Addendum to the Environmental Impact Assessment Report

NISA
North Irish Sea Array

Volume 9 - Offshore Appendices

Appendix A15.1
Offshore and Intertidal Ornithology Technical Baseline

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North Irish Sea Array Offshore Wind Farm Ltd

Appendix 15.1: Offshore and Intertidal Ornithology Technical Baseline

North Irish Sea Array Offshore Wind Farm

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Contents

Figures

Tables

Acronyms

Term	Definition
BDMPS	Biologically Defined Minimum Population Scales
BTO	British Trust for Ornithology
BWI	BirdWatch Ireland
CIEEM	Chartered Institute of Ecology and Environmental Management
CRM	Collision Risk Modelling
DAS	Digital Aerial Survey
ECC	Export Cable Corridor
EIA	Environmental Impact Assessment
ESAS	European Seabirds at Sea
FAME	Future of the Atlantic Marine Environment
HPAI	Highly Pathogenic Avian Influenza
HRA	Habitats Regulations Assessment
HWM	High Water Mark
IUCN	International Union for Conservation of Nature
JNCC	Joint Nature Conservation Committee
LOD	Limit of Deviation
LWM	Low Water Mark
MAC	Maritime Area Consent
NEWS	Non-Estuarine Waterbird Surveys
NIS	Natura Impact Statement
NISA	North Irish Sea Array
NPWS	National Parks and Wildlife Service
NWIS	North West Irish Sea
OWF	Offshore Wind Farm
PAM	Passive Acoustic Monitoring
RSPB	Chartered Institute of Ecology and Environmental Management
SMP	Seabird Monitoring Programme
SNCB	Statutory Nature Conservation Bodies
SOSS	Strategic Ornithological Support Services
SPA	Special Protection Areas

UK	United Kingdom
VP	Vantage Point
WWT	Wildfowl and Wetlands Trust

1 Introduction

1.1.1 North Irish Sea Array Windfarm Ltd (NISA, hereafter referred to as 'the Developer') has been considering the Request for Further Information (RFI) issued by An Bord Pleanála (now An Coimisiún Pleanála) as well as the third-party submissions received following public consultation. At An Coimisiún Pleanála's behest, the Developer has also continued to consult with stakeholders in respect of the 2024 planning application throughout 2024-2026. The Developer has refined elements of the design to respond to the third-party submissions, the continued public and stakeholder consultation and the RFI. Amendments are therefore required to Appendix 15.1 Offshore and Intertidal Ornithology Technical Baseline of the 2024 Environmental Impact Assessment Report (EIAR). Full details of consultation undertaken can be found in Appendix A.1.2 in the Addendum to the EIAR.

1.1.2 For the purposes of clarity, this document shall be read as a replacement for Appendix 15.1 submitted as part of the 2024 EIAR. Any cross reference to a chapter, section, table, image, figure or appendix within this document is to another location within the Addendum to the EIAR unless explicitly stated otherwise. Cross reference to anything included in the 2024 EIAR will be clearly labelled as such.

1.1.3 Several of the RFI responses related to additional data collection or data gaps in the assessment, as such the Developer is incorporating updated datasets, such as the North-west Irish Sea (NWIS) SPA digital aerial survey (DAS) dataset (hereafter referred to as 'NWIS DAS'), as well as updated density and bio season peak estimates.

1.1.4 The sections relevant to Appendix A15.1 in the RFI are included below as well where key updates have been made within this Appendix.

RFI Section	RFI	Relevance to Appendix
1 (b)	The scientific information provided as part of the planning application documentation should be based on up-to-date survey reports and data. Accordingly, the applicant is requested to confirm/provide justification/verification that the information submitted in support of the planning application remains relevant and appropriate at the point of submitting further information or to update same as required.	The timeframes associated with the RFI have necessitated a review of the datasets previously used in the 2024 EIAR to ensure any necessary updates to the baseline environment are captured. Therefore, a review of Appendix 15.1 has been undertaken to comply with RFI 1 (b). Several new datasets have been incorporated to address the RFI including the NWIS DAS dataset and additional vantage point (VP) surveys.
1 (c)	The applicant is requested to confirm whether any on-going or additional surveying has been carried out since the application was lodged and, if so, the applicant is invited to submit any further survey data results and analysis and update the planning application documentation, as appropriate.	Additional ornithological surveys have been undertaken since submission of the Application. These additional surveys are described in Table A 1-1.
8 (a) (i)	Roseate Tern: Perrow et al. (2019) studied the at-sea foraging distribution of the Rockabill colony over one breeding season (2018), showing the species uses the nearby proposed array area. The EIAR discusses tracking data from Perrow et al. (2019) in the Technical Baseline (Appendix 15.1), however, unlike the accounts of other species, the relevant section of the EIAR appendix does not provide a summary figure of the Roseate Tern tracking data. Considering the importance of the area to Roseate Tern, available data should be considered in further detail and used to inform the assessment. The applicant is requested to present the information provided by Perrow et al. (2019) in the technical baseline and to consider the tracking data when assessing potential impacts to Roseate Tern.	The Developer notes An Coimisiún Pleanála's comments regarding the inclusion and use of roseate tern tracking data at Rockabill SPA from Perrow *et al*. (2019). A figure has not been included as the underlying tracking data were not available to the Developer for reproduction. However, the study has been reviewed and is cited in Section 3.8. Its findings on the spatial use of waters around the array area have informed the assessment in Addendum to Chapter 15 Offshore Ornithology. In the absence of raw data, no further analysis was possible; however, the assessment is based on the best available evidence, including Perrow et al. (2019), and is not prejudiced by this limitation. In addition, 12 additional months of North West Irish Sea (NWIS) Digital Aerial Survey (DAS) data (NWIS DAS), which recorded Roseate tern within the breeding season and in July, thereby providing greatly expanded spatial and temporal coverage of usage within and around the array area.

RFI Section	RFI	Relevance to Appendix
8 (a) (ii)	Red-throated Diver: The desktop review summarised in Table 15.3 of Chapter 15 of the EIAR does not appear to include the results generated from a series of Digital Aerial Surveys (DAS) undertaken over marine waters off Gormanstown (HiDef, 2019) that was commissioned by the Marine Institute and referenced in the National Parks and Wildlife Service (NPWS) Conservation Objective document for the NWIS cSPA. This survey data indicates a high density of Red-throated Diver Gavia stellata in the area of the coast west of the array, and overlapping with the proposed cable route. Densities were notably larger than those densities that informed the applicant's assessment of mortality caused by displacement-disturbance effects for this proposed development (i.e. 3.26 individuals km-2 on 29/12/2018; 1.35 individuals km-2 on 16/01/19; 3.45 individuals km-2 on 04/02/19; 2.99 individuals km-2 on 23/03/19). As well as being important for assessment of Red-throated Diver, the HiDef/Gormanstown 2019 surveys are also likely to be relevant for the assessment of other species that the applicant is requested to reconsider (e.g. Great Northern Diver *Gavia immer*, Common Scoter). As such, the applicant is requested to include the HiDef/Gormanstown 2019 survey data in the assessment of impacts on the marine birds of the NWIS cSPA in relation to this proposed development, including in the assessment associated with the cable route. The applicant is requested to review the EIAR and Natural Impact Statement (NIS) accordingly.	The Developer notes the request to include the HiDef (2019) data within the analysis (covering the waters off of Gormanstown). The Developer chose to use the 12-month NWIS DAS dataset, which provides the most spatially comprehensive, high-resolution dataset available for the assessment, with >16% coverage of the SPA and >18% coverage within the 10 km displacement assessment buffer. Given this extensive coverage and the consistently low diver usage within and around the array area, the Developer considers the NWIS DAS dataset sufficient to characterise baseline diver distribution without requiring additional targeted winter surveys. The NWIS DAS dataset provides sufficient temporal survey coverage of one survey per month in line with the OWF industry standards. Based on the combined evidence, the NWIS DAS dataset represents the most robust and proportionate basis for assessing potential displacement of red throated diver within both the PFI +10 km buffer and the ECC +2 km buffer. This RFI is addressed below in Section 3 (Paragraph 3.14.1).
8 (a) (iv)	Migratory Waterbirds: Chapter 15 of the EIAR, and NIS Appendix 19 Offshore and Intertidal Ornithology Migration Collision, address migratory waterbird species. The DAU notes that a significant number of migratory waterbirds (in terms of species and absolute numbers) migrate to and from Ireland	The Developer used the latest Marine Directorate migratory CRM tool to assess collision risk to migratory waterbirds and found impacts to be negligible and not significant. The NIS similarly concluded no adverse effect on site integrity. Precautionary assumptions, such as assuming all migratory bird species in Ireland are present and fly within the collision-risk

RFI Section	RFI	Relevance to Appendix
	across the Irish Sea. The DAU observation raises concerns in relation to the lack of sufficient collection of spatially relevant field data at key migration times (i.e. spring and autumn) in the EIAR, combined with the acknowledged low confidence levels applied in relation to avoidance rates in the migratory Collision Risk Modelling (mCRM) Tool. The DAU states the information submitted is insufficient to assess the migratory movements of birds through the development area. The DAU has concerns that the proposed development has the potential to have significant impacts upon migratory waterbirds and the Conservation Objectives of the SPAs for which they are listed. The DAU recommends that the applicant develops and implements more appropriate survey methodologies to detect and robustly characterise and assess the level of bird migration through the proposed development area, working collectively with the other Irish Sea ORE applicants. The Board notes the Vantage Point survey results submitted by the applicant have spatial limitations in terms of robustness and have not been used in quantifiable assessments. There is also limited information on flux or passage of birds through the proposed array area itself during migration (east-west and north-south). The data query is only partially filled by the applicant's approach to assessing collision risk, where GIS and straight-lines have been applied to identify potential migration pathways/flight routes to assess the proportion of flights (as a proxy for population) which may pass through the proposed array area. Having reviewed all the information presented, the Board requests that further assessment is carried out regarding impacts to migratory species. The applicant is requested to address the purported data gap relating to migratory birds to enable the assessment of potential impacts of the	zone, mean that the conclusions are robust and additional surveys would not change the outcome. Existing datasets from the literature and evidenced assumptions on migratory corridors provide stronger evidence than could be collected on-site. Alternative methods such as radar monitoring and boat-based surveys were not used because they have major limitations, including poor species identification, restricted spatial coverage and unreliable offshore flight-height data. Radar is particularly unsuitable in the Irish Sea, where migration routes are broad and diffuse rather than concentrated. Instead, dedicated vantage-point surveys were carried out throughout the autumn migration periods in 2024 and 2025 to better characterise coastal migratory movements. Passive acoustic monitoring (PAM) was also deployed to capture migration activity during periods when visual surveys were not feasible, including at night and in low-visibility conditions. Species-specific behavioural and ecological data were therefore used as more reliable CRM inputs. The current assessment already incorporates precautionary parameters and demonstrates no significant impact on migratory waterbirds. Further data collection would not alter outcomes due to the inbuilt precautionary assumptions that all migratory bird species in Ireland are present and fly within the collision-risk zone. This RFI is addressed below in Section 2.8.

RFI Section	RFI	Relevance to Appendix
	proposed development. Radar (horizontal and vertical surveys) (or similar) at the array area during peak migration periods should be utilised to provide site-specific data, which could be used to support the applicant's current assessment and provide quantitative information on passage of birds to feed into collision modelling. Should radar not be conducted and an alternative survey methodology utilised, comprehensive justification for the alternative should be provided. Peak migration periods during which data are to be collected can be further informed through review of existing data and published literature relevant to the project area and region. Whilst the DAU makes reference to the key migration times being spring and autumn, the Board considers that migration information during the winter months would also be of assistance to the assessment (e.g. irruptive cold weather movements from the continent and UK). The applicant is invited to consider this aspect for inclusion also. The applicant should note reliance on literature to fill knowledge gaps, while useful, does not provide adequate data to ensure a comprehensive assessment of potential effects on birds.	
8 (a) (v)	Terrestrial Bird Species: The DAU considers there to be deficiencies in the assessment of land-based avifauna, with CRM data based on general assumptions. The DAU recommends additional data and consideration of survey/monitoring options such as targeted deployment of passive acoustic devices at headlands and offshore nocturnal boat transects; review of available ringing/tracking data for migratory species and/or species which are known/likely to conduct staging/dispersal movement; and thermal imaging devices (hand-held/drone) surveys targeted at likely peak periods of passage.	**The Developer has undertaken an expanded programme of VP surveys during the autumn migrations of 2024 and 2025 alongside a PAM programme during 2024 and 2025. This RFI is addressed in Section 2.8.**

RFI Section	RFI	Relevance to Appendix
	The Board requests that further assessment is carried out regarding impacts on terrestrial bird species. The applicant is requested, having regard to the above comments to address the purported data gap and potential impacts of the proposed development on terrestrial birds.	
8 (a) (vi)	Baseline Data Vintage: The Board queries the age and relevance of the submitted aerial and boat-based survey data used in the application, in particular considering the 2022 Highly Pathogenic Avian Influenza (HPAI) season, which had significant negative impacts on a range of seabird species. The applicant is requested to provide justification that the original digital aerial surveys and boat-based data remains relevant and appropriate at the point of submitting additional information to support the proposed development.	The Commission's query as to the age and relevance of data is addressed through inclusion of design refinements and the expanded monitoring programmes, including both the 12-month NWIS DAS survey , additional VP surveys and PAM surveys. Furthermore, the reference populations have been updated for common gull and black-headed gull in response to RFI 8 a) viii, to use the more spatially appropriate Western Irish Sea population estimates from Jessop *et al*. (2018). This RFI is addressed below in Section 2.4: Baseline Environment and Section 2.5: Site-specific surveys and Section 2.13: Reference Populations.
8 (a) (vii)	Regional Breeding Population: The robustness of population calculations used within Chapter 15 Ornithology, and associated appendices, is important in assessing the potential effects of the proposed development. The Board notes that the EIAR (Chapter 15, Table 15.17 and Appendix 15.1, Table 2.12) presents two methods for estimating regional breeding season populations against which impacts are assessed in the EIAR. Method 1 (applied in the EIAR and used to inform assessment conclusions) involves the number of breeding adults in the breeding season plus the number of immatures in the previous non-breeding season. Method 2 (presented in the EIAR but not used to inform assessment conclusions) applies the ratio of adults to immature birds in the population to the number of breeding adults in the breeding season. The applicant is requested to provide evidence-based justification for applying its chosen method.	In response to the RFI the developer acknowledges ACPs preference for Method 2 in estimating the regional breeding populations. The underlying values and calculations that inform the process by which the regional breeding population values were produced are therefore presented in an updated Table A2-16 to allow validation of the methodology. This RFI is addressed below in Section 2.13: Reference Populations.

RFI Section	RFI	Relevance to Appendix
	Method 2 is considered to be the more appropriate and precautionary method to apply for estimating regional breeding season populations and the applicant is requested to use this methodology to inform assessment conclusions. The applicant is requested to clearly present the values and equations used to derive the population estimates, including their sources (e.g. a list of colonies or sites included within the reference populations), to allow validation of the methodology. The applicant is requested to also address this issue in the Cumulative Effects Assessment (CEA) chapter.	
8 (a) (viii)	The applicant has used the Ireland-wide populations of Black-headed Gull Ichthyaetus ridibundus and Common (Mew) Gull Larus canus, resulting in an overestimation of the reference population which may be affected by the project and, therefore, underestimation of potential impacts. The applicant is requested to apply more appropriate regional population estimates to these species and revise the baseline and assessment accordingly.	The Board highlighted that the use of Ireland-wide populations for black-headed gull and common gull was inappropriate, as it risked overestimating the reference population and therefore underestimating potential project-level impacts. In line with this request, the regional populations for both species have been revised using Western Irish Sea population estimates, derived from the Jessop *et al*. (2018) dataset and supporting calculations. These revised regional population estimates for both species are likely conservative. This is because the underlying survey data represent single-period “snapshots”, which do not capture the full temporal variability in bird use of the region. In addition, black-headed gulls and common gulls are not confined to the Western Irish Sea; they form part of a wider, mobile metapopulation that moves freely across the broader Irish Sea and adjacent waters. As a result, estimates derived solely from Western Irish Sea survey coverage inevitably exclude birds utilising the region at other times, and therefore provide a precautionary underestimation rather than a complete representation of the true regional population. All other species retained their existing regional populations, as the RFI did not identify deficiencies requiring further

RFI Section	RFI	Relevance to Appendix
		revision, and the underlying datasets remain appropriate for the purposes of the EIA. This RFI is addressed below in Section 2.13: Reference Populations.
8 (a) (xi)	Breeding Season of Common Guillemot: The Board does not agree with the applicant's determination that the Irish east coast Common Guillemot Uria aalge breeding season ends at the end of June. The evidence presented by the applicant is based on a study conducted at a colony in Scotland (Dunn, 2020, 2022) and suggests that the breeding season 'ends' around 10 July, although the July DAS were flown on 18 July 2020, 05 July 2021, and 04 July 2022. There are consequences to regarding the July period as non-breeding which results in the breeding mean peak count bio season for the proposed array area plus 2 km, to be 1,813 (95% Cis 1,258 – 2,385) individuals as opposed to 13,703 (95% Cis 8,940 – 18,414) individuals (see Table 3-1 of Appendix 15 of the EIAR / Appendix 17 of the NIS, Offshore and Intertidal Ornithology Displacement Analysis). This has consequences when apportioning estimated mortality figures arising from displacement impacts to Common Guillemot populations breeding at Lambay Island SPA, Ireland's Eye SPA and others. The applicant is requested to apply the UK seasons (Furness, 2015) for Common Guillemot (breeding season: March to July; non-breeding season: August to February), aligning with the approach taken for other species assessed.	This RFI requested that July be treated as part of the breeding season; the Developer acknowledges the Board's position on guillemot bio-seasons and agrees that the approach to bio-seasons proposed in Furness (2015) is appropriate for many seabird species. However, the Developer does not propose to amend the guillemot bio-season definitions due to the site-specific evidence presented in Section 2.12, which has been expanded since the RFI response was submitted. Recent large-scale DAS data collected across the NWIS SPA (NWIS DAS) further indicate that post-breeding dispersal was already underway for several species in July. This is reflected in the substantial increase in bird numbers recorded during this month, alongside a more dispersed spatial distribution of individuals. This pattern was particularly evident for guillemot, supporting the continued use of the existing bio-season definitions. Accordingly, July continues to be treated as a post-breeding period in this assessment, although updated apportioning assumptions have been applied to reflect that a greater proportion of birds are still likely to be associated with breeding colonies during this month. Alongside this approach the generic approach using the Furness (2015) bio-season definitions is also presented for context. This RFI is addressed below in Section 2.12.
8 (a) (x)	The DAU notes there appear to be miscalculations or typographical errors with the display of the survey data and its analyses in relation to Common Guillemot. Table 2.40 of Appendix 12 Offshore and Intertidal Ornithology Technical Baseline presents a zero count of Common Guillemot for the November 2020 survey. This is at odds with the non-	This was due to raw counts from guillemot/razorbill being used in the heatmap in November 2020. This inconsistency has been resolved in Section 3 below.

RFI Section	RFI	Relevance to Appendix
	zero density Common Guillemot heat map for November 2020 (page 84), and it does not correspond to the estimate of density and abundance for Common Guillemot for November 2020. The Common Guillemot Density Heat map (dated February 2021, page 85) indicates that no Common Guillemots were present during that particular survey, which corresponds to the zero count in Table 2.40 but which appears to be at odds with the non-zero estimates of abundance and density for Common Guillemot for February 2021. The applicant is requested to address the issues raised.	

Table A 1-1: Changes made to Appendix A15.1 in response to the RFI.

Section	Relevant Update
Section 2.4: Baseline Environment	The key change within this section is Table 2.1 from the 2024 Offshore Ornithology Technical Baseline has now been replaced with Table A2.1 which includes the 12-months of DAS data collected across the NISA offshore wind farm site and broader North-West Irish Sea (NWIS) Special Protection Area (SPA).
Section 2.5 Site Specific Surveys	The key change for this section is the inclusion of the 12-months of DAS data collected across the NISA offshore wind farm site and broader North-West Irish Sea (NWIS) Special Protection Area (SPA) (NWIS DAS).
Section 2.7: DAS	Updates include the addition of a new NWIS DAS section which provides an overview of the 12-months of DAS undertaken; revised bootstrapping and seabird-apportioning methods; expanded detail on estimating bird abundance and density; updated availability-bias correction values from recent literature; removal of an unreliable flight-height calculation method; and a new section describing the full 12-month DAS survey programme and survey coverage across the North West Irish Sea SPA.
Section 2.8: Coastal Vantage Point Surveys	They key change to this section is the inclusion of the expanded VP survey programme that was undertaken during the autumn migration of 2025 at the original VP locations and a new VP location at Rockabill Island to address the RFI 8 (a) (iv) and 8 (a) (v).
Section 2.10: Desktop Data Sources	The key change to this section is that the ObSERVE dataset was excluded from the updated assessment because the NWIS DAS provided a more recent, larger and more spatially relevant dataset for assessing key species within the SPA. ObSERVE was instead used only to help evaluate regional populations and provide contextual population information, while the section itself remains largely unchanged to allow comparison with species accounts in Section 3.
Section 2.11: Definition of Bio Seasons	No changes have been made to species bio-season definitions in response to the RFI. In particular, RFI 8. (a) (ix), which requested that July be included within the guillemot breeding season, was fully considered. However, the Developer does not propose to amend the guillemot bio-season definitions due to the site-specific evidence presented in Section 2.12, which has been expanded since the RFI response was submitted. Recent large-scale DAS data collected across the NWIS SPA (NWIS DAS) further indicate that post-breeding dispersal was already underway for several species in July. This is reflected in the substantial increase in bird numbers recorded during this month, alongside a more dispersed spatial distribution of individuals. These patterns were particularly evident for guillemot, kittiwake and razorbill, supporting the continued use of the existing bio-season definitions.

Section	Relevant Update
Section 2.12: Guillemot Bio Seasons	This section has been updated to address the RFI concerning guillemot bio-seasons (RFI 8. a) ix.). The RFI requested that July be treated as part of the breeding season. In response, the Developer has reviewed all available evidence and incorporated the expanded DAS datasets. These consistently show a substantial increase in guillemot abundance and a wider spatial distribution in July, indicating the onset of post-breeding dispersal rather than continued breeding activity. Behavioural data and survey timing further support this conclusion. Accordingly, July continues to be treated as a post-breeding period in the assessment.
Section 2.13: Reference Populations	No major changes to the regional population estimates were required in response to the RFI. However, RFI 8 (a) (viii) highlighted that the use of Ireland-wide populations for black-headed gull and common gull was inappropriate, as it risked overestimating the reference population and therefore underestimating potential project-level impacts. In line with this request, the regional populations for both species have been revised using Western Irish Sea population estimates, derived from the Jessop *et al*. (2018) dataset and supporting calculations.
Section 2.15: Species Accounts	The key change to this section is the inclusion of the 12-month NWIS DAS programme that has been used to inform the updated species accounts.
Section 3: Results	For each species account, updated abundance and density estimates have been produced using both the original MAC DAS dataset combined with the more recent NWIS DAS dataset, reflecting the refinement of the spatial extents of the WTG layouts for the proposed development, defined by the Projected Footprint of Infrastructure (PFI). These updates are presented within the revised tables in this section. In addition, species distribution maps for the full NWIS SPA are provided, along with monthly abundance estimates for the entire NWIS SPA.

1.2 Background

1.2.1 The aim of this report is to present the findings from a desk-based data review and site-based baseline of offshore ornithological surveys and incorporate any new data following the submission of the RFI. These findings are used to determine those receptors which characterise the baseline environment and are of relevance to the assessment of potential impacts from the proposed development within Chapter 15: Offshore and Intertidal Ornithology.

1.2.2 Since submission of the Planning Application in June 2024, the Developer has implemented additional design refinements, including a reduction in the offshore infrastructure footprint within which the turbines will be placed to reduce coverage of the proposed development within the NWIS Special Protection Area (SPA), and therefore reducing the area from which some birds may be displaced. This reduced area is termed the Projected Footprint of Infrastructure (PFI)[1], the area within the array area within which infrastructure will be placed. The PFI represents the overlap of Project Options 1 and 2, including the Limit of Deviation (LOD), and is therefore a conservative approach, given that only one project option will ultimately be constructed. The remainder of the array area will not have any permanent infrastructure placed within it but may be used for temporary works.

1.2.3 The study area considered in the context of offshore ornithological receptors now only includes the PFI, covering 57.7 km^2, up to a 10[2] km buffer surrounding the PFI, and the offshore Export Cable Corridor (ECC) plus 2 km buffer covering a further 67.8 km^2.

1.2.4 This report outlines the background to the proposed development and the need to characterise the baseline environment for offshore ornithological species. The baseline will provide a *"necessary benchmark against which change may be predicated, detected, mitigated and measured when seeking to detect change as a result of impact from a project"* (DCCAE, 2018). This includes information on the site and the potential impact footprint, a comprehensive account of species that are expected to be present, their abundance and spatial and temporal distribution characterised from site-specific data collection.

1.2.5 This report presents findings from a desk-based review and site-based baseline offshore ornithological surveys. This desk-based study is additional to the standard assessment guidance and was undertaken in acknowledgement that the proposed development now sits within the NWIS SPA, which was not the case when its Maritime Area Consent (MAC) was awarded. These findings are utilised to determine the receptors which make up the baseline environment and are relevant to assessing the potential impacts from the proposed development within Chapter 15: of the 2024 EIAR and Chapter 15: Offshore and Intertidal Ornithology.

[1] The PFI represents a defined ornithology study sub-area within the overall array area, where all permanent offshore array infrastructure will be located. The PFI has been developed following design refinements to minimise spatial overlap with sensitive receptors and occupies just 57.7 km^2, representing 2.5% of the NWIS cSPA.

[2] The full 10 km buffer is only assessed for the diver receptors. Other ornithological receptors are assessed against a 2 km buffer. However, the 10 km buffer has been defined here as the full extent of the area considered in the context of offshore ornithological receptors.

1.2.6 As birds rely on and interact with other habitats and species this section should be read alongside the following chapters (and their associated appendices) of the Environmental Impact Assessment Report (EIAR):

- Addendum to Chapter 13: Fish and Shellfish Ecology and associated 2024 EIAR chapter (in terms of key prey resources available to birds) (hereafter the 'Fish and Shellfish Chapter'); and
- Addendum to Chapter 12: Benthic Subtidal and Intertidal Ecology and associated 2024 EIAR chapter (in terms of relevant habitat and key prey resources available to birds) (hereafter the 'Benthic Ecology Chapter'); and
- Addendum to Chapter 23: Biodiversity and associated 2024 EIAR chapter (which covers onshore ecology for onshore birds).

2 Methodology

2.1 Introduction

2.1.1 The proposed development will comprise offshore wind turbine generators (WTGs), offshore converter station, inter-array cables, interconnector cables and offshore and onshore export cables taking power to an onshore converter station. The proposed development site is located approximately 11.3km off the east coast of Ireland at the nearest point to the mainland.

2.2 Study Area

2.2.1 The full extent of the offshore and intertidal ornithology study area is now defined as the PFI plus a 10 km buffer, reflecting the requirements of the updated red-throated diver assessment (Section 3, Paragraph 3.14.1). This revised study area supersedes the original scoping area (the MAC boundary plus a 4 km buffer) and provides the maximum spatial extent used to characterise offshore ornithological receptors. In addition to the original baseline DAS dataset collected across the MAC Boundary +4 km area (termed MAC DAS), a further 12 months of DAS covering the full North-West Irish Sea (NWIS) SPA were undertaken (termed NWIS DAS). These additional data now form an integral part of the baseline. Together, the combined datasets, supported by desk-based sources described in Section 2.11, have been used to generate abundance and density estimates for all relevant species and to account for regional and biogeographical population contexts. To do this, abundance and density estimates were calculated separately for the MAC DAS, and NWIS DAS, and the two datasets combined to provide a total of 41 months of DAS data, representing a dataset substantially larger than the standard 24 months generally used for baseline characterisation. This ensures that the baseline fully captures the mobile nature of seabirds, interannual variability and other ornithological receptors when defining those relevant to the assessment.

2.2.2 The study area used within this chapter for the purposes of the impact assessment covers the following areas:

- PFI +10 km buffer;
- ECC +2 km buffer; and
- Intertidal area within the proposed landfall site encompassing the area between the High Water Mark (HWM) and Low Water Mark (LWM).

2.2.3 The relevant Zone of Influence (ZoI) is dependent on the baseline data gathering, the nature of the impact, and the sensitivity of the species to that impact. This varies by species and impact and therefore the key ZoIs are:

- The PFI only for collision impacts to seabirds and migratory birds;
- PFI plus a 2 km buffer for disturbance and displacement impacts to seabird species (excluding ducks and divers) from activities and infrastructure in the array area;

- PFI plus a 4 km buffer and the ECC plus a 2 km buffer for disturbance and displacement impacts to seaducks and divers (excluding red-throated diver) from activities and infrastructure within the array area and ECC, respectively;
- PFI plus a 10 km buffer and the ECC plus a 2 km buffer for disturbance and displacement impacts to red-throated diver from activities and infrastructure within the array area and ECC, respectively; and
- The nearshore ECC only for disturbance and displacement impacts to birds found within the intertidal and nearshore area (assessed qualitatively).

2.2.4 During the breeding season, the Irish Sea region provides foraging, loafing and preening habitat for a range of seabirds, including (but not limited to) gannet, *Morus bassanus*, various gull species, including kittiwake, *Rissa tridactyla*, several species of auk and terns. During the non-breeding season, the region supports numerous species; divers and seaducks reside in more inshore waters, while auks are found further offshore. The Irish Sea is also subject to pronounced passages of birds travelling to and from mainland Britain, Europe and further afield (Stienen *et al.,* 2007). This includes the migratory movements of non-seabirds such as waders, wildfowl, passerines and non-passerines. Due to the mix of birds present, the array area is used at different times of the year by birds (i) overwintering in the area; (ii) foraging from nearby breeding coastal colonies; and (iii) on autumn migration dispersal and spring migration return.

2.3 Data Collection and Collation

2.3.1 Data to inform the characterisation of the study area has been collated by combining information from a series of site-specific surveys supplemented with a thorough desk-based study of published data. Data were drawn from previous site surveys, studies commissioned by the proposed development and existing published datasets.

2.3.2 In addition to the data sources identified relevant to the Irish Sea and study area, consideration has been given to relevant scientific literature and research material in relation to ornithology.

2.3.3 More details on the various datasets used in this report are provided in Section 2.4 below.

2.4 Baseline Environment

2.4.1 The data sources in Table A2-1 were considered when determining the ornithology baseline.

Table A 2-1: Data sources considered in the development of the ornithology baseline.

Source	Date	Summary	Temporal and spatial coverage
New data			
NISA – NWIS DAS data	2024-2025	DAS conducted by APEM Ltd. monthly between September 2024 and August 2025.	Twelve monthly surveys covering the NWIS SPA. This included a 10 km buffer on the PFI and the full ECC +2 km buffer
NISA – Coastal vantagepoint surveys including Rockabill Island	2025	Vantagepoint surveys conducted at three locations to inform the migratory bird assessment.	Weekly vantagepoint surveys from three locations throughout the 2025 Autumn migration season (Sep–Dec 2025)
NISA – Coastal PAM surveys	2025	PAM surveys conducted to inform the migratory bird assessment on Rockabill Island during the 2025 autumn migration period.	PAM surveys throughout the 2025 Autumn migration season on Rockabill Island (Sep-Dec 2025)
Existing project survey data			
NISA – MAC DAS data	2020-2022	DAS conducted by APEM Ltd. Monthly between May 2020 and October 2022.	Maritime Area Consent (MAC) plus a 4 km buffer. A total of 16 transects with 2.3 km spacing totaling 15% coverage of the survey area.
NISA – MAC Boat-based survey data	2019 – 2020	Vessel surveys were conducted in November 2019, January 2020, March 2020, August 2020, June 2021, July 2021, and July 2022.	MAC plus a 4km buffer. Variable transects and coverage.
NISA – Landfall surveys	2021 – 2022	Intertidal bird surveys were conducted at the selected landfall site.	Includes the intertidal area and immediate onshore area of the landfall.
NISA – Coastal vantagepoint surveys	2019 – 2021	Vantagepoint surveys conducted at two locations to supplement DAS data.	Includes the intertidal area and out to the array area at the north and south edge at each location respectively.
Existing offshore windfarm 'grey literature'	Various dates	Information obtained from various offshore windfarm Environmental Statements (i.e. Awel-y-Mor and Mona OWF).	Includes data across the broader region for the array area.
Relevant literature on seabird distribution, population sizes, migration routes and foraging ranges			
JNCC Report No. 267 (Pollock *et al*. 1997)	1997	ESAS survey data collected between 1980 and 1997 in Irish waters, including a period of intensive surveys between 1994 and 1997, which targeted areas around	Offshore waters around Ireland, within and beyond Ireland's continental shelf.

Source	Date	Summary	Temporal and spatial coverage
		Ireland with poor survey coverage. Used to provide historic context for the wider Irish Sea.	
ObSERVE (Jessop *et al*. 2018)	2018	Visual aerial surveys of the western Irish Sea. Four surveys: summer 2015, winter 2015, summer 2016 and winter 2016.	Offshore waters around Ireland, within and beyond Ireland's continental shelf.
Designated sites	Various dates	Information of Special Protection Areas (SPAs) and other designations relevant to Important Ornithological Features (IOFs) with potential connectivity to NISA. Key source of information will be Natural England designated sites portal.	Country wide information on designated sites.
Seabird Monitoring Programme (SMP) (BTO, 2023)	2015-2025	Online database of seabird colony counts in Ireland and UK – most recent data from Seabirds Count national census 2015-2025. Used to provide SPA reference populations for the EIAR.	Colony counts in Ireland and UK
NPWS Published Report (Cummins *et al*. 2019)	2019	The Status of Ireland's Breeding Seabirds: Birds Directive Article 12 Reporting 2013 – 2018. Used to provide SPA reference populations for the EIAR.	Ireland
British Trust for Ornithology (BTO) Wetland Bird Survey (WeBS) and Non-Estuarine Waterbird Surveys (NEWS)	Annual Reports	Annual survey reports of wetland waterbirds and intertidal birds. Though collected in the west coast of the UK can be drawn upon to consider the wider regional scale (e.g. potential movements of birds through the Irish Sea on migrations).	Coverage of UK intertidal and wetland zones.
Regional and national bird reports and atlases	Various	Atlases covering breeding and non-breeding birds within relevant areas, e.g. Birds in Ireland (Hutchinson, 2010), North-west European waters (Stone *et al*., 1995) and in Europe (BirdLife international, 2004).	Coverage across region at various intertidal and wetland and coastal areas.
Review of seabird foraging ranges - Woodward *et al*., (2019)	2019	BTO report updating foraging ranges of seabirds. These are used to consider connectivity with both designated sites and other OWFs. This report provides an update from previous information on foraging ranges from Thaxter *et al*., (2012).	Review of foraging ranges covered available information across the globe.
Literature on seabird foraging movements	Various	Various sources on seabird foraging (e.g. tracking data), including the FAME Project (Baer & Newton, 2012) and tern tracking data at Rockabill Island (Perrow *et al*., 2019)	Various sources in Ireland.

Source	Date	Summary	Temporal and spatial coverage
Non-breeding season populations of seabirds in UK waters: Population sizes for Biologically Defined Minimum Population Scales (BDMPS) – Furness (2015)	2015	Furness 2015 provides regional non-breeding season population sizes for relevant offshore ornithological receptors. Though focused on UK waters, population sizes in UK Western Waters are considered relevant to Ireland.	Coverage across the UK.
The status of Ireland's Breeding Seabirds: Birds Directive Article 12 Reporting 2013 – 2018 – Cummins *et al.*(2019)	2019	NPWS commissioned report providing data on breeding seabird population sizes and trends of Ireland's breeding seabird species.	Coverage across Ireland
Literature on migratory bird populations and movements relevant to NISA	Various	Various sources on migratory birds and movements, including 'The Migration Atlas: Movements of the birds of Britain and Ireland' (Wernham *et al.*, 2002), and literature on the risk of OWF developments to migratory birds (Wright *et al.*, 2012).	UK and Ireland.
Bird breeding ecology	Various dates	Information on the breeding ecology of various bird species e.g. Cramp and Simmons, 1977-94; Del Hoyo *et al.*, 1992-2011; Robinson, 2005.	Generic information applicable to NISA IOFs.
JNCC review of seabird demographic rates (Horswill and Robinson 2015)	2015	Information on demographic rates of seabirds, used to inform the EIAR assessment.	Predominantly UK based, with data from further afield also considered.
The status of the UK's breeding seabirds. Burnell *et al.* (2024)	2024	Seabird census results showing widespread but variable changes in British Isles seabird populations between the Seabird 2000 survey and the 2015–2021 Seabirds Count.	British Isles from 2015-2021
Relevant literature on the vulnerability of birds to OWFs			
Potential impacts of offshore windfarms on birds	Various dates	Various peer reviewed scientific literature regarding the potential impacts from OWF e.g. (Garthe and Hüppop, 2004; Drewitt and Langston, 2006; Stienen *et al.*, 2007; Speakman *et al.*, 2009; Langston, 2010; Band, 2012; Cook *et al.*, 2012; Furness and Wade, 2012; Wright *et al.*, 2012; Furness *et al.*, 2013; Johnston *et al.*, 2014a,b; Cook *et al.*, 2014; Dierschke *et al.*, 2017; Jarrett *et al.*, 2018; Leopold & Verdaat, 2018; Mendel *et al.*, 2019; Peshko *et al.*, 2022;	Generic information applicable to the proposed development IOFs.

Source	Date	Summary	Temporal and spatial coverage
		Willmott *et al*. 2023; Garthe *et al*. 2023; Trinder *et al*., 2024; Critchley *et al*., 2025)	
Potential impacts resulting from highly pathogenic avian influenza (HPAI)	Various	Various literature regarding the impacts of HPAI on seabird species is considered in relation to potential additional impacts on ornithological receptors assessed in this EIAR. These include: Paradell *et al*., (2023), Lane *et al*., (2023), Pearce-Higgins *et al*., 2022). Available information on HPAI from sources such as Birdwatch Ireland and the BTO is also considered wherever relevant.	Ireland and further afield.

2.5 Site-specific surveys

2.5.1 The requirement for data gathering to inform the baseline to detect any impact attributable to the development from natural levels or other developments is provided by DCCAE (2018) Guidance Part 1. The DCCAE Guidance recommends that three years of ornithological baseline surveys should be undertaken where no data previously exist, or a reduced period of two years depending on the sensitivity of site and availability of existing data (DCCAE, 2018). The approach taken is in line with the guidance and requirements in the UK industry. The proposed development also has supplementary vessel-based data to help inform the baseline. In accordance with these requirements, the sections below provide details of all site-specific surveys undertaken across the study area, which now comprises more than three years of survey data, with 41 months of DAS forming the main basis of the assessment.

2.5.2 Monthly boat-based ornithology and marine mammal surveys were initially planned as the primary method of at-sea data collection at the proposed development. However, boat-based surveys were no longer possible due to restrictions on social distancing and travel as a result of Covid-19 global pandemic in spring 2020. In accordance with Irish Government guidance the principal survey method was switched to DAS, with surveys commencing in March 2020. However, five additional supplementary vessel surveys were also conducted in 2021 and 2022 after the commencement of DAS data collection.

2.5.3 The original site-specific DAS survey extent mirrored the array area within the foreshore licence plus a 4km buffer. The DAS survey extent was updated in November 2020 to include the entire MAC boundary (which included the small area beyond 12nm that was not within the original site specific DAS survey extent) plus a 4km buffer (MAC presented as pink in Figure A 2-1) plus a 4 km buffer area. This resulted in 16 transects across the area for original surveys, spaced 2.3 km apart with a minimum of 15% coverage in the original survey area. Notably the revised site boundary lies fully within the survey area covered during the year 1 baseline surveys. In the updated survey area, data were collected across 18 transect lines, also spaced 2.3km apart with a minimum coverage of 15%. The final area array is a subset of the full survey area as shown in Figure A 2-1.

2.5.4 For the most recent data collection effort, a 12-month programme of DAS was undertaken to collect baseline information on the entirety of the NWIS SPA (2,333 km^2), with an entire survey area of 2,396 km^2 when including other SPAs (Rockabill SPA) and Special Areas of Conservation (SAC) within the SPA. Multiple survey layouts were developed to accommodate potential restrictions associated with controlled airspace. The primary design (Plan A) utilised contiguous east–west transects, while alternative layouts (Plan B and Plan C) incorporated modified transect arrangements to reduce or avoid time within the Dublin Airport Control Zone (CTR) when access was limited by Dublin Airport.

2.5.5 Both the MAC DAS and the NWIS DAS data were used together for baseline characterisation and subsequent assessments, providing a total of 41 months of DAS data across the PFI and surrounding 4 km buffer (with the NWIS DAS also providing coverage of a surrounding 10 km buffer for 12 months which was not required during the original 29 months of data collection).

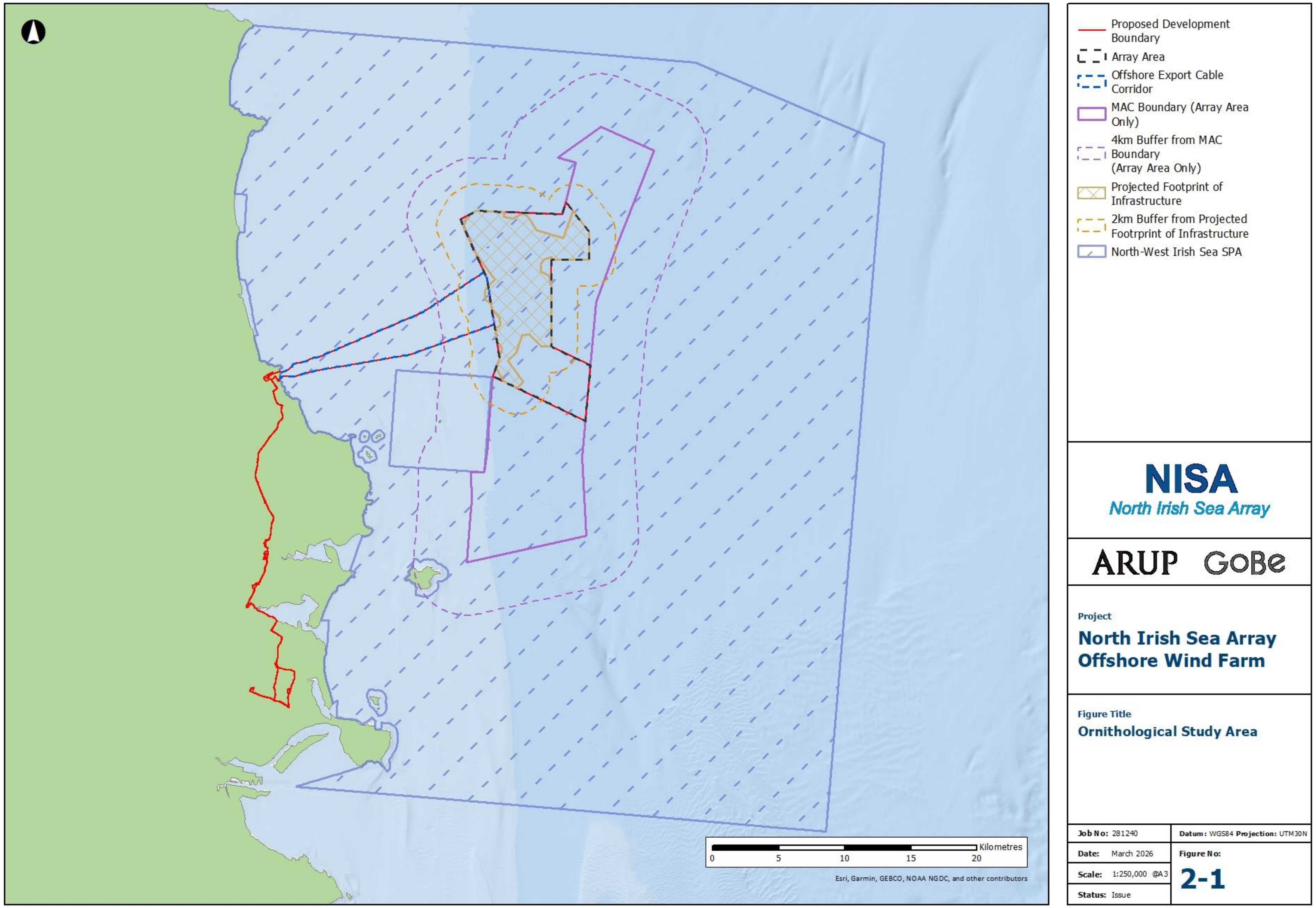

Figure A 2-1: Ornithological Study Area.

2.6 Vessel Surveys

2.6.1 As part of the baseline characterisation for the proposed development, vessel surveys have been undertaken across seven months, with three surveys undertaken between November 2019 and March 2020, followed by a further four supplementary surveys in August 2020, June 2021, July 2021 and July 2022, corresponding to the bird breeding seasons (details presented in Table A2-2). Vessels were conducted using European Seabirds at Sea (ESAS) methods, undertaken by accredited and experienced bird surveys. This methodology is widely used to record the distribution of seabirds and has been widely adapted into baseline recording for offshore wind developments.

- During Survey 6 (21st July 2021), data was collected for all observed species, and a second survey (23rd July 2021) focused on collecting flight height data, and focussed only on flying gulls, terns and gannets. This data was collected to provide an additional dataset that can be used to compare site-specific data against both generic flight heights available in the literature and against flight height data collected obtained using DAS. Birds in flight were recorded as follows:
- Flight heights of <10m recorded to the nearest metre;
- Flight heights of 10 to 50m recorded to the nearest 5m;
- Flight heights of 50 to 100m recorded to the nearest 10m; and
- Flight heights of >100m recorded to the nearest 20m.

2.6.2 Data on the recorded species is presented in Section 3, with flight height data presented in Section Vessel surveys.

2.6.3 Additionally, Survey 7 (July 2022) was undertaken as a supplementary survey with the aim of gathering flight height data of relevant species and identifying species which are more recorded on DAS to a species group (e.g. unidentified tern species'). Consequently, data on less abundant species (e.g. common scoter *Melanitta nigra*) is not presented for this survey.

Table A 2-2: Timings of vessel surveys undertaken for the proposed development.

Aerial survey number	Date	Timing
1	28th November 2019	08:08 – 16:44
	29th November 2019	07:59 – 16:53
2	18th January 2020	08:24 – 16:28
	19th January 2020	09:02 – 16:31
	20th January 2020	09:55 – 14:14
3	5th March 2020	10:10 – 17:32
	6th March 2020	07:38 – 14:19
4	6th August 2020	06:39 – 13:33
	7th August 2020	06:36 – 12:40
5	21st June 2021	08:23 – 16:48
6	21st July 2021	10:37 – 14:47
	23rd July 2021	10:07 – 16:50
7	27th July 2022	12:41 – 19:51
	28th July 2022	07:43 - 15:21

2.7 DAS

MAC DAS

2.7.1 APEM Ltd began a 29-month programme of baseline DAS (MAC DAS) in May 2020 that were completed in October 2022, the survey dates are presented in Table A2-3. Data was collected via monthly transect surveys across the full MAC area of 195.9km^2 and a 4km buffer surrounding the site. Since these surveys were undertaken, there has been a reduction to the proposed development boundary. Consequently, the assessment focussed on the refined array area and appropriate buffer, not the full survey area (MAC + 4km buffer), see Figure A 2-2. All survey methodologies and data analysis was undertaken in line with guidance that is accepted in other markets (e.g. the UK).

2.7.2 The data collected were 1.5 cm ground survey distance digital still images, by a twin-engine aircraft flying at an altitude of 1,300 feet at a speed of approximately 120 knots. Images were collected along 18 transects across the project site and 4km buffer, with a minimum of 15% of the sea surface covered, during each survey, for analysis. Surveys were also conducted under the following environmental conditions:

- Cloud base: >1,700 feet;
- Visibility: >5 km;
- Windspeed: <30 knots;
- Sea state: 4 or less (Beaufort 5 or 6); and
- No icing conditions.

Table A 2-3: Date and timings of the DAS conducted by APEM Ltd between May 2020 and October 2022.

Aerial survey number	Date	Timing
1	13 May 2020	08:10 – 10:30
2	02 June 2020	16:26 – 18:20
6	18 July 2020	16:44 – 18:21
4	15 August 2020	12:51 – 14:42
5	10 September 2020	11:58 – 13:41
6	17 October 2020	11:11 – 12:48
7	13 November 2020	09:49 – 12:03
8	12 December 2020	12:11 – 13:59
9	21 February 2021	11:49 – 13:41
10	19 March 2021	13:16 – 15:19
11	07 April 2021	08:43 – 10:30
12	14 May 2021	08:54 – 10:41
13	03 June 2021	10:55 – 12:40
14	05 July 2021	12:18 – 14:04
15	22 August 2021	13:08 – 15:07
16	05 September 2021	09:48 – 11:27 & 14:03 – 14:13
17	08 October 2021	11:31 – 13:35
18	05 November 2021	12:55 – 14:46
19	05 December 2021	10:28 – 12:22

20	11 January 2022	10:26 – 12:29
21	11 February 2022	10:38 – 12:20
22	05 March 2022	09:45 – 11:41
23	01 April 2022	09:42 – 11:16
24	12 May 2022	13:40 – 15:23
25	04 June 2022	10:07 – 12:12
29	04 July 2022	11:51 – 13:39
27	06 August 2022	09:09 – 10:53
28	01 September 2022	13:04 – 14:48
29	01 October 2022	10:50 – 12:52

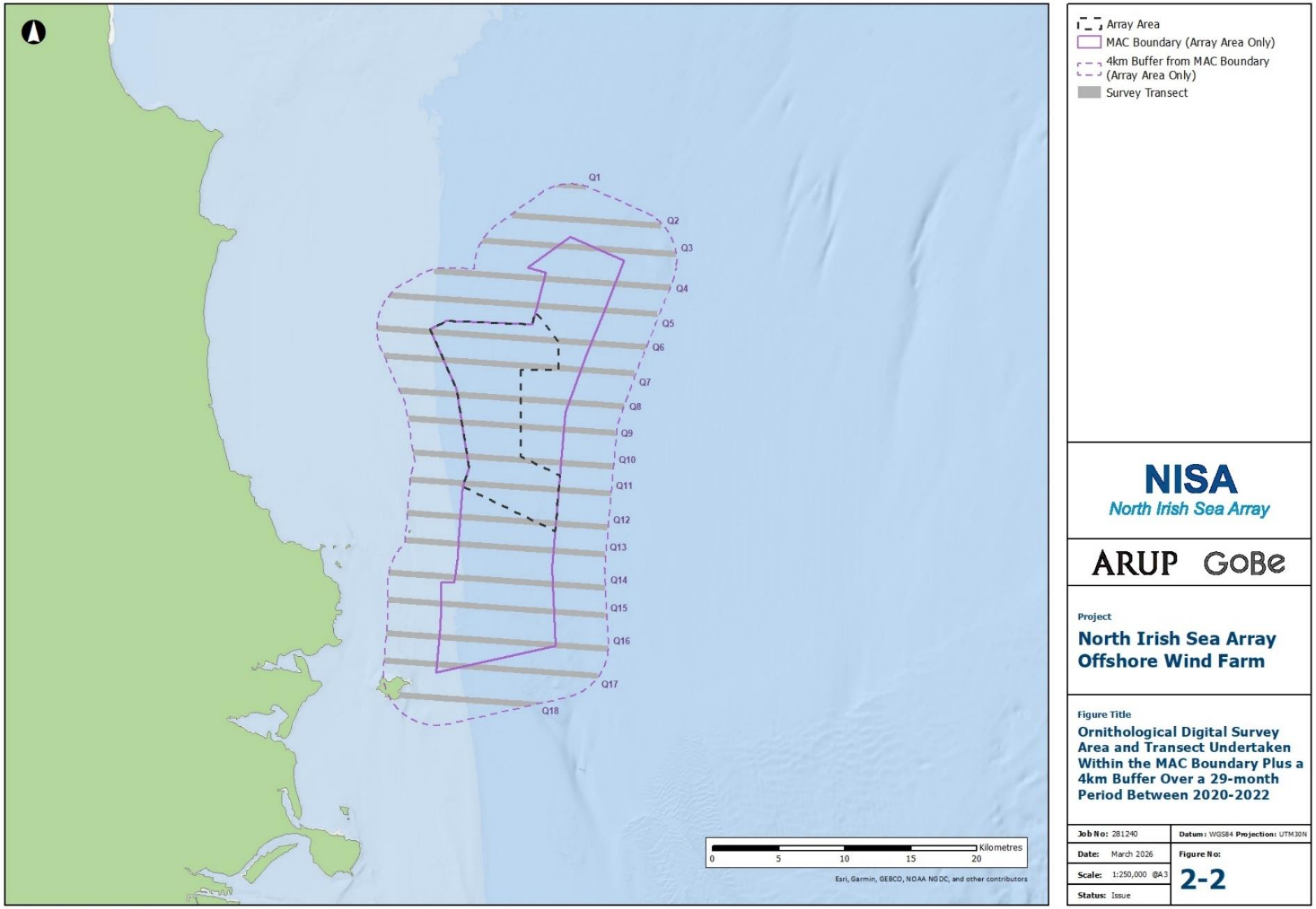

Figure A 2-2: Ornithological Digital Survey Area and Transect Undertaken Within the MAC Boundary Plus a 4km Buffer Over a 29-month Period Between 2020-2022.

2.7.3 Seabirds were identified to species level during image analysis, where identification to species level was not possible individuals were classified to the lowest taxonomic level. To ensure the accuracy of the species identification APEM Ltd conducted internal quality assurance, this also guaranteed any missed individuals were included in the data. The data collected during the DAS provided the information listed below.

- Date and time of each seabird and recorded during a survey;
- Corresponding coordinates for each seabird recorded;
- Age, sex and moult status of seabirds, where possible;
- Additional behavioural information whether a bird is sitting, flying, or diving; and
- Estimated flight heights, where possible.

2.7.4 As per the Image Analysis section above unidentified species were identified to the lowest taxonomic level/species group. To assign these individuals to a species, and avoid underestimating the species abundance, the proportion of identified birds within the corresponding species groups were used from that month's survey. During this apportionment process, non-parametric bootstrap samples generated as part of abundance estimate calculations were apportioned individually. This allows for variation between bootstrap samples in the number of individuals identified to group level as well as in the species proportions to be considered; and ensures that uncertainty in species-level abundances as well as group-level abundances is fully accounted for within the final apportioned abundance estimates. The upper and lower 95% confidence intervals are calculated from the apportioned (and corrected where availability bias applies) bootstrap samples. The CV is similarly calculated from the bootstrap samples and is based on the relationship of the standard deviation to the mean.

2.7.5 In cases where individuals have only been identified to group level and there are there are no positively identified species within that month's survey a hierarchical approach was used, increasing the temporal and spatial extent until positively identified individuals within the species group are included to allow apportioning:

- Same month, same year, same array area (site or buffer only);
- Same month, same year, full survey area (site and buffer);
- Same bio-season / season (combined sum), same year, same array area;
- Same bio-season / season (combined sum) same year, full survey area;
- Same bio-season / season (combined sum), same year, wider buffer (if available);
- Same bio-season / season (combined sum), same year, full survey area, different behaviour (for use in sitting / diving birds only);
- Same bio-season / season (combined sum), different year, same array area ;
- Same bio-season / season (combined sum), different year, full survey area;
- Same bio-season / season (combined sum), different year, wider buffer (if available);
- Same bio-season / season (combined sum), different year, full survey Area (different behaviour).

2.7.6 Where:

- 'Same area' refers to the abundance estimates calculated for the specific area being apportioned. This will either be the Site area or buffer only;
- 'Survey area' refers to the entirety of the area surveyed within that period (site area and buffers);
- 'Bio-season' refers to significant periods in the year for the apportioned bird species, for example, migration season or breeding / non-breeding seasons (if applicable);
- 'Season' refers to typical seasons within the year for apportioned marine megafauna species: spring, summer, autumn, winter.

2.7.7 For each monthly DAS, geo-referenced locations of all birds are recorded within each individual digital still image, which were used to generate raw counts. Bird locations contained within the survey area were then extracted using ArcGIS or QGIS, providing raw count data.

2.7.8 The raw counts were then divided by the number of images collected to give the mean number of birds per image (*i*). Population estimates (*N*) for each survey month were then generated by multiplying the mean number of animals per image by the total number of images required to cover the entire Study Area (A):

$$N = iA$$

2.7.9 Each transect in the study area was treated as statistically independent. Non-parametric block bootstrap methods were used for variance estimation. A variability statistic was generated by re-sampling with replacement from the raw count data 1000 times (Buckland, *et al*., 2004). To ensure that equal transect effort was sampled across each bootstrap iteration we used transect ID as the sampling unit with replacement. The statistic was evaluated from each of these bootstrap samples and upper and lower 95% confidence intervals of these values were taken as the variability of the statistic over the population (Efron & Tibshirani, 1993).

2.7.10 A measure of precision was calculated using a Poisson precision. This produced a coefficient of variation based on the relationship of the standard error to the mean (Thomas *et al*., 2010). A target precision of ≤ 0.16 allows the detection of a population change of a factor as small as 2 (Bohlin, 1990).

2.7.11 All analyses and data manipulation carried out by APEM were conducted in the R programming language (R Development Core Team, 2012) and non-parametric 95% confidence intervals were generated using the 'boot' library of function (Canty & Ripley, 2017). This results in species-specific monthly abundance estimates being calculated from the raw count data, with upper and lower confidence limits. Where appropriate, a level of precision is also presented for each monthly abundance estimate. Dividing the monthly abundance estimates by the size of the area covered calculates the associated density (e.g. birds per km^2) for any given species.

Correction of availability bias

2.7.12 Seabirds that spent periods of time underwater, particularly auk species (such as guillemot and razorbill) that perform frequent foraging dives, were not always detectable at the surface. Density and abundance estimates therefore need to be adjusted to allow for this 'availability bias'. Although diver species and Manx shearwater display similar foraging activity, there is no robust data on availability bias for these species that are currently recommended for use by SNCBs which could be applied, with the exception of red-throated diver, whereby availability bias data provided in Dunn *et al*. (2024) was used.

2.7.13 The correction factors provided in Dunn *et al*. (2024) focus on the non-breeding season of July to March which they define as starting after the mean population fledging dates. For months outside of the Dunn *et al*. (2024) non-breeding season (April to June), Thaxter *et al.* (2010) fixed availability bias values were used for guillemot (1.311) and razorbill (1.211), with Spencer (2012) values being applied for puffin (1.165). Likewise, where other data was missing for puffin (December to March) and razorbill (February and March) as a precaution the highest values recorded elsewhere in the year were used. For puffin in July no data is value is provided by Dunn *et al.* (2024), since this falls within the species' breeding season the value from Thaxter *et al.* (2010) is applied.

2.7.14 When applying the Thaxter *et al*. (2010) availability bias correction factors, these are multiplied with the abundance estimates of the relevant species in order to provide a corrected abundance value. The availability bias correction values provided in Dunn *et al.* (2024) and Spencer (2010) are expressed as the probability of being available at the surface or in flight. In order for the Dunn *et al.* (2024) and Spencer (2012) values to be applied in the manner as the Thaxter *et al.* (2010) factors, the values provided in the paper were converted to analogous corrections factors from the provided proportional values. This was conducted by dividing 1 by the Dunn *et al.* (2024) value. The final correction factors used in for the abundance estimates are outlined in Table A2-4.

Table A 2-4: Availability bias correction rates applied using regional values from Dunn *et al*. (2024) unless specified otherwise.

	UK West Coast		North Sea	
Month	Guillemot	Razorbill	Puffin	Red-throated Diver
July	1.147	1.090	1.165	NA
August	1.106	1.079	1.129	NA
September	1.112	1.123	1.196	NA
October	1.175	1.136	1.250	NA
November	1.223	1.176	1.280	1.305
December	1.405	1.140	1.280	1.383
January	1.424	1.228	1.280	1.394
February	1.427	1.228	1.280	NA
March	1.414	1.228	1.280	NA
April	1.311	1.211	1.165	NA
May	1.311	1.211	1.165	NA
June	1.311	1.211	1.165	NA

2.7.15 Where possible, flight heights of flying birds were also obtained from DAS data. This was calculated trigonometrically using species-specific bird measurements, image GSD (the distance between centre pixels), the known height of the aircraft when the image was taken, and the pitch, yaw and roll of the aircraft. The flight height estimates produced using this method were unreliable and therefore not used within ornithological assessments.

NWIS DAS

2.7.16 APEM Ltd began a 12-month programme of DAS in September 2024 that were completed in August 2025, the survey dates and other relevant information is presented in Table A 2-5. Data was collected via monthly transect surveys across the NISA offshore wind farm site and broader NWIS SPA (collectively referred to as the Survey Area). The total area for the NWIS SPA was 2,333 km² with a maximum Survey Area of 2,396 km² when including other SPAs and SACs contained within the SPA.

2.7.17 The primary purpose of the programme was to establish robust baseline information on the distribution and abundance of seabirds and marine mammals within the NWIS SPA (alongside collecting further data on the proposed development Study Area), addressing several bird-related RFI responses as outlined in Section 1.2 (RFI 8 (a) (ii), 8 (a) (vi), and 8 (a) (vii). The survey provides:

- A clearer understanding of the temporal and spatial distribution of birds across the NWIS SPA, helping to address concerns raised in the RFI in relation to the site's conservation objectives, particularly with respect to change in distribution.
- Full coverage of the ECC + 2 km buffer, enabling a robust assessment of divers and seaducks.
- Full coverage of the PFI + 10 km buffer, ensuring a robust assessment of red-throated diver out to 10 km.
- More accurate reference population sizes for the NWIS SPA than those previously derived from ObSERVE data, due to the higher-resolution digital aerial methods and consistent 12-month survey period.

2.7.18 The original survey plan, dubbed 'Plan A', involved surveying in contiguous east-west transects across the extent of the Survey Area. However, complications with access to the Dublin Airport Control Zone (CTR) meant a second survey design 'Plan B' was required, adapted to follow the Plan A design as close as possible whilst avoiding the CTR but with an additional two north-south oriented flight transects flown (Figure A 2-3). When it was not possible to carry out north-south surveys, a third survey design 'Plan C' was implemented. This compromise allowed the survey to maximise possible coverage outside of the CTR whilst also minimising time necessary within the CTR, resulting in a target coverage of 18% for Plan A, and 15% coverage for Plan B & C.

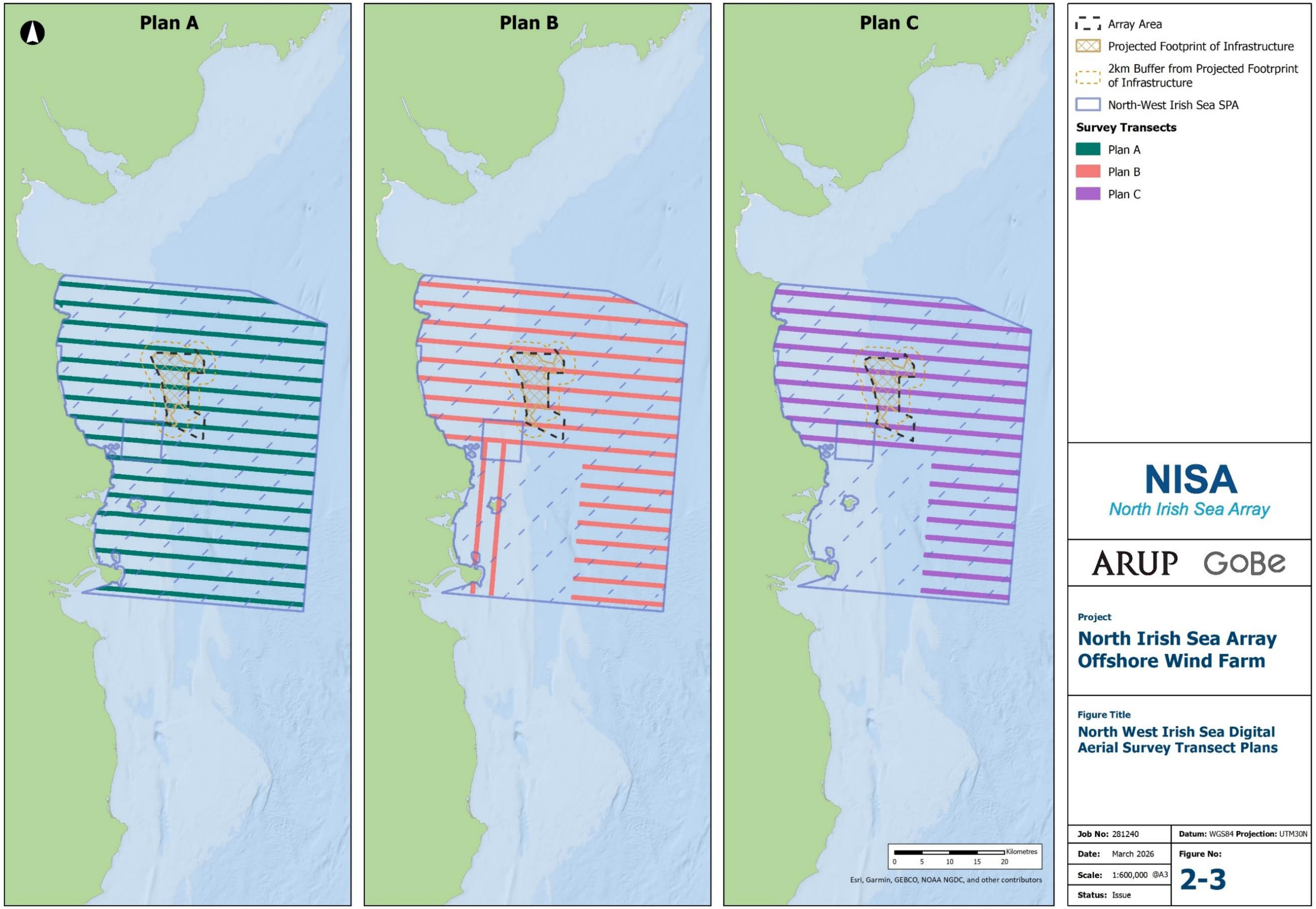

Figure A 2-3: Ornithological Digital Ariel Survey and Transects (including different plan variations) Undertaken within the NWIS SPA over a 12-month Period Between 2024-2025.

2.7.19 The camera system captured abutting still imagery along either 17 survey lines (Plan A & C) or 19 survey lines (Plan B) spaced approximately 3.5 km between-track and was flown at an altitude of approximately 1,300 feet (ft). The survey involved high-resolution digital still image collection at a GSD of 1.5 cm, using a Global Positioning System (GPS)-linked bespoke flight management system to ensure the tracks were flown with a high degree of accuracy.

2.7.20 All survey methodology and data analysis was undertaken in line with guidance that is accepted in other markets (e.g. the UK). Full details of survey date, timings and plan used are provided below (Table A2-5).

Table A 2-5: Date and timings of the DAS data collection conducted by APEM Ltd between September 2024 and August 2025.

Aerial survey number	Survey Plan	Date	Timing
1	Plan B	21st September 2024	10.00 – 11:38 & 13:49 – 16:22[3]
2	Plan B	1st October 2024	13:47 – 17:17
3	Plan A	26th November 2024	10:58 – 13:41 & 10:56 – 13:26
4	Plan B	10th December 2024	10:05 – 14:38 & 10:41 – 14:45[4]
5	Plan B	8th January 2025	09:30 – 14:49
6	Plan B	27th February 2025	10:20 – 15:55
7	Plan B	11th & 12th March 2025	14:52 – 16:40 & 09:15 – 11:18[5]
8	Plan C (Excluding the N-S transects over the CTR)	5th April 2025	09:35 – 11:25 & 13:30 – 17:05[3]
9	Plan C (Excluding the N-S transects over the CTR)	10th May 2025	13:20 – 18:41
10	Plan B	3rd June 2025	13:58 – 19:16
11	Plan B	19th July 2025	08:30 – 13:05 & 13:35 – 15:55[3]
12	Plan B	3rd & 6th August 2025	13:33 – 18:15 & 13:15 – 15:54[5]

[3] Survey was undertaken over two flights.
[4] Survey was undertaken using two aircraft.
[5] Survey was undertaken over two days.

Image analysis

2.7.21 Seabirds were identified to species level during image analysis, where identification to species level was not possible individuals were classified to the lowest taxonomic level. To ensure the accuracy of the species identification APEM Ltd conducted internal quality assurance, this also guaranteed any missed individuals were included in the data. The data collected during the DAS provided the information listed below.

- Date and time of each seabird and recorded during a survey;
- Corresponding coordinates for each seabird recorded;
- Age, sex and moult status of seabirds, where possible;
- Additional behavioural information whether a bird is sitting, flying, or diving; and
- Estimated flight heights, where possible.

Apportionment of unidentified seabird

2.7.22 As per the section above, unidentified species were identified to the lowest taxonomic level/species group. To assign these individuals to a species and avoid underestimating the species abundance the same approach outlined in the Apportionment of unidentified seabirds Section above for the MAC DAS data was taken for the NWIS DAS data.

Bird abundance and density estimates

2.7.23 For details regarding the approach used to calculate seabird abundance and density estimates from the NWIS DAS data see the 'Bird abundance and density estimates' section under MAC DAS. In addition, abundance estimates were also calculated using model-based approaches (MRSea). For full details of that see Chapter 15: MRSea for Offshore Ornithology of the 2024 EIAR.

Correction for availability bias

2.7.24 The same approach outlined in Correction of Availability Section above for the MAC DAS was also taken for the NWIS DAS data.

Collection of flight height data

2.7.25 The same approach outlined in the Collection of flight height data section above for the MAC DAS, regarding the collection of flight height data, was also taken for the NWIS DAS.

Combined datasets (MAC DAS and NWIS DAS)

2.7.26 Both the MAC DAS and NWIS DAS datasets were used together to characterise the baseline and inform subsequent assessments. In total, this provided 41 months of DAS coverage across the PFI and its surrounding 4 km buffer. The NWIS DAS additionally provided 12 months of coverage across a wider 10 km buffer, which was not available during the original 29-month MAC DAS programme.

2.7.27 Monthly density and abundance estimates were first calculated separately for each dataset. These were then combined by extending the original 29-month MAC DAS time series to incorporate the additional NWIS DAS months, resulting in a unified 41-month dataset. Bootstrapped monthly density estimates were combined for use in CRM, and mean-peak abundances were derived from the full 41-month series. Where only partial coverage was available for a given bio-season (because only some of the months that fall within that bio-season were surveyed), professional judgement was used to determine whether to include the bio-seasons with partial coverage in the mean-peak calculation. Based on this, it was decided to include all bio-seasons with partial coverage because their abundance estimates were consistent with those observed in fully sampled bio-seasons, and there was thus no strong justification for removing data.

2.8 Coastal vantage-point surveys

2.8.1 Coastal VP surveys were undertaken to supplement the offshore DAS programme by providing additional spatial and temporal context on the movements of migratory and coastal bird species along the east coast of Ireland. These surveys were particularly relevant to understanding potential migratory pathways, coastal flight corridors, and localised movements that may not be fully captured by offshore datasets alone. The work also directly responds to RFI comments highlighting data gaps relating to spring and autumn migration movements.

Pre-EIAR Submission

2.8.2 Two core VP locations were monitored during the original survey programme: Clogherhead (VP1) and Rush/Drumanagh Head (VP2). These positions were selected to provide broad coverage of the coastline north and south of the proposed development area, with both locations offering elevated, unobstructed viewing arcs extending offshore towards the array.

- VP1: Clogherhead (Grid reference O 17487 84276); and
- VP2: Rush/Drumanagh Head (Grid reference O 27495 56247).

2.8.3 Survey effort was structured to align with peak seasonal migration periods. A total of four seasonal blocks were completed:

- Autumn 2019 (six survey visits, September - December);
- Spring 2020 (six survey visits, March - May);
- Autumn 2020 (six survey visits, September - November); and
- Spring 2021 (six survey visits, March - May).

2.8.4 Across both VP locations, movements of a wide range of species were recorded, including waterfowl, waders, passerines, seabirds, and non-seabird coastal migrants. These data provide additional evidence for broad-scale migration movements along the Irish east coast but also demonstrate that, for the majority of species, sustained concentrations of birds travelling directly through the PFI are limited. VP data were therefore used primarily to corroborate the migratory bird collision risk assessment, rather than to produce quantitative flux estimates.

2.8.5 The number of species recorded across VP surveys is presented in Table A3-55.

2.8.6 In 2025, VP survey coverage was expanded to three locations, including Rockabill Island, to directly address RFI requests for enhanced migration data collection. RFI responses 8 (a) (iv) and 8 (a) (v) suggested a lack of sufficient spatially relevant field data during peak migration periods (spring and autumn) and recommended the use of methodologies capable of detecting movement patterns, including vantage-point observations, passive monitoring and targeted migration-focused fieldwork. The extension to the VP programme outlined in Table A 2-6 directly responds to the RFI by providing structured evidence of flight activity along the east coast of Ireland, including seasonal migration movements and species-specific coastal passage patterns.

Table A 2-6 Overview of VP survey effort.

VP Locations	Latitude, Longitude	Survey Period	Seasonal Coverage
VP1 (Clogherhead)	53.795109, -6.219967	September–December 2019 March–May 2020 September–November 2020 March–May 2021 September – December 2025	Spring & Autumn Migration
VP2 (Rush/Drumanagh Head)	53.67833723, -6.23761576	September–December 2019 March–May 2020 September–November 2020 March–May 2021 September–December 2025	Spring & Autumn Migration
VP3 (Rockabill)	53.59733466, -6.00431851	September–December 2025	Autumn Migration

2.8.1 During these surveys the species, count, behaviour, direction, distance and flight height were recorded to allow analyses of migratory bird flights along the coast of the western Irish Sea. Between September and December 2025 an additional 15 surveys each were undertaken at VPs 1 and 2, with six VP surveys occurring at VP3 on Rockabill.

2.8.2 Weekly surveys during the autumn migration season (September–December 2025) provided improved resolution of waterbird movements within and adjacent to the Rockabill SPA, supporting both the migratory collision risk assessment and the review of SPA connectivity.

2.9 Passive acoustic monitoring

2.9.1 PAM was undertaken to supplement the VP survey programme by providing additional evidence on nocturnal and poor-visibility migration activity that cannot be reliably captured through visual methods. PAM was deployed on Rockabill Island between mid-September and mid-December 2025, aligning with the core autumn migration period and directly responding to RFI requests for expanded data collection on migratory waterbirds and terrestrial species.

2.9.2 Acoustic devices were installed at suitable locations on the island to maximise detection of overhead calling birds while minimising interference from local colony noise and other ambient background noise. The deployment recorded continuously throughout the survey window, capturing both diurnal and nocturnal flight calls. Detection files were subsequently processed with manual verification. For taxonomic groups where species-level discrimination is not possible, calls were categorised to broader assemblages.

2.9.3 The PAM dataset provides insight into:

- the timing and intensity of nocturnal and crepuscular migration movements;
- periods of elevated passage activity that may not coincide with visual survey windows;
- confirmation of the presence of migratory species with limited detectability through VP surveys, including small passerines and high-altitude waterbirds; and
- qualitative patterns of coastal migration corridors in proximity to the Rockabill SPA.

2.9.4 Results are summarised in Table A 3-55. Across the PAM period, 39 species were recorded including species of passerine, wildfowl, wader and seabird. A total of 2834 individuals were estimated from 1447 encounters, with 80% of encounters and 83% of individuals attributed to just five species (Curlew, Oystercatcher, Robin, Redwing and Turnstone). Ten species were recorded on less than five occasions with a further nine species recorded only once.

2.9.5 The number of migratory birds increased throughout September, building from 128 individuals of five species recorded in the first week (04/09-11/09) of the period to 376 individuals of 15 species in the last week of September (20/09-27/09). The number of migrating individuals continued to build until a peak of 656 individuals of 16 species in the week of the 14/10-21/10. Migration proceeded to slow in the following week (22/10-29/10) to 460 individuals of 26 species, a decrease in the number of individuals but the highest number of migrating species recorded in one week during the period. By the end of October and beginning of November (30/10-03/11), the migration had dropped considerably to only 96 individuals of 11 species. These results indicate that the main migratory period fell in an approximate seven-week period between early/mid-September and late-October, with very few birds continuing to migrate by early November.

2.9.6 The most frequently recorded species during the PAM period was the Oystercatcher with 437 encounters and an estimated 678 individuals, however, Turnstone were the most abundant with 893 individuals recorded from 411 encounters. Both species were recorded in every week of the PAM period with both reaching a peak abundance during the week of 06/10-13/10, with 142 Oystercatchers and 295 Turnstone. Other common species included Blackbird with 79 individuals from 59 encounters, Curlew with 194 individuals from 90 encounters, Robin with 210 individuals from 140 encounters and Redwing with 379 individuals from 85 encounters.

2.9.7 Of the species recorded from the PAM, Roseate Tern and Purple Sandpiper are both designated within the Rockabill SPA, with Roseate Tern also designated in the NWIS SPA. Roseate Tern were recorded on 11 occasions with an estimated 14 individuals, these encounters fell exclusively from 14/09-19/09. Purple Sandpiper were recorded on 20 occasions, consisting of 28 individuals, this species was first recorded on 14/09 and last recorded on 18/10 with the peak (16 individuals) from 06/10 to 21/10. Other species of note, that are uncommon or unexpected are Firecrest and Dotterel, with one Dotterel recorded on 13/10 and three Firecrest recorded on three separate occasions between 13/10 and 16/10.

2.9.8 The results indicate that while a diverse suite of migratory species passed through the Rockabill area during autumn 2025, most call activity was concentrated within nearshore airspace and did not indicate substantial offshore movements across the PFI. The PAM dataset therefore complements the VP surveys by confirming the presence and timing of migration events, while supporting the conclusion that large-scale offshore migration through the proposed array area is limited.

2.10 Landfall surveys

2.10.1 To characterise the baseline environment in terms of ornithological receptors at the proposed landfall site(s), surveys have been conducted since January 2021. Initially, three areas were considered though from October 2021 onwards, surveys were conducted at a single site covering a stretch of coast between Ballbriggan and the mouth of the river Delvin. Results for this area only are presented in Section 0, with 24-months of data incorporating raw counts of all bird species seen between January 2021 and December 2022.

2.10.2 The surveys were undertaken based upon the Irish Wetland Bird Survey (I-WeBS) method, which is a long-standing national survey of waterbirds that takes place annually, but which focusses on the non-breeding period (September to March). Target species were waders, waterfowl, divers, grebes, gulls and seabirds, with herons/egrets and raptors also recorded.

2.10.3 The length of the survey area (site plus a 500m buffer to north and south) was walked by an experienced ornithologist, with counts made from suitable VPs along the coast such that the full length of the survey area was covered, taking care not to double count any already recorded birds. All species within 1km of the coast (offshore) were recorded, though birds up to 2km offshore were recorded where visible. Onshore, all target species were recorded when they were present within 100m of the coast.

2.11 Desktop data sources

ObSERVE (Jessop et al. 2018)

2.11.1 From 2015-2016, offshore aerial surveys were conducted during the summer and winter months in Ireland (Rogan *et al.* 2018), collecting data on the distributions and abundances of seabird species present within the survey area. In 2016, additional inshore/coastal surveys were conducted in both the winter and summer months (Jessop *et al.* 2018). This data can be used to provide recent context for inter-seasonal changes in seabird abundance and distribution at a regional scale across the Irish Sea.

2.11.2 The survey design included a study area consisting of offshore waters around Ireland, both within and beyond Ireland's continental shelf. This study area was initially divided into five strata in 2015, with a further three inshore strata added in 2016. Two zigzag transects were flown within each stratum, with observations recorded and conducted following a standardised protocol designed for aerial surveys. In the case of cetacean sightings, the protocol used was designed using a line-transect methodology, with observer effort restriction to approximately 500 m either side of the aircraft. Two randomly placed transect lines were generated for each stratum. The line-transect positions and start points were changed each year to provide two independent datasets per season per stratum, also providing a more representative coverage of the survey area. In 2015, the total distance flown was 16,802km within a survey area measuring 297,480km^2 and in 2016 the distance flown totalled at 20,295km within a survey area measuring 339,377km^2.

2.11.3 During all four surveys, four observers were on board the aircraft, with two on each side of the aircraft. The aircrafts position was recorded every two seconds through the use of an on-board GPS. Observers recorded all sightings of marine fauna, as well as Beaufort Sea State, cloud cover, glare extent and severity, the corresponding declination angle of the aircraft to the animal sighted, species, sighting time, group size, presence of calves and behaviours observed.

2.11.4 This data was used to qualitatively compare the density of divers and common scoter within the ECC with the recent, more comprehensive NWIS DAS data, which is now used to assess vessel disturbance. The data is still useful to inform the distribution of species throughout the North-west Irish Sea (NWIS) SPA.

2.11.5 Due to the positioning of transects, data from Jessop *et al*. (2018) had relatively low coverage (4%) of the offshore ECC. It was therefore deemed appropriate to include data from the ECC plus a 4 km buffer to obtain density estimates and data on species presence, noting that the relevant ECC study area remains the offshore ECC only, with no surrounding buffer. Although these data cover a wider spatial extent, by incorporating a 4 km buffer on the ECC, coverage of the area (ECC +4 km buffer) was increased to >10% (10.5%) increasing the confidence in the data. The coverage of survey transects and the resulting densities are provided in Table A2-7, respectively. Please see sections on red-throated diver, great northern diver and common scoter for further information on specific species.

Table A 2-6: The raw count, mean densities and estimated abundance of birds in the ECC plus a 4km buffer for red-throated diver, great northern diver and common scoter.

Species	Raw count of birds detected	Mean density (birds/km^2)	Estimated abundance
Common scoter	61	3.38	579.2
Scoter species	12	0.66	113.9
Diver species	25	1.39	237.4

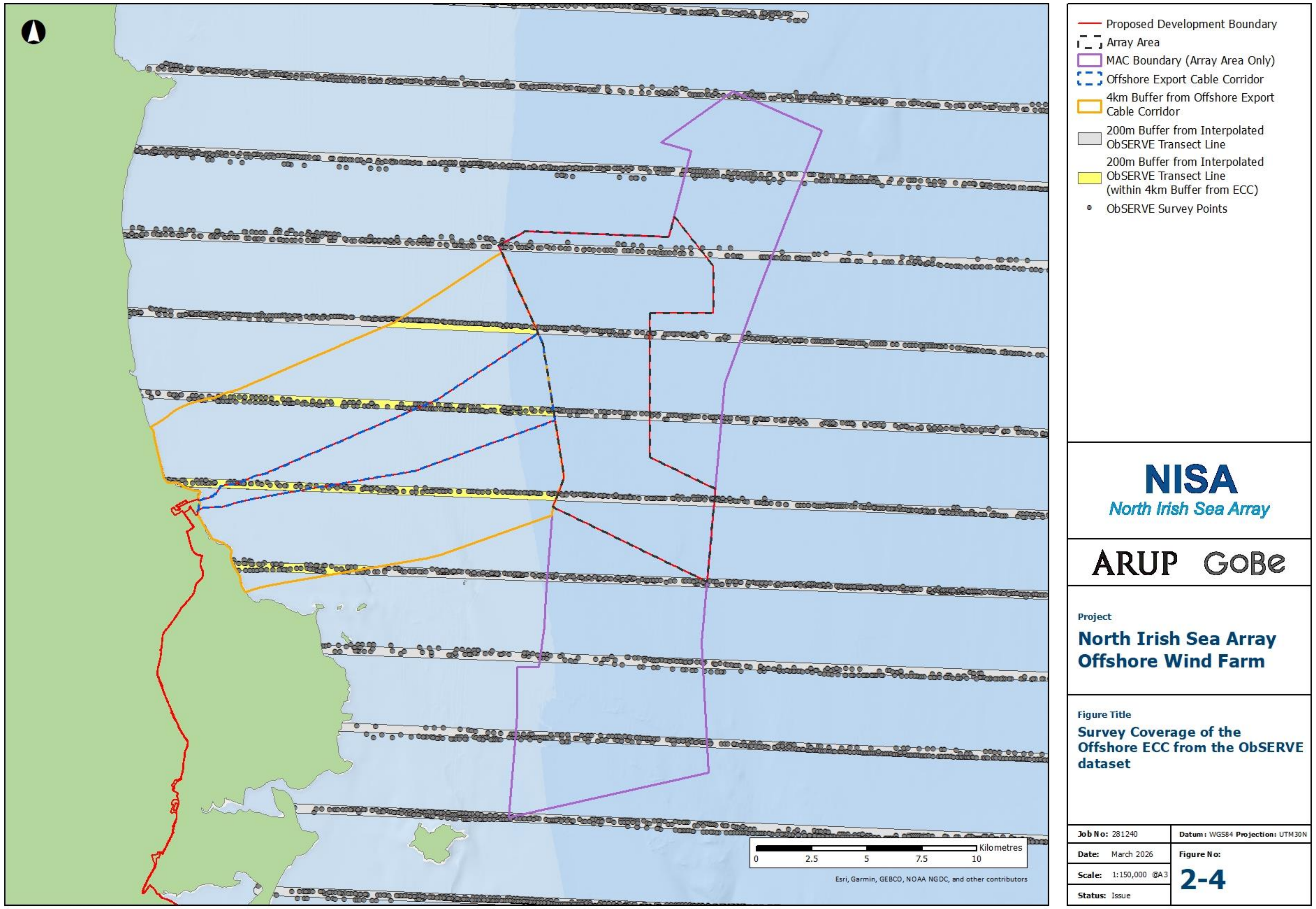

Figure A 2-4: Survey Coverage of the Offshore ECC from the ObSERVE dataset.

2.11.6 On behalf of the Marine Institute Ireland, HiDef undertook DAS of marine water off Gormanstown between December 2018 to March 2019 (HiDef, 2019). This was commissioned with the aim to assess the abundance and distribution of common scoter over four sites along the east Irish coast. However, DAS was collected of other seabirds as well as marine mammals. This dataset overlaps with the cable route and is also near the array area as such is relevant data to analyse the densities of red-throated diver and common scoter.

2.11.7 Within the HiDef (2019) DAS, high abundance of red-throated diver was recorded north of the NWIS SPA, especially in December and February. The majority of red-throated diver densities and distribution occurred closer to the coast within the 10km buffer (Figure A 2-1). Although the HiDef (2019) survey did not cover the array area, it is predicted that red-throated diver density will decrease with distance from the coast (Furness, 1983). HiDef (2019) surveys within the ECC vary monthly (Figure A 2-1), with highest densities recorded in December, February and March. However, these densities occurred northwards outside of the ECC.

2.11.8 For common scoter however, the HiDef (2019) surveys did not cover an area large enough to analyse density or distribution within the PFI plus 4km buffer. However, the majority of common scoter were observed close to the coast (Figure A 2-2). Within the ECC common scoter were recorded in the highest densities in December and March towards the north of the ECC. This indicates that the northern coastal sections and the area north of the NWIS SPA are of high importance for red-throated diver and common scoter compared to the ECC.

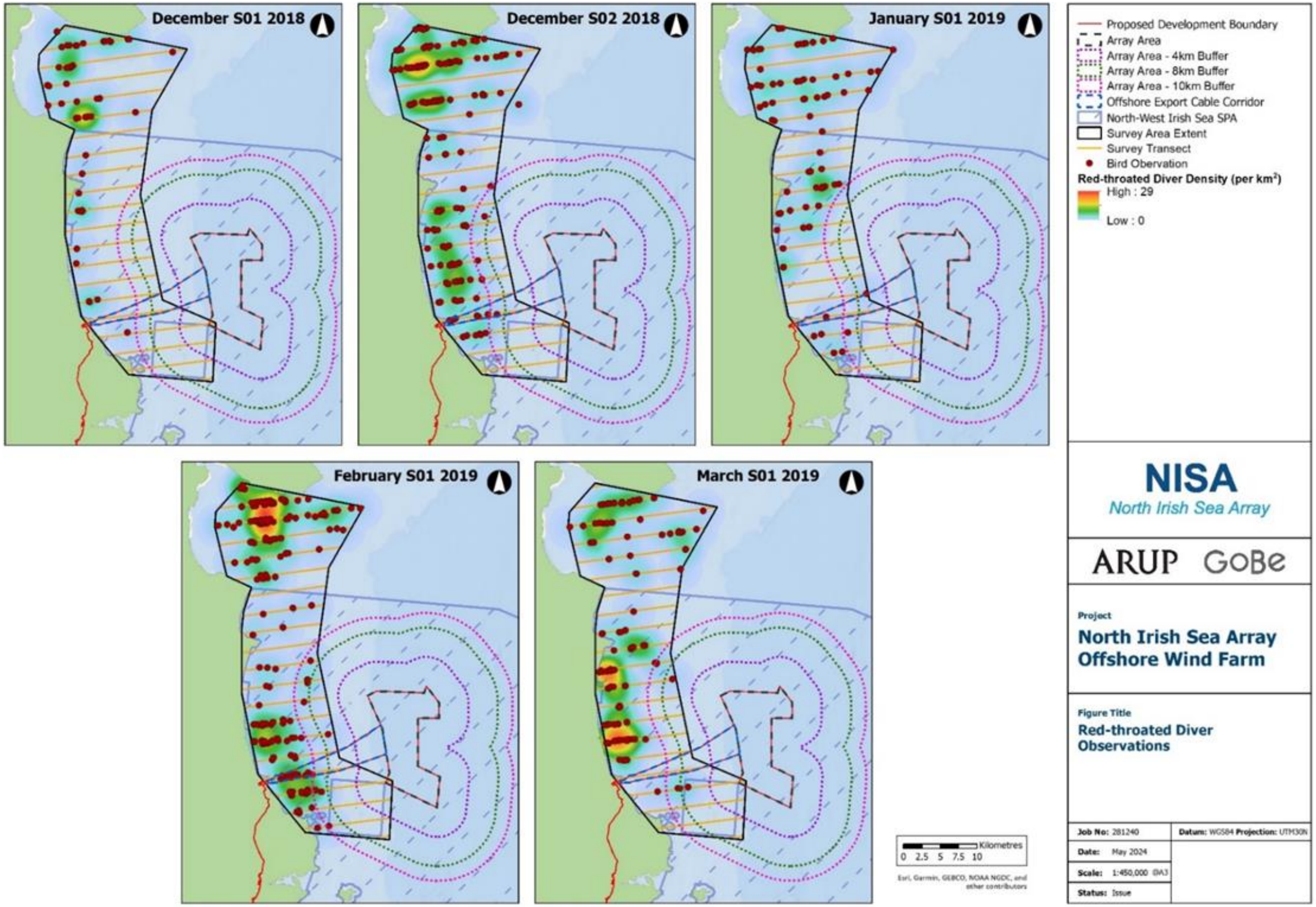

Figure A 2-1: Red-throated diver observations within the HiDef (2019) Gormanstown surveys.

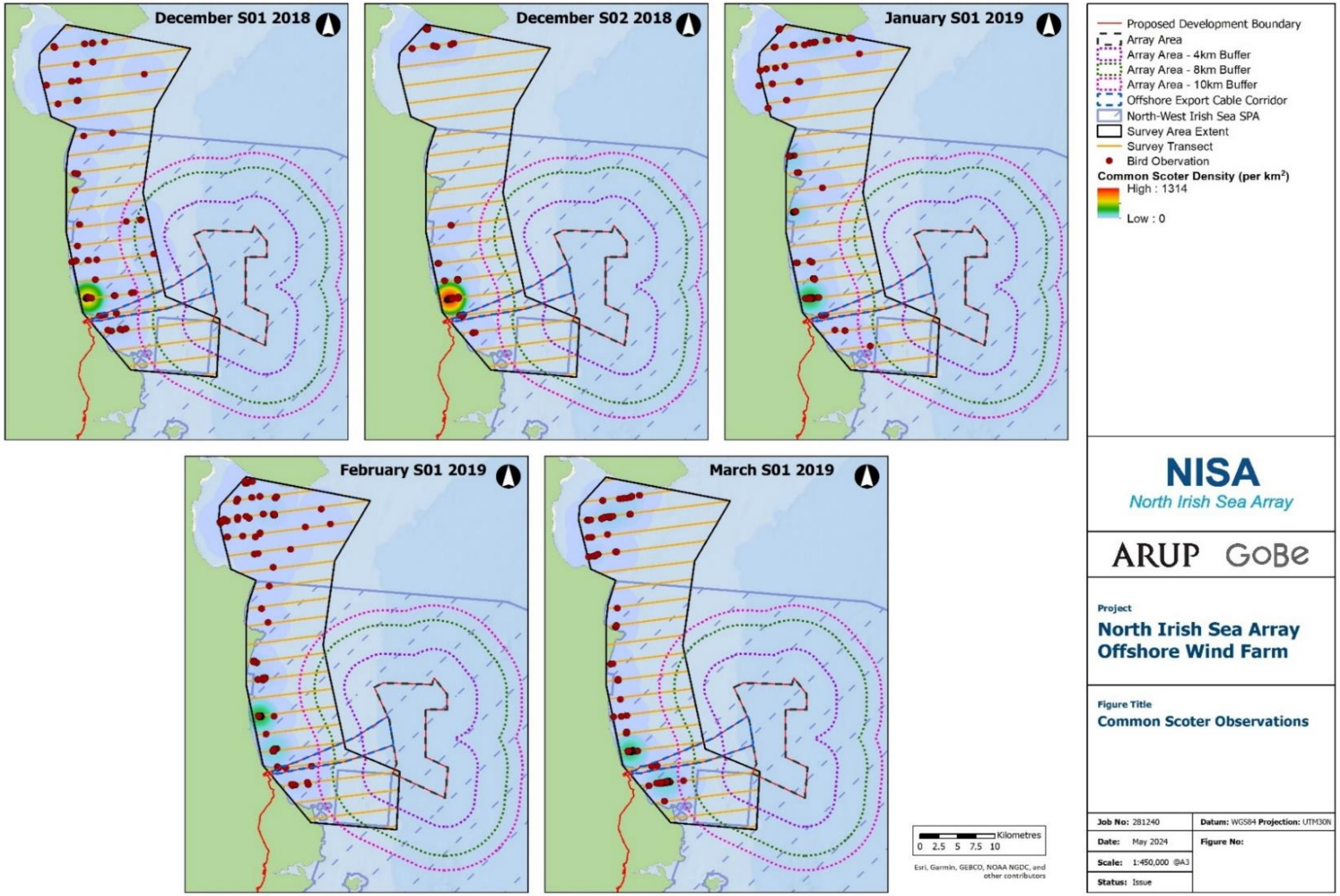

Figure A 2-2: Common scoter observations within the HiDef (2019) Gormanstown surveys.

Seabird Tracking Database (BirdLife International, 2025)

2.11.9 The BirdLife International Seabird Tracking Database contains tracking data for over 150 bird species across over 400 colonies. Included within this are several tracking datasets of key species relevant to the proposed development from Irish colonies (e.g., Gannet, guillemot, razorbill and kittiwake at Lambay Island). Where possible, tracking data were used to inform spatial habitat use by seabirds in close proximity to the proposed development, helping to determine potential foraging overlap with the PFI. Further information can be found in the species sections.

Other datasets

2.11.10 In addition to the above datasets, consideration was also given to a range of available literature and datasets, including tern tracking data from Perrow *et al*. (2019), colony sizes and population trends from the JNCC SMP database, from Cummins *et al*. (2019) and Burnell *et al.* (2023), and older ESAS survey data collected between 1980 and 1997, presented in Pollock *et al*. (1997).

2.11.11 In addition, BirdWatch Ireland (BWI) collected census data for several key seabird species at east coast SPAs during the 2024 and 2025 breeding seasons (BirdWatch Ireland, 2024; 2025). This data has primarily been used to inform the NIS.

2.12 Definition of bio-seasons

2.12.1 Within this Technical report, six bio-seasons are defined: spring migration, migration-free breeding, autumn migration, migration-free winter, full breeding and non-breeding. These bio-seasons can be applied to different periods within the annual cycle for most seabird species, though not all six are applicable for all species depending on the species-specific biology and life-history:

- Spring (Return) migration: birds are migrating to breeding grounds;
- Breeding: extended bio-season from modal arrival of breeding birds to the colony to modal departure from the colony.
- Migration-free breeding: birds are attending colonies, nesting and provisioning young;
- Autumn (Post-breeding) migration: birds are either migrating to wintering areas or dispersing from colonies;
- Migration-free winter: non-breeding birds are over-wintering in an area;
- Non-breeding: extended bio-season from modal departure from the colony at the end of breeding to modal return to the colony the following year; and

2.12.2 A monthly definition of seabird breeding or non-breeding season is not included in the Irish guidance (DCCAE, 2017, DCCAE, 2018). Two options were therefore considered for determining a breakdown of months for the breeding and non-breeding seasons for seabird species covered in this technical report. The first option considered was to follow the season definitions published by NatureScot (NatureScot, 2020), which have been used in assessments of offshore wind farms in Scotland. The second option was to use those presented in Furness (2015).

2.12.3 Seabird behaviour and distribution can vary throughout the year with migration patterns influencing the times of the year certain species are present and breeding birds must attend their nests and as a result are restricted by the distance at which they can forage during the breeding season. Therefore, it is key to consider seasonality within assessments by assigning species biologically defined seasons (or bio-seasons) with distinct differences in population size or distribution to assess the impact of OWFs more accurately over these periods. The bio-seasons used throughout the assessments were defined from Furness (2015) for all screened in species (Table A 2-7). The bio-seasons for three key species were adjusted slightly where site-specific survey evidence indicated that the Furness (2015) definitions were not appropriate for the site, or where particular outlier events warranted refinement. The Developer chose to adapt the Furness (2015) bio-season approach for guillemot, kittiwake and razorbill. For these species, site-specific evidence indicated that deviations from the generic definitions were appropriate. The changes made, together with their justification, are described in the species-specific bio-season sections that follow.

2.12.4 As seen in Table A 2-7 some species have a different number of non-breeding bio-seasons to account for periods during which substantial migration of the species occurs through UK waters. Notably for multiple species, both a migration-free breeding season and a 'full' breeding season is presented in Furness (2015). Since the full breeding season will extend into the late stages of the return migration bio-season, and the early stages of the post-breeding migration bio-season, it is considered highly likely that large numbers of birds recorded in these overlaps are travelling through the area on migration as opposed to being breeding birds within the area. Therefore, the migration-free breeding season is considered the most biologically appropriate definition. However, as a precaution, the full breeding season was applied unless substantial site-specific evidence indicated that an alternative approach to defining the breeding season is needed (i.e., as discussed for guillemot, kittiwake and razorbill below).

Table A 2-7: Definitions of breeding and non-breeding season used in this assessment (Furness, 2015).

Species	Autumn migration	Spring migration	Migration-free winter	Breeding	Non-breeding
Common scoter[6]	-	-	-	NA	Sep-Apr
Kittiwake (Furness (2015) approach)	Sep-Dec	Jan-Feb	-	Mar-Aug	-
Kittiwake (site-specific approach)	Jul - Dec	Jan - Mar	-	Apr-Jun	-
Black-headed gull[7]	-	-	-	Apr – Aug	Sep-Mar
Common gull	-	-	-	Apr – Aug	Sep-Apr
Great black-backed gull	-	-	-	Apr-Aug	Sep-Mar
Herring gull	-	-	-	Mar-Aug	Sep-Feb
Lesser black-backed gull	Sep-Oct	Mar	Nov-Feb	Apr-Aug	-
Roseate tern *Sterna dougallii*	Sep	Apr	-	May-Aug	-
Common tern	Sep	Apr	-	May-Aug	-
Arctic tern	Sep	Apr	-	May-Aug	-
Guillemot (site-specific approach)	-	-	-	Apr-Jun	Jul-Mar
Guillemot (Furness 2015 approach)	-	-	-	Mar-Jul	Aug-Feb
Razorbill (site-specific approach)	Aug-Oct	Jan-Mar	Nov-Dec	Apr-Jul (excluding July 2025)	-
Razorbill (Furness 2015 approach)	Aug-Oct	Jan-Mar	Nov-Dec	Apr-Jul	-
Puffin	-	-	-	Apr-Jul	Aug-Mar
Red-throated diver *Gavia stellata*	Sep-Nov	Feb-Apr	Dec-Jan	Mar-Aug	-
Great northern diver	-	-	-	NA	Sep-May
Fulmar *Fulmarus glacialis*	Sep-Oct	Dec	Nov	Jan-Aug	-
Manx shearwater *Puffinus puffinus*	Sep-Oct	Mar	-	Apr-Aug	-
Northern gannet	Oct-Nov	Dec-Feb	-	Mar-Sep	-

6 https://www.nature.scot/sites/default/files/2018-11/Guidance%20-%20Suggested%20seasonal%20definitions%20for%20birds%20in%20the%20Scottish%20Marine%20Environment.pdf
7 Not in Furness (2015), bio-seasons based on Kober *et al.*, (2010)

Guillemot bio-seasons

2.12.5 Assessments of impacts are carried out on a bio-seasonal basis, where each bio-season represents a distinct period in a species' annual cycle during which a discrete population can be defined. Bio-seasons for seabirds are typically based on the monthly definitions set out in Furness (2015), which draw upon data from across the UK. These definitions assume that ecological periods such as "breeding" or "migration" begin and end at calendar month boundaries. In reality, the transitions between ecological states, particularly the onset and completion of breeding, are gradual and often vary spatially between regions and colonies.

2.12.6 For guillemot, two approaches to defining the breeding bio-season were therefore applied. This reflects clear site-specific evidence demonstrating that the generic definitions in Furness (2015), which classify the breeding season as March to July, are not ecologically appropriate for this region. Project-specific DAS data, supported by published literature (e.g. van Katwijk *et al*., 1993; Harris *et al*., 2015; Dunn *et al*., 2020), show that birds recorded offshore during the latter part of the Furness breeding period are no longer constrained by central-place foraging energetics (daily returns to a set nest site). Instead, many individuals have dispersed from the colonies or are making use of much larger foraging ranges than would be expected during the core incubation and chick-rearing phases, as chick provisioning has ceased during this period.

2.12.7 This topic was raised explicitly by ACP in the RFI, which states:

"8.a(ix). The Board does not agree with the Applicant's determination that the Irish east coast Common Guillemot Uria aalge breeding season ends at the end of June… The Applicant is requested to apply the UK seasons (Furness, 2015) for Common Guillemot (breeding season: March to July; non-breeding season: August to February), aligning with the approach taken for other species assessed."

2.12.8 While the Developer agrees that using Furness (2015) is appropriate for the majority of seabird species within the EIAR, the Developer maintains that the guillemot bio-season should be refined based on site-specific evidence and best available scientific information. Consistent with good practice, this section presents further justification for the adjusted guillemot bio-season used in the assessment.

2.12.9 The Developer is not stating that the guillemot breeding season is complete at the end of June. It is highly likely that some breeding continues into July. However, the Developer's position is that for the relevant colonies, the majority of birds spend the majority of July engaging in non-breeding as opposed to breeding behaviours. As such, when assessing at a colony population level, July should not be considered to be within the breeding season.

2.12.10 Where robust evidence demonstrates that generic bio-seasons do not accurately reflect local ecological conditions, bio-seasons may be refined to provide a more biologically realistic representation of seasonal use. This approach has been adopted previously in agreement with SNCBs (e.g., for the Hornsea Project Four EIA), including instances where additional bio-seasons were defined to reflect strong local patterns in seasonal behaviour.

2.12.11 For the proposed development, DAS data collected across the MAC boundary plus buffer over 29 months, and an additional 12 months of DAS covering the full NWIS SPA, show a clear increase in offshore guillemot numbers in July. This rise, combined with a wider spatial distribution of individuals, is consistent with the onset of post-breeding dispersal. These patterns strongly indicate that July should not be considered part of the core breeding season for guillemot at this site (see Figure A 2-5 below).

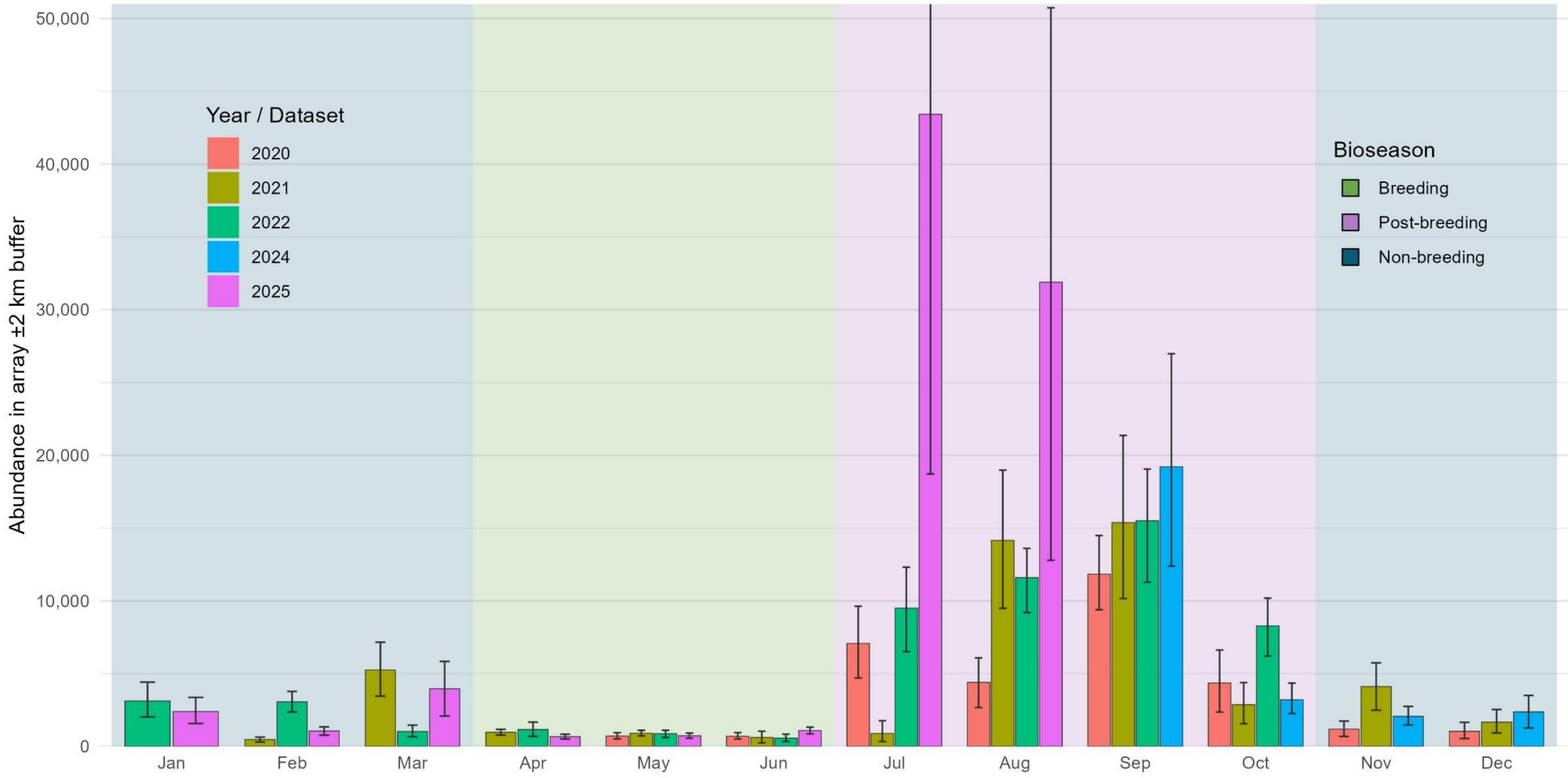

Figure A 2-5: Digital Aerial Survey preliminary abundance estimates of guillemot within the Projected Footprint of Infrastructure.

2.12.12 This evidence aligns with observations for several other species (e.g. kittiwake, razorbill), further supporting the conclusion that post-breeding dispersal begins earlier than suggested by the generic Furness (2015) definitions.

Evidence from available literature

2.12.1 Though Furness (2015) suggest a breeding season of March to July, project-site specific DAS data and available literature (e.g., Dunn *et al*., 2020) demonstrates that birds at the early stages of this period are not under the same energy constraints as in the core breeding season.

2.12.2 During the early stages of colony attendance there is no demand to return to the colony to relieve the other parent, or to provision the chick. Dunn *et al*. (2020) also demonstrated that colony attendance in March and April is lower than in May and through the rest of the breeding season. This can only be a result of adult birds either not attending the colony at all, or birds spending more time away from the colony (as a result of travelling further or staying away for longer). Either option demonstrates that during the early breeding season guillemots are not under the same energetic constraints as when they have eggs or young, and as such are not limited by the mean max foraging ranges that are applicable to the incubation and chick-rearing period. If birds are not limited by mean max foraging ranges, then they should not be considered in the same manner as those that are.

2.12.3 Dunn *et al*. (2022) presents a breeding cycle at the Isle of May where incubation begins in early May, and this is likely to be the case at similar latitudes (breeding is later further north, but not at a scale where similar latitudes could have substantially different timings, for example breeding in Iceland is approximately one week later than in the UK (Cramp *et al*. 1977 – 1994)). Dunn (2022) also demonstrated that energy gain in March and April was relatively consistent with earlier in the year, before reducing substantially through May and June, indicating a radical change in behaviour between these two periods. Therefore, Guillemots may be present at colonies in March and April, but we conclude that their behaviour in March and April is not consistent with their behaviour during incubation and chick rearing in May and June. Therefore, we conclude that where breeding season assessment is framed around incubation and chich-rearing mean max foraging ranges, March and April should not be considered as the breeding season.

2.12.4 On the Isle of May, the median fledging date varied between June 20th and July 10th and timings are likely to be similar across similar latitudes. Therefore, aggregations of birds in the offshore development area in July are highly likely to include large numbers of birds undergoing post-breeding dispersal (i.e. birds that have finished breeding, as opposed to being breeding birds). With a large but unknown proportion of birds present in July no longer considered as breeding, a more ecologically relevant breeding season of April to June is used as the site-specific approach.

2.12.5

Evidence from site-specific DAS data

2.12.6 Site-specific DAS data show a marked increase in guillemot numbers within the array area and its 2 km buffer from July onwards (Figure A2-5), reflecting post-breeding dispersal. Counts during this period are inflated by birds dispersing from colonies across the wider region, with numbers continuing to rise through August and September. Including July within the core breeding season results in double counting, artificially inflating predicted impacts on local SPA populations. This risk is significant, as DAS data show up to a ten-fold increase in guillemot numbers between June and July in 2020, 2022 and 2025 (Figure A2-5), driven by dispersal rather than breeding activity. The same is evident to an even greater extent in the 2025 DAS data covering the full NWIS SPA. The number of guillemots estimated to be present within the full SPA in July increases to 326,565. This figure is almost an order of magnitude greater than the most recent full count of the Lambay Island breeding population (59,610 individuals). This indicates that (1) the majority of birds present during this period are either non-breeding individuals or originate from colonies located considerably further afield, and (2) it is therefore clearly not appropriate to use breeding season apportioning in July (i.e. apportion 93.8% of guillemot present to Lambay Island SPA).

Seasonal variation and behavioural indicators

2.12.7 Robust site-specific survey data across four breeding seasons confirm substantial seasonal variation in guillemot use of the array area (Figure A2-5). During the core breeding season (April–June), counts average fewer than 1,500 birds in the PFI +2 km buffer. In July, numbers rise sharply, almost tenfold, to approximately 11,000 individuals, marking the onset of post-breeding dispersal.

2.12.8 Behavioural data also support this distinction: the proportion of birds detected in flight in July is more consistent with August and September than May and June (Table A2-9), suggesting behaviour aligns with post-breeding activity. The Developer considers this a distinct bio-season, supported by consistent DAS data from July 2020, July 2022, and September 2024 - August 2025. While some birds may originate from nearby SPAs, many are likely non-breeding immatures and adults from distant colonies, including non-SPA sites, given wide dispersal ranges evidenced in the literature (Buckingham *et al*., 2021).

Table A 2-8: Percentage (%) of birds in flight from DAS.

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2020	—	—	—	—	13.8	20.6	1.2	0.1	0.0	2.3	0.0	6.8
2021	—	0.0	0.1	1.1	10.0	9.1	10.3	0.0	0.0	0.2	3.3	8.9
2022	8.6	22.4	22.8	1.4	19.0	16.4	3.2	0.0	0.0	0.3	—	—

Timing of post-breeding dispersal

2.12.9 For transparency, Table A2-10 presents DAS survey dates and evidence of post-breeding dispersal in July. Across most years, dispersal begins in the second half of July, though it can start earlier. Surveys in late July (e.g., MAC DAS Year 1 and NWIS DAS) show clear signs of dispersal, while early July surveys occasionally coincide with the tail end of chick-rearing. This exception is evident in the 2021 MAC DAS Year 2 survey. This variation reflects natural inter-annual differences in breeding phenology influenced by prey availability and weather. Overall, evidence supports classifying July as part of the post-breeding period for assessment purposes (with this month considered as part of the non-breeding season instead of the breeding season).

Table A 2-9: Survey dates are evidence for post-breeding dispersal between 2020 and 2025.

Survey	Date	Guillemot abundance* Array area +2 km buffer	Clear post-breeding dispersal
MAC DAS Year 1 2020	18/07/2020	5,884	Yes
MAC DAS Year 2 2021	05/07/2021	518	No
MAC DAS Year 3 2022	04/07/2022	7,804	Yes
NWIS DAS 2025	19/07/2025	43,430	Yes

Summary

2.12.10 The Developer's position is that defining the breeding season as April–June inclusive prevents double counting individuals between the breeding and post-breeding season and best reflects actual behaviour based on site-specific data and published evidence. This alternative bio-season approach is therefore preferred and included alongside the generic approach using the Furness (2015) bio-season definitions. It should be noted that the Developer is not stating that the guillemot breeding season is complete at the end of June, as suggested in the RFI. It is highly likely that some breeding continues into July. However, the Developer's position is that an assessment (at a colony population level) based on the guidance methodology is not appropriate if apportionment in July were assumed to be the same as the core breeding season.

2.12.11 The increase in abundance within the whole NWIS SPA and PFI +2 km buffer observed in July is consistent with post-breeding dispersal, as evidenced by the timing of the increase and the spatial shift in bird distribution away from breeding colonies. Accordingly, birds contributing to the July population estimates should be considered predominantly post-breeding, dispersing individuals, and the assessment has been structured to reflect this.

2.12.12 A key consideration is that the breeding season apportioning methodology assumes that more than 90% of guillemots present within the PFI +2 km buffer during the breeding season originate from the Lambay Island SPA breeding population. However, survey data demonstrate that the NWIS SPA supports in excess of 300,000 guillemots in July, indicating that the majority of birds present at this time are not breeding adults from Lambay Island. Consequently, applying a breeding-season apportioning approach to July would not be appropriate and would lead to substantial over-attribution of impacts to SPA breeding populations. The most robust and biologically defensible solution based on the evidence is to treat July as a post-breeding period and apply an apportioning methodology that reflects this. The approach used for this purpose is presented in Appendix A15.8: Offshore and Intertidal Ornithology Apportioning Appendix.

Kittiwake bio-seasons

2.12.13 For kittiwake, two approaches to defining the breeding season are also presented. Furness (2015) defines the full breeding season for kittiwake as March to August, with a migration-free breeding season of May to July. Based on site-specific data, the Developer considers the use of a migration-free breeding season to be more appropriate for kittiwake and therefore presents two approaches to bio-seasons (one using the full breeding season, one using the migration-free breeding season).

2.12.14 Site-specific data (as presented in Figure A 2-6 below), indicates that kittiwake abundance increases noticeably at both the beginning and end of the breeding season. Prior to the core breeding period, higher abundances were recorded in March, with levels comparable to those observed in January and February during the spring migration period. These elevated early-season counts are therefore considered indicative of birds travelling towards breeding colonies rather than individuals already constrained to nest sites.

2.12.15 Towards the end of the breeding season, substantial increases in abundance were recorded in July and August, particularly in the 2025 NWIS DAS dataset. By August, kittiwakes are no longer expected to be tied to their colonies, and the observed peak is considered characteristic of autumn migration behaviour. Although elevated counts also occurred in July, this month has not been excluded from the site-specific breeding season. This precautionary approach reflects available evidence indicating that most kittiwakes remain engaged in breeding activities during July.

2.12.16 Therefore, the Developer presents an additional, site-specific approach for kittiwake whereby the breeding season is defined as May to July based on the migration-free breeding season defined in Furness (2015) and trends seen in site-specific data.

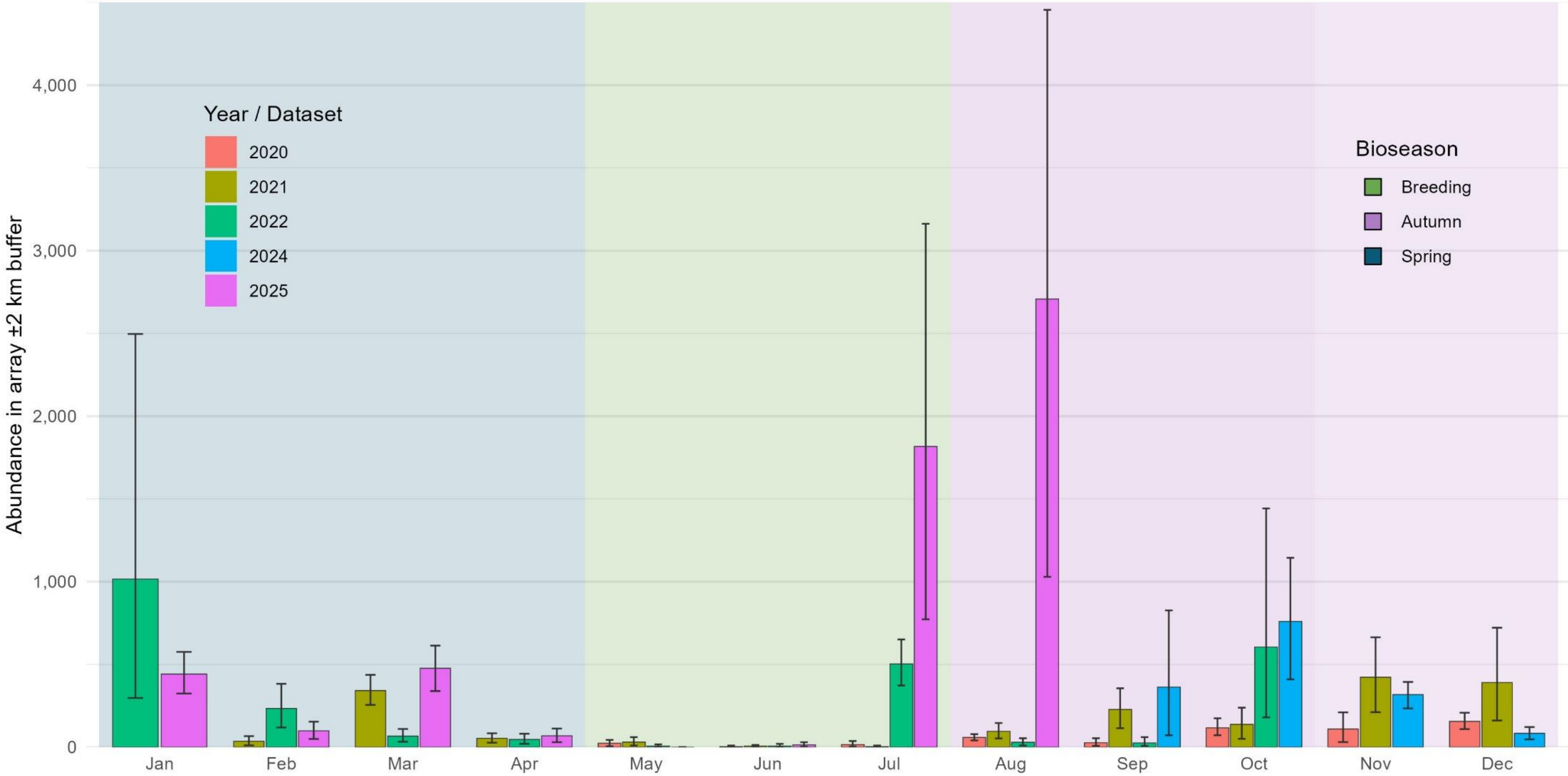

Figure A 2-6 Digital Aerial Survey preliminary abundance estimates of kittiwake within the Projected Footprint of Infrastructure.

Razorbill bio-seasons

2.12.17 For razorbill, the data generally supports the use of the full breeding season as defined in Furness (2015). The exception is July 2025, when an uncharacteristically high peak in razorbill numbers was recorded (see Figure A 2-7 below). This peak is not considered representative of abundance during the core breeding season.

2.12.18 Across the DAS data, four breeding seasons are captured. Within the first three years, the peak abundance of razorbill in the PFI plus 2 km buffer is:

- 110 (July 2020);
- 22 (April 2021); and
- 105 (July 2022).

2.12.19 In the fourth year, the highest count was 4,201 razorbills recorded in July 2025. However, peak abundance during the remainder of the breeding season (April–June) was 274 individuals in April 2025, consistent with values from the previous three years. The July 2025 peak is therefore considered anomalously high and is attributed to post-breeding dispersal rather than typical breeding-season behaviour.

2.12.20 Therefore, a site-specific approach is presented for razorbill which uses the full breeding season, with the exception of the fourth year of breeding season data whereby July 2025 is excluded (and included in the Autumn migration season).

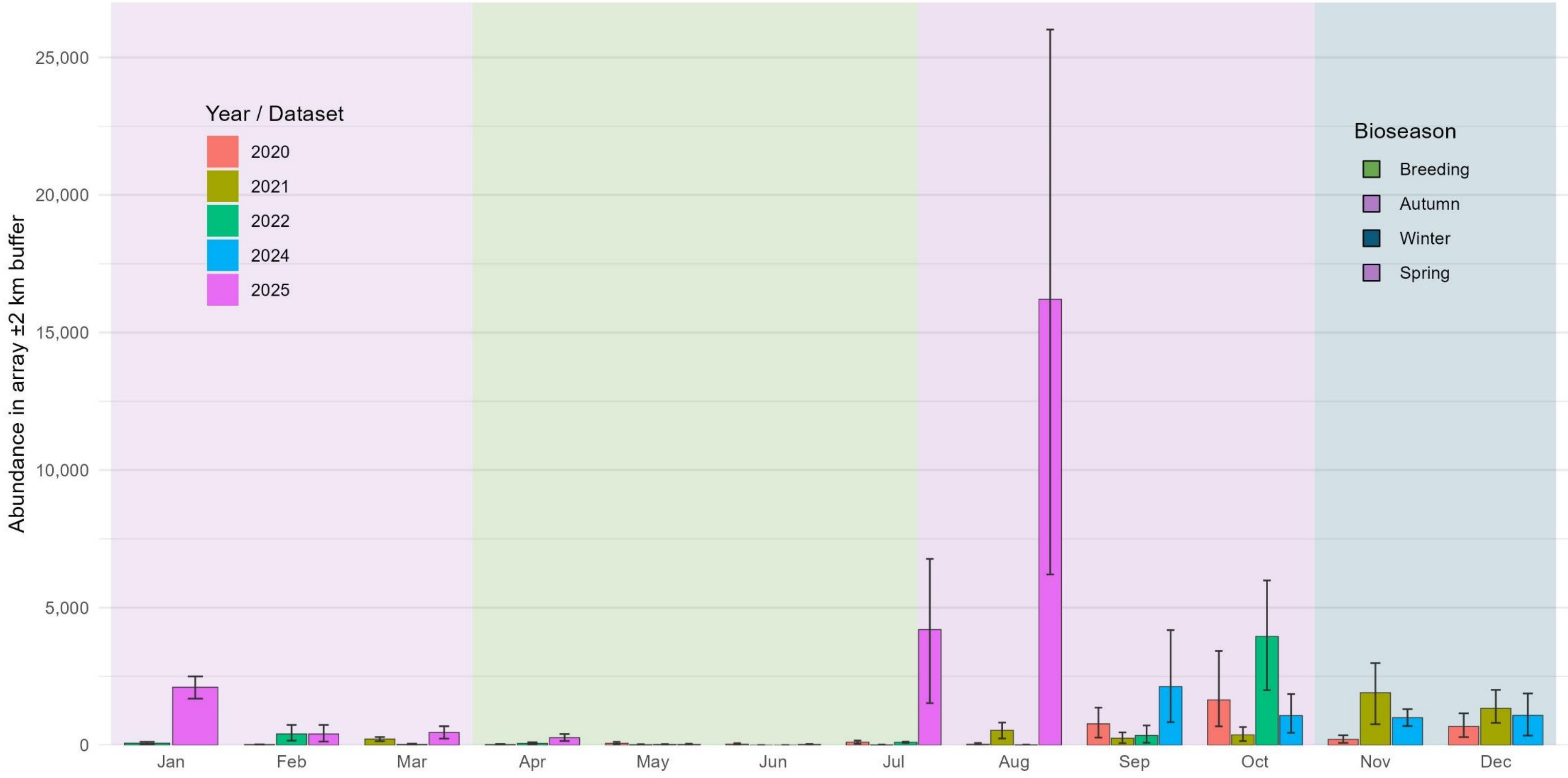

Figure A 2-7: Digital Aerial Survey preliminary abundance estimates of razorbill within the Projected Footprint of Infrastructure.

Non-breeding regional populations

2.13.1 Across OWFs in the UK, regional populations for use in Environmental Impact Assessments (EIA) are based on those presented in Furness (2015). Though Furness (2015) provides regional populations within the Irish Sea, these do not account for the higher Irish component of the population relevant to the assessment for the proposed development. If used within the assessment as presented in Furness (2015), these populations would not accurately reflect the mix of birds present within the Irish portion of the Irish Sea in which the Proposed Development is sited. Therefore, where available, regional populations provided by Furness (2015) are used as a basis of the assessment, with adjustments made as outlined in this section to ensure that the populations are appropriate for the east coast of Ireland (as opposed to the west coast of the UK). Furness populations for relevant species are presented in Table A2-11 below.

2.13.2 For most species, two regional populations are available (one for the east coast of the UK/in the North Sea, and one for the west coast/in the Irish Sea). For great black-backed gull *Larus marinus*, two west coast regions are defined; 'West of Scotland', and 'South-west and Channel'. Though the proposed development is located within the 'South-west and Channel' region, it is sufficiently far north that birds from the 'West of Scotland' region are also considered relevant, and therefore a combined population was used from these two regions.

2.13.3 The exceptions to this methodology are black-headed gull and common gull, which are not detailed in Furness (2015):

- For common gull the number of Herring/Common gull in the Western Irish Sea from Jessop *et al*. (2018) was apportioned into birds within the NWIS SPA. The proportion of birds within the SPA was then used to correct the peak abundance derived from the DAS of the NWIS SPA to produce a Western Irish Sea population of 55,395 which was then apportioned into herring and common gull using the proportion of each species detected in the DAS to provide a population of 11,030 common gull. This value reflects the best evidence available closely resembles that provided by Dublin Array OWF (SLR Consulting & GoBe Consultants, 2025).
- For black-headed gull the NWIS SPA peak abundance from the DAS programme was used, to provide a population of 3,709.

2.13.4 Both population estimates are based on the best available evidence, but they are likely to underestimate the true regional population. The estimates reflect only the peak monthly counts recorded over 12 months of NWIS survey data. In practice, a greater number of birds may be using the NWIS area than were detected by DAS, and an even larger population is expected within the wider region. Consequently, using these peak counts as population estimates provides a conservative basis for assessment and a precautionary approach (due to impacts being assessed against a smaller population).

2.13.5 Additionally, for common scoter a precautionary approach was taken by using the peak abundance estimated from Jessop data and using this as a regional population. This was done due to a reliable common scoter population not being presented in Furness (2015).

Table A 2-10: Non-breeding regional populations from Furness (2015).

Species	Region	Autumn migration	Spring Migration	Migration -free winter	Non-breeding
Kittiwake	UK western waters plus a Channel	911,586	691,526	-	-
Great black-backed Gull	UK South-west & Channel + UK West of Scotland	-	-	-	52,122
Herring Gull	UK Western waters	-	-	-	173,299
Lesser black-backed Gull	UK Western waters	163,304	163,304	41,159	-
Roseate Tern	UK Western waters	2,100	2,100	-	-
Common Tern	UK Western waters	64,659	64,659	-	-
Arctic tern	UK Western waters	71,398	71,398	-	-
Guillemot	UK Western waters	-	-	-	1,139,220
Razorbill	UK Western waters	606,914	606,914	341,422	-
Puffin	UK Western waters	304,557	304,557	304,557	-
Red-throated diver	UK Western Waters plus a Channel / NW England & Wales	4,373	4,373	1,657	-
Great northern diver *Gavia immer*	NW England & Wales	-	-	-	300
Fulmar	UK western waters plus a Channel	828,194	828,194	556,367	-
Manx shearwater	UK western waters plus a Channel	1,580,895	1,580,895	-	-
Gannet	UK Western waters	545,954	661,888	-	-

2.13.6 To account for coverage of waters within the Western Irish Sea, populations from Furness (2015) were altered using the following approach:

- Removal of the Irish (RoI) component of the Furness (2015) regional populations; and
- Addition of an adapted Irish component derived from Irish (RoI) seabird population estimates presented in Burnell *et al.* (2023).

2.13.7 To remove the Irish (RoI) component of a BDMPS region population the total number of immatures and adults in that BDMPS region deriving from Irish source populations were calculated with reference to Tables in Appendix A of Furness (2015). The parameters used to calculate the total numbers of immatures and adults from the relevant BDMPS region for each species are presented in Table A2-12.

Table A 2-11: Parameters used to calculate the Irish component of BDMPS populations in Furness (2015).

Species	Region	Irish population (adults)	Proportion occurring within BDMPS (Ad/Imm)	Immature: Adult ratio
Kittiwake	UK western waters plus a Channel	40,000	(0.3/0.2)	0.88
Great black-backed Gull	UK South-west & Channel + UK West of Scotland	4000	(0.1/0.3)	1.26
Herring Gull	UK Western waters	10000	(0.3/0.4)	1.09
Lesser black-backed Gull	UK Western waters	7600	PBM & RM: (0.4/0.2)	
Roseate Tern	UK Western waters	5000	(0.3/0.3)	0.58
Common Tern	UK Western waters	MFW: (0.2/0.05)	0.68	
Arctic tern	UK Western waters	5400	(0.4/0.4)	0.67
Guillemot	UK Western waters	0	NA	0.74
Razorbill	UK Western waters	34000	(0.1/0.1	0.75
Puffin	UK Western waters	40000	(0.1/0.1)	1.04
Red-throated diver	UK Western Waters plus a Channel / NW England & Wales	0	NA	0.74
Great northern diver	NW England & Wales	NA8	NA	1.1
Fulmar	UK western waters plus a Channel	0	NA	0.62
Manx shearwater	UK western waters plus a Channel	NA9	NA	0.84
Gannet	UK Western waters	72000	PBM: (0.2/0.3)	-
Cormorant *Corvus marinus*	SW England and Wales	RM: (0.3/0.3)	0.81	-
Shag *Gulosus aristotelis*	SW England and Wales	8200	(0/0.02)	1.17

2.13.8 From this, the Irish (RoI) component of the regional populations in Furness (2015) were calculated from the sum of adult and immature birds where:

- The number of adults = Irish population (adults) * Proportion in BDMPS (adults); and
- The number of immatures = Irish population (adults) * Proportion in BDMPS (immatures) * Imm:Ad

2.13.9 The total resulting Irish component which was removed is presented in Table A2.13 below.

[8] No BDMPS population source table provided in Furness, 2015
[9] UK BDMPS population only used in assessment

Table A 2-12: Irish population component removed from the Furness (2015) BDMPS populations.

Species	Region	Autumn migration	Spring Migration	Migration-free winter	Non-breeding
Kittiwake	UK western waters plus a Channel	19,040	19,040	-	-
Great black-backed Gull	UK South-west & Channel + UK West of Scotland	-	-	-	3,320
Herring Gull	UK Western waters	-	-	-	7,360
Lesser black-backed Gull	UK Western waters	4,074	4,074	1,778	-
Roseate Tern	UK Western waters	2,100	2,100	2,100	-
Common Tern	UK Western waters	3,607	3,607	3,607	-
Arctic tern	UK Western waters	2,370	2,370	2,370	-
Guillemot	UK Western waters	-	-	-	0
Razorbill	UK Western waters	5,950	5950	5,950	-
Puffin	UK Western waters	8,160	8,160	8,160	-
Red-throated diver	UK Western Waters plus a Channel / NW England & Wales	0	0	0	-
Fulmar	UK western waters plus a Channel	0	0	0	-
Manx shearwater	UK western waters plus a Channel	0	0	-	-
Gannet	UK Western waters	31,896	39,096	-	-

2.13.10 To calculate the Adapted Irish (RoI) component of the revised bio-seasonal regional population estimates which were added to the Furness (2015) BDMPS population, Irish (RoI) seabird populations from Burnell *et al*. (2023) were calculated for the east and south-east coast of Ireland. This incorporated seabird counts between County Louth to County Cork (For County Cork, only south coast colonies between Youghal and Mizen Head were included). Since these counts only included adults, the number of immatures was added to the population by multiplying total by the Imm:Ad ratio. The resulting Irish component is presented in Table A2-14 below.

Table A 2-13: Irish population component added to the Furness (2015) BDMPS populations based on Burnell *et al*. (2023)

Species	East and South coast ROI population (adults) from Burnell *et al.* (2023)	Imm:Ad ratio (Horswill and Robinson, 2015)	East and South coast ROI population (adults and immatures)
Kittiwake	21,418	0.898	40,651
Great black-backed Gull	1,814	1.538	4,604
Herring Gull	8,926	1.370	21,155
Lesser black-backed Gull	6,540	0.876	12,269
Roseate Tern	3,748	0.701	6,375
Common Tern	7,612	0.701	12,948
Arctic tern	2,120	0.511	3,203
Guillemot	100,941	0.916	193,403
Razorbill	16,785	0.876	31,489
Puffin	2,188	0.842	4,030
Red-throated diver	-	-	-
Great northern diver	-	-	-
Fulmar	7,484	1.083	15,589
Manx shearwater	2,170	1.132	4,626
Gannet	11,996	0.761	21,125

2.13.11 For red-throated diver and great northern diver, the Irish population was based on digital aerial survey data in Jessop *et al*., (2018). This data was only collected to the level of Diver species, and therefore this was apportioned to red-throated diver and great northern diver according to the proportion of the population in the region based on Furness (2015). This is outlined in Table A2-15.

Table A 2-14: Calculation of Western Irish Sea diver populations based on Jessop *et al*. (2018).

Bio-season	Total estimated Western Irish Sea abundance (all divers)	Proportion of red-throated divers	Proportion of great northern divers	No. red-throated divers	No. great northern divers
Autumn migration (and Spring migration)	8,916	0.9358	0.0642	8,344	572
Migration-free Winter	2,942	0.8467	0.1533	2,491	451

2.13.12 The resulting non-breeding regional populations are presented in Table A2-16 below.

Table A 2-15: Final non-breeding bio-season regional populations relevant for the proposed development.

Species	Non-breeding	Autumn migration	Spring migration	Winter
Common scoter[10]	8,616	-	-	-
Kittiwake	-	933,197	713,137	-
Black-headed gull	3,709	-	-	-
Common gull	11,030	-	-	-
Great black-backed gull	53,406	-	-	-
Herring gull	187,094	-	103,941	186,502
Lesser black-backed gull	-	171,500	171,500	53,368
Roseate tern	-	6,375	6,375	-
Common tern	-	74,000	74,000	-
Arctic tern	-	72,238	72,238	-
Guillemot	1,332,623	-	-	-
Razorbill	-	632,453	632,453	366,961
Puffin	-	-	300,427	
Red-throated diver	-	12,717	12,717	4,148
Great northern diver	871	-	-	-
Fulmar	-	843,783	843,783	571,956
Manx shearwater	-	1,585,521	1,585,521	-
Gannet	596,525	535,183	643,917	-

Breeding regional populations

2.13.13 In the breeding bio-season, two approaches are available to calculate the regional population size:

- Method 1: Taking colony counts of all colonies within mean maximum foraging range plus a one standard deviation (based on Woodward *et al.*, 2019) and adding the number of immatures from the non-breeding season preceding the breeding season, calculated based on the proportion of immatures from the relevant regional population (using adult proportions from Horswill and Robinson 2015); and
- Method 2: Taking colony counts of all colonies within mean maximum foraging range plus a one standard deviation (based on Woodward *et al.*, 2019) and adjusting these based on the number of immatures per adult calculated from Horswill and Robinson (2015).

[10] Based on Jessop *et al* 2018 aerial survey data

2.13.14 The first approach (Method 1) is considered more ecologically relevant because it accounts for the breeding adult population, which are constrained by the necessity to tend to a nest (i.e. their foraging range), and the remaining regional population of immature birds and non-breeders that do not have the same constraints during the breeding season. Evidence suggests that large proportion of these birds are likely to remain in the region, and use the area for foraging during the breeding season and therefore should be considered as part of the regional population. Both populations are presented in Table A2-17 below.

2.13.15 In spite of this, in line with the requirements set out in RFI 8. a) vii, the assessment has adopted Method 2 exclusively when deriving Regional Breeding Population estimates. This approach applies the adult-to-immature ratios from Horswill & Robinson (2015) to adjust colony counts within the relevant foraging range and is considered the more precautionary method for population estimation, though less ecologically relevant due to underestimating the population that could be subject to impacts during the breeding season as discussed in the paragraph above. Consequently, Method 2 has been used consistently throughout the EIA to ensure compliance with the RFI.

2.13.16 For fulmar, a slightly different approach was undertaken based on knowledge of their behaviour and expert judgement. Fulmar foraging behaviour changes radically between the incubation period and the chick rearing period. During chick rearing, fulmars are constrained by the need to return to the nest to feed young. As such, the average foraging range during this period is substantially reduced in comparison with incubation. Studies of Norwegian birds showed a chick rearing average foraging range of 60km (Weimerskirch *et al*., 2001). Birds tracked from colonies in Orkney during chick rearing showed median ranges of 6km (males) and 5km (females), compared to median ranges of 475km (males) and 702km (females) during incubation. (Edwards 2015). Fulmar occurrence in the project area is highest during the chick rearing period (defined as July 1 – Aug 20 in Orkney by Edwards) and into September, possibly corresponding with occurrences of locally fledged birds. As fulmar presence is so low in the project area during the incubation period (total of 10 birds across three years in the array area pls 4km buffer), potential impacts will be similarly low. For the chick rearing period, impacts can be assessed against colonies within a precautionary foraging range of 100km.

Table A 2-16: Final breeding bio-season regional populations relevant for the proposed development

Species	Breeding Method 1	Breeding method 2			
	Regional Population	No. of Breeding Birds[11]	Juvenile Proportion	No. of Non-breeding Immatures	Regional Population
Common scoter	-	-	-	-	
Kittiwake	412,374	75,060	0.898	67,404	142,464
Black-headed gull	32,000	-	-	-	
Common gull	-	-	-	-	
Great black-backed gull	33,422	1,058	1.538	1,627	2,685
Herring gull	119,304	11,164	1.370	15,295	26,459
Lesser black-backed gull	120,320	40,229	0.876	35,241	75,470
Roseate tern	5,911	3,284	0.701	2,302	5,586
Common tern	34,574	4,086	0.701	2,863	6,949
Arctic tern	24,532	118	0.511	60	178
Guillemot	736,212	99,218	0.916	90,855	190,073
Razorbill	321,633	26,278	0.876	23,020	49,298
Puffin	180,693	43,398	0.842	36,451	79,939
Red-throated diver	-	-	-	-	
Great northern diver	-	-	-	-	
Fulmar		441,767	3,000	1.083	3,249
Manx shearwater	2,727,371	1,279,137	0.469	841,912	2,121,049

[11] Breakdown of colony counts within MMFR+1SD can be found in the Appendix A15.8: Offshore and Intertidal Ornithology Apportioning Appendix.

Gannet	637,440	359,268	0.761	273,246	632,514

2.13.17 The determination of appropriate reference population sizes for qualifying interest (QI) species of the North-West Irish Sea (NWIS) SPA is a critical component of the assessment. Using reference populations that are unrealistically small or overly large would lead to an inaccurate estimation of potential impacts on the actual NWIS SPA population. However, for several species, including auk species, the population figures currently cited in the Site Synopsis[12] and conservation objectives[13] are not consistent, based on limited survey effort and do not reflect the scale or temporal variability of bird usage within the SPA.

2.13.18 For a number of QIs, population estimates derive from the ObSERVE programme (Jessopp *et al.*, 2018), which collected only two aerial surveys per season in 2015–2016. These datasets provide useful contextual information but represent single snapshots of abundance rather than a reliable estimate of the number of birds using the SPA across an annual cycle. For example, for auks, the Site Synopsis provides a combined figure of c.93,000 guillemot and razorbill, and a guillemot figure of 13,914 based on autumn and winter surveys alone. These values are not representative of the full annual population using the NWIS SPA as they do not accurately capture how many birds will realistically use the site (only how many birds were present during the very short survey period).

2.13.19 To address this limitation, the Developer has undertaken 12 months of high-resolution digital DAS covering the full NWIS SPA (September 2024–August 2025). This provides substantially greater spatial coverage and temporal resolution than the historical datasets on which current population citations are based. For several QI species, the peak abundances recorded during the NWIS DAS exceed those in the Site Synopsis by orders of magnitude, demonstrating that the cited values significantly under-represent actual usage of the SPA.

2.13.20 Notwithstanding this, it is important to recognise that even DAS-derived peak abundances provide only a precautionary snapshot of usage at the time of survey. DAS methods do not identify the origin of birds and therefore cannot account for the broader regional population that may utilise the SPA at different times of year for foraging, rafting, staging or migration. For highly mobile species - such as auks, kittiwake, gannet and several gull species - the regional non-breeding population, as defined in Furness (2015) and adapted for the Irish Sea, is multiple times larger than both the Site Synopsis values and DAS-derived maxima. This population is relevant because all these populations have potential connectivity with the NWIS SPA. The relevant regional population (modified Furness 2015 BDMPS values) represents the wider pool of birds with potential ecological connectivity to the SPA, but is broad-scale and may over-represent the population that is likely to be regularly exposed to site-specific effects.

2.13.21 Given these considerations, the Developer has chosen to present an assessment at three population scales in the NIS:

- The population cited in the Site Synopsis / conservation objectives (recognised as an underestimate).

[12] https://www.npws.ie/sites/default/files/protected-sites/synopsis/SY004236.pdf

[13] https://www.npws.ie/sites/default/files/protected-sites/conservation_objectives/CO004236.pdf

- The peak NWIS DAS abundance (precautionary snapshot; represents best available spatially relevant evidence).
- The relevant regional population (modified Furness 2015 BDMPS values; represents the wider pool of birds with potential ecological connectivity to the SPA).

2.13.22 This approach ensures transparency while acknowledging the potential limitations of each dataset. Although the Site Synopsis and ObSERVE-derived values are not considered ecologically realistic for impact assessment, they are presented for comparison. For the purposes of determining potential effects and applying proportionality in the assessment, the Developer considers the NWIS DAS-derived population to be the most appropriate and up-to-date representation of SPA usage, while recognising that even this remains precautionary in the absence of a comprehensive annual population estimate.

2.14 Designated sites

2.14.1 Six designated sites have been identified which are considered highly relevant to the ornithology EIAR assessment based on their proximity to the proposed development, and the features for which they are designated (noting that these six sites and all other SPAs with potential connectivity to the proposed development are fully considered within the NIS). These SPAs correspond with those highlighted in the Site Synopsis for the North-West Irish Sea candidate SPA. These include:

- North-West Irish Sea SPA;
- Rockabill SPA;
- Lambay Island SPA;
- Ireland's Eye SPA;
- Skerries Island SPA; and
- Boyne Estuary SPA.

2.14.2 The offshore development area is located within the North-West Irish Sea SPA, which covers an area of 2,333km^2 and is designated for 21 bird species, including four tern species, three auk species, seven gull species, two diver species, fulmar, Manx shearwater, shag, cormorant and common scoter. All designated species have been considered in the ornithology assessment. Notable exceptions to this include cormorant and shag which are not considered at risk of collision effects (based on flight height data) or displacement impacts (with evidence of birds even being attracted to OWFs and roosting on the structures) (Bradbury *et al*. 2014, Dierschke *et al*. 2016). Furthermore, no cormorants were identified in 29-months of DAS data, and only one shag (with no cormorant identified in the 12 months of NWIS DAS, and shag only recorded within the 10 km buffer). Similarly, only one Sandwich tern (*Thalasseus sandvicensis*) was recorded in the 19-months of MAC DAS, and no individuals in the PFI within the 12 months of NWIS DAS and therefore no likely significant effects on this species are expected.

2.14.3 The Rockabill SPA is also located within close proximity (0.2km) to the array area and is designated for three tern species and purple sandpiper. Consideration of tern species is given through an assessment on collision risk, with purple sandpiper assessed in the migratory collision risk assessment. Notably purple sandpiper is considered low risk, with no birds recorded during DAS surveys and vantagepoint surveys, and low numbers recorded during landfall surveys. Although the boundary of Rockabill SPA is located just 0.2km from the proposed development, the island, where purple sandpiper will be over-wintering, is over 3.7km away and therefore beyond the disturbance range for this species of approximately 300m (Goodship & Furness, 2022).

2.14.4 The Lambay Island SPA is located 22.2km from the array area, and is designated for ten species (fulmar, cormorant, shag, greylag goose (*Anser anser*), lesser black-backed gull (*Larus fuscus*), herring gull (*Larus argentatus*), kittiwake (*Rissa tridactyla*), guillemot (*Uria aalge*), razorbill (*Alca torda*) and puffin (*Fratercula arctica*)). With the exception of cormorant and shag which are not considered vulnerable to OWF impacts (as discussed above), and greylag goose which was screened out of the migratory collision risk assessment due to low risk and the mCRM calculations predicting zero percent of the population likely to be at collision risk, all designated species have been considered in the ornithology assessment.

2.14.5 The Ireland's Eye SPA is located 33.0km from the array area, and is designated for five species (cormorant, herring gull, kittiwake, guillemot and razorbill). With the exception of cormorant, which is not considered vulnerable to OWF impacts, all designated species have been considered in the ornithology assessment.

2.14.6 The Skerries Island SPA is located 18.5km from the array area and has breeding season connectivity for herring gull qualifying interest. Shag and cormorant are not considered to be vulnerable to impacts from OWFs and are therefore scoped out of the assessment. Three qualifying wintering waterbird interests from this SPA may pass through the array area twice per annum on migration and are assessed within the ornithology assessment.

2.14.7 The Boyne Estuary SPA is primarily designated for non-seabird species which have limited connectivity to the proposed development. All species are considered to have low vulnerability to OWF impacts. The SPA is beyond the displacement ranges for wintering waterbirds from ECC construction activity. However, some qualifying interests from this SPA may pass through the array area twice per annum on migration. Little tern is the only qualifying seabird species at this SPA and has no breeding season connectivity with the array area due to their small foraging ranges coastal distribution.

2.15 Species Accounts

2.15.1 An account for species is provided below, summarising the main findings of the baseline surveys. A full account is provided for key species, considered to be those which were recorded in high numbers/frequencies during surveys and/or are considered sensitive to OWF developments. Monthly raw counts, abundance estimates and density estimates are provided where possible within the array area and a 2 km buffer, with a 4 km and 10 km buffer presented for red-throated diver to reflect what will be used within the displacement assessment. Numbers presented have been apportioned and corrected for availability bias where appropriate, as outlined on page 44.

2.15.2 It should be noted that the data from two datasets (MAC DAS and NWIS DAS) has been combined to provide an even more robust dataset spanning 41 months of survey. Where possible, density maps, flight directions and information on spatial habitat use from available tracking studies is provided for key species.

3 Results

3.1.1 Abundance, density and bio-season peak estimates, which are presented below, are derived from a combined DAS dataset. This is made up of both the MAC DAS and NWIS DAS data collection effort. Estimates are presented for the PFI and relevant buffers as opposed to the array area boundary. Full raw counts and abundance and density estimates for the NWIS SPA are provided in each species account. Flight direction data are presented for the original MAC DAS programme and these are considered representative of the NWIS DAS.

3.2 Kittiwake

General overview

3.2.1 Kittiwake were once one of the most abundant seabird species in Ireland with an estimated population size of 24,728 breeding pairs (2015-2018). However, kittiwake populations have been declining across the UK and this same trend has been recorded in Ireland with a 32% population decline since 2000. As a result, kittiwake are red listed in Ireland and have a European International Union for Conservation of Nature (IUCN) red-list status of vulnerable. Kittiwakes mostly prey on small fish species such as lesser sandeels and clupeids, as well as fishery discards (Forrester *et al.*, 2007).

3.2.2 Kittiwake breeding season is between March to August, with a migration free breeding period between May and July (Furness, 2015). They have relatively large mean-maximum foraging range (± 1 SD) compared to other gull species of 156.1 ± 144.5km (Woodward *et al.*, 2019). Kittiwakes disperse large distances during the non-breeding season, spending time offshore in the North Atlantic or south around the Bay of Biscay.

Abundance and density

3.2.3 Kittiwake were recorded in the PFI in 38 of 41 months. Raw counts ranged from 1 (June and July 2020) to 246 (July 2025), with abundance and density peaking at 1,174 birds and 20.36 birds/km^2 respectively (Table A3-1).

3.2.4 In the PFI plus a 2km buffer, raw counts ranged from 1 (June 2020 and July 2021) to 549 (August 2025), with abundance and density peaking at 2,708 birds and 16.91 birds/km^2 respectively (Table A3-1).

Table A 3-1: Kittiwake raw counts, estimated abundance (birds) and estimated density (birds/km^2) in the PFI and PFI plus a 2km buffer (CI values are presented in brackets).

Survey	Raw Count	Abundance Estimate	Density Estimate	Raw Count	Abundance Estimate	Density Estimate
		PFI			PFI plus a 2km buffer	
May, 2020	2	8 (2 – 16)	0.14	6	24 (6 – 44)	0.15
June, 2020	1	3 (1 – 10)	0.05	1	3 (1 – 10)	0.02
July, 2020	1	3 (1 – 10)	0.05	5	16 (5 – 37)	0.1
August, 2020	7	24 (10 – 40)	0.42	17	59 (41 – 79)	0.37
September, 2020	2	7 (2 – 16)	0.12	8	27 (8 – 54)	0.17
October, 2020	15	51 (17 – 102)	0.88	33	117 (72 – 175)	0.73
November, 2020	4	21 (4 – 42)	0.36	21	110 (31 – 211)	0.69
December, 2020	11	36 (11 – 65)	0.62	48	156 (109 – 208)	0.97
February, 2021	4	13 (4 – 33)	0.23	11	36 (11 – 67)	0.22
March, 2021	46	154 (96 – 219)	2.67	99	342 (256 – 437)	2.14
April, 2021	5	16 (5 – 33)	0.28	16	54 (27 – 84)	0.34
May, 2021	6	20 (7 – 36)	0.35	9	31 (10 – 61)	0.19
June, 2021	2	7 (2 – 13)	0.12	2	7 (2 – 14)	0.04
July, 2021	0	0 (0 – 0)	0	1	3 (1 – 10)	0.02
August, 2021	8	26 (8 – 52)	0.45	29	96 (53 – 146)	0.6
September, 2021	28	95 (44 – 147)	1.65	68	228 (115 – 356)	1.42
October, 2021	16	53 (16 – 96)	0.92	41	138 (51 – 239)	0.86
November, 2021	33	118 (56 – 190)	2.05	113	423 (212 – 664)	2.64
December, 2021	18	59 (26 – 92)	1.02	110	391 (161 – 722)	2.44

Survey	Raw Count	Abundance Estimate	Density Estimate	Raw Count	Abundance Estimate	Density Estimate
	PFI			PFI plus a 2km buffer		
January, 2022	223	734 (223 – 1,969)	12.73	297	1,016 (297 – 2,497)	6.34
February, 2022	17	57 (26 – 93)	0.99	70	234 (119 – 383)	1.46
March, 2022	2	7 (2 – 13)	0.12	20	67 (33 – 110)	0.42
April, 2022	4	13 (4 – 30)	0.23	14	47 (20 – 81)	0.29
May, 2022	2	7 (2 – 13)	0.12	2	7 (2 – 17)	0.04
June, 2022	2	7 (2 – 20)	0.12	2	7 (2 – 20)	0.04
July, 2022	38	124 (71 – 181)	2.15	152	503 (373 – 651)	3.14
August, 2022	1	3 (1 – 10)	0.05	9	30 (10 – 54)	0.19
September, 2022	0	0 (0 – 0)	0	8	26 (8 – 61)	0.16
October, 2022	15	49 (16 – 89)	0.85	180	605 (180 – 1,443)	3.78
September, 2024	5	24 (5 – 44)	0.42	72	363 (72 – 827)	2.27
October, 2024	21	106 (21 – 219)	1.84	151	760 (410 – 1,144)	4.74
November, 2024	9	47 (10 – 97)	0.82	58	318 (234 – 394)	1.99
December, 2024	6	28 (6 – 63)	0.49	16	84 (47 – 122)	0.52
January, 2025	15	73 (39 – 107)	1.27	87	442 (324 – 576)	2.76
February, 2025	5	24 (10 – 38)	0.42	14	99 (50 – 154)	0.62
March, 2025	34	163 (48 – 300)	2.83	95	477 (339 – 614)	2.98
April, 2025	4	19 (4 – 48)	0.33	14	69 (30 – 113)	0.43
May, 2025	0	0 (0 – 0)	0	0	0 (0 – 0)	0
June, 2025	2	10 (2 – 24)	0.17	3	14 (3 – 30)	0.09
July, 2025	246	1,174 (398 – 2,214)	20.36	371	1,817 (773 – 3,162)	11.34

Survey	Raw Count	Abundance Estimate	Density Estimate	Raw Count	Abundance Estimate	Density Estimate
	PFI			PFI plus a 2km buffer		
August, 2025	214	1,030 (214 – 2,303)	17.87	549	2,708 (1,029 – 4,455)	16.91

3.2.5 ESAS surveys, which took place in Irish waters between 1980 and 1997, recorded the highest densities of kittiwake (>5 birds/km^2) off the Dublin coast directly after the breeding season in August and September. High densities were also recorded in April and May, directly before breeding season. Lowest densities were recorded between October and January.

3.2.6 ObSERVE aerial surveys (2016) detected 2,421 kittiwake across summer, autumn and winter. Highest abundance was estimated to be in autumn with 13,892 (95% CIs 11,314 – 17,057) kittiwake, compared to 1,453 (95% CIs 908 – 2,326) birds in winter and 628 (95% CIs 425 - 929) during the summer.

Bio-season peak estimates

3.2.7 Kittiwake were present across all three bio-seasons. In the PFI, presence was greatest in the breeding bio-season (March to August), with a mean peak abundance of 369 birds, and a mean peak density of 6.40 birds/km^2 (Table A 3-2). Within the PFI plus a 2km buffer, presence was greatest in the breeding bio-season, with a mean peak abundance of 903 birds, and a mean peak density of 5.64 birds/km^2.

Table A 3-2: Kittiwake bio-season mean peak abundance and density estimates, in the PFI and PFI plus a 2km buffer using combined DAS datasets.

BDMPS Bio-seasons	Area	Months	Bio-season peak abundance (n)	Bio-season peak density (n/km^2)
Autumn migration	PFI	Sep–Dec	81	1.40
Breeding	PFI	Mar–Aug	369	6.40
Spring migration	PFI	Jan–Feb	273	4.74
Autumn migration	PFI plus a 2km buffer	Sep–Dec	486	3.03
Breeding	PFI plus a 2km buffer	Mar–Aug	903	5.64
Spring migration	PFI plus a 2km buffer	Jan–Feb	498	3.11

Spatial density distribution and flight direction

3.2.8 Density maps based on MAC DAS data are presented in Figure A 3-1 to Figure A 3-3 below. Kittiwakes were recorded throughout the survey area. Across all bio-seasons, densities were highest in the west/south-west of the survey area, though in the breeding season a high density of birds was also encountered in the east and south-east, predominantly located outside the PFI and buffer (i.e. within the 4km buffer).

3.2.9 Density data from Jessop *et al*. (2018) also shows a relatively high density of birds in close proximity to NISA during the Autumn migration bio-season, though during other bio-seasons, densities were higher to the south of the project.

3.2.10 The flight direction recorded during the DAS surveys was varied throughout, with five months recording a significant number of flying birds but with no consistent direction noted. In August and September 2021, the predominant direction was southwest and south while in November 2021 it was a westerly direction and in December 2021 it was predominantly north westerly. In July 2022 the majority of flying birds were recorded flying west or southwest (Figure A3-4).

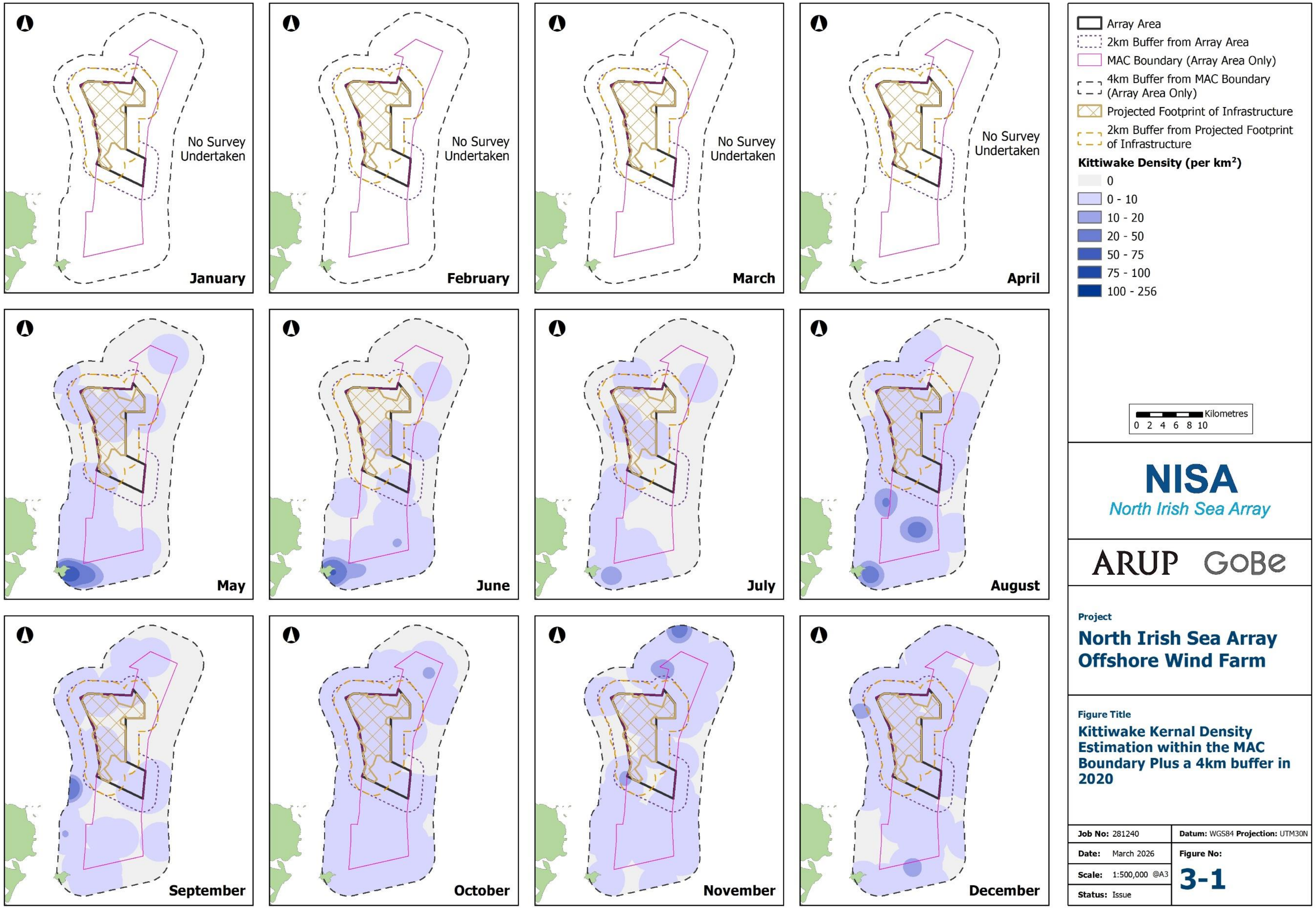

Figure A 3-1: Kittiwake Kernal Density Estimation within the MAC Boundary Plus a 4km buffer in 2020.

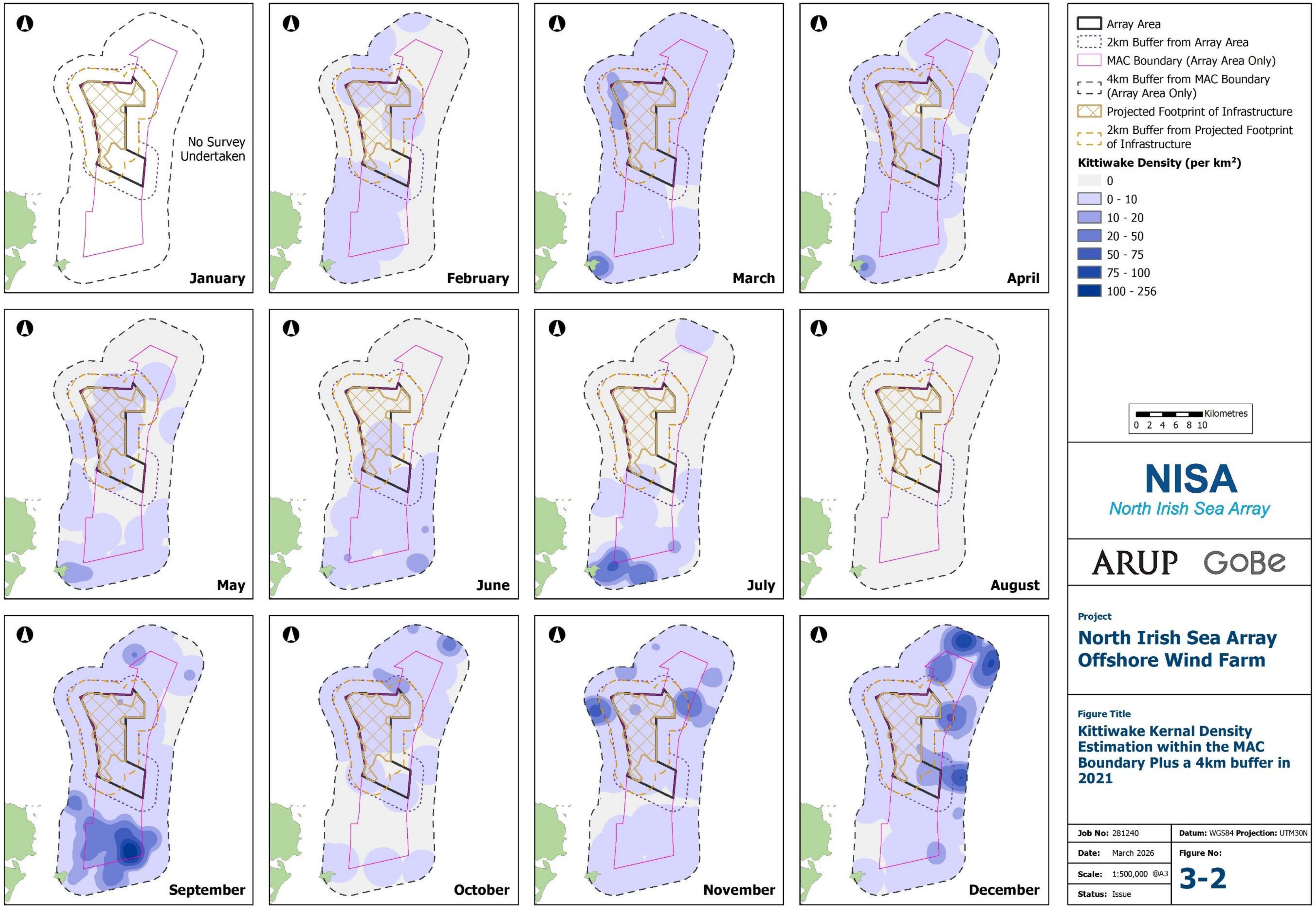

Figure A 3-2: Kittiwake Kernal Density Estimation within the MAC Boundary Plus a 4km buffer in 2021.

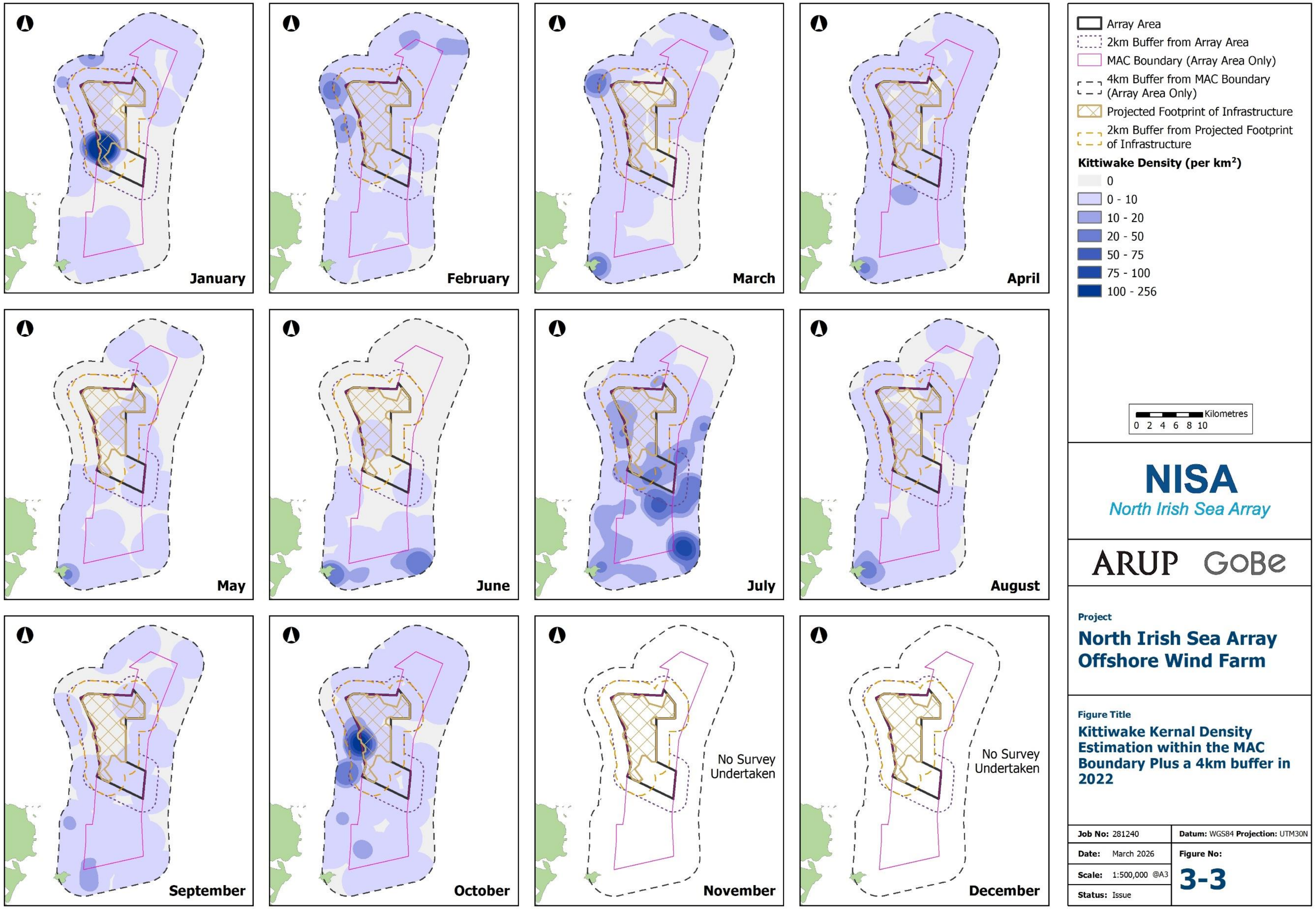

Figure A 3-3: Kittiwake Kernal Density Estimation within the MAC Boundary Plus a 4km buffer in 2022.

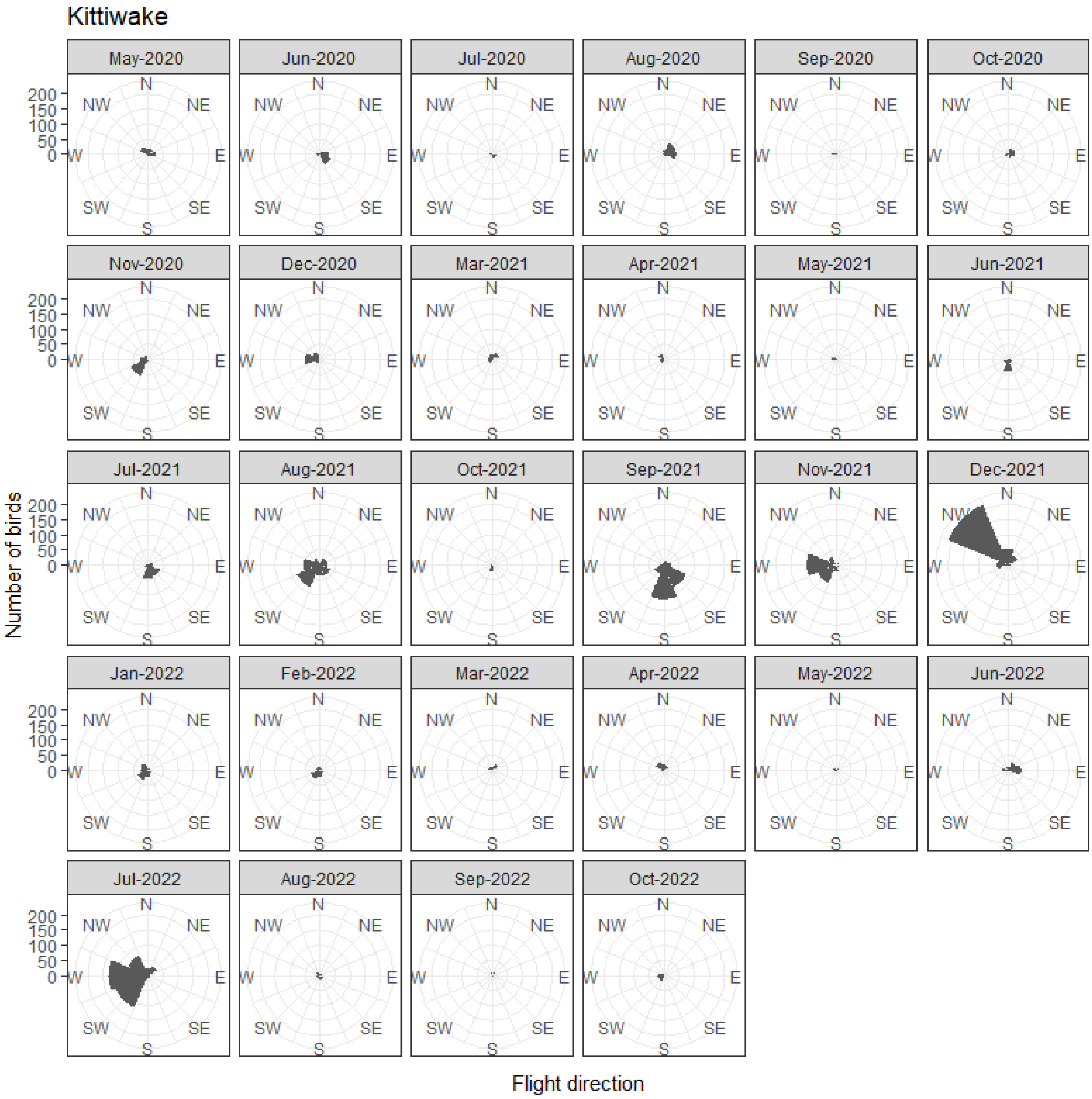

Figure A 3-4: Kittiwake monthly flight directions in the ornithology study area (using baseline 29-month DAS data).

3.2.11 DAS data for kittiwake within the NWIS SPA are presented below in Table A3-3. Kittiwakes were recorded throughout the NWIS SPA, across all 12 survey months. Raw counts ranged from 91 in December 2024 to 2,498 in August 2025 with abundance and density peaking 15,629 birds and 6.55 birds/km^2 respectively.

3.2.12 Density maps from the NWIS DAS data are presented in Figure A3-5. Kittiwake were observed throughout the NWIS SPA, across all months, with peaks occurring in November 2024, in the south of the NWIS SPA, and to the north of the PFI in August 2025.

Table A 3-3: Kittiwake raw counts, estimated abundance (birds) and estimated density (birds/km^2) in the NWIS SPA (CI values are presented in brackets).

Survey	Raw Count	Abundance Estimate	Density Estimate
September, 2024	816	5,098 (2,775 – 8,239)	2.14
October, 2024	840	5,568 (2,667 – 9,173)	2.33
November, 2024	2,177	12,799 (7,854 – 18,396)	5.37
December, 2024	91	681 (395 – 1,043)	0.29
January, 2025	469	4,041 (2,680 – 6,238)	1.69
February, 2025	300	2,223 (1,636 – 2,815)	0.93
March, 2025	568	3,564 (2,698 – 4,477)	1.49
April, 2025	362	2,345 (1,655 – 3,115)	0.98
May, 2025	165	1,113 (695 – 1,620)	0.47
June, 2025	315	1,861 (1,249 – 2,588)	0.78
July, 2025	1,434	9,033 (6,275 – 12,657)	3.79
August, 2025	2,498	15,629 (11,027 – 20,469)	6.55

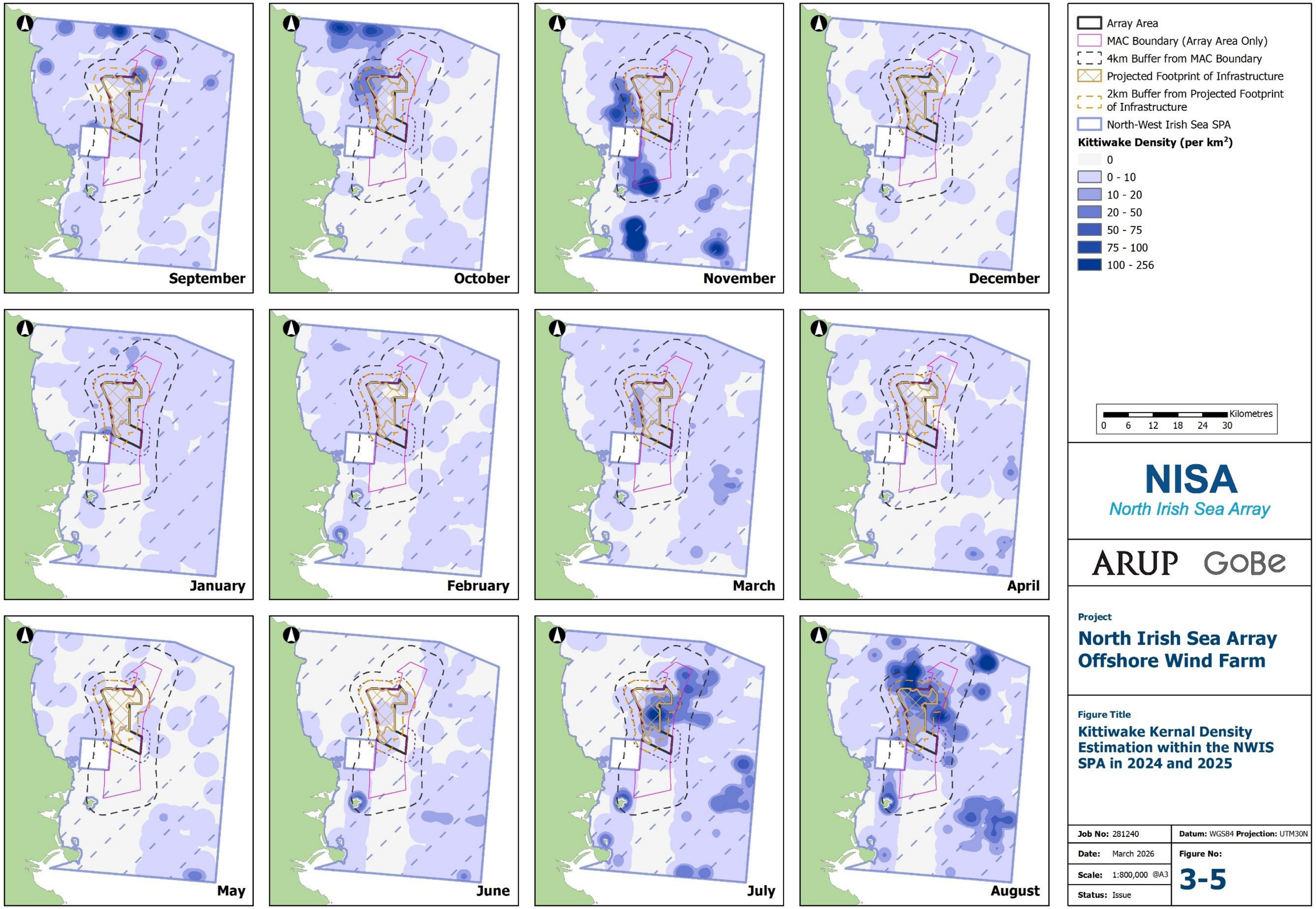

Figure A 3-5: Kittiwake Kernal Density Estimation within the NWIS SPA in 2024 & 2025.

Available tracking data

3.2.13 Tracking data is available from Lambay Island through the FAME Project (Baer & Newton, 2012), representing the largest cliff nesting colony for this species in Ireland. Over a 20-day period between 2010 and 2011, 14 kittiwakes were tracked from the Lambay breeding site. Birds were recorded up to 40km away from Lambay Island (though the mean foraging distance was 29.5km), with individuals predominantly moving south-east from the colony. No track's from Maggie's Leap overlapped with the PFI.

3.2.14 Tracking data is also available from Rockabill, which hosts a smaller colony of kittiwakes (~150-200 pairs) (Ruffino *et al*., 2023). However, this data was based on a small number of individuals (n=4), with birds ranging widely from the colony. From the available data the PFI was not frequently entered or used as a foraging hotspot.

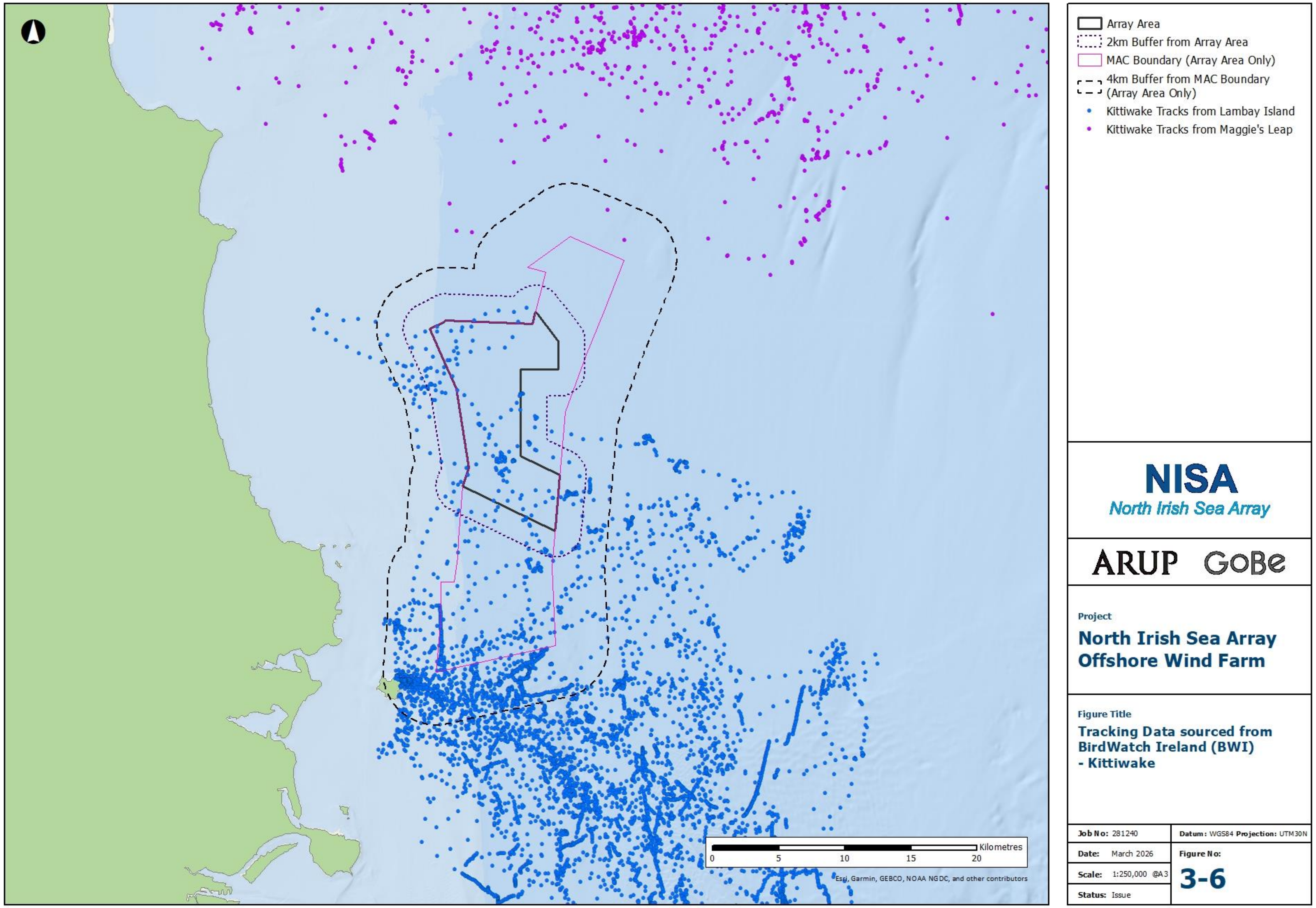

Figure A 3-6: Tracking Data sourced from Birdwatch Ireland (BWI) – Kittiwake

3.3 Black-headed Gull

General overview

3.3.1 Black-headed gulls are found breeding in Ireland regularly, with an estimated breeding population of 7,810 pairs (2016 – 2018). A large proportion of these (>25%) breed inland (as opposed to coastally) (Cummins *et al*. 2019). In Ireland, breeding numbers have shown a general decline of 11% between 1985-88 and 2015/18, largely as a result of predation (Mitchell *et al*. 2004).

Abundance and density

3.3.2 Black-headed gull were only recorded in the PFI in 1 of 41 months. The raw count was 1 (July 2020), with abundance and density peaking at 3 birds and 0.05 birds/km^2 respectively (Table A3-4).

3.3.3 In the PFI plus a 2km buffer, raw counts ranged from 1 (July 2020 and October 2021) to 7 (February 2021), with abundance and density peaking at 23 birds and 0.14 birds/km^2 respectively (Table A3-4).

Table A 3-4: Black-headed gull raw counts, estimated abundance (birds) and estimated density (birds/km^2) in the PFI and PFI plus a 2km buffer (CI values are presented in brackets).

Survey	Raw Count	Abundance Estimate	Density Estimate	Raw Count	Abundance Estimate	Density Estimate
	PFI			PFI plus a 2km buffer		
May, 2020	0	0 (0 – 0)	0	0	0 (0 – 0)	0
June, 2020	0	0 (0 – 0)	0	0	0 (0 – 0)	0
July, 2020	0	0 (0 – 0)	0	1	3 (1 – 10)	0.02
August, 2020	0	0 (0 – 0)	0	0	0 (0 – 0)	0
September, 2020	0	0 (0 – 0)	0	0	0 (0 – 0)	0
October, 2020	0	0 (0 – 0)	0	0	0 (0 – 0)	0
November, 2020	0	0 (0 – 0)	0	0	0 (0 – 0)	0
December, 2020	0	0 (0 – 0)	0	0	0 (0 – 0)	0
February, 2021	0	0 (0 – 0)	0	7	23 (7 – 64)	0.14
March, 2021	0	0 (0 – 0)	0	0	0 (0 – 0)	0
April, 2021	0	0 (0 – 0)	0	0	0 (0 – 0)	0
May, 2021	0	0 (0 – 0)	0	0	0 (0 – 0)	0
June, 2021	0	0 (0 – 0)	0	0	0 (0 – 0)	0
July, 2021	0	0 (0 – 0)	0	0	0 (0 – 0)	0
August, 2021	0	0 (0 – 0)	0	0	0 (0 – 0)	0
September, 2021	0	0 (0 – 0)	0	0	0 (0 – 0)	0
October, 2021	0	0 (0 – 0)	0	1	3 (1 – 10)	0.02
November, 2021	1	3 (1 – 10)	0.05	4	14 (4 – 35)	0.09
December, 2021	0	0 (0 – 0)	0	0	0 (0 – 0)	0
January, 2022	0	0 (0 – 0)	0	0	0 (0 – 0)	0

Survey	Raw Count	Abundance Estimate	Density Estimate	Raw Count	Abundance Estimate	Density Estimate
	PFI			PFI plus a 2km buffer		
February, 2022	0	0 (0 – 0)	0	0	0 (0 – 0)	0
March, 2022	0	0 (0 – 0)	0	0	0 (0 – 0)	0
April, 2022	0	0 (0 – 0)	0	0	0 (0 – 0)	0
May, 2022	0	0 (0 – 0)	0	0	0 (0 – 0)	0
June, 2022	0	0 (0 – 0)	0	0	0 (0 – 0)	0
July, 2022	0	0 (0 – 0)	0	0	0 (0 – 0)	0
August, 2022	0	0 (0 – 0)	0	0	0 (0 – 0)	0
September, 2022	0	0 (0 – 0)	0	0	0 (0 – 0)	0
October, 2022	0	0 (0 – 0)	0	0	0 (0 – 0)	0
September, 2024	0	0 (0 – 0)	0	0	0 (0 – 0)	0
October, 2024	0	0 (0 – 0)	0	0	0 (0 – 0)	0
November, 2024	0	0 (0 – 0)	0	0	0 (0 – 0)	0
December, 2024	0	0 (0 – 0)	0	0	0 (0 – 0)	0
January, 2025	0	0 (0 – 0)	0	0	0 (0 – 0)	0
February, 2025	0	0 (0 – 0)	0	0	0 (0 – 0)	0
March, 2025	0	0 (0 – 0)	0	0	0 (0 – 0)	0
April, 2025	0	0 (0 – 0)	0	0	0 (0 – 0)	0
May, 2025	0	0 (0 – 0)	0	0	0 (0 – 0)	0
June, 2025	0	0 (0 – 0)	0	0	0 (0 – 0)	0
July, 2025	0	0 (0 – 0)	0	0	0 (0 – 0)	0
August, 2025	0	0 (0 – 0)	0	0	0 (0 – 0)	0

Bio-season peak estimates

3.3.1 Black-headed gull was present in only one bio-season (non-breeding) within the PFI. A mean peak abundance of 1 bird, and a mean peak density of 0.02 birds/km^2 was estimated (Table A 3-5). Black-headed gull was present across both bio-seasons within the PFI plus a 2km buffer, with a mean peak abundance of 12 birds and a mean peak density of 0.08 birds/km^2 estimated in the non-breeding bio-season (Table A 3-5).

Table A 3-5: Black-headed gull bio-season mean peak abundance and density estimates in the PFI and PFI plus a 2km buffer using combined DAS datasets.

BDMPS Bio-seasons	Area	Months	Bio-season peak abundance (n)	Bio-season peak density (n/km^2)
Breeding	PFI	Apr-Aug	-	-
Non-breeding	PFI	Sep-Mar	1	0.02
Breeding	PFI plus a 2km buffer	Apr-Aug	1	0.01
Non-breeding	PFI plus a 2km buffer	Sep-Mar	12	0.08

North West Irish Sea SPA

3.3.2 DAS data for black-headed gull within the NWIS SPA are presented below in Table A3-6. Black-headed gulls were recorded within the NWIS SPA across nine of the 12 survey months. Raw counts ranged from 0 in April, May and June 2025 to 563 in October 2024 with abundance and density peaking 3,709 birds and 1.55 birds/km^2 respectively.

Table A 3-6: Black-headed gull raw counts, estimated abundance (birds) and estimated density (birds/km2) in the NWIS SPA (CI values are presented in brackets).

Survey	Raw Count	Abundance Estimate	Density Estimate
September, 2024	77	480 (111 – 1,004)	0.2
October, 2024	563	3,709 (563 – 10,149)	1.55
November, 2024	517	2,893 (1,775 – 4,419)	1.21
December, 2024	22	184 (61 – 342)	0.08
January, 2025	103	1,121 (321 – 2,515)	0.47
February, 2025	11	67 (12 – 150)	0.03
March, 2025	1	6 (1 – 18)	0
April, 2025	0	0 (0 – 0)	0
May, 2025	0	0 (0 – 0)	0
June, 2025	0	0 (0 – 0)	0
July, 2025	252	1,568 (252 – 3,766)	0.66
August, 2025	35	221 (36 – 546)	0.09

3.4 Common Gull

General overview

3.4.1 The common gull breeding population in Ireland has been relatively stable over the long-term with an estimated at 1,948 pairs between 2015 and 2018. The largest colonies are found to the north and west of Ireland. Populations have shown a general decline, with a 25% decline between 1069/78 and 2015/18 (Cummins *et al*., 2019).

3.4.2 The common gull breeding season is between March to August (SNH, 2017). During this time, adults stay relatively close to their nests with a mean-maximum foraging range of 50 km (although data to inform this is limited). Common gulls are Amber-listed in Ireland due to declines in their population over the long term (25% decline between 1980 and 2018) (Gilbert *et al*., 2021). Ireland is home to a large wintering population during the non-breeding season because birds from Europe move into the UK and Ireland (Gilbert *et al*., 2021).

Abundance and density

3.4.3 Common gull were recorded in the PFI in 10 of 29 months. Raw counts ranged from 1 (across several months) to 22 (November 2021), with abundance and density peaking at 77 birds and 1.34 birds/km^2 respectively (Table A3-7).

3.4.4 In the PFI plus a 2km buffer, raw counts ranged from 1 (across several months) to 47 (November 2021). Common gull abundance and density was estimated to peak at 181 birds and 1.13 birds/km^2 respectively (January 2025). (Table A3-7).

Table A 3-7: Common gull raw counts, estimated abundance (birds) and estimated density (birds/km^2) in the PFI and PFI plus a 2km buffer (CI values are presented in brackets).

Survey	Raw Count	Abundance Estimate	Density Estimate	Raw Count	Abundance Estimate	Density Estimate
	PFI			PFI plus a 2km buffer		
May, 2020	0	0 (0 – 0)	0	0	0 (0 – 0)	0
June, 2020	0	0 (0 – 0)	0	0	0 (0 – 0)	0
July, 2020	0	0 (0 – 0)	0	0	0 (0 – 0)	0
August, 2020	0	0 (0 – 0)	0	0	0 (0 – 0)	0
September, 2020	0	0 (0 – 0)	0	0	0 (0 – 0)	0
October, 2020	0	0 (0 – 0)	0	0	0 (0 – 0)	0
November, 2020	0	0 (0 – 0)	0	0	0 (0 – 0)	0
December, 2020	2	6 (2 – 19)	0.10	8	26 (8 – 49)	0.16
February, 2021	1	3 (1 – 10)	0.05	1	3 (1 – 10)	0.02
March, 2021	2	6 (2 – 13)	0.10	14	48 (14 – 95)	0.3
April, 2021	1	3 (1 – 10)	0.05	1	3 (1 – 10)	0.02
May, 2021	0	0 (0 – 0)	0	0	0 (0 – 0)	0
June, 2021	0	0 (0 – 0)	0	0	0 (0 – 0)	0
July, 2021	0	0 (0 – 0)	0	0	0 (0 – 0)	0
August, 2021	0	0 (0 – 0)	0	0	0 (0 – 0)	0
September, 2021	0	0 (0 – 0)	0	0	0 (0 – 0)	0
October, 2021	0	0 (0 – 0)	0	0	0 (0 – 0)	0
November, 2021	22	77 (22 – 147)	1.34	47	177 (56 – 332)	1.11
December, 2021	0	0 (0 – 0)	0	4	14 (4 – 29)	0.09
January, 2022	8	26 (8 – 66)	0.45	16	52 (16 – 142)	0.32

Survey	Raw Count	Abundance Estimate	Density Estimate	Raw Count	Abundance Estimate	Density Estimate
		PFI			PFI plus a 2km buffer	
February, 2022	8	26 (8 – 46)	0.45	15	51 (15 – 95)	0.32
March, 2022	1	3 (1 – 10)	0.05	1	3 (1 – 10)	0.02
April, 2022	0	0 (0 – 0)	0	0	0 (0 – 0)	0
May, 2022	0	0 (0 – 0)	0	0	0 (0 – 0)	0
June, 2022	0	0 (0 – 0)	0	0	0 (0 – 0)	0
July, 2022	0	0 (0 – 0)	0	0	0 (0 – 0)	0
August, 2022	0	0 (0 – 0)	0	0	0 (0 – 0)	0
September, 2022	0	0 (0 – 0)	0	0	0 (0 – 0)	0
October, 2022	1	3 (1 – 10)	0.05	1	3 (1 – 10)	0.02
September, 2024	0	0 (0 – 0)	0	0	0 (0 – 0)	0
October, 2024	0	0 (0 – 0)	0	1	5 (1 – 15)	0.03
November, 2024	7	36 (7 – 81)	0.62	13	71 (38 – 112)	0.44
December, 2024	2	9 (2 – 19)	0.16	13	66 (20 – 109)	0.41
January, 2025	4	19 (5 – 34)	0.33	36	181 (67 – 296)	1.13
February, 2025	1	5 (1 – 14)	0.09	4	20 (10 – 25)	0.12
March, 2025	0	0 (0 – 0)	0	1	5 (1 – 15)	0.03
April, 2025	0	0 (0 – 0)	0	0	0 (0 – 0)	0
May, 2025	0	0 (0 – 0)	0	0	0 (0 – 0)	0
June, 2025	0	0 (0 – 0)	0	0	0 (0 – 0)	0
July, 2025	0	0 (0 – 0)	0	0	0 (0 – 0)	0
August, 2025	0	0 (0 – 0)	0	0	0 (0 – 0)	0

3.4.5 ESAS surveys, which took place in Irish waters between 1980 and 1997, recorded the highest densities of common gull off the Dublin coast between October and March. Low densities were recorded between April and May and no common gulls were recorded off the east Irish coast during the summer months (June to September).

3.4.6 The ObSERVE aerial surveys, which took place in 2016, recorded 2,726 herring and common gull off the east Irish coast (grouped because they could not be differentiated). In agreement with the ESAS surveys, the birds were observed more frequently in the autumn (35,015 birds) and winter (16,110 birds) months with lower densities during the summer (6,196 birds) (Jessopp *et al*., 2018). The coastal waters north of Dublin Bay were highlighted as being particularly important for common or herring gulls in all seasons. Abundance of common or herring gulls across the survey area was estimated at 6,196 (95% CIs 5,303 – 9,019) individuals in summer, 35,015 (95% CIs 14,829 – 82,680) birds in autumn, and 16,110 (95% CIs 11,489 – 22,590) birds in winter (Jessopp *et al*., 2018).

Bio-season peak estimates

3.4.1 Common gull was present across both bio-seasons. Presence was greatest in the non-breeding bio-season (September to March), with a mean peak abundance of 31 birds, and a mean peak density of 0.53 birds/km^2 in the PFI (Table A3-8).

3.4.2 Within the PFI plus a 2km buffer presence was also greatest within the non-breeding bio-season. A mean peak abundance of 102, and a mean peak density of 0.64 birds/km^2 was estimated (Table A3-8).

Table A 3-8: Common gull bio-season mean peak abundance and density estimates in the PFI and PFI plus a 2km buffer using combined DAS datasets.

BDMPS Bio-seasons	Area	Months	Bio-season peak abundance (n)	Bio-season peak density (n/km^2)
Breeding	PFI	Apr–Aug	1	0.01
Non-breeding	PFI	Sep–Apr	31	0.53
Breeding	PFI plus a 2km buffer	Apr–Aug	1	0.00
Non-breeding	PFI plus a 2km buffer	Sep–Apr	102	0.64

Spatial density distribution and flight direction

3.4.3 Common gulls were recorded throughout the survey area. Across both bio-seasons, densities were highest in the west of the survey area. Notably in the breeding season, the peak densities were recorded outside of the PFI to the northwest of the PFI.

3.4.4 The number of common gulls recorded flying was minimal in most months except November 2021 where the majority were recorded flying in a westerly direction, with smaller numbers flying in a south-westerly direction (Figure A3-7). Other months with low numbers of flying birds included November and December 2020, December 2021, January, February and March 2022 and all had a westerly element dominating the direction of flight (Figure A3-7).

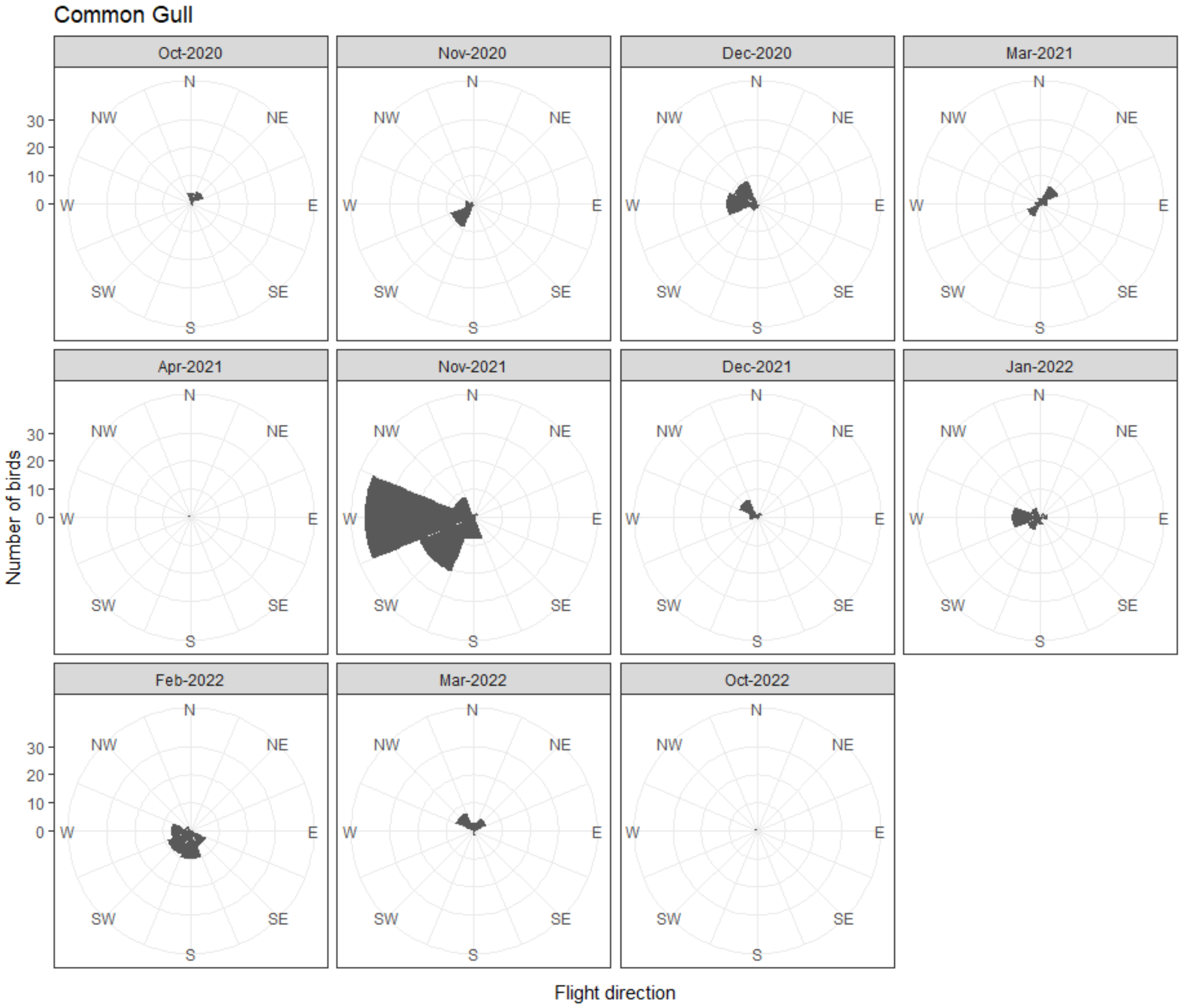

Figure A 3-7: Common Gull monthly flight directions in the ornithology study area (using baseline 29-month DAS data).

3.4.5 DAS data for common gull within the NWIS SPA are presented below in Table A3-9. Common gulls were recorded within the NWIS SPA across ten of the 12 survey months. Raw counts ranged from 0 in May and June 2025 to 1,109 in November 2024 with abundance and density peaking 6,408 birds and 2.69 birds/km^2 respectively.

Table A 3-9: Common gull raw counts, estimated abundance (birds) and estimated density (birds/km2) in the NWIS SPA (CI values are presented in brackets).

Survey	Raw Count	Abundance Estimate	Density Estimate
September, 2024	18	111 (43 – 189)	0.05
October, 2024	45	286 (124 – 467)	0.12
November, 2024	1,109	6,408 (4,660 – 8,273)	2.69
December, 2024	208	1,595 (967 – 2,319)	0.67
January, 2025	379	3,087 (1,616 – 4,998)	1.29
February, 2025	114	748 (472 – 1,041)	0.31
March, 2025	68	428 (139 – 848)	0.18
April, 2025	3	20 (3 – 39)	0.01
May, 2025	0	0 (0 – 0)	0
June, 2025	0	0 (0 – 0)	0
July, 2025	13	81 (31 – 140)	0.03
August, 2025	20	126 (20 – 311)	0.05

3.5 Great Black-backed Gull

General overview

3.5.1 The great black-backed gull breeding population in Ireland has been relatively stable over the long-term with an estimated at 3,081 pairs between 2015 and 2018. The largest colonies are situated on the west-coast.

3.5.2 The great black-backed gull breeding season is between March to August (Furness, 2015; Table A 2-7). During this time, adults stay relatively close to their nests with a mean-maximum foraging range of 73 km. The colonies in proximity to NISA are Lambay Island (99 pairs) and Ireland's Eye (127 pairs) (Cummins *et al.*, 2019). Great black-backed gulls do not migrate large distances and tend to remain close to their breeding colonies throughout the non-breeding season (Wernham *et al.*, 2002). The species is Green listed in Ireland, in terms of its conservation status (Gilbert *et al.*, 2021).

Abundance and density

3.5.3 Great black-backed gull was recorded in the PFI in 26 of 41 months. Raw counts ranged from 1 (across several months) to 49 (November 2024), with abundance and density peaking at 274 birds and 4.75 birds/km^2 respectively (Table A3-10).

3.5.4 In the PFI plus a 2km buffer, raw counts ranged from 1 (across several months) to 103 (December 2020), with abundance and density peaking at 338 birds and 2.11 birds/km^2 respectively (Table A3-10).

Table A 3-10: Great black-backed gull raw counts, estimated abundance (birds) and estimated density (birds/km^2) in the PFI and PFI plus a 2km buffer (CI values are presented in brackets).

Survey	Raw Count	Abundance Estimate	Density Estimate	Raw Count	Abundance Estimate	Density Estimate
	PFI			PFI plus a 2km buffer		
May, 2020	0	0 (0 – 0)	0	0	0 (0 – 0)	0
June, 2020	0	0 (0 – 0)	0	1	3 (1 – 10)	0.02
July, 2020	0	0 (0 – 0)	0	5	17 (5 – 34)	0.11
August, 2020	1	3 (1 – 10)	0.05	1	3 (1 – 10)	0.02
September, 2020	0	0 (0 – 0)	0	0	0 (0 – 0)	0
October, 2020	3	10 (3 – 20)	0.17	8	31 (14 – 48)	0.19
November, 2020	2	11 (2 – 27)	0.19	3	16 (5 – 31)	0.1
December, 2020	1	3 (1 – 10)	0.05	103	338 (103 – 903)	2.11
February, 2021	7	25 (7 – 63)	0.43	12	43 (12 – 94)	0.27
March, 2021	3	10 (3 – 20)	0.17	8	26 (8 – 64)	0.16
April, 2021	0	0 (0 – 0)	0	2	7 (2 – 17)	0.04
May, 2021	0	0 (0 – 0)	0	0	0 (0 – 0)	0
June, 2021	0	0 (0 – 0)	0	0	0 (0 – 0)	0
July, 2021	1	3 (1 – 10)	0.05	2	7 (2 – 17)	0.04
August, 2021	5	34 (5 – 71)	0.59	8	44 (13 – 84)	0.27
September, 2021	2	7 (2 – 17)	0.12	10	34 (10 – 75)	0.21
October, 2021	1	3 (1 – 10)	0.05	3	11 (3 – 26)	0.07
November, 2021	7	24 (10 – 38)	0.42	13	65 (22 – 126)	0.41
December, 2021	1	4 (1 – 11)	0.07	38	159 (38 – 370)	0.99
January, 2022	11	37 (11 – 73)	0.64	17	58 (20 – 105)	0.36

Survey	Raw Count	Abundance Estimate	Density Estimate	Raw Count	Abundance Estimate	Density Estimate
		PFI			PFI plus a 2km buffer	
February, 2022	11	36 (13 – 63)	0.62	24	83 (31 – 137)	0.52
March, 2022	9	29 (9 – 65)	0.50	13	44 (13 – 83)	0.27
April, 2022	0	0 (0 – 0)	0	0	0 (0 – 0)	0
May, 2022	0	0 (0 – 0)	0	1	3 (1 – 10)	0.02
June, 2022	0	0 (0 – 0)	0	1	3 (1 – 10)	0.02
July, 2022	0	0 (0 – 0)	0	9	29 (10 – 53)	0.18
August, 2022	0	0 (0 – 0)	0	2	7 (2 – 20)	0.04
September, 2022	1	3 (1 – 10)	0.05	5	48 (5 – 172)	0.3
October, 2022	1	3 (1 – 10)	0.05	3	10 (3 – 20)	0.06
September, 2024	0	0 (0 – 0)	0	4	24 (4 – 65)	0.15
October, 2024	2	10 (2 – 29)	0.17	4	21 (5 – 40)	0.13
November, 2024	49	274 (49 – 745)	4.75	56	321 (56 – 774)	2.00
December, 2024	0	0 (0 – 0)	0	0	0 (0 – 0)	0
January, 2025	4	19 (4 – 48)	0.33	12	60 (15 – 114)	0.37
February, 2025	6	28 (6 – 63)	0.49	11	54 (20 – 104)	0.34
March, 2025	6	32 (10 – 58)	0.56	24	123 (78 – 170)	0.77
April, 2025	2	9 (2 – 24)	0.16	4	20 (5 – 44)	0.12
May, 2025	0	0 (0 – 0)	0	0	0 (0 – 0)	0
June, 2025	1	5 (1 – 14)	0.09	1	5 (1 – 15)	0.03
July, 2025	4	20 (5 – 38)	0.35	10	50 (20 – 80)	0.31
August, 2025	30	148 (30 – 279)	2.57	42	216 (75 – 363)	1.35

3.5.5 ESAS surveys which took place in Irish waters between 1980 and 1997 recorded low densities of great black-backed gulls off the east coast of Ireland between October and January, and no birds off the Irish east coast between February and June, although survey coverage was incomplete. Between July and September, great black-backed gulls were recorded off the east coast in low to moderate densities (Pollock *et al*., 1997).

Bio-season peak estimates

3.5.6 Great black-backed gull was present across both bio-seasons. Presence was greatest in the non-breeding bio-season (September to March), with a mean peak abundance of 85 birds, and a mean peak density of 1.47 birds/km^2 in the PFI (Table A3-11).

3.5.7 Within the PFI plus a 2km buffer, presence was also greatest in the non-breeding bio-season, with mean peak abundance and mean peak density estimated at 217 birds and 1.35 birds/km^2 respectively (Table A3-11).

Table A 3-11: Great black-backed gull bio-season mean peak abundance and density estimates in the PFI and PFI plus a 2km buffer using combined datasets.

BDMPS Bio-seasons	Area	Months	Bio-season peak abundance (n)	Bio-season peak density (n/km^2)
Breeding	PFI	Apr-Aug	46	0.80
Non-breeding	PFI	Sep-Mar	85	1.47
Breeding	PFI plus a 2km buffer	Apr-Aug	77	0.48
Non-breeding	PFI plus a 2km buffer	Sep-Mar	217	1.35

Spatial density distribution and flight direction

3.5.8 Density maps based on MAC DAS data are presented in Figure A3-8 to Figure A3-9 below. Great black-backed gulls were recorded throughout the survey area, with highest densities in the south of the survey area in the breeding bio-season, and in the west in the non-breeding bio-season.

3.5.9 This trend was also evident in data from Jessop *et al*. (2018), with more birds around the south/south-west of the proposed development, though notably great and lesser black-backed gulls were not differentiated in this dataset.

3.5.10 The flight direction was recorded during the DAS surveys with an obvious peak of flying birds recorded in December 2020, with the majority of birds flying in a westerly direction (Figure A3-11). June and July 2020 had small numbers of flying birds recorded and the flight direction for both months varied from southwest and westerly directions to east or southeast and in 2022 the predominant directions were easterly or north easterly in February, March and June (Figure A3-11).

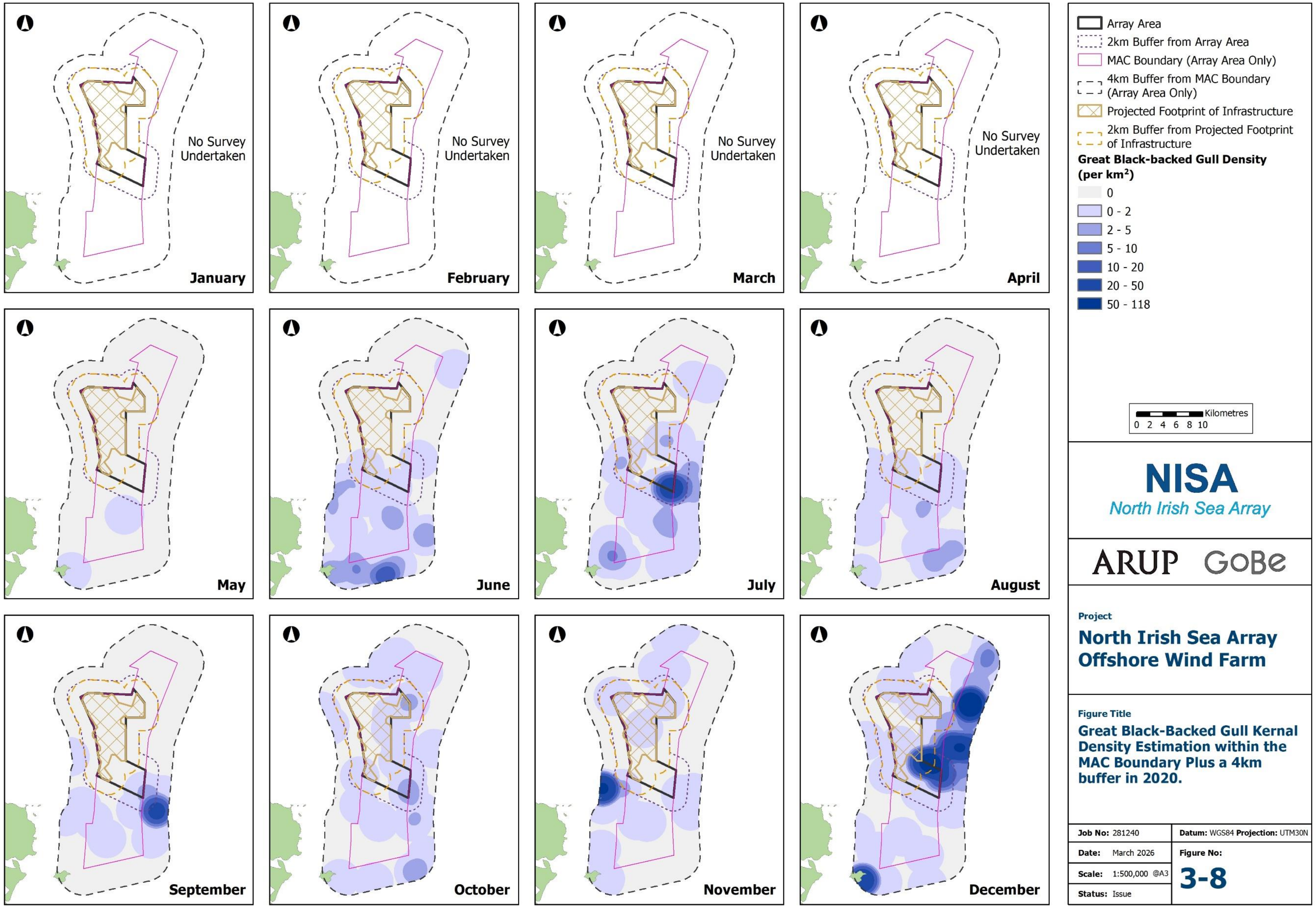

Figure A 3-8: Great black-backed Kernal Density Estimation within the MAC Boundary Plus a 4km buffer in 2020.

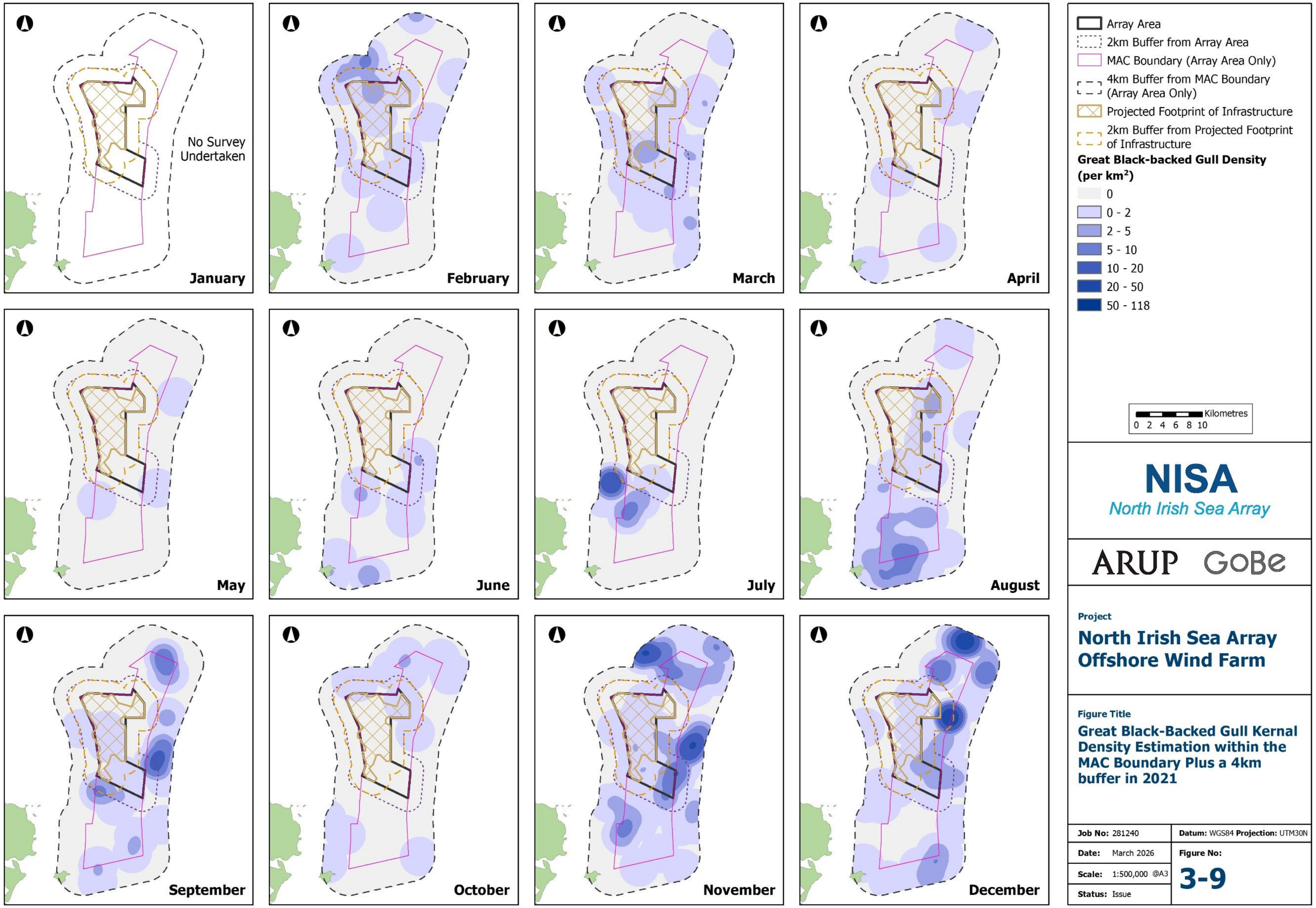

Figure A 3-9: Great black-backed Gull Kernal Density Estimation within the MAC Boundary Plus a 4km buffer in 2021.

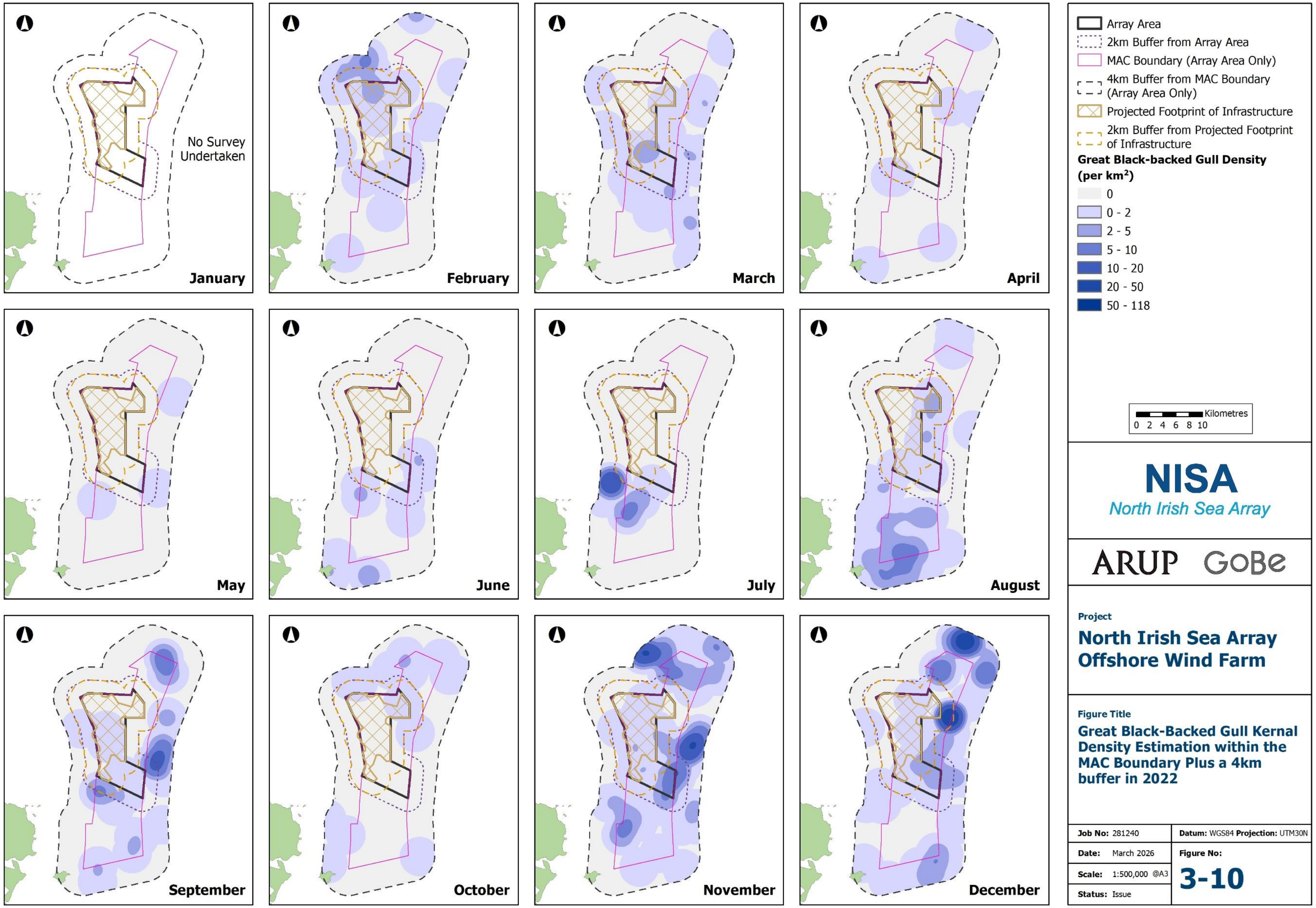

Figure A 3-10: Great Black-backed Gull Kernal Density Estimation within the MAC Boundary Plus a 4km buffer in 2022.

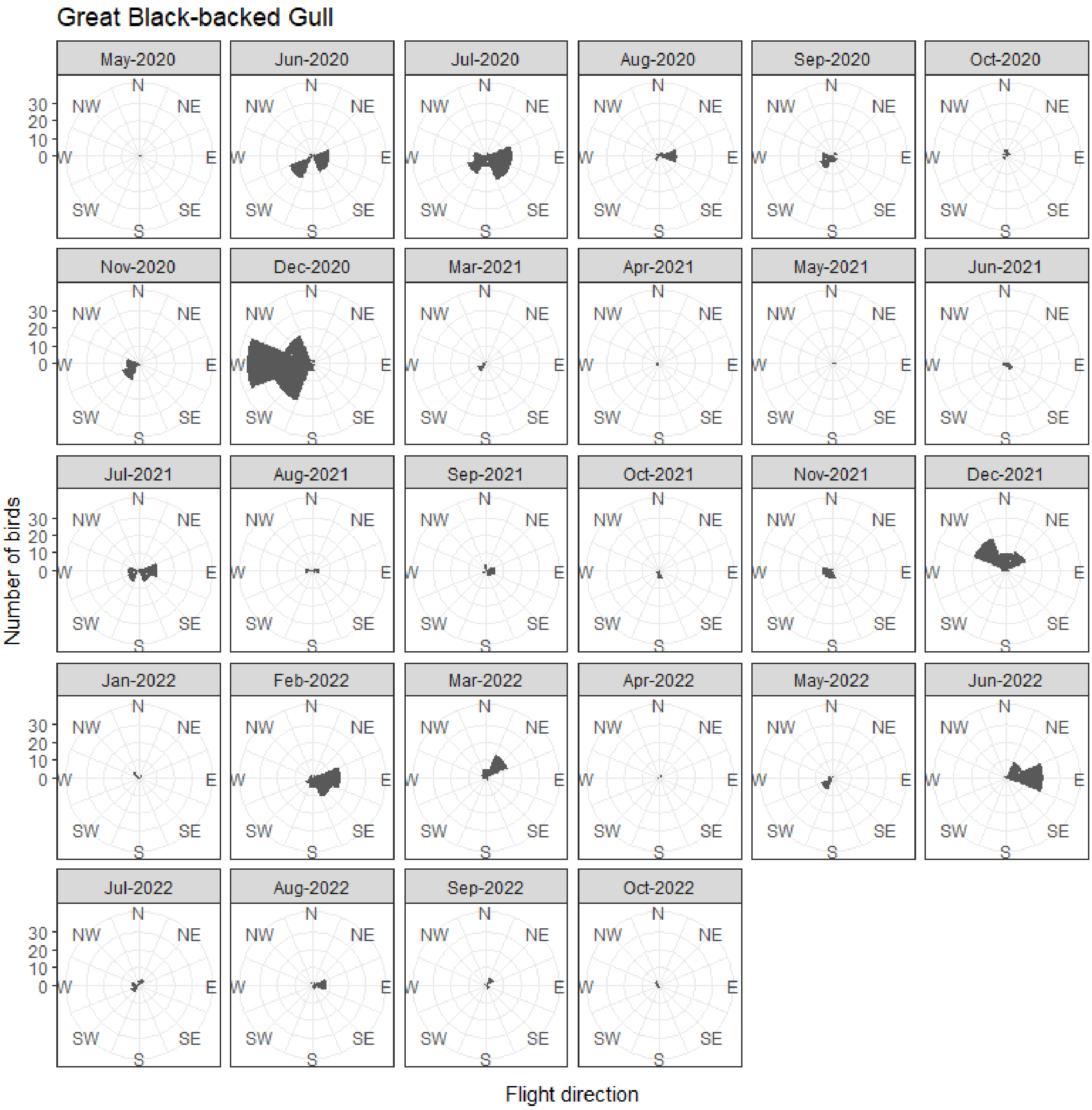

Figure A 3-11: Great black-backed gull monthly flight directions in the ornithology study area (using baseline 29-month DAS data).

3.5.11 DAS data for great black-backed gull within the NWIS SPA are presented below in Table A3-12. Great black-backed gulls were recorded within the NWIS SPA across all of the 12 survey months. Raw counts ranged from 36 in May 2025 to 305 in April 2025 with abundance and density peaking 2,148 birds and 0.90 birds/km^2 respectively.

3.5.12 Density maps from the NWIS DAS data are presented in Figure A3-12. Densities were observed to occur throughout the NWIS SPA across all months. Density peaks were observed in April 2025, to the east of the PFI and within the PFI in November 2024.

Table A 3-12: Great black-backed gull raw counts, estimated abundance (birds) and estimated density (birds/km2) in the NWIS SPA (CI values are presented in brackets).

Survey	Raw Count	Abundance Estimate	Density Estimate
September, 2024	72	508 (289 – 780)	0.21
October, 2024	75	471 (274 – 685)	0.20
November, 2024	174	964 (495 – 1,508)	0.40
December, 2024	87	413 (246 – 624)	0.17
January, 2025	48	293 (173 – 427)	0.12
February, 2025	140	912 (412 – 1,674)	0.38
March, 2025	123	758 (357 – 1,308)	0.32
April, 2025	305	2,148 (607 – 4,043)	0.90
May, 2025	36	240 (92 – 414)	0.10
June, 2025	80	502 (260 – 803)	0.21
July, 2025	117	716 (469 – 1,045)	0.30
August, 2025	207	1,331 (862 – 1,868)	0.56

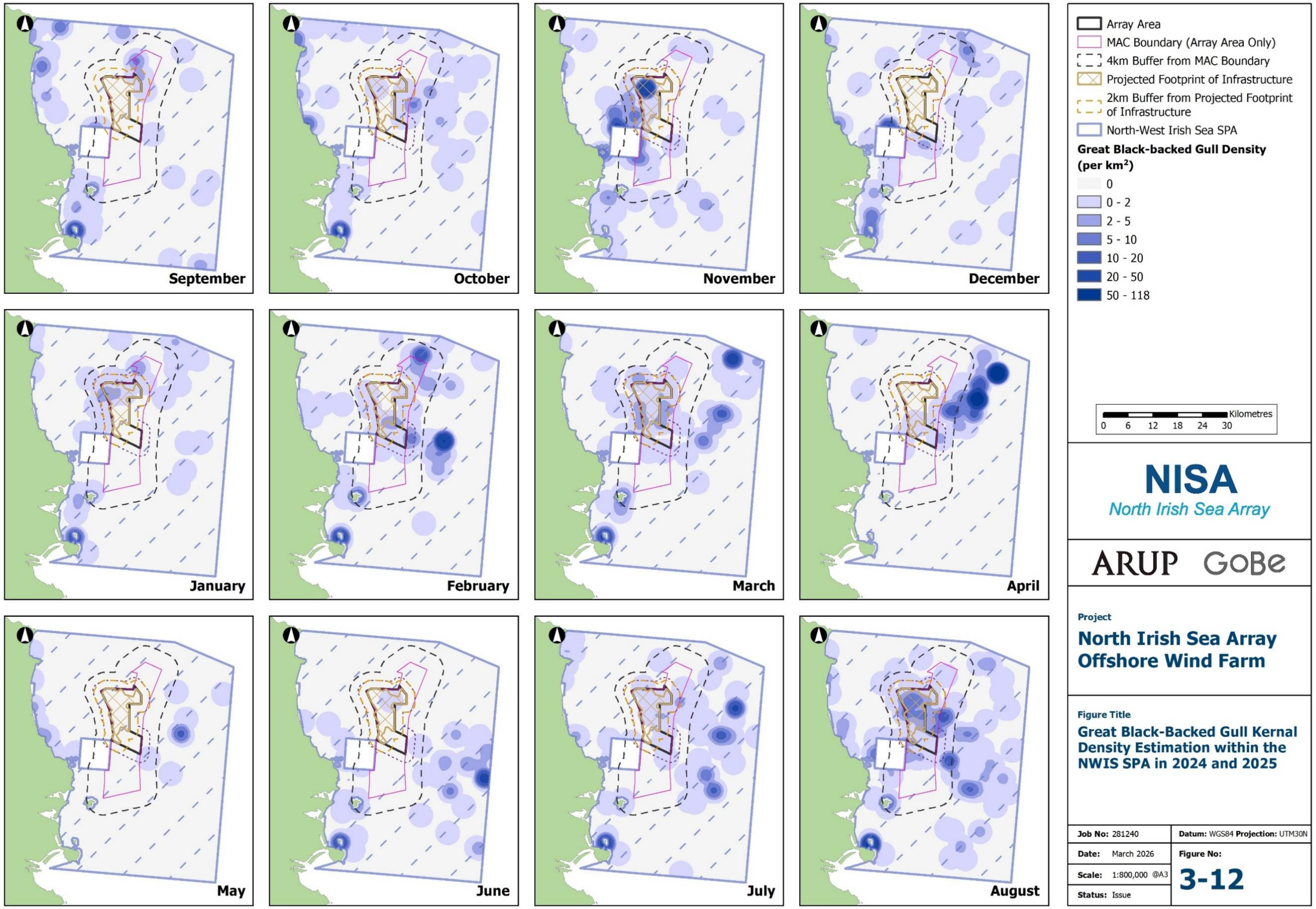

Figure A 3-12: Great Black-Backed Gull Kernal Density Estimation within the NWIS SPA in 2024 & 2025.

3.6 Herring Gull

General overview

3.6.1 Ireland has an estimated breeding population of 10,333 herring gull pairs at coastal colonies (2015 - 2018). However, the population is widespread and if urban gulls were included it would increase this estimate considerably. The long-term population trend varies depending on the colony but has shown a slight decline in the breeding population of 29% in recent years (2000 - 2018) (Cummins *et al.*, 2019). This has led to herring gull becoming amber listed in Ireland (Gilbert *et al.*, 2021).

3.6.2 Herring gull breed between March to August (Furness, 2015). Their mean-maximum foraging range during this time is 58.8 ± 26.8km (Woodward *et al*., 2019). The following table presents the counts at colonies within the mean-maximum foraging range from the proposed development (Table A3-14). During the non-breeding season, the majority of Irish breeding birds remain in Irish waters (Wernham *et al*., 2002). There may be some dispersal during this time and additional gulls arriving from Europe.

Abundance and density

3.6.3 Herring gulls were recorded in the PFI in 31 of 41 months. Raw counts ranged from 1 (across several months) to 357 (August 2025), with abundance and density peaking at 1,678 birds and 29.11 birds/km^2 respectively (Table A3-13).

3.6.4 In the PFI plus a 2km buffer, raw counts ranged from 1 (across several months) to 605 (August 2025), with abundance and density peaking at 3,055 birds and 19.07 birds/km^2 respectively (Table A3-13).

Table A 3-13: Herring gull raw counts, estimated abundance (birds) and estimated density (birds/km^2) in the PFI and PFI plus a 2km buffer (CI values are presented in brackets).

Survey	Raw Count	Abundance Estimate	Density Estimate	Raw Count	Abundance Estimate	Density Estimate
	PFI			PFI plus a 2km buffer		
May, 2020	0	0 (0 – 0)	0	1	4 (1 – 12)	0.02
June, 2020	5	17 (5 – 29)	0.29	9	30 (13 – 47)	0.19
July, 2020	2	7 (2 – 20)	0.12	12	41 (17 – 68)	0.26
August, 2020	0	0 (0 – 0)	0	0	0 (0 – 0)	0
September, 2020	1	3 (1 – 10)	0.05	2	7 (2 – 13)	0.04
October, 2020	0	0 (0 – 0)	0	31	107 (31 – 319)	0.67
November, 2020	1	5 (1 – 16)	0.09	5	25 (5 – 57)	0.16
December, 2020	6	20 (6 – 45)	0.35	159	519 (159 – 1,065)	3.24
February, 2021	17	59 (17 – 142)	1.02	22	76 (22 – 165)	0.47
March, 2021	9	30 (9 – 56)	0.52	32	107 (51 – 180)	0.67
April, 2021	1	3 (1 – 10)	0.05	1	3 (1 – 10)	0.02
May, 2021	0	0 (0 – 0)	0	0	0 (0 – 0)	0
June, 2021	0	0 (0 – 0)	0	0	0 (0 – 0)	0
July, 2021	0	0 (0 – 0)	0	1	3 (1 – 10)	0.02
August, 2021	2	13 (2 – 34)	0.23	6	31 (8 – 60)	0.19
September, 2021	0	0 (0 – 0)	0	0	0 (0 – 0)	0
October, 2021	1	3 (1 – 10)	0.05	2	12 (2 – 26)	0.07
November, 2021	20	67 (20 – 161)	1.16	68	273 (84 – 564)	1.7
December, 2021	11	39 (15 – 63)	0.68	213	831 (213 – 1,766)	5.19
January, 2022	88	290 (88 – 726)	5.03	103	356 (103 – 816)	2.22

Survey	Raw Count	Abundance Estimate	Density Estimate	Raw Count	Abundance Estimate	Density Estimate
		PFI			PFI plus a 2km buffer	
February, 2022	8	26 (8 – 53)	0.45	23	79 (31 – 146)	0.49
March, 2022	1	3 (1 – 10)	0.05	1	3 (1 – 10)	0.02
April, 2022	1	3 (1 – 10)	0.05	2	7 (2 – 17)	0.04
May, 2022	0	0 (0 – 0)	0	1	3 (1 – 10)	0.02
June, 2022	2	6 (2 – 20)	0.1	3	10 (3 – 23)	0.06
July, 2022	5	16 (5 – 32)	0.28	22	73 (36 – 116)	0.46
August, 2022	0	0 (0 – 0)	0	6	20 (6 – 50)	0.12
September, 2022	3	10 (3 – 30)	0.17	7	44 (7 – 139)	0.27
October, 2022	2	6 (2 – 20)	0.1	33	109 (33 – 305)	0.68
September, 2024	0	0 (0 – 0)	0	26	149 (26 – 323)	0.93
October, 2024	5	24 (5 – 63)	0.42	43	236 (126 – 355)	1.47
November, 2024	161	817 (161 – 2,127)	14.17	181	980 (181 – 2,297)	6.12
December, 2024	8	38 (8 – 77)	0.66	27	134 (50 – 234)	0.84
January, 2025	24	113 (24 – 276)	1.96	85	423 (185 – 700)	2.64
February, 2025	6	29 (6 – 87)	0.5	56	289 (56 – 594)	1.8
March, 2025	6	31 (15 – 48)	0.54	10	52 (25 – 80)	0.32
April, 2025	1	5 (1 – 14)	0.09	4	19 (4 – 49)	0.12
May, 2025	1	5 (1 – 15)	0.09	1	5 (1 – 15)	0.03
June, 2025	1	5 (1 – 14)	0.09	2	10 (2 – 20)	0.06
July, 2025	105	509 (182 – 920)	8.83	182	905 (436 – 1,382)	5.65
August, 2025	357	1,678 (357 – 3,380)	29.11	605	3,055 (896 – 5,628)	19.07

3.6.5 Herring gull was present across both bio-seasons. Presence was greatest in the breeding bio-season (March to August), with a mean peak abundance of 435 birds, and a mean peak density of 7.55 birds/km^2 in the PFI (Table A3-14). Within the PFI plus a 2km buffer, presence was also greatest in the breeding bio-season, with mean peak abundance of 819 birds and a mean peak density of 5.11 birds/km^2.

Table A 3-14: Herring gull bio-season mean peak abundance and density estimates in the PFI and PFI plus a 2km buffer using combined datasets.

BDMPS Bio-seasons	Area	Months	Bio-season peak abundance (n)	Bio-season peak density (n/km^2)
Breeding	PFI	Mar-Aug	435	7.55
Non-breeding	PFI	Sep-Feb	294	5.10
Breeding	PFI plus a 2km buffer	Mar-Aug	819	5.11
Non-breeding	PFI plus a 2km buffer	Sep-Feb	610	3.81

3.6.6 Density maps based on MAC DAS data are presented in Figure A3-13 to Figure A3-14 below. Herring gulls were found throughout the survey area. In the breeding bio-season, highest densities were found in the south-east of the survey area, whereas in the non-breeding bio-season density hotspots were evident in both the north-east and south-east.

3.6.7 Data from Jessop *et al*. (2018) showed no clear trend in density distribution, though densities appeared slightly higher in close proximity to the coast (i.e. away from the proposed development). Notably herring gulls and common gulls were not differentiated in this dataset.

3.6.8 Flight direction was recorded during the DAS surveys, with three months representing most flying birds recorded. In July 2020 the predominant flight direction was south-westerly, in December 2020 it was westerly and in December 2021 it was north-westerly (Figure A3-16). Most other months had low numbers of flying birds recorded with varying directions of flight (Figure A3-16).

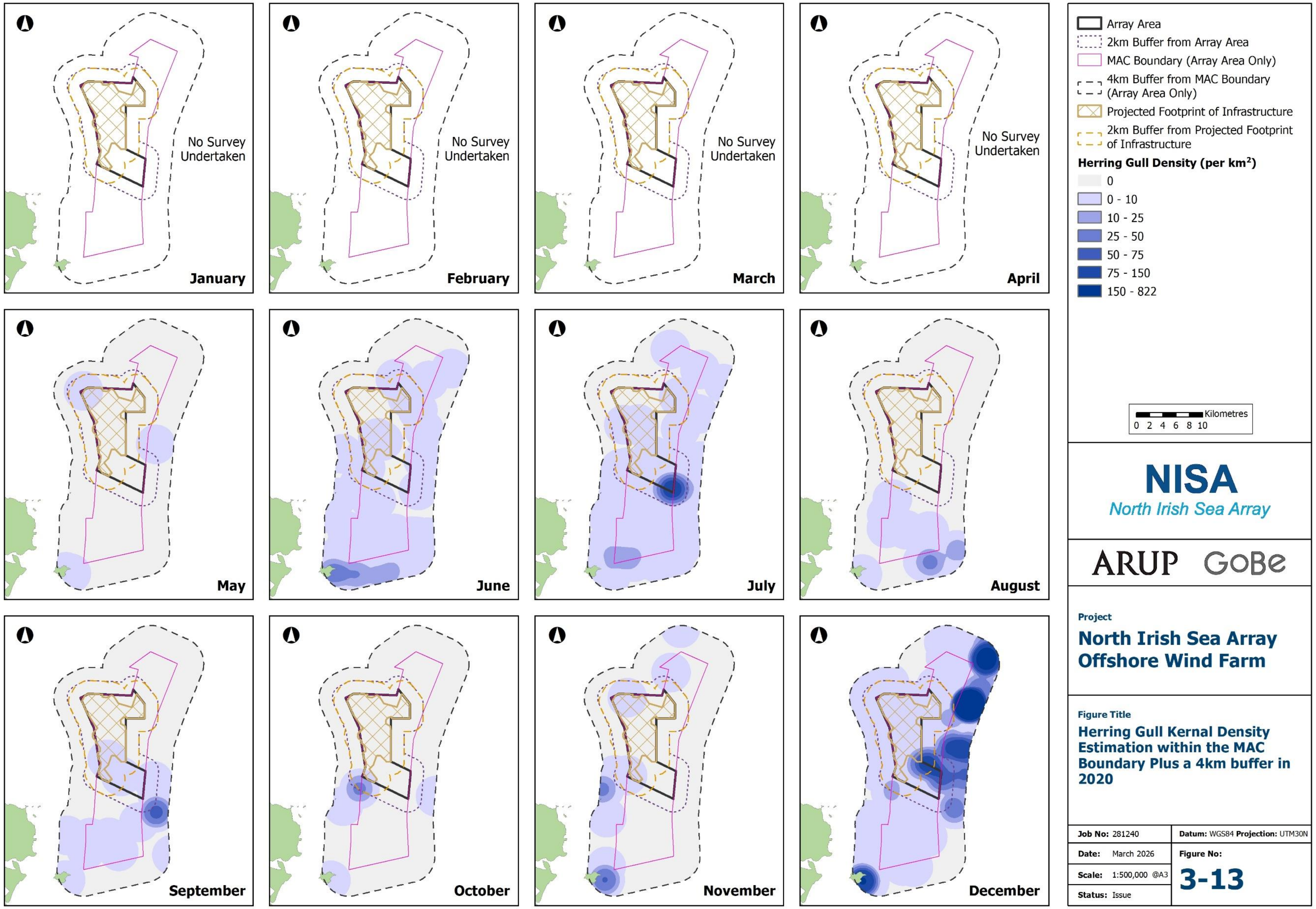

Figure A 3-13: Herring gull Kernal Density Estimation within the MAC Boundary Plus a 4km buffer in 2020.

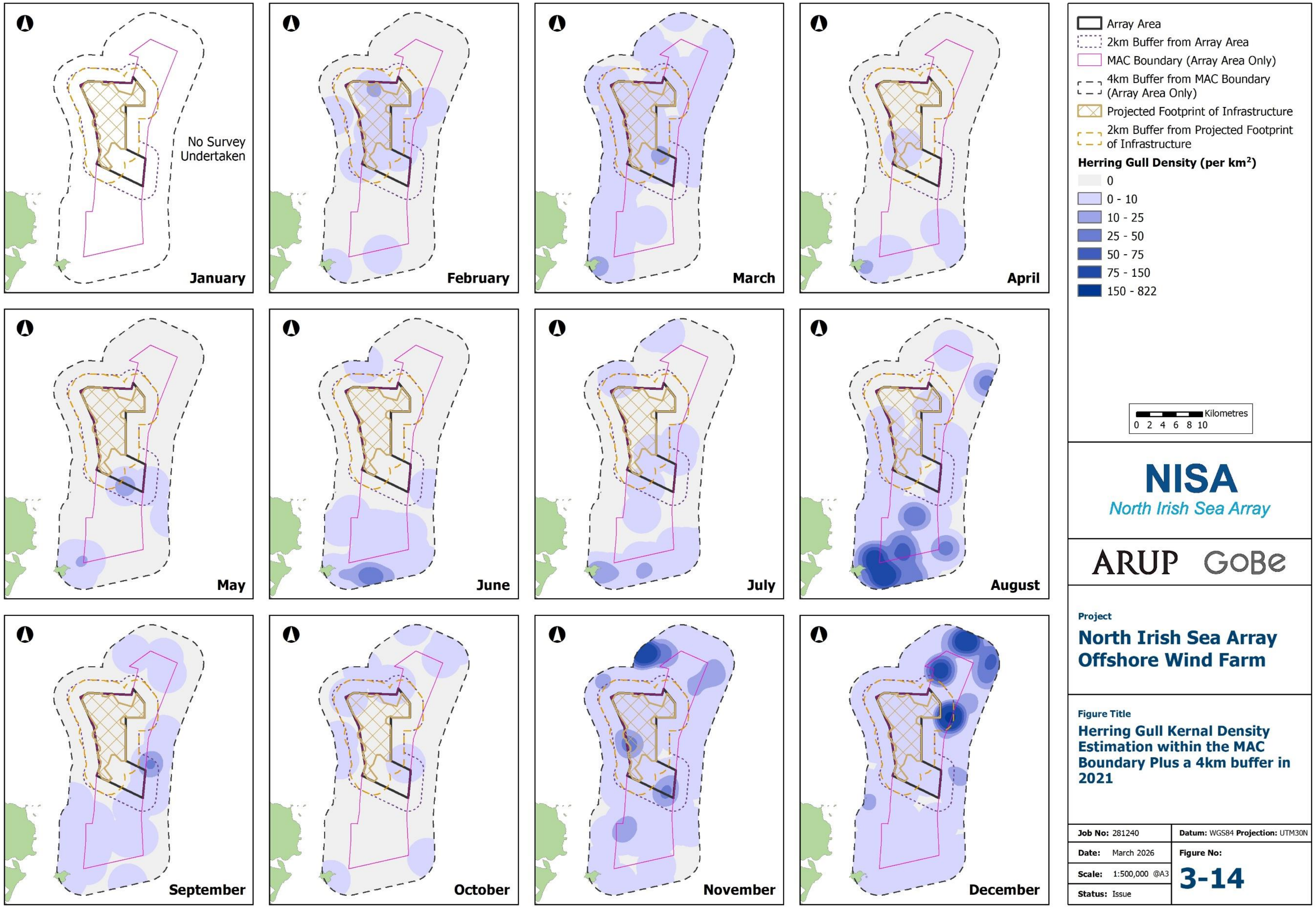

Figure A 3-14: Herring gull Kernal Density Estimation within the MAC Boundary Plus a 4km buffer in 2021.

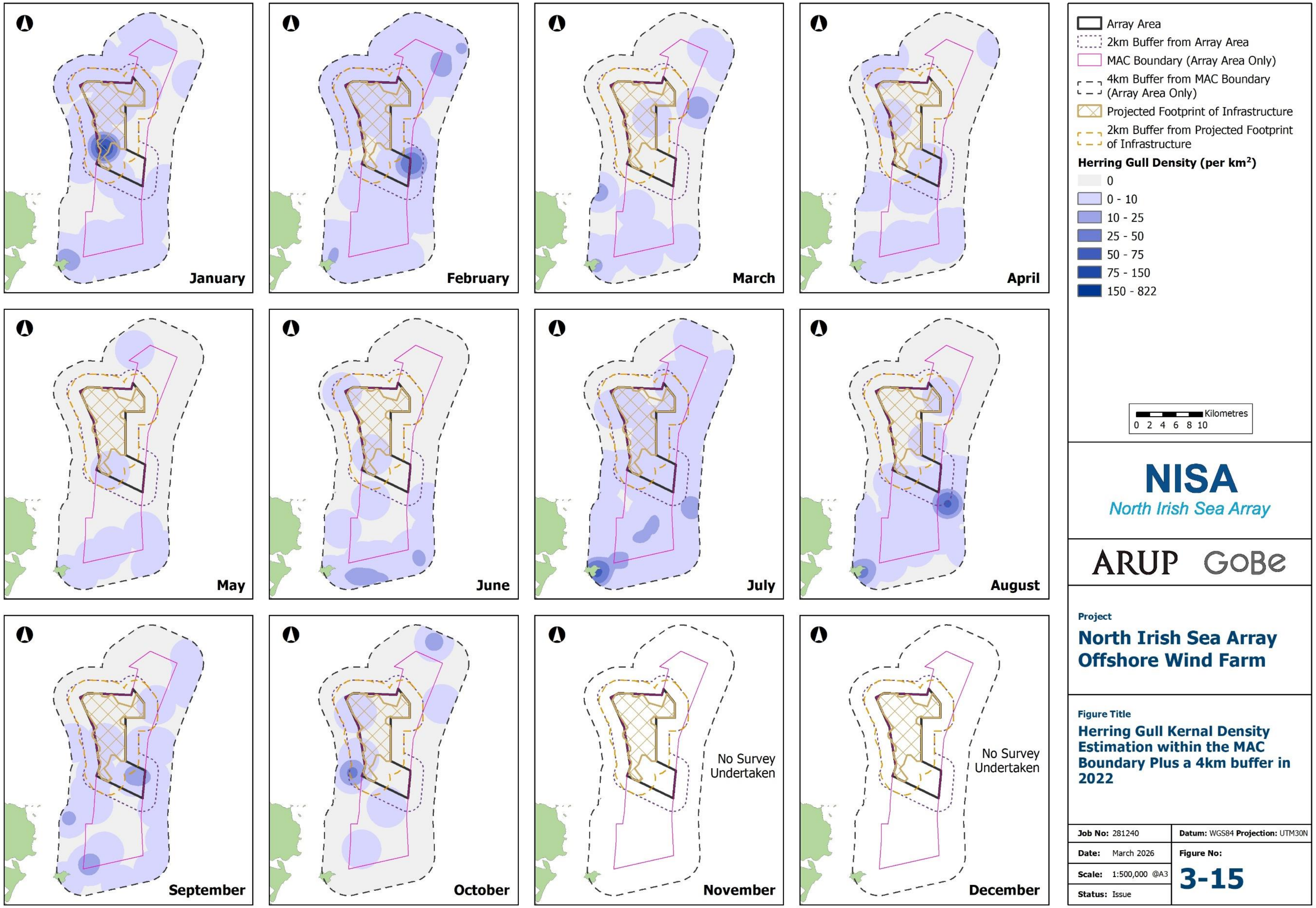

Figure A 3-15: Herring gull Kernal Density Estimation within the MAC Boundary Plus a 4km buffer in 2022

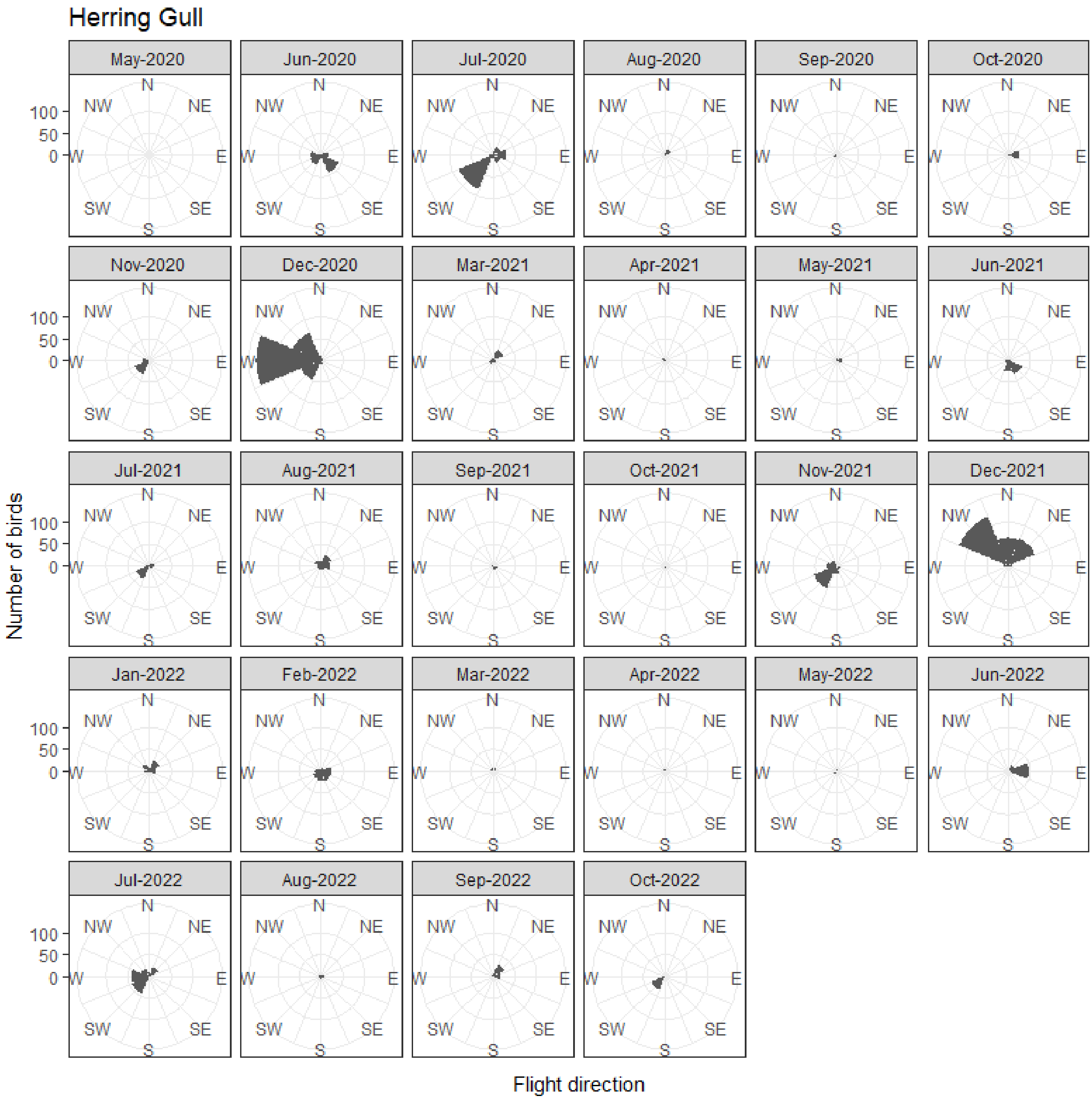

Figure A 3-16: Herring Gull monthly flight directions in the ornithology study area (using baseline 29-month DAS data).

3.6.9 ESAS surveys during the 1980s and 90s showed low densities of herring gull across the Irish east coast throughout the year, however their distribution was less widespread throughout the spring (Pollock *et al.*, 1997). Results from the 2016 ObSERVE aerial surveys are presented in the common gull section above.

North West Irish Sea SPA

3.6.10 DAS data for herring gull within the NWIS SPA are presented below in Table A3-15. Herring gulls were recorded within the NWIS SPA across all of the 12 survey months. Raw counts ranged from 238 in March 2025 to 4,124 in August 2025 with abundance and density peaking 26,355 birds and 11.05 birds/km^2 respectively.

3.6.11 Density maps from the NWIS DAS data are presented in Figure A3-17. Peak densities of Herring gull were observed close to shore, in July 2025, to the north of the PFI, in August 2025 and to the east of the PFI in April 2024.

Table A 3-15: Herring gull raw counts, estimated abundance (birds) and estimated density (birds/km2) in the NWIS SPA (CI values are presented in brackets).

Survey	Raw Count	Abundance Estimate	Density Estimate
September, 2024	1,106	7,759 (4,178 – 11,931)	3.25
October, 2024	980	6,076 (2,452 – 10,953)	2.55
November, 2024	1,520	8,220 (5,932 – 10,673)	3.45
December, 2024	508	3,189 (1,823 – 5,012)	1.34
January, 2025	512	3,156 (1,740 – 4,843)	1.32
February, 2025	791	4,848 (2,377 – 7,565)	2.03
March, 2025	238	1,476 (729 – 2,483)	0.62
April, 2025	648	4,412 (1,303 – 8,084)	1.85
May, 2025	921	6,083 (2,800 – 10,171)	2.55
June, 2025	608	3,714 (2,146 – 5,516)	1.56
July, 2025	2,867	17,458 (10,662 – 25,269)	7.32
August, 2025	4,124	26,355 (17,206 – 37,193)	11.05

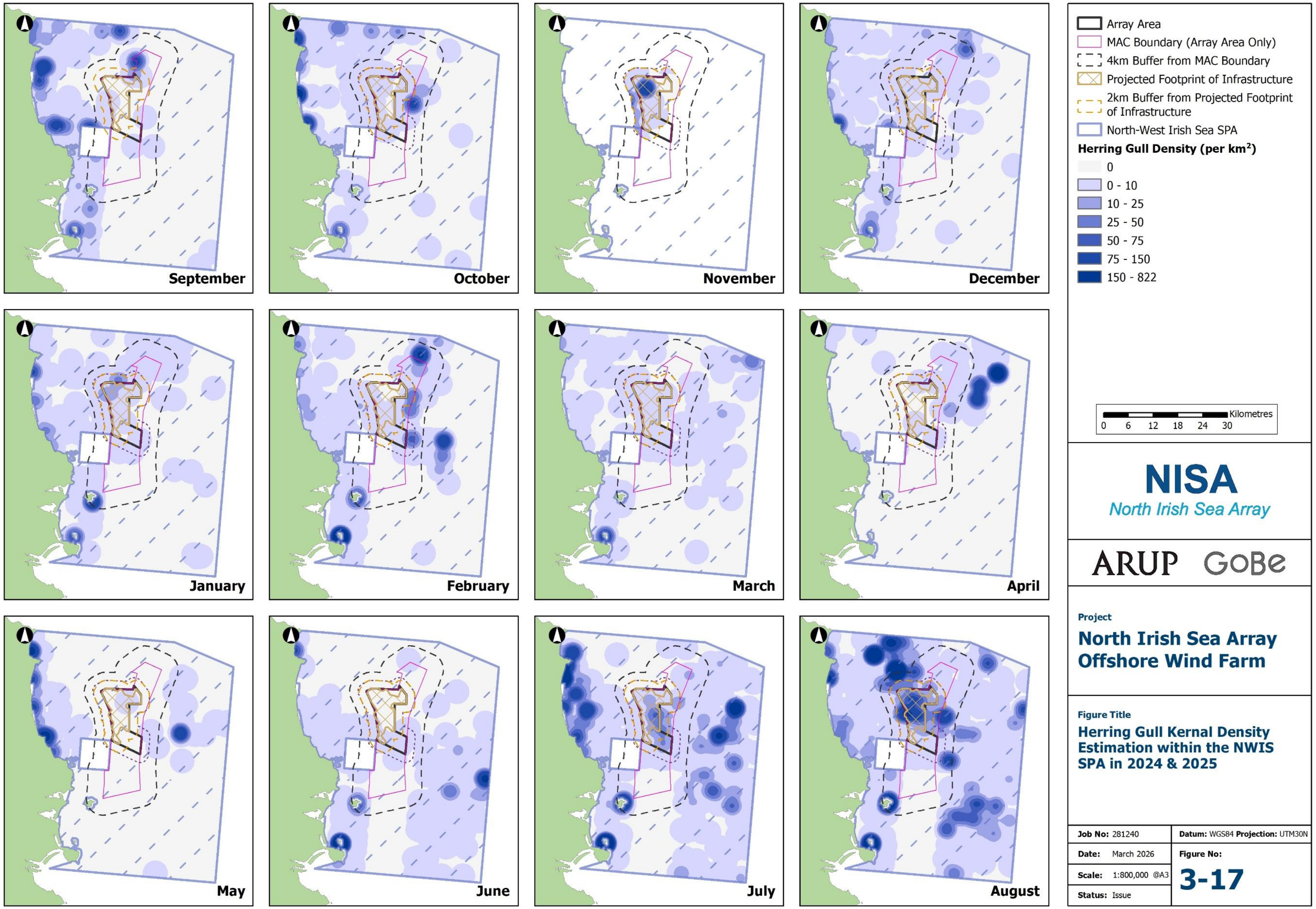

Figure A 3-17: Herring Gull Kernal Density Estimation within the NWIS SPA in 2024 & 2025.

3.7 Lesser Black-backed Gull

General overview

3.7.1 Ireland has an estimated breeding population of 7,112 herring gull pairs at coastal colonies (2015 - 2018). However, the population is widespread and if urban gulls were included it would increase this estimate considerably. The long-term population trend varies depending on the colony but evidence suggests that the population has been steadily increasing over the long-term (Cummins *et al.*, 2019). Lesser black-backed gull is Amber-listed in Ireland because more that 50% of the population is situated in fewer than 10 breeding colonies.

3.7.2 Lesser black-backed gull breed between April to August (Furness, 2015). Their mean-maximum foraging range during this time is 127 ± 109km (Woodward *et al*., 2019). During the non-breeding season, the majority of Irish breeding migrate south to north Africa leaving very few remaining in Irish waters (Wernham *et al*., 2002). There may be some dispersal during this time and additional gulls arriving from Europe.

Abundance and density

3.7.3 Lesser black-backed gull were recorded in the PFI in 3 of 41 months. Raw counts ranged from 2 (August 2021) to 21 (August 2025), with abundance and density peaking at 102 birds and 1.77 birds/km^2 respectively (Table A 3-16).

In the PFI plus a 2km buffer, raw counts ranged from 1 (across several months) to 48 (August 2025), with abundance and density peaking at 246 birds and 1.54 birds/km^2 respectively (Table A 3-16)

Table A 3-16: Lesser black-backed gull raw counts, estimated abundance (birds) and estimated density (birds/km^2) in the PFI and PFI plus a 2km buffer (CI values are presented in brackets).

Survey	Raw Count	Abundance Estimate	Density Estimate	Raw Count	Abundance Estimate	Density Estimate
	PFI			PFI plus a 2km buffer		
May, 2020	0	0 (0 – 0)	0	0	0 (0 – 0)	0
June, 2020	0	0 (0 – 0)	0	1	3 (1 – 10)	0.02
July, 2020	0	0 (0 – 0)	0	0	0 (0 – 0)	0
August, 2020	0	0 (0 – 0)	0	0	0 (0 – 0)	0
September, 2020	0	0 (0 – 0)	0	0	0 (0 – 0)	0
October, 2020	0	0 (0 – 0)	0	0	0 (0 – 0)	0
November, 2020	0	0 (0 – 0)	0	0	0 (0 – 0)	0
December, 2020	0	0 (0 – 0)	0	0	0 (0 – 0)	0
February, 2021	0	0 (0 – 0)	0	0	0 (0 – 0)	0
March, 2021	0	0 (0 – 0)	0	0	0 (0 – 0)	0
April, 2021	0	0 (0 – 0)	0	0	0 (0 – 0)	0
May, 2021	0	0 (0 – 0)	0	0	0 (0 – 0)	0
June, 2021	0	0 (0 – 0)	0	0	0 (0 – 0)	0
July, 2021	0	0 (0 – 0)	0	0	0 (0 – 0)	0
August, 2021	2	15 (2 – 43)	0.26	4	21 (4 – 49)	0.13
September, 2021	0	0 (0 – 0)	0	0	0 (0 – 0)	0
October, 2021	0	0 (0 – 0)	0	0	0 (0 – 0)	0
November, 2021	0	0 (0 – 0)	0	1	3 (1 – 10)	0.02
December, 2021	0	0 (0 – 0)	0	1	3 (1 – 11)	0.02
January, 2022	0	0 (0 – 0)	0	0	0 (0 – 0)	0

Survey	Raw Count	Abundance Estimate	Density Estimate	Raw Count	Abundance Estimate	Density Estimate
	PFI			PFI plus a 2km buffer		
February, 2022	0	0 (0 – 0)	0	0	0 (0 – 0)	0
March, 2022	0	0 (0 – 0)	0	0	0 (0 – 0)	0
April, 2022	0	0 (0 – 0)	0	0	0 (0 – 0)	0
May, 2022	0	0 (0 – 0)	0	0	0 (0 – 0)	0
June, 2022	0	0 (0 – 0)	0	0	0 (0 – 0)	0
July, 2022	0	0 (0 – 0)	0	2	6 (2 – 20)	0.04
August, 2022	0	0 (0 – 0)	0	2	6 (2 – 20)	0.04
September, 2022	0	0 (0 – 0)	0	0	0 (0 – 0)	0
October, 2022	0	0 (0 – 0)	0	0	0 (0 – 0)	0
September, 2024	0	0 (0 – 0)	0	4	27 (5 – 85)	0.17
October, 2024	0	0 (0 – 0)	0	1	5 (1 – 16)	0.03
November, 2024	0	0 (0 – 0)	0	0	0 (0 – 0)	0
December, 2024	0	0 (0 – 0)	0	0	0 (0 – 0)	0
January, 2025	0	0 (0 – 0)	0	0	0 (0 – 0)	0
February, 2025	0	0 (0 – 0)	0	1	5 (1 – 15)	0.03
March, 2025	0	0 (0 – 0)	0	0	0 (0 – 0)	0
April, 2025	0	0 (0 – 0)	0	0	0 (0 – 0)	0
May, 2025	0	0 (0 – 0)	0	0	0 (0 – 0)	0
June, 2025	0	0 (0 – 0)	0	0	0 (0 – 0)	0
July, 2025	6	29 (6 – 72)	0.5	14	69 (15 – 123)	0.43
August, 2025	21	102 (21 – 253)	1.77	48	246 (76 – 435)	1.54

3.7.5 Lesser black-backed gulls were not recorded between February and June off the east coast of Ireland during the ESAS surveys in Irish waters between 1980 and 1997, however low densities were recorded further east in the Irish sea during the surveys. During July to October low densities of lesser black-backed gull were recorded closer to the Irish east coast. Lesser black-backed gulls were largely absent from the Irish Sea between November to January (Pollock *et al*., 1997).

Bio-season peak estimates

3.7.6 Lesser black-backed gull was present across one bio-season in the PFI. Presence was greatest in the breeding bio-season (April to August), with a mean peak abundance of 29 birds, and a mean peak density of 0.51 birds/km^2 (Table A3-17).

3.7.7 Within the PFI plus a 2km buffer, lesser black-backed gull was present across three bio-seasons. Presence was greatest in the breeding bio-season, with a mean peak abundance of 69, and a mean peak density of 0.43 birds/km^2 (Table A3-17).

Table A 3-17: Lesser black-backed gull bio-season mean peak abundance and density estimates in the PFI and PFI plus a 2km buffer using combined DAS datasets.

BDMPS Bio-seasons	Area	Months	Bio-season peak abundance (n)	Bio-season peak density (n/km^2)
Autumn migration	PFI	Sep–Oct	-	-
Breeding	PFI	Apr–Aug	29	0.51
Migration-free winter	PFI	Nov–Feb	-	-
Spring migration	PFI	Mar–Mar	-	-
Autumn migration	PFI plus a 2km buffer	Sep–Oct	7	0.04
Breeding	PFI plus a 2km buffer	Apr–Aug	69	0.43
Migration-free winter	PFI plus a 2km buffer	Nov–Feb	3	0.02
Spring migration	PFI plus a 2km buffer	Mar–Mar	-	-

Spatial density distribution and flight direction

3.7.8 Across all bio-seasons, lesser black-backed gulls were predominantly recorded in the east of the survey area, with the greatest density in the south-east in the breeding bio-season, and in the east in the non-breeding bio-seasons.

3.7.9 In data from Jessop *et al*. (2018), densities were highest around the south/south-west of the PFI, though notably great and lesser black-backed gulls were not differentiated in this dataset.

3.7.10 The DAS data recorded flight directions of all flying birds during the surveys with several months recording a large proportion of flying birds (Figure A3-18). In June 2020 the flight direction varied greatly from southwest to easterly and south easterly and in July 2020 the predominant direction was southwest (Figure A3-18). In 2022 the majority of flying birds were recorded flying east in June and west in July and August (Figure A3-18).

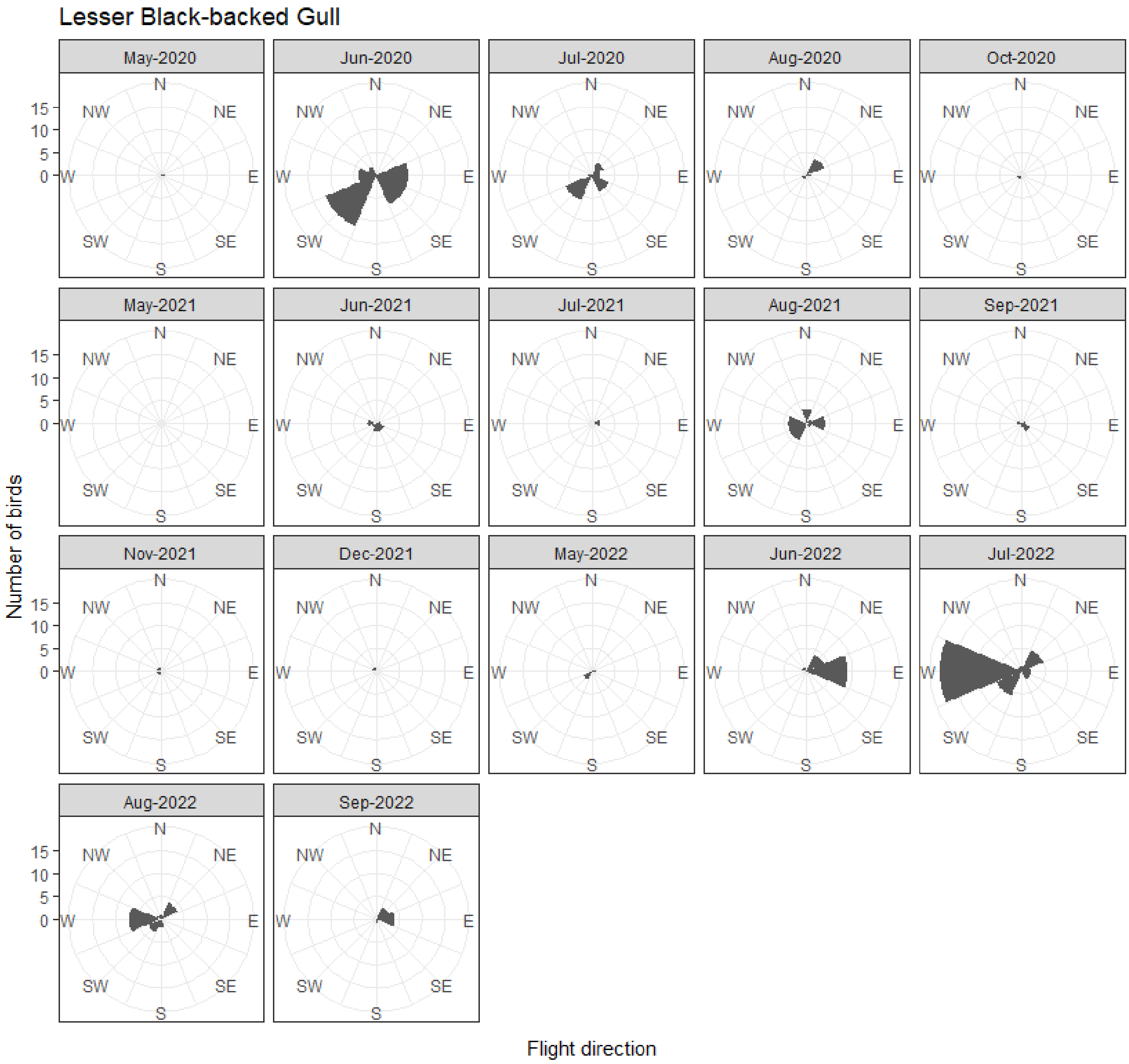

Figure A 3-18: Lesser black-backed gull monthly flight directions in the ornithology study area (using baseline 29-month DAS data).

3.7.1 DAS data for lesser black-backed gull within the NWIS SPA are presented below in Table A3-18. Herring gulls were recorded within the NWIS SPA across nine of the 12 survey months. Raw counts ranged from 0 in November, December 2024 and January 2025 to 539 in August 2025 with abundance and density peaking 3,419 birds and 1.43 birds/km^2 respectively.

Table A 3-18: Lesser black-backed gull raw counts, estimated abundance (birds) and estimated density (birds/km2) in the NWIS SPA (CI values are presented in brackets).

Survey	Raw Count	Abundance Estimate	Density Estimate
September, 2024	39	266 (112 – 465)	0.11
October, 2024	3	18 (3 – 42)	0.01
November, 2024	0	0 (0 – 0)	0
December, 2024	0	0 (0 – 0)	0
January, 2025	0	0 (0 – 0)	0
February, 2025	30	196 (56 – 411)	0.08
March, 2025	7	43 (18 – 73)	0.02
April, 2025	103	722 (192 – 1,525)	0.3
May, 2025	59	394 (59 – 943)	0.17
June, 2025	47	286 (104 – 552)	0.12
July, 2025	157	978 (577 – 1,465)	0.41
August, 2025	539	3,419 (1,965 – 5,264)	1.43

Available tracking data

3.7.2 Tracking data is available for lesser black-backed gulls from Lambay Island. Though this was a small dataset (n=2), tracked birds foraged almost exclusively in the terrestrial environment with no overlap with the NISA array.

3.8 Roseate Tern

General overview

3.8.1 Roseate terns visit Ireland during the summer months to breed. The breeding population in Ireland is estimated at 1,820 pairs, concentrated at two main colonies, Rockabill Island and Lady's Island Lake, with Rockabill Island representing the largest Roseate tern colony in Europe. The population has shown an increase of 82% over the last 12 years based on the annual monitoring at both sites (Cummins *et al*., 2019). Roseate tern is Amber-listed in Ireland because the breeding range reduced by 46% between 1968 and 2011, and because more than 50% of the Irish breeding population is concentrated in less than 10 sites. The Irish population represents 40% of the European population and it is listed on Annex I of the EC Birds Directive.

3.8.2 Roseate tern breeding season is between May to August (Furness, 2015) (Table A3-19). During the breeding season the mean-maximum foraging range of adults is 12.6 ± 10.6km (Woodward *et al*., 2019). Autumn migration season, roseate terns migrate south along the Atlantic seaboard to winter along the west coast of Africa around the Gulf of Guinea (Wernham *et al*., 2002).

Abundance and density

3.8.3 Roseate tern was recorded in the PFI in 4 of 41 months, with two birds recorded in May 2025 and 57 in August 2025. Abundance and density peaked at 308 birds and 5.34 birds/km^2 respectively (Table A3-19).

In the PFI plus a 2km buffer, raw counts ranged from 1 (July 2021 & 2022) to 124 (August 2025), with abundance and density peaking at 30 birds and 0.15 birds/km^2 respectively (Table A3-19).

Table A 3-19: Roseate tern raw counts, estimated abundance (birds) and estimated density (birds/km^2) in the PFI and PFI plus a 2km buffer (CI values are presented in brackets).

Survey	Raw Count	Abundance Estimate	Density Estimate	Raw Count	Abundance Estimate	Density Estimate
	PFI			PFI plus a 2km buffer		
May, 2020	0	0 (0 – 0)	0	0	8 (0 – 20)	0.05
June, 2020	0	0 (0 – 0)	0	3	20 (3 – 43)	0.12
July, 2020	0	0 (0 – 0)	0	0	0 (0 – 0)	0
August, 2020	0	0 (0 – 0)	0	0	0 (0 – 0)	0
September, 2020	0	0 (0 – 0)	0	0	0 (0 – 0)	0
October, 2020	0	0 (0 – 0)	0	0	0 (0 – 0)	0
November, 2020	0	0 (0 – 0)	0	0	0 (0 – 0)	0
December, 2020	0	0 (0 – 0)	0	0	0 (0 – 0)	0
February, 2021	0	0 (0 – 0)	0	0	0 (0 – 0)	0
March, 2021	0	0 (0 – 0)	0	0	0 (0 – 0)	0
April, 2021	0	0 (0 – 0)	0	0	0 (0 – 0)	0
May, 2021	0	0 (0 – 0)	0	0	0 (0 – 0)	0
June, 2021	0	6 (0 – 20)	0.10	0	20 (0 – 61)	0.12
July, 2021	0	0 (0 – 0)	0	1	10 (1 – 20)	0.06
August, 2021	0	3 (0 – 10)	0.05	0	10 (0 – 23)	0.06
September, 2021	0	0 (0 – 0)	0	0	0 (0 – 0)	0
October, 2021	0	0 (0 – 0)	0	0	0 (0 – 0)	0
November, 2021	0	0 (0 – 0)	0	0	0 (0 – 0)	0
December, 2021	0	0 (0 – 0)	0	0	0 (0 – 0)	0
January, 2022	0	0 (0 – 0)	0	0	0 (0 – 0)	0

Survey	Raw Count	Abundance Estimate	Density Estimate	Raw Count	Abundance Estimate	Density Estimate
		PFI			PFI plus a 2km buffer	
February, 2022	0	0 (0 – 0)	0	0	0 (0 – 0)	0
March, 2022	0	0 (0 – 0)	0	0	0 (0 – 0)	0
April, 2022	0	0 (0 – 0)	0	0	0 (0 – 0)	0
May, 2022	0	0 (0 – 0)	0	0	0 (0 – 0)	0
June, 2022	0	0 (0 – 0)	0	0	0 (0 – 0)	0
July, 2022	0	0 (0 – 0)	0	1	5 (1 – 18)	0.03
August, 2022	0	0 (0 – 0)	0	0	0 (0 – 0)	0
September, 2022	0	0 (0 – 0)	0	0	0 (0 – 0)	0
October, 2022	0	0 (0 – 0)	0	0	0 (0 – 0)	0
September, 2024	0	0 (0 – 0)	0	0	0 (0 – 0)	0
October, 2024	0	0 (0 – 0)	0	0	0 (0 – 0)	0
November, 2024	0	0 (0 – 0)	0	0	0 (0 – 0)	0
December, 2024	0	0 (0 – 0)	0	0	0 (0 – 0)	0
January, 2025	0	0 (0 – 0)	0	0	0 (0 – 0)	0
February, 2025	0	0 (0 – 0)	0	0	0 (0 – 0)	0
March, 2025	0	0 (0 – 0)	0	0	0 (0 – 0)	0
April, 2025	0	0 (0 – 0)	0	0	0 (0 – 0)	0
May, 2025	2	10 (2 – 29)	0.17	4	21 (4 – 60)	0.13
June, 2025	4	19 (4 – 58)	0.33	10	50 (10 – 108)	0.31
July, 2025	12	80 (17 – 151)	1.39	50	300 (50 – 589)	1.87
August, 2025	57	308 (133 – 473)	5.34	124	702 (324 – 1,083)	4.38

3.8.5 The ESAS surveys which took place between 1980 and 1997 recorded six roseate terns in the Irish Sea between May and August (Pollock *et al.*, 1997).

Bio-season peak estimates

3.8.6 Roseate tern was present only in the breeding bio-season (May to August), with a mean peak abundance of 79 birds, and a mean peak density of 1.36 birds/km^2, in the PFI (Table A3-20).

3.8.7 Within the PFI plus a 2km buffer, roseate tern was only present in the breeding bio-season, with a mean peak abundance of 187 and a mean peak density of 1.17 birds/km^2 (Table A3-20).

Table A 3-20: Roseate tern bio-season mean peak abundance and density estimates in the PFI and PFI plus a 2km buffer.

BDMPS Bio-seasons	Area	Months	Bio-season peak abundance (n)	Bio-season peak density (n/km^2)
Autumn migration	PFI	Sep-Sep	-	-
Breeding	PFI	May-Aug	79	1.36
Spring Migration	PFI	Apr-Apr	-	-
Autumn migration	PFI plus a 2km buffer	Sep-Sep	-	-
Breeding	PFI plus a 2km buffer	May-Aug	187	1.17
Spring Migration	PFI plus a 2km buffer	Apr-Apr	-	-

Spatial density distribution and flight direction

3.8.8 In the breeding bio-season, birds were recorded across the south of the survey area, with the highest density of birds in the south-west, predominantly restricted to the buffer zone outside of the PFI.

3.8.9 This trend was also evident from Jessop *et al.*, (2018), with highest densities of birds around the south of NISA during the breeding season. Densities were also higher to the south of the proposed development, in close proximity to Lambay Island.

3.8.10 Flight directions for roseate terns were recorded during the DAS surveys with the predominant directions being west and northwest in May 2021, July and August 2022 (Figure A3-19). In July 2021 a significant number of birds were recorded flying south (Figure A3-19). All other months had minimal numbers of birds recorded flying.

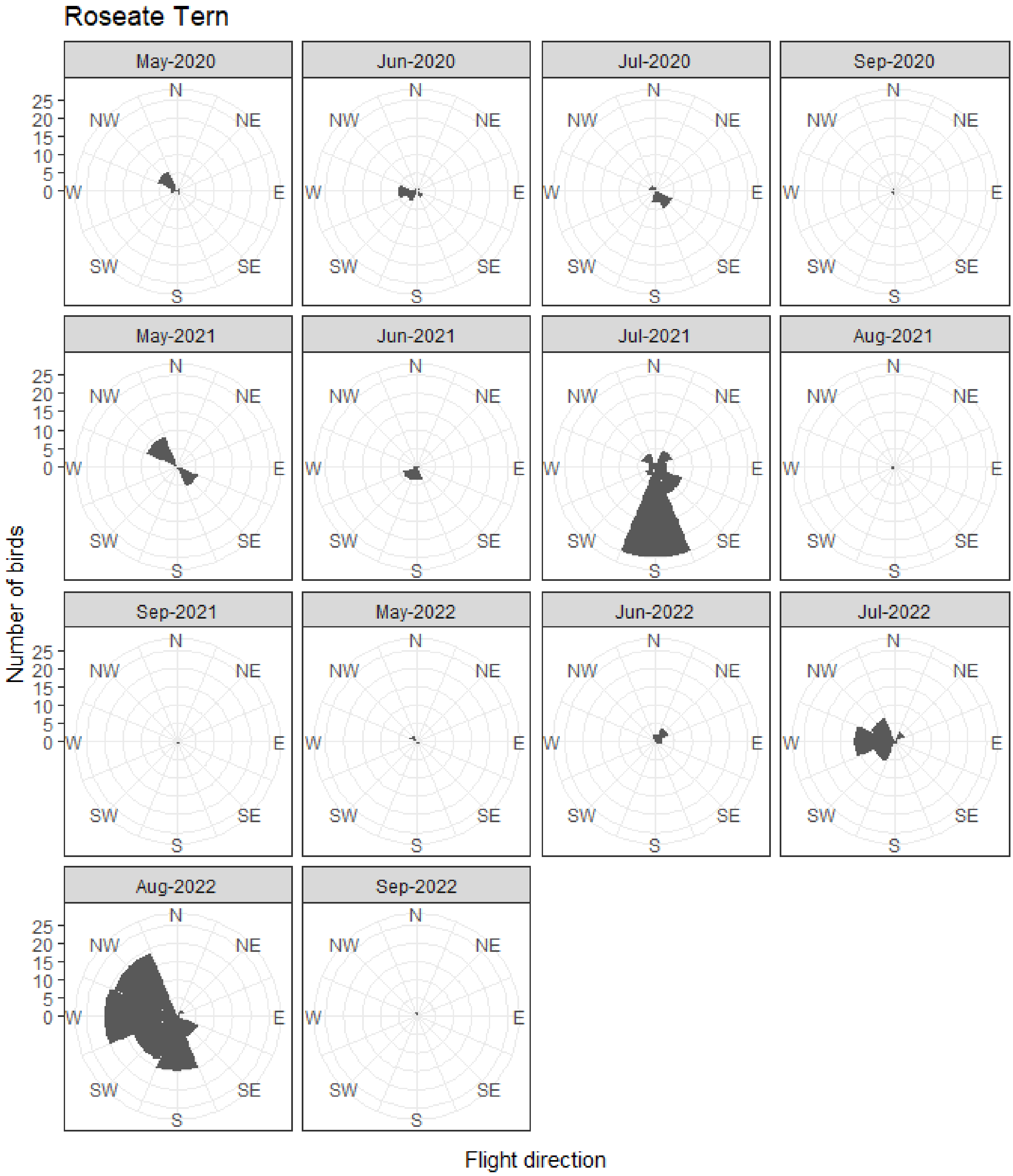

Figure A 3-19: Roseate tern monthly flight directions in the ornithology study area (using baseline 29-month DAS data).

3.8.11 DAS data for roseate tern within the NWIS SPA are presented below in Table A3-21. Roseate terns were only recorded within the NWIS SPA across four of the 12 survey months. Raw counts ranged from 0 in all months except May to August 2025, to 461 in August 2025 with abundance and density peaking at 4,109 birds and 1.72 birds/km^2 respectively. The peak abundance of 4,109 birds in August 2025 is particularly high and may represent an overestimate as there are only approximately 3,500 breeding roseate terns on Rockabill.

Table A 3-21:Roseate tern raw counts, estimated abundance (birds) and estimated density (birds/km2) in the NWIS SPA (CI values are presented in brackets).

Survey	Raw Count	Abundance Estimate	Density Estimate
September, 2024	0	0 (0 – 0)	0
October, 2024	0	0 (0 – 0)	0
November, 2024	0	0 (0 – 0)	0
December, 2024	0	0 (0 – 0)	0
January, 2025	0	0 (0 – 0)	0
February, 2025	0	0 (0 – 0)	0
March, 2025	0	0 (0 – 0)	0
April, 2025	0	0 (0 – 0)	0
May, 2025	199	1,815 (806 – 3,079)	0.76
June, 2025	182	1,227 (309 – 2,549)	0.51
July, 2025	229	2,221 (958 – 3,678)	0.93
August, 2025	461	4,109 (1,349 – 7,631)	1.72

3.8.12 Tracking data from this colony also highlights high foraging usage of the area to the east and north-east of the site, resulting in potential overlap with the PFI (Perrow *et al*. 2019). In addition, recent research has shown that Roseate tern populations breeding in the northern North Sea pass through the Irish sea during both northward and southbound migrations having passed overland across Great Britain rather than flying through the North Sea itself (Redfern & Bevan 2019). Consequently, there is potential for additional birds from further afield to be present within close proximity to the proposed development.

3.9 Common Tern

General overview

3.9.1 Common terns visit Ireland during the summer months to breed. The breeding population of Ireland has been steadily increasing over the long-term and was 5,058 pairs during 2016 to 2018 (Cummins *et al*., 2019). Their colonies are mainly coastal but there are also a couple of inland sites. The majority breed at two colonies, Rockabill (2,034 pairs, representing one of the largest colonies in Europe) and Lady's Island Lake (979 pairs) (SMP, 2020), which have seen steady population growth over the long term due to conservation efforts at these sites (Acampora *et al*., 2018). Although the overall population seems to be increasing common tern is Amber-listed and on Annex I of the EC Birds Directive in Ireland because the Irish breeding population is concentrated at 10 sites or less (Gilbert *et al*., 2021).

3.9.2 Common tern breeding season is between May to August (Furness, 2015; Table A 2-7).During the breeding season the mean-maximum foraging range of adults is 18.0 ± 8.9km (Woodward *et al*., 2019). Autumn migration season, common terns migrate south along the Atlantic seaboard to winter along the west coast of Africa (Wernham *et al*., 2002).

Abundance and density

3.9.3 Common tern was recorded in the PFI in 4 of 41 months, with raw counts ranging from 3 (June 2022) to 17 (August 2025). Abundance and density peaked at 117 birds and 2.03 birds/km^2 respectively (Table A3-22).

3.9.4 In the PFI plus a 2km buffer, raw counts ranged from 1 (August 2022) to 34 (August 2025), with abundance and density peaking at 282 birds and 1.76 birds/km^2 respectively in July 2025 (Table A3-22).

Table A 3-22: Common tern raw counts, estimated abundance (birds) and estimated density (birds/km^2) in the PFI and PFI plus a 2km buffer (CI values are presented in brackets).

Survey	PFI			PFI plus a 2km buffer		
	Raw Count	Abundance Estimate	Density Estimate	Raw Count	Abundance Estimate	Density Estimate
May, 2020	0	0 (0 – 0)	0	0	0 (0 – 0)	0
June, 2020	0	0 (0 – 0)	0	0	0 (0 – 0)	0
July, 2020	0	0 (0 – 0)	0	0	0 (0 – 0)	0
August, 2020	0	0 (0 – 0)	0	0	0 (0 – 0)	0
September, 2020	0	0 (0 – 0)	0	0	0 (0 – 0)	0
October, 2020	0	0 (0 – 0)	0	0	0 (0 – 0)	0
November, 2020	0	0 (0 – 0)	0	0	0 (0 – 0)	0
December, 2020	0	0 (0 – 0)	0	0	0 (0 – 0)	0
February, 2021	0	0 (0 – 0)	0	0	0 (0 – 0)	0
March, 2021	0	0 (0 – 0)	0	0	0 (0 – 0)	0
April, 2021	0	0 (0 – 0)	0	0	0 (0 – 0)	0
May, 2021	0	0 (0 – 0)	0	0	0 (0 – 0)	0
June, 2021	0	0 (0 – 0)	0	0	8 (0 – 24)	0.05
July, 2021	0	0 (0 – 0)	0	0	0 (0 – 0)	0
August, 2021	0	2 (0 – 6)	0.03	0	10 (0 – 26)	0.06
September, 2021	0	0 (0 – 0)	0	0	0 (0 – 0)	0
October, 2021	0	0 (0 – 0)	0	0	0 (0 – 0)	0
November, 2021	0	0 (0 – 0)	0	0	0 (0 – 0)	0
December, 2021	0	0 (0 – 0)	0	0	0 (0 – 0)	0
January, 2022	0	0 (0 – 0)	0	0	0 (0 – 0)	0

Survey	Raw Count	Abundance Estimate PFI	Density Estimate	Raw Count	Abundance Estimate PFI plus a 2km buffer	Density Estimate
February, 2022	0	0 (0 – 0)	0	0	0 (0 – 0)	0
March, 2022	0	0 (0 – 0)	0	0	0 (0 – 0)	0
April, 2022	0	0 (0 – 0)	0	0	0 (0 – 0)	0
May, 2022	0	0 (0 – 0)	0	0	0 (0 – 0)	0
June, 2022	3	23 (3 – 50)	0.4	4	31 (4 – 77)	0.19
July, 2022	6	23 (6 – 64)	0.4	31	181 (79 – 300)	1.13
August, 2022	0	0 (0 – 0)	0	1	5 (1 – 13)	0.03
September, 2022	0	0 (0 – 0)	0	0	0 (0 – 0)	0
October, 2022	0	0 (0 – 0)	0	0	0 (0 – 0)	0
September, 2024	0	0 (0 – 0)	0	0	0 (0 – 0)	0
October, 2024	0	0 (0 – 0)	0	0	0 (0 – 0)	0
November, 2024	0	0 (0 – 0)	0	0	0 (0 – 0)	0
December, 2024	0	0 (0 – 0)	0	0	0 (0 – 0)	0
January, 2025	0	0 (0 – 0)	0	0	0 (0 – 0)	0
February, 2025	0	0 (0 – 0)	0	0	0 (0 – 0)	0
March, 2025	0	0 (0 – 0)	0	0	0 (0 – 0)	0
April, 2025	0	0 (0 – 0)	0	0	0 (0 – 0)	0
May, 2025	0	0 (0 – 0)	0	0	0 (0 – 0)	0
June, 2025	0	0 (0 – 0)	0	0	0 (0 – 0)	0
July, 2025	7	92 (23 – 173)	1.60	21	282 (143 – 414)	1.76
August, 2025	17	117 (27 – 243)	2.03	34	248 (135 – 417)	1.55

3.9.5 The ObSERVE 2016 aerial surveys were unable to differentiate between common and Arctic terns due to their similarities. Therefore, overall 1,235 common/Arctic terns were recorded during the survey of the east Irish coast during the summer and autumn. The mean density of common/Arctic terns was 0.49 birds/km^2 in summer, and 0.79 birds/km^2 in autumn. The estimates total abundance of common/Arctic terns across the survey area was 4,514 (95% CIs 3,883 – 5,247) individuals in summer, and 7,268 (95% CIs 5,178 – 10,202) birds in autumn (Jessopp *et al*., 2018).

Bio-season peak estimates

3.9.6 Common tern was present only in the breeding bio-season (May to August), with a mean peak abundance of 36 birds, and a mean peak density of 0.62 birds/km^2 in the PFI (Table A3-23).

3.9.7 With the PFI plus a 2km buffer, common tern was only present in the breeding bio-season, with mean peak abundance of 118, and a mean peak density of 0.74 birds/km^2 (Table A3-23).

Table A 3-23: Common tern bio-season mean peak abundance and density estimates in the NISA PFI and PFI plus a 2km buffer.

BDMPS Bio-seasons	Area	Dataset	Months	Bio-season peak abundance (n)	Bio-season peak density (n/km^2)
Autumn migration	PFI	Combined	Sep-Sep	-	-
Breeding	PFI	Combined	May-Aug	36	0.62
Spring Migration	PFI	Combined	Apr-Apr	-	-
Autumn migration	PFI plus a 2km buffer	Combined	Sep-Sep	-	-
Breeding	PFI plus a 2km buffer	Combined	May-Aug	118	0.74
Spring Migration	PFI plus a 2km buffer	Combined	Apr-Apr	-	-

Spatial density distribution and flight direction

3.9.8 Density maps based on MAC DAS data are presented in Figure A 3-20 to Figure A 3-22 below. In the breeding bio-season, birds were recorded in highest density in the south-west of the survey area, predominantly restricted to the buffer zone outside of the PFI.

3.9.9 Data from Jessop *et al*. (2018) similarly found higher densities of birds towards the south-west of the proposed development during the breeding season, through during the Autumn migration bio-season birds were also present in higher densities towards the north-west of the proposed development (notably with minimal overlap with the survey area). Notably this dataset did not differentiate between Arctic and common terns.

3.9.10 Flight directions of common tern recorded during the DAS surveys found that, much like with roseate terns, that the predominant direction of flight in May 2021, July and August 2022 was west or northwest and in July 2021 it was south (Figure A 3-23). All other months had minimal numbers of birds recorded flying.

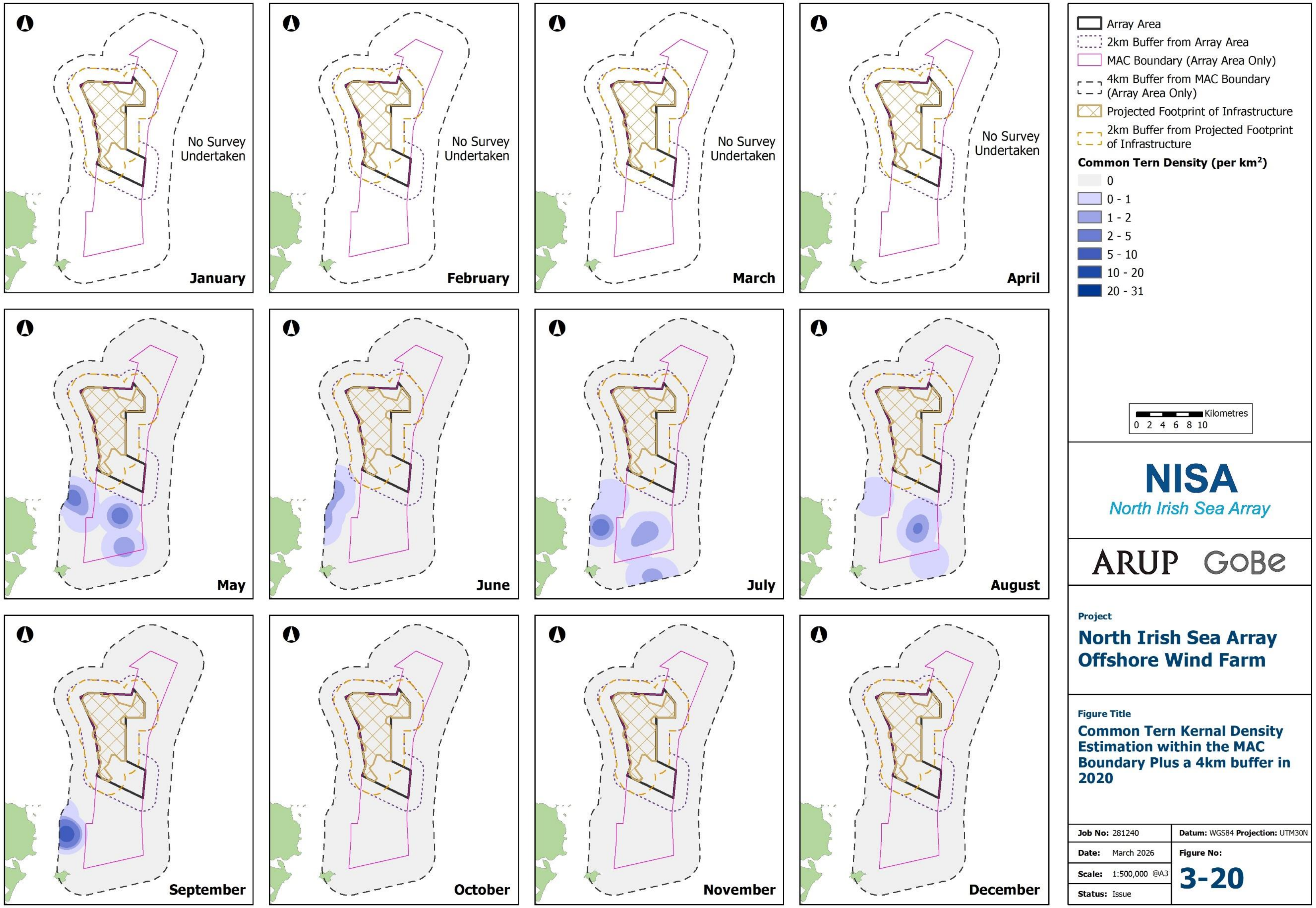

Figure A 3-20: Common tern Kernal Density Estimation within the MAC Boundary Plus a 4km buffer in 2020.

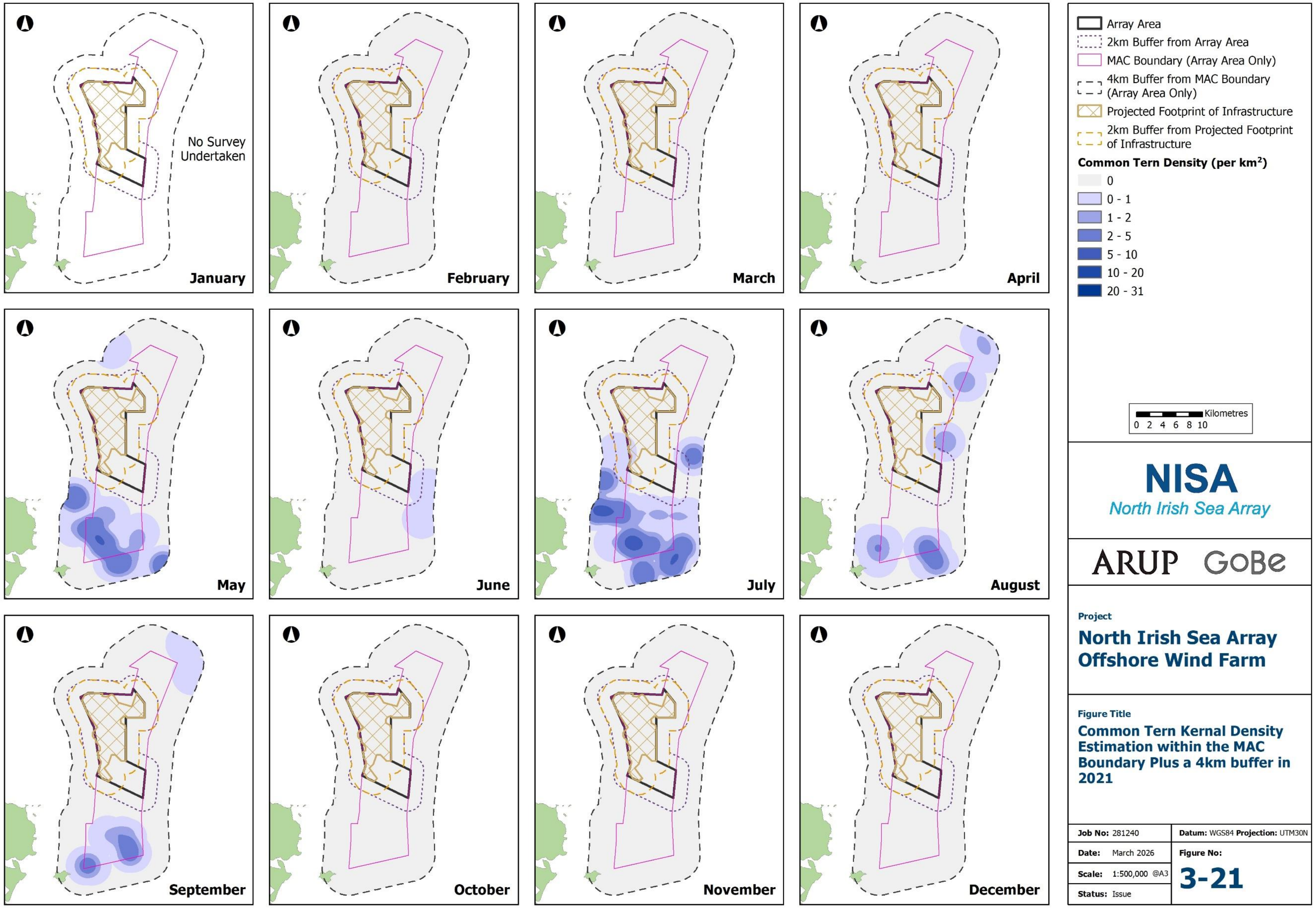

Figure A 3-21: Common tern Kernal Density Estimation within the MAC Boundary Plus a 4km buffer in 2021.

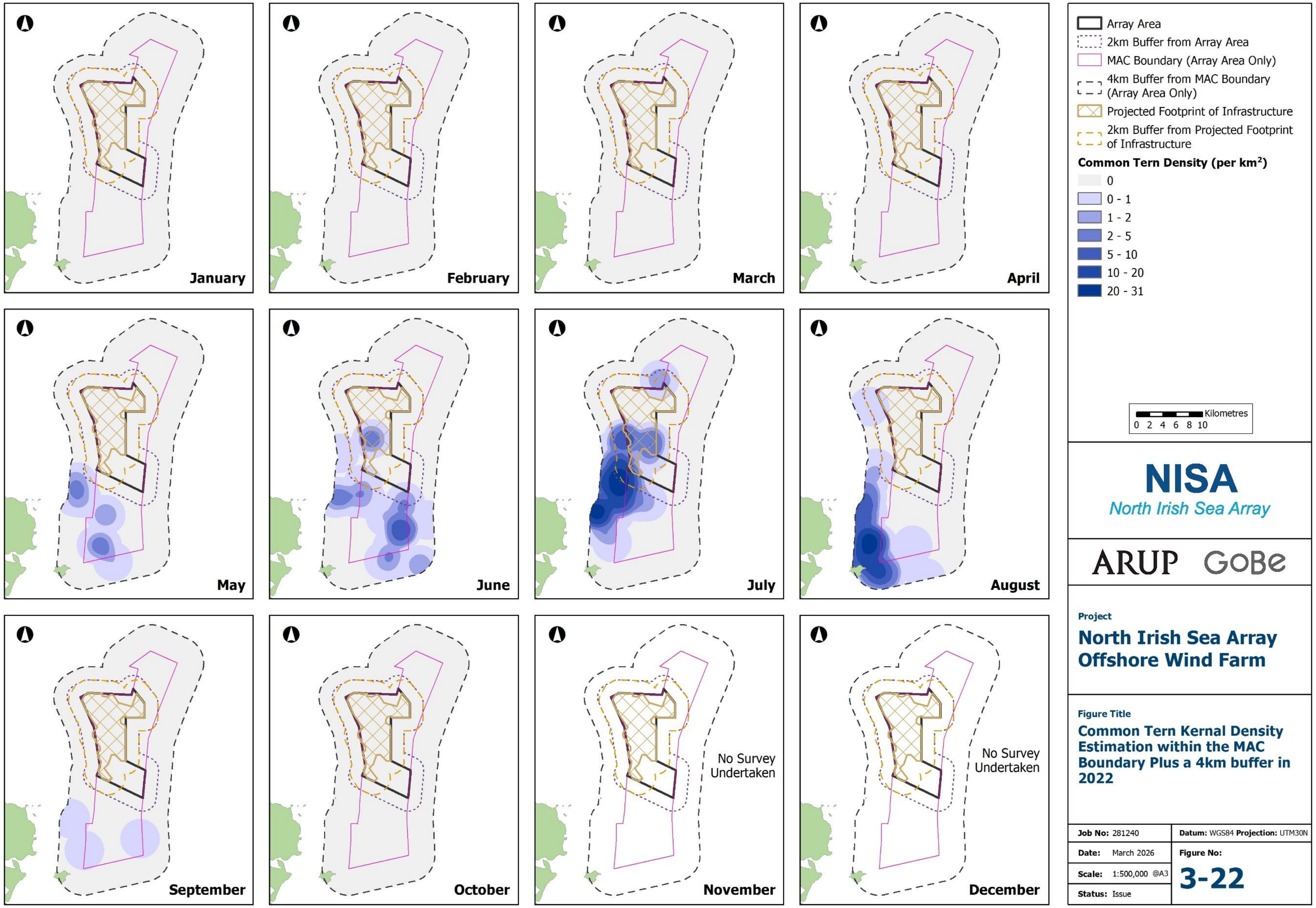

Figure A 3-22: Common tern Kernal Density Estimation within the MAC Boundary Plus a 4km buffer in 2022.

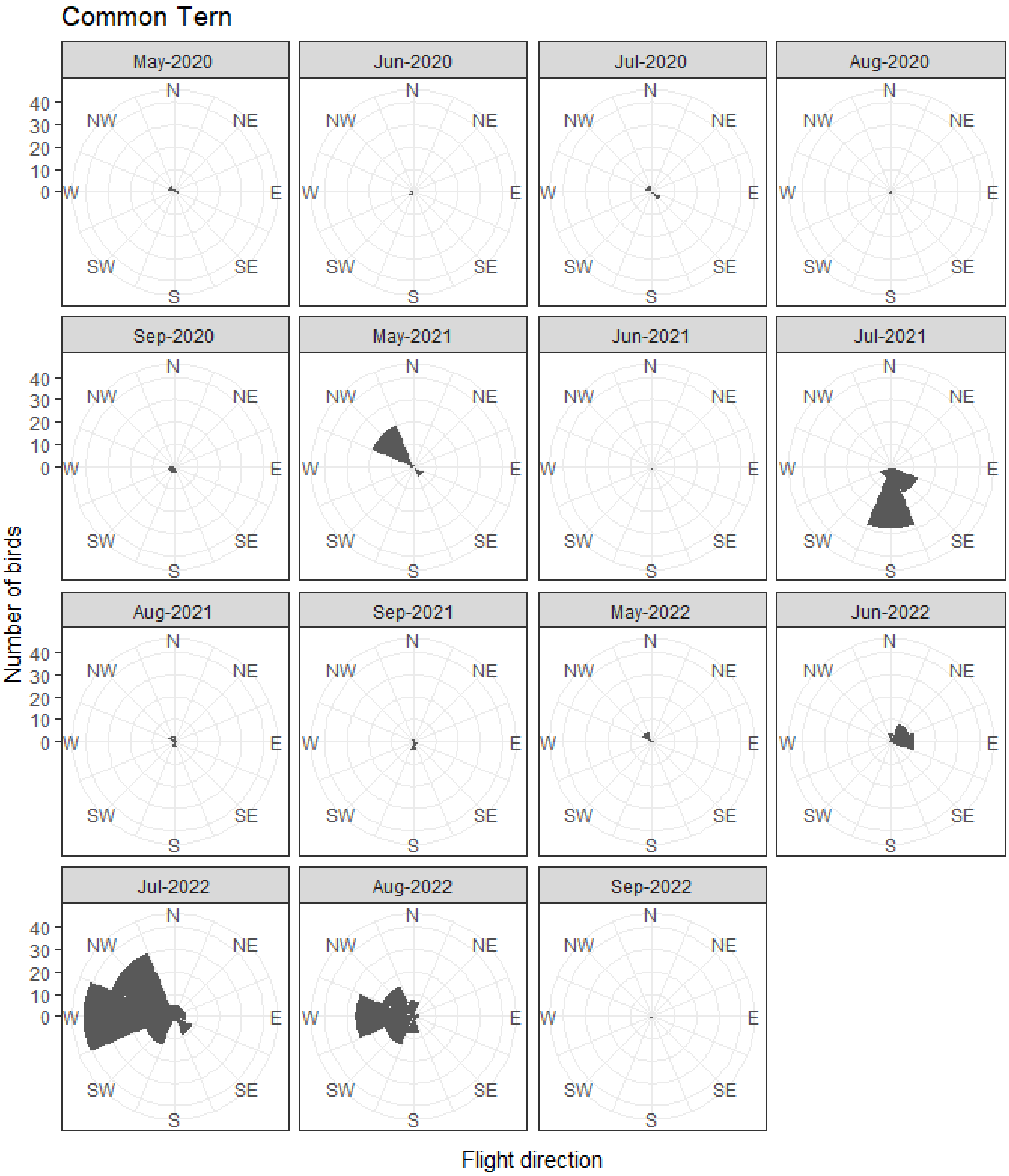

Figure A 3-23: Common tern monthly flight directions in the ornithology study area (using baseline 29-month DAS data).

3.9.11 DAS data for common tern within the NWIS SPA are presented below in Table A3-24. Common terns were only recorded within the NWIS SPA across five of the 12 survey months. Raw counts ranged from 0 in all months except September 2024 and May to August 2025, to 336 in August 2025 with abundance and density peaking at 3,934 birds and 1.65 birds/km^2 respectively.

3.9.12 Density maps from the NWIS DAS data are presented in Figure A3-24. Common terns were found in the highest densities around Rockabill and in the inshore waters in the west of the NWIS SPA.

Table A 3-24: Common tern raw counts, estimated abundance (birds) and estimated density (birds/km2) in the NWIS SPA (CI values are presented in brackets).

Survey	Raw Count	Abundance Estimate	Density Estimate
September, 2024	3	37 (6 – 74)	0.02
October, 2024	0	0 (0 – 0)	0
November, 2024	0	0 (0 – 0)	0
December, 2024	0	0 (0 – 0)	0
January, 2025	0	0 (0 – 0)	0
February, 2025	0	0 (0 – 0)	0
March, 2025	0	0 (0 – 0)	0
April, 2025	0	0 (0 – 0)	0
May, 2025	15	352 (124 – 670)	0.15
June, 2025	22	529 (22 – 1,270)	0.22
July, 2025	87	1,857 (1,090 – 2,899)	0.78
August, 2025	336	3,934 (1,727 – 6,990)	1.65

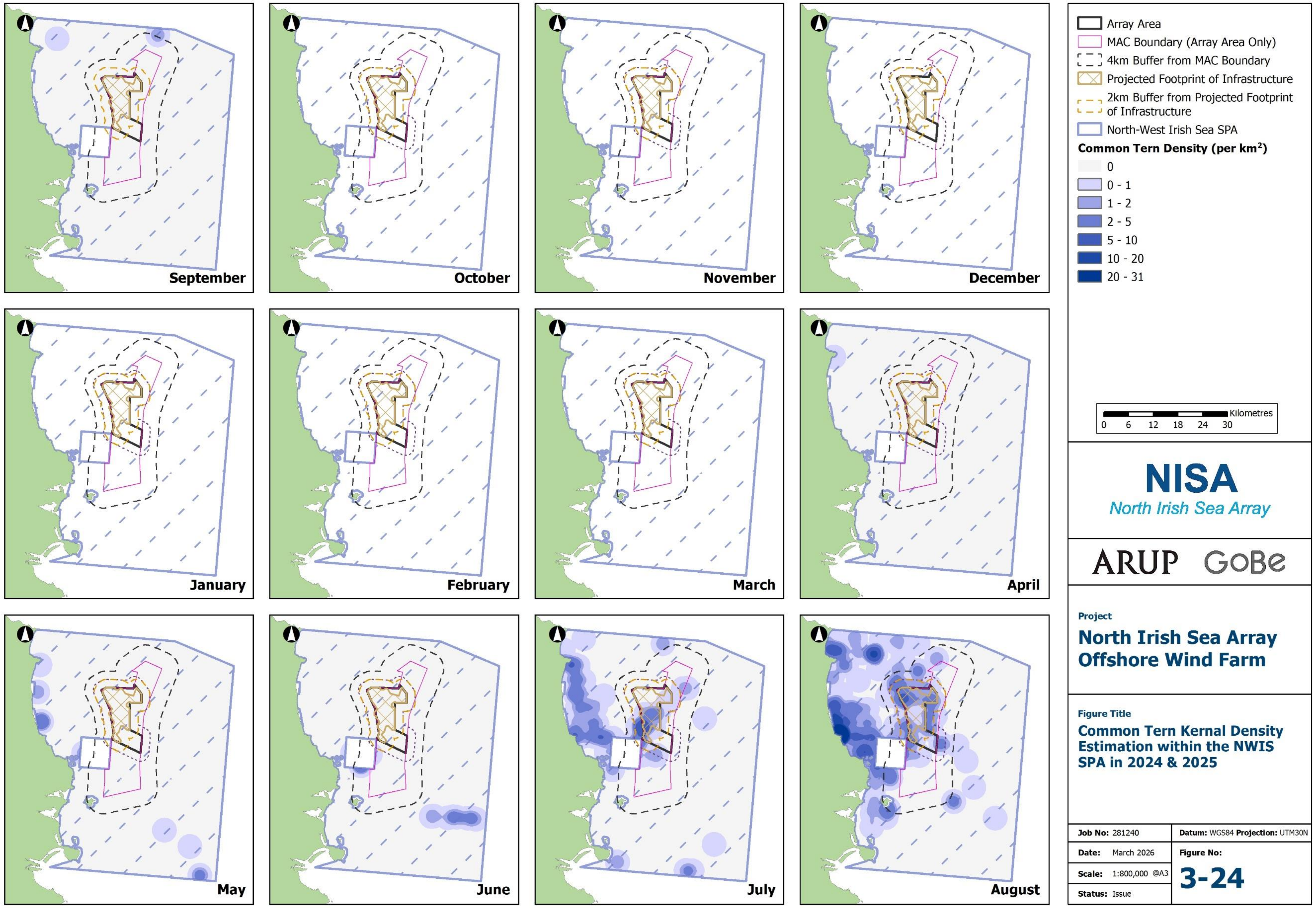

Figure A 3-24: Common Tern Kernal Density Estimation within the NWIS SPA in 2024 & 2025.

3.10 Arctic tern

General overview

3.10.1 Arctic terns visit Ireland during the summer months to breed. The breeding population of Ireland has been steadily increasing over the long-term and was 2,778 pairs during 2016 to 2018 (Cummins *et al*., 2019). Their colonies are mainly coastal but there are also a couple of inland sites. Although the overall population seems to be increasing Arctic tern is Amber-listed and on Annex I of the EC Birds Directive in Ireland because the breeding range has been reduced by 44% between 1998 and 2018, and because much of the breeding population is concentrated in fewer than 10 sites (Gilbert *et al*., 2021).

3.10.2 The breeding season for Arctic tern is between May and early August (Furness, 2015) During the breeding season the mean-maximum foraging range of adults is 25.7 ± 14.8km (Woodward *et al*., 2019).

Abundance and density

3.10.3 Arctic tern was recorded in the PFI in 3 of 41 months, with raw counts ranging from 1 in July 2025 to 35 in August 2025. Abundance and density peaked at 210 birds and 3.64 birds/km^2 respectively (Table A3-25).

3.10.4 In the PFI plus a 2km buffer, raw counts ranged from 1 in July 2025 to 87 in August 2025. Abundance and density peaked at 616 birds and 3.85 birds/km^2 respectively (Table A3-25).

Table A 3-25: Arctic tern raw counts, estimated abundance (birds) and estimated density (birds/km^2) in the PFI and PFI plus a 2km buffer (CI values are presented in brackets).

Survey	Raw Count	Abundance Estimate	Density Estimate	Raw Count	Abundance Estimate	Density Estimate
	PFI			PFI plus a 2km buffer		
May, 2020	0	0 (0 – 0)	0	0	0 (0 – 0)	0
June, 2020	0	0 (0 – 0)	0	0	0 (0 – 0)	0
July, 2020	0	0 (0 – 0)	0	0	0 (0 – 0)	0
August, 2020	0	0 (0 – 0)	0	0	0 (0 – 0)	0
September, 2020	0	0 (0 – 0)	0	0	0 (0 – 0)	0
October, 2020	0	0 (0 – 0)	0	0	0 (0 – 0)	0
November, 2020	0	0 (0 – 0)	0	0	0 (0 – 0)	0
December, 2020	0	0 (0 – 0)	0	0	0 (0 – 0)	0
February, 2021	0	0 (0 – 0)	0	0	0 (0 – 0)	0
March, 2021	0	0 (0 – 0)	0	0	0 (0 – 0)	0
April, 2021	0	0 (0 – 0)	0	0	0 (0 – 0)	0
May, 2021	0	0 (0 – 0)	0	0	0 (0 – 0)	0
June, 2021	0	0 (0 – 0)	0	0	2 (0 – 7)	0.01
July, 2021	0	0 (0 – 0)	0	0	0 (0 – 0)	0
August, 2021	0	1 (0 – 4)	0.02	0	3 (0 – 7)	0.02
September, 2021	0	0 (0 – 0)	0	0	0 (0 – 0)	0
October, 2021	0	0 (0 – 0)	0	0	0 (0 – 0)	0
November, 2021	0	0 (0 – 0)	0	0	0 (0 – 0)	0
December, 2021	0	0 (0 – 0)	0	0	0 (0 – 0)	0
January, 2022	0	0 (0 – 0)	0	0	0 (0 – 0)	0
February, 2022	0	0 (0 – 0)	0	0	0 (0 – 0)	0

Survey	Raw Count	Abundance Estimate	Density Estimate	Raw Count	Abundance Estimate	Density Estimate
	PFI			PFI plus a 2km buffer		
March, 2022	0	0 (0 – 0)	0	0	0 (0 – 0)	0
April, 2022	0	0 (0 – 0)	0	0	0 (0 – 0)	0
May, 2022	0	0 (0 – 0)	0	0	0 (0 – 0)	0
June, 2022	0	0 (0 – 0)	0	2	16 (2 – 54)	0.10
July, 2022	3	13 (3 – 36)	0.23	3	18 (3 – 61)	0.11
August, 2022	0	0 (0 – 0)	0	5	18 (5 – 54)	0.11
September, 2022	0	0 (0 – 0)	0	0	0 (0 – 0)	0
October, 2022	0	0 (0 – 0)	0	0	0 (0 – 0)	0
September, 2024	0	0 (0 – 0)	0	0	0 (0 – 0)	0
October, 2024	0	0 (0 – 0)	0	0	0 (0 – 0)	0
November, 2024	0	0 (0 – 0)	0	0	0 (0 – 0)	0
December, 2024	0	0 (0 – 0)	0	0	0 (0 – 0)	0
January, 2025	0	0 (0 – 0)	0	0	0 (0 – 0)	0
February, 2025	0	0 (0 – 0)	0	0	0 (0 – 0)	0
March, 2025	0	0 (0 – 0)	0	0	0 (0 – 0)	0
April, 2025	0	0 (0 – 0)	0	0	0 (0 – 0)	0
May, 2025	0	0 (0 – 0)	0	0	0 (0 – 0)	0
June, 2025	0	0 (0 – 0)	0	0	0 (0 – 0)	0
July, 2025	1	15 (1 – 56)	0.26	1	15 (1 – 53)	0.09
August, 2025	35	210 (35 – 611)	3.64	87	616 (109 – 1,115)	3.85

Bio-season peak estimates

3.10.1 Arctic tern was only present in the breeding bio-season (May to August), with a mean peak abundance of 56 birds, and a mean peak density of 0.97 birds/km^2 in the PFI (Table A3-26).

3.10.2 Within the PFI plus a 2km buffer, arctic tern was only present in the breeding bio-season, with a mean peak abundance of 159 birds and a mean peak density of 0.99 birds/km^2 (Table A3-26).

Table A 3-26: Arctic tern bio-season mean peak abundance and density estimates in the NISA PFI and PFI plus a 2km buffer using combined DAS datasets.

BDMPS Bio-seasons	Area	Months	Bio-season peak abundance (n)	Bio-season peak density (n/km^2)
Autumn migration	PFI	Sep-Sep	-	-
Breeding	PFI	May-Aug	56	0.97
Spring Migration	PFI	Apr-Apr	-	-
Autumn migration	PFI plus a 2km buffer	Sep-Sep	-	-
Breeding	PFI plus a 2km buffer	May-Aug	159	0.99
Spring Migration	PFI plus a 2km buffer	Apr-Apr	-	-

North West Irish Sea SPA

3.10.1 DAS data for common tern within the NWIS SPA are presented below in Table A3-27. Arctic terns were only recorded within the NWIS SPA across four of the 12 survey months. Raw counts ranged from 0 in all months except May to August 2025, to 277 in August 2025 with abundance and density peaking 3,306 birds and 1.39 birds/km^2 respectively.

Table A 3-27: Arctic tern raw counts, estimated abundance (birds) and estimated density (birds/km2) in the NWIS SPA (CI values are presented in brackets).

Survey	Raw Count	Abundance Estimate	Density Estimate
September, 2024	0	0 (0 – 0)	0
October, 2024	0	0 (0 – 0)	0
November, 2024	0	0 (0 – 0)	0
December, 2024	0	0 (0 – 0)	0
January, 2025	0	0 (0 – 0)	0
February, 2025	0	0 (0 – 0)	0
March, 2025	0	0 (0 – 0)	0
April, 2025	0	0 (0 – 0)	0
May, 2025	13	307 (64 – 636)	0.13
June, 2025	21	465 (35 – 1,143)	0.19
July, 2025	12	227 (71 – 459)	0.1
August, 2025	277	3,306 (1,805 – 5,176)	1.39

Available tracking data

3.10.2 Though tracking data from Irish colonies is not currently available, recent research has shown that Arctic tern populations breeding in the northern North Sea pass through the Irish sea during both northward and southbound migrations having passed overland across Great Britain rather than flying through the North Sea itself (Redfern *et al*., 2020). Consequently, while there is no evidence of foraging overlap with the PFI, there is potential for additional birds from further afield to be present within close proximity to NISA during migration seasons. However, based on the absence of Arctic terns within the DAS data presented in Table A3-26 and Table A3-27 during the migratory periods, there is minimal overlap between migrating birds and the PFI. This is likely to be because terns tend to undertake migrations close to the coast (WWT & MacArthur Green, 2014).

3.11 Common guillemot

General overview

3.11.1 The breeding population of guillemot in Ireland is estimated at 177,388 individuals (2015-2018). The population seems to be showing strong growth in the south and west of Ireland (c. 50% since Seabird 2000) and modest growth in the north and east (c. 10% since Seabird 2000). The availability of the preferred prey species (young sprat and sandeels) in the different regions are likely to be driving the differences in population growth (Cummins *et al*., 2019). Numbers breeding at Lambay Island, Ireland's largest colony and one of the closest colonies to the PFI, have remained stable over the long term with a current population of 59,983 individuals (Cummins *et al.*, 2019). Guillemot are Amber listed in Ireland (Gilbert *et al*., 2021) due to the majority of the population breeding at fewer than 10 sites. Guillemot breed in dense, large colonies predominantly between April and June (see Section 2.12). During this time their mean-maximum foraging range is 73.2 ± 80.5 km (Woodward *et al*., 2019).

3.11.2 During the autumn migration season, in July and August, adult guillemots either remain in the waters close to the breeding colonies, or disperse further afield (Wernham *et al*., 2002).

Abundance and density

3.11.3 Guillemot was recorded in the PFI in 39 out of 41 months. Raw counts ranged from 13 (December 2020) to 3,603 (July 2025), with abundance and density peaking at 20,036 birds and 347.53 birds/km^2 respectively (Table A3-28).

3.11.4 In the PFI plus a 2km buffer, raw counts ranged from 29 (December 2020) to 7,318 (July 2025), with abundance and density peaking at 43,430 birds and 271.14 birds/km^2 respectively (Table A3-28).

Table A 3-28: Common guillemot raw counts, estimated abundance (birds) and estimated density (birds/km^2) in the PFI and PFI plus a 2km buffer (CI values are presented in brackets).

Survey	Raw Count	Abundance Estimate	Density Estimate	Raw Count	Abundance Estimate	Density Estimate
	PFI			PFI plus a 2km buffer		
May, 2020	48	287 (171 – 421)	4.98	122	720 (515 – 939)	4.50
June, 2020	36	193 (91 – 301)	3.35	133	710 (512 – 945)	4.43
July, 2020	607	2,493 (1,107 – 3,959)	43.24	1,666	7,078 (4,704 – 9,628)	44.19
August, 2020	399	1,549 (826 – 2,284)	26.87	1,126	4,401 (2,677 – 6,080)	27.48
September, 2020	881	3,640 (2,672 – 4,907)	63.14	2,768	11,839 (9,393 – 14,486)	73.91
October, 2020	71	2,276 (788 – 4,308)	39.48	185	4,363 (2,361 – 6,624)	27.24
November, 2020	0	616 (293 – 969)	10.68	0	1,188 (691 – 1,740)	7.42
December, 2020	13	504 (223 – 901)	8.74	29	1,038 (543 – 1,657)	6.48
February, 2021	0	149 (58 – 233)	2.58	0	472 (303 – 640)	2.95
March, 2021	318	1,674 (776 – 2,675)	29.04	982	5,257 (3,454 – 7,163)	32.82
April, 2021	39	242 (131 – 348)	4.2	168	974 (787 – 1,179)	6.08
May, 2021	86	393 (266 – 515)	6.82	197	913 (722 – 1,109)	5.70
June, 2021	52	243 (69 – 430)	4.21	135	621 (245 – 1,042)	3.88
July, 2021	84	342 (84 – 813)	5.93	220	898 (338 – 1,770)	5.61
August, 2021	1,285	4,989 (2,732 – 7,508)	86.54	3,621	14,156 (9,494 – 18,988)	88.38
September, 2021	2,000	7,941 (3,512 – 12,931)	137.74	3,796	15,378 (10,161 – 21,361)	96.01
October, 2021	205	1,031 (447 – 1,683)	17.88	576	2,870 (1,563 – 4,384)	17.92
November, 2021	256	1,691 (919 – 2,537)	29.33	560	4,113 (2,494 – 5,744)	25.68
December, 2021	83	642 (308 – 993)	11.14	204	1,671 (924 – 2,536)	10.43
January, 2022	243	1,361 (859 – 1,999)	23.61	535	3,123 (2,028 – 4,421)	19.50

Survey	Raw Count	Abundance Estimate	Density Estimate	Raw Count	Abundance Estimate	Density Estimate
	PFI			PFI plus a 2km buffer		
February, 2022	174	1,223 (823 – 1,703)	21.21	461	3,067 (2,374 – 3,780)	19.15
March, 2022	52	279 (94 – 585)	4.84	166	1,026 (672 – 1,466)	6.41
April, 2022	119	553 (315 – 833)	9.59	243	1,163 (696 – 1,673)	7.26
May, 2022	65	277 (131 – 471)	4.8	197	878 (613 – 1,109)	5.48
June, 2022	37	154 (81 – 235)	2.67	135	574 (336 – 840)	3.58
July, 2022	869	3,235 (1,062 – 5,607)	56.11	2,465	9,508 (6,506 – 12,317)	59.36
August, 2022	1,113	4,006 (2,565 – 5,240)	69.49	3,118	11,595 (9,199 – 13,610)	72.39
September, 2022	1,571	5,918 (3,770 – 8,355)	102.65	4,000	15,506 (11,280 – 19,049)	96.81
October, 2022	587	3,150 (2,222 – 4,234)	54.64	1,556	8,287 (6,202 – 10,191)	51.74
September, 2024	1,208	7,430 (2,482 – 13,966)	128.88	2,956	19,216 (12,387 – 26,978)	119.97
October, 2024	183	1,109 (439 – 1,955)	19.24	486	3,211 (2,257 – 4,350)	20.05
November, 2024	59	558 (161 – 1,087)	9.68	225	2,069 (1,480 – 2,746)	12.92
December, 2024	63	654 (63 – 1,230)	11.34	233	2,374 (1,270 – 3,510)	14.82
January, 2025	70	683 (110 – 1,499)	11.85	248	2,399 (1,577 – 3,364)	14.98
February, 2025	41	344 (153 – 545)	5.97	117	1,060 (776 – 1,342)	6.62
March, 2025	183	1,458 (183 – 3,634)	25.29	485	3,961 (2,094 – 5,845)	24.73
April, 2025	38	294 (127 – 466)	5.1	91	676 (513 – 837)	4.22
May, 2025	36	255 (101 – 438)	4.42	103	732 (569 – 913)	4.57
June, 2025	80	530 (204 – 875)	9.19	164	1,093 (865 – 1,323)	6.82
July, 2025	3,603	20,036 (4,682 – 38,427)	347.53	7,318	43,430 (18,717 – 74,589)	271.14
August, 2025	1,836	10,163 (1,836 – 20,700)	176.28	5,686	31,892 (12,784 – 50,743)	199.11

3.11.5 Guillemot were the most abundant species in Irish waters recorded during the ESAS surveys between 1980 and 1997. The highest densities of guillemots (>5 birds/km^2) were recorded off the Irish east coast between July and September, when birds started to disperse from their breeding colonies. Moderate densities were recorded close to breeding colonies between March and June with lower densities between October and February (Pollock *et al*., 1997).

3.11.6 In March and April, moderate densities (2.00-4.99 birds/km^2) were recorded off the Dublin coast, close to the breeding colonies. Moderate to high densities were recorded off the Irish east coast between May and June, with high concentrations (>5.00 birds/km^2) off Wicklow at this time of year. Between July and September, high densities (>5.00 birds/km^2) were recorded off the Irish east coast, with high to moderate densities elsewhere in the Irish Sea, as adults and juvenile birds moved offshore from the breeding colonies. Between October and February, guillemots were present in low to moderate densities off the Irish east coast (Pollock *et al*., 1997).

3.11.7 The ObSERVE aerial surveys in 2016 recorded 24,763 guillemots and razorbills (these could not be differentiated) in the survey area off the Irish east coast during the summer, autumn and winter. The abundance of guillemots and razorbills across the survey area was estimated at 36,255 individuals in summer (density = 3.95 birds/km^2), 159,503 birds in autumn (density = 17.4 birds/km^2), and 42,296 birds in winter (density = 4.61 birds/km^2) (Jessopp *et al*., 2018). Consistently high densities of sightings were recorded in proximity to breeding colonies at Bray Head, Howth Head and Ireland's Eye. During the autumn higher densities were recorded further north.

3.11.8 In addition, guillemot abundance was estimated using model-based approaches using MRSea. This generally predicted considerably lower abundances than the design-based methods presented above. See the Addendum to Appendix A15.2: MRSea Modelling for Offshore Ornithology for further information.

Bio-season peak estimates

3.11.9 Guillemot was present across both bio-seasons, with highest mean peak abundance and density estimates in the non-breeding season for both the Project and Furness approaches within the PFI. A mean peak abundance of 8,993 individuals and a mean peak density of 155.99 birds/km^2 was estimated for the project approach and a mean peak of 7,018 birds and a mean peak density of 121.74 birds/km^2 for the Furness approach (Table A 3-29).

3.11.10 Within the PFI plus a 2km buffer, guillemot was also present across both bio-seasons, with highest mean peak abundance and density estimates in the non-breeding bio-season. A mean peak abundance of 21,074 birds and mean peak density of 131.58 birds/km^2 for the Project approach and a mean peak abundance of 18,766 birds and a mean peak density of 117.18 birds/km^2 for the Furness (2015) approach were estimated (Table A 3-29).

3.11.11 Within the PFI plus a 2km buffer, guillemot was also present across both bio-seasons, with highest mean peak abundance and density estimates in the non-breeding bio-season. A mean peak abundance of 21,074 birds and mean peak density of 131.58 birds/km^2 for the Project approach and a mean peak abundance of 18,766 birds and a mean peak density of 117.18 birds/km^2 for the Furness (2015) approach were estimated (Table A 3-29).

Table A 3-29: Common guillemot bio-season mean peak abundance and density estimates in the PFI and PFI plus a 2km buffer using combined DAS datasets.

BDMPS Bio-seasons	Area	Months	Bio-season peak abundance (n)	Bio-season peak density (n/km^2)
Breeding (Project approach)	PFI	Apr-Jun	441	7.64
Non-breeding (Project approach)	PFI	Jul-Mar	8,993	155.99
Breeding (Furness approach)	PFI	Mar-Jul	6,860	118.98
Non-breeding (Furness approach)	PFI	Aug-Feb	7,018	121.74
Breeding (Project approach)	PFI plus a 2km buffer	Apr-Jun	988	6.17
Non-breeding (Project approach)	PFI plus a 2km buffer	Jul-Mar	21,074	131.58
Breeding (Furness approach)	PFI plus a 2km buffer	Mar-Jul	16,318	101.89
Non-breeding (Furness approach)	PFI plus a 2km buffer	Aug-Feb	18,766	117.18

Spatial density distribution and flight direction

3.11.12 Density maps based on MAC DAS data are presented in Figure A 3-25 to Figure A 3-27 below. Guillemots were distributed across the survey area in both the breeding and non-breeding bio-seasons, though across both seasons density was highest towards the east.

3.11.13 Data from Jessop *et al*. (2018) similarly showed that birds were widely distributed. During the breeding season, densities appeared slightly higher towards the south-west of the proposed development (mostly outside of the survey area), while during the Autumn migration bio-season, densities were highest to the north-west of the proposed development. Notably guillemots and razorbills were not differentiated within this dataset.

3.11.14 Flight directions recorded during the DAS surveys found that majority of the time the flight direction was variable for guillemots (Figure A 3-28). There were some exceptions with flying directions in March 2022 being predominantly westerly and in July 2022 south-westerly (Figure A 3-28). Both June 2020 and 2022 saw a large number of flying birds recorded and although the direction was variable there was a slight preference to the easterly direction (Figure A 3-28), suggesting birds flying to and from colonies in search of food.

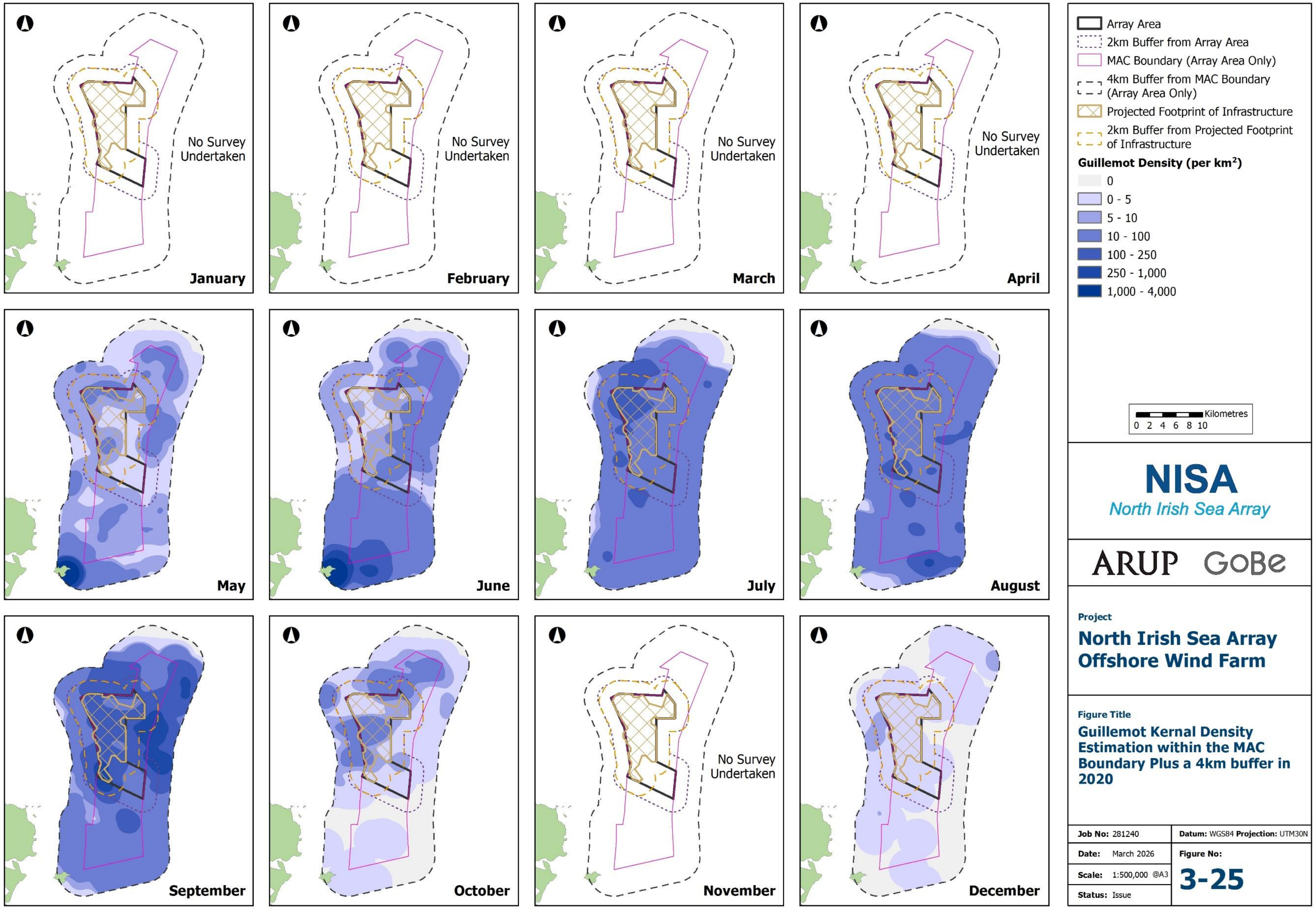

Figure A 3-25: Guillemot Kernal Density Estimation within the MAC Boundary Plus a 4km buffer in 2020.

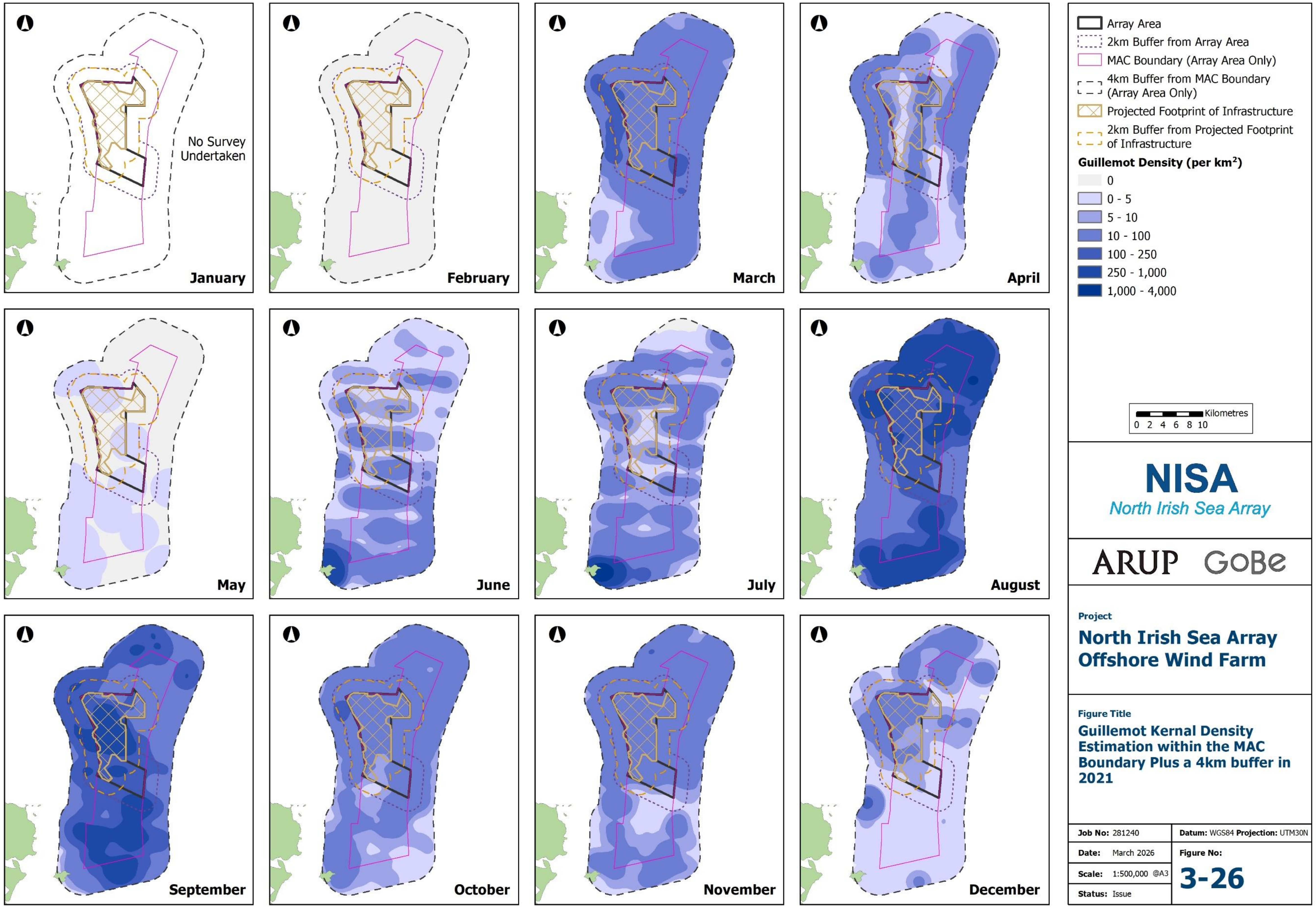

Figure A 3-26: Guillemot Kernal Density Estimation within the MAC Boundary Plus a 4km buffer in 2021.

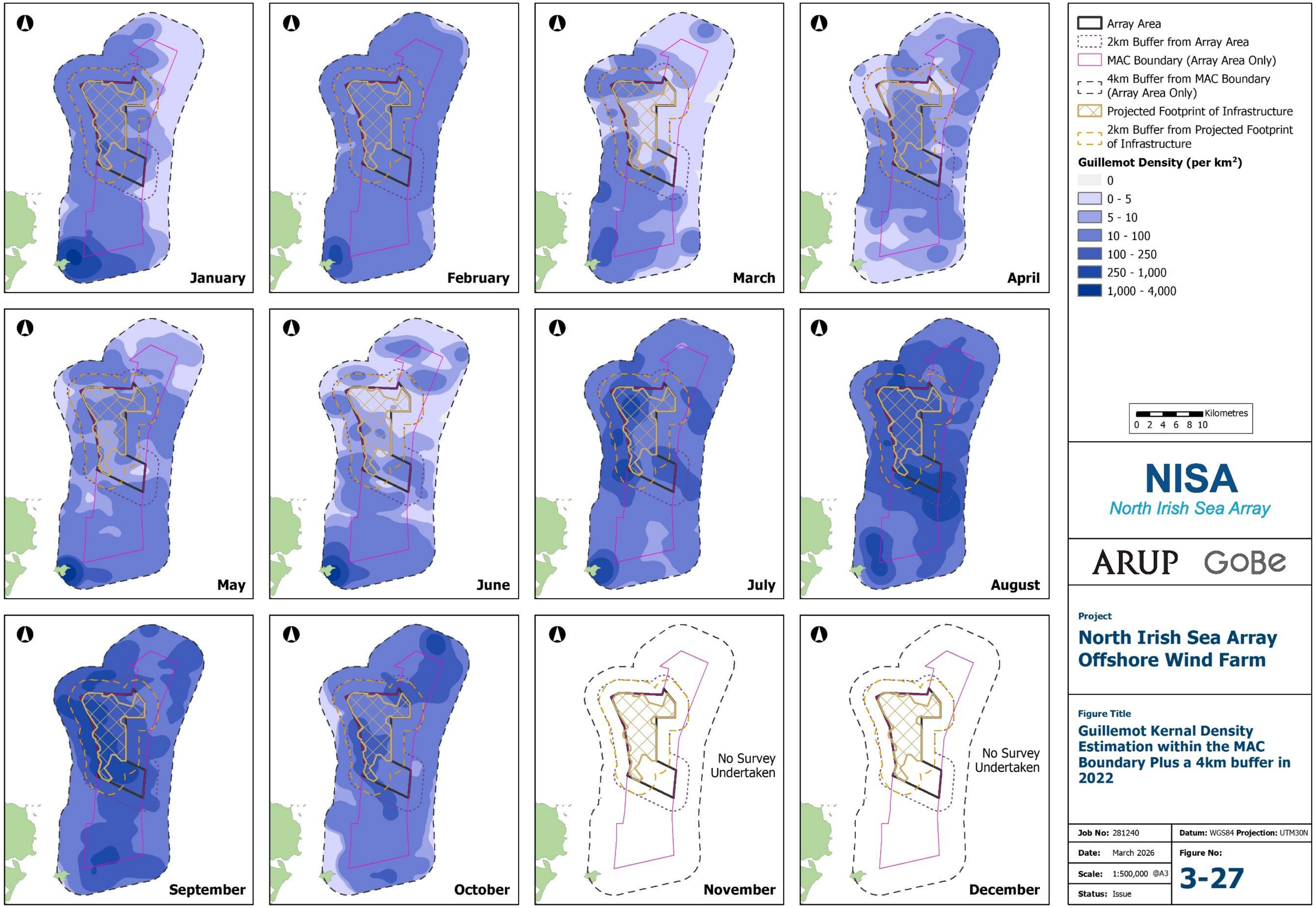

Figure A 3-27: Guillemot Kernal Density Estimation within the MAC Boundary Plus a 4km buffer in 2022.

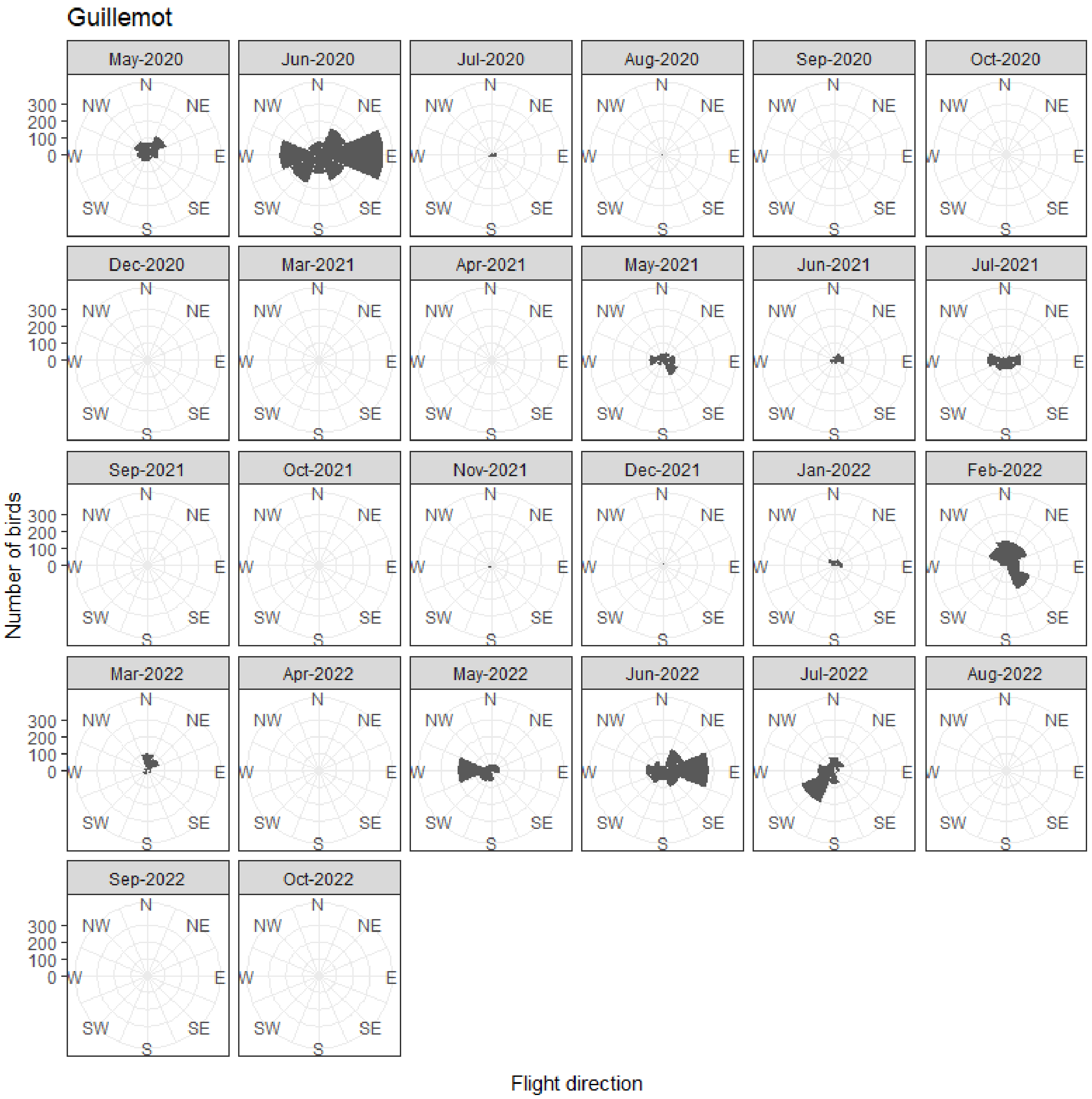

Figure A 3-28: Guillemot monthly flight directions in the ornithology study area (using baseline 29-month DAS data).

3.11.15 DAS data for guillemot within the NWIS SPA are presented below in Table A3-30. Guillemots were recorded within the NWIS SPA across all 12 survey months. Raw counts ranged from 1,035 in January 2025 to 47,812 in August 2025 with abundance and density peaking 326,565 birds and 136.90 birds/km^2 respectively.

3.11.16 Density maps from the NWIS DAS data are presented in Figure A3-29. Densities were uniformly high across the SPA during autumn migration and high in the south of the NWIS SPA during the breeding season.

Table A 3-30: Common guillemot raw counts, estimated abundance (birds) and estimated density (birds/km2) in the NWIS SPA (CI values are presented in brackets).

Survey	Raw Count	Abundance Estimate	Density Estimate
September, 2024	20,606	155,433 (100,616 – 209,799)	65.16
October, 2024	10,697	91,762 (64,172 – 119,858)	38.47
November, 2024	1,568	14,064 (10,050 – 18,131)	5.90
December, 2024	1,074	13,183 (6,684 – 20,380)	5.53
January, 2025	1,035	12,665 (7,082 – 18,684)	5.31
February, 2025	1,391	14,694 (9,345 – 19,902)	6.16
March, 2025	2,463	23,906 (14,527 – 34,221)	10.02
April, 2025	1,214	12,410 (8,589 – 16,516)	5.20
May, 2025	2,778	25,243 (16,637 – 36,987)	10.58
June, 2025	4,240	36,097 (24,060 – 53,165)	15.13
July, 2025	37,305	261,549 (186,625 – 355,476)	109.65
August, 2025	47,812	326,565 (198,103 – 481,810)	136.90

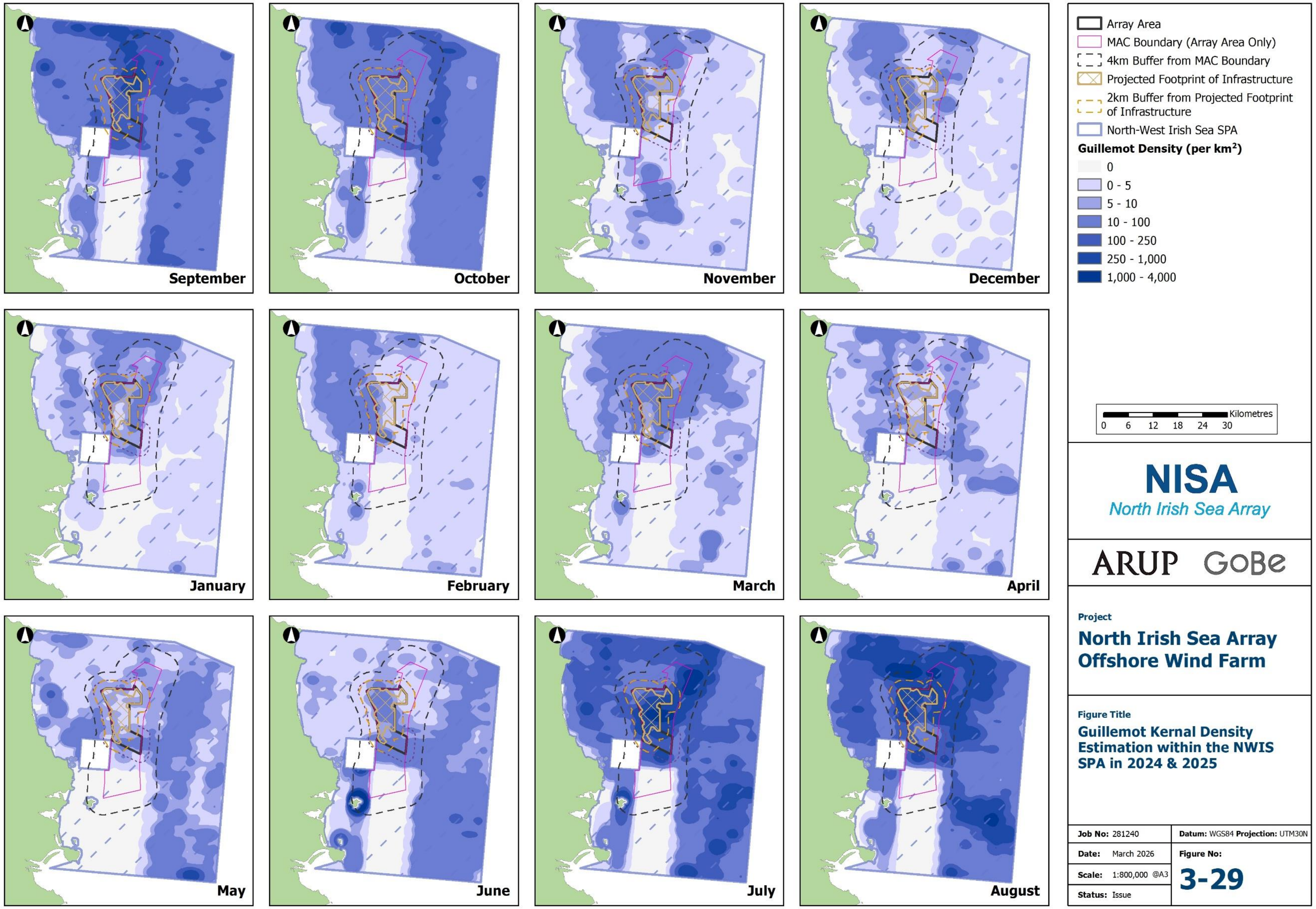

Figure A 3-29: Guillemot Kernal Density Estimation within the NWIS SPA in 2024 & 2025.

Available tracking data

3.11.17 Tracking data is available for guillemots from Lambay Island through the FAME dataset (Baer & Newton, 2012). Four individuals were tracked for a total of 10 days between 2010 and 2011, with individuals travelling up to 45km from Lambay Island, though most foraging activity was located within the mean foraging distance of 29km (Figure A3-30). Key foraging areas were located to the east of Lambay Island, resulting in minimal overlap with the PFI, though notably this dataset was based on only four individuals which may not be representative of the whole colony.

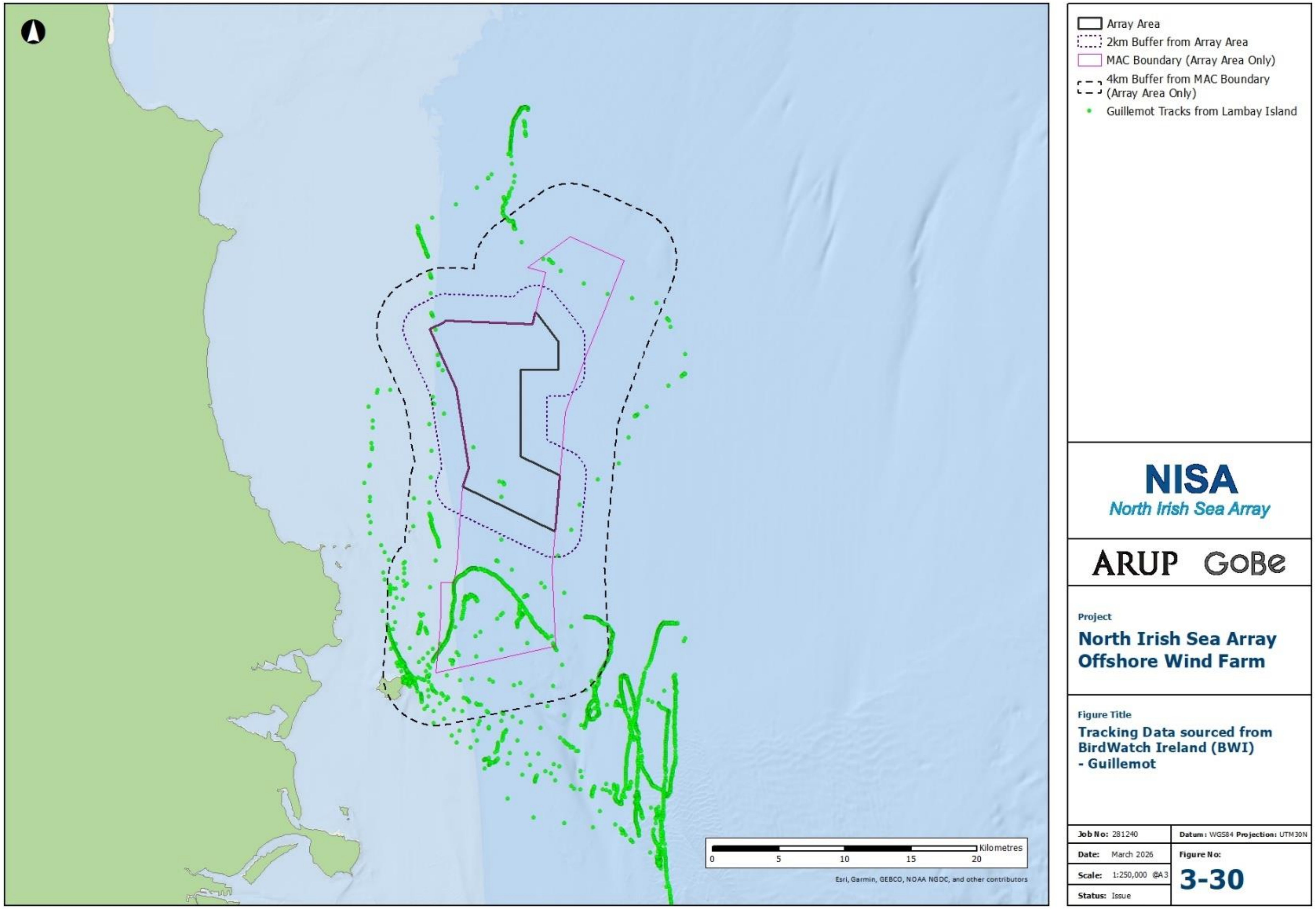

Figure A 3-30: Tracking data sourced from Birdwatch Ireland (BWI) - guillemot

3.12 Razorbill

General overview

3.12.1 Razorbill are generally less abundant than guillemot across Ireland with an estimated breeding population of 33,689 individuals (2015-2018). Both the breeding population and distribution have increased substantially since the 1980s. Similarly, to other species, more than 50% of the Irish razorbill breeding population is concentrated in 10 or less sites (Gilbert *et al*., 2021), giving it a red-listed status in Ireland. It is also classified as being of global conservation concern by Birdlife International.

3.12.2 Razorbill breeding season is between April and July (Furness, 2015). During this time adults travel mean-maximum range of 88.7 ± 75.9 km to forage (Woodward *et al*., 2019).

3.12.3 Post breeding and post-breeding moult period, razorbills winter as far as Iberia and Morocco (Wernham *et al*., 2002).

Abundance and density

3.12.4 Razorbill was recorded in the PFI in 37 out of 41 months. Raw counts ranged from 1 (across several months) to 1,200 (August 2025), with abundance and density peaking at 6,313 birds and 109.50 birds/km^2 respectively (Table A3-31).

3.12.5 In the PFI plus a 2km buffer, raw counts ranged from 2 (July 2021) to 2,965 (August 2025), with abundance and density peaking at 16,207 birds and 101.18 birds/km^2 respectively (Table A3-31).

Table A 3-31: Razorbill raw counts, estimated abundance (birds) and estimated density (birds/km^2) in the PFI and PFI plus a 2km buffer (CI values are presented in brackets).

Survey	Raw Count	Abundance Estimate	Density Estimate	Raw Count	Abundance Estimate	Density Estimate
	PFI			PFI plus a 2km buffer		
May, 2020	2	12 (2 – 35)	0.21	12	69 (34 – 119)	0.43
June, 2020	4	21 (4 – 58)	0.36	7	38 (12 – 72)	0.24
July, 2020	5	19 (5 – 43)	0.33	27	110 (51 – 167)	0.69
August, 2020	5	18 (5 – 49)	0.31	9	35 (9 – 83)	0.22
September, 2020	49	207 (49 – 455)	3.59	179	778 (276 – 1,366)	4.86
October, 2020	22	608 (94 – 1,830)	10.55	115	1,647 (687 – 3,425)	10.28
November, 2020	0	11 (4 – 19)	0.19	0	214 (84 – 364)	1.34
December, 2020	9	258 (40 – 542)	4.48	25	684 (296 – 1,162)	4.27
February, 2021	0	7 (3 – 11)	0.12	0	23 (15 – 32)	0.14
March, 2021	19	88 (45 – 129)	1.53	48	225 (147 – 299)	1.4
April, 2021	2	12 (2 – 35)	0.21	4	22 (5 – 45)	0.14
May, 2021	1	5 (1 – 19)	0.09	4	17 (4 – 38)	0.11
June, 2021	0	0 (0 – 0)	0.00	0	0 (0 – 0)	0
July, 2021	0	0 (0 – 0)	0.00	2	8 (2 – 24)	0.05
August, 2021	55	208 (75 – 343)	3.61	141	540 (243 – 822)	3.37
September, 2021	30	120 (30 – 241)	2.08	63	255 (72 – 468)	1.59

Survey	Raw Count	Abundance Estimate	Density Estimate	Raw Count	Abundance Estimate	Density Estimate
	PFI			PFI plus a 2km buffer		
October, 2021	27	133 (47 – 235)	2.31	78	377 (152 – 659)	2.35
November, 2021	133	781 (228 – 1,363)	13.55	282	1,908 (761 – 2,987)	11.91
December, 2021	74	470 (196 – 797)	8.15	197	1,340 (810 – 2,010)	8.37
January, 2022	5	25 (5 – 49)	0.43	14	72 (26 – 120)	0.45
February, 2022	23	140 (55 – 240)	2.43	72	412 (165 – 738)	2.57
March, 2022	2	11 (2 – 25)	0.19	5	27 (5 – 55)	0.17
April, 2022	3	13 (3 – 31)	0.23	15	66 (27 – 106)	0.41
May, 2022	1	4 (1 – 12)	0.07	6	26 (9 – 42)	0.16
June, 2022	0	0 (0 – 0)	0.00	0	0 (0 – 0)	0
July, 2022	9	32 (25 – 39)	0.56	29	105 (84 – 128)	0.66
August, 2022	1	4 (1 – 11)	0.07	3	11 (4 – 22)	0.07
September, 2022	27	107 (33 – 191)	1.86	90	353 (90 – 719)	2.2
October, 2022	292	1,539 (638 – 2,659)	26.69	768	3,955 (1,997 – 5,990)	24.69
September, 2024	67	421 (114 – 784)	7.30	323	2,130 (839 – 4,182)	13.3
October, 2024	86	529 (86 – 1,279)	9.18	166	1,078 (451 – 1,862)	6.73
November, 2024	25	252 (47 – 563)	4.37	114	1,001 (696 – 1,312)	6.25

Survey	Raw Count	Abundance Estimate	Density Estimate	Raw Count	Abundance Estimate	Density Estimate
	PFI			PFI plus a 2km buffer		
December, 2024	33	283 (33 – 626)	4.91	131	1,084 (352 – 1,880)	6.77
January, 2025	50	452 (121 – 851)	7.84	250	2,109 (1,695 – 2,503)	13.17
February, 2025	16	116 (16 – 221)	2.01	53	410 (132 – 738)	2.56
March, 2025	27	224 (27 – 545)	3.89	64	463 (240 – 690)	2.89
April, 2025	12	80 (15 – 159)	1.39	41	274 (153 – 408)	1.71
May, 2025	1	7 (1 – 21)	0.12	4	26 (4 – 53)	0.16
June, 2025	1	6 (1 – 19)	0.10	4	26 (6 – 45)	0.16
July, 2025	374	2,051 (652 – 3,379)	35.58	749	4,201 (1,530 – 6,771)	26.23
August, 2025	1,200	6,313 (1,200 – 12,436)	109.50	2,965	16,207 (6,207 – 26,014)	101.18

3.12.6 ESAS surveys which took place in Irish waters between 1980 and 1997 recorded low densities of razorbill off the east coast of Ireland between March and June. Similarly to guillemot, the highest abundance of razorbill was recorded off the Dublin coast between July and August, coinciding with birds leaving their breeding colonies. During September and October the distribution was more widespread leading to higher densities across the Irish Sea. Throughout November to February, razorbills were widely distributed across the Dublin coast and elsewhere in the Irish Sea at low densities (Pollock *et al.*, 1997).

3.12.7 Historical surveys recorded razorbill throughout the year with peak abundances of 3,110 birds in September 2002 (Percival *et al.*, 2002), and 2,685 and 1,450 birds in July and August 2010, respectively (Newton and Trewby, 2011). Results from the ObSERVE aerial surveys during 2016 are presented in the guillemot section.

3.12.8 In addition, razorbill abundance was estimated using model-based approaches using MRSea. This generally predicted slightly lower abundances than the design-based methods presented above. See Appendix A15.2: MRSea Modelling for Offshore Ornithology of the 2024 EIAR for further information.

Bio-season peak estimates

3.12.9 Razorbill was present across all bio-seasons, with highest values estimated in the autumn migration bio-season, with a mean peak of 1,839 birds and a density of 31.91 birds/km^2 in the PFI (Table A3-32).

3.12.10 Within the PFI plus a 2km buffer, razorbill was present across all bio-seasons, with highest values predicted in the autumn migration. A mean peak abundance of 4,896 birds and a mean peak density of 30.57 birds/km^2 was estimated (Table A3-32).

Table A 3-32: Razorbill bio-season mean peak abundance and density estimates in the PFI and PFI plus a 2km buffer using combined DAS datasets.

BDMPS Bio-seasons	Area	Months	Bio-season peak abundance (n)	Bio-season peak density (n/km^2)
Autumn migration	PFI	Aug–Oct	1,839	31.91
Breeding	PFI	Apr–Jul	529	9.18
Migration-free winter	PFI	Nov–Dec	441	7.64
Spring migration	PFI	Jan–Mar	227	3.93
Autumn migration	PFI plus a 2km buffer	Aug–Oct	4,896	30.57
Breeding	PFI plus a 2km buffer	Apr–Jul	1,110	6.93
Migration-free winter	PFI plus a 2km buffer	Nov–Dec	1,225	7.65
Spring migration	PFI plus a 2km buffer	Jan–Mar	915	5.72

3.12.11 Density maps based on MAC DAS data are presented in Figure A3-31 to Figure A3-33 below. Razorbills were distributed across the survey area in all bio-seasons. No clear trend was evident, with density hotspots varying across bio-seasons. In the breeding bio-season, the highest density was found in the south of the survey area. In the autumn and spring, density hotspots were found in the west and north-west respectively. In the winter bio-season, densities were highest in the north-east.

3.12.12 Data from Jessop *et al*. (2018) similarly showed that birds were widely distributed. During the breeding season, densities appeared slightly higher towards the south-west of the proposed development (mostly outside of the survey area), while during the Autumn migration bio-season, densities were highest to the north-west of the proposed development. Notably guillemots and razorbills were not differentiated within this dataset.

3.12.13 The flight direction data collected during the DAS surveys was minimal for the majority of the months surveyed (Figure A3-34) apart from October 2020 where large numbers were recorded flying south and in November 2021 where the majority were flying southwest (Figure A3-34). All other months had minimal numbers of birds recorded flying.

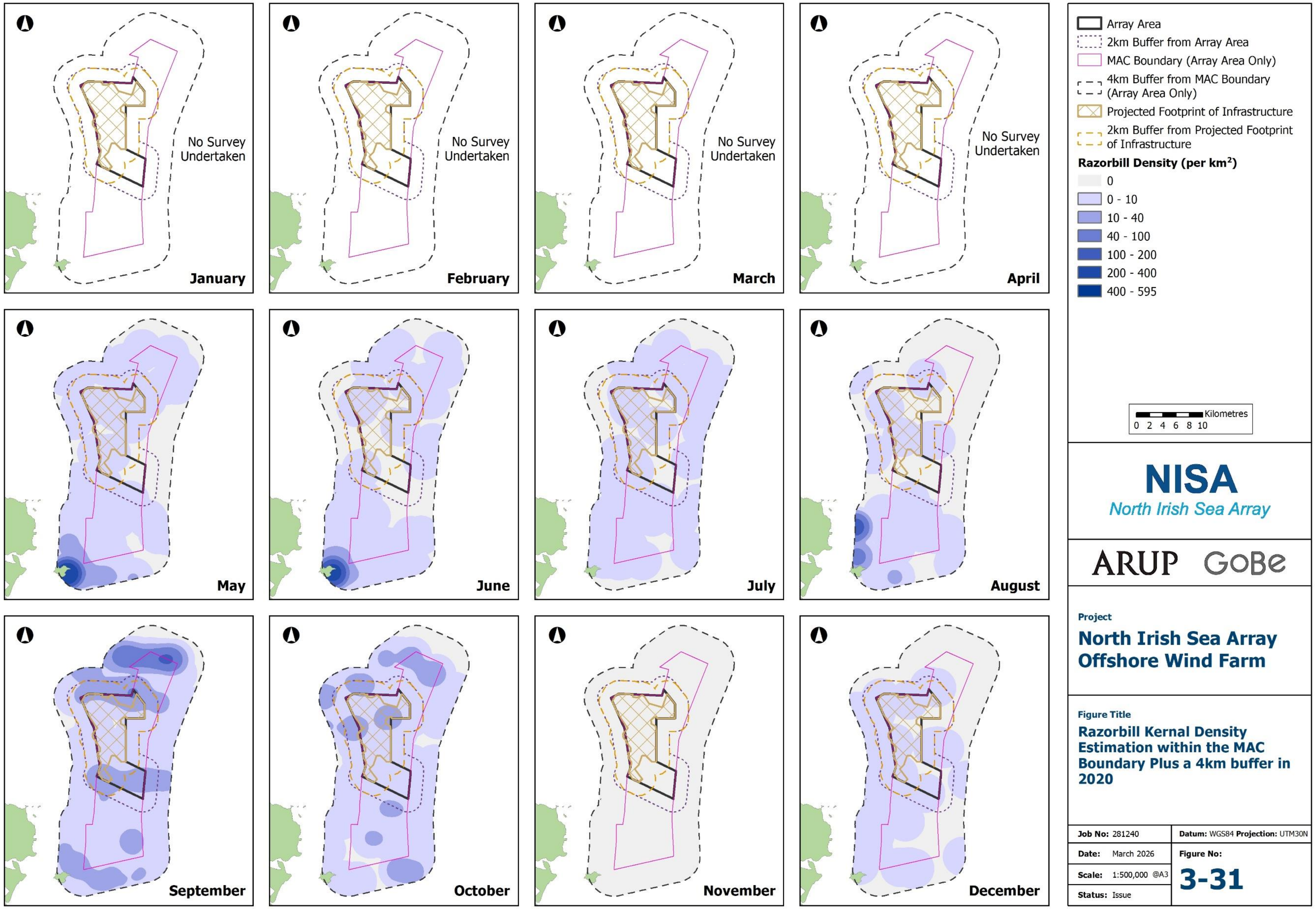

Figure A 3-31: Razorbill Kernal Density Estimation within the MAC Boundary Plus a 4km buffer in 2020.

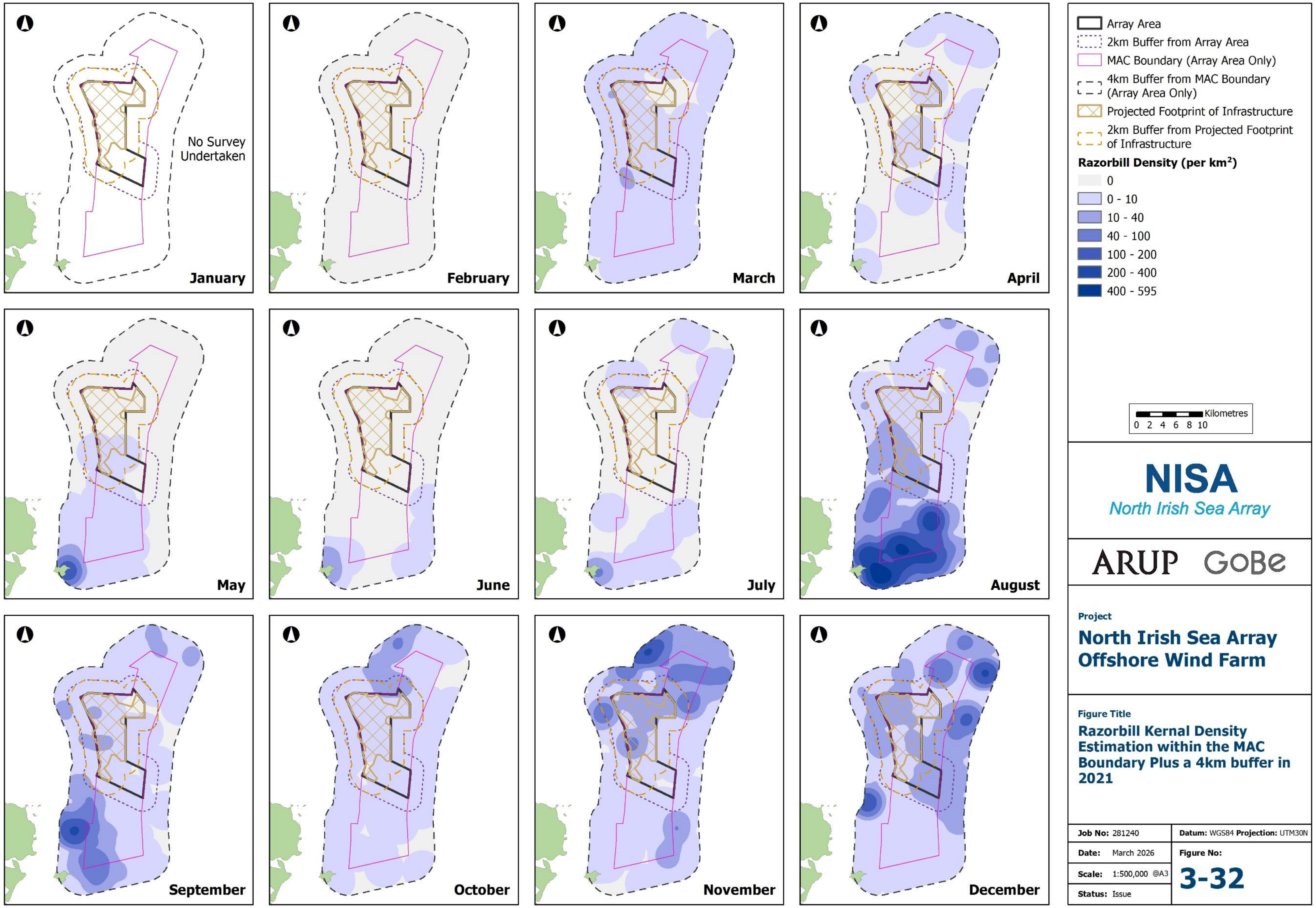

Figure A 3-32: Razorbill Kernal Density Estimation within the MAC Boundary Plus a 4km buffer in 2021.

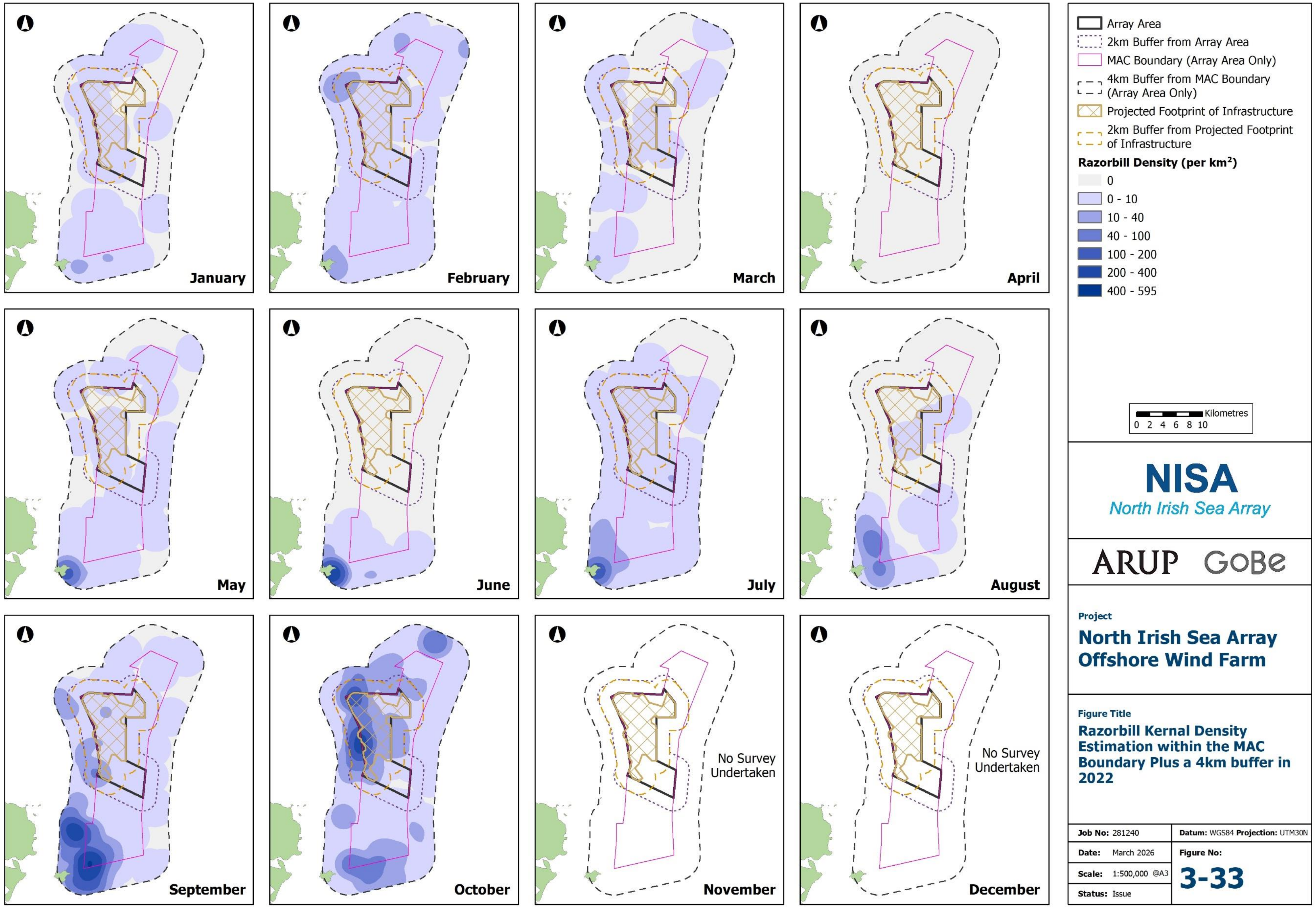

Figure A 3-33: Razorbill Kernal Density Estimation within the MAC Boundary Plus a 4km buffer in 2022.

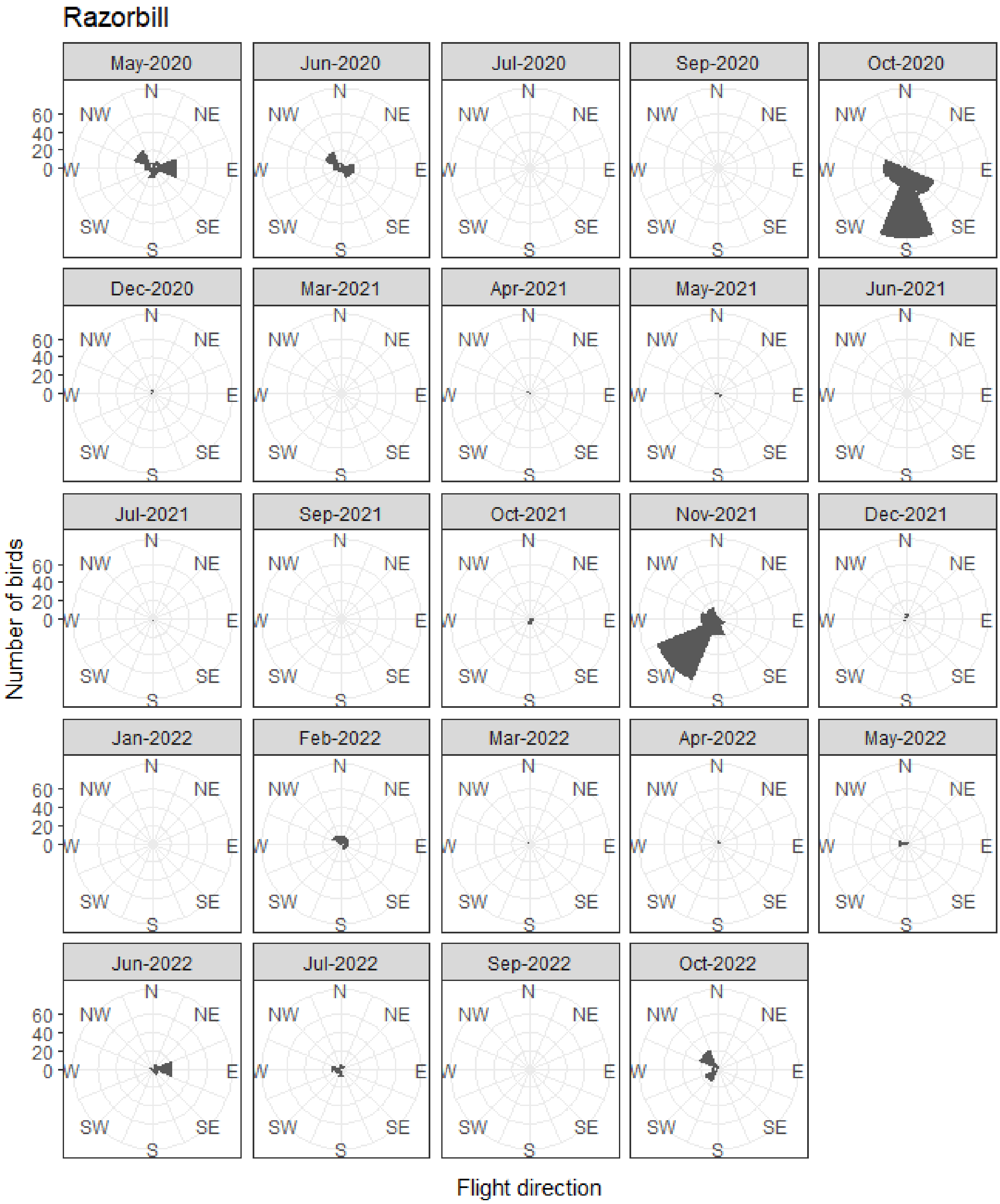

Figure A 3-34: Razorbill monthly flight directions in the ornithology study area (using baseline 29-month DAS data).

3.12.14 DAS data for razorbill within the NWIS SPA are presented below in Table A3-33. Razorbills were recorded within the NWIS SPA across all of the 12 survey months. Raw counts ranged from 236 in May 2025 to 19,781 in August 2025 with abundance and density peaking 131,615 birds and 55.18 birds/km^2 respectively.

3.12.15 Density maps from the NWIS DAS data are presented in Figure A3-35. Densities were uniformly high during the late breeding season and immediately afterwards. The density of razorbill within the SPA was uniformly low during spring migration.

Table A 3-33: Razorbill raw counts, estimated abundance (birds) and estimated density (birds/km2) in the NWIS SPA (CI values are presented in brackets).

Survey	Raw Count	Abundance Estimate	Density Estimate
September, 2024	8,818	65,744 (32,376 – 102,729)	27.56
October, 2024	1,462	12,059 (6,078 – 18,282)	5.06
November, 2024	1,091	9,473 (7,336 – 11,693)	3.97
December, 2024	1,202	11,657 (6,403 – 17,529)	4.89
January, 2025	1,707	17,719 (10,412 – 26,274)	7.43
February, 2025	995	9,159 (6,226 – 12,183)	3.84
March, 2025	863	7,273 (5,549 – 8,991)	3.05
April, 2025	624	5,889 (3,949 – 8,156)	2.47
May, 2025	236	1,971 (1,033 – 3,263)	0.83
June, 2025	345	2,814 (1,519 – 4,487)	1.18
July, 2025	4,941	34,031 (24,619 – 44,343)	14.27
August, 2025	19,781	131,615 (86,295 – 179,984)	55.18

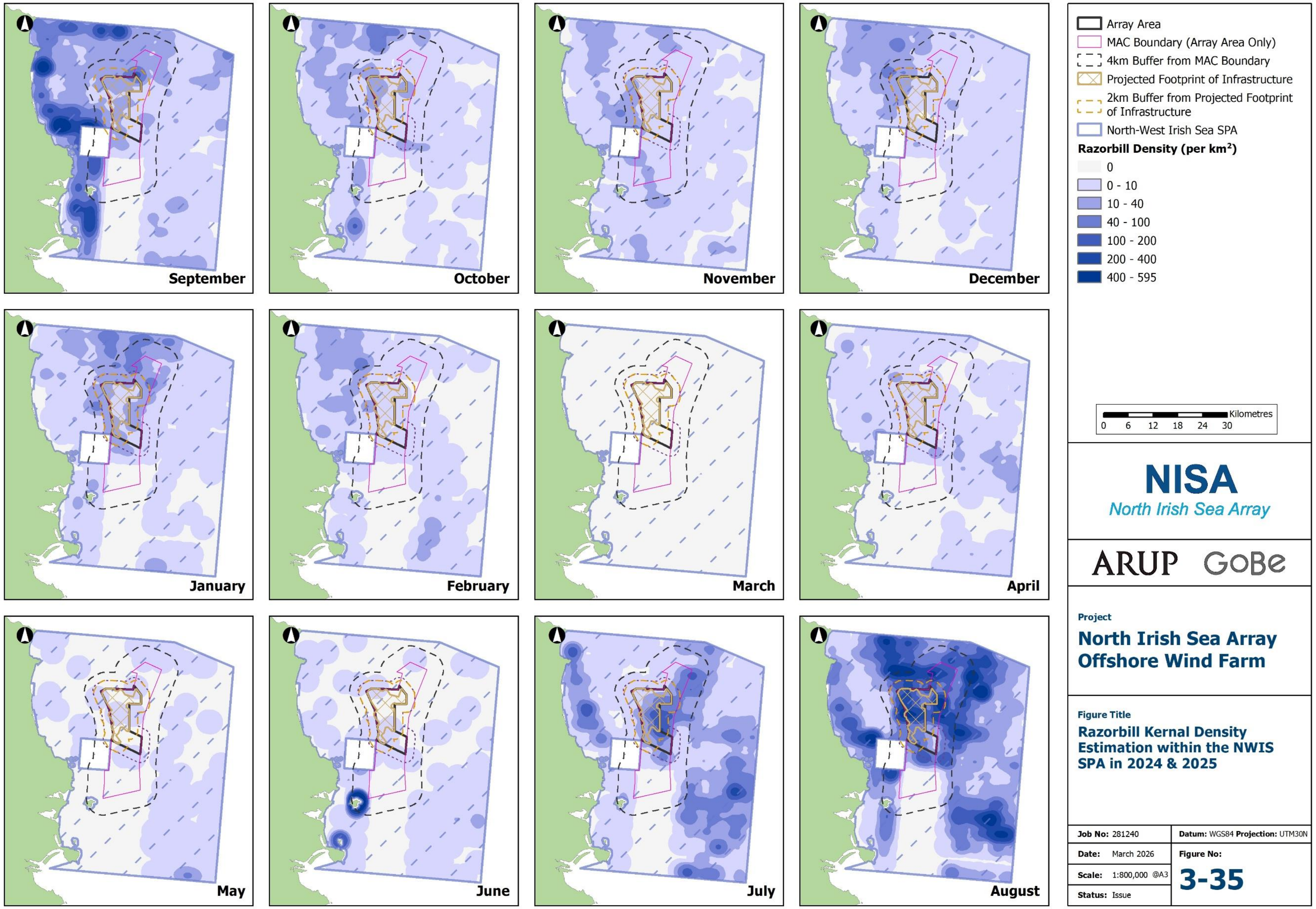

Figure A 3-35: Razorbill Kernal Density Estimation within the NWIS SPA in 2024 & 2025.

Available tracking data

3.12.16 Tracking data is available for razorbills from Lambay Island through the FAME dataset (Baer & Newton, 2012). Five individuals were tracked for a total of 16 days between 2010 and 2011, with individuals travelling up to 40km from Lambay Island, though most foraging activity was located within the mean foraging distance of 31km (Figure A3-36). Data on foraging usage was patchy, though razorbills predominantly appear to be foraging to the east of Lambay Island, resulting in no overlap with the PFI, though notably this dataset was based on only five individuals which may not be representative of the whole colony.

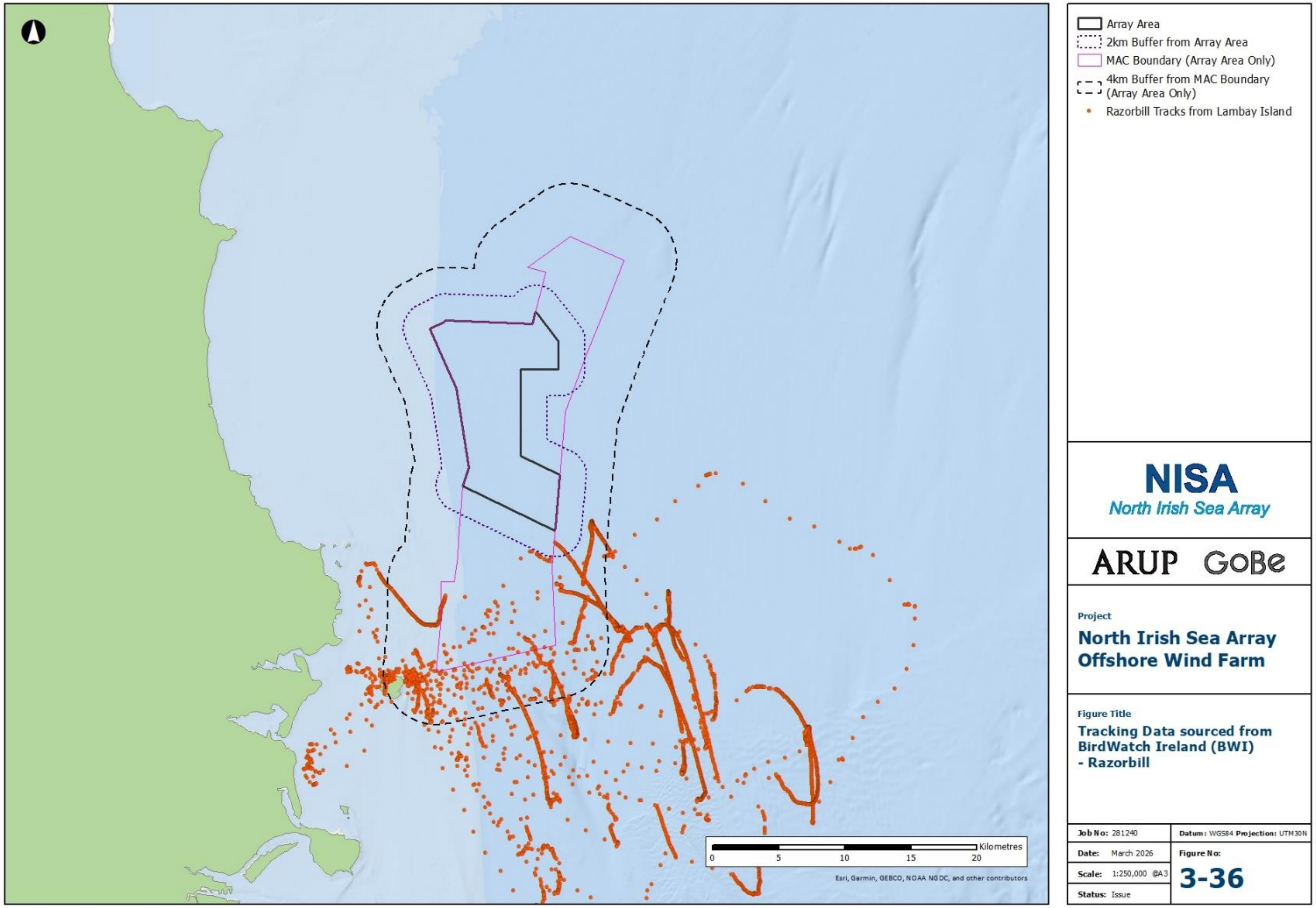

Figure A 3-36: Tracking data sourced from BirdWatch Ireland (BWI) - Razorbill

3.13 Atlantic puffin

General overview

3.13.1 Puffins arrive in Ireland to breed between April to early August (Furness, 2015). Due to difficulty estimating the population of ground nesting species data from the most recent census is not available at this time. Previous surveys from 1998-2002 recorded 19,641 breeding pairs in Ireland (Cummins *et al*., 2019). Breeding colonies in proximity to the proposed development are Lambay Island (estimated 144 individuals, 2015) and Ireland's Eye (127 birds in 2015) (SMP, 2020). During the breeding season, adults may travel widely from their colonies to feed, with a mean maximum foraging range of 137.1 ± 128.3km (Woodward *et al*., 2019).

3.13.2 The species is Red-listed in Ireland, as it has been classified as being Vulnerable by the International Union for Conservation of Nature (IUCN), and because it has been classified as being of global conservation concern by Birdlife International (Gilbert *et al*., 2021).

Abundance and density

3.13.3 Puffin was recorded in the PFI in 9 out of 41 months. Raw counts ranged from 1 (across several months) to 2 (October 2022 and July 2025), with abundance and density peaking at 11 birds and 0.19 birds/km^2 respectively (Table A3-34).

3.13.4 In the PFI plus a 2km buffer, raw counts ranged from 1 (across several months) to 9 (July 2025), with abundance and density peaking at 53 birds and 0.33 birds/km^2 respectively (Table A3-34).

Table A 3-34: Atlantic puffin raw counts, estimated abundance (birds) and estimated density (birds/km^2) in the PFI and PFI plus a 2km buffer (CI values are presented in brackets).

Survey	Raw Count	Abundance Estimate	Density Estimate	Raw Count	Abundance Estimate	Density Estimate
	PFI			PFI plus a 2km buffer		
May, 2020	0	0 (0 – 0)	0	0	0 (0 – 0)	0
June, 2020	0	0 (0 – 0)	0	0	0 (0 – 0)	0
July, 2020	1	4 (1 – 12)	0.07	1	4 (1 – 12)	0.02
August, 2020	0	0 (0 – 0)	0	0	0 (0 – 0)	0
September, 2020	0	0 (0 – 0)	0	0	0 (0 – 0)	0
October, 2020	0	0 (0 – 0)	0	0	0 (0 – 0)	0
November, 2020	0	0 (0 – 0)	0	0	0 (0 – 0)	0
December, 2020	0	0 (0 – 0)	0	0	0 (0 – 0)	0
February, 2021	0	0 (0 – 0)	0	0	0 (0 – 0)	0
March, 2021	0	0 (0 – 0)	0	1	4 (1 – 13)	0.02
April, 2021	0	0 (0 – 0)	0	0	0 (0 – 0)	0
May, 2021	1	4 (1 – 12)	0.07	3	12 (4 – 24)	0.07
June, 2021	1	4 (1 – 12)	0.07	1	4 (1 – 12)	0.02
July, 2021	0	0 (0 – 0)	0	0	0 (0 – 0)	0
August, 2021	0	0 (0 – 0)	0	0	0 (0 – 0)	0
September, 2021	1	4 (1 – 12)	0.07	2	8 (2 – 20)	0.05
October, 2021	0	0 (0 – 0)	0	0	0 (0 – 0)	0
November, 2021	1	4 (1 – 13)	0.07	1	5 (1 – 14)	0.03
December, 2021	0	0 (0 – 0)	0	0	0 (0 – 0)	0
January, 2022	0	0 (0 – 0)	0	0	0 (0 – 0)	0

Survey	Raw Count	Abundance Estimate	Density Estimate	Raw Count	Abundance Estimate	Density Estimate
	PFI			PFI plus a 2km buffer		
February, 2022	0	0 (0 – 0)	0	0	0 (0 – 0)	0
March, 2022	0	0 (0 – 0)	0	0	0 (0 – 0)	0
April, 2022	0	0 (0 – 0)	0	0	0 (0 – 0)	0
May, 2022	0	0 (0 – 0)	0	0	0 (0 – 0)	0
June, 2022	0	0 (0 – 0)	0	0	0 (0 – 0)	0
July, 2022	0	0 (0 – 0)	0	0	0 (0 – 0)	0
August, 2022	1	4 (1 – 11)	0.07	1	4 (1 – 11)	0.02
September, 2022	0	0 (0 – 0)	0	0	0 (0 – 0)	0
October, 2022	2	9 (2 – 25)	0.16	2	8 (2 – 26)	0.05
September, 2024	0	0 (0 – 0)	0	0	0 (0 – 0)	0
October, 2024	0	0 (0 – 0)	0	0	0 (0 – 0)	0
November, 2024	0	0 (0 – 0)	0	0	0 (0 – 0)	0
December, 2024	0	0 (0 – 0)	0	1	6 (1 – 19)	0.04
January, 2025	1	7 (1 – 19)	0.12	1	6 (1 – 19)	0.04
February, 2025	0	0 (0 – 0)	0	0	0 (0 – 0)	0
March, 2025	0	0 (0 – 0)	0	0	0 (0 – 0)	0
April, 2025	0	0 (0 – 0)	0	0	0 (0 – 0)	0
May, 2025	0	0 (0 – 0)	0	0	0 (0 – 0)	0
June, 2025	0	0 (0 – 0)	0	1	6 (1 – 17)	0.04
July, 2025	2	11 (2 – 23)	0.19	9	53 (23 – 87)	0.33
August, 2025	0	0 (0 – 0)	0	8	45 (8 – 123)	0.28

3.13.5 ESAS surveys reported very few birds in the Irish Sea in winter months, and low concentrations off the Irish east coast during the summer (Pollock *et al*., 1997). Evidence shows that puffins disperse across the North Atlantic post-breeding (Harris and Wanless, 2011).

3.13.6 In previous surveys, Percival *et al*. (2002) recorded only 15 Atlantic puffin with a peak count in June. Likewise, in 2010-2011 surveys, 12 puffins were recorded with a peak count of six birds in June (Newton and Trewby, 2011).

3.13.7 The ObSERVE aerial surveys (2016) recorded 26 puffin during the summer in proximity to Ireland's Eye and the Saltee Islands breeding colonies. The majority of observations were in water depths of between 30m and 60m. The estimated total abundance of puffin across the survey area was 229 (95% CIs 169 - 309) individuals during the summer with a density of 0.02 birds/km^2 (Jessopp *et al*., 2018).

Bio-season peak estimates

3.13.8 Puffin were present across both bio-seasons, with highest abundance in the breeding bio-season with a mean peak of 5 birds and a density of 0.08 birds/km^2 in the PFI (Table A3-35).

3.13.9 Within the PFI plus a 2km buffer, Puffin was also present across both bio-seasons, with the highest abundance in the breeding bio-season. There was a mean peak of 17 birds and a density of 0.11 birds/km^2 respectively (Table A3-35).

Table A 3-35: Puffin bio-season mean peak abundance and density estimates in the PFI and PFI plus a 2km buffer using combined DAS datasets.

BDMPS Bio-seasons	Area	Months	Bio-season peak abundance (n)	Bio-season peak density (n/km^2)
Breeding	PFI	Apr–Jul	5	0.08
Non-breeding	PFI	Aug–Mar	4	0.07
Breeding	PFI plus a 2km buffer	Apr–Jul	17	0.11
Non-breeding	PFI plus a 2km buffer	Aug–Mar	14	0.09

North West Irish Sea SPA

3.13.1 DAS data for puffin within the NWIS SPA are presented below in Table A3-36. Puffins were recorded within the NWIS SPA across nine of the 12 survey months. Raw counts ranged from 0 in October and November 2024 to 95 in July 2025 with abundance and density peaking 674 birds and 0.28 birds/km^2 respectively.

Table A 3-36: Atlantic puffin raw counts, estimated abundance (birds) and estimated density (birds/km2) in the NWIS SPA (CI values are presented in brackets).

Survey	Raw Count	Abundance Estimate	Density Estimate
September, 2024	3	22 (3 – 58)	0.01
October, 2024	0	0 (0 – 0)	0
November, 2024	0	0 (0 – 0)	0
December, 2024	19	150 (71 – 236)	0.06
January, 2025	7	55 (8 – 112)	0.02
February, 2025	0	0 (0 – 0)	0
March, 2025	5	39 (5 – 85)	0.02
April, 2025	11	88 (16 – 193)	0.04
May, 2025	18	140 (47 – 249)	0.06
June, 2025	52	367 (205 – 550)	0.15
July, 2025	95	674 (402 – 1,011)	0.28
August, 2025	47	324 (177 – 500)	0.14

3.14 Red-throated diver

RFI Response

3.14.1 Within the RFI, ACP raised several requests relevant to the red-throated diver baseline, including the need to (i) incorporate the HiDef/Gormanstown (2019) dataset, (ii) assess displacement out to at least 10 km from the array, and (iii) ensure adequate survey coverage during the winter period when diver densities are highest.

3.14.2 When reviewing all available datasets to address these requests, a consistent pattern emerges. Red-throated diver densities within the array area are extremely low, with no individuals recorded in any of the 29 months of MAC DAS (2020-2022), and only two individuals recorded within the Projected Footprint of Infrastructure (PFI) during the 12-month NWIS DAS campaign (2024-2025). All datasets: MAC DAS, NWIS DAS, ObSERVE (2018) and HiDef (2019), show the same spatial pattern; the majority of divers occur close to the coast, particularly north of the SPA, with densities declining markedly with distance offshore. This is consistent with published evidence that diver numbers decrease with increasing water depth and distance from inshore feeding areas.

3.14.3 The 12-month NWIS DAS programme provides the most spatially comprehensive, high-resolution dataset available for the assessment, with >16% coverage of the SPA and >18% coverage within the 10 km displacement assessment buffer. Given this extensive coverage and the consistently low diver usage within and around the array, the Developer considers the NWIS DAS dataset sufficient to characterise baseline diver distribution without requiring additional targeted winter surveys. Older datasets (MAC DAS, ObSERVE, HiDef) remain valuable for contextual comparison but are not considered appropriate for quantitative assessment due to their limited or incomplete spatial coverage.

3.14.4 Based on the combined evidence, the NWIS DAS dataset represents the most robust and proportionate basis for assessing potential displacement of red-throated diver within both the array +10 km buffer and the ECC +2 km buffer. Other datasets may be used qualitatively to support interpretation, but the quantitative baseline and subsequent impact assessment will draw primarily on the NWIS DAS, which provides the clearest and most up-to-date representation of diver distribution in the Northwest Irish Sea.

3.14.5 There is a very small population (nine pairs) of breeding red-throated diver in Ireland (Burke *et al*., 2020). However, the majority visit the Irish coast from Scotland, Iceland and Scandinavia over the winter months during the non-breeding season. Generally, the highest density of red-throat divers are found off the south-west coast (Balmer *et al.,* 2013).

3.14.6 Red-throated diver is Amber-listed in Ireland due to the breeding population being less than 100 pairs and because the non-breeding population has declined (between 25% to 49%) between 1994 and 2015/16. Additionally, red-throated diver is listed on Annex 1 of the EC Birds Directive and has an unfavourable conservation status in the Europe (Gilbert *et al.*, 2021).

Abundance and density

3.14.7 Red-throated diver in the PFI were recorded twice, with one individual in August and December 2024. The peak estimated abundance and density were 7 birds and 0.12 birds/km^2 respectively (Table A3-37).

3.14.8 In the PFI plus a 2km buffer, red-throated diver was recorded twice, with one individual in August and December 2024. Abundance and density peaks were 7 birds and 0.04 birds/km^2 respectively (Table A3-37).

3.14.9 In the PFI plus a 4km buffer, red-throated diver was recorded five times, with one individual in August 2020, October 2024, November 2024, December 2024 and April 2025. Abundance and density peaks were 14 birds and 0.05 birds/km^2 respectively (Table A3-38).

3.14.10 In the PFI plus a 10km buffer, red-throated diver was recorded in 8 out of 12 surveys, with a range of 1 (May 2025) to 31 (October 2024). Abundance and density peaks were 170 birds and 0.22 birds/km^2 respectively (Table A3-38).

Table A 3-37: Red-throated diver raw counts, estimated abundance (birds) and estimated density (birds/km^2) in the PFI and PFI plus a 2km buffer (CI values are presented in brackets).

Survey	PFI			PFI plus a 2km buffer		
	Raw Count	Abundance Estimate	Density Estimate	Raw Count	Abundance Estimate	Density Estimate
May, 2020	0	0 (0 – 0)	0	0	0 (0 – 0)	0
June, 2020	0	0 (0 – 0)	0	0	0 (0 – 0)	0
July, 2020	0	0 (0 – 0)	0	0	0 (0 – 0)	0
August, 2020	0	0 (0 – 0)	0	0	0 (0 – 0)	0
September, 2020	0	0 (0 – 0)	0	0	0 (0 – 0)	0
October, 2020	0	0 (0 – 0)	0	0	0 (0 – 0)	0
November, 2020	0	0 (0 – 0)	0	0	0 (0 – 0)	0
December, 2020	0	0 (0 – 0)	0	0	0 (0 – 0)	0
February, 2021	0	0 (0 – 0)	0	0	0 (0 – 0)	0
March, 2021	0	0 (0 – 0)	0	0	0 (0 – 0)	0
April, 2021	0	0 (0 – 0)	0	0	0 (0 – 0)	0
May, 2021	0	0 (0 – 0)	0	0	0 (0 – 0)	0
June, 2021	0	0 (0 – 0)	0	0	0 (0 – 0)	0
July, 2021	0	0 (0 – 0)	0	0	0 (0 – 0)	0
August, 2021	0	0 (0 – 0)	0	0	0 (0 – 0)	0
September, 2021	0	0 (0 – 0)	0	0	0 (0 – 0)	0
October, 2021	0	0 (0 – 0)	0	0	0 (0 – 0)	0
November, 2021	0	0 (0 – 0)	0	0	0 (0 – 0)	0
December, 2021	0	0 (0 – 0)	0	0	0 (0 – 0)	0
January, 2022	0	0 (0 – 0)	0	0	0 (0 – 0)	0
February, 2022	0	0 (0 – 0)	0	0	0 (0 – 0)	0

Survey	Raw Count	Abundance Estimate PFI	Density Estimate	Raw Count	Abundance Estimate PFI plus a 2km buffer	Density Estimate
March, 2022	0	0 (0 – 0)	0	0	0 (0 – 0)	0
April, 2022	0	0 (0 – 0)	0	0	0 (0 – 0)	0
May, 2022	0	0 (0 – 0)	0	0	0 (0 – 0)	0
June, 2022	0	0 (0 – 0)	0	0	0 (0 – 0)	0
July, 2022	0	0 (0 – 0)	0	0	0 (0 – 0)	0
August, 2022	0	0 (0 – 0)	0	0	0 (0 – 0)	0
September, 2022	0	0 (0 – 0)	0	0	0 (0 – 0)	0
October, 2022	0	0 (0 – 0)	0	0	0 (0 – 0)	0
September, 2024	0	0 (0 – 0)	0	0	0 (0 – 0)	0
October, 2024	0	0 (0 – 0)	0	0	0 (0 – 0)	0
November, 2024	1	6 (1 – 19)	0.10	1	7 (1 – 19)	0.04
December, 2024	1	7 (1 – 20)	0.12	1	7 (1 – 21)	0.04
January, 2025	0	0 (0 – 0)	0	0	0 (0 – 0)	0
February, 2025	0	0 (0 – 0)	0	0	0 (0 – 0)	0
March, 2025	0	0 (0 – 0)	0	0	0 (0 – 0)	0
April, 2025	0	0 (0 – 0)	0	0	0 (0 – 0)	0
May, 2025	0	0 (0 – 0)	0	0	0 (0 – 0)	0
June, 2025	0	0 (0 – 0)	0	0	0 (0 – 0)	0
July, 2025	0	0 (0 – 0)	0	0	0 (0 – 0)	0
August, 2025	0	0 (0 – 0)	0	0	0 (0 – 0)	0

Table A 3-38: Red-throated diver raw counts, estimated abundance and estimated density in the PFI plus a 4km buffer and PFI plus a 10km buffer (CI values are presented in brackets).

Survey	Raw Count	Abundance Estimate	Density Estimate	Raw Count	Abundance Estimate	Density Estimate
	PFI plus a 4km buffer			PFI plus a 10km buffer		
May, 2020	0	0 (0 – 0)	0	-	-	-
June, 2020	0	0 (0 – 0)	0	-	-	-
July, 2020	0	0 (0 – 0)	0	-	-	-
August, 2020	1	4 (1 – 10)	0.01	-	-	-
September, 2020	0	0 (0 – 0)	0	-	-	-
October, 2020	0	0 (0 – 0)	0	-	-	-
November, 2020	0	0 (0 – 0)	0	-	-	-
December, 2020	0	0 (0 – 0)	0	-	-	-
February, 2021	0	0 (0 – 0)	0	-	-	-
March, 2021	0	0 (0 – 0)	0	-	-	-
April, 2021	0	0 (0 – 0)	0	-	-	-
May, 2021	0	0 (0 – 0)	0	-	-	-
June, 2021	0	0 (0 – 0)	0	-	-	-
July, 2021	0	0 (0 – 0)	0	-	-	-
August, 2021	0	0 (0 – 0)	0	-	-	-
September, 2021	0	0 (0 – 0)	0	-	-	-
October, 2021	0	0 (0 – 0)	0	-	-	-
November, 2021	0	0 (0 – 0)	0	-	-	-
December, 2021	0	0 (0 – 0)	0	-	-	-
January, 2022	0	0 (0 – 0)	0	-	-	-

Survey	Raw Count	Abundance Estimate	Density Estimate	Raw Count	Abundance Estimate	Density Estimate
	PFI plus a 4km buffer			PFI plus a 10km buffer		
February, 2022	0	0 (0 – 0)	0	-	-	-
March, 2022	0	0 (0 – 0)	0	-	-	-
April, 2022	0	0 (0 – 0)	0	-	-	-
May, 2022	0	0 (0 – 0)	0	-	-	-
June, 2022	0	0 (0 – 0)	0	-	-	-
July, 2022	0	0 (0 – 0)	0	-	-	-
August, 2022	0	0 (0 – 0)	0	-	-	-
September, 2022	0	0 (0 – 0)	0	-	-	-
October, 2022	0	0 (0 – 0)	0	-	-	-
September, 2024	0	0 (0 – 0)	0	0	0 (0 – 0)	0
October, 2024	1	5 (1 – 15)	0.02	31	170 (66 – 290)	0.22
November, 2024	1	7 (1 – 20)	0.03	18	122 (34 – 224)	0.16
December, 2024	1	14 (1 – 35)	0.05	6	52 (15 – 91)	0.07
January, 2025	0	0 (0 – 0)	0	13	99 (23 – 189)	0.13
February, 2025	0	0 (0 – 0)	0	19	117 (43 – 207)	0.15
March, 2025	0	0 (0 – 0)	0	12	65 (22 – 115)	0.08
April, 2025	1	5 (1 – 15)	0.02	7	39 (11 – 73)	0.05
May, 2025	0	0 (0 – 0)	0	1	6 (1 – 17)	0.01
June, 2025	0	0 (0 – 0)	0	0	0 (0 – 0)	0
July, 2025	0	0 (0 – 0)	0	0	0 (0 – 0)	0
August, 2025	0	0 (0 – 0)	0	0	0 (0 – 0)	0

3.14.11 ESAS surveys reported very few birds in the Irish Sea during the winter months (September to March), however coverage of coastal areas during the surveys was fairly limited (Pollock *et al.*, 1997). Evidence shows that puffins disperse across the North Atlantic post-breeding (Harris and Wanless, 2011).

3.14.12 In previous surveys, Percival *et al*. (2002) only recorded five red-throated diver and Newton and Trewby (2011) recorded 29 red-throated diver in 2010-2011 surveys, with a peak count of 22 birds in March.

3.14.13 The ObSERVE aerial surveys (2016) recorded 1,135 divers during the autumn and winter. It was assumed that most of these divers were either red-throated diver or great-northern diver. Sightings were concentrated in the shallower coastal waters (5-20m depth) of the Irish Sea. The mean density of divers across all surveys during the summer was 0.01 birds/km^2, 0.97 birds/km^2 in autumn, and 0.32 birds/km^2 in winter (Jessopp *et al.*, 2018). The mean peak densities per bio-season in the ECC plus a 4km buffer can be found in Table A2-7.

Bio-season peak estimates

3.14.14 Red-throated diver were present across the autumn migration, migration-free winter and non-breeding bio-seasons, with a mean peak in the migration-free winter bio-season of 2 birds individuals and a mean peak density of 0.04 birds/km^2 in the PFI (Table A3-39).

3.14.15 Within the PFI plus a 2km buffer, red-throated diver was present across the autumn migration, migration free winter and non-breeding bio-seasons. Peak mean abundance and density was the same across all bio-seasons, estimated at 2 birds and 0.01 bird/km^2 respectively (Table A3-39).

3.14.16 Within the PFI plus a 4km buffer, red-throated diver was present across all bio-seasons excluding spring migration. Peak mean abundance and density was predicted in the migration-free winter bio-season, with estimates of 5 birds and 0.02 birds/km^2 respectively (Table A3-39).

3.14.17 Within the PFI plus a 10km, red-throated diver was present across all bio-seasons. Peak mean abundance and density was predicted in the autumn migration and non-breeding bio-seasons, with estimates of 170 birds and 0.22 birds/km^2 respectively (Table A3-39).

Table A 3-39: Red-throated diver bio-season mean peak abundance and density estimates in the PFI and PFI plus 2km, 4km and 10km buffers using combined DAS datasets.

BDMPS Bio-seasons	Area	Months	Bio-season peak abundance (n)	Bio-season peak density (n/km^2)
Autumn migration	PFI	Sep–Nov	2	0.03
Breeding	PFI	Mar–Aug	-	-
Migration-free winter	PFI	Dec–Jan	2	0.04
Non-breeding	PFI	Sep–Apr	2	0.03
Spring migration	PFI	Feb–Apr	-	-
Autumn migration	PFI plus a 2km buffer	Sep–Nov	2	0.01
Breeding	PFI plus a 2km buffer	Mar–Aug	-	-
Migration-free winter	PFI plus a 2km buffer	Dec–Jan	2	0.01
Non-breeding	PFI plus a 2km buffer	Sep–Apr	2	0.01
Spring migration	PFI plus a 2km buffer	Feb–Apr	-	-
Autumn migration	PFI plus a 4km buffer	Sep–Nov	2	0.01
Breeding	PFI plus a 4km buffer	Mar–Aug	2	0.01
Migration-free winter	PFI plus a 4km buffer	Dec–Jan	5	0.02
Non-breeding	PFI plus a 4km buffer	Sep–Apr	4	0.01
Spring migration	PFI plus a 4km buffer	Feb–Apr	0	-
Autumn migration	PFI plus a 10km buffer	Sep–Nov	170	0.22
Breeding	PFI plus a 10km buffer	Mar–Aug	65	0.09
Migration-free winter	PFI plus a 10km buffer	Dec–Jan	99	0.13
Non-breeding	PFI plus a 10km buffer	Sep–Apr	170	0.22
Spring migration	PFI plus a 10km buffer	Feb–Apr	117	0.15

3.14.18 DAS data for red-throated diver within the NWIS SPA are presented below in Table A3-40. Red-throated divers were recorded within the NWIS SPA across nine of the 12 survey months. Raw counts ranged from 0 in July to August 2025 to 232 in November 2024 with abundance and density peaking 1,512 birds and 0.63 birds/km^2 respectively.

Table A 3-40: Red-throated diver raw counts, estimated abundance (birds) and estimated density (birds/km^2) in the NWIS SPA (CI values are presented in brackets).

Survey	Raw Count	Abundance Estimate	Density Estimate
September, 2024	102	610 (186 – 1,130)	0.26
October, 2024	188	1,136 (397 – 2,015)	0.48
November, 2024	232	1,512 (832 – 2,272)	0.63
December, 2024	134	1,162 (596 – 1,867)	0.49
January, 2025	150	1,377 (734 – 2,101)	0.58
February, 2025	121	783 (459 – 1,152)	0.33
March, 2025	131	799 (355 – 1,341)	0.33
April, 2025	133	846 (311 – 1,622)	0.35
May, 2025	19	133 (27 – 266)	0.06
June, 2025	0	0 (0 – 0)	0
July, 2025	0	0 (0 – 0)	0
August, 2025	0	0 (0 – 0)	0

3.15 Northern fulmar

General overview

3.15.1 In Ireland, fulmar have a stable or increasing breeding population estimated at 32,899 pairs (Cummins *et al.*, 2019). They are amber listed in Ireland.

3.15.2 Fulmar breed between January and August but the "migration free" period is considered between April and August (Furness, 2015). They have an extensive foraging range of 542.3 ± 657.9 km during the breeding season.

Abundance and density

3.15.3 Fulmar was recorded in the PFI in 5 out of 41 months. A single fulmar was observed, across several surveys, with abundance and density peaking at 6 birds and 0.10 birds/km^2 respectively (Table A3-41).

3.15.4 In the PFI plus a 2km buffer, raw counts ranged from 1 (across several months) to 3 (across three months), with abundance and density peaking at 15 birds and 0.09 birds/km^2 respectively (Table A3-41).

Table A 3-41: Northern fulmar raw counts, estimated abundance (birds) and estimated density (birds/km^2) in the PFI and PFI plus a 2km buffer (CI values are presented in brackets).

Survey	Raw Count	Abundance Estimate	Density Estimate	Raw Count	Abundance Estimate	Density Estimate
	PFI			PFI plus a 2km buffer		
May, 2020	0	0 (0 – 0)	0	0	0 (0 – 0)	0
June, 2020	0	0 (0 – 0)	0	1	3 (1 – 10)	0.02
July, 2020	0	0 (0 – 0)	0	1	3 (1 – 10)	0.02
August, 2020	0	0 (0 – 0)	0	0	0 (0 – 0)	0
September, 2020	0	0 (0 – 0)	0	1	3 (1 – 10)	0.02
October, 2020	0	0 (0 – 0)	0	0	0 (0 – 0)	0
November, 2020	1	6 (1 – 16)	0.10	1	5 (1 – 15)	0.03
December, 2020	0	0 (0 – 0)	0	0	0 (0 – 0)	0
February, 2021	1	3 (1 – 10)	0.05	2	7 (2 – 17)	0.04
March, 2021	0	0 (0 – 0)	0	0	0 (0 – 0)	0
April, 2021	0	0 (0 – 0)	0	0	0 (0 – 0)	0
May, 2021	0	0 (0 – 0)	0	0	0 (0 – 0)	0
June, 2021	0	0 (0 – 0)	0	0	0 (0 – 0)	0
July, 2021	0	0 (0 – 0)	0	0	0 (0 – 0)	0

Survey	Raw Count	Abundance Estimate	Density Estimate	Raw Count	Abundance Estimate	Density Estimate
	PFI			PFI plus a 2km buffer		
August, 2021	0	0 (0 – 0)	0	1	3 (1 – 10)	0.02
September, 2021	1	3 (1 – 10)	0.05	3	10 (3 – 20)	0.06
October, 2021	0	0 (0 – 0)	0	0	0 (0 – 0)	0
November, 2021	0	0 (0 – 0)	0	1	3 (1 – 10)	0.02
December, 2021	0	0 (0 – 0)	0	0	0 (0 – 0)	0
January, 2022	0	0 (0 – 0)	0	0	0 (0 – 0)	0
February, 2022	0	0 (0 – 0)	0	0	0 (0 – 0)	0
March, 2022	0	0 (0 – 0)	0	0	0 (0 – 0)	0
April, 2022	0	0 (0 – 0)	0	0	0 (0 – 0)	0
May, 2022	0	0 (0 – 0)	0	0	0 (0 – 0)	0
June, 2022	0	0 (0 – 0)	0	0	0 (0 – 0)	0
July, 2022	0	0 (0 – 0)	0	0	0 (0 – 0)	0
August, 2022	0	0 (0 – 0)	0	0	0 (0 – 0)	0
September, 2022	0	0 (0 – 0)	0	0	0 (0 – 0)	0
October, 2022	0	0 (0 – 0)	0	0	0 (0 – 0)	0
September, 2024	0	0 (0 – 0)	0	3	15 (3 – 35)	0.09

Survey	Raw Count	Abundance Estimate	Density Estimate	Raw Count	Abundance Estimate	Density Estimate
	PFI			PFI plus a 2km buffer		
October, 2024	1	5 (1 – 15)	0.09	2	10 (2 – 20)	0.06
November, 2024	0	0 (0 – 0)	0	0	0 (0 – 0)	0
December, 2024	0	0 (0 – 0)	0	0	0 (0 – 0)	0
January, 2025	0	0 (0 – 0)	0	1	5 (1 – 15)	0.03
February, 2025	0	0 (0 – 0)	0	0	0 (0 – 0)	0
March, 2025	0	0 (0 – 0)	0	0	0 (0 – 0)	0
April, 2025	0	0 (0 – 0)	0	3	14 (3 – 34)	0.09
May, 2025	0	0 (0 – 0)	0	0	0 (0 – 0)	0
June, 2025	0	0 (0 – 0)	0	0	0 (0 – 0)	0
July, 2025	1	5 (1 – 14)	0.09	2	10 (2 – 20)	0.06
August, 2025	0	0 (0 – 0)	0	2	10 (2 – 30)	0.06

Bio-season peak estimates

3.15.5 Fulmar were present across all bio-seasons, which exhibited coincident abundance and density peaks of 2 individuals and 0.03 birds/km^2 in the PFI (Table A3-42).

3.15.6 Within the PFI plus a 2km buffer, Fulmar was present across all bio-seasons, with highest values being estimated in the Autumn migration. Peak abundance and density estimates were 7 birds and 0.04 birds/km^2 respectively (Table A3-42).

Table A 3-42: Fulmar bio-season mean peak abundance and density estimates in the PFI and PFI plus a 2km buffer.

BDMPS Bio-seasons	Area	Dataset	Months	Bio-season peak abundance (n)	Bio-season peak density (n/km^2)
Autumn migration	PFI	Combined	Sep–Oct	2	0.03
Breeding	PFI	Combined	Jan–Aug	2	0.03
Migration-free winter	PFI	Combined	Nov–Dec	2	0.03
Autumn migration	PFI plus a 2km buffer	Combined	Sep–Oct	7	0.04
Breeding	PFI plus a 2km buffer	Combined	Jan–Aug	6	0.04
Migration-free winter	PFI plus a 2km buffer	Combined	Nov–Dec	3	0.02

North West Irish Sea SPA

3.15.7 DAS data for fulmar within the NWIS SPA are presented below in Table A3-43 Fulmars were recorded within the NWIS SPA across all of the 12 survey months. Raw counts ranged from 6 in May 2025 to 306 in September 2024 with abundance and density peaking 1,846 birds and 0.77 birds/km^2 respectively.

Table A 3-43: Northern fulmar raw counts, estimated abundance (birds) and estimated density (birds/km2) in the NWIS SPA (CI values are presented in brackets).

Survey	Raw Count	Abundance Estimate	Density Estimate
September, 2024	306	1,846 (1,268 – 2,463)	0.77
October, 2024	90	535 (362 – 712)	0.22
November, 2024	16	81 (35 – 141)	0.03
December, 2024	27	161 (90 – 240)	0.07
January, 2025	84	506 (275 – 778)	0.21
February, 2025	10	60 (24 – 108)	0.03
March, 2025	28	168 (96 – 247)	0.07
April, 2025	16	105 (52 – 168)	0.04
May, 2025	6	39 (13 – 72)	0.02
June, 2025	24	143 (78 – 221)	0.06
July, 2025	77	457 (168 – 904)	0.19
August, 2025	169	1,015 (638 – 1,413)	0.43

3.16 Manx shearwater

General overview

3.16.1 Irish waters are extremely important for Manx shearwater that breed at a small number of large colonies in the Irish sea and off the west-coast of the UK. Due to difficulty estimating the population of ground nesting species, such as shearwater, data from the most recent census is not available at this time. However, the previous count estimated the Irish population was 32,545 between 1998 and 2002 (Cummins *et al*., 2019). Manx shearwater are Amber-listed in Ireland because their numbers have declined by up to 69% (35% to 69%) between 1968 and 2011 (Gilbert *et al*., 2021).

3.16.2 Manx shearwater breed between April and August but are completely migration free during June and July because some birds are still returning to colonies during April and May and leave the colonies in August (Furness, 2015). The mean-maximum foraging range during the breeding season is extensive (1,346.8 ± 1,018.7km) as birds range widely to feed (Woodward *et al*., 2019). However, the foraging range during chick rearing is considerably reduced (136.1 ± 88.7km) (Woodward *et al*., 2019).

3.16.3 Autumn migration season, Manx shearwaters from Ireland and the UK winter in the South Atlantic, primarily off the coast of Brazil (Wernham *et al*., 2002).

3.16.4 The nearest breeding colony to proposed development is on Lambay Island (estimated 25 pairs in 2002) (Newton, 2002), Other colonies that are within foraging range of the study area, include the Copeland Islands (4,850 pairs, 2007), Bardsey Island, Wales (16,183 pairs, 2001), Isle of Man (424 pairs, 2014), and Skomer, Midland Island and Skokholm, Wales (455,156 pairs, 2011) (SMP, 2021).

Abundance and density

3.16.5 Manx shearwater was recorded in the PFI in 18 out of 41 months. Raw counts ranged from 1 (across several months) to 743 (August 2022), with abundance and density peaking at 5,114 birds and 88.70 birds/km^2 respectively (Table A3-44).

3.16.6 In the PFI plus a 2km buffer, raw counts ranged from 1 (across several months) to 1,309 (July 2025), with abundance and density peaking at 9,176 birds and 57.29 birds/km^2 respectively (Table A3-44).

Table A 3-44: Manx shearwater raw counts, estimated abundance (birds) and estimated density (birds/km^2) in the PFI and PFI plus a 2km buffer (CI values are presented in brackets).

Survey	Raw Count	Abundance Estimate	Density Estimate	Raw Count	Abundance Estimate	Density Estimate
			PFI		PFI plus a a 2km buffer	
May, 2020	0	0 (0 – 0)	0	2	8 (2 – 20)	0.05
June, 2020	1	3 (1 – 10)	0.05	1	3 (1 – 10)	0.02
July, 2020	39	133 (39 – 338)	2.31	422	1,432 (531 – 2,613)	8.94
August, 2020	208	697 (208 – 1,281)	12.09	402	1,391 (705 – 2,182)	8.68
September, 2020	39	126 (39 – 220)	2.19	82	276 (144 – 413)	1.72
October, 2020	0	0 (0 – 0)	0	0	0 (0 – 0)	0
November, 2020	0	0 (0 – 0)	0	0	0 (0 – 0)	0
December, 2020	0	0 (0 – 0)	0	0	0 (0 – 0)	0
February, 2021	0	0 (0 – 0)	0	0	0 (0 – 0)	0
March, 2021	0	0 (0 – 0)	0	0	0 (0 – 0)	0
April, 2021	0	0 (0 – 0)	0	1	3 (1 – 10)	0.02
May, 2021	8	27 (8 – 70)	0.47	65	214 (65 – 468)	1.34
June, 2021	1	3 (1 – 10)	0.05	4	13 (4 – 34)	0.08
July, 2021	116	387 (116 – 1,108)	6.71	142	497 (142 – 1,270)	3.1
August, 2021	232	1,019 (260 – 1,957)	17.67	446	1,847 (666 – 3,202)	11.53

Survey	Raw Count	Abundance Estimate	Density Estimate	Raw Count	Abundance Estimate	Density Estimate
			PFI		PFI plus a a 2km buffer	
September, 2021	25	85 (25 – 218)	1.47	117	476 (142 – 969)	2.97
October, 2021	0	0 (0 – 0)	0	0	3 (0 – 10)	0.02
November, 2021	0	0 (0 – 0)	0	0	0 (0 – 0)	0
December, 2021	0	0 (0 – 0)	0	0	0 (0 – 0)	0
January, 2022	0	0 (0 – 0)	0	0	0 (0 – 0)	0
February, 2022	0	0 (0 – 0)	0	0	0 (0 – 0)	0
March, 2022	0	0 (0 – 0)	0	0	0 (0 – 0)	0
April, 2022	0	0 (0 – 0)	0	1	3 (1 – 10)	0.02
May, 2022	0	0 (0 – 0)	0	3	10 (3 – 24)	0.06
June, 2022	18	88 (18 – 191)	1.53	67	275 (74 – 572)	1.72
July, 2022	124	401 (124 – 871)	6.96	241	852 (311 – 1,505)	5.32
August, 2022	358	1,338 (840 – 1,795)	23.21	938	3,446 (1,981 – 4,995)	21.51
September, 2022	78	412 (138 – 739)	7.15	215	1,047 (552 – 1,548)	6.54
October, 2022	1	3 (1 – 10)	0.05	7	24 (7 – 54)	0.15
September, 2024	0	0 (0 – 0)	0	7	33 (7 – 105)	0.21
October, 2024	0	0 (0 – 0)	0	0	0 (0 – 0)	0

Survey	Raw Count	Abundance Estimate	Density Estimate	Raw Count	Abundance Estimate	Density Estimate
	PFI			PFI plus a a 2km buffer		
November, 2024	0	0 (0 – 0)	0	0	0 (0 – 0)	0
December, 2024	0	0 (0 – 0)	0	0	0 (0 – 0)	0
January, 2025	0	0 (0 – 0)	0	0	0 (0 – 0)	0
February, 2025	0	0 (0 – 0)	0	0	0 (0 – 0)	0
March, 2025	0	0 (0 – 0)	0	0	0 (0 – 0)	0
April, 2025	1	5 (1 – 14)	0.09	2	10 (2 – 25)	0.06
May, 2025	0	0 (0 – 0)	0	3	15 (3 – 46)	0.09
June, 2025	479	2,834 (479 – 6,855)	49.16	506	3,078 (506 – 7,185)	19.22
July, 2025	743	5,114 (1,516 – 9,331)	88.70	1,309	9,176 (5,480 – 12,949)	57.29
August, 2025	119	846 (258 – 1,580)	14.67	685	4,533 (1,508 – 9,019)	28.3

3.16.7 ESAS surveys recorded very few Max shearwater between September and March, low densities between March and June and the highest densities (>10 birds/km2), between July and September (Pollock *et al.*, 1997).

3.16.8 In previous surveys, Percival *et al*. (2002) recorded Manx shearwaters between March and September, with an estimated peak of 3,764 birds in early August 2002. Likewise, in 2010-2011 surveys, peak count of 4,513 birds were recorded in mid-August (Newton and Trewby, 2011).

3.16.9 ObSERVE 2016 aerial surveys recorded a total of 4,736 individuals predominantly during the breeding season. Birds were generally recorded at least four km from shore, and showed a clear preference for deeper waters in the survey area. The abundance of Manx shearwaters across the survey area was estimated at 30,928 (95% CIs 26,815 – 35,671) individuals in summer, 10,566 (95% CIs 5,462 – 20,441) in autumn, and 114 (95% CIs 47-278) in winter (Jessopp *et al.*, 2018).

Bio-season peak estimates

3.16.10 Manx shearwater was present across the breeding and autumn migration bio-seasons only, with highest abundance in the breeding bio-season. A mean peak of 2,042 birds and a density of 35.42 birds/km^2 was estimated in the PFI (Table A3-45).

3.16.11 Within the PFI plus a 2km buffer, Manx shearwater was present across the breeding and autumn migration bio-seasons only, with highest abundance in the breeding bio-season. A mean peak abundance of 3,975 birds and density of 24.82 birds/km^2 (Table A3-45).

Table A 3-45: Manx shearwater bio-season mean peak abundance and density estimates in the PFI and PFI plus a 2km buffer using combined DAS datasets.

BDMPS Bio-seasons	Area	Months	Bio-season peak abundance (n)	Bio-season peak density (n/km^2)
Autumn migration	PFI	Sep-Oct	156	2.70
Breeding	PFI	Apr-Aug	2,042	35.42
Spring migration	PFI	Mar-Mar	-	-
Autumn migration	PFI plus a 2km buffer	Sep-Oct	458	2.86
Breeding	PFI plus a 2km buffer	Apr-Aug	3,975	24.82
Spring migration	PFI plus a 2km buffer	Mar-Mar	-	-

3.16.12 Manx shearwaters were found throughout the survey area in the breeding and autumn migration bio-seasons. During the breeding bio-seasons, the highest density of birds was found towards the north and north-east of the survey area. During the autumn migration bio-season, densities were highest in the north and the west of the survey area.

3.16.13 Data from Jessop *et al*. (2018) similarly found birds to be present almost exclusively in the breeding and autumn migration bio-seasons, with higher densities in the breeding season, though no clear pattern in density was evident.

3.16.14 The majority of flying birds recorded during the DAS surveys were recorded during the summer months. In July 2021 and 2022 the predominant direction of flight was southeast and south (Figure A3-37), while in August 2020, May 2021 and June 2022 the majority of flights were in a north easterly or easterly direction (Figure A3-37). In August 2022 the majority of flights were recorded flying in a westerly or north-westerly direction (Figure A3-37). All other months had minimal numbers of birds recorded flying.

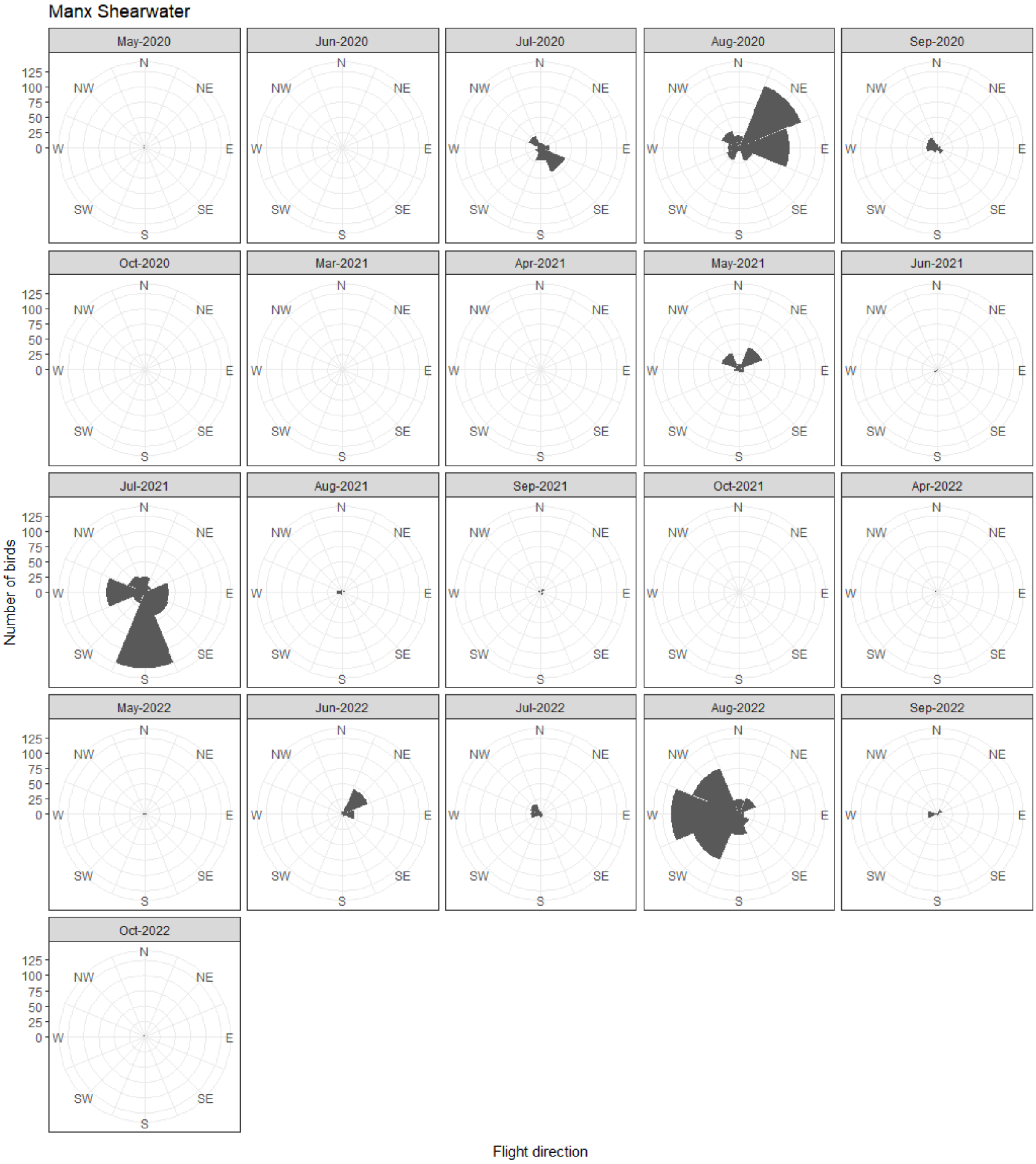

Figure A 3-37: Manx shearwater monthly flight directions in the ornithology study area (using baseline 29-month DAS data).

3.16.1 DAS data for Manx shearwater within the NWIS SPA are presented below in Table A3-46. Manx shearwater were recorded within the NWIS SPA across eight of the 12 survey months. Raw counts ranged from 0 in December 2024 to March 2025 to 5,548 in August 2025 with abundance and density peaking 49,312 birds and 20.67 birds/km^2 respectively.

Table A 3-46: Manx shearwater raw counts, estimated abundance (birds) and estimated density (birds/km2) in the NWIS SPA (CI values are presented in brackets).

Survey	Raw Count	Abundance Estimate	Density Estimate
September, 2024	36	217 (60 – 421)	0.09
October, 2024	9	55 (18 – 102)	0.02
November, 2024	1	5 (1 – 15)	0
December, 2024	0	0 (0 – 0)	0
January, 2025	0	0 (0 – 0)	0
February, 2025	0	0 (0 – 0)	0
March, 2025	0	0 (0 – 0)	0
April, 2025	70	471 (233 – 732)	0.2
May, 2025	97	630 (178 – 1,218)	0.26
June, 2025	2,225	15,624 (8,654 – 23,487)	6.55
July, 2025	5,457	46,154 (32,416 – 60,994)	19.35
August, 2025	5,548	49,312 (29,768 – 69,772)	20.67

3.17 Northern gannet

General overview

3.17.1 The population of gannet in Irish waters is estimated at 47,946 pairs during 2013 and 2014. The population has increased by 30% since 2004 with the majority breeding at Little Skellig, off Kerry on the west coast. The two colonies closest to the proposed development are Lambay Island (926 pairs) and Ireland's Eye (547 pairs). The species is Amber-listed in Ireland, as 50% or more of the Irish breeding population is found at 10 breeding colonies or less (Gilbert *et al*., 2021).

3.17.2 Gannets breed between March to September, but the "migration free" breeding season is April to August (Furness, 2015). Their mean-maximum foraging range during the breeding season is 315.2 ± 194.2km (Woodward *et al*., 2019).

Abundance and density

3.17.3 Gannet was recorded in the PFI in 29 out of 41 months. Raw counts ranged from 1 (across several months) to 74 (July 2025), with abundance and density estimates peaking at 358 birds and 6.21 birds/km^2 respectively (Table A3-47).

3.17.4 In the PFI plus a 2km buffer, raw counts ranged from 1 (across several months) to 120 (September 2020), with abundance and density estimates peaking at 604 birds and 3.77 birds/km^2 respectively (Table A3-47).

Table A 3-47: Northern gannet raw counts, estimated abundance (birds) and estimated density (birds/km^2) in the PFI and PFI plus a 2km buffer (CI values are presented in brackets).

Survey	Raw Count	Abundance Estimate	Density Estimate	Raw Count	Abundance Estimate	Density Estimate
	PFI			PFI plus a a 2km buffer		
May, 2020	3	12 (3 – 28)	0.21	7	28 (8 – 53)	0.17
June, 2020	2	6 (2 – 20)	0.10	6	20 (6 – 37)	0.12
July, 2020	12	41 (17 – 67)	0.71	63	208 (68 – 457)	1.30
August, 2020	2	7 (2 – 17)	0.12	7	24 (7 – 45)	0.15
September, 2020	30	100 (53 – 148)	1.73	84	285 (192 – 376)	1.78
October, 2020	9	30 (9 – 71)	0.52	32	110 (32 – 199)	0.69
November, 2020	0	0 (0 – 0)	0	1	5 (1 – 15)	0.03
December, 2020	0	0 (0 – 0)	0	1	3 (1 – 10)	0.02
February, 2021	2	7 (2 – 17)	0.12	4	13 (4 – 27)	0.08
March, 2021	0	0 (0 – 0)	0	0	0 (0 – 0)	0
April, 2021	0	0 (0 – 0)	0	3	10 (3 – 27)	0.06
May, 2021	1	3 (1 – 10)	0.05	4	14 (4 – 30)	0.09
June, 2021	2	7 (2 – 17)	0.12	5	17 (7 – 30)	0.11
July, 2021	4	13 (4 – 23)	0.23	7	24 (10 – 41)	0.15
August, 2021	8	26 (8 – 58)	0.45	19	64 (33 – 96)	0.4
September, 2021	29	97 (54 – 141)	1.68	40	135 (71 – 207)	0.84
October, 2021	13	43 (13 – 99)	0.75	44	148 (78 – 233)	0.92
November, 2021	1	3 (1 – 10)	0.05	4	14 (4 – 31)	0.09
December, 2021	0	0 (0 – 0)	0	1	3 (1 – 11)	0.02
January, 2022	1	3 (1 – 10)	0.05	1	3 (1 – 10)	0.02

Survey	Raw Count	Abundance Estimate	Density Estimate	Raw Count	Abundance Estimate	Density Estimate
	PFI			PFI plus a a 2km buffer		
February, 2022	0	0 (0 – 0)	0	0	0 (0 – 0)	0
March, 2022	2	7 (2 – 16)	0.12	2	6 (2 – 17)	0.04
April, 2022	1	3 (1 – 10)	0.05	2	7 (2 – 20)	0.04
May, 2022	2	7 (2 – 13)	0.12	5	17 (7 – 30)	0.11
June, 2022	3	10 (3 – 20)	0.17	4	13 (4 – 27)	0.08
July, 2022	2	7 (2 – 16)	0.12	7	23 (7 – 43)	0.14
August, 2022	7	23 (10 – 36)	0.40	17	57 (27 – 94)	0.36
September, 2022	7	23 (7 – 39)	0.40	13	43 (20 – 67)	0.27
October, 2022	26	85 (26 – 177)	1.47	67	222 (114 – 335)	1.39
September, 2024	4	19 (5 – 39)	0.33	28	139 (35 – 284)	0.87
October, 2024	1	5 (1 – 15)	0.09	12	60 (35 – 85)	0.37
November, 2024	5	24 (5 – 53)	0.42	7	35 (10 – 69)	0.22
December, 2024	0	0 (0 – 0)	0	0	0 (0 – 0)	0
January, 2025	0	0 (0 – 0)	0	0	0 (0 – 0)	0
February, 2025	0	0 (0 – 0)	0	2	10 (2 – 20)	0.06
March, 2025	0	0 (0 – 0)	0	0	0 (0 – 0)	0
April, 2025	0	0 (0 – 0)	0	0	0 (0 – 0)	0
May, 2025	0	0 (0 – 0)	0	2	10 (2 – 20)	0.06
June, 2025	8	37 (8 – 115)	0.64	10	49 (10 – 128)	0.31
July, 2025	74	358 (74 – 877)	6.21	120	604 (231 – 1,106)	3.77
August, 2025	23	109 (24 – 200)	1.89	42	208 (128 – 286)	1.30

3.17.5 Outside of the breeding season, gannets typically migrate southward wintering in the Bay of Biscay and off West Africa (Wernham *et al*., 2002).

3.17.6 ESAS surveys in Irish waters between 1980 and 1997 recorded gannets in low densities in the Irish Sea throughout the year, with a peak in numbers in the Irish Sea in September and October. Numbers were lowest in the Irish Sea between November and January (Pollock *et al*., 1997).

Bio-season peak estimates

3.17.7 Gannet was present across all bio-seasons, with highest abundance in the breeding bio-season with a mean peak of 145 birds and a density of 2.51 birds/km^2 in the PFI (Table A3-48).

3.17.8 Within the PFI plus a 2km buffer, gannet was present in all bio-seasons, with highest abundance being in the breeding bio-season. There was a mean peak abundance of 270 birds and a mean peak density of 1.69 birds/km^2 (Table A3-48).

Table A 3-48: Northern gannet bio-season mean peak abundance and density estimates in the PFI and PFI plus a 2km buffer using combined DAS datasets.

BDMPS Bio-seasons	Area	Months	Bio-season peak abundance (n)	Bio-season peak density (n/km^2)
Autumn migration	PFI	Oct–Nov	46	0.79
Breeding	PFI	Mar–Sep	145	2.51
Spring migration	PFI	Dec–Feb	3	0.06
Autumn migration	PFI plus a 2km buffer	Oct–Nov	135	0.84
Breeding	PFI plus a 2km buffer	Mar–Sep	270	1.69
Spring migration	PFI plus a 2km buffer	Dec–Feb	9	0.05

Spatial density distribution and flight direction

3.17.9 Density maps based on MAC DAS data are presented in Figure A3-38 to Figure A3-40 below. Gannets showed no clear trend in spatial density distribution. In the breeding and autumn migration bio-seasons, individuals were distributed throughout the survey area, with highest densities in the south-west and south-east in the breeding bio-season, and across the west and north-east in the autumn migration bio-season. In the spring migration bio-season birds were more sparsely distributed, with hotspots in the east and north-west.

3.17.10 Data from Jessop *et al*. (2018) similarly found no clear pattern in spatial density distribution, though densities were higher during the breeding and autumn migration bio-seasons.

3.17.11 The flight direction data collected during the DAS surveys was generally highly variable most months, both in numbers and directions (Figure A3-41). There were several months that had a significant number of flying birds and a predominant flight direction including September 2020 (southwest), June and September 2021 (southeast /south) and September 2022 (northeast) (Figure A3-41).

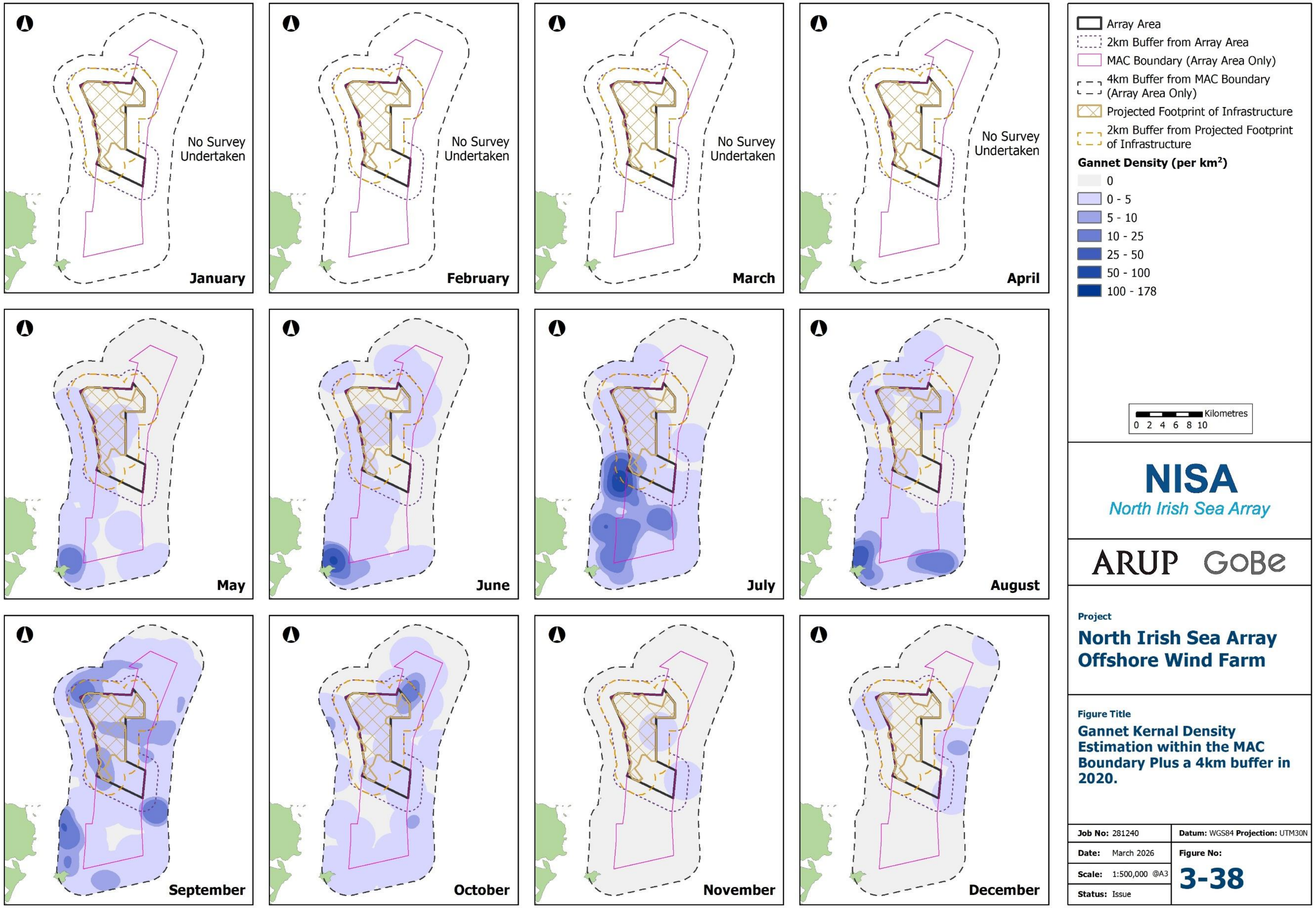

Figure A 3-38: Gannet Kernal Density Estimation within the MAC Boundary Plus a 4km buffer in 2020.

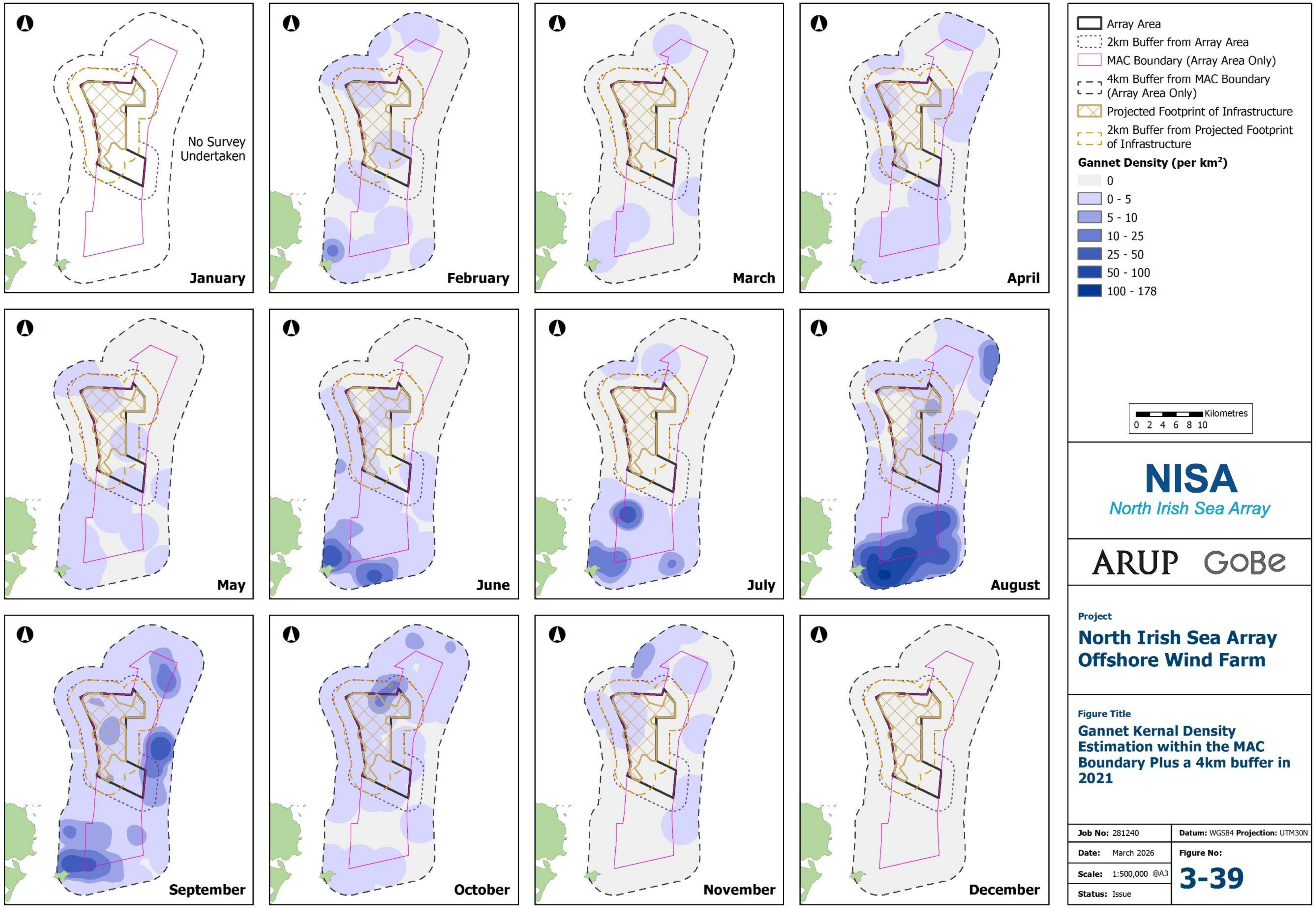

Figure A 3-39: Gannet Kernal Density Estimation within the MAC Boundary Plus a 4km buffer in 2021.

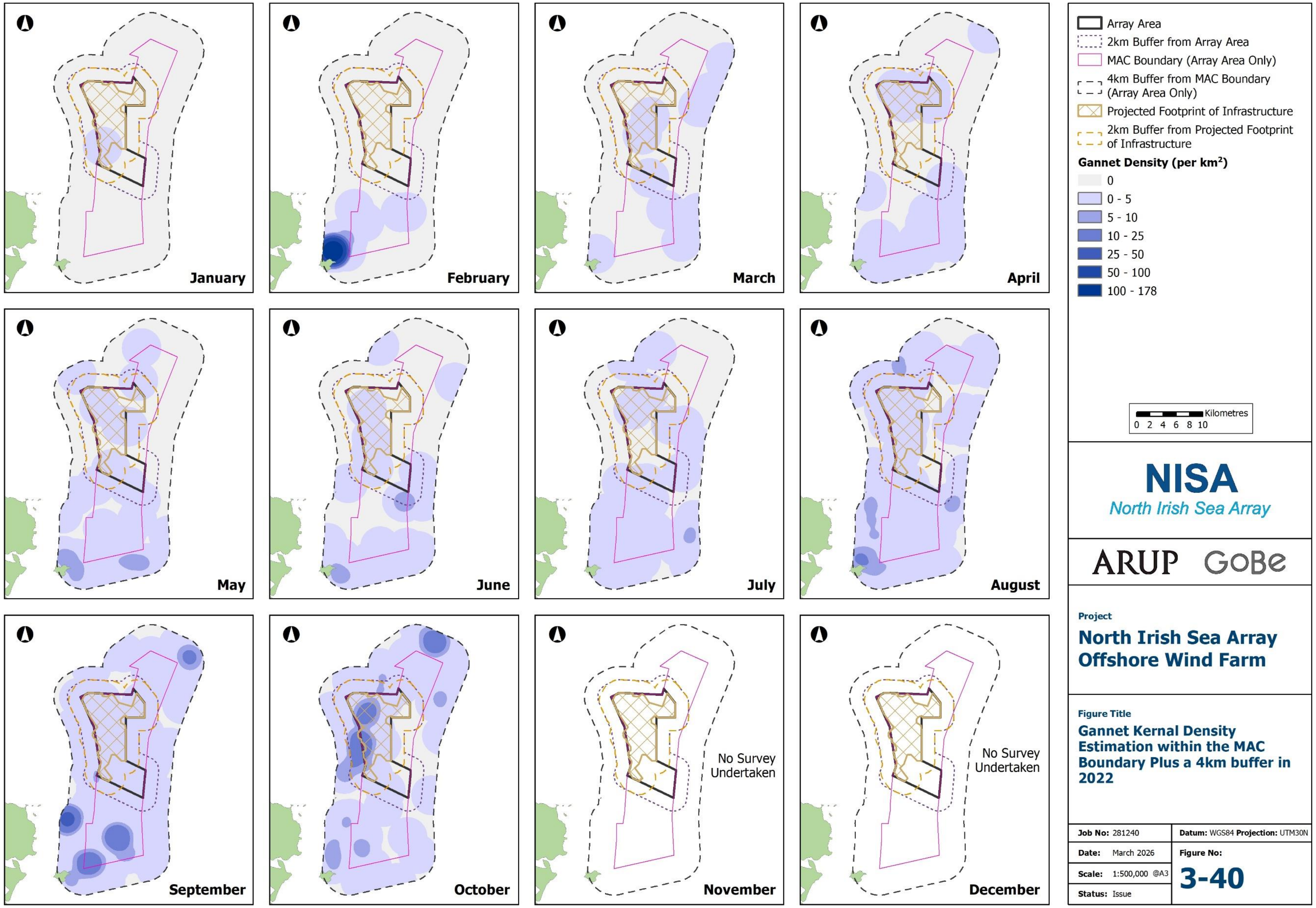

Figure A 3-40: Gannet Kernal Density Estimation within the MAC Boundary Plus a 4km buffer in 2022.

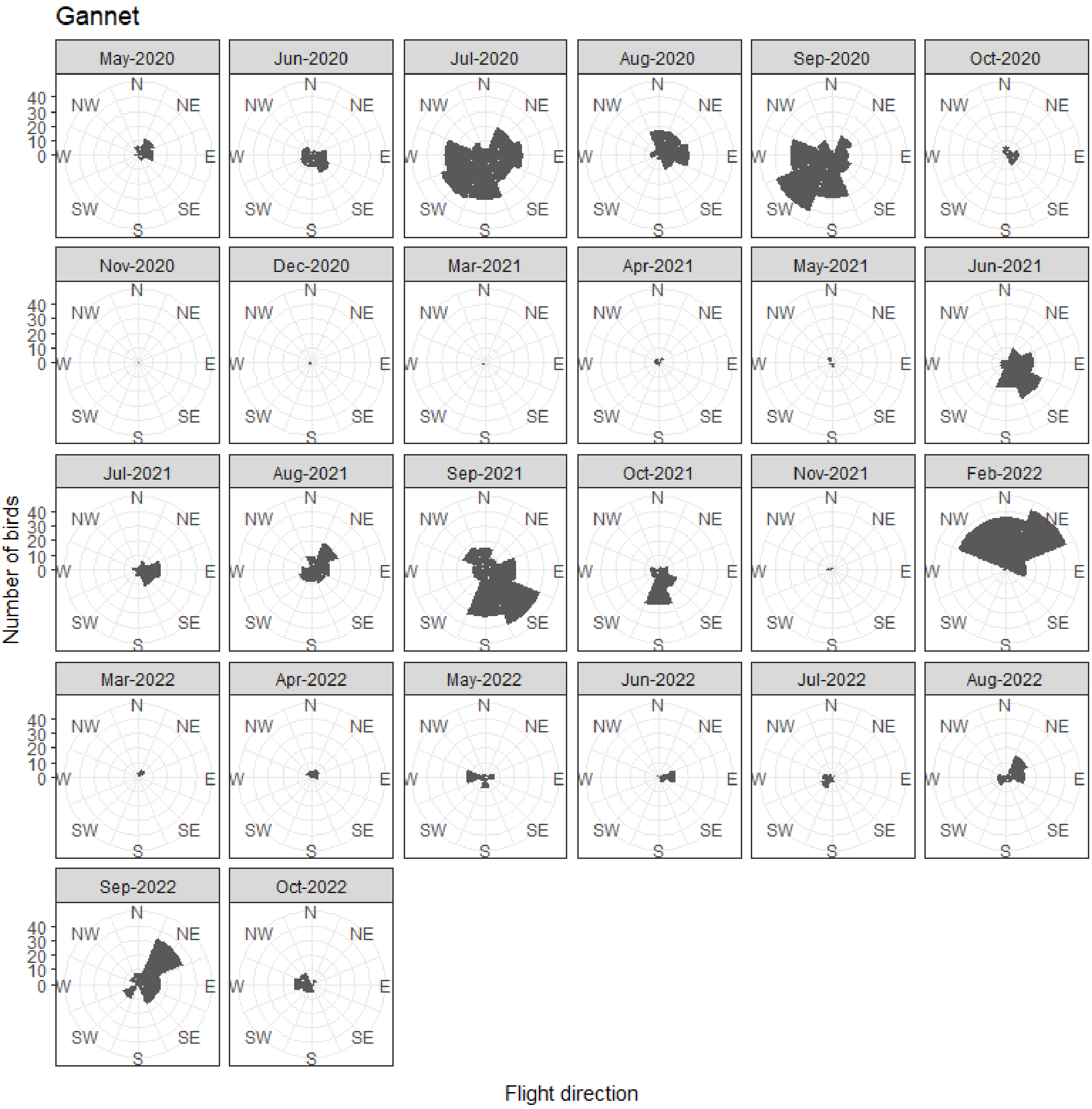

Figure A 3-41: Gannet monthly flight directions in the ornithology study area (using baseline 29-month DAS data).

3.17.12 DAS data for gannet within the NWIS SPA are presented below in Table A3-49. Gannets were recorded within the NWIS SPA across all of the 12 survey months. Raw counts ranged from 3 in December 2024 and January 2025 to 731 in July 2025 with abundance and density peaking 4,434 birds and 1.86 birds/km^2 respectively.

3.17.13 Density maps from the NWIS DAS data are presented in Figure A3-42. Densities were observed to occur throughout the SPA across all months. Peak densities are observed in proximity to Lambay Island in July and August 2025 and to the north-east of the PFI in April 2025.

Table A 3-49: Northern gannet raw counts, estimated abundance (birds) and estimated density (birds/km2) in the NWIS SPA (CI values are presented in brackets).

Survey	Raw Count	Abundance Estimate	Density Estimate
September, 2024	448	2,693 (1,610 – 4,037)	1.13
October, 2024	175	1,047 (493 – 1,907)	0.44
November, 2024	36	180 (91 – 281)	0.08
December, 2024	3	18 (3 – 36)	0.01
January, 2025	3	18 (3 – 48)	0.01
February, 2025	100	594 (185 – 1,124)	0.25
March, 2025	113	667 (259 – 1,299)	0.28
April, 2025	665	4,311 (1,519 – 8,271)	1.81
May, 2025	133	866 (438 – 1,379)	0.36
June, 2025	358	2,127 (1,375 – 2,970)	0.89
July, 2025	731	4,434 (2,756 – 6,420)	1.86
August, 2025	713	4,261 (2,908 – 5,767)	1.79

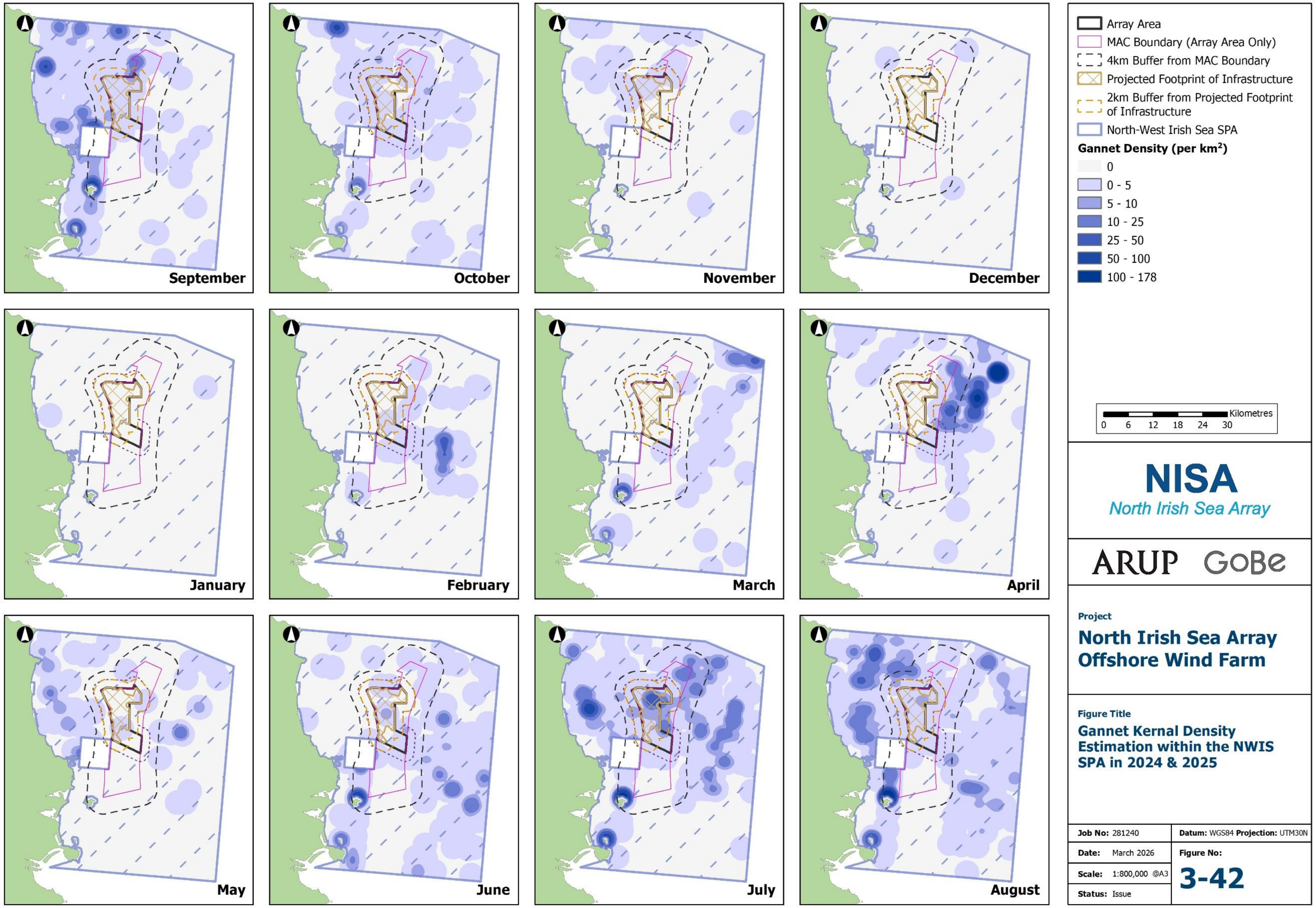

Figure A 3-42: Gannet Kernal Density Estimation within the NWIS SPA in 2024 & 2025.

3.18 Great Cormorant

General overview

3.18.1 The Irish cormorant breeding population was estimated at 4,688 pairs between 2015 and 2018. The general population and breeding distribution seems to have steadily increased in Ireland since 1970, but this may be due to more extensive survey effort (Cummins *et al.*, 2019). Cormorants breed in colonies between April and August (Furness, 2015) and they prey on a wide range of small fish species, from shallow coastal waters, less than 20m deep (Forrester *et al.*, 2007). The species is Amber-listed in Ireland as 50% or more of the Irish breeding population is found at 10 breeding colonies or less (Gilbert *et al.*, 2021).

3.18.2 The closest colonies to the proposed development are Lambay Island (299 pairs in 2015), Ireland's Eye (424 pairs in 2015) and the Skerries Islands (544 pairs in 2010) (Cummins *et al.*, 2019).

Abundance and density

3.18.3 No cormorants were recorded during the 41 months of data collection within the PFI and associated 2km buffer.

North West Irish Sea SPA

3.18.4 DAS data for cormorant within the NWIS SPA are presented below in Table A3-50. Cormorants were recorded within the NWIS SPA across eight of the 12 survey months. Raw counts ranged from 0 in November 2024, May, July and August 2025, to 34 in March 2025 to 2025 with abundance and density peaking 651 birds and 0.27 birds/km2 respectively.

Table A 3-50: Great cormorant raw counts, estimated abundance (birds) and estimated density (birds/km2) in the NWIS SPA (CI values are presented in brackets).

Survey	Raw Count	Abundance Estimate	Density Estimate
September, 2024	2	65 (24 – 114)	0.03
October, 2024	2	81 (12 – 289)	0.03
November, 2024	0	46 (0 – 115)	0.02
December, 2024	2	24 (6 – 48)	0.01
January, 2025	1	42 (1 – 108)	0.02
February, 2025	1	64 (12 – 230)	0.03
March, 2025	34	651 (149 – 1,419)	0.27
April, 2025	4	49 (4 – 119)	0.02
May, 2025	0	27 (0 – 58)	0.01
June, 2025	10	174 (10 – 323)	0.07
July, 2025	0	174 (73 – 296)	0.07
August, 2025	0	194 (69 – 334)	0.08

3.19 European shag

General overview

3.19.1 The Irish shag breeding population was estimated at 4,688 pairs between 2015 and 2018. The general population and breeding distribution seems to have steadily increased in Ireland since 1970, but this may be due to more extensive survey effort (Cummins *et al*., 2019). They breed in colonies between February and August (Furness, 2015) and they prey on a wide range of small fish species, from shallow coastal waters, between 20m to 40m deep (Forrester *et al*., 2007). The species is Amber-listed in Ireland as 50% or more of the Irish breeding population is found at 10 breeding colonies or less (Gilbert *et al*., 2021).

3.19.2 During the breeding season, adults forage close to their colonies, with a mean-maximum foraging range of 13.2 ± 10.5km (Woodward *et al*., 2019). Six colonies are within the mean-maximum foraging distance ± 1 SD of the proposed development area.

Abundance and density

3.19.3 Across the 41 months, only 1 bird was recorded, in March 2021, within the PFI plus a 2km buffer. This equates to an abundance estimate of 3 birds and a density of 0.02 birds/km^2.

North West Irish Sea SPA

3.19.4 DAS data for European shag within the NWIS SPA are presented below in Table A3-51. European shag were recorded within the NWIS SPA across seven of the 12 survey months. Raw counts ranged from 0 in December 2024, January, May, July and August 2025 to 17 in February 2025 with abundance and density peaking 379 birds and 0.16 birds/km^2 respectively.

Table A 3-51: European shag raw counts, estimated abundance (birds) and estimated density (birds/km2) in the NWIS SPA (CI values are presented in brackets).

Survey	Raw Count	Abundance Estimate	Density Estimate
September, 2024	4	102 (42 – 162)	0.04
October, 2024	4	163 (4 – 437)	0.07
November, 2024	4	246 (70 – 537)	0.1
December, 2024	0	235 (30 – 558)	0.1
January, 2025	0	353 (66 – 826)	0.15
February, 2025	17	379 (17 – 786)	0.16
March, 2025	6	198 (16 – 749)	0.08
April, 2025	2	257 (19 – 670)	0.11
May, 2025	0	155 (1 – 440)	0.06
June, 2025	4	220 (61 – 489)	0.09
July, 2025	0	1,161 (50 – 3,368)	0.49
August, 2025	0	415 (29 – 865)	0.17

Available tracking data

3.19.5 Tracking data is available for shags from Lambay Island through the FAME dataset (Baer & Newton, 2012). Between 2010 and 2011, 62 individuals were tracked for a total of 62 days. Individuals travelled a maximum distance of 32km from the colony, and a mean distance of 15km. All individuals foraged only in waters <20m, and birds almost exclusively moved south/south-east from the colony resulting in no overlap with the PFI (Figure A3-43). Further data was also available from June 2016, with a further 12 shags tracked from the island. This data similarly showed almost all birds moving southeast, with no overlap with the PFI.

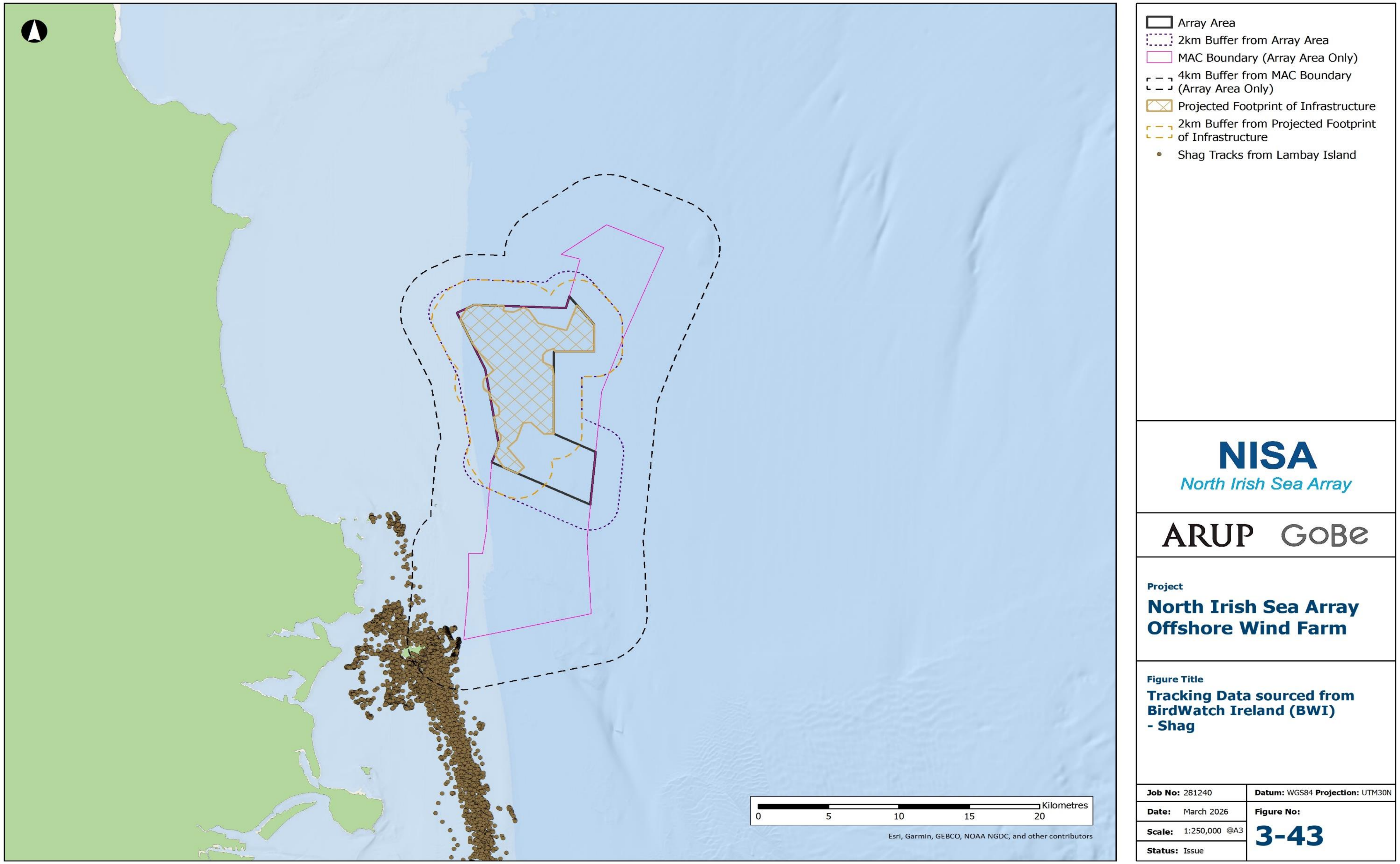

Figure A 3-43: Tracking data sourced from Birdwatch Ireland (BWI) - Shag

3.20 Less abundant seabird species/non-seabird species

3.20.1 Less abundant species recorded across surveys are outlined below.

3.20.2 Arctic skua *Stecorarius parasiticus* was recorded once across the survey period, with one individual recorded in the 4km buffer in November 2020 only. This corresponded to an abundance estimate of 5 birds, and a density of 0.02 birds per km^2 in the PFI plus a 4km buffer.

3.20.3 Black guillemot was recorded across three months, with 1 bird recorded in September 2020, December 2020 and February 2025. This corresponded to a peak abundance and density estimate of 5 birds and 0.09 birds per km^2. Within the PFI plus a 2km buffer, a peak abundance and density of 11 birds and 0.07 birds per km^2 respectively was estimated in December 2020.

3.20.4 Great northern diver was recorded across one month within the PFI, with 1 bird recorded in February 2021. This corresponded to an abundance and density estimate of 3 birds and 0.05 birds/km2. Within the PFI plus a 2km buffer great northern diver was recorded across two months, with 2 birds in February 2021 and 1 bird in May 2021. This corresponded to peak abundance and density estimates of 7 birds and 0.04 birds/km2 respectively. The mean peak densities per bio-season in the ECC plus a 4km buffer based on the data from the ObSERVE aerial surveys (2016) can be found in Table A2-7.

3.20.5 Common scoter was not recorded in the PFI or PFI plus a 2km buffer across any surveys. Common scoter was recorded within the full NWIS SPA survey area with observations ranging from 2 (July 2025) to 3,504 birds (January 2025). Peak abundance and density values of 16,711 birds and 7.01 birds/km2 were estimated respectively. Common scoter was also the most common bird recorded during the landfall surveys with 13,262 individuals observed over the two survey years. As such the density of birds within the Offshore ECC was calculated from the ObSERVE dataset (Jessop *et al*., 2019). The mean peak densities per bio-season in the ECC plus a 4km buffer based on the data from the ObSERVE aerial surveys (2016) can be found in Table A2-7.

3.20.6 Great skua *Stercorarius skua* was recorded once across the survey period, within the PFI and associated 2km buffer, in July 2025. This corresponded to a peak abundance and density estimate of 5 birds and 0.09 birds/km^2.

3.20.7 Little gull was not recorded across the survey period within the PFI or associated 2km buffer.

3.20.8 Sandwich tern was recorded once across the survey period, within the PFI and associated 2km buffer, with 1 bird in October 2024. This corresponded to an abundance estimate of five individuals, and a density of 0.03 birds per km^2.

3.20.9 Sooty shearwater *Ardenna grisea* was recorded in one month within the PFI, with one individual in September 2020. This corresponded to an abundance of 3 birds, and a density of 0.05 birds per km^2. Within the PFI plus a 2km buffer, sooty shearwater was recorded twice across two months (September 2020 and August 2022). This equated to a peak abundance and density estimate of 5 birds and 0.03 birds per km^2 respectively.

3.20.10 Whimbrel *Numenius phaeopus* was not recorded across the survey period within the PFI or associated 2km buffer.

Vessel surveys

3.20.11 Raw counts of birds recorded across site specific vessel-based surveys are presented in Table A3-52 below, with numbers presented in brackets to differentiate between birds in flight and birds sitting on the water within each month.

Table A 3-52: Vessel surveys of ornithological receptors collected between November 2019 and July 2022.

Species	Number of birds recorded (total (in flight/sitting)						
	Survey 1 Nov 2019	Survey 2 Jan 2020	Survey 3 Mar 2020	Survey 4 Aug 2020	Survey 5 Jun 2021	Survey 6 Jul 2021[14]	Survey 7[15] Jul 2022
Common Scoter	5 (5/0)	13 (13/0)	1 (1/0)	1 (1/0)	-	-	-
Red-throated diver	1 (1/0)	1 (1/0)	2 (2/0)	-	-	-	-
Great northern diver	3 (3/0)		-	-	-	-	-
Fulmar	29 (28/1)	26 (22/4)	28 (9/19)	36 (34/2)	27 (21/6)	3 (1/2)	-
Gannet	7 (7/0)	27 (19/8)	51 (51/0)	358 (288/70)	144 (50/94)	32 (8/24)	189 (178/1)
Kittiwake	232 (210/22)	111 (90/21)	155 (52/103)	272 (202/70)	494 (60/434)	51 (15/36)	93 (43/50)
Black-headed gull	1 (1/0)	-	1 (1/0)	3 (3/0)	-	-	-
Common gull	19 (16/3)	34 (34/0)	8 (3/5)	1 (1/0)	-	-	-
Great black-backed gull	169 (156/13)	247 (121/126)	46 (21/25)	41 (35/6)	-	4 (1/3)	175 (65/110)
Herring gull	332 (307/25)	821 (418/403)	200 (108/92)	107 (102/5)	145 (31/114)	24 (2/22)	916 (265/651)
Lesser black-backed gull	-	1 (0/1)	2 (2/0)	51 (47/4)	38 (16/22)	1 (1/0)	-
Large gull species	10 (0/10)	-	-	-	-	-	-
Great skua	2 (2/0)	-	-	2 (1/1)	-	-	-

14 Note that in Survey 6 the second survey (23rd July) only focused on flying gulls, terns, and gannets to collect data on flight heights. This data is therefore excluded from counts in this table

15 A breakdown of the number of birds sitting vs in flight is not available for all species for this survey.

Species	Number of birds recorded (total (in flight/sitting)						
	Survey 1 Nov 2019	Survey 2 Jan 2020	Survey 3 Mar 2020	Survey 4 Aug 2020	Survey 5 Jun 2021	Survey 6 Jul 2021[14]	Survey 7[15] Jul 2022
Guillemot	657 (309/348)	4,702 (1,194/3,508)	1,485 (1,398/87)	1,522 (4/1,518)	1,385 (457/928)	4,035 (1/4,034)	1,540
Razorbill	111 (49/23)	41 (32/9)	231 (224/7)	195 (0/195)	64 (41/23)	15 (1/14)	29
Guillemot/razorbill	65 (42/23)	12 (12/0)	3,207 (902/2,305)	240 (0/240)	110 (0/110)	140 (0/140)	-
Puffin	2 (0/2)	-	-	4 (1/3)	6 (3/3)	1 (0/1)	17
Shag	-	1 (1/0)	30 (27/3)	2 (2/0)	1 (1/0)	-	-
Black guillemot	-	-	2 (2/0)_	-	-	-	-
White wagtail *Moticilla alba*	-	-	2 (2/0)	-	-	-	-
Meadow pipit *Anthus pratensis*	-	-	19 (19/0)	-	-	-	-
Passerine sp.	-	-	1 (1/0)	1 (1/0)	-	-	-
Sandwich tern	-	-	-	1 (1/0)	-	1 (1/0)	-
Roseate tern	-	-	-	19 (19/0)	9 (1/8)	48 (48/0)	36
Common tern	-	-	-	41 (41/0)	14 (3/11)	8 (8/0)	27
Arctic tern	-	-	-	17 (17/0)	-	1 (1/0)	1
Arctic skua	-	-	-	1 (1/0)	-	-	-
Storm petrel *Hydrobates pelagicus*	-	-	-	3 (3/0)	-	-	-
Manx shearwater	-	-	-	1,682 (1,234/448)	1,197 (395/802)	1,020 (157/863)	4,312 (846/3,466)
Cormorant	-	-	-	5 (5/0)	-	-	-

Species	Number of birds recorded (total (in flight/sitting)						
	Survey 1 Nov 2019	Survey 2 Jan 2020	Survey 3 Mar 2020	Survey 4 Aug 2020	Survey 5 Jun 2021	Survey 6 Jul 2021[14]	Survey 7[15] Jul 2022
Wigeon *Anus penelope*	-	-	-	-	2 (2/0)	-	-

Flight height data

3.20.12 Flight height data was collected during both DAS surveys (Table A 3-53) and vessel surveys (Table A 3-54). Based on available literature, it is expected that relatively low numbers of birds should be at collision risk height, ~14% of gannets and ~31% of herring gull flights being at rotor swept heights as an example (Furness and Wade, 2012). Considering the data below, the boat and vessel data is roughly in agreement with this, with ~10% of gannets in the 21-30m band based on DAS data, and 11% based on vessel data. However, there were considerable differences in the flight height distribution between the DAS and vessel data, with a higher proportion of birds estimated to be at higher flight bands compared with the vessel data. As an example, no Manx shearwaters were recorded above 10m based on vessel data, though based on DAS data, the majority of individuals were distributed in higher flight bands up to and above 50m. Similarly, for kittiwake only a small proportion (~11%) of birds were recorded above 20m based on vessel data, but from DAS data, ~77% of individuals were estimated at heights above 20m.

3.20.13 Given these discrepancies of seabird flight heights in data collected over the same time period (though noting that the DAS data covered more months), this data is not considered a reliable indicator of flight height, with DAS data considered to be an overestimate of flight height. This is supported by species which generally have consistently low flight heights (e.g. Manx shearwater and guillemot) having disproportionately high flight heights in this dataset. Given this inconsistency in flight height distribution between the two datasets, site-specific flight height data is not taken forward to use in the collision risk modelling (CRM) assessment. This is a common approach in the UK because flight height data from DAS is not yet considered sufficiently robust.

Table A 3-53: Flight heights of seabirds recorded on DAS surveys (May 2021 to October 2022).

Species	Sample size	Flight height band				
		0 to 10m	11 to 20m	21 to 30m	31 to 50m	51m+
Kittiwake	1045	127	111	101	196	511
Herring gull	473	57	52	50	83	231
Guillemot	352	64	65	36	68	119
Manx shearwater	117	23	15	11	25	43
Gannet	273	31	35	26	54	127
Great black-backed gull	106	15	13	8	18	52
Common gull	68	9	11	3	11	34
Roseate tern	21	4	1	3	3	1
Common tern	10	3	0	3	3	1

Table A 3-54: Flight heights of seabirds recorded on vessel surveys (June and July 2021, and July 2022).

Species	Sample size	Flight height band				
		0 to 10m	11 to 20m	21 to 30m	31 to 50m	51m+
Kittiwake	177	118	40	15	3	1
Herring gull	391	253	72	29	32	5
Roseate tern	155	155	0	0	0	0
Common tern	56	55	1	0	0	0
Gannet	288	174	60	33	18	3
Manx shearwater	846	846	0	0	0	0
Great black-backed gull	65	47	6	4	6	2

Pre-RFI

3.20.1 Bird species recorded during VP surveys across the two VP locations are presented in Table A3-55 below. The most abundant species recorded were pale-bellied brent geese, and common scoter.

Table A 3-55 Bird species recorded during vantage-point surveys conducted between November 2019 and May 2021.

Species	Number of individuals recorded (n)			
	Sept-Nov 2019 + March 2020	Apr-May 2020	Sept-Nov 2020	Mar-May 2021
Pale-bellied brent goose Branta bernicla hrota	940	101	223	24
Greylag goose Anser anser	159	-	-	-
Pink-footed goose Anser brachyrhynchus	1	-	-	-
Mute swan Cygnus color	4	-	-	-
Whooper swan Cygnus cygnus	22	-	23	-
Shelduck Tadorna tadorna	26	23	17	15
Teal Anas crecca	4	-	-	-
Eider Somateria mollissima	3	-	-	4
Velvet scoter Melanitta fusca	13	-	-	1
Common scoter	2,367	105	1,020	582
Unidentified scoter sp.	8	-	-	-
Long-tailed duck Clangula hyemalis	2	-	2	1
Red-breasted merganser Mergus serrator	17	-	6	19
Red-throated diver	106	7	38	54
Great northern diver	18	3	7	6
Unidentified diver sp.	7	-	1	-
Great crested grebe Podiceps cristatus	57	-	22	2
Red-throated diver or great crested grebe	2	-	-	-
Grey heron Ardea cinerea	2	-	-	-

Species	Number of individuals recorded (n)			
	Sept-Nov 2019 + March 2020	Apr-May 2020	Sept-Nov 2020	Mar-May 2021
Oystercatcher Haematopus ostralegus	235	-	-	-
Golden plover Pluvialis apricaria	543	-	-	-
Ringed plover Charadrius hiaticula	28	-	-	-
Curlew Numenius arquata	40	-	-	-
Bar-tailed godwit Limosa lapponica	27	-	-	-
Black-tailed godwit Limosa limosa	7	-	-	-
Turnstone Arenaria interpres	237	-	-	-
Knot Calidris canutus	40	-	-	-
Ruff Calidris pugnax	2	-	-	-
Curlew sandpiper Calidris ferruginea	3	-	-	-
Sanderling Calidris alba	79	-	-	-
Dunlin Calidris alpina	223	-	-	-
Redshank Tringa totanus	58	-	-	-
Greenshank Tringa nebularia	11	-	-	-
Skylark Alauda arvensis	9	-	-	-
Swallow Hirundo rustica	77	-	-	-
House martin Delichon urbicum	45	-	-	-
Unidentified hirundine species	32	-	-	-
Meadow pipit	30	-	-	-
Linnet Linaria cannabina	58	-	-	-
Mallard Anas platyrhynchos	-	-	2	-
Tufted duck Aythya fuligula	-	-	2	1

3.20.1 These data demonstrated that while coastal movements occur frequently, the majority of flights remain within nearshore corridors and are not strongly associated with the offshore PFI footprint.

3.20.2 VP survey results from the extended VP survey period are summarised in Table A 3-56 and described below. These counts present the individuals of the target species that were considered to be on migration, excluding any individuals not considered to be on migration and any non-target species such as seabirds.

3.20.3 During the extended VP period a total of 11,847 individual birds of 55 species were recorded over 702 records, these records were dominated by passerines but also included waders, wildfowl, raptors, seaducks and grebes. The most common migratory species in order, by number of individuals, were common scoter (n=3,081), meadow pipit (n=2,520), linnet (n=1,390), barn swallow (n=1,100) and goldfinch (n=937). Together, these five species accounted for 76.2% of the individuals recorded. It should be noted that while these records are consistent with terrestrial species migrating over sea and along the coast, specific behaviours could not be determined for many individuals.

3.20.4 The number of birds recorded from the VPs was highest throughout September and remained high into October, the number of records dropped throughout November and into December. However, a few surveys in December continued to see higher numbers of records and individuals. VP1 reached a peak of 68 records on 12/09 with a peak count of 2,073 individuals on 17/09 and VP2 peaking at 44 records on 06/10 with a peak count of 897 individuals was recorded on 20/11. The peak at VP3 (Rockabill Island) was only 6 records on 16/10 with the number of migratory individuals peaking at 48 on 03/12 with the number of migrants passing the site remaining low compared to the onshore VPs. These results indicate that the main migratory period fell across September and into October, with fewer birds continuing to migrate by early November and only occasional surveys still continued to record large numbers of birds in December.

3.20.5 Accounting for the different number of visits to the onshore VPs (15 visits each) and offshore VP (6 visits) by calculating the mean number of migratory individuals per visit reveals 378 birds/visit at VP1, 404 birds/visit at VP2 and only 20 birds/visit at VP3. This further indicates that the majority of migratory individuals were utilising inshore flyways and that far fewer are likely to interact with the offshore development area while undertaking migration.

3.20.6 Of the total 55 target species recorded from all VPs, 50 were able to have their flight heights estimated within pre-defined bands, totalling 4,928 individuals. Recorded flight heights were predominantly within Bands A and B, with 89.2% of birds with available flight height data flying below 20m. Only 10.8% of birds with available flight height data were flying in height band C, with meadow pipit the most common (19.8%) but no one species dominating this height band, consisting of waders, wildfowl and passerines. No migratory individuals were observed in flight height Band D, at over 40m. This indicates that a large majority of migratory birds are flying at low heights, with only a small proportion of individuals flying within the height bands in the precautionary rotor swept area.

3.20.7 A total of 8,820 migratory individuals of 54 species were able to have their distance from the VPs estimated within the pre-defined bands. The vast majority of birds were recorded flying in distance Bands A-C within 1km of shore (94.9% of individuals), with 83.4% of individuals flying within 100m of the shore (distance Band A). All migratory individuals with distance data recorded from VP3 on Rockabill Island were within 500 m of shore, indicating that few birds are likely to be migrating further offshore.

3.20.8 Of the target species considered to be migrating 92% were recorded flying south and 3.0% were flying north, typically following the contours of the coastline or flying over open sea adjacent to the land. Almost all species with flight direction data were recorded flying south on at least one occasion. Common scoter were the most common species flying north (82.1% of individuals), followed predominantly by waders and wildfowl. Starling were the most common species recorded flying west, totalling 276 individuals (79.1% of birds flying west), with the next most common species being 45 shelduck and ten greylag goose.

3.20.9 The results of the extended VP programme provide evidence that the migratory bird assemblage recorded form the VPs is predominantly utilising inshore flyways following the coast and that few birds are migrating offshore. Alongside this, the majority of birds were flying close to the water's surface, with only 10.8% of birds recorded flying at potential collision height (20-40m), however, this is based on the precautionary assumption of lower turbine heights across some of the array. Together, this indicates that while large numbers of birds were recorded migrating many of them were flying below potential collision height and that few were likely to have interacted with PFI when migrating south and even fewer are suspected to have crossed the Irish Sea potentially through the PFI.

3.20.10 Collectively, the VP survey programme forms an important supporting dataset to the offshore baseline. While not used for quantitative flux modelling due to its inherent spatial constraints, the VP dataset robustly characterises the timing, directionality and relative magnitude of coastal migration movements and provides confidence that the combined DAS datasets sufficiently capture offshore distributions of key species relevant to the EIA and NIS assessments.

Table A 3-56 Summary of VP Survey results

Species	1 Clogherhead	2 Laytown	3 Rockabill	Grand Total
Barn swallow	776	320	4	1100
Bar-tailed godwit	2			2
Black-tailed godwit		92		92
Brambling	1			1
Brent goose	173	291		464
Buzzard	3			3
Chaffinch	133	67		200
Common scoter	806	2256	19	3081
Curlew	8		7	15
Curlew sandpiper		2		2
Dunlin	30			30
Eider	15	1		16
Fieldfare	1			1
Goldcrest		1		1
Golden plover	3	40		43
Goldfinch	238	699		937
Great crested grebe	5	151		156
Grey heron			1	1
Grey wagtail	8	16		24
Greylag goose	11	1		12
House martin	200	50		250
House sparrow	11			11
Knot	26	16		42
Lapwing	150	3	4	157
Lesser redpoll	61	5		66
Linnet	872	518		1390
Little egret	2			2
Long-tailed duck		4		4
Long-tailed tit	2			2
Mallard		37		37
Meadow pipit	1445	1066	9	2520
Mute swan	2			2
Oystercatcher	50	39		89
Peregrine falcon	1			1
Pied wagtail	51	60		111
Red-breasted merganser	19	22		41

Redshank	2			2
Redwing	6			6
Reed bunting	8	21		29
Rook	22			22
Ruff		1		1
Sand martin	10			10
Scaup	1	9		10
Shelduck		49		49
Siskin	39	39		78
Skylark	188	93	4	285
Snipe		2		2
Snow bunting	1			1
Starling	210	30	73	313
Teal		19		19
Tree sparrow	40	2		42
Velvet scoter	4	9		13
Whooper swan	4	8		12
Wigeon	29	12		41
Yellowhammer	1	5		6
Grand Total	5670	6056	121	11847

3.20.11 Results are summarised in Table A 3-55. A total of 71 nights of bioacoustics data were collected from the offshore and onshore monitoring units. From the period 830 recording blocks were processed however 20 blocks were too poor for analysis, the remaining 98% of the blocks are analysed and presented below.

3.20.12 In total 40 species of migratory wader, waterfowl and terrestrial bird species were recorded across the PAM period. Of these, passerines were the most prevalent with 19 species over 526 records and totalling an estimated 1,613 individuals. Of these passerine species, many are considered diurnal migrants so it is considered likely that the PAM unit was recording the beginning of the diurnal movements around sunrise rather than true nocturnal movements. It is therefore considered highly unlikely that these birds would have crossed the Irish Sea. For these species, the VP data should be considered to be more appropriate. As such, among the passerines recorded, only the data for thrushes (including closely related *Muscicapidae* species such as robin) should be considered as true nocturnal migrants.

3.20.13 Waders were the next most numerous group of species, with 15 species recorded, totalling 1,340 records comprising of an estimated 2,698 individuals. Four species of wildfowl and rails were recorded, comprising of 5 records of 6 individuals. While these species will migrate both by day and by night, it is considered that these records are all comprised of migrating birds.

3.20.14 The number of migratory birds increased throughout September, reaching a sustained peak from 06/10-29/10 with between ~450-650 individuals recorded each week and 33 species moving during this period. Migration proceeded to slow in the following week (30/10-03/11) to 96 individuals of 11 species. However, the week of 04/11-11/11 saw the highest number of migratory individuals at 1,340 of 22 species before reducing again the following week. These results indicate that the main migratory period fell approximately during October, with a peak during early November that while unexplained could be contributed to favourable weather conditions.

3.20.15 In addition to the target species, one seabird species, roseate tern, was recorded. As this species is a breeding feature of Rockabill SPA, and terns are known to migrate nocturnally, these records during September are considered to be true nocturnal migration from their breeding grounds.

3.20.16 The results indicate that while a diverse suite of migratory species passed through the Rockabill area during autumn 2025, most call activity was concentrated within nearshore airspace and did not indicate substantial offshore movements across the PFI. The PAM dataset therefore complements the VP surveys by confirming the presence and timing of migration events, while supporting the conclusion that large-scale offshore migration through the proposed array area is limited.

Table A 3-55 Summary of PAM results, broken down by group

Species	Number of encounters	Estimated individuals	First date	Last date	Number of calls recorded
Herons					
Grey heron	18	20	28/09/2025	13/11/2025	77
Wildfowl and rails					
Brent goose	1	1	25/10/2025	25/10/2025	4
Mallard	2	2	26/09/2025	13/11/2025	5
Moorhen	1	1	27/10/2025	27/10/2025	1
Wigeon	1	2	06/11/2025	06/11/2025	16
Waders					
Dotterel	1	1	13/10/2025	13/10/2025	3
Golden plover	27	33	19/09/2025	13/11/2025	91
Ringed plover	7	8	10/09/2025	13/11/2025	21
Lapwing	113	299	19/09/2025	13/11/2025	1,465
Purple sandpiper	20	28	14/09/2025	29/10/2025	81
Sanderling	1	1	28/09/2025	28/09/2025	4
Oystercatcher	504	860	05/09/2025	13/11/2025	8,123
Turnstone	412	895	04/09/2025	04/11/2025	3,468
Dunlin	13	16	14/09/2025	13/11/2025	66
Common sandpiper	3	3	14/09/2025	17/09/2025	7
Redshank	19	29	06/09/2025	13/11/2025	70
Greenshank	25	39	23/10/2025	12/11/2025	331
Black-tailed godwit	4	4	27/10/2025	30/10/2025	15
Curlew	161	416	12/09/2025	13/11/2025	1,576
Snipe	30	66	29/09/2025	13/11/2025	333
Raptors					
Long-eared owl	8	8	08/11/2025	13/11/2025	20
Passerines					
Blackbird	69	89	04/09/2025	12/11/2025	196
Chiffchaff	5	6	20/09/2025	24/10/2025	64
Chaffinch	12	62	24/10/2025	10/11/2025	121
Firecrest	3	3	13/10/2025	16/10/2025	32
Goldcrest	26	36	24/09/2025	10/11/2025	125
Goldfinch	2	6	10/24/2025	29/10/2025	15
Linnet	3	18	25/10/2025	29/10/2025	66
Lesser redpoll	2	5	25/10/2025	25/10/2025	32
Meadow pipit	20	41	14/09/2025	11/10/2025	177
Pied wagtail	7	8	24/09/2025	29/10/2025	37
Robin	140	210	04/09/2025	02/11/2025	1,457
Reed bunting	2	2	12/10/2025	10/11/2025	7
Rock pipit	4	8	25/09/2025	22/10/2025	25

Redwing	170	991	25/09/2025	13/11/2025	881
Skylark	31	93	24/10/2025	12/11/2025	353
Starling	3	3	16/10/2025	30/09/2025	45
Siskin	1	1	30/10/2025	30/10/2025	2
Song thrush	13	17	25/09/2025	13/11/2025	68
Yellowhammer	14	16	24/10/2025	13/11/2025	59

Landfall surveys

3.20.17 Landfall survey results between January 2021 and December 2022 are presented in Table A3-56 below. Raw counts of recorded bird species are presented, with the survey area consisting of the stretch of coast between Balbriggan and the mouth of the river Delvin. A total of 64 bird species were recorded across the 24-month period.

3.20.18 The most commonly recorded species were common scoter and Herring gull, with 13,262 and 9,165 individuals recorded across the survey period respectively.

Table A 3-56: Bird species recorded during landfall surveys.

Species	2021												2022											
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Waders																								
Bar-tailed godwit	3	117	75	8	0	0	11	98	2	2	0	1	0	0	0	0	2	0	0	1	6	13	11	10
Black-tailed godwit	6	18	11	0	0	0	0	12	6	0	1	6	0	0	0	0	0	0	1	3	10	12	1	0
Curlew	182	38	33	3	0	0	5	34	41	165	16	64	34	28	0	0	0	0	1	3	108	69	6	1
Dunlin	0	122	153	0	0	0	0	41	11	1	10	18	49	30	4	3	20	0	18	12	2	128	2	20
Golden plover	42	141	285	4	0	0	0	0	88	34	44	5	57	1	0	0	0	0	0	0	3	1	2	120
Greenshank	0	2	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	15	13	7	10	7	15
Grey plover *Pluvialis squatarola*	0	2	0	0	0	0	0	0	1	2	5	14	4	15	0	0	0	0	0	0	3	8	4	10
Knot	4	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	2	1	2	0	3
Lapwing *Vanellus vanellus*	86	53	130	0	0	0	0	18	0	14	126	0	41	0	0	0	0	0	0	0	0	0	1	20
Oystercatcher	142	58	163	15	4	2	4	123	104	142	43	81	58	73	8	10	0	113	42	260	73	209	68	89
Purple sandpiper *Calidris maritima*	2	11	2	0	0	0	0	0	0	3	0	2	0	4	0	0	0	0	0	0	0	6	2	8

Species	2021												2022											
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Redshank	74	19	6	4	0	0	0	13	37	72	21	45	31	11	15	0	0	2	26	62	29	112	34	35
Ringed plover	12	0	29	0	2	0	4	13	23	1	1	11	49	8	0	1	20	2	22	89	5	39	1	25
Sanderling	11	29	30	0	0	0	0	44	0	0	0	0	0	0	0	0	0	38	16	5	0	8	0	0
Snipe *Gallinago gallinago*	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	8	5	10
Turnstone	128	92	81	15	11	0	19	69	22	39	0	7	4	71	0	20	1	76	23	52	2	179	15	40
Whimbrel	0	0	1	0	0	0	0	12	0	0	0	0	0	0	0	8	1	0	0	0	0	0	0	0
Swans, geese and non-marine ducks																								
Mallard	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	0	9
Mute swan	0	0	0	0	0	0	0	4	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0
Brent goose	79	171	144	0	0	0	0	0	1	17	15	41	0	140	142	0	0	0	0	0	9	0	24	92
Shelduck	5	37	8	2	0	0	0	15	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0
Teal	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	0
Whooper swan	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Wigeon	0	0	0	0	0	0	0	0	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Species	2021												2022											
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Herons																								
Grey heron	4	11	5	3	5	0	2	8	4	4	3	4	3	0	2	1	0	2	5	8	3	9	4	7
Little egret *Egretta garzetta*	0	9	0	6	1	1	1	12	5	1	3	0	1	0	0	1	0	0	17	1	8	0	0	2
Raptors																								
Buzzard *Buteo buteo*	0	0	0	0	0	0	0	0	1	0	2	2	1	0	2	0	0	0	0	0	0	0	0	0
Hen harrier *Circus cyaneus*	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Kestrel *Falco tinnunculus*	0	0	0	1	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0
Merlin *Falco columbarius*	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
Seaducks, divers and grebes																								
Common scoter	2,016	1,383	1,370	50	0	0	0	53	780	575	404	870	500	490	395	0	0	0	0	3	65	638	3,440	230
Eider	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Great-crested grebe	11	11	5	1	0	0	0	3	0	4	1	10	1	0	0	1	0	0	0	3	1	9	63	3
Great northern diver	7	3	5	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	1	3	0

Species	2021												2022											
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Little grebe *Tachybaptus ruficollis*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0
Long-tailed duck	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Red-breasted merganser	3	6	2	0	0	0	1	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Red-throated diver	9	16	12	2	0	0	0	2	30	28	2	9	17	3	3	0	0	0	0	0	0	40	47	0
Velvet scoter	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Gulls and terns																								
Arctic tern	0	0	0	0	0	1	2	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0
Black-headed gull	61	93	102	0	11	4	47	132	122	652	23	129	100	3	0	0	0	5	108	147	239	160	66	36
Common gull	21	27	60	5	0	0	6	16	72	76	7	97	47	0	1	0	0	0	15	24	23	61	21	17
Common tern	0	0	0	0	1	6	4	0	1	0	0	0	0	0	0	0	6	2	40	4	0	0	0	0
Common or Arctic tern	0	0	0	0	4	11	30	43	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Common or Arctic or Roseate tern	0	0	0	0	0	24	30	25	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Fosters tern *Sterna forsteri*	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Great black-backed gull	23	27	44	12	4	3	13	26	58	6	27	25	13	1	88	20	12	3	11	18	22	10	10	3

Species	2021												2022											
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Herring gull	126	126	187	37	35	19	56	159	1,364	611	354	529	454	234	1,458	315	497	228	446	385	816	253	360	116
Kittiwake	0	1	0	0	2	0	0	7	41	0	0	0	0	0	0	0	0	3	1	191	270	0	0	0
Lesser black-backed gull	0	0	11	2	2	1	14	34	2	2	0	0	0	1	23	4	6	8	9	14	1	0	0	0
Mediterranean gull	0	0	0	0	0	0	0	1	115	8	0	0	0	0	0	0	0	2	9	207	69	2	0	0
Roseate tern	0	0	0	0	0	5	2	5	0	0	0	0	0	0	0	0	0	0	17	0	0	0	0	0
Sandwich tern	0	0	0	0	0	0	4	113	93	0	0	0	0	0	0	2	3	3	27	6	0	0	0	0
Seabirds																								
Arctic skua	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Black guillemot	0	6	2	0	3	2	6	4	0	0	0	6	0	0	0	1	2	9	17	0	0	0	0	0
Cormorant	13	20	13	7	7	6	6	8	70	25	19	40	22	3	19	49	42	57	95	222	46	19	72	0
Gannet	0	1	4	2	3	4	7	8	2	0	0	0	0	0	0	0	6	0	0	0	0	0	0	0
Guillemot	0	2	2	2	7	2	4	19	40	50	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Razorbill	0	3	0	2	4	0	2	10	400	50	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Shag	9	10	11	7	6	5	4	18	25	19	3	20	2	0	1	3	4	3	11	14	32	4	10	1
Passerines																								

Species	2021												2022											
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Sand martin *Riparia riparia*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	11	4	20	10	0	0	0	0	0
Skylark	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0
Yellowhammer *Emberiza citrinella*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0
Other waterbirds																								
Kingfisher *Alcedo atthis*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1

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