occur. Therefore, with the removal of this mortality there is effectively a positive offset in the baseline for ABWP2, from which predicted potential impacts should subsequently be subtracted. This has been considered in the ABWP2 impact assessment (Volume II, Chapter 12: Offshore Ornithology (Revised March 2026)).
4. It is worth noting that while only kittiwake has been considered here (due to that species sensitivity with respect to the close proximity of the Wicklow Head SPA colony), the same consideration will also apply to other species which would have been at risk of collisions with the ABWP1 (e.g. gannet, large gulls, terns, etc.). Therefore, the risks assessed for these species include some precaution, albeit this will be expected to be small and unlikely to materially affect the impact assessment conclusions.

1.2 Methods

5. In order to determine the number of predicted collisions that would have occurred at ABWP1 and hence the change in the baseline (i.e. the number of birds no longer at risk of mortality), with a focus on kittiwake (as the species with the highest collision predictions at ABWP2), the density of birds in flight within 2 km of the ABWP1 turbines was calculated from the ABWP2 baseline surveys (see Technical Appendices. 12.1 and 12.2 for details) for the period when the turbines were operating (March 2018 to April 2020). These densities were used as inputs to the deterministic Band CRM (2012) along with turbine dimensions and operating parameters for the ABWP1 turbines. The deterministic CRM was used instead of the stochastic one since the focus was on understanding the mean mortality rather than the uncertainty around those values.

1.2.1 Collision Risk Model Input Parameters

6. CRM input parameters are provided in the following tables:
   a) Table 12.4.1: counts of kittiwake recorded in height bands at ABWP2, Dublin Array (DA) and Codling Wind Park (CWP) used to estimate site-specific flight heights;

b) Table 12.4.2: average density (birds/km^2) of kittiwake in flight within a 2 km buffer around the ABWP1 turbines in each month;

c) Table 12.4.3: kittiwake biometrics (e.g. wingspan, body length, etc.), nocturnal activity factors and avoidance rates; and

d) Table 12.4.4: the ABWP1 wind turbine dimensions and operating parameters.

7. Kittiwake site-specific flight height data have been collected during boat-based surveys of three sites (ABWP2, Codling, Dublin Array). The proportion of kittiwake at potential collision height (PCH) at ABWP1 was calculated using each dataset. The sample sizes and estimated kittiwake PCH are provided in Table 12.4.1.

8. The most recent UK guidance on CRM (JNCC 2024) states with respect to flight heights:

> *We recommend that robust site-specific flight height data is utilised for proposed offshore wind developments, if available.*

9. The JNCC guidance also states that alongside option 1 CRM (i.e. using site-specific data) option 2 should be provided for comparison.

10. In the Irish context, Part 2 of the Guidance on Marine Baseline Ecological Assessments & Monitoring Activities for Offshore Renewable Energy Projects (DCCAE 2018) states the following in Box 7 in relation to Bird survey flight height assessment:

> *Flight height assessment is required for Collision Risk Modelling. Flight heights can be recorded through a range of survey methods and expressed as bird density (e.g. number of birds flying at a given height as in the 'Snapshot' survey method), bird occupancy in a given airspace per unit time, or bird flux as expressed as birds passing an imaginary transect line per unit time. This data should be recorded as accurately as possible, e.g. +/- 10/20m, rather than in generic flight bands. This will ensure the usability of the data regardless of future changes in turbine design. In addition, this will allow a refinement of the collision risk model to reflect the fact that most seabirds fly close to the sea surface and may only be at risk of collision with the lower sweep of the rotor. As detailed flight height data at sea may be difficult to record, typical flight heights gathered from other comparable sites could also be used. Flight height data should be presented in terms of density, bird occupancy, or bird flux e.g. birds/km2, to assess collision risk height with a turbine. At proposed wind farm sites where the collision risk is not negligible, further survey work may be required to assess the significance of the predicted mortality, particularly with regard to impacts on potentially sensitive species. Digital aerial survey techniques, telemetry and altimeters (pressure censors) are becoming increasingly used to gain more accurate flight height data for use in flight height and behavioural assessment.*

11. Both the UK and Irish guidance therefore place an emphasis on use of site-specific flight height estimates as preferable to generic, if available. The Irish guidance further allows for use of such data from 'comparable sites'.

12. The ABWP1 site-specific kittiwake PCH for a lower rotor tip height of 22m from mean sea level (MSL; using 20 m as a precautionary value) as recorded from surveys at ABWP2, DA and CWP were 2.54%, 5.47% and 7.86%, respectively. CRM was conducted for kittiwake using all three estimates, as well as the generic flight heights in Johnston *et al.* (2014).

Table 12.4.1: Kittiwake flight height data recorded at ABWP2, Dublin Array (DA) and Codling Wind Park (CWP) and estimated PCH.

Site	Number of surveys	Number of observations in each height band (m; note overlapping bands from different surveys)							Total	Height assumed for ABWP1 PCH (m above MSL)	Proportion at ABWP1 PCH
		0-5	5-10	10-20	20-30	20-40	>30	>40			
DA	39	956	2161	2776	300	NA	41	NA	6234	20	0.0547
CWP	15	1127	486	345	123	NA	38	6	2119	20	0.0786
ABWP2	7	1544	743		NA	7	NA	0	2294	20	0.003
Weighted average											0.0483

Table 12.4.2: Kittiwake biometrics used in the CRM.

Species	Body length[1] (m)	Wingspan[2] (m)	Flight speed[3] (m/s)	Nocturnal Activity Rate [4] (%)	Avoidance rate[5]	Flight type
Kittiwake	0.39	1.08	8.71	37.5	99.3	Flapping

1. Robinson (2005)
2. Pennycuick (1987), Alerstam (2007), Skov *et al.*, (2018)
3. Garthe and Hüppop (2004), Furness *et al.* (2018), MacArthur Green (2015)
4. Cook *et al.* (2014), JNCC *et al.*, (2014), Bowgen and Cook (2018)
5. UK Joint SNCBs (2024)

Table 12.4.3: Monthly mean densities (birds/km²) of birds in flight within 2km of the ABWP1 turbines (data collected between March 2018 and April 2020).

Species	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Kittiwake	13.82	17.75	1.37	0.68	5.12	0.17	1.48	2.05	0.85	1.02	6.14	4.95

Table 12.4.4: Windfarm and turbine specifications used in the CRM.

Average Revolutions Per Minute (RPM)	Rotor radius (m)	Hub height above Lowest Astronomical Tide (MSL) (m)	Max. blade width (m)	Mean blade pitch (°)	No. of turbines	Latitude (°)	Monthly operation (%)
11.04	51.5	73.5	4.0	10.0	7	52.81	90

1.3 Results

Table 12.4.5: Monthly mean kittiwake collision predictions for the ABWP1 turbines using Options 1 (weighted average site specific flight height) and 2 of the deterministic Band (2012) collision risk model (CRM).

Band Option	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
1: Weighted average	2.54	3.16	0.29	0.15	1.26	0.04	0.37	0.49	0.18	0.21	1.12	0.89	10.71
2: Generic	6.25	7.76	0.72	0.37	3.09	0.10	0.91	1.19	0.45	0.51	2.75	2.19	26.29
1: Site-specific (ABWP2)	0.16	0.20	0.02	0.01	0.08	0.00	0.02	0.03	0.01	0.01	0.07	0.06	0.68

13. The predicted annual kittiwake collision risk for the ABWP1 turbines varied between 10.7 using the weighted average flight heights recorded at ABWP2, DA and CWP to 26.3 using the generic flight height data.

14. The estimated collision mortality for ABWP1 would have been predicted to occur on an annual basis for the duration of operation at ABWP1 since 2004. There was no submitted collision risk assessment for ABWP1, and consequently it was not possible to include this in a form of cumulative assessment for ABWP2, but instead this mortality was treated as part of the baseline for ABWP2. However, with the estimates now available and the wind farm no longer operational, it is possible to discount the ABWP1 mortality from that for ABWP2, which is appropriate given that ABWP1 is located wholly within the Array Area of ABWP2. This has been discussed in the EIAR (Volume II, Chapter 12: Offshore Ornithology (Revised March 2026)) and the NIS.

REFERENCES

Alerstam, T. *et al.* (2007). Flight speeds among bird species: Allometric and phylogenetic effects. PLoS Biology, 5(8), pp. 1656–1662. doi: 10.1371/journal.pbio.0050197.

Band, W. (2012) Using a collision risk model to assess bird collision risks for offshore windfarms. The Crown Estate Strategic Ornithological Support Services (SOSS) report SOSS-02. SOSS Website.

Bowgen, K. and Cook, A. (2018) Bird Collision Avoidance: Empirical evidence and impact assessments. JNCC Report No. 614, JNCC, Peterborough, ISSN 0963-8091.

Cook, A.S.C.P., Humphries, E.M., Masden, E.A., and Burton, N.H.K. (2014). The avoidance rates of collision between birds and offshore turbines. BTO research Report No 656 to Marine Scotland Science.

DCCAE (2018) Guidance on Marine Baseline Ecological Assessments & Monitoring Activities for Offshore Renewable Energy Projects Part 2 April 2018

Furness, R.W., Garthe, S., Trinder, M., Matthiopoulos, J., Wanless, S. and Jeglinski, J. (2018). Nocturnal flight activity of northern gannets *Morus bassanus* and implications for modelling collision risk at offshore windfarms. Environmental Impact Assessment Review, 73, pp.1-6.

Garthe, S and Hüppop, O. (2004) Scaling possible adverse effects of marine windfarms on seabirds: developing and applying a vulnerability index. Journal of Applied Ecology, 41, 724-734.

Johnston, A., Cook, A.S.C.P., Wright, L.J., Humphreys, E.M. and Burton, E.H.K. (2014) Modelling flight heights of marine birds to more accurately assess collision risk with offshore wind turbines. Journal of Applied Ecology, 51, 31-41.

JNCC, Natural England, Natural Resources Wales, NatureScot. (2024). Joint advice note from the Statutory Nature Conservation Bodies (SNCBs) regarding bird collision risk modelling for offshore wind developments. JNCC, Peterborough. https://hub.jncc.gov.uk/f7892820-0f84-4e96-9eff-168f93bd343d.

Natural England (2022). Natural England interim advice on updated Collision Risk Modelling parameters (July 2022).

Pennycuick, C.J. (1987). Flight of auks (Alcidae) and other northern seabirds compared with southern Procellariiformes: ornithodolite observations. Journal of Experimental Biology, 128(1), pp.335-347.

Robinson, R.A. (2005). BirdFacts: profiles of birds occurring in Britain & Ireland. BTO, Thetford (http://www.bto.org/birdfacts, accessed on 12 January 2021).

Skov, H., Heinänen, S., Norman, T., Ward, R.M., Méndez-Roldán, S. and Ellis, I. 2018. ORJIP Bird Collision and Avoidance Study. Final report – April 2018. The Carbon Trust. 247 pp.