FEHILY TIMONEY

DESIGNING AND DELIVERING
A SUSTAINABLE FUTURE

APPENDIX 8-2

Ornithology

Appendix 8-2.1: Assessment Contributors

Appendix 8-2.2: Ornithological Baseline Report

Appendix 8-2.3: Kingfisher Baseline Report

Appendix 8-2.4: Ecological Resource Evaluation

Appendix 8-2.5: Collision Risk Modelling Report

APPENDIX 8-2.1

Assessment Contributors

Contributor	Work/Surveys Completed	Biography
Ben O'Dwyer	EcIA/EIAR Ornithology Chapter General ecological walkover surveys	Ben is a Senior Project Ecologist with Fehily Timoney with over 8 years' experience in ecological assessment and holds a BSc (Hons) in Wildlife Biology from Institute of Technology Tralee (now MTU). Ben has prepared EcIAs, EIAR Biodiversity chapters, AA Screening reports and Natura Impact Statements for numerous large scale infrastructure projects in the renewable energy, commercial, waste management and transport sectors. He is an experienced and versatile field surveyor and his experience across a broad range of habitats and projects in Ireland has given him an extensive knowledge of protected sites and species across the country.
Jon Kearney	Collision risk modelling (CRM)	Jon is Technical Director of Ecology with Fehily Timoney and has 20 years' experience in the field of ecological assessment. He holds a BSc (Hons) in Applied Ecology from University College Cork and MSc in Ecological Management and Biological Conservation from Queens University Belfast. In his time as an ecological consultant in both the UK and Ireland, he has worked on a broad diversity of projects including NIS's for several offshore renewable energy projects, wind farms projects, solar farms, road schemes and commercial developments. Jon has been the lead expert witness for biodiversity and Appropriate Assessment at several An Bord Pleanála Oral Hearings.
Éimear Stephenson	Ornithological baseline reports EcIA/EIAR Ornithology Chapter	Éimear is a Project Ecologist with Fehily Timoney and Company. She holds an MSc in Biodiversity and Conservation from Trinity College Dublin and a BSc in Marine Science from the University of Galway. She has extensive experience in aquatic and terrestrial ecological studies, including field work, laboratory work and desk-based studies. Éimear has worked both independently and collaboratively, and has worked on many international, interdisciplinary projects with National Geographic, WWF UK and more.

Contributor	Work/Surveys Completed	Biography
		She has extensive experience in assessment and report-writing, and has contributed to various ecological reports, including EIARs, environmental monitoring reports and risk assessments. She is also currently in the midst of publishing a paper on her identification and ecological analysis of a fossil echinoid she discovered. As the Head of Science Communication at the scientific journal Youth STEM Matters, her role included the management and support of the editorial team. She was also responsible for the quality control of scientific publications, in terms of the quality of writing, and the quality assurance of the data within the reports.
Lorraine Benson	Ornithological surveys	Lorraine is an Ecologist with a Masters in Environmental Science from UCD. She has published in Irish Birds and Bird Habitats in Ireland and has led a campaign to recover and restore large scale habitats in Kildare for birds and nature. Lorraine is an experienced ornithologist, with experience carrying out bird surveys for both ecological consultancies and voluntary organisations.
Adrian Allen	Ornithological surveys	Adrian holds a BSc in Environmental management, is a Qualifying Member of CIEEM, a member of the British Trust for Ornithology and the Botanical Society of Britain and Ireland. Adrian is a skilled and highly experienced ornithologist, with over 20 years' experience carrying out bird surveys for various organisations including ecological consultancies. These surveys include general breeding/wintering bird, hinterland, vantage point, breeding waders/raptors and specialised surveys for hen harrier, merlin, barn owl and woodcock. Adrian has experience in using a range of bird survey methodologies in an ecological consultancy capacity across various proposed wind energy projects. His surveys adhere to the required standards (SNH, 2017) and the survey methodologies he employs are the most up to date, ensuring his survey work is robust and adheres to best practice and relevant guidelines.

Contributor	Work/Surveys Completed	Biography
Joe Proudfoot	Ornithological surveys	Joe is an ornithologist with a BSc in Zoology. He has experience carrying out ornithological surveys in a commercial capacity having worked for a number of consultancies, and also on a voluntary basis conducting I-WeBS counts for Birdwatch Ireland. He is well-versed in the required survey methodologies and has completed vantage point, hinterland, breeding bird transect, wetland bird, raptor, breeding tern and breeding gull surveys.
Cian Cardiff	Ornithological surveys	Ornithologist with many years experience, field surveyor and consultant since 2019 (undertook training in with Veale Ecology). Also studied bird biodiversity and survey techniques, working on a broad range of bird studies, including reporting covering of field studies findings carried out by CC Ornithology, bird tour guide, public speaker, writer (has written many articles on birds and bird identification) and photographer. Owner of CC Ornithology and The life of an Irish Birder (bird tour guiding).
Thomas Cardiff	Ornithological surveys	Lifelong ornithologist, working as a professional field surveyor since 2021 with CC Ornithology. Completed training in field surveying for ecological consultancy with CC Ornithology. Experienced in a broad range of field survey methods including vantage point watches, breeding bird and breeding water transects, woodcock surveys, I-WeBs counts and hen harrier roost watches.

APPENDIX 8-2.2

Ornithological Baseline Report

FEHILY TIMONEY

DESIGNING AND DELIVERING
A SUSTAINABLE FUTURE

DREHID WIND FARM

Baseline Ornithological Report

Prepared for:

North Kildare Wind Farm Ltd

Date: May 2025

Unit 3/4, Northwood House, Northwood Crescent,
Northwood, Dublin, D09 X899, Ireland

T: +353 21 496 4133 | E: info@ftco.ie

CORK | DUBLIN | CARLOW

www.fehilytimoney.ie

Baseline Ornithological Report

REVISION CONTROL TABLE, CLIENT, KEYWORDS AND ABSTRACT

User is responsible for Checking the Revision Status of This Document

Rev. No.	Description of Changes	Prepared by:	Checked by:	Approved by:	Date:
0	Final	ÉSS/KB	BOD	JH	27/05/2025

Client: North Kildare Wind Farm Ltd.

Keywords: Baseline, Ornithological Surveys, Wind Farm, Summer 2022, Summer 2023, Winter 2021/22, Winter 2022/23

Abstract: Fehily Timoney and Company is pleased to submit this Baseline Ornithological Report to North Kildare Wind Farm Ltd. in relation to ornithological surveys carried out to inform the EIA.

TABLE OF CONTENTS

LIST OF APPENDICES

LIST OF FIGURES

Page

LIST OF TABLES

Page

1. INTRODUCTION

Fehily Timoney and Company (FT) was appointed by North Kildare Wind Farm Ltd. to undertake ornithological surveys at the proposed Drehid wind farm over summer 2021, summer 2022, summer 2023, winter 2021/22, winter 2022/23, and additional spring migration surveys in 2022 and 2023. This report presents the results of the ornithological surveys and summarises the activity of bird species during this survey period. The study area of Drehid Wind Farm is located within Drehid, Co. Kildare.

This ornithological assessment for surveys includes the assessment of bird species occurring within the proposed site boundary, and surveys of surrounding habitats of value to birds. Surveys adhered to Scottish Natural Heritage guidance (Scottish Natural Heritage Guidance, 2017). The following surveys were carried out: Vantage point, breeding transects, winter transects, breeding wader surveys, raptor surveys, barn owl surveys, woodcock surveys, merlin surveys, and hinterland surveys.

1.1 Study Area

The proposed Drehid Wind Farm Site includes lands in the townlands of Ballynamullagh, Kilmurry, Killyon, Coolree, Mulgeeth, Drehid and Dunfierth and is ca. 107ha in size. The site is accessed from the M4 motorway until Enfield, then along the R402 for ca. 7.7km and finally along the local road (L5025) to the entrance of the site. The site lies c. 2.8km south of the M4 motorway at Enfield and 1.2km southeast of the R402 regional road. Figure 1-1 details the location of the proposed Drehid Wind Farm.

The site of the Proposed Development is located in relatively low-lying but undulating land with the majority of proposed turbines located beneath the 80m contour line. The landcover is classified in Corine as 2.3.1 Pastures; 3.1.2 Coniferous Forest and 3.2.4 Transitional Woodland shrub. The east of the Site is adjacent to a cutover bog (Timahoe Bog). The Fear English River passes through the Site and travels along its eastern boundary. The landscape is classified as being of low sensitivity from a landscape perspective.

The GSI 1:100,000 scale bedrock geology map shows that Lucan Formation (Calp) underlies the Drehid Wind Farm site. Lucan Formation comprises varied dark grey to black basinal limestone and shale beds. Fieldwork confirmed the presence of peat over a large proportion of the site area; with peat depths varying between 0.2m to 4.4m with an average depth of peat of approximately 2.2m.

The Fear English River also known as Blackwater (Longwood)_020[2] dissects the proposed development. This waterbody is a tributary of the River Blackwater. The main tributary of the River Boyne is the River Blackwater and a number of its small tributaries.

SPAs are designated under the EU Birds Directive (2009/147/EC) ('The Birds Directive'). There is one Special Protection Area within a 15 km radius of the proposed Drehid Wind Farm. The full NPWS Site synopses for designated areas are available on www.NPWS.ie. Sites of National Importance in Ireland are termed Natural Heritage Areas (NHAs) and proposed Natural Heritage Areas (pNHAs). A total of four NHAs and 11 pNHAs are present within 15 km of the Proposed Development One of which, Ballynafagh Bog pNHA (000391) is of importance for bird species, and is noted as being within the territory of a breeding pair of Merlin (NPWS, 2013). See Table 1-1 for details.

[2] WDF River Sub Basin identification: EPA Maps, accessed December 2018: https://gis.epa.ie/EPAMaps/

Table 1-1: Special Protection Areas (SPAs), Natural Heritage Areas (NHAs) and proposed Natural Heritage Areas (pNHAs) within the 15km of the proposed Wind Farm Site

Site	Code	Features of Interest	Summary Description	Closest Turbine
Sites of International Importance				
River Boyne and River Blackwater SPA	004232	Kingfisher (*Alcedo atthis*) [A229]	The River Boyne and River Blackwater SPA is a linear site comprised of the River Boyne and a number of its tributaries. The site has been designated for special conservation interest Kingfisher.	10.2 km (turbine 6)
Sites of National Importance				
Royal Canal pNHA	002103	Aquatic Flora and Fauna, Corridor value	The Royal Canal is a man-made waterway linking the River Liffey at Dublin to the River Shannon near Termonbarry Co. Longford. The canal has been designated as an NHA which is generally comprised of the central channel and the banks on either side of it.	3.3 km (turbine 11)
Carbury Bog NHA	001388	Raised Bog Habitat	The site consists of four sections separated by the old Edenderry railway line and the Carbury-Broadford road. A narrow strip of deciduous woodland cuts through the main section in line with the old railway. Much of the high bog has vegetation typical of a Midland Raised Bog.	3.8 km (turbine 5)
Grand Canal pNHA	002104	Diversity of species, corridor value, Flora Protection Order Species	The Rare and legally protected Opposite-leaved Pondweed (Groenlandia densa) (Flora Protection Order 1999) is present at a number of sites in the eastern section of the Main Line.	5.5 km (turbine 1)

Site	Code	Features of Interest	Summary Description	Closest Turbine
			The ecological value of the canal lies more in the diversity of species it supports along its linear habitats than in the presence of rare species.	
Ballina Bog pNHA	000390	Raised Bog Habitat	Ballina Bog is situated about 8km west of Enfield and just south-west of Moyvalley in an elongated valley in Co. Kildare. Much of the surface is of good quality and quite wet in spite of the presence of many drains.	5.5 km (turbine 6)
Hodgestown Bog NHA	001393	Raised Bog Habitat	The site comprises a raised bog that includes both areas of high bog and cutover bog.	6 km (turbine 2)
Donadea Wood pNHA	001391	Two rare species of Myxomycete fungus and woodland	This site is located about 6km north of Prosperous in Co. Kildare. The entire site has been planted with a mix of deciduous and coniferous trees. The site is notable for the presence of two rare species of Myxomycete fungus, namely Diderma chondrioderma and Licea testudinacea, the latter in one of only two known Irish sites	7.3 km (turbine 10)
The Long Derries, Edenderry pNHA (also an SAC)	000925	[6210] Orchid-rich Calcareous Grassland*	The Long Derries is located approximately 5 km south-east of Edenderry in Co. Offaly and is part of a low esker ridge running from Edenderry to Rathdangan. It consists primarily of glacial gravels interspersed with loam and peat soil.	8 km (turbine 1)
Ballynafagh Lake pNHA	001387	[7230] Alkaline Fens [1016] Desmoulin's Whorl Snail (*Vertigo moulinsiana*)	Ballynafagh Lake is located about 2 km north-west of Prosperous in Co. Kildare.	8 km (turbine 2)

Site	Code	Features of Interest	Summary Description	Closest Turbine
(also an SAC)		[1065] Marsh Fritillary (*Euphydryas aurinia*)	It is a shallow alkaline lake with some emergent vegetation. The Blackwood Feeder, which connects Ballynafagh Lake to the Grand Canal, is also included in the site. The site contains the Annex Habitat Alkaline fens [7230].	
Ballynafagh Bog pNHA (also an SAC)	000391	[7110] Raised Bog (Active)* [7120] Degraded Raised Bog [7150] Rhynchosporion Vegetation	The site is a raised bog situated c.1km west of Prosperous, Co. Kildare. The site contains the priority habitat active raised bog and also supports breeding Merlin.	8.7 km (turbine 2)
Molerick Bog NHA	001582	Peatlands [4]	Comprises a raised bog that includes both areas of high bog and cutover bog. The site is bounded by the Dublin-Sligo railway line to the north and local roads to the east.	12.7 km (turbine 6)
Black Castle Bog NHA	000570	Peatlands [4]	Raised bog that includes both areas of high bog and cutover bog. The north-western margins of the site are bounded by roads and those on the south-east are bounded mainly by scrub and woodland.	14.3 km (turbine 1)
Mount Hevey Bog pNHA (also an SAC)	001584	Active raised bogs [7110] Degraded raised bogs still capable of natural regeneration [7120] Depressions on peat substrates of the Rhynchosporion [7150]	The site comprises a raised bog that includes both areas of high bog and cutover bog. The Dublin-Sligo railway runs through the northern part of the bog isolating two northern lobes. The northern lobes are adjacent to the Royal Canal.	14.8 km (turbine 6)

Site	Code	Features of Interest	Summary Description	Closest Turbine
Ballynabarny Fen pNHA	001573	Fen vegetation	This sedge-rich fen lies in a small, deep, artificially-created valley between the embankments of the Royal Canal and the nearby railway, and is situated about 3km. west-north-west of Longwood.	10.9 km (turbine 6)
Rathmoylan Esker pNHA	000557	Eskers Woodland	Comprised of several segments of eskers near the village of Rathmoylan. Several parts of these eskers have been colonised by semi-natural deciduous and mixed woodland.	10.5 km (turbine 11)
Mouds Bog pNHA (also an SAC)	002331	Active raised bogs [7110] Degraded raised bogs still capable of natural regeneration [7120] Depressions on peat substrates of the Rhynchosporion [7150]	Mouds Bog is located north-west of Newbridge in Co. Kildare, close to the Hill of Allen. The site comprises a raised bog that includes both areas of high bog and cutover bog. Much of the margins of the site are bounded by trackways.	14.4 km (turbine 2)
Royal Canal pNHA	002103	Aquatic Flora and Fauna, Corridor value	The Royal Canal is a man-made waterway linking the River Liffey at Dublin to the River Shannon near Termonbarry Co. Longford. The canal has been designated as an NHA which is generally comprised of the central channel and the banks on either side of it.	3.3 km (turbine 11)

Path: R:\Map Production\2020\P20-326\Workspaces\P20_326_Report_Figures\P20_326_Report_Figures.aprx

Legend

Proposed Development Boundary

TITLE: Site Location	
PROJECT: Drehid Wind Farm and Substation	
FIGURE NO: 1.1	
CLIENT: North Kildare Wind Farm Ltd.	
SCALE: 1:25,000	**REVISION:** 0
DATE: 01/05/2025	**PAGE SIZE:** A3

FEHILY TIMONEY
Cork | Dublin | Carlow
www.fehilytimoney.ie

N W E S

0 0.5 1 2 Kilometers

2. SURVEY METHODOLOGY

The following surveys were carried out: Vantage Point (VP), breeding transects, winter transects, breeding wader surveys, woodcock surveys, merlin surveys, hinterland surveys, barn owl surveys, and raptor surveys. Methodologies for these surveys are detailed below.

2.1 Target Species

The following criteria have been utilised to select target species for the current study. SNH guidance (Scottish Natural Heritage Guidance, 2017)on the assessment of the effects of wind farms on ornithological interests suggests that there are four important lists from which target species be drawn, as follows:

- Species listed on Annex 1 of the Birds Directive;
- Red-listed birds of Conservation Concern;
- Schedule 1 of the Wildlife and Countryside Act 1981 (not applicable in Ireland); and
- Regularly occurring migratory species.

In the Irish context, it has been suggested that target species should be taken from species of conservation concern in Ireland (Gilbert et al., 2021), those likely to occur within the vicinity of the proposed wind farm, and those most at risk from particular impacts such as disturbance and displacement (Nairn and Partridge, 2013).

'Birds of Conservation Concern in Ireland' (BoCCI) are classified into three separate lists; red, amber and green. Red-listed species are of high conservation concern, amber-listed species are of medium conservation concern and green-listed species are not considered to be of conservation concern (Gilbert et al., 2021).

Additionally, a review of the bird species listed on Annex I on the EU Birds Directive (2009/147/EC) was undertaken in assessing the conservation status of birds. Annex I species are often afforded additional protection through the designation of Special Protection Areas (SPAs) throughout EU countries in addition to existing national legislation.

The primary target species for these surveys were: all raptors and owls, all wild goose, swan and duck species, all waders, and all gull species.

In addition to the above, consideration was given to species identified as being of local or regional conservation concern, particularly those susceptible to impacts from wind farm development. Note that not all species on the above lists are categorised as target species, e.g., most passerine species and general lowland farmland birds are not considered to be particularly susceptible to impacts from wind farms (Scottish Natural Heritage Guidance, 2017).

2.2 Vantage Point Surveys

Vantage Point (VP) surveys were carried out at the proposed Drehid Wind Farm site during the breeding seasons of April to September 2022 and April to September 2023 and non-breeding seasons of October 2021 to March 2022 and October 2022 to March 2023, in accordance with Scottish Natural Heritage (SNH) methodology for onshore Wind Farms (Scottish Natural Heritage Guidance, 2017).Additional migration VP watches were also completed in Spring 2022 and 2023. A total of two VP locations overlooking the Drehid wind farm flight activity study area were used during the VP survey (see Figure 2-1). These were chosen to cover specific viewsheds of the Proposed Wind Farm and to encompass a 500m buffer zone around the proposed turbine layout of the wind farm. SNH (2017) guidance states that viewsheds should cover a 500 m circular buffer drawn around each proposed turbine location. This buffer is referred to as the 'SNH Buffer' (see Figure 2-1).

The flight activity study area, comprised of the combined viewsheds, overlaps the Proposed Wind farm and the Proposed Substation. This 'flight activity study area, or 'study area' is utilised as a geographic descriptor when detailing the results of flight activity surveys (Section 3.2).

The combined viewshed coverage of the SNH buffer is 95.91%.

The main purpose of VP survey watches is to collect data on target species that will enable estimates to be made of:

- The time spent flying over the defined survey area;
- The relative use of different parts of the defined survey area; and
- The proportion of flying time spent within the upper and lower height limits as determined by the rotor diameter and rotor hub height.

VP locations were based on observations from walkover/reconnaissance surveys, viewshed analysis (using GIS) and collated information on known feeding and roosting sites from both desktop review and consultation. The number and location of vantage points was selected in order to achieve visibility of the entire study area and important features for birds in close proximity to the site (e.g., lakes, wetlands).

In line with recommended best practice (Scottish Natural Heritage Guidance, 2017) (Band et al. 2007 and Band, 2024), viewshed analysis was undertaken using ArcMap, to calculate a theoretical zone of visibility from each vantage point. Visibility is calculated from each vantage point along an invisible layer suspended at the predicted lowermost height passed through by the rotor blade tips, using an observer height of 1.5 m. We note the following from SNH guidance in respect of priority areas for viewshed analysis (emphasis added):

> *"Where the key purpose is to estimate the risk of collision with turbines, it is the visibility of the airspace to be occupied by the turbine rotors (the collision risk volume) that is of prime importance. Therefore, it is recommended that visibility be calculated using the least visible part of this airspace, i.e. an imaginary layer suspended at the lowermost height passed through by the rotor blade tips (typically about 20-30m above ground level). Predicting visibility at this level is a simple task using GIS, however it should be noted that the baseline should take account of any forestry or other features that will potentially obstruct the view. For example, forestry may be 10-30m high and if viewshed height is taken as 20-30m ground level the visible area could be overestimated if there is forestry within the viewshed. Being able to view all or most of the site to ground level can be helpful in gauging overall bird activity and usage of the site but is not as important as being able to view the collision risk volume"*

Following SNH guidance (2017), watches were conducted to sample diurnal and crepuscular activity of target species, exceeding the required effort from SNH.

Data recorded included flight activity of target species (flight height, duration, directionality) in addition to metrics such as flock size (per recorded transit) and time of observation. Detailed notes of each observation of a target bird species was recorded including behaviour, gender (where possible), numbers, flight height, associated habitat and the period of time spent within the study area. Successful foraging events were also noted if they arose. Other bird species seen or heard during the VP surveys were also recorded and were considered separately in the analysis as additional species. Flight activity was annotated onto field maps. Total numbers of birds present both on arrival at the vantage point and on departure is noted. The Vantage Point survey schedule can be found in Appendix 1, and Vantage Point survey results can be found in Appendix 2. Details of each flight-path observation are provided Appendix 3. Binoculars and telescopes are used to scan for target species. Dictaphones are utilised to dictate bird heights whilst tracking flight events.

Flight heights are estimated visually as allowed for in SNH (2017) guidance. Flight height estimation using a clinometer or rangefinder is accepted as an alternative means of determining flight height however this is often not practicable (equipment may be clumsy and birds may be lost from view whilst trying to focus additional equipment on a target species rapidly moving out of sight); it should be noted that in practice many flocks of swans do not fly close enough to a surveyor for a rangefinder to be used, resulting in most flights heights being estimated in any case. As is often the case an experienced observer will be able to record accurate observations at a higher frequency.

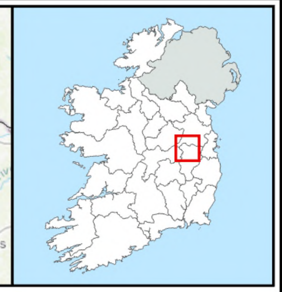
VP surveys involved carrying out 2 x 3-hour VPs at each VP every month. As per SNH guidance (2017), the requisite 36 hours were carried out at each vantage point during the breeding period, and 36 hours during the wintering period. Additional VP survey rounds (6 hours per VP) were conducted in April 2022 and April 2023 to cover the spring migration period, and an additional three hours of VP survey time was completed in July 2023, exceeding SNH (2017) requirements.

The bird activity recorded both inside and outside the Proposed Wind Farm and Proposed Substation site boundaries was used as part of the overall analysis and assessment of target species usage of the study area. Details of vantage point locations can be found in Table 2-1 below. All surveys were conducted during suitable weather conditions.

Table 2-1: Vantage Point Locations (ITM)

Vantage Point	Eastings (ITM)	Northings (ITM)
VP 1	673136	735084
VP 2	676257	736663

Path: R:\Map Production\2020\P20-326\Workspaces\P20_326_Report_Figures\P20_326_Report_Figures.aprx



Legend

- Proposed Development Boundary
- VP2 Viewshed
- VP1 Viewshed
- 500m
- VP Locations
- Turbine Locations

TITLE:	Vantage Point Locations and Viewshed Analysis		
PROJECT:	Drehid Wind Farm and Substation		
FIGURE NO:	2.1		
CLIENT:	North Kildare Wind Farm Ltd.		
SCALE:	1:25,000	**REVISION:**	0
DATE:	01/05/2025	**PAGE SIZE:**	A3

FEHILY TIMONEY
Cork | Dublin | Carlow
www.fehilytimoney.ie

0 0.5 1 2 Kilometers

2.3 Breeding Bird Transect Surveys

For general breeding birds the method utilised was based on the existing British Trust for Ornithology (BTO) Breeding Bird Survey (BBS or CBS; Bibby et al. 2000). In 2021, the study area comprised one c. 0.6 km and one 2.2 km transects centred on different habitats present within the subject site (see Figure 2 2). In 2022 and 2023, the study area comprised two transects centred on different habitats present within the subject site. Each transect was c. 2 km in length but was subdivided into two 1 km transects (see Figure 2-2).

Breeding bird transects were carried out over three years (2021, 2022 and 2023). Birds were counted over two visits per breeding season, each timed to coincide with the early part of the breeding season (April to mid-May) and later part of the season (mid-May to July). Surveyors recorded all birds seen or heard as they walked methodically along the transect routes.

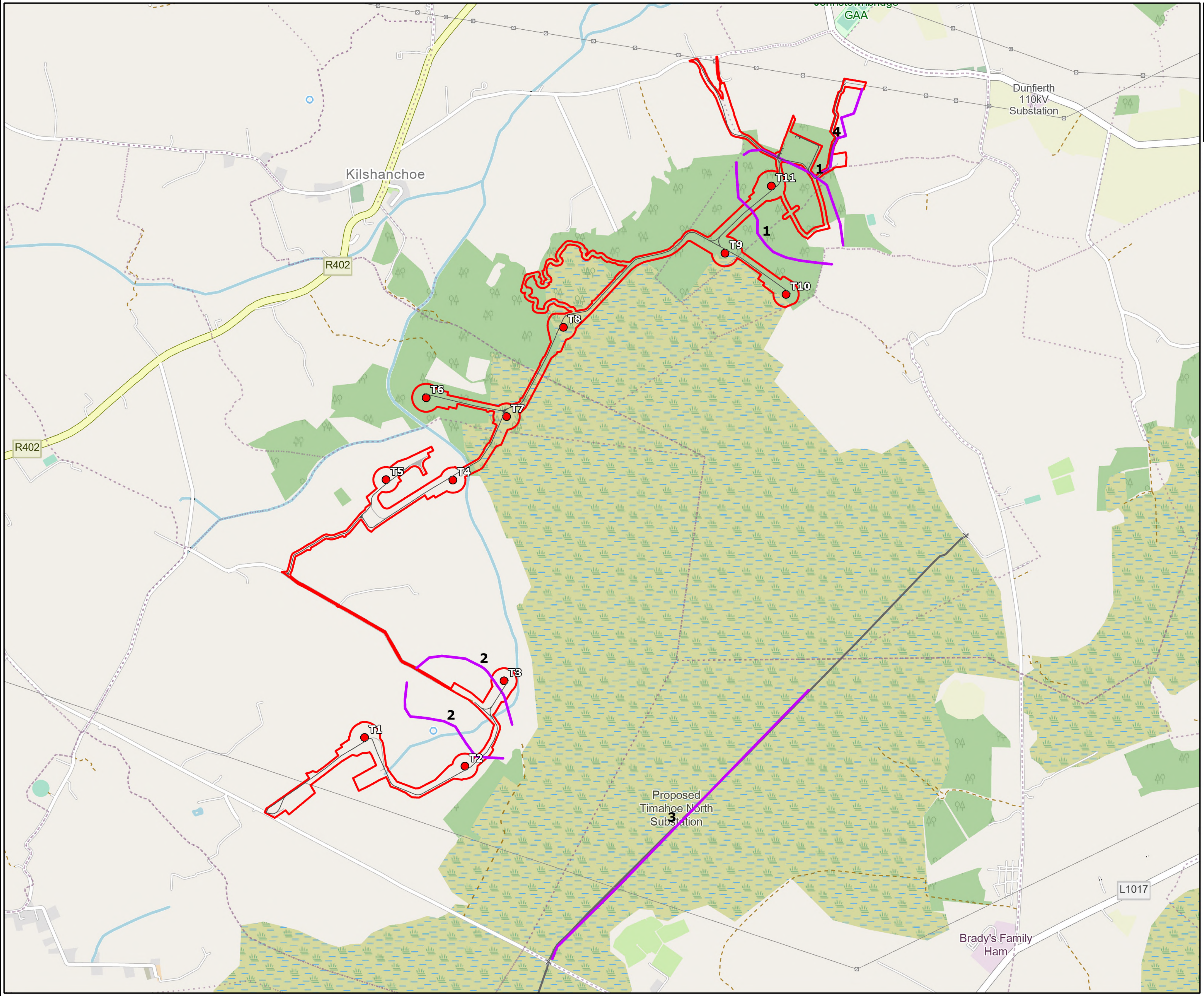
Birds were noted in three distance categories, measured at right angles to the transect line (within 25 m, between 25 m-100 m and over 100 m from the transect line) and those seen in flight only. Recording birds in distance bands gives a measure of bird detectability and allows relative population densities to be estimated if required (BTO, 2018).

Table 2-2 below details the breeding bird transect survey schedule, and includes the weather conditions for each survey.

Table 2-2: Breeding Bird Transect Survey Details

Date	Cloud (Oktas)	Precipitation	Visibility	Wind Speed (Beaufort)	Wind Direction	Transect	Start	End
Summer 2021								
23/04/2021	0	Dry	Good	1	E	4	07:00	09:30
07/05/2021	0	Dry	Good	1	E	3	09:00	11:00
25/05/2021	8	Dry	Good	1	W	4	07:00	09:00
29/05/2021	4	Dry	Good	0	-	3	07:00	09:00
Summer 2022								
14/05/2022	1	Dry	Good	1	-	1	07:20	07:55
14/05/2022	1	Dry	Good	1	-	1	08:15	08:50
14/05/2022	6	Dry	3-5km	2	-	2	10:10	10:35
14/05/2022	6	Dry	3-5km	2	-	2	09:30	10:00
01/07/2022	7	Dry	Good	1	-	1	08:00	08:30
01/07/2022	7	Dry	Good	2	-	2	09:15	09:35
01/07/2022	6	Dry	Good	2	-	2	09:40	09:55
01/07/2022	8	Light Drizzle	3-5km	4	-	1	07:15	07:55
Summer 2023								
16/05/2023	-	Dry	Ex.	2	NW	1 + 2	08:00	10:00
08/06/2023	-	Dry	Ex.	3	NE	1 + 2	09:00	10:45

Path: R:\Map Production\2020\P20-326\Workspaces\P20_326_Report_Figures\P20_326_Report_Figures.aprx



Legend

- Proposed Development Boundary
- Access Track
- Temporary Access Track
- Breeding and Wintering Bird Transects
- Turbine Locations

TITLE:	Breeding/Wintering Bird Survey Transects
PROJECT:	Drehid Wind Farm and Substation
FIGURE NO:	2.2
CLIENT:	North Kildare Wind Farm Ltd.
SCALE: 1:22,500	**REVISION:** 0
DATE: 15/05/2025	**PAGE SIZE:** A3

FEHILY TIMONEY
Cork | Dublin | Carlow
www.fehilytimoney.ie

0 0.5 1 2 Kilometers

2.4 Transect Surveys during Winter Months

General wintering bird transects methodology followed the same methodology as the breeding bird transects. These transects were carried out during the 2021/22 non-breeding season, where three survey rounds were undertaken between December 2021 and March 2022.

The wintering bird transect schedule is available in Table 2-3:

Table 2-3: Wintering Bird Transect Survey Details

Date	Cloud (Oktas)	Precipitation	Visibility	Wind Speed (Beaufort)	Wind Direction	Transect	Start	En
15/12/2021	0	Dry	3-5km	1	SW	1	11:00	15:30
16/12/2021	8	Dry	3-5km	1	SW	2	10:30	14:30
03/01/2022	4	Dry	Good	2	S	2	10:00	13:00
03/01/2022	8	Dry	Good	3	S	1	13:15	14:45
15/02/2022	4	Dry	3-5km	2	W	2	11:50	14:00
15/02/2022	7	Dry	3-5km	2	NW	1	10:00	11:30

2.5 Breeding Wader Surveys

Survey transects to assess the presence of breeding wader populations were completed during the 2021, 2022 and 2023 breeding seasons. A number of methods were combined from published literature including Bibby et al, (2000), Gilbert et al, (1998), O'Brien & Wilson (2011) and SNH (2017) to estimate numbers of target species breeding within this envelope.

Methods utilised were grouped into two categories; those for breeding lapwing *Vanellus vanellus* and those for other species such as curlew *Numenius arquata*, common snipe *Gallinago gallinago*, redshank *Tringa totanus*, common sandpiper *Actitis hypoleucos* and ringed plover *Charadrius hiaticula*. For each species, a pre-defined matrix of suitable habitats was created and used to select target habitats for survey (Table 2-4):

Table 2-4: Target Species and associated suitable breeding habitat

Target Species	Suitable Breeding Habitat
Lapwing	Lowland wet grassland, arable farmland, cutover bog with pools and wet grassland
Snipe	Wet pastures, marsh, bogs (intact and cutover) and fens
Redshank	Bog
Curlew	Bog
Common Sandpiper	Streams/rivers in bog
Ringed Plover	Cutover bog, milled peat with exposed gravel

Survey methods for lapwing followed those in Bibby et al. (2000) where the primary count unit for breeding birds is defined as an incubating female. In addition, displaying birds, birds standing guard near nests or distraction displays were also recorded as indications of occupied territories. Extensive areas of open ground were covered from roads, farm tracks or roadsides (where possible); larger areas of open ground not visible from easily accessible vantage points were walked using transects.

Surveys were carried out during the time periods recommended in Bibby et al. (2000) although territorial behaviour noted outside these periods was also utilised in the assessment. For all additional species of wader the employed method was the same and utilised transects walked through suitable habitat within three hours of dawn or dusk. Count units were predefined for each target species and included in the method statement provided to surveyors (See Table 2-5).

Table 2-5: Count Units for each Wading Species

Species	Unit
Lapwing	Incubating Bird
Common Snipe	Drumming or Chipping Bird
Redshank	Alarming Bird
Ringed Plover	Presence or Absence/ Fledged Young late in season
Common Sandpiper	Presence or Absence/ Fledged young late in season
Curlew	Territorial Activity

All suitable habitats for waders were visited and observations were made along four transects (Figure 2-3), between the months of April - May (2021), May - July (2022) and May - June (2023). Breeding wader summary sheets were compiled at the end of the breeding season, indicating in each case the minimum number of breeding pairs/occupied territories known to occur.

All species encountered (seen or heard) were recorded and their abundance, behaviour, sex/age and breeding status noted. Any species occurring more than 100 m from the observer, or flying over the site and not using it, were recorded as 'additional' species to further inform the baseline survey. Table 2-6 details survey dates and weather conditions.

Table 2-6: Breeding Wader Survey Details

Date	Transect	Cloud (Oktas)	Precipitation	Visibility	Wind Speed (Beaufort)	Wind Direction	Start	End
2021								
24/04/2021	3	7	Dry	Good	0	-	07:00	08:00
25/04/2021	3	7	Dry	Good	0	-	10:00	11:00
07/05/2021	3	0	Dry	Good	0	-	11:00	15:00
16/05/2021	3	8	Dry	Good	0	-	07:00	11:00
29/05/2021	3	4	Dry	Good	0	-	09:30	11:30
2022								
17/05/2022	A	2	Showers	Good	F2	-	07:30	08:30
17/05/2022	B	2	Showers	Good	F2	-	08:30	09:30
31/05/2022	A	2	Dry	5 + km	F2	S	05:50	07:05
31/05/2022	B	2	Dry	5 + km	F2	S	07:05	08:20
04/07/2022	A	8	Dry	Good	F2	-	21:30	22:30
04/07/2022	B	8	Dry	Good	F2	-	22:30	23:30
2023								
16/05/2023	A & B	-	Dry	Ex.	F2	-	10:00	12:00
08/06/2023	A & B	-	Dry	Ex.	F3	-	10:45	13:30
26/06/2023	A & B	7	Dry	3-5km	F1	-	21:44	22:55

2.6 Woodcock Surveys

Breeding season surveys were undertaken in 2021, 2022 and 2023 to determine the presence of breeding woodcock (*Scolopax rusticola*) and record any potential breeding activity.

During the 2021 and 2022 breeding seasons, dusk surveys were carried out using transect-based recording to assess for the presence of woodcock following the methods set out in Bibby et al. (2000) and Gilbert et al., (1998) where the primary count unit for breeding birds is defined as a displaying male. Survey effort was focused wooded habitats and clearings potentially suitable for use by breeding woodcock. Surveys were timed to take in the dusk period.

Table 2-7: Woodcock Transect Survey Details 2021 & 2022

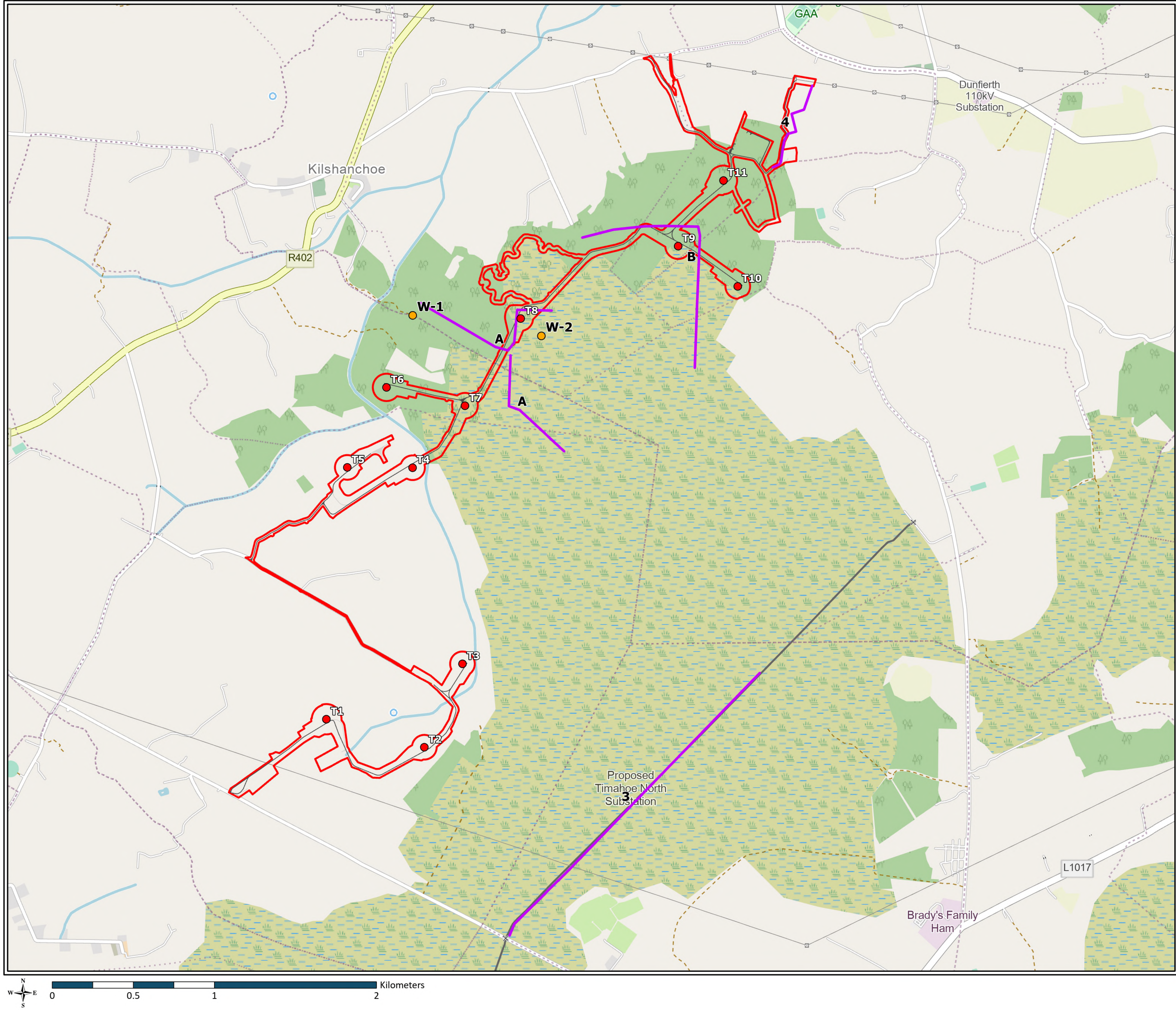
Date	Transect	Cloud (Oktas)	Precipitation	Visibility	Wind Speed (Beaufort)	Wind Direction	Start	End
Summer 2021								
14/05/2021	3	8	Dry	Good	0	N/A	20:15	22:00
26/05/2021	4	4	Dry	Good	0	N/A	21:10	22:30
Summer 2022								
13/05/2022	A + B	3	Dry	Good	F2	-	21:00	22:45
17/06/2022	A + B	7	Dry	Good	F1	-	21:00	23:15
06/07/2022	A + B	8	Dry	Good	F2	-	21:30	23:15

Dusk watches for woodcock were carried out from fixed points overlooking suitable woodcock breeding habitat during the 2023 breeding season. The survey methodology utilised was the method used for the UCC Breeding Woodcock Survey (adapted from Hoodless et al. 2009). Two points (see Figure 2-3) central to the site and located in a woodland clearing and facing a woodland edge were used as survey points from which the surveyor observed woodcock activity. All specimens encountered (seen or heard) were recorded and their abundance, behaviour, sex/age and breeding status noted. Table 2-8 details the survey dates and weather conditions.

Table 2-8: Woodcock Survey Details 2023

Date	VP	Cloud (Oktas)	Precipitation	Visibility	Wind Speed (Beaufort)	Wind Direction	Start	End
08/06/2023	W-1	7	Dry	Good	F1	NE	21:34	22:50
20/06/2023	W-2	8	Dry	Good	F1	-	21:43	22:58
26/06/2023	W-1	7	Dry	Ex.	F2	-	21:44	22:59

Path: R:\Map Production\2020\P20-326\Workspaces\P20_326_Report_Figures\P20_326_Report_Figures.aprx



Legend

- Proposed Development Boundary
- Access Track
- Temporary Access Track
- Wader Transects
- Woodcock Survey Points 2023
- Turbine Locations

TITLE: Breeding Wader Survey Locations	
PROJECT: Drehid Wind Farm and Substation	
FIGURE NO: 2.3	
CLIENT: North Kildare Wind Farm Ltd.	
SCALE: 1:22,500	**REVISION:** 0
DATE: 15/05/2025	**PAGE SIZE:** A3

FEHILY TIMONEY
Cork | Dublin | Carlow
www.fehilytimoney.ie

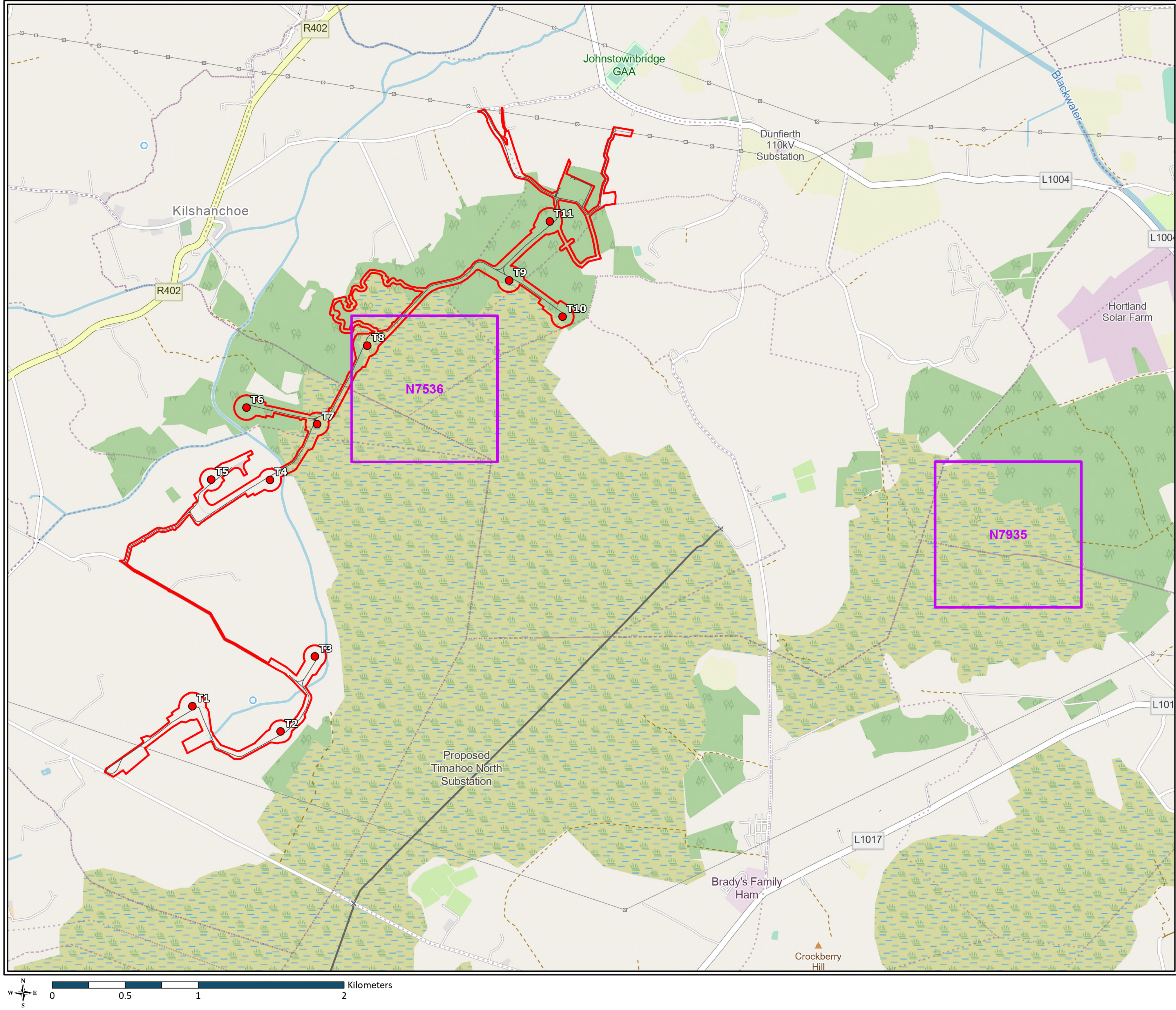
2.7 Merlin Surveys

A survey to assess the presence of merlin populations was completed during the 2023 breeding season. Merlin surveys were centred on suitable habitat for the species and methods used are based on previous surveys in Ireland (Lusby et al. 2011 and Fernandez et al. 2010); developed in association with Dr. John Lusby of BirdWatch Ireland. The study area for merlin is defined as a 1km square centrally placed on suitable habitat. A total of two 1 km grid squares were surveyed for merlin (N7935 and N7536). A total of three survey rounds were completed during the 2023 merlin breeding season (May 18th, June 24th and July 15th 2023). Weather conditions were suitable for all surveys (dry, F2, 6 to 8 Oktas with good to excellent visibility).

Prior to the survey, all areas within the squares identified as unsuitable for merlin (open water, urban areas, farmland, enclosed pastures and areas above 700m) were excluded from the target search area. The remaining habitat was walked using parallel transects 120m apart and intensively searched for evidence of merlin. Features such as suitable nest sites (old corvid nests) and suitable perches (posts, hummocks, boulders, remnant peat stands and root mats) are noted and the grid reference recorded.

Transect locations are recorded on orthophotographs of the study square. Recorded information/evidence is defined in the form of secondary merlin evidence (whitewash, pellets, feathers), prey remains (feather spots, moth wings, prey remains etc.), nests (possible or occupied) and direct observations (calling birds, displaying birds, hunting birds, inter-specific aggression etc.). The surveyor walked along conifer forestry edge and lines of fence posts throughout the site searching for pellets or plucking posts. Suitable prominent rocks were searched for in open habitats as they can also provide plucking points.

Path: R:\Map Production\2020\P20-326\Workspaces\P20_326_Report_Figures\P20_326_Report_Figures.aprx



Legend

- Proposed Development Boundary
- Merlin Survey Areas
- Access Track
- Temporary Access Track
- Turbine Locations

TITLE: Merlin Survey	
PROJECT: Drehid Wind Farm and Substation	
FIGURE NO: 2.4	
CLIENT: North Kildare Wind Farm Ltd.	
SCALE: 1:25,000	**REVISION:** 0
DATE: 15/05/2025	**PAGE SIZE:** A3

FEHILY TIMONEY
Cork | Dublin | Carlow
www.fehilytimoney.ie

2.8 Hinterland Surveys

The methodology used for wetland sites during winter hinterland surveys followed I-WeBS (Irish Wetland Bird Survey) methodology (Lewis et al., 2019), whereby each location was surveyed for the duration necessary to identify and obtain a count for all target species present. The same approach was adapted for non-wetland sites. A hinterland survey for raptors was conducted in accordance with Raptors: a field guide to survey and monitoring (Hardey et al. 2013) to assess raptor activity over the winter and breeding periods in the greater surroundings. The hinterland survey also encompassed searches for hen harrier breeding and roosting sites within 2km of the proposed wind farm, fulfilling the requirement set out in SNH Guidance (2017).

The surveys were carried out in suitable habitats for birds (woodland, wetland, peatland, farmland) in the area surrounding the proposed wind farm site. The survey was focused on nine sites within c. 10 km of the proposed Drehid Wind Farm (see Figure 2-5). Hinterland surveys were carried out between April 2021 and September 2023. The sites detailed in Table 2-10 were checked regularly across this period. These sites were chosen as they had suitable habitat for the following target species: raptors, waders, waterfowl, barn owl, geese and swans. The survey schedule and weather conditions can be found in Appendix 4.

2.8.1 Barn Owl

A high level assessment of potential barn owl habitat was undertaken based on observations during hinterland surveys, desktop assessment and information from local residents.

A targeted survey for barn owl was caried out during 26-27th June 2023 between 23:00 - 01:30. The guidance documents 'Survey and Mitigation Standards for Barn Owls to inform the Planning, Construction and Operation of National Road Projects' (TII, 2021) and Shawyer (2012) 'Barn Owl Tyto alba Survey Methodology and Techniques for use in Ecological Assessment' informed the survey. The surveys searched suitable breeding and foraging habitats, including areas overlapped by HVP2, HVP3, and local access tracks and roads within 5km of the Proposed Wind Farm traversing and accessing suitable habitats.

A search for suitable habitats and nest locations was also carried out during 22nd-25th May 2021. Extensive enquiries with local Birdwatch Ireland members and farmers were also undertaken.

2.8.2 Raptor Surveys

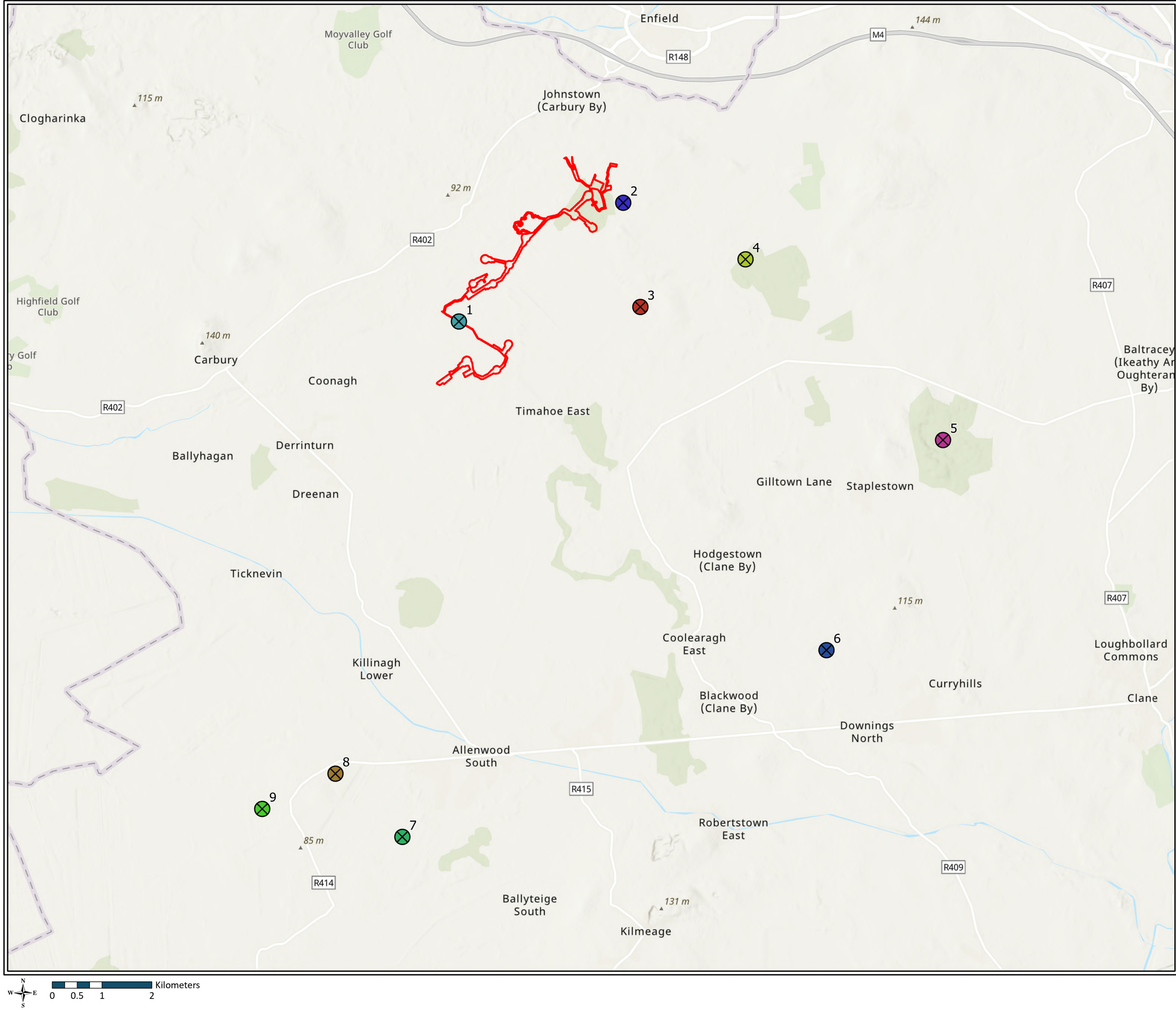
Targeted surveys to assess the presence of raptor populations following Hardey et al. (2013) were completed during the 2023 breeding season. The surveys involved visits to suitable breeding habitats within c.8 km of the proposed Wind Farm Site, examining the existing hinterland survey locations with an increased focus on raptor habitats. Following initial surveys covering HVP1 - HVP6, extended watches (2 - 2.5 hours length) were conducted at higher potential habitat locations.

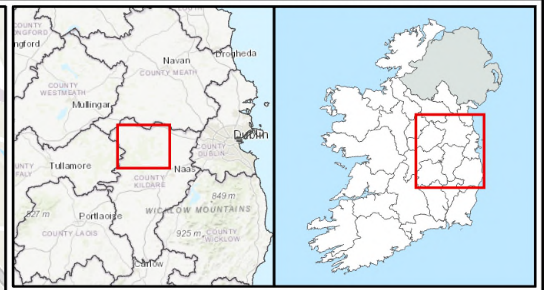
These surveys were carried out on June 08th and 20th, July 15th, August 15th, and September 13th 2023.

Table 2-9: Hinterland Survey Locations & Schedule

Code	Site Name	Distance/Direction from Nearest Turbine (km)	Nearest Turbine
HVP1	Drehid	0.8km S & N	T1 & T5
HVP2	Coolree	0.72km SE	T11
HVP3	Timahoe North	1.8km SE	T10
HVP4	Hortland	3.1km E	T10
HVP5	Donadea Forest	8.2km SE	T10
HVP6	Ballynafagh Lake & Bog	8.7km SE	T2
HVP7	Lodge Bog	9.5km S	T2
HVP8	Lullymore & Lodge Bog	8.7km SW	T2
HVP 9	Lullymore Wetlands	9.9km SW	T2

Path: R:\Map Production\2020\P20-326\Workspaces\P20_326_Report_Figures\P20_326_Report_Figures.aprx





Legend

Proposed Development Boundary

Site

1. Drehid
2. Coolree
3. Timahoe North Wetlands
4. Hortland
5. Donadea Forest Park
6. Ballynafagh Lake and Bog
7. Lodge Bog
8. Lullymore and Lodge Bog
9. Lullymore Wetlands

TITLE:	Hinterland Site Locations
PROJECT:	Drehid Wind Farm and Substation
FIGURE NO:	2.5
CLIENT:	North Kildare Wind Farm Ltd.
SCALE: 1:73,242	REVISION: 0
DATE: 13/05/2025	PAGE SIZE: A3

FEHILY TIMONEY
Cork | Dublin | Carlow
www.fehilytimoney.ie

3. RESULTS

3.1 Vantage Point Results

A total of 18 target species were recorded during VP surveys across the 2022 and 2023 breeding seasons, 2021/22 and 2022/23 non-breeding seasons, and additional 2023 spring migration season. Of these species, six are Red-listed under the BoCCI (Gilbert et al., 2021), namely golden plover, kestrel, lapwing, snipe, stock dove, and swift. Six species are Amber-listed, namely goshawk, herring gull, lesser black-backed gull, red kite, merlin and whooper swan. The remaining seven are Green-listed. Of these species, six are also protected under Annex I of the EU Birds Directive, namely golden plover, little egret, merlin, peregrine, red kite, and whooper swan.

In total, 532 records of 18 target species were observed during the survey period. All species, including non-target species found during VP surveys are listed in Table 3-1.

3.2 Target Species

3.2.1 Buzzard

Summer 2022

A total of 69 records of buzzard were made during the 2022 summer VP surveys, across both VPs. Four of which did not observe flight activity, and noted single buzzards perched in trees or calling in the south-eastern and northern portion of the Site. The majority of the remaining records (65) traversed the 500m turbine buffer. Observations were recorded across the study area, most of which overlapped in the southern portion of the 500m turbine buffer dominated by agricultural habitats, near turbines 1, 2 and 3. Observations were predominantly of lone individuals, however there were nine records of pairs within the buffer zone, and one record of a group of four Buzzards within the buffer zone. Buzzards were recorded circling, soaring, and perching in trees. No breeding or hunting activity was observed.

Spring Migration 2022

Four records of buzzard were detected during the 2022 spring migration surveys. One of which was a call-only record. The remaining three records noted buzzards traversing the 500m buffer zone. Of which, lone individuals were noted on two occasions and a pair was noted on one occasion. No breeding or hunting activity was observed.

Summer 2023

During the 2023 summer VP surveys, 28 records of buzzards were made. Most of these records (23) were within the 500m buffer zone, with many records again clustered in the agricultural habitats in the southern portion of the buffer zone near turbines 1, 2 and 3. Records were primarily of single individuals, however there were ten records of pairs, two records of groups of three Buzzards, and a single records of group of five individuals. Both soaring and displaying was traversed the 500m buffer zone. No hunting activity was observed.

Spring Migration 2023

Buzzard were observed on ten occasions during the 2023 spring migration VP surveys. Nine of which overlapped the 500m buffer zone. In April 2023, a pair of buzzards were sighted soaring in the northern portion of the 500m buffer zone. Later that day, a pair were sighted soaring and displaying in the southern portion of the study area. Groups of three, four and six individuals were also sighted during this survey.

Winter 2021/22

During the 2021/22 winter VP surveys, 35 records of buzzards were made. Most of these (29) traversed the 500m buffer zone, clustered within the southern portion of the buffer zone near turbines 1, 2 and 3. In February 2022, a pair were observed flying at rotor-swept height near this area. The remaining records were of lone individuals, flying through the Site or perching in nearby trees. No hunting activity was observed.

Winter 2022/23

A total of 19 records of buzzard were made during the 2022/23 non-breeding season. Most of which (17) traversed the 500m buffer zone. The majority of observations recorded lone individuals, however there were two records of a pair of Buzzards, and two records of a group of four. Buzzards were observed calling, displaying and soaring during these surveys. No hunting activity was observed.

3.2.2 Golden Plover

Golden plover were not observed during the 2022 summer or spring migration VP surveys.

Summer 2023

During the 2023 summer VP surveys, one record of golden plover was made. In September 2023, two individuals were observed flying over the study area and calling. The timing of which indicates migratory activity. No breeding behaviours or activity were observed.

Spring Migration 2023

During the 2023 spring migration surveys, two records of golden plover were made, where a distant flock of over 50 individuals was observed traversing the 500m buffer zone from VP 2 in April 2023. Later that day, a flock of 25 birds were observed within the 500m buffer zone near turbines 3, 4 and 7

Winter 2021/22

One record of golden plover was made during the 2021/22 winter VP surveys, where a flock of eight individuals were observed flying within the 500m buffer zone, near turbine 1.

Winter 2022/23

Six records of golden plover were made during the winter 2022/23 VP surveys. All six records overlapped the 500m buffer, with flocks of between three and 200 individuals recorded. Four of the six records observed birds flying at rotor-swept height. One record observed a flock of 200 individuals circling and calling over cutaway and intact raised bog, intersecting the 500m buffer near turbines 8, 9 and 10.

3.2.3 Goshawk

There were no observations of goshawk during the 2022 and 2023 spring migration surveys, 2022 and 2023 summer VP surveys, or the 2021/22 winter VP surveys.

Winter 2022/23

Goshawk was observed once during the 2022/23 winter VP surveys, in March 2023. An individual female was observed flying at rotor-swept height within the 500m buffer zone, between turbines 9 and 11. The surveyor noted this individual was recorded flying through and under a group of four soaring Buzzard, into the adjacent woodland. The surveyor noted there is potential breeding habitat in the general area for this species; however, no further observations were recorded and as such goshawk activity observed is limited to a single occurrence of a winter vagrant.

3.2.4 Great Black-backed Gull

Great black-backed gull were not observed during the 2023 spring migration surveys.

Summer 2022

This species was observed on 5 occasions during the 2022 summer VP surveys. All five records overlapped the southern portion of the 500m buffer zone, near turbines 1, 2 and 3. Lone individuals, pairs and groups of eight birds were observed during these surveys.

Spring Migration 2022

During the 2022 spring migration surveys, six records of great black-backed gull were made. In April 2022, a flock of 19 individuals were observed circling near turbine 2 before heading in an easterly direction. The remaining records observed single individuals or pairs.

Summer 2023

During the 2023 summer VP surveys, eight records of great black-backed gull were made. All of these observed individuals within the 500m buffer zone, with most records occurring in the southern portion of the study area near turbines 1, 2 and 3. One individual was noted landing in an agricultural field on May 9th 2023.

Winter 2021/22

Great black-backed gull were noted on 45 occasions during the 2021/22 non-breeding season. All records overlapped the 500m buffer zone. Records of lone individuals and flocks of up to 164 birds were noted, most of which were seen flying at rotor-swept height. On one occasion, 17 individuals were observed circling in a mixed flock with herring gulls within the buffer zone near turbine 2, in February 2022.

Winter 2022/23

During the 2022/23 non-breeding season, seven records of great black-backed gull were made. Five of these observed between two and 13 birds flying at rotor-swept height within the 500m buffer zone. The remaining two records involved two birds landing in a nearby agricultural field in December 2022 and a lone first-year observed in March 2023.

3.2.5 Grey Heron

Grey heron were not recorded during the 2022 spring migration, 2023 summer, or 2021/22 winter VP surveys.

Summer 2022

During the 2022 breeding season, two records of grey heron were made. Both of which noted lone individuals, located within the 500m buffer zone.

Spring Migration 2023

A single record of Heron was made during the spring migration surveys, where a lone adult was observed within the 500m buffer zone in April 2023.

Winter 2021/22

One record of grey heron was noted during the 2021/22 non-breeding season, which observed a lone adult traversing the 500m buffer zone.

Winter 2022/23

One record of grey heron was noted during the 2022/23 non-breeding season, which observed a lone adult within the 500m buffer zone.

3.2.6 Herring Gull

Summer 2022

During the 2022 breeding season, four records of herring gull were made. Three of which traverse the northern portion of the 500m buffer zone. Two records were of lone individuals, and one observed a group of six birds. Outside of the 500m buffer zone, a group of four birds were sighted.

Spring Migration 2022

During the 2022 spring migration surveys, two records of herring gull were made. A single individual was noted traversing the northern portion of the 500m buffer zone, and a flock of twenty individuals was noted circling the southern portion of the 500m buffer zone before heading east.

Summer 2023

Three records of herring gull were made during the 2023 summer VP surveys. All overlapped the 500m buffer zone. In May 2023, a flock of seven individuals was observed soaring near turbines 8, 9 and 10 in the north of the Site. In July 2023, a flock of three individuals was noted in the same area, made up of two first-year birds and one second-year bird. In June 2023, a flock of 42 birds was observed in the south of the Site, flying near turbines 1, 2, 3 and 4.

Spring Migration 2023

During the 2023 spring migration VP surveys, one record of this species was made, whereby three individuals were noted flying within the northern portion of the 500m buffer zone, between turbines 9, 10 and 11.

Winter 2021/22

A total of 86 records of herring gull were made during the 2021/22 winter VP surveys. All of these overlapped the 500m buffer zone. Records were noted across the study area, with most clustered within the southern portion of the buffer zone near turbines 1, 2 and 3. Observations noted lone individuals, and flocks of up to 290 birds. The majority of records were of smaller flocks of less than 50 individuals. Flocks of 75, 120, 129 and 290 birds were observed flying through the southern portion of the 500m buffer, near turbines 1 and 2 in January 2022.

Winter 2022/23

Herring gull were noted on 32 occasions during the 2022/23 winter VP surveys, all of which overlapped the 500m buffer zone. Lone individuals and flocks of up to 18 birds were noted across the study area. Two records noted flocks of three and four birds landing in agricultural fields. In March 2023, a flock of six birds made up of adults and first-years were recorded in the north of the Site near turbines 9, 10 and 11. Near turbine 9, a lone individual noted as a second-year was observed in January 2023.

3.2.7 Kestrel

Summer 2022

Kestrel were noted on 11 occasions during the 2022 summer VP surveys. All 12 records observed lone individuals flying at rotor-swept height within the northern section of the 500m buffer zone near turbines 9, 10 and 11. No breeding behaviours or hunting activities were observed.

Spring Migration 2022

One kestrel was noted during the 2022 spring migration surveys, where a single individual was observed flying within the northern portion of the study area near turbine 10.

Summer 2023

During the 2023 summer VP surveys, eight records of kestrel were made. All noted lone individuals flying at rotor-swept height within the northern section of the 500m buffer zone near turbines 8, 9, 10 and 11. One of these records noted a juvenile kestrel in September 2023, and another observed a single male moulting in August 2023. Hunting was observed on two occasions, in July and September 2023.

Spring Migration 2023

During the 2023 spring migration VP surveys, two records of kestrel were made. Both noted lone individuals flying at rotor-swept height within the northern section of the 500m buffer zone near turbines 9, 10 and 11 on April 6th 2023. One observation recorded a single female, and another recorded a single individual hunting and feeding. No breeding activity was detected.

Winter 2021/22

A total of 12 records of kestrel were noted during the 2021/22 winter VP surveys. All 12 records overlapped the 500m buffer zone. All 12 of these observations recorded lone individuals flying at rotor-swept height within the northern section of the 500m buffer zone near turbines 9, 10 and 11. The remaining record occurred outside the 500m buffer zone north-west of T3.

Winter 2022/23

A total of five records of kestrel were made during the 2022/23 winter VP surveys, all of which observed lone individuals flying at rotor-swept height within the northern section of the 500m buffer zone near turbines 9, 10 and 11. Hunting was observed on two occasions (single female hunting on March 22nd 2023; single individual hunting on March 20th 2023).

3.2.8 Lapwing

Lapwing were not observed during the 2022 or 2023 summer VP surveys, 2022 or 2023 spring migration VP surveys, or the 2022/23 winter VP surveys.

Winter 2021/22

One record of lapwing was made during the 2021/22 winter VP surveys. In February 2022, a group of four individuals were noted flying at rotor-swept height within the 500m buffer zone between turbines 1 and 2.

3.2.9 Lesser Black-backed Gull

Lesser black-backed gull were not noted during the 2022 spring migration VP surveys or 2022 summer VP surveys.

Summer 2023

A total of 12 records of lesser black-backed gull were made during the 2023 summer VP surveys. Lone individuals and flocks of up to 43 birds were noted across the study area, most of which were observed at rotor-swept height. Lesser Black-backed Gull were noted landing in fields on four occasions, and soaring on two occasions.

Spring Migration 2023

During the 2023 spring migration VP surveys, six records of this species were made, with three records occurring in the southern portion of the study area and two occurring in the northern portion of the study area. Records of lone individuals and flocks of up to 34 birds were observed flying, soaring and landing in fields.

Winter 2021/22

Two records of lesser black-backed gull were made during the winter 2021/22 VP surveys, whereby a group of four individuals were observed flying with a mixed flock of herring gull and great black-backed gull in January 2022. This observation overlapped the southern portion of the 500m buffer zone. In march 2023, a lone individual was sighted traversing the northern portion of the 500m buffer zone.

Winter 2022/23

During the 2022-23 winter VP surveys, a total of nine records of lesser black-backed gull were made. Most of these records occurred in the north of the study area near turbines 9, 10 and 11. Observations were predominantly of lone individuals, however groups of two and five birds were also noted.

3.2.10 Little Egret

Little egret were not observed during the 2023 summer VP surveys, 2022 or 2023 spring migration VP surveys, or the 2021/22 or 2022/23 winter VP surveys.

Summer 2022

One record of little egret was made during the 2022 summer VP surveys. On September 10th 2022, a single little Egret was observed flying at rotor-swept height in the southern portion of the 500m buffer zone, near turbine 2.

3.2.11 Merlin

Merlin were not observed during the 2022 or 2023 summer VP surveys, 2022 or 2023 spring migration VP surveys, or the 2022/23 winter VP surveys.

Winter 2021/22

Merlin were noted on two occasions during the 2021/22 winter VP surveys. Both records observed single individuals flying at rotor-swept height within the northern portion of the 500m buffer zone on November 30th 2021 near turbine 10. One of these observations recorded a single female being briefly chased by a male sparrowhawk.

3.2.12 Peregrine

Peregrine were not observed during the 2022 or 2023 summer VP surveys, 2022 or 2023 spring migration VP surveys, or the 2021/22 winter VP surveys.

Winter 2022/23

One record of peregrine was made during the 2022/23 winter VP surveys, where a lone individual was noted flying at rotor-swept height in the vicinity of turbines 1, 4 and 5, traversing the 500m buffer.

3.2.13 Red Kite

Red kite were not observed during the 2022 summer VP surveys, 2023 spring migration VP surveys, or the 2021/22 or 2022/23 winter VP surveys.

Summer 2023

One record of red kite was made during the 2023 summer VP surveys. On June 7th 2023, a single individual flew over the 500m buffer zone above the rotor swept height band (>170m altitude), between turbine 7 and 8.

3.2.14 Snipe

Snipe were not observed during 2022/23 winter VP surveys.

Summer 2022

Five records of snipe were made during the 2022 summer VP surveys, three of these records occurred in May, one in April, and one in June. Three of the five observations were call only records, with one call originating from the intact bog south-west of T10 and two from semi-intact bog habitats (one north-west of T7 and one north-west of T8). The remaining two records traversed the 500m buffer zone, and were clustered within the intact bog south of T9-T10. Records were all of lone individuals, concentrated in bog habitats in the north of the study area. Chipping was noted.

Spring Migration 2022

Snipe were observed on five occasions during the 2022 spring migration VP surveys. Two of which were call-only records. The remaining three records were of lone individuals, traversing the 500m buffer zone. All records were clustered within the intact raised bog habitat located to the south of T9 and T10 (outside proposed wind farm boundary).

Summer 2023

Snipe were observed twice during the 2023 summer VP surveys. Both records were observed from VP 2 in in June 2023.Records were of lone individuals traversing the 500m buffer zone, near turbines 9 and 10. One flew overhead at VP2, and the other was observed performing a display flight and calling.

Spring Migration 2023

A single record of snipe was made during the 2023 spring migration VP surveys, where on April 6th 2022, a single individual was observed in a display flight within the 500m buffer zone near turbines 9 and 10.

Winter 2021/22

During the 2021/22 winter VP surveys, four records of snipe were made. All traversed the northern portion of the 500m buffer zone, occurring near turbines 9, 10 and 11. Three of these records noted lone individuals, and one record noted a pair (December 20th 2021).

3.2.15 Sparrowhawk

Sparrowhawk were not observed during the 2023 spring migration VP surveys.

Summer 2022

A total of ten records of sparrowhawk were noted during the 2022 summer VP surveys. All ten records observed lone individuals flying at rotor-swept height. All of the flight lines overlapped the 500m buffer zone. Four of these records overlapped the southern portion of the study area near turbines 1 and 3, and the remaining six records occurred in the northern portion of the study area, near turbines 7, 8, 9, 10 and 11.

Spring Migration 2022

During the 2022 spring migration VP surveys, three records of sparrowhawk were made in April 2022. All records noted lone individuals traversing the 500m buffer zone. Records were made across the study area, with one record occurring in the north of the Site near turbine 9, another occurring in the centre of the Site near turbines 7 and 8, and another occurring in the southern portion of the study area.

Summer 2023

During the 2023 summer VP surveys, four records of sparrowhawk were made. In June 2023, a single sparrowhawk was observed near turbines 8 and 9 in the northern portion of the buffer zone. In September 2023, a single female individual was mobbed by house martin within the southern portion of the buffer zone near T1.

The remaining two records occurred in the southern part of the study area. On one of these occasions (June 7th 2023), a pair of sparrowhawk were observed flying to the south of the proposed development.

Winter 2021/22

A total of 14 records of sparrowhawk were noted during the 2021/22 winter VP surveys. All 14 records overlapped the 500m buffer zone. Three of these observations were noted in the southern portion of the 500m buffer zone: a group of three sparrowhawks was observed there on November 29th 2021; a lone individual was noted on there February 14th 2022, and a pair was observed on February 25th 2022. The remaining eleven records overlapped the northern portion of the 500m buffer zone near turbines 8, 9, 10, and 11, where ten records were of lone individuals and one record was of a pair.

Winter 2022/23

During the 2022/23 winter VP surveys, twelve records of sparrowhawk were made.. The majority of records were observed within the northern portion of the buffer zone, near turbines 8, 9, 10 and 11. Ten of these records noted lone individuals, and two noted pairs. In March 2023, a single adult was noted with prey, flying low within the buffer zone.

3.2.16 Stock Dove

Stock dove were not observed during the 2023 summer VP surveys, 2022 or 2023 spring migration VP surveys, or the 2021/22 or 2022/23 winter VP surveys.

Summer 2022

A total of two records of stock dove were made during the 2022 summer VP surveys. Both were noted on May 4th 2022, and were located in the south of the study area. One was observed within the 500m buffer zone, where a single individual was noted near turbine 1 and was observed landing in a tree. The other record was of a single individual flying inside the buffer zone.

3.2.17 Swift

Swift were not observed during the 2022 or 2023 spring migration VP surveys, or the 2021/22 or 2022/23 winter VP surveys.

Summer 2022

Two records of swift were made during the 2022 summer VP surveys. Both of which occurred on June 6th 2022, and noted birds within the 500m buffer zone, in the north of the Site near turbines 8, 9, 10 and 11. One record observed five individuals flying together, and the other noted two individuals flying together.

Summer 2023

Swift were observed on three occasions during the 2023 summer VP surveys. All three records occurred in the northern portion of the 500m buffer zone, near turbines T7-T11 and observed swift hawking. Two of these records identified two individuals, and the other noted four individuals.

3.2.18 Whooper Swan

Whooper swan were not observed during the 2022 or 2023 summer VP surveys, or the 2022 or 2023 spring migration VP surveys.

Winter 2021/22

A total of four records of Whooper Swan were made during the 2021/22 winter VP surveys. Three of these overlapped the 500m buffer zone. On December 21st 2022, a flock of seven adults and three juveniles were observed feeding in an agricultural field within the buffer zone near turbine 3. No flight activity occurred during this observation. Later that day, a flock of ten individuals was observed flying away from this the same area in a southeasterly direction. This is likely to be the same group noted feeding in the same area earlier. On January 22nd 2022, two individuals were sighted flying at rotor-swept height in the northern portion of the Site.

The remaining record occurred outside of the 500m buffer zone, near the south of the Site. This record noted a flock of 18 - 19 Whooper Swan feeding in an agricultural field immediately west of the buffer zone near turbines 1, 2 and 3.

Winter 2022/23

During the 2022/23 winter VP surveys, three records of Whooper Swan were made. One of these records involved a flock of 13 whooper swans flying within the 500m buffer near turbine 1 before landing in a field to the south of VP1 and feeding on January 24th 2023.

The remaining two records were located outside of the 500m buffer zone, to the south-west of the Site, where flocks of 13 individuals were sighted landing and feeding in agricultural fields near VP1 on December 21st 2022 and February 13th 2022.

Table 3-1: Bird Species recorded during VP Surveys

Common Name	Scientific Name	BoCCI	Annex I
Blackbird	*Turdus merula*	Green	No
Blackcap	*Sylvia atricapilla*	Green	No
Blue Tit	*Cyanistes caeruleus*	Green	No
Bullfinch	*Pyrrhula pyrrhula*	Green	No
Buzzard	*Buteo buteo*	Green	No
Chaffinch	*Fringilla coelebs*	Green	No
Chiffchaff	*Phylloscopus collybita*	Green	No
Coal Tit	*Periparus ater*	Green	No
Collared Dove	*Streptopelia decaocto*	Green	No
Common Crossbill	*Loxia curvirostra*	Green	No
Cuckoo	*Cuculus canorus*	Green	No
Dunnock	*Prunella modularis*	Green	No
Fieldfare	*Turdus pilaris*	Green	No
Goldcrest	*Regulus regulus*	Amber	No

Common Name	Scientific Name	BoCCI	Annex I
Golden Plover	**Pluvialis apricaria**	**Red**	**Yes**
Goldfinch	*Carduelis carduelis*	Green	No
Goshawk	*Accipiter gentilis*	Amber	No
Great Black-backed Gull	*Larus marinus*	Green	No
Great Spotted Woodpecker	*Dendrocopos major*	Green	No
Great Tit	*Parus major*	Green	No
Greenfinch	*Carduelis chloris*	Amber	No
Grey Heron	*Ardea cinerea*	Green	No
Herring Gull	*Larus argentatus*	Amber	No
Hooded Crow	*Corvus cornix*	Green	No
House Martin	*Delichon urbicum*	Amber	No
House Sparrow	*Passer domesticus*	Amber	No
Jackdaw	*Corvus monedula*	Green	No
Jay	*Garrulus glandarius*	Green	No
Kestrel	*Falco tinnunculus*	Red	No
Lapwing	*Vanellus vanellus*	Red	No
Lesser Black-backed Gull	*Larus fuscus*	Amber	No
Lesser Redpoll	*Carduelis cabaret*	Green	No
Linnet	*Carduelis cannabina*	Amber	No
Little Egret	**Egretta garzetta**	**Green**	**Yes**
Long-tailed Tit	*Aegithalos caudatus*	Green	No
Magpie	*Pica pica*	Green	No
Meadow Pipit	*Anthus pratensis*	Red	No
Merlin	**Falco columbarius**	**Amber**	**Yes**
Mistle Thrush	*Turdus viscivorus*	Green	No
Peregrine	**Falco peregrinus**	**Green**	**Yes**
Pheasant	*Phasianus colchicus*	Green	No

Common Name	Scientific Name	BoCCI	Annex I
Pied/White Wagtail	*Motacilla alba*	Green	No
Raven	*Corvus corax*	Green	No
Red Kite	**Milvus milvus**	**Red**	**Yes**
Redwing	*Turdus iliacus*	Red	No
Reed Bunting	*Emberiza schoeniclus*	Green	No
Robin	*Erithacus rubecula*	Green	No
Rook	*Corvus frugilegus*	Green	No
Sand Martin	*Riparia riparia*	Amber	No
Siskin	*Carduelis spinus*	Green	No
Skylark	*Alauda arvensis*	Amber	No
Snipe	*Gallinago gallinago*	Red	No
Song Thrush	*Turdus philomelos*	Green	No
Sparrowhawk	*Accipiter nisus*	Green	No
Spotted Flycatcher	*Muscicapa striata*	Amber	No
Starling	*Sturnus vulgaris*	Amber	No
Stock Dove	*Columba oenas*	Red	No
Stonechat	*Saxicola rubicola*	Green	No
Swallow	*Hirundo rustica*	Amber	No
Swift	*Apus apus*	Red	No
Treecreeper	*Certhia familiaris*	Green	No
Whitethroat	*Sylvia communis*	Green	No
Whooper Swan	**Cygnus cygnus**	**Amber**	**Yes**
Willow Warbler	*Phylloscopus trochilus*	Amber	No
Woodpigeon	*Columba palumbus*	Green	No
Wren	*Troglodytes troglodytes*	Green	No
Yellowhammer	*Emberiza citrinella*	Red	No

3.3 Breeding Bird Transect Surveys

The results of the 2021, 2022 and 2023 summer breeding bird transect surveys at Drehid Wind Farm are shown in Table 3-2, Table 3-3, and Table 3-4 respectively.

A total of 54 species were observed across all three years. Of these, four are Red-listed under the BoCCI: meadow pipit, stock dove, swift, and yellowhammer. A further 13 are Amber-listed under the BoCCI: goldcrest, greenfinch, house martin, house sparrow, lesser black-backed gull, linnet, mallard, northern wheateater, skylark, spotted flycatcher, starling, swallow, and willow warbler. The remaining 36 are Green-listed under the BoCCI.

One species is protected under Annex I of the EU Birds Directive, namely the Green-listed Peregrine.

3.3.1 Meadow Pipit

This Red-listed species was recorded on eight occasions across the 2021, 2022 and 2023 breeding transect surveys. In 2021, two records were noted, where single individuals were observed along transect 3. In 2022, five records were noted. All five records observed single individuals; four of which occurred along transect 2, and one along transect 1. The latest breeding bird survey in 2023 noted one record for this species, where a group of four individuals were observed flying over transect 2.

3.3.2 Peregrine

This Annex I species was noted on one occasion across the three-year survey period. In May 2022, a single individual was observed flying over along transect 1.

3.3.3 Stock Dove

Stock Dove was noted once during the three-year breeding bird transect survey period. One individual was observed along transect 2 in July 2022.

3.3.4 Swift

Swift were observed flying across the study area on three occasions during the three-year survey period. All of which were noted along transect 1, during July of the 2022 breeding bird transect surveys. Two records observed single individuals, and one noted a pair along transect 1.

3.3.5 Northern Wheatear

Wheatear were observed once in May 2022, where a group of four individuals were observed in a ploughed field along transect 2.

3.3.6 Yellowhammer

Six records of Red-listed Yellowhammer were made across the three-year survey period. No records were made during the latest breeding bird transect surveys in 2023. In 2021, three records of single individuals were noted flying across farmland habitats along transect 4. In 2022, three records were made along transect 2. Two of which observed single individuals along this transect, and one observed a group of six birds.

Table 3-2: Results of the 2021 Breeding Bird Transect Surveys

	Transect 3						Transect 4					
	Round 1			Round 2			Round 1			Round 2		
	0-25m	25-100m	100m+ / FO	0-25m	25-100m	100m+ / FO	0-25m	25-100m	100m+ / FO	0-25m	25-100m	100m+ / FO
Blackbird	3			2			2			3		
Blackcap				3			2					
Blue Tit							1					
Bullfinch											1	
Buzzard			1	1								
Chaffinch	1			1			4			2		
Chiffchaff										2		
Coal Tit	1									1		
Dunnock	1						1					
Great Tit				1						1		
Greenfinch							1					
Hooded Crow								1				
House Sparrow							1					
Jay								1			1	
Lesser Redpoll	1	1										
Linnet				1			1					
Long-tailed Tit				1								
Meadow Pipit	1				1							
Mistle Thrush	1							2			1	
Raven						2						
Reed Bunting				2								
Robin	1		1	2			3					
Rook							1					

	Transect 3						Transect 4					
	Round 1			Round 2			Round 1			Round 2		
	0-25m	25-100m	100m+ / FO	0-25m	25-100m	100m+ / FO	0-25m	25-100m	100m+ / FO	0-25m	25-100m	100m+ / FO
Siskin					1		1					
Skylark	1	1			2							
Song Thrush	1									2		
Swallow												1
Whitethroat				2								
Willow Warbler	3			2			1			2		
Woodpigeon			1		1			1	1			
Wren	1		1				2			3		
Yellowhammer							2			1		

Table 3-3: Results of the 2022 Breeding Bird Transect Surveys

	Transect 1						Transect 2					
	Round 1			Round 2			Round 1			Round 2		
	0-25m	25-100m	100m+ / FO	0-25m	25-100m	100m+ / FO	0-25m	25-100m	100m+ / FO	0-25m	25-100m	100m+ / FO
Blackbird	6	1	2	1			4	4		1		
Blackcap	3	1	1	4	3	2	1	3		2	3	
Blue Tit		1		1			1			1	1	
Bullfinch		5		1						1		
Buzzard		1					2			1		
Chaffinch	2	2			3		2	4		2	3	
Chiffchaff	2	1				1						
Coal Tit	1			7	3						1	
Common Crossbill	4											
Cuckoo	1	1						1				
Dunnock	2				2	1		1		2	1	
Goldcrest	5	2		6				2		1		
Goldfinch							1	2		1		
Great Spotted Woodpecker		2										
Great Tit			1				2					
Grey Heron			1									
Hooded Crow		1	1		1		4			1	2	
House Martin								2		1		
Jackdaw	1	2										
Jay		1			1							
Lesser Black-backed Gull					1							
Lesser Redpoll					1							

	Transect 1						Transect 2					
	Round 1			Round 2			Round 1			Round 2		
	0-25m	25-100m	100m+ / FO	0-25m	25-100m	100m+ / FO	0-25m	25-100m	100m+ / FO	0-25m	25-100m	100m+ / FO
Linnet							2	3				
Long-tailed Tit							2	2				
Mallard		2										
Meadow Pipit					1			1			3	
Mistle Thrush	1	2					2		1			
Northern Wheatear								4				
Peregrine*		1										
Pheasant		1	1									
Pied / White Wagtail								1				
Raven	1	13									2	1
Redshank								3	16			
Reed Bunting		1			1							
Robin	4	2		5	2		2	6		5	1	
Siskin					1						1	
Skylark						1					4	1
Song Thrush	1	2	2	2						1		
Spotted Flycacther							1				2	
Starling					1	1	1	1			20	
Stock Dove											1	
Stonechat				1								
Swallow		1					2	2		21		
Swift	3	1										
Treecreeper				2	1							

	Transect 1						Transect 2					
	Round 1			Round 2			Round 1			Round 2		
	0-25m	25-100m	100m+ / FO	0-25m	25-100m	100m+ / FO	0-25m	25-100m	100m+ / FO	0-25m	25-100m	100m+ / FO
Whitethroat	2											
Willow Warbler		4		3	2	1		2		1		
Woodpigeon	4	3		2	3	2	3	1	1		4	
Wren	7	4		4	9	2	3	2		1	3	
Yellowhammer							6	1		1		

Table 3-4: Results of the 2023 Breeding Bird Transect Surveys

	Transect 1						Transect 2					
	Round 1			Round 2			Round 1			Round 2		
	0-25m	25-100m	100m+ / FO	0-25m	25-100m	100m+ / FO	0-25m	25-100m	100m+ / FO	0-25m	25-100m	100m+ / FO
Blackbird	1	3			2		2			2	1	
Blackcap	7	1		5						3	1	
Blue Tit	1			1								
Bullfinch	1											
Buzzard		1							2			1
Chaffinch				3			1			1		
Chiffchaff	2	2										
Coal Tit				1								
Common Crossbill											4	
Cuckoo			1				2	1				
Dunnock										2		
Goldcrest				3						4		
Goldfinch			3				1					
Great Tit	1	1		1			1			1		
Grey Heron											1	
Hooded Crow												3
Jackdaw						2						4
Jay	1	1								2	1	
Lesser Redpoll			5		1					1	1	
Linnet			1						2			
Long-tailed Tit	6									3		
Meadow Pipit								4				
Mistle Thrush		1			1						1	

	Transect 1						Transect 2					
	Round 1			Round 2			Round 1			Round 2		
	0-25m	25-100m	100m+ / FO	0-25m	25-100m	100m+ / FO	0-25m	25-100m	100m+ / FO	0-25m	25-100m	100m+ / FO
Reed Bunting				4								
Robin	4	2		3						2		
Siskin				1	2					1	4	
Song Thrush	1			2						4	1	
Willow Warbler	5	3		3								
Woodpigeon	1	2	6	1	1	2	2		1			7
Wren	2			3						3		

3.4 Transect Surveys during Winter Months

The results of the 2021/22 winter transect surveys at Drehid Wind Farm are presented in Table 3-5. A total of 34 species were recorded during this survey period. Of which, four are Red-listed under the BoCCI: kestrel, meadow pipit, redwing, and snipe. Six species are Amber-listed under the BoCCI: goldcrest, hen harrier, herring gull, merlin, starling, and whooper swan. One species is also protected under Annex I of the EU Birds Directive, namely whooper swan.

3.4.1 Hen Harrier

On 16th December 2021, there were two records of hen harrier flying over along Transect 1 (recorded between 10:30 - 14:30). Both observations recorded a juvenile hen harrier; the first was seen flying over raised bog and the second was seen fling over forestry at Coolree. The surveyor noted both observations may have been of the same bird.

3.4.2 Kestrel

Two records of Red-listed kestrel were made during the winter transect surveys. Both of which observed single individuals along transect 1.

3.4.3 Meadow Pipit

Meadow pipit was observed on one occasion during the winter transect surveys, whereby two individuals were observed on peatland habitats along transect 2 in December 2021.

3.4.4 Merlin

One record of merlin was made in December 2021, where a single individual was observed on peatland habitat along transect 2.

3.4.5 Redwing

Four records of redwing were made during this survey period. Three of which occurred along Transect 2, where two individual birds and a flock of 30 birds were seen on farmland and flooded agricultural fields. One record was made along Transect 1, where a flock of 60 birds was observed in in the 25-100m buffer during December 2021.

3.4.6 Snipe

Snipe was noted once during the winter transect survey period, where a single individual was found along transect 1 in December 2021.

3.4.7 Sparrowhawk

Two records of sparrowhawk were noted during the winter transect survey period. In December 2021, a single sparrowhawk was observed along transect 1, and in January 2022 a single individual was observed along transect 1.

3.4.8 Whooper Swan

Whooper swan were observed on three occasions. All of these occurred along transect 2. Ten individuals were observed on farmland in December 2021, eleven were noted on flooded fields in January 2022, and 21 individuals were observed in February 2022. All of these records were located in the same area, i.e. agricultural fields within 1 km grid square N7434.

Table 3-5: Results of 2021/22 Winter Transect Survey Results

	Transect 1							Transect 2					
	Round 1			Round 2		Round 3		Round 1		Round 2		Round 3	
	0-25m	25-100m	100m+ / FO	0-25m	25-100m	0-25m	25-100m	0-25m	25-100m	0-25m	25-100m	0-25m	25-100m
Blackbird	3			1		3		1		1		1	
Blue Tit	1			1									
Buzzard						1		2					
Chaffinch								1		30			
Coal Tit				1		1							
Dunnock	1					1							
Fieldfare		1							1		60		150
Goldcrest	2			2									
Great Black-backed Gull										5			
Great Tit				1									
Hen Harrier			2										
Herring Gull										5			
Hooded Crow			1						6	1			
Jackdaw													25
Jay					4								
Kestrel	1				1								
Lesser Redpoll	25							1			1	1	
Long-tailed Tit				1		4						6	
Magpie								1					
Meadow Pipit								2					
Merlin									1				
Mistle Thrush		1											
Pied / White Wagtail								1					

	Transect 1							Transect 2					
	Round 1			Round 2		Round 3		Round 1		Round 2		Round 3	
	0-25m	25-100m	100m+ / FO	0-25m	25-100m	0-25m	25-100m	0-25m	25-100m	0-25m	25-100m	0-25m	25-100m
Raven	1	1							1	1			
Redwing		60							1		30	1	
Reed Bunting												2	
Robin	3			1		2		1				1	
Rook													25
Snipe	1												
Song Thrush	1												
Sparrowhawk	1			1									
Starling											150	1	
Whooper Swan								10		11			21
Woodpigeon					1								

3.5 Breeding Wader Surveys

A total of four wader species were recorded during the 2021, 2022 and 2023 breeding wader surveys. Three of which are Red-listed under the BoCCI: lapwing, snipe, and woodcock. The remaining wader species is Amber-listed: common sandpiper. No Annex I wader species were observed. Details of the breeding wader survey results can be found in Table 3-4.

One non-wader species was observed during the three-year survey period, namely long-eared owl.

3.5.1 Common Sandpiper

This species was noted on one occasion, where an individual was heard calling and flying over woodland habitats covered by transect A in June 2023. The surveyor noted that this individual may have been a failed breeding bird moving back towards the coast. No evidence of breeding sandpiper was observed during surveys, and the study area does not host suitable breeding habitat (lakes and larger rivers).

3.5.2 Lapwing

Lapwing were noted on ten occasions during the three-year survey period. All ten records occurred during the 2021 breeding season. All noted adults along pools, pool margins and wetland habitats along Transect 3, and observed Lapwing displaying. Six of the ten observations noted that Lapwing were seen on suitable breeding habitat, however successful breeding was not determined. It is noted that Transect 3 is located to the south-west of the study area on Timahoe North Bog, and that no lapwing habitat or breeding activity was observed within or adjacent to the Proposed Development. It is further noted that a solar array has been installed on Timahoe North Bog to the north-west of Transect 3 since surveys were completed there in 2021.

3.5.3 Snipe

This species was observed eleven times during the three-year survey period. No records of Snipe were made during the latest breeding wader surveys in 2023.

Seven observations were made during the 2021 breeding season (all recorded along Transect 3), where six records recorded chipping and/or drumming, and a single pair was observed flying together. Snipe were heard chipping and drumming on pool margins, bog margins and wetland habitats along transect 3. Six of the seven records during this survey period noted Snipe on suitable breeding habitats, however successful breeding was not noted.

Four observations of Snipe were made during the 2022 breeding season. One record indicated Snipe were heard drumming and occupying territory along transect B in May 2022, within raised bog habitats. The remaining three records also occurred along transect B in bog habitats, where three individuals were heard drumming and occupying territory in July 2022.

3.5.4 Woodcock

Woodcock were observed twice during the breeding wader surveys. Both records were noted in July 2022, and noted individual woodcock roding over bog (adjacent to conifer plantation), along transect B. Breeding status was assessed as 'Occupied Territory'.

3.5.5 Non-Wader Species: Long-eared Owl

This Green-listed species was observed on one occasion, during the 2023 breeding wader surveys carried out at dusk. A family unit of at least four to five individuals, comprised of 2-3 juveniles and a pair of adults was observed along Transect A on 26th June 2023 at 22:20. The surveyor noted these birds were calling and confirmed breeding status as successful breeding.

Table 3-6: Breeding Wader Survey Results

Season	Date	Transect	Species Name	Scientific Name	Observtion Time	Quantity	Habitat	Sex / Age	Behaviour	Breeding Status
Summer 2021										
Summer 21	24/04/2021	3	Lapwing	*Vanellus vanellus*	-	1	Wetland	Adult	Displaying	Breeding success unknown, but on suitable breeding habitat
Summer 21	24/04/2021	3	Lapwing	*Vanellus vanellus*	-	1	Wetland	Adult	Displaying	Breeding success unknown, but on suitable breeding habitat
Summer 21	24/04/2021	3	Lapwing	*Vanellus vanellus*	-	1	Wetland	Adult	Displaying	Breeding success unknown, but on suitable breeding habitat

Season	Date	Transect	Species Name	Scientific Name	Observtion Time	Quantity	Habitat	Sex / Age	Behaviour	Breeding Status
Summer 21	24/04/2021	3	Lapwing	*Vanellus vanellus*	-	1	Wetland	Adult	Displaying	Breeding success unknown, but on suitable breeding habitat
Summer 21	24/04/2021	3	Lapwing	*Vanellus vanellus*	-	1	Wetland	Adult	Displaying	Breeding success unknown, but on suitable breeding habitat
Summer 21	24/04/2021	3	Lapwing	*Vanellus vanellus*	-	1	Wetland	Adult	Displaying	Breeding success unknown, but on suitable breeding habitat

Season	Date	Transect	Species Name	Scientific Name	Observtion Time	Quantity	Habitat	Sex / Age	Behaviour	Breeding Status
Summer 21	25/04/2021	3	Snipe	*Gallinago gallinago*	-	1	Wetland	Adult	Chipping	Breeding success unknown, but on suitable breeding habitat
Summer 21	25/04/2021	3	Snipe	*Gallinago gallinago*	-	1	Wetland	Adult	Chipping	Breeding success unknown, but on suitable breeding habitat
Summer 21	07/05/2021	3	Lapwing	*Vanellus vanellus*	-	1	Pools	Adult	Displaying	Unknown
Summer 21	07/05/2021	3	Lapwing	*Vanellus vanellus*	-	1	Pools	Adult	Displaying	Unknown
Summer 21	07/05/2021	3	Snipe	*Gallinago gallinago*	-	1	Pool Margin	Adult	Chirping	Unknown
Summer 21	16/05/2021	3	Lapwing	*Vanellus vanellus*	-	1	Pool	Adult	Displaying	Unknown
Summer 21	16/05/2021	3	Lapwing	*Vanellus vanellus*	-	1	Pool Margin	Adult	Displaying	Unknown

Season	Date	Transect	Species Name	Scientific Name	Observtion Time	Quantity	Habitat	Sex / Age	Behaviour	Breeding Status
Summer 21	29/05/2021	3	Snipe	*Gallinago gallinago*	09:30	1	Bog Margin	Adult	Drumming	Suitable breeding habitat
Summer 21	29/05/2021	3	Snipe	*Gallinago gallinago*	10:30	1	Bog Margin	Adult	Chipping	Suitable breeding habitat
Summer 21	29/05/2021	3	Snipe	*Gallinago gallinago*	10:45	1	Bog Margin	Adult	Chipping	Suitable breeding habitat
Summer 21	29/05/2021	3	Snipe	*Gallinago gallinago*	10:50	2	Bog Margin	Adult	Pair flying together	Suitable breeding habitat
Summer 2022										
Summer 22	17/05/2022	A + B	N/A	N/A	N/A	N/A	N/A	N/A	N/A	No waders observed.
Summer 22	31/05/2022	B	Snipe	*Gallinago gallinago*	07:22	-	Raised Bog	-	Drumming	Occupied territory
Summer 22	04/07/2022	B	Snipe	*Gallinago gallinago*	22:51	-	Bog	-	Drumming	Occupied territory
Summer 22	04/07/2022	B	Woodcock	*Scolopax rusticola*	22:55	-	Bog	-	Roding	Occupied territory

Season	Date	Transect	Species Name	Scientific Name	Observtion Time	Quantity	Habitat	Sex / Age	Behaviour	Breeding Status
Summer 22	04/07/2022	B	Woodcock	*Scolopax rusticola*	23:06	-	Bog	-	Roding	Occupied territory
Summer 22	04/07/2022	B	Snipe	*Gallinago gallinago*	23:11	1	Bog	-	Drumming	Occupied territory
Summer 22	04/07/2022	B	Snipe	*Gallinago gallinago*	23:20	2	Bog	-	Drumming	Occupied territory
Summer 2023										
Summer 23	26/06/2023	A	Common Sandpiper	*Actitis hypoleucos*	22:38	1	Mixed Wood	Unknown	Flyover calling, flying S/SE	Unknown
Summer 23	26/06/2023	A	Long-eared Owl	*Asio otus*	22:20	4-5	Conifer Wood	2-3 Juveniles, Adult Male, Female	Calling	Successful Breeding

3.6 Woodcock Surveys

A total of 32 records of woodcock were made across the 2021, 2022 and 2023 targeted woodcock surveys. The results of which are available in Table 3-7.

During the 2021 breeding season, 17 sightings of woodcock were made, including four observations of breeding pairs flying together and calling.. All records observed woodcock roding and occupying territory along transect 3. Six of which occurred within willow, alder, rowan birch woodland habitat along the track, and the remaining eleven records occurred within a clearing between woodland habitats.

During the 2022 breeding season, a total of ten records of woodcock were made. In May 2022, five records of woodcock were made along transect A, and a further five records were made in June 2022 along transect B. All of which were observed roding, and occupying territory. In July 2022, a third round of surveys was undertaken. During which, no woodcock were observed.

During the 2023 woodcock surveys, five records of Woodcock were made in June 2023. Three of these observations noted roding males occupying territory in mixed woodland habitat (W-1), while two observations noted roding males occupying territory from W-2 (located in drained raised bog facing mixed woodland).

Table 3-7: Results of Woodcock Surveys

Date	Transect/VP	Observation Time	Species Name	Habitat	Sex / Age	Behaviour	Breeding Status
Summer 2021							
14/05/2021	3	21:10	Woodcock	Willow, Alder, Rowan, Birch woodland along track.	Adult	Roding	Suitable breeding habitat
14/05/2021	3	21:20	Woodcock	Rowan Birch	Adult	Roding	Suitable breeding habitat
14/05/2021	3	21:35	Woodcock	Willow, Alder, Rowan, Birch woodland along track.	Adult	Roding	Suitable breeding habitat
14/05/2021	3	21:40	Woodcock	Willow, Alder, Rowan, Birch woodland along track.	Adult	Roding	Suitable breeding habitat
14/05/2021	3	21:45	Woodcock	Willow, Alder, Rowan, Birch woodland along track.	Adult	Roding	Suitable breeding habitat
14/05/2021	3	21:55	Woodcock	Willow, Alder, Rowan, Birch woodland along track.	Adult	Roding	Suitable breeding habitat

Date	Transect/VP	Observation Time	Species Name	Habitat	Sex / Age	Behaviour	Breeding Status
26/05/2021	3	21:25	Woodcock	Clearing between woodland	Adult	Roding	Suitable breeding habitat
26/05/2021	3	21:30	Woodcock	Clearing between woodland	Adult	Roding	Suitable breeding habitat
26/05/2021	3	21:35	Woodcock	Clearing between woodland	Adult	Roding	Suitable breeding habitat
26/05/2021	3	21:40	Woodcock	Clearing between woodland	Adult	Roding	Suitable breeding habitat
26/05/2021	3	21:45	Woodcock	Clearing between woodland	Adult	Roding	Suitable breeding habitat
26/05/2021	3	21:50	Woodcock	Clearing between woodland	Adult	Roding	Suitable breeding habitat
26/05/2021	3	21:55	Woodcock	Clearing between woodland	Adult	Roding	Suitable breeding habitat
26/05/2021	3	22:00	Woodcock	Clearing between woodland	Adult	Roding	Suitable breeding habitat
26/05/2021	3	22:05	Woodcock	Clearing between woodland	Adult	Roding	Suitable breeding habitat
26/05/2021	3	22:10	Woodcock	Clearing between woodland	Adult	Roding	Suitable breeding habitat
26/05/2021	3	22:15	Woodcock	Clearing between woodland	Adult	Roding	Suitable breeding habitat
Summer 2022							
13/05/2022	A	21:41	Woodcock	Woodcock / Bog	-	Roding	Occupied Territory
13/05/2022	A	21:43	Woodcock	Woodland	-	Roding	Occupied Territory
13/05/2022	A	21:48	Woodcock	Woodland	-	Roding	Occupied Territory
13/05/2022	A	21:56	Woodcock	Woodland	-	Roding	Occupied Territory

Date	Transect/VP	Observation Time	Species Name	Habitat	Sex / Age	Behaviour	Breeding Status
13/05/2022	A	22:14	Woodcock	Woodland / Bog	-	Roding	Occupied Territory
17/06/2022	B	22:05	Woodcock	Woodland	-	Roding	Occupied Territory
17/06/2022	B	22:15	Woodcock	Woodland	-	Roding	Occupied Territory
17/06/2022	B	22:20	Woodcock	Woodland	-	Roding	Occupied Territory
17/06/2022	B	22:31	Woodcock	Woodland	-	Roding	Occupied Territory
17/06/2022	B	22:43	Woodcock	Woodland	-	Roding	Occupied Territory
05/07/2022	A + B	N/A	N/A	N/A	N/A	N/A	No woodcock observed.
Summer 2023							
08/06/2023	W-1	21:50	Woodcock	Mixed Wood	Male	Roding	Occupied territory
08/06/2023	W-1	22:05	Woodcock	Mixed Wood	Male	Roding	Occupied territory
08/06/2023	W-1	22:12	Woodcock	Mixed Wood	Male	Roding	Occupied territory
20/06/2023	W-2	21:59	Woodcock	Mixed Wood	Male	Roding	Occupied territory
20/06/2023	W-2	22:10	Woodcock	Mixed Wood	Male	Roding	Occupied territory

3.7 Merlin Surveys

Merlin surveys were carried out during the 2023 breeding season. No merlin or signs of their presence were found during these targeted surveys.

Other bird species were observed during the merlin surveys, namely buzzard, kestrel and swift.

3.7.1 Buzzard

Buzzard were noted four times during the 2023 merlin surveys, where single individuals were observed flying over the survey area.

3.7.2 Kestrel

One record of this Red-listed species was made in May 2023, where a single individual was noted flying over the survey area.

3.7.3 Swift

One record of Swift was made in May 2023, where a pair of swift were sighted flying over the survey area.

3.8 Raptor Surveys

During targeted Raptor surveys, 13 records of two different raptor species were made, namely Buzzard and Kestrel. A further 12 records of non-raptor species were made during these surveys, namely cuckoo, herring gull, lesser black-backed gull, and swift.

Suitable breeding raptor habitat is present across the survey area and surrounding region. Records of juvenile buzzards and kestrel indicate breeding populations are present within the local area of the proposed Drehid wind farm. However, no breeding sites or nest sites were located during the targeted raptor surveys or any other survey type.

3.8.1 Buzzard

Buzzards were recorded eleven times during the 2023 breeding season. Most records related to single individuals, however pairs and groups of three and four individuals were also sighted.

At HVP 3 (1.8km E), four records of buzzard were made. Two records noted single individuals at this location. The remaining two records at this HVP noted a group of two and three individuals soaring.

At HVP 4 (3.1km E), five records of this species were made. In June 2023, one record identified a single individual hunting at this location. In July 2023, two records were made at this HVP, where a juvenile and adult were sighted together, and later a pair of buzzards were sighted together. In August 2023, two records of buzzards were made at this HVP, where a group of three individuals and four individuals were sighted.

At HVP 8 (8.6km S), a single observation of buzzard was made, where a pair was sighted soaring and hunting in September 2023.

At HVP 6 (8.7km SE), one record of this species was made, where a single individual was noted in July 2023.

3.8.2 Kestrel

Kestrel were recorded twice during targeted raptor surveys. In July 2023, one record of two juveniles and a single female was made at HVP 4 (3.1km E). In September 2023, a pair of kestrel were observed soaring and hunting at HVP 8 (8.6km S).

3.8.3 Non-Raptor Species

Two gull species, namely herring gull and lesser black-backed gull, were detected during these targeted raptor surveys. One record of Amber-listed herring gull was made during these surveys, whereby in June 2023, a flock of seven Amber-listed herring gull were observed soaring at HVP 3 (8.7km SE). Lesser black-backed gulls were observed on seven occasions during these surveys, alone or in flocks of up to 26 individuals. Four of these records were made at HVP 3 (1.8km E), and the remaining three occurred at HVP 4 (3.1km E).

Cuckoo was noted once during these surveys, where a single record of cuckoo in song was noted at HVP 3 (1.8km E) in June 2023.

Swift were detected on three occasions during the targeted raptor surveys. In June 2023, one individual was observed hawking at HVP 3 (1.8km E). In August 2023, a flock of nine individuals were observed at HVP 4 (3.1km E), and a flock of three individuals were observed at HVP 6 (8.7km SE).

3.9 Barn Owl Surveys

During targeted barn owl surveys in summer 2021 and summer 2023, no barn owls or evidence of their presence were detected. Despite absence of barn owl observations during surveys, this species is considered to breed in the local area based on desktop records and local sightings.

According to the NBDC and local records, barn owls are present within the surrounding environment, with NBDC records as recent as 2023. An adult was recorded in 100m grid square N770372 outside the proposed wind farm boundary to the east in February 2023. A barn owl was recorded in 100m grid square N765385 at Muckloon outside the proposed wind farm boundary to the north in August 2018. In July 2021, a group of three juveniles and one adult was observed in grid square N751372 (located in woodland north of T8 outside the proposed wind farm boundary). In August 2022, a family unit of five individuals was observed in grid square N757398 (north of Johnstown Bridge).

A barn owl nest in N742365 (in woodland north of T6 outside proposed wind farm boundary) is indicated in an NBDC record from June 2021. Further consultation with the landowner at this location indicated a barn owl box has been installed here, but has not been occupied to date by barn owl.

3.10 Hinterland Surveys

Hinterland surveys to establish breeding occupancy and census wetland sites within a 10 km radius of the site were carried out during the breeding and non-breeding seasons of 2021, 2022 and 2023 (from April 2021 to September 2023, inclusive). The survey schedule and locations of the Hinterland watches are detailed in Appendix 4, and results are listed in Appendix 5. Figure 2-5 provides mapping of hinterland survey locations.

During hinterland surveys, a total of 30 species were observed across the three-year survey period. Of which, nine are Red-listed under the BoCCI: curlew, golden plover, kestrel, lapwing, meadow pipit, snipe, swift, woodcock, and yellowhammer. Seven are Amber-listed under the BoCCI: herring gull, lesser black-backed gull, mallard, mute swan, skylark, teal, and whooper swan. The remaining 14 species are Green-listed. A total of four species protected under Annex I of the EU Birds Directive were recorded: golden plover, little egret, peregrine, and whooper swan. All species recorded during Hinterland surveys are listed in Table 3-5.

Species of conservation concern that are known to be potentially vulnerable to wind farm developments are discussed in more detail in this section. Species have been selected for detailed discussion based on conservation status, vulnerability to wind farm developments and where species were recorded on or near the proposed wind farm Site, which will indicate potential links between species recorded at the proposed Site and in the surrounding environment.

3.10.1 Buzzard

Buzzards were observed 39 times across the three-year hinterland survey period. Of which, the majority of records (32) were noted during the breeding season.

During the summer seasons, a total of 32 records of buzzards were made. Of which, seven were noted during the 2021 breeding season, nine were noted during the 2022 breeding season, and 18 were noted during the 2023 breeding season. Records were observed in April, May, June, July, August and September, throughout the hinterland survey area at HVPs 1, 2, 3, 4, 5, 6, 7, and 8. The majority of observations (20) were of single birds. A total of nine pairs were sighted across HVP 1 (0.8km S) in May and June 2022, at HVP 3 (1.8km E) in May and June 2023, at HVP 4 (3.1km E) in August 2023, and at HVP 8 (8.6km S) in May 2023. On two occasions, a group of three birds were noted at HVP 7 (9.5km S) in June 2022, and at HVP 4 (3.1km E) in May 2023. On one occasion, a group of four birds were sighted at HVP 4 (3.1km E) in July 2023. No hunting activity or breeding behaviours were recorded during this three-year survey period.

During the wintering periods, a total of seven records of buzzards were made. Six of which were noted during the 2021/22 non-breeding season, where five single birds were noted across HVP 1 (0.8km S) in December 2021 and January 2022, HVP 9 (9.8km S) in March 2022, and HVP 6 (8.7km SE) in February 2022; and a group of four birds were sighted once at HVP 6 (8.7km SE) in March 2022. During the 2022/23 winter hinterland surveys, one record of Buzzard was made, where a lone bird was noted at HVP 3 (1.8km E) in February 2023. No hunting or nesting activity was noted.

3.10.2 Curlew

A total of seven records of curlew were noted across the three-year hinterland survey period.

During the breeding seasons, curlew were observed four times. Two of which occurred in the 2021 breeding season. In April 2021, a pair were sighted at HVP 7 (Lodge Bog) (9.5km S). In May 2021, another pair was sighted at HVP 7. The surveyor highlighted that this pair failed to successfully breed due to predation on their nests. During the 2022 breeding season, two records of curlew were made whereby a group of three birds were sighted at HVP 7 (9.5km S) in April 2022, and again at HVP 9 (Lullymore Wetlands) (9.8km S) in May 2022.

During the winter seasons, curlew were noted on three occasions. Two of which were made during the 2021/22 winter season, both of which were noted at HVP 4 (Hortland) (3.1km E) in October 2021 and February 2022. The remaining record observed a pair of curlew at HVP 4 in January 2023.

Curlew were not recorded within the proposed wind farm Site or in adjacent lands during VP surveys, breeding and winter transect surveys, breeding wader surveys, or any other surveys conducted at the Site. As such, surveys indicate that breeding curlew are not present at the proposed wind farm site but are present on peatland habitats c. 9 km south-west. Similarly, surveys did not detect any wintering curlew at the proposed wind farm site but did note this species during winter at HVP4 c. 3.1 km east.

3.10.3 Golden Plover

Golden plover were observed five times across the three-year hinterland survey period. All off which occurred during the winter seasons.

During the 2021/22 non-breeding season, golden plover were noted four times across HVP 1 (0.8km S) in November 2021 and January 2022, and HVP 6 (8.7km SE) in October and December 2021. During the 2022/23 non-breeding season, this species was observed once, where a flock of seven birds was observed at HVP 4 (3.1km E) in January 2023.

3.10.4 Grey Heron

Seven records of grey heron were made during the three-year hinterland survey period. Two of which occurred during the 2021 breeding season, and the remaining five occurred during the 2023 breeding season.

During the 2021 summer hinterland surveys, single birds were noted twice at HVP 6 (8.7km SE) in May 2021.

During the 2023 summer hinterland surveys, two records of individual birds were made at HVP 6 (8.7km SE) during May and September 2023. A single grey heron was also recorded at HVP 2 (0.2km NE) in July 2023. An additional two records were made during this season, where pairs were noted at HVP 6 in June and July 2023.

3.10.5 Herring Gull

Herring gull were observed nine times during the three-year period. Two of which occurred during the 2023 breeding season, whereby two individuals were sighted at HVP 4 (3.1km E) and three individuals were sighted at HVP 8 (8.6km S) on 16th July 2023.

The remaining eight records were observed during the winter period. One of which was noted during the 2021/22 winter season, where an individual was observed at HVP 4 (3.1km E) in February 2022. Seven records were made during the 2022/23 winter season. Of which, six recorded observations of birds in groups of two to 13 individuals were made at HVP 3 (1.8km E). One record occurred at HVP 4, whereby seven individuals were noted in January 2023.

3.10.6 Kestrel

Seven observations of kestrel were made across the three-year hinterland survey period. Most of which (six) occurred during the breeding seasons. During the 2021 breeding season, Kestrel were noted twice. Both of which observed lone individuals at HVP 1 (0.8km S). During the 2022 breeding season, one observation of kestrel was made, whereby a male and a female in flight was noted at HVP 1 (0.8km S). During the 2023 breeding season, two records of kestrel were observed. Both observations were at HVP 8 (8.6km S), and one of these noted a pair in September 2023. The remaining record occurred during the 2021/22 non-breeding season, whereby a single individual was noted at HVP 6 (8.7km SE).

3.10.7 Lapwing

Lapwing were noted six times across all hinterland surveys. Five of these observations were noted during the 2021 breeding season, where lone individuals and groups of two, six and twelve birds were observed. At HVP 1 (0.8km S), a flock of six lapwing were noted in April 2021. At HVP 7 (9.5km S), a flock of six were noted in April 2021, and a flock of twelve birds were noted at the same location in May 2021 where an attempt at breeding failed due to nest predation. At HVP 6 (8.7km SE), two records were made in May 2021 where a lone individual and a pair were noted. The remaining record occurred during the 2022 breeding season, where a pair were sighted at HVP 1 (0.8km S) in May 2022.

3.10.8 Lesser Black-backed Gull

Five records of lesser black-backed gull were made during the three-year survey period. All occurred during the 2023 breeding season. At HVP 3 (1.8km E), two records of groups of three individuals were made. At HVP 4 (3.1km E), two records were made. One of which noted a flock of three gulls, and the other noted a flock of six. At HVP 6 (8.7km SE), a single individual was observed in July 2023.

3.10.9 Little Egret

Two observations of little egret were made during the hinterland surveys. During the 2021/22 non-breeding season, a single individual was noted at HVP 1 (0.8km S) in November 2021. During the 2022/23 non-breeding season, a single individual was noted at HVP 4 (3.1km E) in January 2023.

3.10.10 Long-eared Owl

Long-eared owl was observed once during the three-year survey period, where a family group was sighted at HVP 5 (8.2km SE) in June 2021 near Donadea Forest Park beside the castle.

3.10.11 Mallard

Mallard were observed twelve times during the hinterland surveys. Three records occurred during the 2021 breeding season, where lone individuals and groups of three, six and eight birds were noted at HVP 1 (0.8km E) and HVP 6 (8.7km SE). During the 2022 breeding season, four records of Mallard were made. Two of which noted two and three individuals at HVP 6 (8.7km SE), one of which recorded two birds at HVP 1 (0.8km E) and one of which noted mallard on the park pond at HVP5 (8.2km SE). During the 2023 breeding season, two records were made. Both were at HVP 6 (8.7km SE), where six individuals were recorded in June 2023, and ten individuals were recorded in May 2023.

During the 2021/22 winter season, mallard were observed three times. Two of which occurred at HVP 9 (9.8km S), where a group of seven birds were sighted in March 2022, and a lone individual was sighted in December 2021. At HVP 1 (0.8km S), a single individual was observed in November 2021.

3.10.12 Meadow Pipit

Three records of meadow pipit were made during hinterland surveys. During the 2022 breeding season, six individuals were sighted at HVP 9 (9.8km S) in May 2022. During the 2021/22 non-breeding season, a lone individual was observed at HVP 6 (8.7km SE) in December 2021 and May 2022.

3.10.13 Mute Swan

One record of mute swan was made during the three-year hinterland survey period. In March 2022, a pair of Mute Swan were observed flying at HVP 9 (9.8km S). Mute swan were not recorded within the wind farm Site or in adjacent lands during VP surveys, breeding and winter transect surveys, breeding wader surveys, or any other survey conducted at the Site.

3.10.14 Peregrine

Peregrine were recorded on three occasions during the hinterland surveys. All of which observed lone individuals. Individual birds were noted at HVP 1 (0.8km S) in April 2023 and November 2022, and one bird was noted at HVP 8 (8.6km S) in May 2023.

3.10.15 Snipe

Twelve records of snipe were made during the three-year hinterland survey period. Most of which (eight) were noted during the breeding seasons.

During the 2021 breeding season, snipe were observed on six occasions. Five of which occurred at HVP 1 (0.8km S), and one of which occurred at HVP 6 (8.7km SE). Three records noted lone individuals, and three records noted pairs.

During the 2022 breeding season, two records of snipe were made whereby a pair was sighted at HVP 1 (0.8km S) in May 2022, and a pair were sighted at HVP 6 (8.7km SE) in April 2022.

During the winter 2021/22 non-breeding season, four records of snipe were noted. Two of which occurred at HVP 9 (9.8km S), where a lone individual was sighted in December 2021, and a group of eight were sighted in March 2022. The remaining two records observed lone individuals at HVP 1 (0.8km S) and HVP 6 (8.7km SE) in December 2021.

3.10.16 Sparrowhawk

Sparrowhawk were observed on two occasions during the hinterland surveys. In June 2022, a lone individual was sighted at HVP 7 (9.5km S). In January 2023, a single bird was observed at HVP 4 (3.1km E).

3.10.17 Swift

One record of swift was made during the hinterland surveys. This occurred at HVP4 on 16th July 2023; seven birds were recorded.

3.10.18 Whooper Swan

Whooper swan were observed twice during hinterland surveys. Both of which occurred at HVP 3 (1.8km E) during the 2022/23 non-breeding season. In January 2023, a flock of 13 individuals, six of which were first-winters was observed. In February 2023, a flock of twelve individuals was sighted.

3.10.19 Woodcock

Woodcock was sighted on one occasion during the three-year hinterland survey period, where a single individual was observed at HVP 1 (0.8km S) in December 2021.

3.10.20 Yellowhammer

Two records of yellowhammer were made during the hinterland surveys. In May 2021, a record was made at HVP 6 (8.7km SE) where this species was noted as being locally common. In June 2021, Yellowhammer were observed at HVP 1 (0.8km S). The surveyor noted that this species was widespread along hedgerows in this area.

Table 3-8: Bird species recorded during Hinterland surveys

Species	Scientific Name	BoCCI	Annex I
Buzzard	*Buteo buteo*	Green	No
Cuckoo	*Cuculus canorus*	Green	No
Curlew	*Numenius arquata*	Red	No
Golden Plover	**Pluvialis apricaria**	**Red**	**Yes**
Grasshopper Warbler	*Locustella naevia*	Green	No
Great Black-backed Gull	*Larus marinus*	Green	No
Great White Egret	*Ardea alba*	Green	No
Grey Heron	*Ardea cinerea*	Green	No
Herring Gull	*Larus argentatus*	Amber	No
Kestrel	*Falco tinnunculus*	Red	No
Lapwing	*Vanellus vanellus*	Red	No
Lesser Black-backed Gull	*Larus fuscus*	Amber	No
Little Egret	**Egretta garzetta**	**Green**	**Yes**
Little Grebe	*Tachybaptus ruficollis*	Green	No
Long-eared Owl	*Asio otus*	Green	No
Mallard	*Anas platyrhynchos*	Amber	No
Meadow Pipit	*Anthus pratensis*	Red	No
Mistle Thrush	*Turdus viscivorus*	Green	No
Moorhen	*Gallinula chloropus*	Green	No
Mute Swan	*Cygnus olor*	Amber	No
Peregrine	**Falco peregrinus**	**Green**	**Yes**
Skylark	*Alauda arvensis*	Amber	No
Snipe	*Gallinago gallinago*	Red	No

Species	Scientific Name	BoCCI	Annex I
Sparrowhawk	*Accipiter nisus*	Green	No
Swift	*Apus apus*	Red	No
Teal	*Anas crecca*	Amber	No
Water Rail	*Rallus aquaticus*	Green	No
Whooper Swan	**Cygnus cygnus**	**Amber**	**Yes**
Woodcock	*Scolopax rusticola*	Red	No
Yellowhammer	*Emberiza citrinella*	Red	No

4. CONCLUSION

Two full years of vantage point (VP) surveys were completed at the proposed Drehid Wind Farm between November 2021 and September 2023 inclusive.

The following surveys were also undertaken: breeding and wintering bird transect surveys, breeding wader surveys, breeding woodcock surveys, raptor survey, barn owl survey, merlin survey and hinterland surveys. These surveys extended over three summer seasons (summer 2021,2022 and 2023) and two winter seasons (winter 2021-22 and winter 2022-23).

Detailed information on target species activity was recorded, as well as notes on activity and distribution of additional species to provide a comprehensive ornithological baseline for the Proposed Development and surrounding hinterland.

The detailed baseline data recorded enabled collision risk modelling (CRM) to be undertaken for target species (Band, 2024) to facilitate assessment of potential collision mortality rates based on recorded flight activity. In addition to collision risk modelling, a comprehensive and detailed ornithological impact assessment has been carried out within EIAR Chapter 8-2: Ornithology. This assessment encompasses detailed discussion of observed behaviour and distribution of target species, potential effects of habitat loss, construction and operational phase disturbance/displacement effects, and operational phase barrier effects.

Information on assessment of the ornithological baseline in terms of potential effects associated with the Proposed Development is available within the CRM Report and EIAR Chapter 8-2: Ornithology.

5. REFERENCES

Band, W., Madders, M., & Whitfield , D. P. (2007). Developing Field and Analytical Methods to assess Avian Collision Risk at Wind Farms.

Band (2024). Using a collision risk model to assess bird collision risks for onshore wind farms. NatureScot Research Report 909.

Bibby, C. J., Burgess, N. D., Hill, D. A., & Mustoe, S. H. (2000). Bird census techniques. (2).

Fernandex-Bellon, D., Carroll, D., & Lusby, J. (2010). The Pilot Merlin Survey.

Gilbert, G., Gibbons, D. W., & Evans, J. (1998). Bird Monitoring Methods - a manual of techniques for key UK species.

Gilbert, G., Stanbury, A., & Lewis, L. (2021). Birds of Conservation Concern in Ireland 2020 - 2026. 9.

Hardey, J., Crick, H., Wernham, C., Riley, H., Etheridge, B., & Thompson, D. (2013). Raptors: a field guide to survey and monitoring. (3).

Lewis, L. J., Burke, B., Fitzgerald, N., Tierney, T. D., & Kelly, S. (2019). Irish Wetland Bird Survey: Waterbird Status and Distribution 2009/10-2015/16. Irish Wildlife Manuals(106).

Lusby, J., Fernandez-Bellon, D., Norriss, D. W., & Lauder, A. (2010). Assessing the effectiveness of monitoring methods for Merlin Falco columbarius in Ireland: the Pilot Merlin Survey. 9.

National Parks and Wildlife Service. (2013). Ballynafagh Bog pNHA Site Synopsis.

O'Brien, M., & Wilson, J. D. (2011). Population changes of breeding waders on farmland in relation to agri-environmental management. 58.

Scottish Natural Heritage Guidance. (2017). Recommended bird survey methods to inform impact assessment of onshore wind farms. Scottish Natural Heritage.

Shawyer , C. (2012). Barn Owl Tyto Alba Survey Methodology and Techniques for use in Ecological Assessment.

Transport Infrastructure Ireland. (2021). Survey and Mitigation Standards for Barn Owls to inform the Planning, Construction and Operation of National Road Projects.

FEHILY TIMONEY

DESIGNING AND DELIVERING
A SUSTAINABLE FUTURE

APPENDIX 1

Vantage Point Survey Schedule

Season	VP	Date	Surveyor	Start	End	Cloud	Precipitation	Wind Speed	WindDirection
Winter 21/22	1	29/11/2021	AA	08:00	11:00	8	Light drizzle occasionally	1.5	W
Winter 21/22	1	29/11/2021	AA	11:30	14:30	8	Light drizzle at start	2	W
Winter 21/22	2	30/11/2021	AA	07:45	10:45	8	Light drizzle at start	2.5	W
Winter 21/22	2	30/11/2021	AA	11:15	14:15	8	Light drizzle	3.5	W
Winter 21/22	2	20/12/2021	AA	09:15	12:15	8	Dry	3	E
Winter 21/22	2	20/12/2021	AA	12:45	15:45	8	Dry	3	E
Winter 21/22	1	21/12/2021	AA	10:20	13:20	8	Dry	2.5	E
Winter 21/22	1	21/12/2021	AA	13:50	16:50	8	Dry	2.5	E
Winter 21/22	2	12/01/2022	AA	10:30	13:30	1	Dry	2	SW
Winter 21/22	2	12/01/2022	AA	14:00	17:00	1	Dry	2	SW
Winter 21/22	1	21/01/2022	AA	11:05	14:05	8	Dry	2.5	W
Winter 21/22	1	21/01/2022	AA	14:35	17:35	8	Dry	2.5	W
Winter 21/22	2	22/01/2022	AA	08:10	11:10	4	Dry	2	W
Winter 21/22	1	14/02/2022	AA	07:35	10:35	Variable	Dry	3.5	NW
Winter 21/22	1	14/02/2022	AA	11:05	14:05	Variable	Light showers	2.5	NW
Winter 21/22	2	17/02/2022	AA	07:35	10:35	7	Heavy shower at end	3	W
Winter 21/22	2	17/02/2022	AA	11:05	14:05	8	Light showers	3.5	W

Season	VP	Date	Surveyor	Start	End	Cloud	Precipitation	Wind Speed	WindDirection
Winter 21/22	1	25/02/2022	AA	08:30	11:30	Not detailed.	Dry	2.5	SW
Winter 21/22	1	25/02/2022	AA	12:00	15:00	Not detailed.	Dry	2.5	SW
Winter 21/22	1	07/03/2022	AA	12:05	15:05	8	Light showers	4	SE
Winter 21/22	1	07/03/2022	AA	15:35	18:35	8	Light showers	4	SE
Winter 21/22	2	08/03/2022	AA	07:00	10:00	8	Dry	4	ESE
Winter 21/22	2	08/03/2022	AA	10:30	13:30	8	Light showers	4.5	SE
Spring Migration 22	1	13/04/2022	AA	15:10	18:10	6	Dry	2.5	
Spring Migration 22	1	14/04/2022	AA	13:40	16:40	8	Dry	3	S
Spring Migration 22	2	14/04/2022	AA	10:05	13:05	8	Dry	2.5	S
Spring Migration 22	2	14/04/2022	AA	06:35	09:35	8	Dry	2.5	S
Spring Migration 22	2	14/04/2022	AA	06:35	09:35	8	Dry	2.5	SW
Summer 22	1	19/04/2022	AA	11:00	14:00	6	One light shower	2	SW
Summer 22	1	20/04/2022	AA	10:00	13:00	8	Dry	2.5	S
Summer 22	2	29/04/2022	AA	12:25	15:25	4	Dry	2	E
Summer 22	2	29/04/2022	AA	15:55	18:55	4	Dry	2	E
Summer 22	2	29/04/2022	Adrian Allen	12.25	15.25	4	Dry		E
Summer 22	1	04/05/2022	AA	11:00	14:00	7	Dry	2.5	W

Season	VP	Date	Surveyor	Start	End	Cloud	Precipitation	Wind Speed	WindDirection
Summer 22	1	04/05/2022	AA	14:30	17:30	7	Dry	2.5	W
Summer 22	2	05/05/2022	AA	10:30	13:30	7	Light showers	3	W
Summer 22	2	05/05/2022	AA	14:00	17:00	7	Light showers	3	W
Summer 22	2	06/06/2022	AA	13:05	16:05	8	Dry	2	E
Summer 22	2	06/06/2022	AA	16:35	19:35	8	Light showers	2	E
Summer 22	1	09/06/2022	AA	05:10	08:10	7	Light showers	4	W
Summer 22	1	09/06/2022	AA	05:10	08:10	7	Light showers	4	SW
Summer 22	1	09/06/2022	AA	08:40	11:40	7	Light showers	4	SW
Summer 22	1	11/07/2022	AA	09:50	12:50	8	Dry	3	S
Summer 22	1	11/07/2022	AA	13:20	16:20	8	Dry	4	S
Summer 22	2	13/07/2022	AA	08:10	11:10	4	Dry	3	W
Summer 22	2	13/07/2022	AA	11:40	14:40	8	Dry	3	W
Summer 22	1	08/08/2022	AA	14:00	17:00	1	Dry	1.5	W
Summer 22	1	08/08/2022	AA	17:30	20:30	2	Dry	1.5	W
Summer 22	2	09/08/2022	AA	10:40	13:40	2	Dry	1	SW
Summer 22	2	09/08/2022	AA	07:10	10:10	2	Dry	1	SW
Summer 22	1	17/08/2022	AA	15:15	18:15	6	Dry	1	W

Season	VP	Date	Surveyor	Start	End	Cloud	Precipitation	Wind Speed	WindDirection
Summer 22	1	10/09/2022	AA	14:40	17:40	4	Dry	2.5	E
Summer 22	2	10/09/2022	AA	07:05	10:05	4	Dry	1.5	E
Summer 22	2	10/09/2022	AA	10:35	13:35	4	Dry	1.5	E
Winter 22/23	1	21/12/2022	TC	09:30	12:30	3	Dry	4	SW
Winter 22/23	1	21/12/2022	TC	13:00	16:00	4	Dry	4	SW
Winter 22/23	2	22/12/2022	TC	09:00	12:00	Not detailed.	Dry	3	SW
Winter 22/23	2	22/12/2022	TC	12:30	15:30	2	Dry	3	SW
Winter 22/23	2	24/01/2023	CC	09:00	12:00	7	Dry	2	SW
Winter 22/23	2	24/01/2023	CC	12:30	15:30	7	Dry	3	SW
Winter 22/23	1	24/01/2023	TC	09:30	12:30	5	Dry	3	SW
Winter 22/23	1	24/01/2023	TC	13:00	16:00	5	Dry	4	SW
Winter 22/23	2	13/02/2023	CC	08:30	11:30	7	Dry	2	S
Winter 22/23	2	13/02/2023	CC	12:00	15:00	7	Dry	2	S
Winter 22/23	1	13/02/2023	TC	09:00	12:00	6	Dry	3	S
Winter 22/23	1	13/02/2023	TC	12:30	15:30	5	Dry	4	S
Winter 22/23	2	27/02/2023	CC	08:30	11:30	7	Dry	1	E
Winter 22/23	2	27/02/2023	CC	12:00	15:00	6	Light drizzle	2	E

Season	VP	Date	Surveyor	Start	End	Cloud	Precipitation	Wind Speed	WindDirection
Winter 22/23	1	01/03/2023	TC	09:00	12:00	7	Light rain at times	3	E
Winter 22/23	1	01/03/2023	TC	12:30	15:30	4	Dry	3	E
Winter 22/23	1	20/03/2023	TC	09:45	12:45	6	Dry	3	SSW
Winter 22/23	2	20/03/2023	CC	09:00	12:00	8	Light drizzle	2	SW
Winter 22/23	2	20/03/2023	CC	12:30	15:30	7	Dry	2	SW
Winter 22/23	1	22/03/2023	TC	09:45	12:45	6	Dry	4	SSW
Winter 22/23	1	22/03/2023	TC	13:15	16:15	7	Light showers	4	SSW
Winter 22/23	2	22/03/2023	CC	10:00	13:00	5	Not detailed	3.5	SW
Spring Migration 23	2	06/04/2023	CC	06:50	09:50	6	Dry	2	NW
Spring Migration 23	2	06/04/2023	CC	10:20	13:20	6	Light Drizzle	2	NW
Spring Migration 23	1	06/04/2023	TC	14:00	17:00	6	Light showers	2	NW
Spring Migration 23	1	06/04/2023	TC	17:30	20:30	7	Light showers	2	NW
Spring Migration 23	1	06/04/2023	TC	17:30	20:30	6	Light showers	2	NW
Summer 23	2	09/05/2023	CC	10:00	13:00	5	Dry	2	W
Summer 23	2	09/05/2023	CC	13:30	16:30	5	Dry	2	SSE
Summer 23	1	09/05/2023	TC	09:30	12:30	6	Dry	2	NSW
Summer 23	1	09/05/2023	TC	13:00	16:00	6	Dry	2	W

Season	VP	Date	Surveyor	Start	End	Cloud	Precipitation	Wind Speed	WindDirection
Summer 23	2	15/05/2023	CC	09:00	12:00	4	Dry	3	NW
Summer 23	2	15/05/2023	CC	12:30	15:30	6	Dry	2	NW
Summer 23	1	15/05/2023	TC	12:30	15:30	4	Dry	2	NW
Summer 23	1	15/05/2023	TC	09:00	12:00	4	Dry	2	NW
Summer 23	1	07/06/2023	TC	09:30	12:30	6	Dry	2.5	ENE
Summer 23	1	07/06/2023	TC	13:00	16:00	5	Dry	2.5	ENE
Summer 23	2	07/06/2023	CC	09:00	12:00	8	Dry	3	NE
Summer 23	2	07/06/2023	CC	12:30	15:30	7	Dry	3	NE
Summer 23	2	06/07/2023	CC	09:00	12:00	7	Dry	3	SSE
Summer 23	2	06/07/2023	CC	12:30	15:30	8	Light showers	3	SSE
Summer 23	1	06/07/2023	TC	09:00	12:00	7	Dry	3.5	S
Summer 23	1	01/08/2023	TC	09:30	12:30	4	Dry	2	SW
Summer 23	1	01/08/2023	TC	13:00	16:00	6	Dry	2	SW
Summer 23	2	01/08/2023	CC	09:00	12:00	6	Dry	3	W
Summer 23	2	01/08/2023	CC	12:30	15:30	5	Dry	2	W
Summer 23	1	12/09/2023	TC	13:30	16:30	6	Dry	2	N
Summer 23	2	12/09/2023	CC	09:00	12:00	2	Dry	2	N

DESIGNING AND DELIVERING
A SUSTAINABLE FUTURE

APPENDIX 2

Vantage Point Survey Results

Season	Date	VP	Observation Time	Species Name	Quantity	Sex	Notes	Bird ID No.
Winter 2021/22	29/11/2021	1	09:48	Herring Gull	5	Not Recorded	Flew at 20-50m.	1
Winter 2021/22	29/11/2021	1	09:55	Herring Gull	2	Not Recorded	Flew at 0-20m, then 20-50m.	2
Winter 2021/22	29/11/2021	1	10:08	Herring Gull	5	Not Recorded	Flew at 20-50m	3
Winter 2021/22	29/11/2021	1	10:26	Herring Gull	7	Not Recorded	Flew at 20-50m.	4
Winter 2021/22	29/11/2021	1	10:36	Herring Gull	7	Not Recorded	Flew at 20-50m.	5
Winter 2021/22	29/11/2021	1	10:56	Herring Gull	2	Not Recorded	Flew at 20-50m.	6
Winter 2021/22	29/11/2021	1	11:49	Herring Gull	1	Not Recorded	Flew at 20-50m.	7
Winter 2021/22	29/11/2021	1	12:08	Herring Gull	2	Not Recorded	Flew at 20-50m.	8
Winter 2021/22	29/11/2021	1	12:17	Sparrowhawk	3	Not Recorded	Flew at 0-20m.	1
Winter 2021/22	29/11/2021	1	12:27	Herring Gull	1	Not Recorded	Flew at 20-50m	9
Winter 2021/22	29/11/2021	1	12:34	Herring Gull	3	Not Recorded	Flew at 20-50m.	10
Winter 2021/22	29/11/2021	1	12:39	Great Black-backed Gull	1	Not Recorded	N/A	1
Winter 2021/22	29/11/2021	1	13:53	Herring Gull	1	Not Recorded	Flew at 20-50m, and 50-100m.	11

Season	Date	VP	Observation Time	Species Name	Quantity	Sex	Notes	Bird ID No.
Winter 2021/22	29/11/2021	1	13:59	Herring Gull	4	Not Recorded	Flew at 50-100m.	12
Winter 2021/22	29/11/2021	2	08:45	Herring Gull	2	Not Recorded	Flew at 50-100m.	13
Winter 2021/22	29/11/2021	2	08:53	Herring Gull	3	Not Recorded	Flew at 50-100m.	14
Winter 2021/22	29/11/2021	2	09:01	Herring Gull	15	Not Recorded	Flew at 20-50m.	15
Winter 2021/22	29/11/2021	2	09:04	Herring Gull	6	Not Recorded	Mixed flock. 6 HG, 3 GB. Flew at 20-50m, and 50-100m.	16
Winter 2021/22	29/11/2021	2	09:17	Herring Gull	17	Not Recorded	Mixed flock. 17 HG, 2 GB. Flew at 20-50m, and 50-100m.	17
Winter 2021/22	29/11/2021	2	09:31	Herring Gull	10	Not Recorded	Flew at 50-100m.	18
Winter 2021/22	29/11/2021	2	10:37	Merlin	1	Female	Flew at 0-20m, 20-50m, and 50-100m. Female merlin chased briefly by male sparrowhawk during flight watch.	1
Winter 2021/22	29/11/2021	2	09:04	Great Black-backed Gull	3	Not Recorded	Mixed flock. 6 HG, 3 GB. Flew at 20-50m, and 50-100m.	2
Winter 2021/22	30/11/2021	2	09:38	Kestrel	1	Not Recorded	Flew at 20-50m.	3
Winter 2021/22	30/11/2021	2	11:23	Sparrowhawk	1	Not Recorded	Flew at 0-20m.	2

Season	Date	VP	Observation Time	Species Name	Quantity	Sex	Notes	Bird ID No.
Winter 2021/22	30/11/2021	2	12:06	Kestrel	1	Not Recorded	Flew at 20-50m.	1
Winter 2021/22	30/11/2021	2	12:12	Kestrel	1	Not Recorded	Flew at 0-20m, and 20-50m.	2
Winter 2021/22	30/11/2021	2	12:36	Herring Gull	7	Not Recorded	Flew at 50-100m.	19
Winter 2021/22	30/11/2021	2	13:06	Merlin	1	Not Recorded	Flew at 50-100m.	2
Winter 2021/22	20/12/2021	2	09:47	Sparrowhawk	1	Not Recorded	Flew at 20-50m.	3
Winter 2021/22	20/12/2021	2	09:53	Herring Gull	1	Not Recorded	Flew at 50-100m, and 100-200m.	20
Winter 2021/22	20/12/2021	2	10:10	Herring Gull	2	Not Recorded	Flew at 50-100m.	21
Winter 2021/22	20/12/2021	2	10:34	Kestrel	1	Not Recorded	Flew at 20-50m.	4
Winter 2021/22	20/12/2021	2	10:43	Sparrowhawk	2	Not Recorded	Flew at 0-20m, and 20-50m.	4
Winter 2021/22	20/12/2021	2	11:18	Snipe	1	Not Recorded	Flew at 0-20m, and 20-50m.	2
Winter 2021/22	20/12/2021	2	11:06	Snipe	2	Not Recorded	Flew at 0-20m, 20-50m, and 50-100m.	1
Winter 2021/22	20/12/2021	2	11:20	Herring Gull	2	Not Recorded	Flew at 50-100m.	22
Winter 2021/22	20/12/2021	2	13:56	Sparrowhawk	1	Not Recorded	Flew at 20-50m, 50-100m, 100-200m, and >200m.	5
Winter 2021/22	20/12/2021	2	13:02	Kestrel	1	Not Recorded	Flew at 0-20m, and 20-50m.	5

Season	Date	VP	Observation Time	Species Name	Quantity	Sex	Notes	Bird ID No.
Winter 2021/22	20/12/2021	2	14:44	Herring Gull	3	Not Recorded	Flew at 100-200m.	23
Winter 2021/22	20/12/2021	2	15:12	Herring Gull	2	Not Recorded	Flew at 50-100m, and 100-200m.	24
Winter 2021/22	21/12/2021	1	11:08	Kestrel	1	Not Recorded	Flew at 0-20m.	6
Winter 2021/22	21/12/2021	1	10:53	Herring Gull	5	Not Recorded	Flew at 50-100m.	25
Winter 2021/22	21/12/2021	1	11:16	Whooper Swan	10	Not Recorded	7 adult, 3 juvenile. Feeding in field.	1
Winter 2021/22	21/12/2021	1	12:55	Buzzard	1	Not Recorded	Perched in tree.	1
Winter 2021/22	21/12/2021	1	15:08	Buzzard	1	Not Recorded	Flew at 0-20m.	2
Winter 2021/22	21/12/2021	1	15:56	Buzzard	1	Not Recorded	Flew at 0-20m.	3
Winter 2021/22	21/12/2021	1	16:43	Sparrowhawk	1	Not Recorded	Flew at 0-20m.	6
Winter 2021/22	21/12/2021	1	16:43	Whooper Swan	10	Not Recorded	Flew at 0-20m, and 20-50m.	2
Winter 2021/22	29/12/2021	2	09:17	Great Black-backed Gull	2	Not Recorded	Mixed flock. 17 HG, 2 GB. Flew at 20-50m, and 50-100m.	3
Winter 2021/22	12/01/2022	2	10:41	Herring Gull	6	Not Recorded	Flew at 20-50m.	26
Winter 2021/22	12/01/2022	2	10:59	Great Black-backed Gull	2	Not Recorded	Flew at 20-50m, and 50-100m.	4

Season	Date	VP	Observation Time	Species Name	Quantity	Sex	Notes	Bird ID No.
Winter 2021/22	12/01/2022	2	13:14	Sparrowhawk	1	Not Recorded	Flew at 0-20m, and 20-50m.	7
Winter 2021/22	12/01/2022	2	13:27	Herring Gull	2	Not Recorded	Flew at 20-50m.	27
Winter 2021/22	12/01/2022	2	14:05	Herring Gull	2	Not Recorded	Flew at 20-50m, and 50-100m.	28
Winter 2021/22	12/01/2022	2	14:53	Kestrel	1	Not Recorded	Flew at 0-20m.	7
Winter 2021/22	12/01/2022	2	15:07	Kestrel	1	Not Recorded	Flew at 0-20m.	8
Winter 2021/22	12/01/2022	2	16:01	Kestrel	1	Not Recorded	Flew at 0-20m, and 20-50m.	9
Winter 2021/22	12/01/2022	2	16:18	Herring Gull	85	Not Recorded	Flew at 50-100m. 85 HG, 19GB.	29
Winter 2021/22	12/01/2022	2	16:24	Herring Gull	280	Not Recorded	Flew at 50-100m. 280 HG, 48 GB.	30
Winter 2021/22	12/01/2022	2	16:18	Great Black-backed Gull	19	Not Recorded	Flew at 50-100m. 85 HG, 19GB.	5
Winter 2021/22	12/01/2022	2	16:24	Great Black-backed Gull	48	Not Recorded	Flew at 50-100m. 280 HG, 48 GB.	6
Winter 2021/22	21/01/2022	1	11:46	Herring Gull	3	Not Recorded	Flew at 0-20m, and 20-50m.	31
Winter 2021/22	21/01/2022	1	13:24	Great Black-backed Gull	9	Not Recorded	Flew at 20-50m, and 50-100m.	7
Winter 2021/22	21/01/2022	1	13:12	Buzzard	1	Not Recorded	Flew at 0-20m, and 20-50m.	4
Winter 2021/22	21/01/2022	1	13:58	Buzzard	1	Not Recorded	Flew at 0-20m.	5

Season	Date	VP	Observation Time	Species Name	Quantity	Sex	Notes	Bird ID No.
Winter 2021/22	21/01/2022	1	14:53	Buzzard	1	Not Recorded	Perched in tree	6
Winter 2021/22	21/01/2022	1	14:58	Buzzard	1	Not Recorded	Perched in tree	7
Winter 2021/22	21/01/2022	1	14:59	Buzzard	1	Not Recorded	Flew at 0-20m.	8
Winter 2021/22	21/01/2022	1	15:16	Herring Gull	2	Not Recorded	Flew at 50-100m.	32
Winter 2021/22	21/01/2022	1	15:33	Herring Gull	2	Not Recorded	Flew at 50-100m, and 100-200m.	33
Winter 2021/22	21/01/2022	1	16:14	Herring Gull	290	Not Recorded	Flew at 50-100m.Mixed flock of 290 HG, 93 GB, and 4 LB.	34
Winter 2021/22	21/01/2022	1	15:53	Buzzard	1	Not Recorded	Flew at 0-20m.	9
Winter 2021/22	21/01/2022	1	16:14	Herring Gull	75	Not Recorded	Flew at 50-100m, and 100-200m.	35
Winter 2021/22	21/01/2022	1	16:22	Herring Gull	120	Not Recorded	Flew at 20-50m, 50-100m, 100-200m, and >200m. Mixed flock of 120 HG, and 22 GB.	36
Winter 2021/22	21/01/2022	1	16:30	Herring Gull	129	Not Recorded	Flew at 50-100m, 100-200m, and >200m.	37
Winter 2021/22	21/01/2022	1	16:14	Great Black-backed Gull	93	Not Recorded	Flew at 50-100m.Mixed flock of 290 HG, 93 GB, and 4 LB.	8

Season	Date	VP	Observation Time	Species Name	Quantity	Sex	Notes	Bird ID No.
Winter 2021/22	21/01/2022	1	16:14	Lesser Black-backed Gull	4	Not Recorded	Flew at 50-100m.Mixed flock of 290 HG, 93 GB, and 4 LB.	1
Winter 2021/22	21/01/2022	1	17:14	Great Black-backed Gull	9	Not Recorded	Flew at 50-100m, and 100-200m.	9
Winter 2021/22	21/01/2022	1	16:22	Great Black-backed Gull	22	Not Recorded	Flew at 20-50m, 50-100m, 100-200m, and >200m. Mixed flock of 120 HG, and 22 GB.	10
Winter 2021/22	22/01/2022	2	08:34	Herring Gull	52	Not Recorded	Flew at 20-50m.	38
Winter 2021/22	22/01/2022	2	08:48	Whooper Swan	2	Not Recorded	Flew at 50-100m.	3
Winter 2021/22	22/01/2022	2	08:52	Herring Gull	69	Not Recorded	Flew at 20-50m.	39
Winter 2021/22	22/01/2022	2	08:59	Kestrel	1	Not Recorded	Flew at 0-20m, 20-50m, and 50-100m.	10
Winter 2021/22	22/01/2022	2	09:28	Herring Gull	14	Not Recorded	Flew at 20-50m.	40
Winter 2021/22	22/01/2022	2	09:42	Kestrel	1	Not Recorded	Flew at 0-20m, 20-50m, and 50-100m.	11
Winter 2021/22	22/01/2022	2	09:48	Great Black-backed Gull	1	Not Recorded	Flew at 50-100m.	11
Winter 2021/22	22/01/2022	2	10:07	Great Black-backed Gull	7	Not Recorded	Flew at 20-50m.	12
Winter 2021/22	22/01/2022	2	10:21	Great Black-backed Gull	9	Not Recorded	Flew at 20-50m.	13

Season	Date	VP	Observation Time	Species Name	Quantity	Sex	Notes	Bird ID No.
Winter 2021/22	22/01/2022	2	10:36	Great Black-backed Gull	2	Not Recorded	Flew at 20-50m.	14
Winter 2021/22	22/01/2022	2	11:04	Herring Gull	2	Not Recorded	Flew at 20-50m.	41
Winter 2021/22	22/01/2022	2	08:34	Great Black-backed Gull	12	Not Recorded	Flew at 20-50m.	15
Winter 2021/22	22/01/2022	2	08:52	Great Black-backed Gull	8	Not Recorded	Flew at 20-50m.	16
Winter 2021/22	14/02/2022	1	08:10	Great Black-backed Gull	1	Not Recorded	N/A	17
Winter 2021/22	14/02/2022	1	09:02	Great Black-backed Gull	2	Not Recorded	N/A	18
Winter 2021/22	14/02/2022	1	09:17	Great Black-backed Gull	4	Not Recorded	N/A	19
Winter 2021/22	14/02/2022	1	09:31	Herring Gull	1	Not Recorded	N/A	42
Winter 2021/22	14/02/2022	1	09:40	Great Black-backed Gull	5	Not Recorded	N/A	20
Winter 2021/22	14/02/2022	1	09:48	Lapwing	4	Not Recorded	N/A	1
Winter 2021/22	14/02/2022	1	10:01	Great Black-backed Gull	11	Not Recorded	Circling	21
Winter 2021/22	14/02/2022	1	10:32	Herring Gull	4	Not Recorded	N/A	43
Winter 2021/22	14/02/2022	1	10:35	Whooper Swan	18	Not recorded	At least 18, possibly 19, feeding in field.	4
Winter 2021/22	14/02/2022	1	11:19	Great Black-backed Gull	14	Not Recorded	N/A	22

Season	Date	VP	Observation Time	Species Name	Quantity	Sex	Notes	Bird ID No.
Winter 2021/22	14/02/2022	1	11:28	Herring Gull	2	Not Recorded	N/A	44
Winter 2021/22	14/02/2022	1	11:33	Buzzard	1	Not Recorded	N/A	10
Winter 2021/22	14/02/2022	1	11:41	Herring Gull	19	Not Recorded	19 HG and 7 GB	45
Winter 2021/22	14/02/2022	1	11:58	Buzzard	1	Not Recorded	N/A	11
Winter 2021/22	14/02/2022	1	12:15	Great Black-backed Gull	3	Not Recorded	N/A	23
Winter 2021/22	14/02/2022	1	12:25	Sparrowhawk	1	Not Recorded	N/A	8
Winter 2021/22	14/02/2022	1	12:27	Buzzard	1	Not Recorded	N/A	12
Winter 2021/22	14/02/2022	1	12:38	Buzzard	1	Not Recorded	N/A	13
Winter 2021/22	14/02/2022	1	13:07	Herring Gull	16	Not Recorded	Cirling in area. Too far away to ID to species. Mixed HG/GB flock.	46
Winter 2021/22	14/02/2022	1	11:41	Great Black-backed Gull	7	Not Recorded	19 HG and 7 GB	24
Winter 2021/22	14/02/2022	1	13:07	Great Black-backed Gull	17	Not Recorded	Cirling in area. Too far away to ID to species. Mixed HG/GB flock.	25
Winter 2021/22	17/02/2022	2	08:04	Herring Gull	9	Not Recorded	N/A	47
Winter 2021/22	17/02/2022	2	08:21	Great Black-backed Gull	6	Not Recorded	N/A	26

Season	Date	VP	Observation Time	Species Name	Quantity	Sex	Notes	Bird ID No.
Winter 2021/22	17/02/2022	2	08:28	Great Black-backed Gull	4	Not Recorded	N/A	27
Winter 2021/22	17/02/2022	2	08:36	Buzzard	1	Not Recorded	N/A	18
Winter 2021/22	17/02/2022	2	08:39	Herring Gull	39	Not Recorded	N/A	48
Winter 2021/22	17/02/2022	2	08:36	Herring Gull	10	Not Recorded	N/A	49
Winter 2021/22	17/02/2022	2	08:52	Great Black-backed Gull	12	Not Recorded	N/A	28
Winter 2021/22	17/02/2022	2	09:03	Great Black-backed Gull	2	Not Recorded	N/A	29
Winter 2021/22	17/02/2022	2	09:06	Herring Gull	29	Not Recorded	N/A	50
Winter 2021/22	17/02/2022	2	09:14	Sparrowhawk	1	Not Recorded	N/A	9
Winter 2021/22	17/02/2022	2	09:27	Great Black-backed Gull	6	Not Recorded	N/A	30
Winter 2021/22	17/02/2022	2	11:26	Herring Gull	2	Not Recorded	N/A	51
Winter 2021/22	17/02/2022	2	11:48	Snipe	1	Not Recorded	N/A	3
Winter 2021/22	17/02/2022	2	11:53	Snipe	1	Not Recorded	N/A	4
Winter 2021/22	17/02/2022	2	12:02	Sparrowhawk	1	Not Recorded	N/A	10
Winter 2021/22	17/02/2022	2	12:29	Sparrowhawk	1	Not Recorded	N/A	11

Season	Date	VP	Observation Time	Species Name	Quantity	Sex	Notes	Bird ID No.
Winter 2021/22	17/02/2022	2	12:34	Buzzard	1	Not Recorded	Perched in tree	19
Winter 2021/22	17/02/2022	2	12:41	Buzzard	1	Not Recorded	Flew from tree to tree	14
Winter 2021/22	17/02/2022	2	12:44	Buzzard	1	Not Recorded	Flew from tree to tree	15
Winter 2021/22	17/02/2022	2	12:49	Sparrowhawk	1	Not Recorded	N/A	12
Winter 2021/22	17/02/2022	2	12:58	Sparrowhawk	1	Not Recorded	N/A	13
Winter 2021/22	17/02/2022	2	13:18	Herring Gull	4	Not Recorded	N/A	52
Winter 2021/22	17/02/2022	2	13:31	Buzzard	1	Not Recorded	N/A	17
Winter 2021/22	17/02/2022	2	13:56	Buzzard	1	Not Recorded	Perched in tree	16
Winter 2021/22	17/02/2022	2	08:21	Herring Gull	6	Not Recorded	N/A	53
Winter 2021/22	17/02/2022	2	08:28	Herring Gull	4	Not Recorded	N/A	54
Winter 2021/22	17/02/2022	2	08:52	Herring Gull	13	Not Recorded	N/A	55
Winter 2021/22	17/02/2022	2	09:27	Herring Gull	6	Not Recorded	N/A	56
Winter 2021/22	25/02/2022	1	08:34	Herring Gull	42	Not Recorded	N/A	58
Winter 2021/22	25/02/2022	1	08:41	Herring Gull	12	Not Recorded	N/A	59

Season	Date	VP	Observation Time	Species Name	Quantity	Sex	Notes	Bird ID No.
Winter 2021/22	25/02/2022	1	08:46	Herring Gull	7	Not Recorded	N/A	60
Winter 2021/22	25/02/2022	1	08:51	Herring Gull	28	Not Recorded	N/A	61
Winter 2021/22	25/02/2022	1	08:57	Great Black-backed Gull	9	Not Recorded	N/A	31
Winter 2021/22	25/02/2022	1	09:03	Herring Gull	8	Not Recorded	N/A	62
Winter 2021/22	25/02/2022	1	09:09	Herring Gull	18	Not Recorded	N/A	63
Winter 2021/22	25/02/2022	1	09:13	Sparrowhawk	2	Not Recorded	N/A	14
Winter 2021/22	25/02/2022	1	09:17	Herring Gull	9	Not Recorded	N/A	64
Winter 2021/22	25/02/2022	1	09:22	Great Black-backed Gull	5	Not Recorded	N/A	32
Winter 2021/22	25/02/2022	1	09:27	Herring Gull	2	Not Recorded	N/A	65
Winter 2021/22	25/02/2022	1	09:32	Buzzard	1	Not Recorded	Perched in tree	20
Winter 2021/22	25/02/2022	1	09:35	Great Black-backed Gull	17	Not Recorded	N/A	33
Winter 2021/22	25/02/2022	1	10:04	Herring Gull	15	Not Recorded	N/A	66
Winter 2021/22	25/02/2022	1	10:16	Great Black-backed Gull	3	Not Recorded	N/A	34
Winter 2021/22	25/02/2022	1	10:23	Herring Gull	1	Not Recorded	N/A	67

Season	Date	VP	Observation Time	Species Name	Quantity	Sex	Notes	Bird ID No.
Winter 2021/22	25/02/2022	1	10:35	Herring Gull	5	Not Recorded	N/A	68
Winter 2021/22	25/02/2022	1	11:08	Herring Gull	14	Not Recorded	N/A	69
Winter 2021/22	25/02/2022	1	11:14	Great Black-backed Gull	2	Not Recorded	N/A	35
Winter 2021/22	25/02/2022	1	12:06	Great Black-backed Gull	4	Not Recorded	N/A	36
Winter 2021/22	25/02/2022	1	12:21	Herring Gull	12	Not Recorded	N/A	70
Winter 2021/22	25/02/2022	1	12:46	Great Black-backed Gull	1	Not Recorded	N/A	37
Winter 2021/22	25/02/2022	1	13:04	Buzzard	1	Not Recorded	N/A	21
Winter 2021/22	25/02/2022	1	13:06	Buzzard	1	Not Recorded	N/A	22
Winter 2021/22	25/02/2022	1	13:10	Buzzard	1	Not Recorded	N/A	23
Winter 2021/22	25/02/2022	1	13:39	Herring Gull	6	Not Recorded	N/A	57
Winter 2021/22	25/02/2022	1	13:35	Buzzard	1	Not Recorded	N/A	24
Winter 2021/22	25/02/2022	1	13:39	Great Black-backed Gull	7	Not Recorded	N/A	38
Winter 2021/22	25/02/2022	1	13:27	Buzzard	2	Not Recorded	N/A	25
Winter 2021/22	25/02/2022	1	14:22	Great Black-backed Gull	1	Not Recorded	N/A	39

Season	Date	VP	Observation Time	Species Name	Quantity	Sex	Notes	Bird ID No.
Winter 2021/22	25/02/2022	1	14:36	Herring Gull	11	Not Recorded	N/A	71
Winter 2021/22	25/02/2022	1	14:49	Herring Gull	15	Not Recorded	N/A	72
Winter 2021/22	25/02/2022	1	08:51	Great Black-backed Gull	28	Not Recorded	N/A	40
Winter 2021/22	25/02/2022	1	09:35	Herring Gull	18	Not Recorded	N/A	73
Winter 2021/22	25/02/2022	1	14:36	Great Black-backed Gull	12	Not Recorded	N/A	41
Winter 2021/22	07/03/2022	1	13:24	Herring Gull	16	Not Recorded	N/A	74
Winter 2021/22	07/03/2022	1	13:53	Herring Gull	2	Not Recorded	N/A	75
Winter 2021/22	07/03/2022	1	14:02	Buzzard	1	Not Recorded	N/A	26
Winter 2021/22	07/03/2022	1	14:25	Herring Gull	9	Not Recorded	N/A	76
Winter 2021/22	07/03/2022	1	14:35	Buzzard	1	Not Recorded	N/A	27
Winter 2021/22	07/03/2022	1	14:41	Herring Gull	11	Not Recorded	N/A	77
Winter 2021/22	07/03/2022	1	15:38	Great Black-backed Gull	1	Not Recorded	N/A	42
Winter 2021/22	07/03/2022	1	16:36	Herring Gull	1	Not Recorded	N/A	78
Winter 2021/22	07/03/2022	1	16:51	Great Black-backed Gull	1	Not Recorded	N/A	43

Season	Date	VP	Observation Time	Species Name	Quantity	Sex	Notes	Bird ID No.
Winter 2021/22	07/03/2022	1	17:27	Golden Plover	8	Not Recorded	N/A	1
Winter 2021/22	07/03/2022	1	18:05	Herring Gull	38	Not Recorded	N/A	79
Winter 2021/22	08/03/2022	2	07:46	Herring Gull	2	Not Recorded	N/A	80
Winter 2021/22	08/03/2022	2	08:13	Herring Gull	5	Not Recorded	N/A	81
Winter 2021/22	08/03/2022	2	08:19	Herring Gull	3	Not Recorded	N/A	82
Winter 2021/22	08/03/2022	2	08:29	Grey Heron	1	Not Recorded	N/A	1
Winter 2021/22	08/03/2022	2	08:46	Herring Gull	2	Not Recorded	N/A	83
Winter 2021/22	08/03/2022	2	09:03	Kestrel	1	Not Recorded	N/A	12
Winter 2021/22	08/03/2022	2	09:13	Buzzard	1	Not Recorded	N/A	28
Winter 2021/22	08/03/2022	2	09:20	Buzzard	2	Not Recorded	N/A	29
Winter 2021/22	08/03/2022	2	09:33	Buzzard	1	Not Recorded	N/A	30
Winter 2021/22	08/03/2022	2	09:38	Buzzard	2	Not Recorded	N/A	31
Winter 2021/22	08/03/2022	2	10:50	Buzzard	1	Not Recorded	N/A	32
Winter 2021/22	08/03/2022	2	10:53	Herring Gull	3	Not Recorded	N/A	84

Season	Date	VP	Observation Time	Species Name	Quantity	Sex	Notes	Bird ID No.
Winter 2021/22	08/03/2022	2	11:00	Herring Gull	6	Not Recorded	N/A	85
Winter 2021/22	08/03/2022	2	11:23	Great Black-backed Gull	2	Not Recorded	N/A	44
Winter 2021/22	08/03/2022	2	11:46	Buzzard	1	Not Recorded	N/A	33
Winter 2021/22	08/03/2022	2	11:50	Great Black-backed Gull	4	Not Recorded	N/A	45
Winter 2021/22	08/03/2022	2	12:15	Buzzard	1	Not Recorded	N/A	34
Winter 2021/22	08/03/2022	2	12:24	Buzzard	1	Not Recorded	N/A	35
Winter 2021/22	08/03/2022	2	12:56	Herring Gull	3	Not Recorded	N/A	86
Winter 2021/22	08/03/2022	2	11:00	Lesser Black-backed Gull	1	Not Recorded	N/A	2
Spring Migration 2022	13/04/2022	1	15:24	Great Black-backed Gull	1	Not Recorded	N/A	46
Spring Migration 2022	13/04/2022	1	17:06	Buzzard	1	Not Recorded	N/A	36
Spring Migration 2022	13/04/2022	1	17:25	Sparrowhawk	1	Not Recorded	N/A	15
Spring Migration 2022	14/04/2022	2	06:35 - 09:35	Snipe	1	Not Recorded	Calling from this area for majority of VP watch	9

Season	Date	VP	Observation Time	Species Name	Quantity	Sex	Notes	Bird ID No.
Spring Migration 2022	14/04/2022	2	10:16	Buzzard	1	Not Recorded	Calling from trees	39
Spring Migration 2022	14/04/2022	2	12:49	Snipe	1	Not Recorded	Calling from bog	8
Spring Migration 2022	14/04/2022	1	14:39	Buzzard	2	Not Recorded	N/A	37
Spring Migration 2022	14/04/2022	1	14:48	Buzzard	1	Not Recorded	N/A	38
Spring Migration 2022	14/04/2022	1	15:45	Herring Gull	20	Not Recorded	Circling this area before heading off east	87
Spring Migration 2022	14/04/2022	2	10:23	Herring Gull	1	Not Recorded	N/A	88
Spring Migration 2022	14/04/2022	2	10:37	Sparrowhawk	1	Not Recorded	N/A	16
Spring Migration 2022	14/04/2022	2	10:44	Snipe	1	Not Recorded	N/A	6
Spring Migration 2022	14/04/2022	2	10:53	Snipe	1	Not Recorded	N/A	7
Spring Migration 2022	14/04/2022	2	12:18	Sparrowhawk	1	Not Recorded	N/A	17

Season	Date	VP	Observation Time	Species Name	Quantity	Sex	Notes	Bird ID No.
Spring Migration 2022	14/04/2022	2	12:25	Great Black-backed Gull	2	Not Recorded	N/A	47
Spring Migration 2022	14/04/2022	2	12:32	Kestrel	1	Not Recorded	N/A	13
Spring Migration 2022	14/04/2022	2	07:44	Great Black-backed Gull	1	Not Recorded	N/A	48
Spring Migration 2022	14/04/2022	2	07:49	Snipe	1	Not Recorded	Displaying, chipping call, landed back in bog	5
Spring Migration 2022	14/04/2022	2	07:55	Great Black-backed Gull	2	Not Recorded	N/A	49
Spring Migration 2022	14/04/2022	2	08:06	Great Black-backed Gull	1	Not Recorded	N/A	50
Spring Migration 2022	14/04/2022	1	15:45	Great Black-backed Gull	19	Not Recorded	Circling this area before heading off east	51
Summer 2022	19/04/2022	1	11:03	Buzzard	2	Not Recorded	N/A	40
Summer 2022	19/04/2022	1	11:11	Great Black-backed Gull	2	Not Recorded	N/A	52
Summer 2022	19/04/2022	1	12:15	Great Black-backed Gull	8	Not Recorded	N/A	53
Summer 2022	19/04/2022	1	12:22	Buzzard	1	Not Recorded	N/A	41

Season	Date	VP	Observation Time	Species Name	Quantity	Sex	Notes	Bird ID No.
Summer 2022	19/04/2022	1	12:35	Buzzard	1	Not Recorded	N/A	42
Summer 2022	19/04/2022	1	13:37	Buzzard	1	Not Recorded	Landed in tree	43
Summer 2022	20/04/2022	1	11:09	Buzzard	1	Not Recorded	N/A	44
Summer 2022	20/04/2022	1	11:41	Buzzard	1	Not Recorded	N/A	45
Summer 2022	20/04/2022	1	11:47	Sparrowhawk	1	Not Recorded	N/A	18
Summer 2022	20/04/2022	1	12:06	Buzzard	1	Not Recorded	N/A	46
Summer 2022	29/04/2022	2	12:31	Snipe	1	Not Recorded	N/A	10
Summer 2022	29/04/2022	2	13:26	Kestrel	1	Not Recorded	Flew at 0-20m, 20-50m, and 50-100m.	14
Summer 2022	29/04/2022	2	13:35	Kestrel	1	Not Recorded	Flew at 0-20m.	15
Summer 2022	29/04/2022	2	14:48	Buzzard	1	Not Recorded	N/A	47
Summer 2022	29/04/2022	2	16:13	Buzzard	1	Not Recorded	N/A	48
Summer 2022	29/04/2022	2	16:28	Buzzard	1	Not Recorded	Landed in plantation	49
Summer 2022	29/04/2022	2	16:48	Buzzard	1	Not Recorded	N/A	50
Summer 2022	29/04/2022	2	17:03	Kestrel	1	Not Recorded	N/A	16

Season	Date	VP	Observation Time	Species Name	Quantity	Sex	Notes	Bird ID No.
Summer 2022	29/04/2022	2	17:12	Buzzard	1	Not Recorded	N/A	51
Summer 2022	29/04/2022	2	17:17	Kestrel	1	Not Recorded	N/A	17
Summer 2022	04/05/2022	1	11:30	Buzzard	2	Not Recorded	N/A	52
Summer 2022	04/05/2022	1	11:33	Great Black-backed Gull	1	Not Recorded	N/A	54
Summer 2022	04/05/2022	1	11:38	Buzzard	1	Not Recorded	N/A	53
Summer 2022	04/05/2022	1	11:53	Buzzard	1	Not Recorded	N/A	54
Summer 2022	04/05/2022	1	12:01	Sparrowhawk	1	Not Recorded	N/A	19
Summer 2022	04/05/2022	1	12:18	Buzzard	2	Not Recorded	N/A	55
Summer 2022	04/05/2022	1	12:29	Buzzard	1	Not Recorded	N/A	56
Summer 2022	04/05/2022	1	12:41	Buzzard	1	Not Recorded	Landed in tree	57
Summer 2022	04/05/2022	1	13:01	Stock Dove	1	Not Recorded	Landed in tree	1
Summer 2022	04/05/2022	1	13:03	Buzzard	1	Not Recorded	N/A	58
Summer 2022	04/05/2022	1	13:05	Buzzard	1	Not Recorded	N/A	59
Summer 2022	04/05/2022	1	13:08	Buzzard	2	Not Recorded	N/A	60

Season	Date	VP	Observation Time	Species Name	Quantity	Sex	Notes	Bird ID No.
Summer 2022	04/05/2022	1	14:31	Buzzard	1	Not Recorded	N/A	61
Summer 2022	04/05/2022	1	14:41	Buzzard	1	Not Recorded	N/A	62
Summer 2022	04/05/2022	1	15:50	Buzzard	1	Not Recorded	N/A	64
Summer 2022	04/05/2022	1	16:14	Sparrowhawk	1	Not Recorded	N/A	20
Summer 2022	04/05/2022	1	16:25	Stock Dove	1	Not Recorded	N/A	2
Summer 2022	04/05/2022	1	14:47	Buzzard	1	Not Recorded	Perched in tree	63
Summer 2022	05/05/2022	2	10:52	Buzzard	1	Not Recorded	N/A	65
Summer 2022	05/05/2022	2	12:09	Sparrowhawk	1	Not Recorded	N/A	21
Summer 2022	05/05/2022	2	12:28	Buzzard	2	Not Recorded	N/A	66
Summer 2022	05/05/2022	2	12:43	Buzzard	1	Not Recorded	N/A	67
Summer 2022	05/05/2022	2	12:54	Buzzard	2	Not Recorded	N/A	68
Summer 2022	05/05/2022	2	12:56	Buzzard	4	Not Recorded	N/A	69
Summer 2022	05/05/2022	2	13:14	Buzzard	1	Not Recorded	N/A	70
Summer 2022	05/05/2022	2	14:05	Snipe	1	Not Recorded	N/A	11

Season	Date	VP	Observation Time	Species Name	Quantity	Sex	Notes	Bird ID No.
Summer 2022	05/05/2022	2	14:21	Snipe	1	Not Recorded	N/A	12
Summer 2022	05/05/2022	2	14:23	Grey Heron	1	Not Recorded	N/A	2
Summer 2022	05/05/2022	2	14:37	Snipe	1	Not Recorded	Chipping calling from bog	13
Summer 2022	05/05/2022	2	15:35	Herring Gull	1	Not Recorded	N/A	89
Summer 2022	05/05/2022	2	15:48	Buzzard	1	Not Recorded	N/A	71
Summer 2022	05/05/2022	2	16:12	Buzzard	1	Not Recorded	N/A	72
Summer 2022	06/06/2022	2	14:45	Buzzard	1	Not Recorded	N/A	73
Summer 2022	06/06/2022	2	14:57	Buzzard	1	Not Recorded	N/A	74
Summer 2022	06/06/2022	2	15:04	Grey Heron	1	Not Recorded	N/A	3
Summer 2022	06/06/2022	2	15:09	Snipe	1	Not Recorded	Chipping from bog	14
Summer 2022	06/06/2022	2	15:28	Buzzard	1	Not Recorded	N/A	75
Summer 2022	06/06/2022	2	16:42	Swift	5	Not Recorded	N/A	1
Summer 2022	06/06/2022	2	16:54	Kestrel	1	Not Recorded	N/A	18

Season	Date	VP	Observation Time	Species Name	Quantity	Sex	Notes	Bird ID No.
Summer 2022	06/06/2022	2	18:29	Herring Gull	1	Not Recorded	N/A	90
Summer 2022	06/06/2022	2	18:36	Swift	2	Not Recorded	N/A	2
Summer 2022	09/06/2022	1	Not Recorded	Sparrowhawk	1	Not Recorded	N/A	22
Summer 2022	09/06/2022	1	Not Recorded	Buzzard	1	Not Recorded	N/A	76
Summer 2022	09/06/2022	1	Not Recorded	Buzzard	1	Not Recorded	N/A	77
Summer 2022	09/06/2022	1	09:16	Buzzard	1	Not Recorded	N/A	78
Summer 2022	09/06/2022	1	09:27	Buzzard	1	Not Recorded	N/A	79
Summer 2022	09/06/2022	1	09:55	Buzzard	1	Not Recorded	N/A	80
Summer 2022	09/06/2022	1	10:06	Buzzard	1	Not Recorded	Perched in tree	81
Summer 2022	09/06/2022	1	11:18	Buzzard	1	Not Recorded	N/A	82
Summer 2022	11/07/2022	1	12:10	Great Black-backed Gull	1	Not Recorded	No quantity provided.	55
Summer 2022	11/07/2022	1	13:46	Sparrowhawk	1	Not Recorded	No quantity provided.	23
Summer 2022	11/07/2022	1	14:17	Buzzard	1	Not Recorded	No quantity provided.	83
Summer 2022	11/07/2022	1	14:37	Buzzard	1	Not Recorded	No quantity provided.	84

Season	Date	VP	Observation Time	Species Name	Quantity	Sex	Notes	Bird ID No.
Summer 2022	11/07/2022	1	15:33	Buzzard	1	Not Recorded	Landed in tree. No quantity provided.	85
Summer 2022	13/07/2022	2	10:14	Buzzard	1	Not Recorded	No quantity provided.	86
Summer 2022	13/07/2022	2	10:56	Kestrel	1	Not Recorded	No quantity provided.	19
Summer 2022	13/07/2022	2	12:10	Kestrel	1	Not Recorded	No quantity provided.	20
Summer 2022	13/07/2022	2	12:18	Buzzard	1	Not Recorded	No quantity provided.	87
Summer 2022	13/07/2022	2	12:22	Buzzard	1	Not Recorded	No quantity provided.	88
Summer 2022	13/07/2022	2	12:35	Buzzard	1	Not Recorded	No quantity provided.	89
Summer 2022	13/07/2022	2	09:38	Sparrowhawk	1	Not Recorded	No quantity provided.	24
Summer 2022	08/08/2022	1	14:40	Great Black-backed Gull	8	Not Recorded	8 birds in flock.	56
Summer 2022	08/08/2022	1	17:38	Buzzard	1	Not Recorded	N/A	90
Summer 2022	08/08/2022	1	18:37	Buzzard	1	Not Recorded	N/A	91
Summer 2022	08/08/2022	1	17:53	Buzzard	1	Not Recorded	N/A	92
Summer 2022	08/08/2022	1	19:20	Buzzard	1	Not Recorded	N/A	93
Summer 2022	08/08/2022	1	19:51	Buzzard	1	Not Recorded	N/A	94

Season	Date	VP	Observation Time	Species Name	Quantity	Sex	Notes	Bird ID No.
Summer 2022	09/08/2022	2	12:28	Buzzard	1	Not Recorded	Spent time soaring within circled area on map	95
Summer 2022	09/08/2022	2	12:11	Buzzard	1	Not Recorded	N/A	96
Summer 2022	09/08/2022	2	12:26	Kestrel	1	Not Recorded	N/A	21
Summer 2022	09/08/2022	2	12:59	Buzzard	1	Not Recorded	N/A	97
Summer 2022	09/08/2022	2	08:53	Sparrowhawk	1	Not Recorded	N/A	25
Summer 2022	09/08/2022	2	09:45	Sparrowhawk	1	Not Recorded	N/A	26
Summer 2022	17/08/2022	1	16:01	Buzzard	1	Not Recorded	N/A	98
Summer 2022	17/08/2022	1	16:16	Buzzard	1	Not Recorded	N/A	99
Summer 2022	17/08/2022	1	17:35	Buzzard	1	Not Recorded	N/A	101
Summer 2022	10/09/2022	1	14:51	Buzzard	1	Not Recorded	N/A	102
Summer 2022	10/09/2022	1	15:06	Buzzard	1	Not Recorded	N/A	103
Summer 2022	10/09/2022	1	16:07	Little Egret	1	Not Recorded	N/A	1
Summer 2022	10/09/2022	1	16:29	Buzzard	1	Not Recorded	Perched in tree	100

Season	Date	VP	Observation Time	Species Name	Quantity	Sex	Notes	Bird ID No.
Summer 2022	10/09/2022	1	16:54	Buzzard	1	Not Recorded	N/A	105
Summer 2022	10/09/2022	2	08:14	Kestrel	1	Not Recorded	Landed on post	22
Summer 2022	10/09/2022	2	08:22	Kestrel	1	Not Recorded	N/A	23
Summer 2022	10/09/2022	2	08:52	Herring Gull	6	Not Recorded	N/A	91
Summer 2022	10/09/2022	2	09:11	Buzzard	2	Not Recorded	N/A	106
Summer 2022	10/09/2022	2	09:36	Herring Gull	4	Not Recorded	N/A	92
Summer 2022	10/09/2022	2	11:19	Sparrowhawk	1	Not Recorded	N/A	27
Summer 2022	10/09/2022	2	12:01	Buzzard	1	Not Recorded	N/A	107
Summer 2022	10/09/2022	2	12:55	Kestrel	1	Not Recorded	N/A	24
Summer 2022	10/09/2022	2	12:59	Buzzard	1	Not Recorded	N/A	108
Summer 2022	10/09/2022	2	15:25	Buzzard	1	Not Recorded	Perched in tree	104
Winter 2022/23	21/12/2022	1	09:38	Herring Gull	15	Not Recorded	Flyover	93
Winter 2022/23	21/12/2022	1	09:50	Herring Gull	10	Not Recorded	Flyover	94
Winter 2022/23	21/12/2022	1	10:33	Herring Gull	5	Not Recorded	Flyover	95

Season	Date	VP	Observation Time	Species Name	Quantity	Sex	Notes	Bird ID No.
Winter 2022/23	21/12/2022	1	10:48	Herring Gull	8	Not Recorded	N/A	96
Winter 2022/23	21/12/2022	1	10:51	Lesser Black-backed Gull	1	Not Recorded	Flyover	3
Winter 2022/23	21/12/2022	1	11:16	Herring Gull	1	Not Recorded	N/A	97
Winter 2022/23	21/12/2022	1	13:02	Herring Gull	1	Not Recorded	N/A	98
Winter 2022/23	21/12/2022	1	13:10	Whooper Swan	13	Not Recorded	Landed in field	5
Winter 2022/23	21/12/2022	1	13:16	Herring Gull	2	Not Recorded	N/A	99
Winter 2022/23	21/12/2022	1	13:30	Great Black-backed Gull	2	Not Recorded	Landed in field	57
Winter 2022/23	21/12/2022	1	13:32	Sparrowhawk	1	Not Recorded	Flew in bushes	28
Winter 2022/23	21/12/2022	1	14:30	Herring Gull	15	Not Recorded	Flyover	100
Winter 2022/23	22/12/2022	2	10:01	Herring Gull	9	Not Recorded	N/A	101
Winter 2022/23	22/12/2022	2	10:04	Herring Gull	3	Not Recorded	N/A	102
Winter 2022/23	22/12/2022	2	10:28	Sparrowhawk	1	Not Recorded	N/A	29
Winter 2022/23	22/12/2022	2	10:29	Herring Gull	1	Not Recorded	N/A	103
Winter 2022/23	22/12/2022	2	10:42	Herring Gull	4	Not Recorded	N/A	104

Season	Date	VP	Observation Time	Species Name	Quantity	Sex	Notes	Bird ID No.
Winter 2022/23	22/12/2022	2	11:55	Kestrel	1	Not Recorded	N/A	25
Winter 2022/23	22/12/2022	2	12:48	Kestrel	1	Not Recorded	N/A	26
Winter 2022/23	22/12/2022	2	13:35	Buzzard	1	Not Recorded	N/A	109
Winter 2022/23	24/01/2023	2	11:53	Kestrel	1	Not Recorded	N/A	27
Winter 2022/23	24/01/2023	2	12:27	Herring Gull	1	Not Recorded	Second Winter	105
Winter 2022/23	24/01/2023	2	12:28	Sparrowhawk	1	Not Recorded	N/A	30
Winter 2022/23	24/01/2023	2	12:55	Buzzard	1	Not Recorded	N/A	110
Winter 2022/23	24/01/2023	1	09:56	Herring Gull	4	Not Recorded	Flying through	106
Winter 2022/23	24/01/2023	1	11:09	Herring Gull	1	Not Recorded	Flying through	107
Winter 2022/23	24/01/2023	1	11:19	Herring Gull	3	Not Recorded	N/A	108
Winter 2022/23	24/01/2023	1	11:27	Whooper Swan	13	Not Recorded	Landed in field, feeding	6
Winter 2022/23	24/01/2023	1	11:34	Herring Gull	8	Not Recorded	N/A	109
Winter 2022/23	24/01/2023	1	13:06	Herring Gull	10	Not Recorded	N/A	110
Winter 2022/23	24/01/2023	1	13:25	Golden Plover	106	Not Recorded	N/A	2

Season	Date	VP	Observation Time	Species Name	Quantity	Sex	Notes	Bird ID No.
Winter 2022/23	24/01/2023	1	13:53	Herring Gull	4	Not Recorded	N/A	111
Winter 2022/23	24/01/2023	1	14:20	Herring Gull	1	Not Recorded	N/A	112
Winter 2022/23	24/01/2023	1	14:35	Herring Gull	10	Not Recorded	N/A	113
Winter 2022/23	24/01/2023	2	12:29	Herring Gull	9	Not Recorded	N/A	114
Winter 2022/23	13/02/2023	2	10:15	Grey Heron	1	Not Recorded	Adult	4
Winter 2022/23	13/02/2023	2	10:33	Golden Plover	30	Not Recorded	N/A	3
Winter 2022/23	13/02/2023	2	10:35	Herring Gull	1	Not Recorded	N/A	115
Winter 2022/23	13/02/2023	2	10:36	Sparrowhawk	1	Female		31
Winter 2022/23	13/02/2023	2	13:32	Sparrowhawk	1	Not Recorded	N/A	32
Winter 2022/23	13/02/2023	1	09:00	Whooper Swan	13	Not Recorded	Feeding in field after landing	7
Winter 2022/23	13/02/2023	1	09:26	Herring Gull	2	Not Recorded	Flying through	116
Winter 2022/23	13/02/2023	1	10:04	Herring Gull	18	Not Recorded	Flying through	117
Winter 2022/23	13/02/2023	1	10:09	Herring Gull	6	Not Recorded	N/A	118
Winter 2022/23	13/02/2023	1	10:15	Great Black-backed Gull	1	Not Recorded	Soaring	58

Season	Date	VP	Observation Time	Species Name	Quantity	Sex	Notes	Bird ID No.
Winter 2022/23	13/02/2023	1	12:32	Herring Gull	3	Not Recorded	N/A	119
Winter 2022/23	13/02/2023	1	12:40	Sparrowhawk	2	Not Recorded	Displaying, soaring	33
Winter 2022/23	13/02/2023	1	14:20	Buzzard	2	Not Recorded	Displaying	111
Winter 2022/23	27/02/2023	2	09:57	Buzzard	1	Not Recorded	N/A	112
Winter 2022/23	27/02/2023	2	10:50	Golden Plover	60	Not Recorded	Distant Flock	4
Winter 2022/23	27/02/2023	2	12:24	Buzzard	1	Not Recorded	N/A	113
Winter 2022/23	01/03/2023	1	09:45	Golden Plover	3	Not Recorded	N/A	5
Winter 2022/23	01/03/2023	1	10:41	Buzzard	1	Not Recorded	Flying through	114
Winter 2022/23	01/03/2023	1	12:32	Peregrine	1	Not Recorded	N/A	1
Winter 2022/23	20/03/2023	1	11:10	Great Black-backed Gull	1	Not Recorded	Passing through	59
Winter 2022/23	20/03/2023	1	11:16	Buzzard	1	Not Recorded	Soaring, calling	115
Winter 2022/23	20/03/2023	1	11:27	Buzzard	4	Not Recorded	Soaring, calling	116
Winter 2022/23	20/03/2023	1	12:10	Buzzard	1	Not Recorded	N/A	117
Winter 2022/23	20/03/2023	1	12:14	Great Black-backed Gull	2	Not Recorded	N/A	60

Season	Date	VP	Observation Time	Species Name	Quantity	Sex	Notes	Bird ID No.
Winter 2022/23	20/03/2023	1	10:40	Great Black-backed Gull	1	Not Recorded	Passing through	61
Winter 2022/23	20/03/2023	1	12:32	Herring Gull	1	Not Recorded	Passing though	120
Winter 2022/23	20/03/2023	1	13:25	Buzzard	1	Not Recorded	Soaring	118
Winter 2022/23	20/03/2023	1	14:35	Sparrowhawk	1	Not Recorded	Mobbed by HC	34
Winter 2022/23	20/03/2023	2	09:40	Buzzard	1	Not Recorded	Flushed	119
Winter 2022/23	20/03/2023	2	09:47	Golden Plover	47	Not Recorded	Flyover, calling	6
Winter 2022/23	20/03/2023	2	10:11	Sparrowhawk	1	Not Recorded	With prey, flying low	35
Winter 2022/23	20/03/2023	2	10:15	Sparrowhawk	1	Not Recorded	Distant over woodland	36
Winter 2022/23	20/03/2023	2	10:47	Sparrowhawk	2	Females		37
Winter 2022/23	20/03/2023	2	10:50	Herring Gull	1	Not Recorded	N/A	121
Winter 2022/23	20/03/2023	2	11:29	Buzzard	4	Not Recorded	N/A	120
Winter 2022/23	20/03/2023	2	11:34	Lesser Black-backed Gull	1	Not Recorded	Adults	4
Winter 2022/23	20/03/2023	2	11:39	Lesser Black-backed Gull	2	Not Recorded	Adults	5
Winter 2022/23	20/03/2023	2	11:40	Buzzard	2	Not Recorded	N/A	121

Season	Date	VP	Observation Time	Species Name	Quantity	Sex	Notes	Bird ID No.
Winter 2022/23	20/03/2023	2	11:42	Lesser Black-backed Gull	1	Not Recorded	Adult	6
Winter 2022/23	20/03/2023	2	11:55	Goshawk	1	Female	Female seen very well through binoculars. Female Goshank seen very well, didn't get scope views. Flew through/under 4 soaring BZ and into woodland. Potential breeding habitat in the general area.	1
Winter 2022/23	20/03/2023	2	11:03	Sparrowhawk	2	Female		38
Winter 2022/23	20/03/2023	2	11:00	Buzzard	1	Not Recorded	Distant	122
Winter 2022/23	20/03/2023	2	13:25	Buzzard	1	Not Recorded	Soaring	123
Winter 2022/23	20/03/2023	2	13:28	Kestrel	1	Not Recorded	Hunting	28
Winter 2022/23	22/03/2023	1	09:50	Lesser Black-backed Gull	5	Not Recorded	Landed in field	7
Winter 2022/23	22/03/2023	1	11:23	Sparrowhawk	1	Not Recorded	N/A	39
Winter 2022/23	22/03/2023	1	12:15	Buzzard	1	Not Recorded	Soaring	124
Winter 2022/23	22/03/2023	1	12:31	Lesser Black-backed Gull	5	Not Recorded	N/A	8
Winter 2022/23	22/03/2023	1	12:36	Buzzard	1	Not Recorded	Landed in field	125

Season	Date	VP	Observation Time	Species Name	Quantity	Sex	Notes	Bird ID No.
Winter 2022/23	22/03/2023	1	12:40	Herring Gull	3	Not Recorded	Landed in field	122
Winter 2022/23	22/03/2023	1	15:02	Buzzard	1	Not Recorded	Soaring	126
Winter 2022/23	22/03/2023	1	15:40	Herring Gull	4	Not Recorded	Landed in fields	123
Winter 2022/23	22/03/2023	2	10:31	Kestrel	1	Female	Hunting	29
Winter 2022/23	22/03/2023	2	10:53	Lesser Black-backed Gull	2	Not Recorded	Adults	9
Winter 2022/23	22/03/2023	2	11:48	Golden Plover	200	Not Recorded	Circling around calling. 200+.	7
Winter 2022/23	22/03/2023	2	11:56	Great Black-backed Gull	2	Not Recorded	Adults	62
Winter 2022/23	22/03/2023	2	12:00	Great Black-backed Gull	1	Not Recorded	First-year	63
Winter 2022/23	22/03/2023	2	12:01	Lesser Black-backed Gull	1	Not Recorded	Adult	10
Winter 2022/23	22/03/2023	2	12:05	Herring Gull	6	Not Recorded	Adults and first-years	124
Winter 2022/23	22/03/2023	2	12:10	Lesser Black-backed Gull	1	Not Recorded	Adult	11
Winter 2022/23	22/03/2023	2	12:15	Buzzard	1	Not Recorded	N/A	127
Spring Migration 2023	06/04/2023	2	07:10	Lesser Black-backed Gull	2	Not Recorded	Adults	12

Season	Date	VP	Observation Time	Species Name	Quantity	Sex	Notes	Bird ID No.
Spring Migration 2023	06/04/2023	2	08:21	Kestrel	1	Female		30
Spring Migration 2023	06/04/2023	2	09:41	Buzzard	1	Not Recorded	N/A	128
Spring Migration 2023	06/04/2023	2	09:47	Golden Plover	50	Not Recorded	Distant flock, 50+ individuals	8
Spring Migration 2023	06/04/2023	2	11:21	Herring Gull	3	Not Recorded	N/A	125
Spring Migration 2023	06/04/2023	2	11:32	Buzzard	1	Not Recorded	N/A	129
Spring Migration 2023	06/04/2023	2	11:41	Buzzard	2	Not Recorded	Soaring	130
Spring Migration 2023	06/04/2023	2	11:49	Grey Heron	1	Not Recorded	Adult	5
Spring Migration 2023	06/04/2023	2	11:53	Lesser Black-backed Gull	1	Not Recorded	Adult	13
Spring Migration 2023	06/04/2023	2	12:00	Lesser Black-backed Gull	4	Not Recorded	Soaring	14
Spring Migration 2023	06/04/2023	2	13:26	Kestrel	1	Not Recorded	Feeding and hunting	31

Season	Date	VP	Observation Time	Species Name	Quantity	Sex	Notes	Bird ID No.
Spring Migration 2023	06/04/2023	2	13:30	Snipe	1	Not Recorded	Display flight	15
Spring Migration 2023	06/04/2023	1	14:52	Buzzard	1	Not Recorded	Soaring, calling	131
Spring Migration 2023	06/04/2023	1	15:04	Lesser Black-backed Gull	32	Not Recorded	Soaring, landing in field	15
Spring Migration 2023	06/04/2023	1	18:13	Lesser Black-backed Gull	2	Not Recorded	Joined 32 in field	16
Spring Migration 2023	06/04/2023	1	18:20	Buzzard	2	Not Recorded	Soaring, displaying	132
Spring Migration 2023	06/04/2023	1	18:23	Golden Plover	25	Not Recorded	N/A	9
Spring Migration 2023	06/04/2023	1	18:24	Buzzard	1	Not Recorded	Calling	133
Spring Migration 2023	06/04/2023	1	18:40	Buzzard	3	Not Recorded	N/A	134
Spring Migration 2023	06/04/2023	1	18:50	Lesser Black-backed Gull	34	Not Recorded	Lifted from field	17
Spring Migration 2023	06/04/2023	1	19:05	Buzzard	4	Not Recorded	Soaring	135

Season	Date	VP	Observation Time	Species Name	Quantity	Sex	Notes	Bird ID No.
Spring Migration 2023	06/04/2023	1	19:49	Buzzard	1	Not Recorded	Mobbed by HC	136
Spring Migration 2023	06/04/2023	1	20:02	Buzzard	6	Not Recorded	N/A	137
Summer 2023	09/05/2023	2	10:37	Kestrel	1	Female		32
Summer 2023	09/05/2023	2	11:06	Buzzard	3	Not Recorded	Soaring	138
Summer 2023	09/05/2023	2	12:29	Lesser Black-backed Gull	13	Not Recorded	Soaring in heat thermals	18
Summer 2023	09/05/2023	2	12:29	Herring Gull	7	Not Recorded	Soaring in heat thermals	126
Summer 2023	09/05/2023	2	13:33	Buzzard	1	Not Recorded	Soaring	139
Summer 2023	09/05/2023	2	13:35	Kestrel	1	Not Recorded	N/A	33
Summer 2023	09/05/2023	2	13:36	Kestrel	1	Not Recorded	N/A	34
Summer 2023	09/05/2023	1	09:45	Buzzard	2	Not Recorded	Soaring	140
Summer 2023	09/05/2023	1	11:09	Buzzard	1	Not Recorded	Soaring, displaying	141
Summer 2023	09/05/2023	1	13:20	Buzzard	2	Not Recorded	Displaying	142
Summer 2023	09/05/2023	1	13:22	Sparrowhawk	1	Not Recorded	N/A	40

Season	Date	VP	Observation Time	Species Name	Quantity	Sex	Notes	Bird ID No.
Summer 2023	09/05/2023	1	13:30	Great Black-backed Gull	1	Not Recorded	N/A	64
Summer 2023	09/05/2023	1	14:35	Buzzard	1	Not Recorded	Mobbed by HC	143
Summer 2023	15/05/2023	2	10:40	Buzzard	1	Not Recorded	CK singing in flight in the air below BZ	144
Summer 2023	15/05/2023	2	10:58	Buzzard	2	Not Recorded	Soaring	145
Summer 2023	15/05/2023	2	13:10	Buzzard	2	Not Recorded	N/A	146
Summer 2023	15/05/2023	1	12:11	Buzzard	1	Not Recorded	Mobbed by HC	147
Summer 2023	15/05/2023	1	12:48	Buzzard	3	Not Recorded	Soaring	148
Summer 2023	15/05/2023	1	12:54	Great Black-backed Gull	1	Not Recorded	Landed in field	65
Summer 2023	15/05/2023	1	13:01	Buzzard	1	Not Recorded	Mobbed by HC	149
Summer 2023	15/05/2023	1	15:07	Buzzard	2	Not Recorded	Soaring	150
Summer 2023	15/05/2023	1	10:36	Buzzard	1	Not Recorded	Soaring	151
Summer 2023	15/05/2023	1	10:52	Buzzard	2	Not Recorded	Soaring	152
Summer 2023	07/06/2023	1	10:45	Lesser Black-backed Gull	1	Not Recorded	Landed in field	19
Summer 2023	07/06/2023	1	10:48	Lesser Black-backed Gull	1	Not Recorded	Landed in field	20

Season	Date	VP	Observation Time	Species Name	Quantity	Sex	Notes	Bird ID No.
Summer 2023	07/06/2023	1	11:12	Lesser Black-backed Gull	1	Not Recorded	N/A	21
Summer 2023	07/06/2023	1	11:16	Buzzard	1	Not Recorded	Soaring	153
Summer 2023	07/06/2023	1	11:23	Buzzard	1	Not Recorded	N/A	154
Summer 2023	07/06/2023	1	11:25	Great Black-backed Gull	1	Not Recorded	Rose up and dropped back into area	66
Summer 2023	07/06/2023	1	13:12	Great Black-backed Gull	1	Not Recorded	N/A	67
Summer 2023	07/06/2023	1	13:14	Herring Gull	42	Not Recorded	N/A	127
Summer 2023	07/06/2023	1	13:41	Lesser Black-backed Gull	2	Not Recorded	Landed in field	22
Summer 2023	07/06/2023	1	14:06	Buzzard	1	Not Recorded	Mobbed by corvids	155
Summer 2023	07/06/2023	1	14:33	Sparrowhawk	2	Not Recorded	N/A	41
Summer 2023	07/06/2023	1	14:50	Great Black-backed Gull	1	Not Recorded	N/A	68
Summer 2023	07/06/2023	1	15:12	Buzzard	1	Not Recorded	Landed in trees	156
Summer 2023	07/06/2023	1	15:37	Great Black-backed Gull	1	Not Recorded	N/A	69
Summer 2023	07/06/2023	2	10:44	Sparrowhawk	1	Not Recorded	N/A	42
Summer 2023	07/06/2023	2	11:00	Snipe	1	Not Recorded	Flew overhead.	16

Season	Date	VP	Observation Time	Species Name	Quantity	Sex	Notes	Bird ID No.
Summer 2023	07/06/2023	2	11:10	Buzzard	2	Not Recorded	N/A	157
Summer 2023	07/06/2023	2	11:57	Snipe	1	Not Recorded	Display flight and calls.	17
Summer 2023	07/06/2023	2	12:40	Swift	2	Not Recorded	Hawking cow over grassland	3
Summer 2023	07/06/2023	2	12:48	Swift	4	Not Recorded	Hawking	4
Summer 2023	07/06/2023	2	13:10	Red Kite	1	Not Recorded	Flyover, high up. Rare in Kildare.	1
Summer 2023	07/06/2023	2	13:20	Buzzard	5	Not Recorded	Soaring	158
Summer 2023	07/06/2023	1	13:14	Lesser Black-backed Gull	43	Not Recorded	N/A	23
Summer 2023	06/07/2023	2	09:33	Kestrel	1	Not Recorded	Hunting	35
Summer 2023	06/07/2023	2	09:40	Great Black-backed Gull	1	Not Recorded	Adult	70
Summer 2023	06/07/2023	2	10:06	Buzzard	1	Not Recorded	N/A	160
Summer 2023	06/07/2023	2	11:07	Herring Gull	3	Not Recorded	Two 1st-years and One 2nd-year	128
Summer 2023	06/07/2023	2	11:09	Lesser Black-backed Gull	5	Not Recorded	Three adults and two 1st-years	24
Summer 2023	06/07/2023	2	14:11	Buzzard	2	Not Recorded	N/A	159
Summer 2023	06/07/2023	1	09:42	Lesser Black-backed Gull	1	Not Recorded	Landed in field	25

Season	Date	VP	Observation Time	Species Name	Quantity	Sex	Notes	Bird ID No.
Summer 2023	06/07/2023	1	09:54	Great Black-backed Gull	1	Not Recorded	N/A	71
Summer 2023	06/07/2023	1	09:05	Buzzard	1	Not Recorded	Flew from trees and perched	161
Summer 2023	01/08/2023	1	10:45	Lesser Black-backed Gull	5	Not Recorded	N/A	26
Summer 2023	01/08/2023	1	11:15	Lesser Black-backed Gull	14	Not Recorded	N/A	27
Summer 2023	01/08/2023	1	13:53	Buzzard	1	Not Recorded	Soaring	162
Summer 2023	01/08/2023	2	11:04	Swift	2	Not Recorded	Hawking	5
Summer 2023	01/08/2023	2	11:07	Kestrel	1	Not Recorded	Hovering	36
Summer 2023	01/08/2023	2	11:10	Lesser Black-backed Gull	1	Not Recorded	Flyover	28
Summer 2023	01/08/2023	2	11:11	Buzzard	2	Not Recorded	Soaring	163
Summer 2023	01/08/2023	2	11:14	Buzzard	1	Not Recorded	Hunting	164
Summer 2023	01/08/2023	2	11:58	Buzzard	2	Not Recorded	Soaring	165
Summer 2023	01/08/2023	2	13:15	Kestrel	1	Male	Moulting	37
Summer 2023	12/09/2023	1	13:47	Sparrowhawk	1	Female	Mobbed by HM	43
Summer 2023	12/09/2023	2	10:53	Kestrel	1	Not Recorded	Hunting	38

Season	Date	VP	Observation Time	Species Name	Quantity	Sex	Notes	Bird ID No.
Summer 2023	12/09/2023	2	11:01	Kestrel	1	Not Recorded	Juvenile	39
Summer 2023	12/09/2023	2	11:33	Lesser Black-backed Gull	3	Not Recorded	Soaring, drifting SW	29
Summer 2023	12/09/2023	2	11:58	Golden Plover	2	Not Recorded	Flyover, calling	10

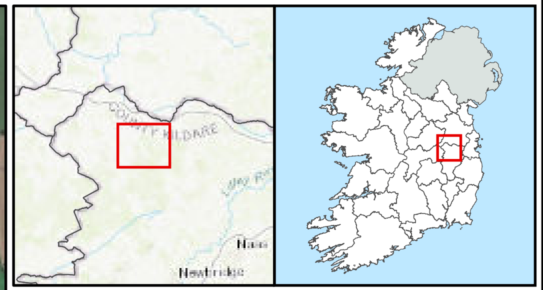
FEHILY TIMONEY

DESIGNING AND DELIVERING
A SUSTAINABLE FUTURE

APPENDIX 3

Target Species Flight Line Maps

Path: R:\Map Production\2020\P20-326\Workspaces\P20_326_Flightlines\P20_326_Flightlines.aprx



Legend

Proposed Development Boundary

SNH Buffer

Bird ID No, Date, Time

36, 13/04/2022, 17:06

37, 14/04/2022, 14:39

38, 14/04/2022, 14:48

TITLE:	Buzzard Spring Migration 2022
PROJECT:	Drehid Wind Farm and Substation
FIGURE NO:	--
CLIENT:	North Kildare Wind Farm Ltd.
SCALE: 1:25,000	REVISION: 0
DATE: 20/05/2025	PAGE SIZE: A3

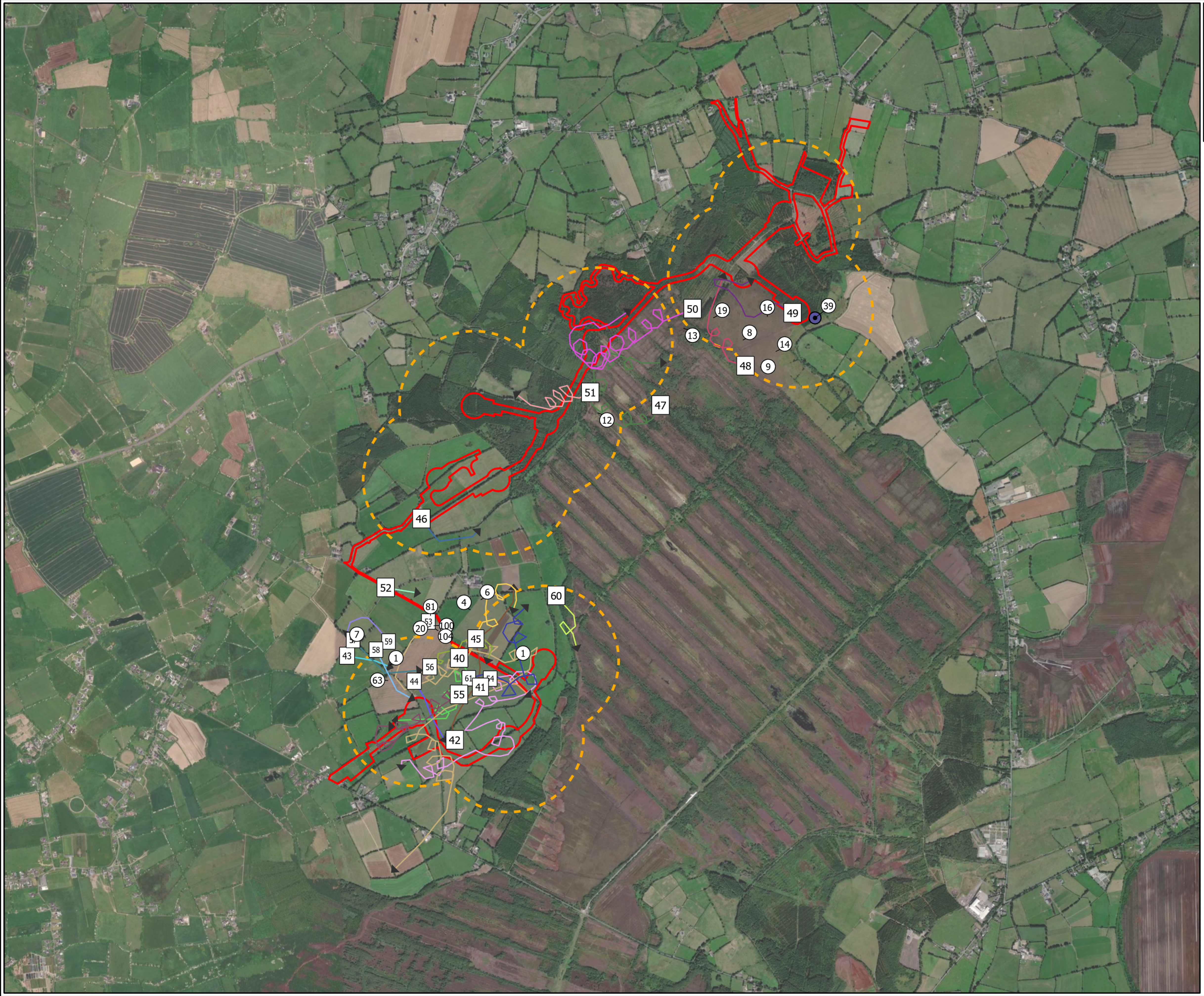
FEHILY TIMONEY Cork | Dublin | Carlow www.fehilytimoney.ie

N W E S

0 0.5 1 Kilometers

World Imagery: Maxar, Microsoft
World Topographic Map: Esri, HERE, Garmin, FAO, USGS, NGACreative and Commons Attribution 4.0 International (CC BY 4.0) licence https://creativecommons.org/licenses/by/4.0/
[INPUT SOURCE HERE]; If Applicable: Mapping Reproduced Under Licence from the Ordnance Survey Ireland Licence No. CYAL50368274 © Government of Ireland

Path: R:\Map Production\2020\P20-326\Workspaces\P20_326_Flightlines\P20_326_Flightlines.aprx



Legend

Proposed Development Boundary

SNH Buffer

Bird ID No, Date, Time

- 40, 19/04/2022, 11:03
- 41, 19/04/2022, 12:22
- 42, 19/04/2022, 12:35
- 43, 19/04/2022, 13:37
- 44, 20/04/2022, 11:09
- 45, 20/04/2022, 11:41
- 46, 20/04/2022, 12:06
- 47, 29/04/2022, 14:48
- 48, 29/04/2022, 16:13
- 49, 29/04/2022, 16:28
- 50, 29/04/2022, 16:48
- 51, 29/04/2022, 17:12
- 52, 04/05/2022, 11:30
- 53, 04/05/2022, 11:38
- 54, 04/05/2022, 11:53
- 55, 04/05/2022, 12:18
- 56, 04/05/2022, 12:29
- 57, 04/05/2022, 12:41
- 58, 04/05/2022, 13:03
- 59, 04/05/2022, 13:05
- 60, 04/05/2022, 13:08
- 61, 04/05/2022, 14:31
- 39, 14/04/2022, 10:16

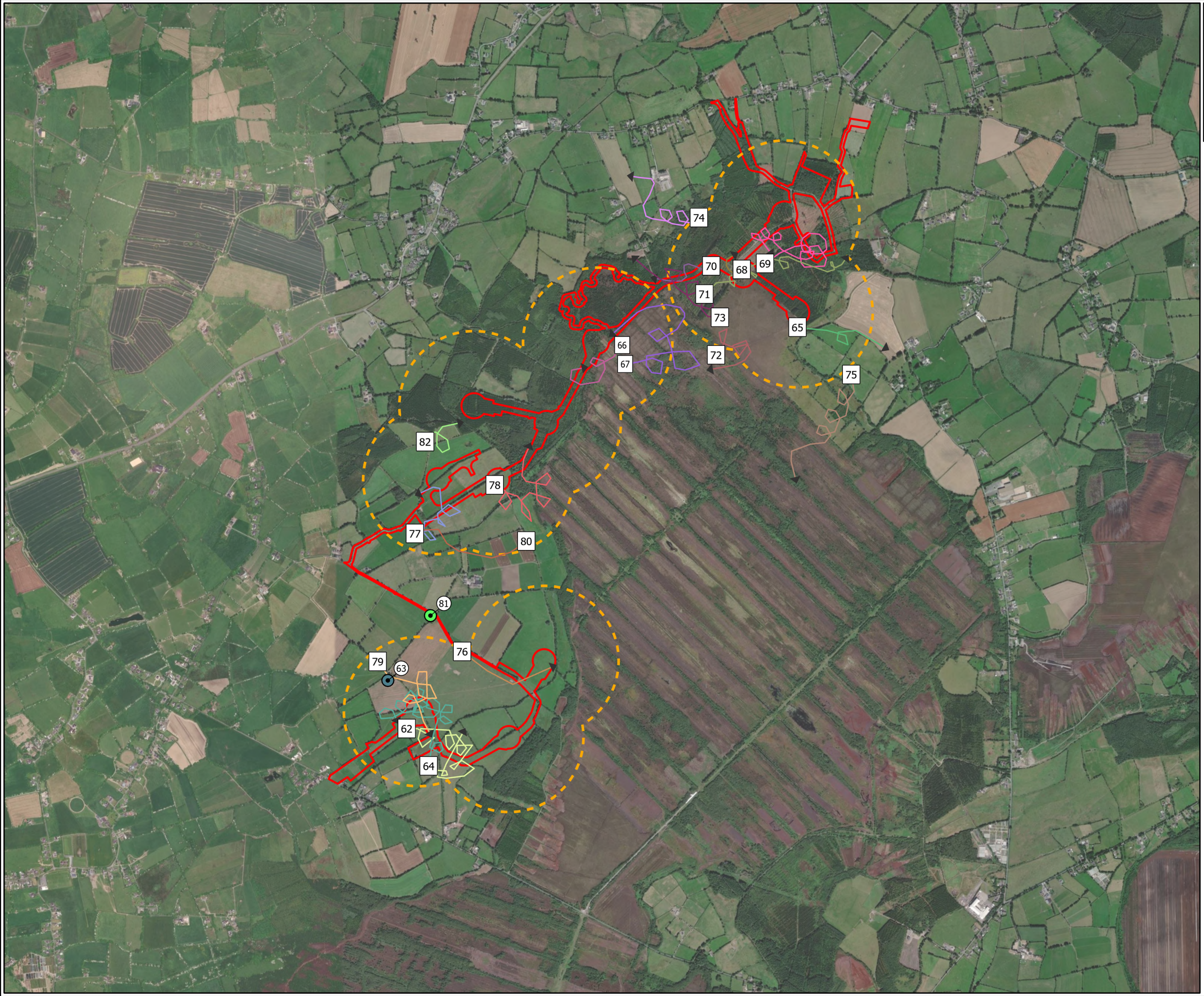
TITLE:	Buzzard 1 Summer 2022
PROJECT:	Drehid Wind Farm and Substation
FIGURE NO:	--
CLIENT:	North Kildare Wind Farm Ltd.

SCALE:	1:25,000	REVISION:	0
DATE:	20/05/2025	PAGE SIZE:	A3

FEHILY TIMONEY
Cork | Dublin | Carlow
www.fehilytimoney.ie

0 0.5 1 Kilometers

Path: R:\Map Production\2020\P20-326\Workspaces\P20_326_Flightlines\P20_326_Flightlines.aprx



Legend

Proposed Development Boundary

SNH Buffer

Bird ID No, Date, Time

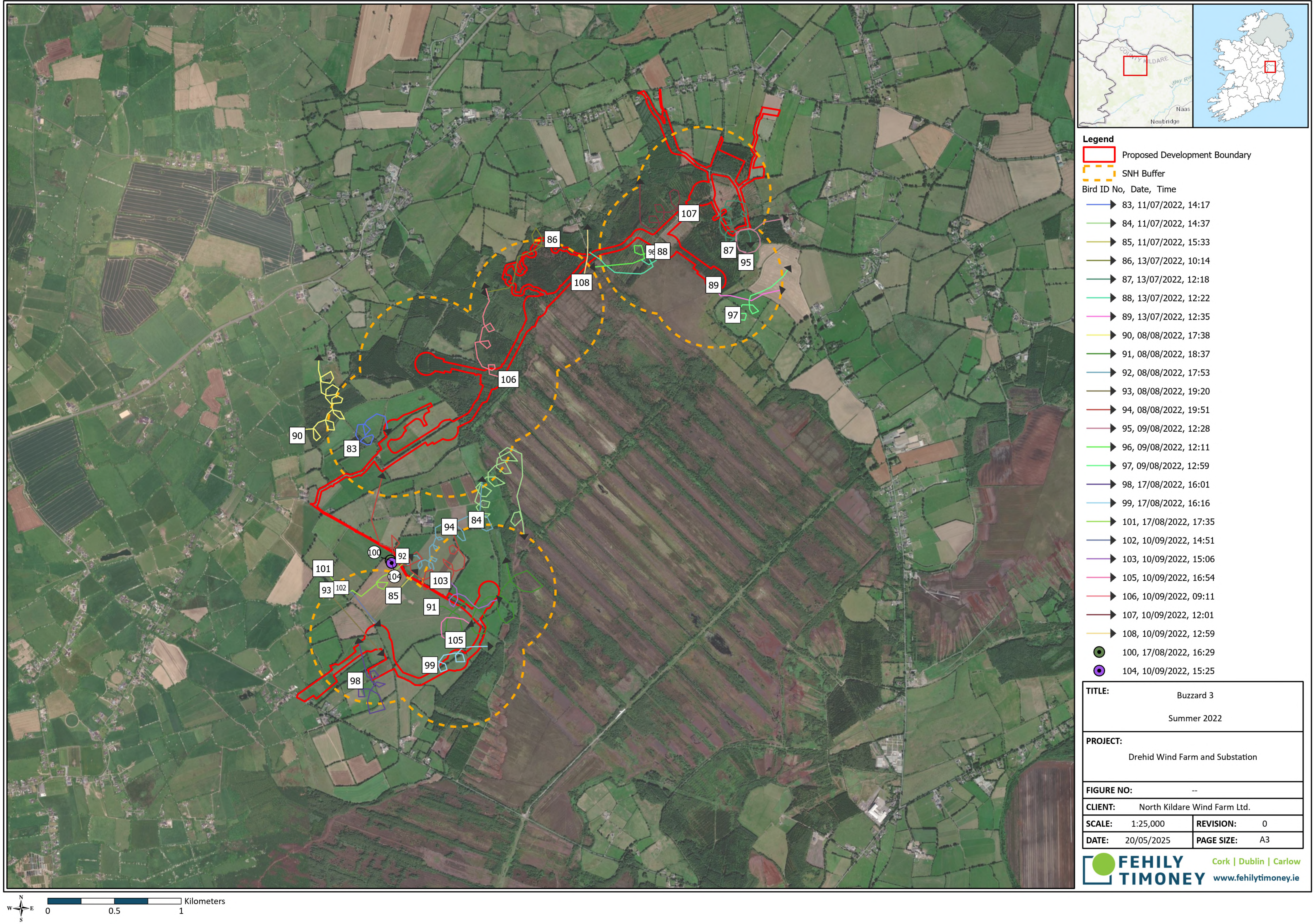
- 62, 04/05/2022, 14:41
- 64, 04/05/2022, 15:50
- 65, 05/05/2022, 10:52
- 66, 05/05/2022, 12:28
- 67, 05/05/2022, 12:43
- 68, 05/05/2022, 12:54
- 69, 05/05/2022, 12:56
- 70, 05/05/2022, 13:14
- 71, 05/05/2022, 15:48
- 72, 05/05/2022, 16:12
- 73, 06/06/2022, 14:45
- 74, 06/06/2022, 14:57
- 75, 06/06/2022, 15:28
- 76, 09/06/2022, Not Recorded
- 77, 09/06/2022, Not Recorded
- 78, 09/06/2022, 09:16
- 79, 09/06/2022, 09:27
- 80, 09/06/2022, 09:55
- 82, 09/06/2022, 11:18
- 63, 04/05/2022, 14:47
- 81, 09/06/2022, 10:06

TITLE:	Buzzard 2 Summer 2022		
PROJECT:	Drehid Wind Farm and Substation		
FIGURE NO:	--		
CLIENT:	North Kildare Wind Farm Ltd.		
SCALE:	1:25,000	REVISION:	0
DATE:	20/05/2025	PAGE SIZE:	A3

FEHILY TIMONEY Cork | Dublin | Carlow www.fehilytimoney.ie

0 0.5 1 Kilometers

Path: R:\Map Production\2020\P20-326\Workspaces\P20_326_Flightlines\P20_326_Flightlines.aprx



Legend

Proposed Development Boundary

SNH Buffer

Bird ID No, Date, Time

83, 11/07/2022, 14:17
84, 11/07/2022, 14:37
85, 11/07/2022, 15:33
86, 13/07/2022, 10:14
87, 13/07/2022, 12:18
88, 13/07/2022, 12:22
89, 13/07/2022, 12:35
90, 08/08/2022, 17:38
91, 08/08/2022, 18:37
92, 08/08/2022, 17:53
93, 08/08/2022, 19:20
94, 08/08/2022, 19:51
95, 09/08/2022, 12:28
96, 09/08/2022, 12:11
97, 09/08/2022, 12:59
98, 17/08/2022, 16:01
99, 17/08/2022, 16:16
101, 17/08/2022, 17:35
102, 10/09/2022, 14:51
103, 10/09/2022, 15:06
105, 10/09/2022, 16:54
106, 10/09/2022, 09:11
107, 10/09/2022, 12:01
108, 10/09/2022, 12:59
100, 17/08/2022, 16:29
104, 10/09/2022, 15:25

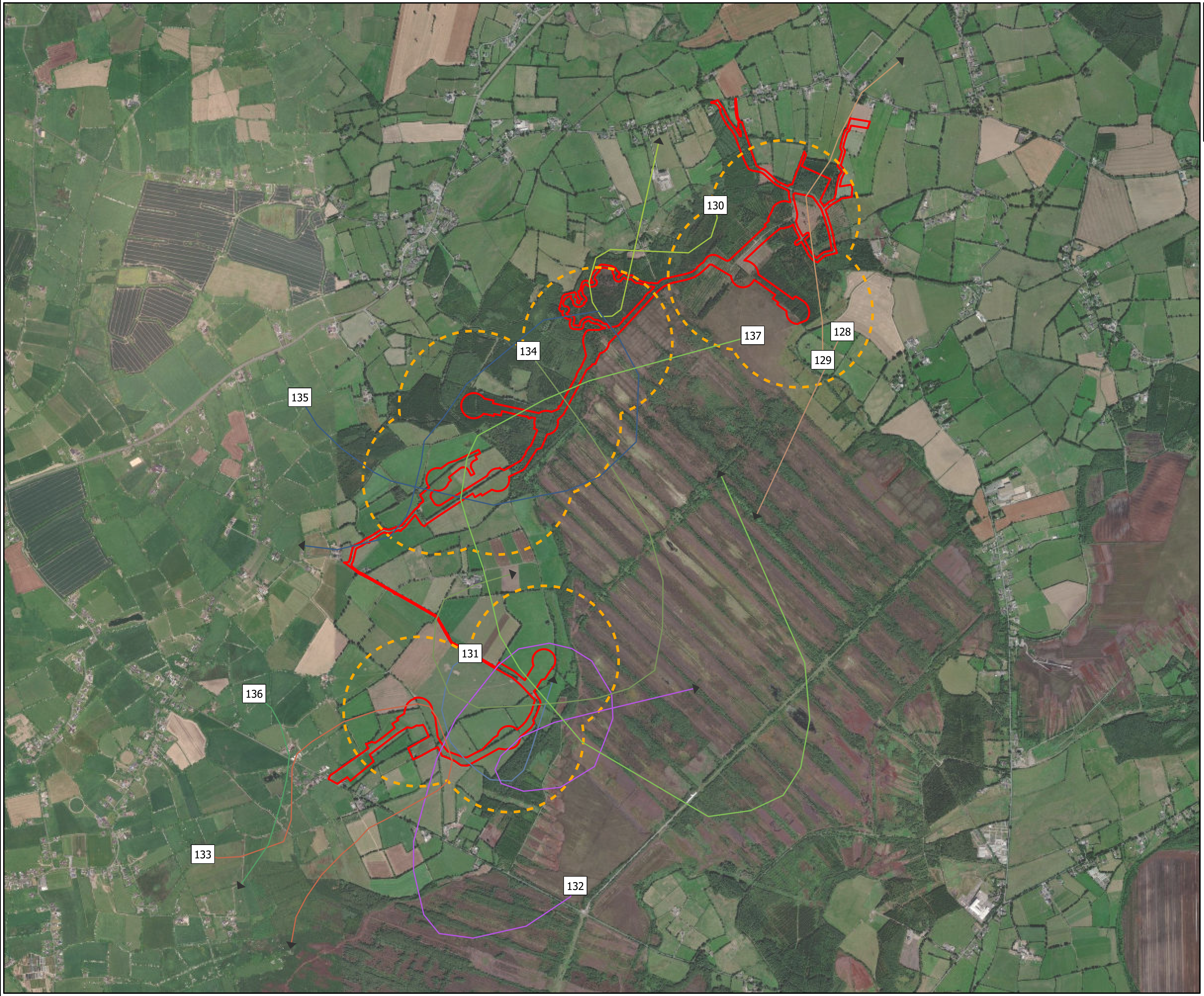
TITLE:	Buzzard 3 Summer 2022		
PROJECT:	Drehid Wind Farm and Substation		
FIGURE NO:	--		
CLIENT:	North Kildare Wind Farm Ltd.		
SCALE:	1:25,000	REVISION:	0
DATE:	20/05/2025	PAGE SIZE:	A3

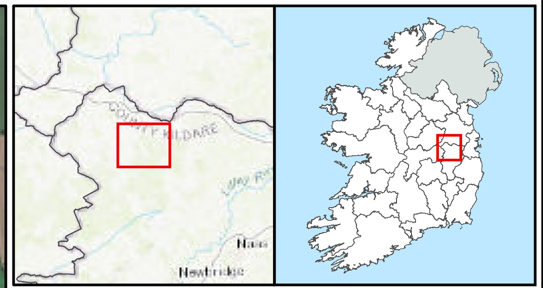
FEHILY TIMONEY

Cork | Dublin | Carlow

www.fehilytimoney.ie

Path: R:\Map Production\2020\P20-326\Workspaces\P20_326_Flightlines\P20_326_Flightlines.aprx





Legend

Proposed Development Boundary

SNH Buffer

Bird ID No, Date, Time

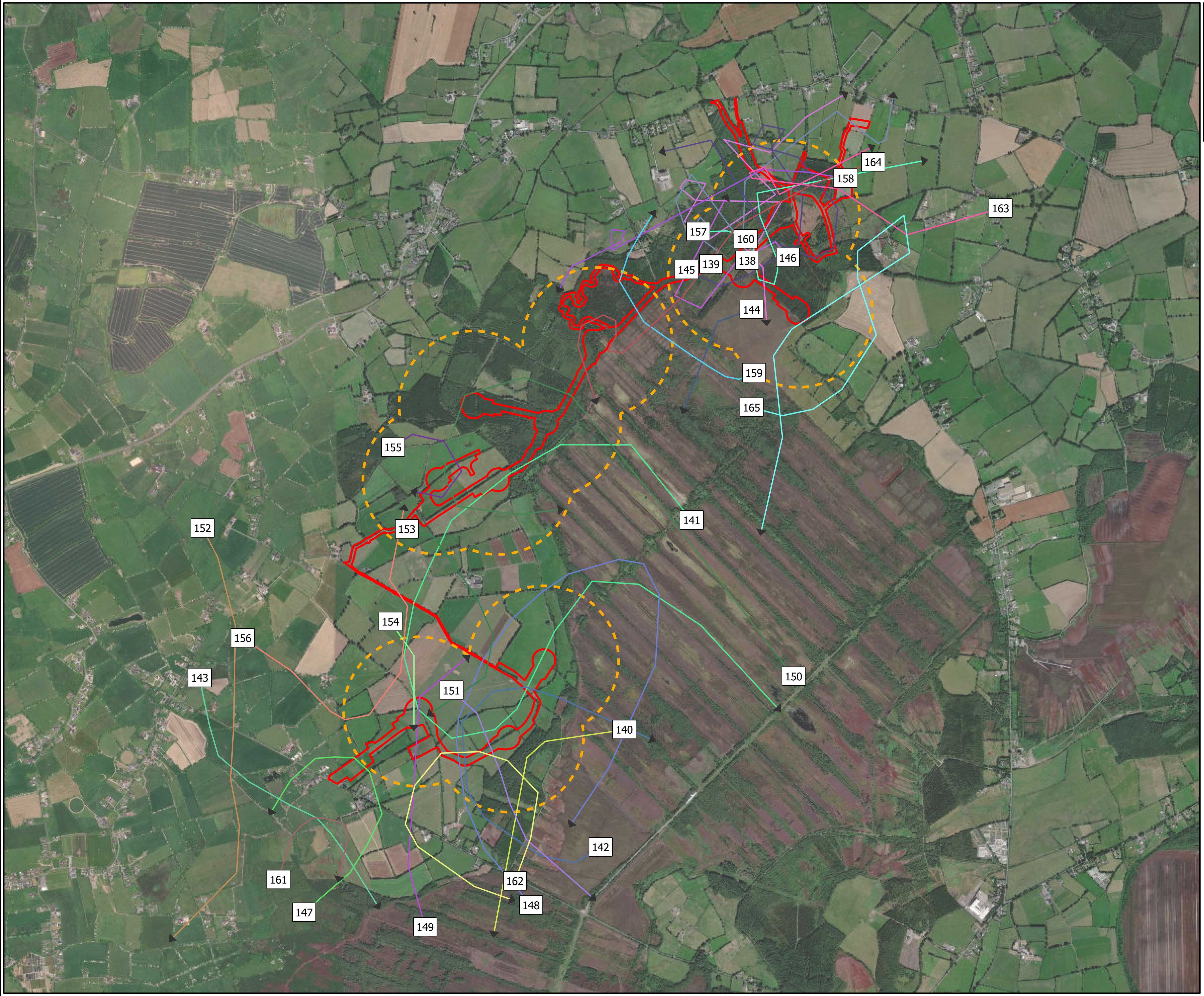
- 128, 06/04/2023, 09:41
- 129, 06/04/2023, 11:32
- 130, 06/04/2023, 11:41
- 131, 06/04/2023, 14:52
- 132, 06/04/2023, 18:20
- 133, 06/04/2023, 18:24
- 134, 06/04/2023, 18:40
- 135, 06/04/2023, 19:05
- 136, 06/04/2023, 19:49
- 137, 06/04/2023, 20:02

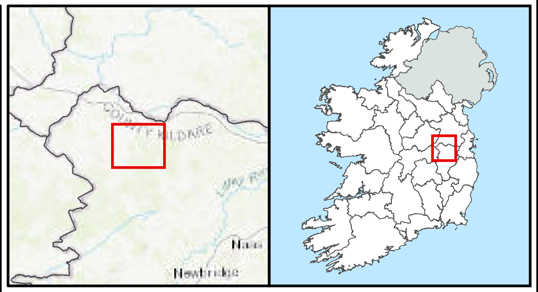
TITLE:	Buzzard Spring Migration 2023
PROJECT:	Drehid Wind Farm and Substation
FIGURE NO:	--
CLIENT:	North Kildare Wind Farm Ltd.
SCALE: 1:25,000	REVISION: 0
DATE: 20/05/2025	PAGE SIZE: A3

FEHILY TIMONEY
Cork | Dublin | Carlow
www.fehilytimoney.ie

0 0.5 1 Kilometers

Path: R:\Map Production\2020\P20-326\Workspaces\P20_326_Flightlines\P20_326_Flightlines.aprx





Legend

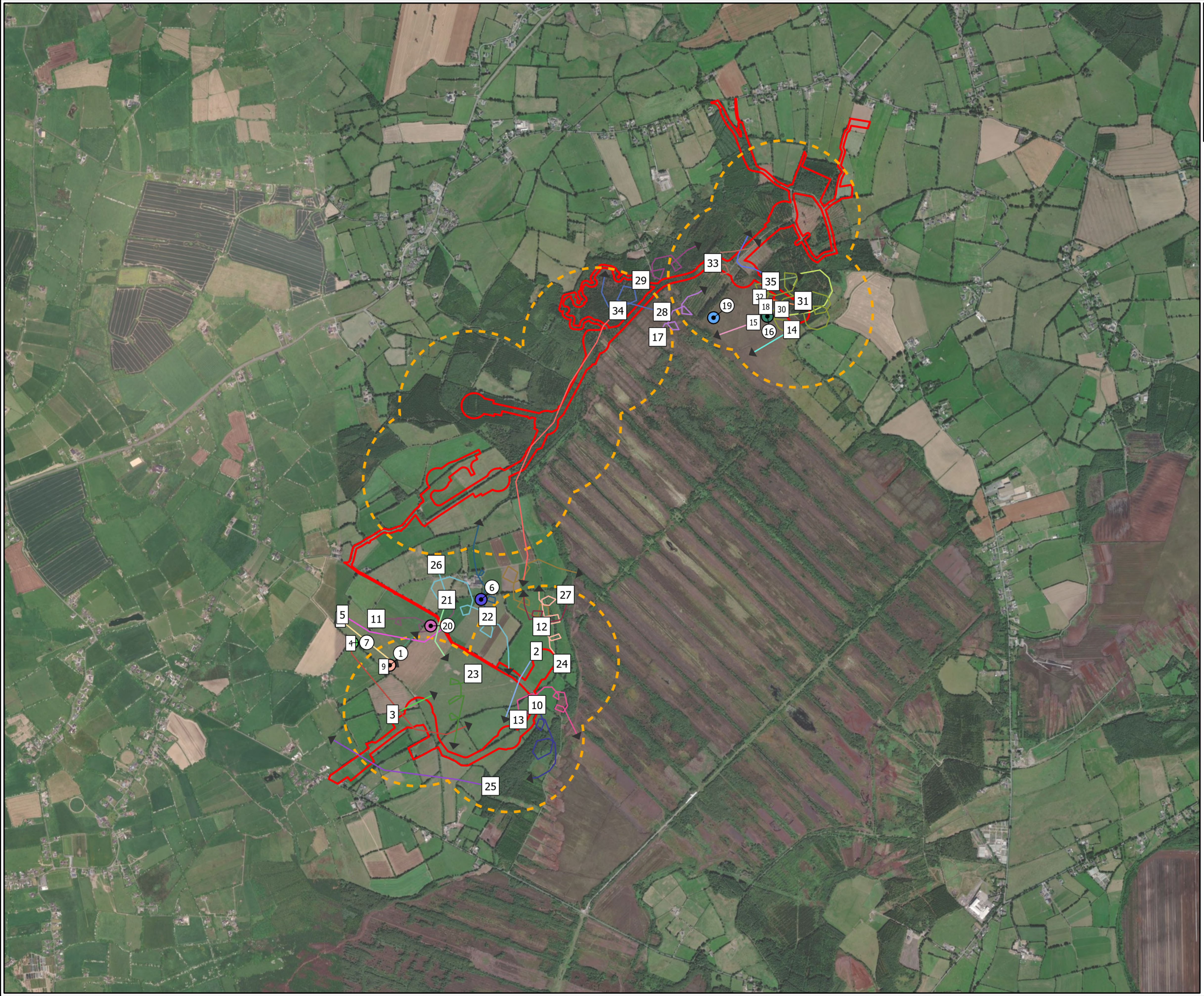
Proposed Development Boundary
SNH Buffer
Bird ID No, Date, Time
138, 09/05/2023, 11:06
139, 09/05/2023, 13:33
140, 09/05/2023, 09:45
141, 09/05/2023, 11:09
142, 09/05/2023, 13:20
143, 09/05/2023, 14:35
144, 15/05/2023, 10:40
145, 15/05/2023, 10:58
146, 15/05/2023, 13:10
147, 15/05/2023, 12:11
148, 15/05/2023, 12:48
149, 15/05/2023, 13:01
150, 15/05/2023, 15:07
151, 15/05/2023, 10:36
152, 15/05/2023, 10:52
153, 07/06/2023, 11:16
154, 07/06/2023, 11:23
155, 07/06/2023, 14:06
156, 07/06/2023, 15:12
157, 07/06/2023, 11:10
158, 07/06/2023, 13:20
159, 06/07/2023, 14:11
160, 06/07/2023, 10:06
161, 06/07/2023, 09:05
162, 01/08/2023, 13:53
163, 01/08/2023, 11:11
164, 01/08/2023, 11:14
165, 01/08/2023, 11:58

TITLE:	Buzzard Summer 2023		
PROJECT:	Drehid Wind Farm and Substation		
FIGURE NO:	--		
CLIENT:	North Kildare Wind Farm Ltd.		
SCALE:	1:25,000	REVISION:	0
DATE:	20/05/2025	PAGE SIZE:	A3

FEHILY TIMONEY
Cork | Dublin | Carlow
www.fehilytimoney.ie

Kilometers
0 0.5 1

Path: R:\Map Production\2020\P20-326\Workspaces\P20_326_Flightlines\P20_326_Flightlines.aprx



Legend

- Proposed Development Boundary
- SNH Buffer

Bird ID No, Date, Time

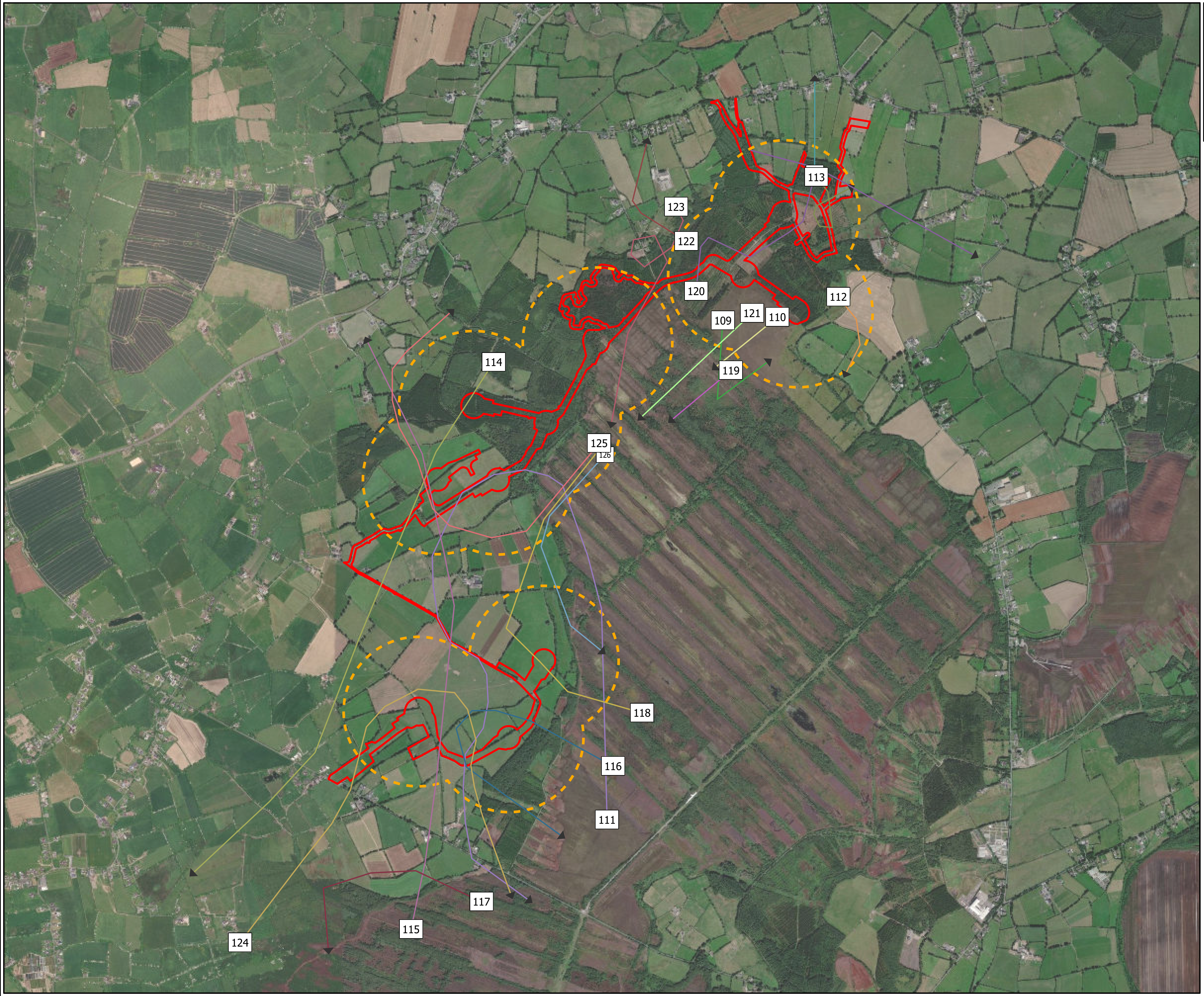
- 2, 21/12/2021, 15:08
- 3, 21/12/2021, 15:56
- 4, 21/01/2022, 13:12
- 5, 21/01/2022, 13:58
- 8, 21/01/2022, 14:59
- 9, 21/01/2022, 15:53
- 10, 14/02/2022, 11:33
- 11, 14/02/2022, 11:58
- 12, 14/02/2022, 12:27
- 13, 14/02/2022, 12:38
- 14, 17/02/2022, 12:41
- 15, 17/02/2022, 12:44
- 17, 17/02/2022, 13:31
- 18, 17/02/2022, 08:36
- 21, 25/02/2022, 13:04
- 22, 25/02/2022, 13:06
- 23, 25/02/2022, 13:10
- 24, 25/02/2022, 13:35
- 25, 25/02/2022, 13:27
- 26, 07/03/2022, 14:02
- 27, 07/03/2022, 14:35
- 28, 08/03/2022, 09:13
- 29, 08/03/2022, 09:20
- 30, 08/03/2022, 09:33
- 31, 08/03/2022, 09:38
- 32, 08/03/2022, 10:50
- 33, 08/03/2022, 11:46
- 34, 08/03/2022, 12:15
- 35, 08/03/2022, 12:24
- 1, 21/12/2021, 12:55
- 6, 21/01/2022, 14:53
- 7, 21/01/2022, 14:58
- 16, 17/02/2022, 12:34
- 19, 17/02/2022, 13:56
- 20, 25/02/2022, 09:32

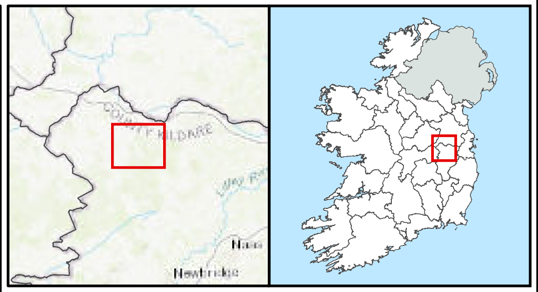
TITLE:	Buzzard Winter 2021/22
PROJECT:	Drehid Wind Farm and Substation
FIGURE NO:	--
CLIENT:	North Kildare Wind Farm Ltd.
SCALE: 1:25,000	**REVISION:** 0
DATE: 20/05/2025	**PAGE SIZE:** A3

FEHILY TIMONEY
Cork | Dublin | Carlow
www.fehilytimoney.ie

0 0.5 1 Kilometers

Path: R:\Map Production\2020\P20-326\Workspaces\P20_326_Flightlines\P20_326_Flightlines.aprx





Legend

Proposed Development Boundary

SNH Buffer

Bird ID No, Date, Time

- 109, 22/12/2022, 13:35
- 110, 24/01/2023, 12:55
- 111, 13/02/2023, 14:20
- 112, 27/02/2023, 09:57
- 113, 27/02/2023, 12:24
- 114, 01/03/2023, 10:41
- 115, 20/03/2023, 11:16
- 116, 20/03/2023, 11:27
- 117, 20/03/2023, 12:10
- 118, 20/03/2023, 13:25
- 119, 20/03/2023, 09:40
- 120, 20/03/2023, 11:29
- 121, 20/03/2023, 11:40
- 122, 20/03/2023, 11:00
- 123, 20/03/2023, 13:25
- 124, 22/03/2023, 12:15
- 125, 22/03/2023, 12:36
- 126, 22/03/2023, 15:02
- 127, 22/03/2023, 12:15

TITLE:	Buzzard Winter 2022/23		
PROJECT:	Drehid Wind Farm and Substation		
FIGURE NO:	--		
CLIENT:	North Kildare Wind Farm Ltd.		
SCALE:	1:25,000	REVISION:	0
DATE:	20/05/2025	PAGE SIZE:	A3

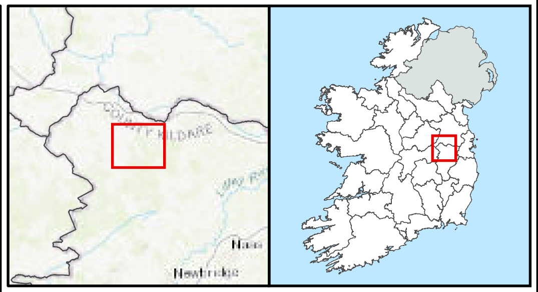
FEHILY TIMONEY
Cork | Dublin | Carlow
www.fehilytimoney.ie

N W E S

0 0.5 1 Kilometers

World Imagery: Maxar, Microsoft
World Topographic Map: Esri, HERE, Garmin, FAO, USGS, NGACreative and Commons Attribution 4.0 International (CC BY 4.0) licence https://creativecommons.org/licenses/by/4.0/
[INPUT SOURCE HERE]; If Applicable: Mapping Reproduced Under Licence from the Ordnance Survey Ireland Licence No. CYAL50368274 © Government of Ireland

Path: R:\Map Production\2020\P20-326\Workspaces\P20_326_Flightlines\P20_326_Flightlines.aprx



Legend

Proposed Development Boundary

SNH Buffer

Bird ID No, Date, Time

8, 06/04/2023, 09:47

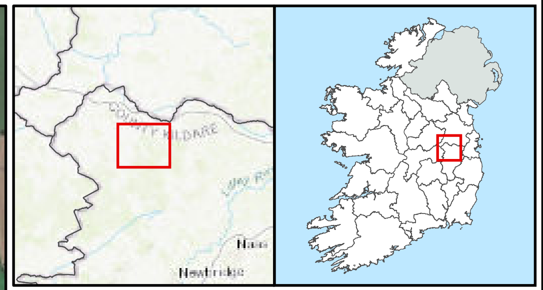
9, 06/04/2023, 18:23

TITLE:	Golden Plover Spring Migration 2023
PROJECT:	Drehid Wind Farm and Substation
FIGURE NO:	--
CLIENT:	North Kildare Wind Farm Ltd.
SCALE: 1:25,000	**REVISION:** 0
DATE: 20/05/2025	**PAGE SIZE:** A3

FEHILY TIMONEY
Cork | Dublin | Carlow
www.fehilytimoney.ie

0 0.5 1 Kilometers

Path: R:\Map Production\2020\P20-326\Workspaces\P20_326_Flightlines\P20_326_Flightlines.aprx



Legend

Proposed Development Boundary

SNH Buffer

Bird ID No, Date, Time

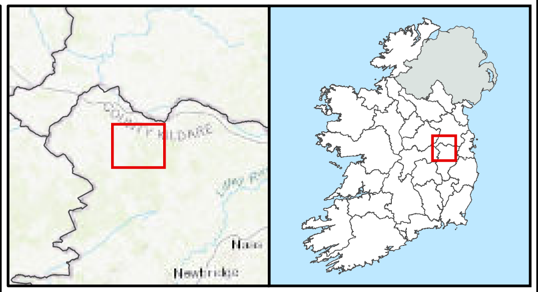
10, 12/09/2023, 11:58

TITLE:	Golden Plover Summer 2023
PROJECT:	Drehid Wind Farm and Substation
FIGURE NO:	--
CLIENT:	North Kildare Wind Farm Ltd.
SCALE: 1:25,000	**REVISION:** 0
DATE: 20/05/2025	**PAGE SIZE:** A3

FEHILY TIMONEY
Cork | Dublin | Carlow
www.fehilytimoney.ie

0 0.5 1 Kilometers

Path: R:\Map Production\2020\P20-326\Workspaces\P20_326_Flightlines\P20_326_Flightlines.aprx



Legend

Proposed Development Boundary

SNH Buffer

Bird ID No, Date, Time

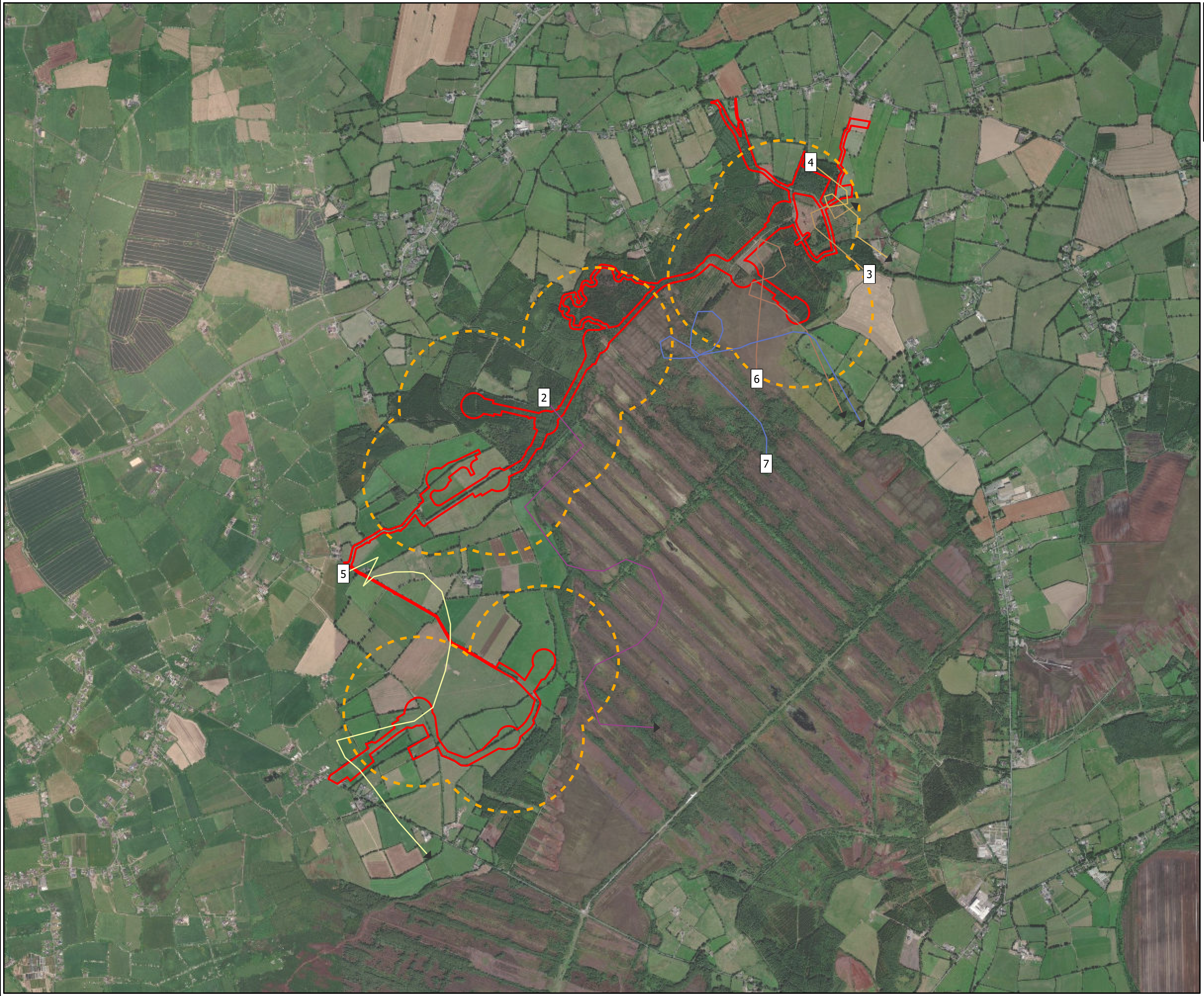
1, 07/03/2022, 17:27

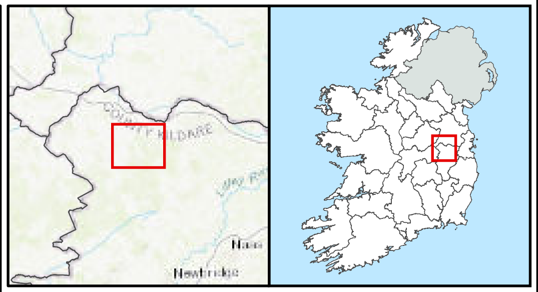
TITLE:	Golden Plover Winter 2021/22
PROJECT:	Drehid Wind Farm and Substation
FIGURE NO:	--
CLIENT:	North Kildare Wind Farm Ltd.
SCALE: 1:25,000	REVISION: 0
DATE: 20/05/2025	PAGE SIZE: A3

FEHILY TIMONEY
Cork | Dublin | Carlow
www.fehilytimoney.ie

World Imagery: Maxar, Microsoft
World Topographic Map: Esri, HERE, Garmin, FAO, USGS, NGACreative and Commons Attribution 4.0 International (CC BY 4.0) licence https://creativecommons.org/licenses/by/4.0/
[INPUT SOURCE HERE]; If Applicable: Mapping Reproduced Under Licence from the Ordnance Survey Ireland Licence No. CYAL50368274 © Government of Ireland

Path: R:\Map Production\2020\P20-326\Workspaces\P20_326_Flightlines\P20_326_Flightlines.aprx





Legend

Proposed Development Boundary

SNH Buffer

Bird ID No, Date, Time

- 2, 24/01/2023, 13:25
- 3, 13/02/2023, 10:33
- 4, 27/02/2023, 10:50
- 5, 01/03/2023, 09:45
- 6, 20/03/2023, 09:47
- 7, 22/03/2023, 11:48

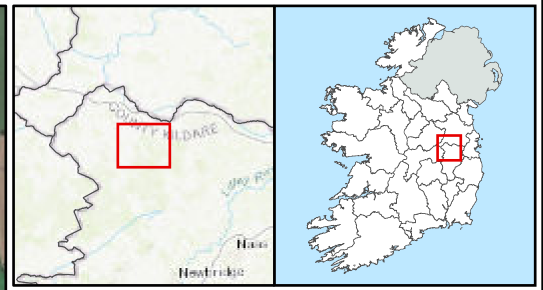
TITLE:	Golden Plover Winter 2022/23		
PROJECT:	Drehid Wind Farm and Substation		
FIGURE NO:	--		
CLIENT:	North Kildare Wind Farm Ltd.		
SCALE:	1:25,000	REVISION:	0
DATE:	20/05/2025	PAGE SIZE:	A3

FEHILY TIMONEY
Cork | Dublin | Carlow
www.fehilytimoney.ie

N W E S

0 0.5 1 Kilometers

Path: R:\Map Production\2020\P20-326\Workspaces\P20_326_Flightlines\P20_326_Flightlines.aprx



Legend

Proposed Development Boundary

SNH Buffer

Bird ID No, Date, Time

1, 20/03/2023, 11:55

TITLE:	Goshawk Winter 2022/23		
PROJECT:	Drehid Wind Farm and Substation		
FIGURE NO:	--		
CLIENT:	North Kildare Wind Farm Ltd.		
SCALE:	1:25,000	REVISION:	0
DATE:	20/05/2025	PAGE SIZE:	A3

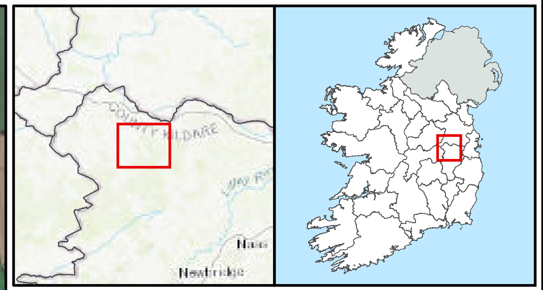
FEHILY TIMONEY

Cork | Dublin | Carlow

www.fehilytimoney.ie

0 0.5 1 Kilometers

Path: R:\Map Production\2020\P20-326\Workspaces\P20_326_Flightlines\P20_326_Flightlines.aprx



Legend

Proposed Development Boundary

SNH Buffer

Bird ID No, Date, Time

46, 13/04/2022, 15:24

47, 14/04/2022, 12:25

48, 14/04/2022, 07:44

49, 14/04/2022, 07:55

50, 14/04/2022, 08:06

51, 14/04/2022, 15:45

TITLE:	Great Black-backed Gull Spring Migration 2022
PROJECT:	Drehid Wind Farm and Substation
FIGURE NO:	--
CLIENT:	North Kildare Wind Farm Ltd.
SCALE: 1:25,000	**REVISION:** 0
DATE: 20/05/2025	**PAGE SIZE:** A3

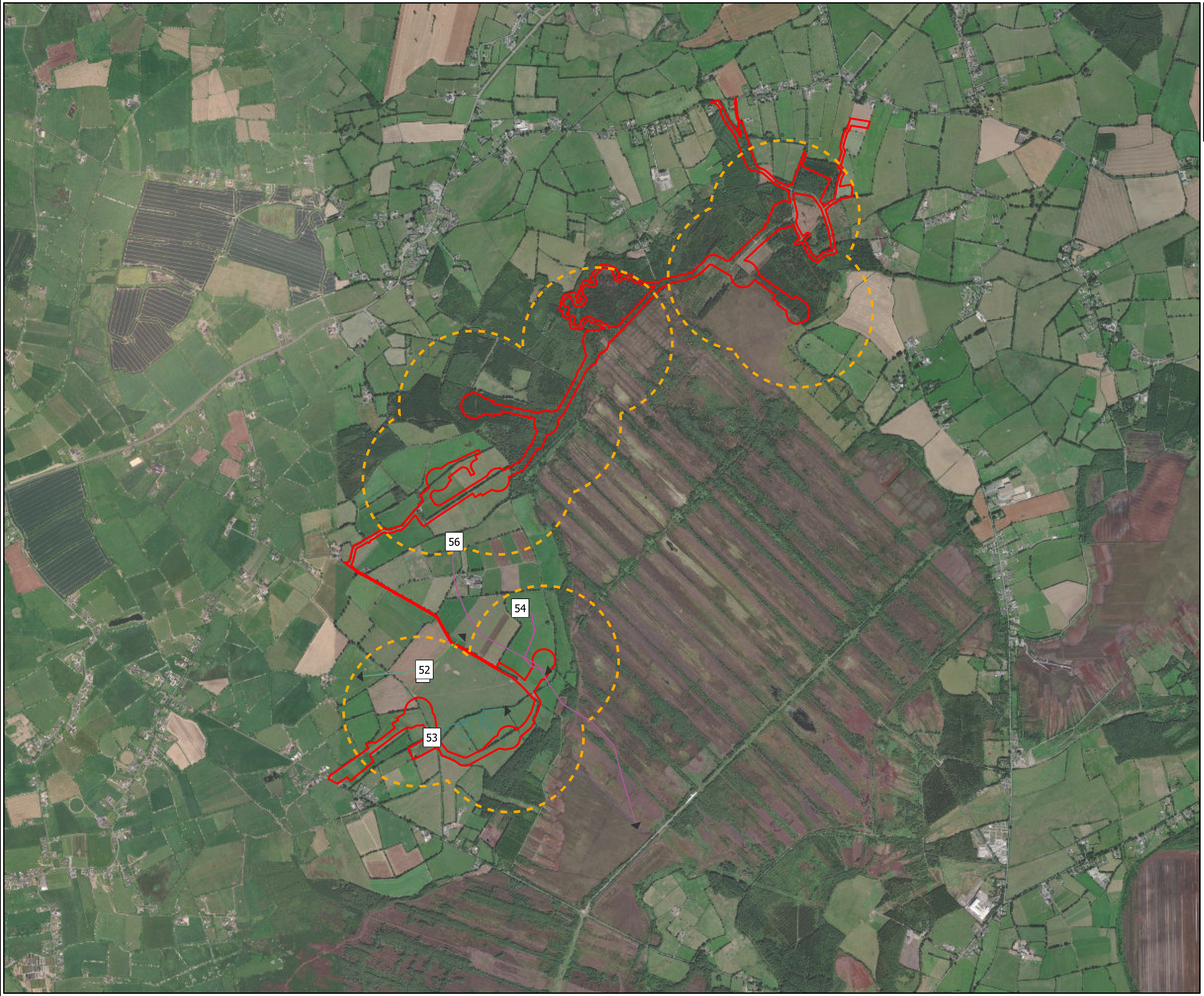
FEHILY TIMONEY

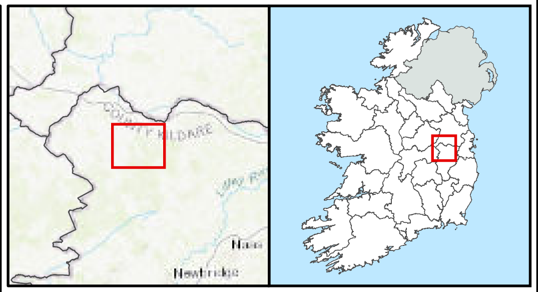
Cork | Dublin | Carlow

www.fehilytimoney.ie

World Imagery: Maxar, Microsoft
World Topographic Map: Esri, HERE, Garmin, FAO, USGS, NGACreative and Commons Attribution 4.0 International (CC BY 4.0) licence https://creativecommons.org/licenses/by/4.0/
[INPUT SOURCE HERE]; If Applicable: Mapping Reproduced Under Licence from the Ordnance Survey Ireland Licence No. CYAL50368274 © Government of Ireland

Path: R:\Map Production\2020\P20-326\Workspaces\P20_326_Flightlines\P20_326_Flightlines.aprx





Legend

Proposed Development Boundary

SNH Buffer

Bird ID No, Date, Time

52, 19/04/2022, 11:11

53, 19/04/2022, 12:15

54, 04/05/2022, 11:33

55, 11/07/2022, 12:10

56, 08/08/2022, 14:40

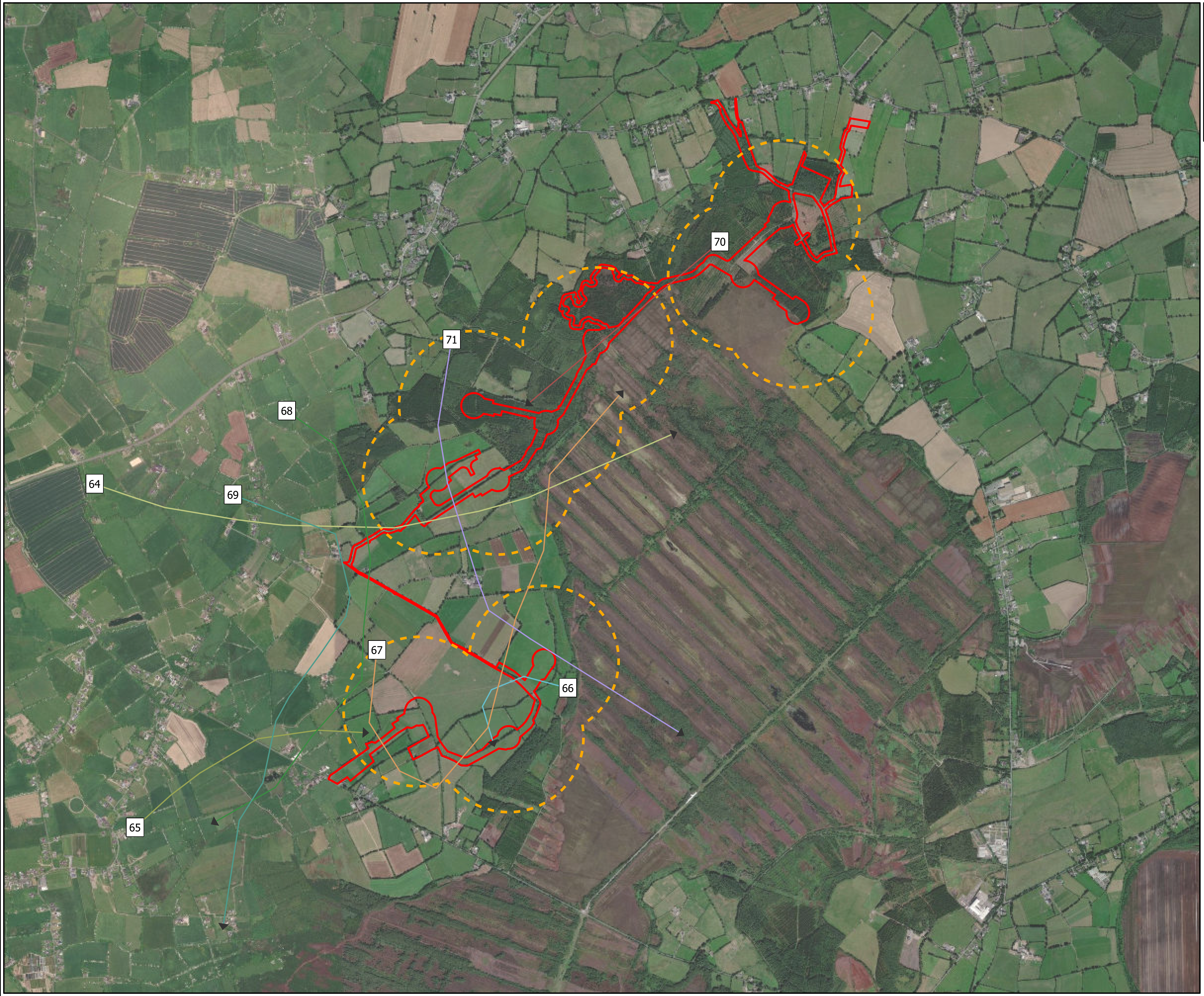
TITLE:	Great Black-backed Gull Summer 2022
PROJECT:	Drehid Wind Farm and Substation
FIGURE NO:	--
CLIENT:	North Kildare Wind Farm Ltd.
SCALE: 1:25,000	**REVISION:** 0
DATE: 20/05/2025	**PAGE SIZE:** A3

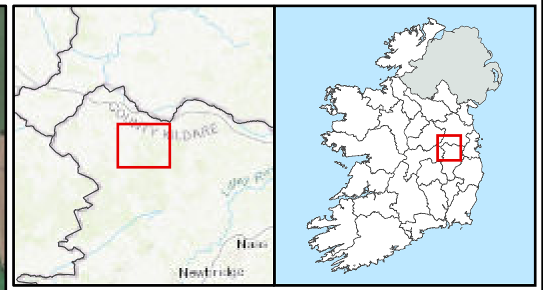
FEHILY TIMONEY
Cork | Dublin | Carlow
www.fehilytimoney.ie

0 0.5 1 Kilometers

World Imagery: Maxar, Microsoft
World Topographic Map: Esri, HERE, Garmin, FAO, USGS, NGACreative and Commons Attribution 4.0 International (CC BY 4.0) licence https://creativecommons.org/licenses/by/4.0/
[INPUT SOURCE HERE]; If Applicable: Mapping Reproduced Under Licence from the Ordnance Survey Ireland Licence No. CYAL50368274 © Government of Ireland

Path: R:\Map Production\2020\P20-326\Workspaces\P20_326_Flightlines\P20_326_Flightlines.aprx





Legend

Proposed Development Boundary

SNH Buffer

Bird ID No, Date, Time

64, 09/05/2023, 13:30

65, 15/05/2023, 12:54

66, 07/06/2023, 11:25

67, 07/06/2023, 13:12

68, 07/06/2023, 14:50

69, 07/06/2023, 15:37

70, 06/07/2023, 09:40

71, 06/07/2023, 09:54

TITLE:	Great Black-backed Gull Summer 2023
PROJECT:	Drehid Wind Farm and Substation
FIGURE NO:	--
CLIENT:	North Kildare Wind Farm Ltd.

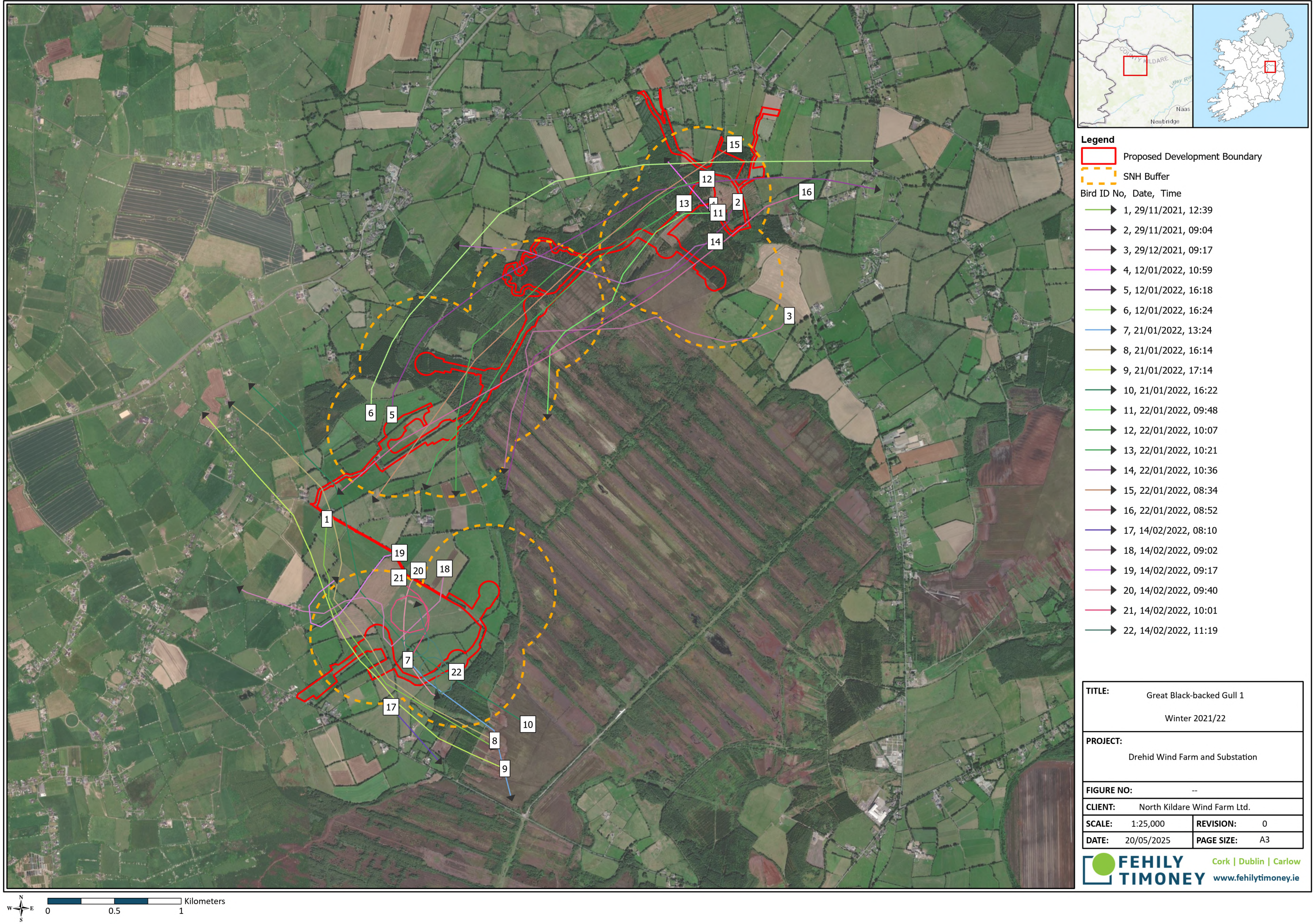
SCALE:	1:25,000	**REVISION:**	0
DATE:	20/05/2025	**PAGE SIZE:**	A3

FEHILY TIMONEY
Cork | Dublin | Carlow
www.fehilytimoney.ie

0 0.5 1 Kilometers

World Imagery: Maxar, Microsoft
World Topographic Map: Esri, HERE, Garmin, FAO, USGS, NGACreative and Commons Attribution 4.0 International (CC BY 4.0) licence https://creativecommons.org/licenses/by/4.0/
[INPUT SOURCE HERE]; If Applicable: Mapping Reproduced Under Licence from the Ordnance Survey Ireland Licence No. CYAL50368274 © Government of Ireland

Path: R:\Map Production\2020\P20-326\Workspaces\P20_326_Flightlines\P20_326_Flightlines.aprx



Legend

Proposed Development Boundary

SNH Buffer

Bird ID No, Date, Time

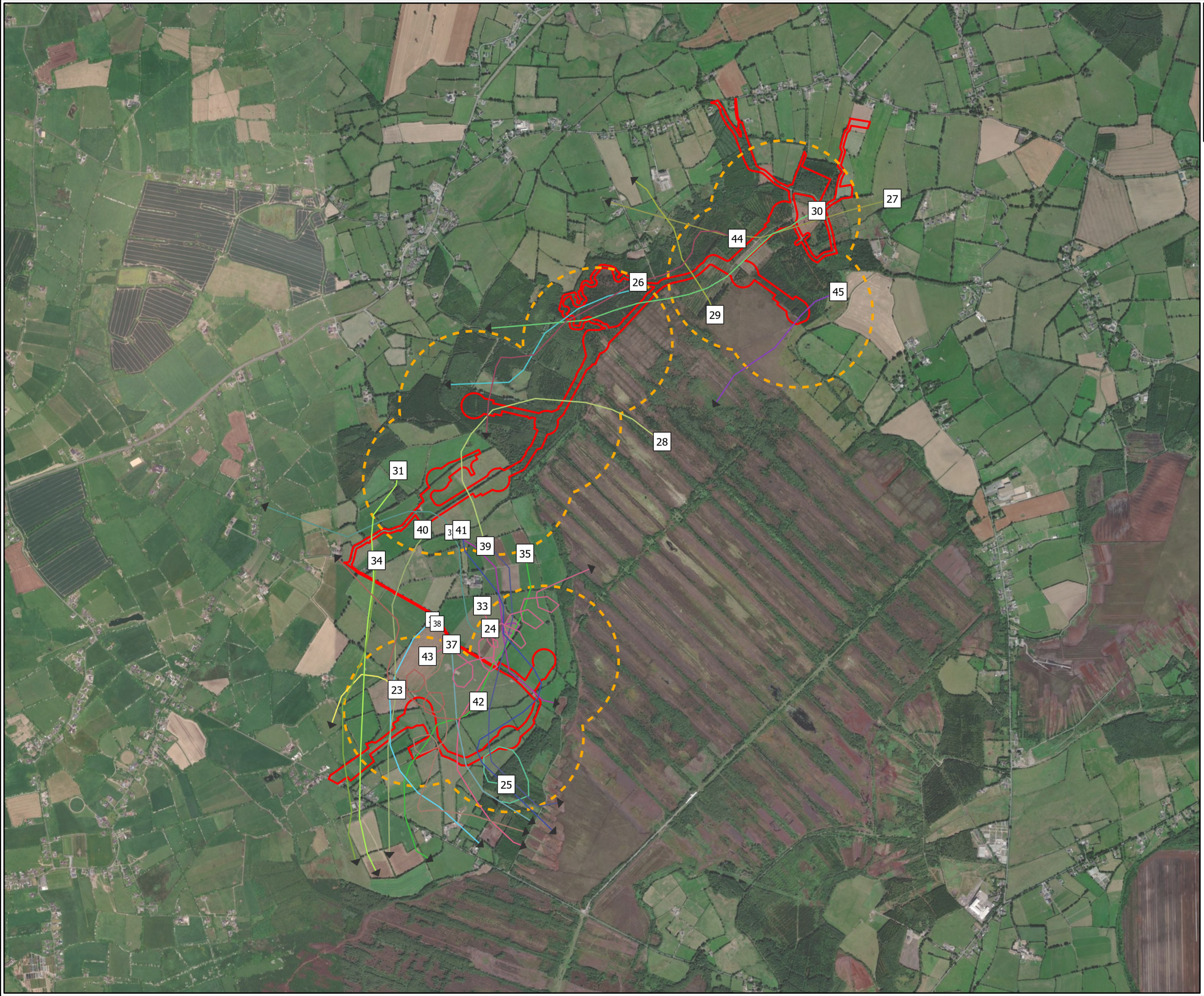
- 1, 29/11/2021, 12:39
- 2, 29/11/2021, 09:04
- 3, 29/12/2021, 09:17
- 4, 12/01/2022, 10:59
- 5, 12/01/2022, 16:18
- 6, 12/01/2022, 16:24
- 7, 21/01/2022, 13:24
- 8, 21/01/2022, 16:14
- 9, 21/01/2022, 17:14
- 10, 21/01/2022, 16:22
- 11, 22/01/2022, 09:48
- 12, 22/01/2022, 10:07
- 13, 22/01/2022, 10:21
- 14, 22/01/2022, 10:36
- 15, 22/01/2022, 08:34
- 16, 22/01/2022, 08:52
- 17, 14/02/2022, 08:10
- 18, 14/02/2022, 09:02
- 19, 14/02/2022, 09:17
- 20, 14/02/2022, 09:40
- 21, 14/02/2022, 10:01
- 22, 14/02/2022, 11:19

TITLE:	Great Black-backed Gull 1 Winter 2021/22		
PROJECT:	Drehid Wind Farm and Substation		
FIGURE NO:	--		
CLIENT:	North Kildare Wind Farm Ltd.		
SCALE:	1:25,000	REVISION:	0
DATE:	20/05/2025	PAGE SIZE:	A3

FEHILY TIMONEY
Cork | Dublin | Carlow
www.fehilytimoney.ie

World Imagery: Maxar, Microsoft
World Topographic Map: Esri, HERE, Garmin, FAO, USGS, NGACreative and Commons Attribution 4.0 International (CC BY 4.0) licence https://creativecommons.org/licenses/by/4.0/
[INPUT SOURCE HERE]; If Applicable: Mapping Reproduced Under Licence from the Ordnance Survey Ireland Licence No. CYAL50368274 © Government of Ireland

Path: R:\Map Production\2020\P20-326\Workspaces\P20_326_Flightlines\P20_326_Flightlines.aprx



Legend

Proposed Development Boundary

SNH Buffer

Bird ID No, Date, Time

- 23, 14/02/2022, 12:15
- 24, 14/02/2022, 11:41
- 25, 14/02/2022, 13:07
- 26, 17/02/2022, 08:21
- 27, 17/02/2022, 08:28
- 28, 17/02/2022, 08:52
- 29, 17/02/2022, 09:03
- 30, 17/02/2022, 09:27
- 31, 25/02/2022, 08:57
- 32, 25/02/2022, 09:22
- 33, 25/02/2022, 09:35
- 34, 25/02/2022, 10:16
- 35, 25/02/2022, 11:14
- 36, 25/02/2022, 12:06
- 37, 25/02/2022, 12:46
- 38, 25/02/2022, 13:39
- 39, 25/02/2022, 14:22
- 40, 25/02/2022, 08:51
- 41, 25/02/2022, 14:36
- 42, 07/03/2022, 15:38
- 43, 07/03/2022, 16:51
- 44, 08/03/2022, 11:23
- 45, 08/03/2022, 11:50

TITLE:	Great Black-backed Gull 2 Winter 2021/22		
PROJECT:	Drehid Wind Farm and Substation		
FIGURE NO:	--		
CLIENT:	North Kildare Wind Farm Ltd.		
SCALE:	1:25,000	REVISION:	0
DATE:	20/05/2025	PAGE SIZE:	A3

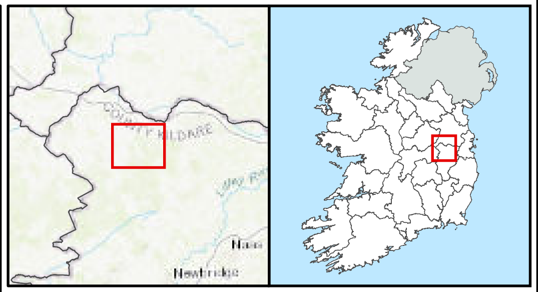
FEHILY TIMONEY Cork | Dublin | Carlow www.fehilytimoney.ie

Kilometers 0 0.5 1

N S E W

World Imagery: Maxar, Microsoft
World Topographic Map: Esri, HERE, Garmin, FAO, USGS, NGACreative and Commons Attribution 4.0 International (CC BY 4.0) licence https://creativecommons.org/licenses/by/4.0/
[INPUT SOURCE HERE]; If Applicable: Mapping Reproduced Under Licence from the Ordnance Survey Ireland Licence No. CYAL50368274 © Government of Ireland

Path: R:\Map Production\2020\P20-326\Workspaces\P20_326_Flightlines\P20_326_Flightlines.aprx



Legend

Proposed Development Boundary

SNH Buffer

Bird ID No, Date, Time

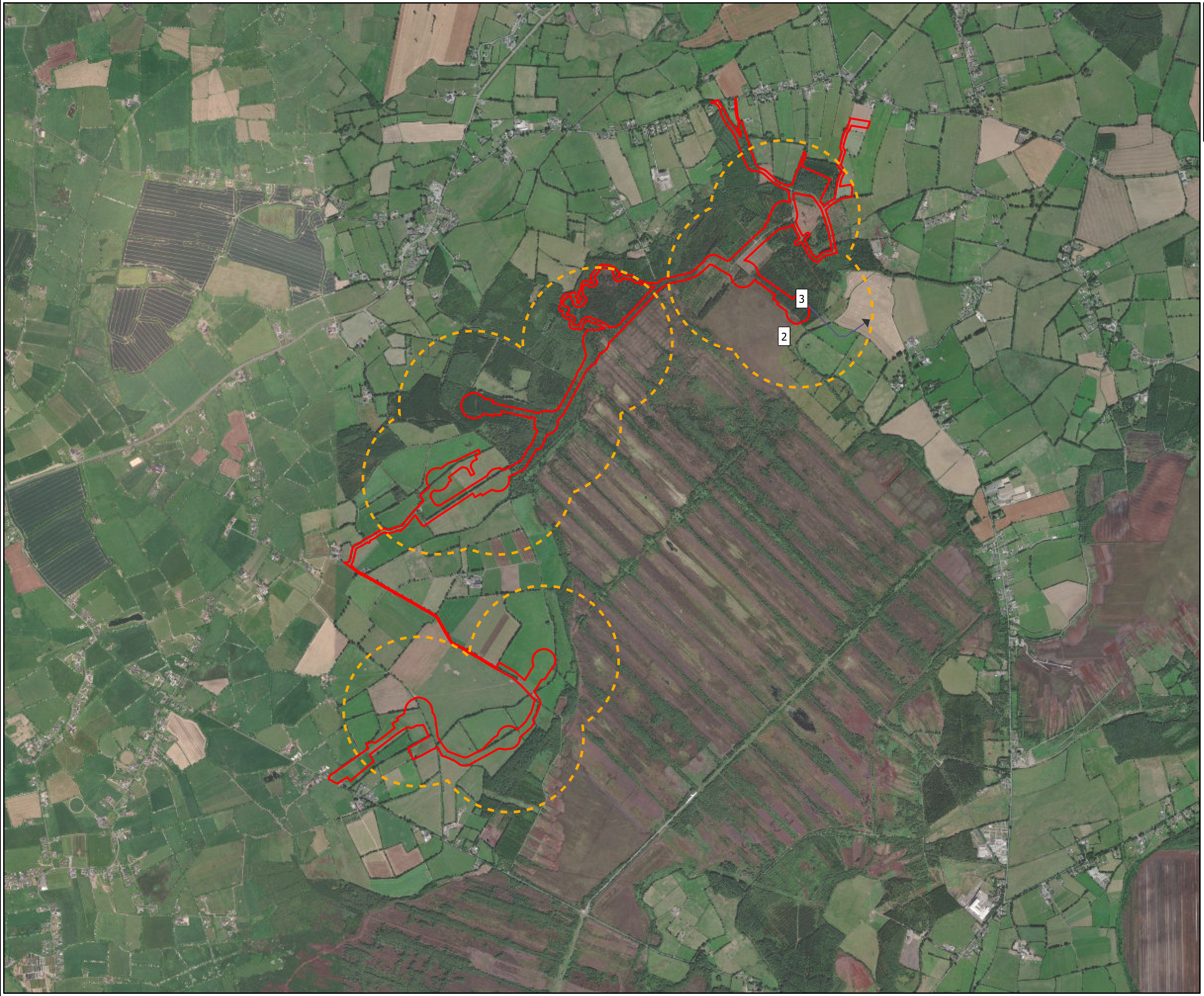
57, 21/12/2022, 13:30
58, 13/02/2023, 10:15
59, 20/03/2023, 11:10
60, 20/03/2023, 12:14
61, 20/03/2023, 10:40
62, 22/03/2023, 11:56
63, 22/03/2023, 12:00

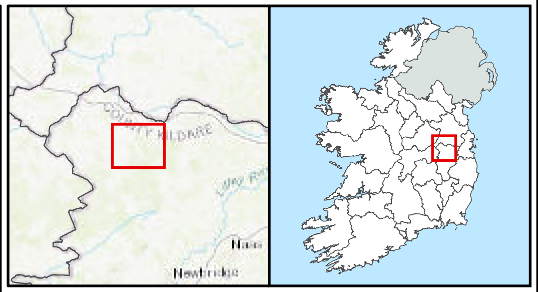
TITLE:	Great Black-backed Gull Winter 2022/23
PROJECT:	Drehid Wind Farm and Substation
FIGURE NO:	--
CLIENT:	North Kildare Wind Farm Ltd.
SCALE: 1:25,000	REVISION: 0
DATE: 20/05/2025	PAGE SIZE: A3

FEHILY TIMONEY
Cork | Dublin | Carlow
www.fehilytimoney.ie

World Imagery: Maxar, Microsoft
World Topographic Map: Esri, HERE, Garmin, FAO, USGS, NGACreative and Commons Attribution 4.0 International (CC BY 4.0) licence https://creativecommons.org/licenses/by/4.0/
[INPUT SOURCE HERE]; If Applicable: Mapping Reproduced Under Licence from the Ordnance Survey Ireland Licence No. CYAL50368274 © Government of Ireland

Path: R:\Map Production\2020\P20-326\Workspaces\P20_326_Flightlines\P20_326_Flightlines.aprx





Legend

Proposed Development Boundary

SNH Buffer

Bird ID No, Date, Time

2, 05/05/2022, 14:23

3, 06/06/2022, 15:04

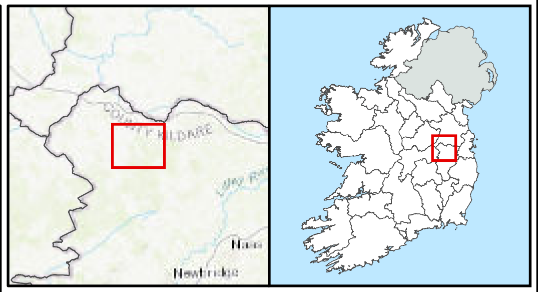
TITLE:	Grey Heron Summer 2022
PROJECT:	Drehid Wind Farm and Substation
FIGURE NO:	--
CLIENT:	North Kildare Wind Farm Ltd.
SCALE: 1:25,000	REVISION: 0
DATE: 20/05/2025	PAGE SIZE: A3

FEHILY TIMONEY
Cork | Dublin | Carlow
www.fehilytimoney.ie

Kilometers
0 0.5 1

World Imagery: Maxar, Microsoft
World Topographic Map: Esri, HERE, Garmin, FAO, USGS, NGACreative and Commons Attribution 4.0 International (CC BY 4.0) licence https://creativecommons.org/licenses/by/4.0/
[INPUT SOURCE HERE]; If Applicable: Mapping Reproduced Under Licence from the Ordnance Survey Ireland Licence No. CYAL50368274 © Government of Ireland

Path: R:\Map Production\2020\P20-326\Workspaces\P20_326_Flightlines\P20_326_Flightlines.aprx



Legend

Proposed Development Boundary

SNH Buffer

Bird ID No, Date, Time

5, 06/04/2023, 11:49

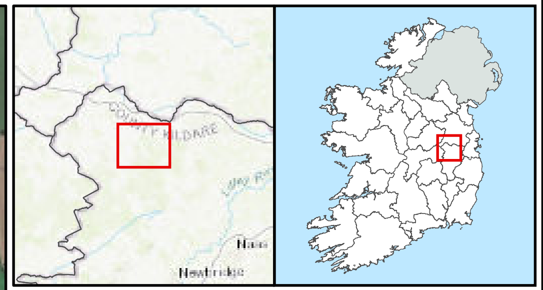
TITLE:	Grey Heron Spring Migration 2023
PROJECT:	Drehid Wind Farm and Substation
FIGURE NO:	--
CLIENT:	North Kildare Wind Farm Ltd.
SCALE: 1:25,000	REVISION: 0
DATE: 20/05/2025	PAGE SIZE: A3

FEHILY TIMONEY
Cork | Dublin | Carlow
www.fehilytimoney.ie

0 0.5 1 Kilometers

World Imagery: Maxar, Microsoft
World Topographic Map: Esri, HERE, Garmin, FAO, USGS, NGACreative and Commons Attribution 4.0 International (CC BY 4.0) licence https://creativecommons.org/licenses/by/4.0/
[INPUT SOURCE HERE]; If Applicable: Mapping Reproduced Under Licence from the Ordnance Survey Ireland Licence No. CYAL50368274 © Government of Ireland

Path: R:\Map Production\2020\P20-326\Workspaces\P20_326_Flightlines\P20_326_Flightlines.aprx



Legend

Proposed Development Boundary

SNH Buffer

Bird ID No, Date, Time

1, 08/03/2022, 08:29

TITLE:	Grey Heron Winter 2021/22
PROJECT:	Drehid Wind Farm and Substation
FIGURE NO:	--
CLIENT:	North Kildare Wind Farm Ltd.
SCALE: 1:25,000	**REVISION:** 0
DATE: 20/05/2025	**PAGE SIZE:** A3

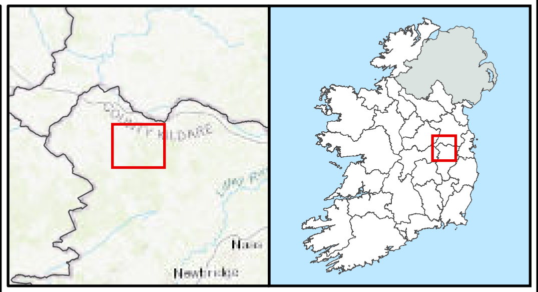
FEHILY TIMONEY

Cork | Dublin | Carlow

www.fehilytimoney.ie

0 0.5 1 Kilometers

Path: R:\Map Production\2020\P20-326\Workspaces\P20_326_Flightlines\P20_326_Flightlines.aprx



Legend

Proposed Development Boundary

SNH Buffer

Bird ID No, Date, Time

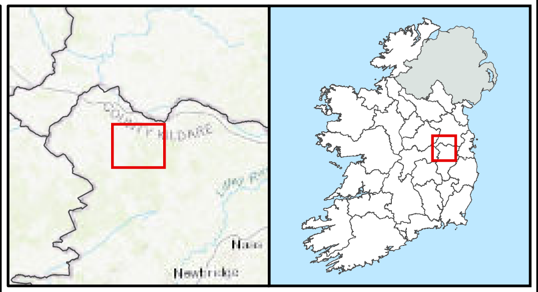
4, 13/02/2023, 10:15

TITLE:	Grey Heron Winter 2022/23
PROJECT:	Drehid Wind Farm and Substation
FIGURE NO:	--
CLIENT:	North Kildare Wind Farm Ltd.
SCALE: 1:25,000	REVISION: 0
DATE: 20/05/2025	PAGE SIZE: A3

FEHILY TIMONEY
Cork | Dublin | Carlow
www.fehilytimoney.ie

0 0.5 1 Kilometers

Path: R:\Map Production\2020\P20-326\Workspaces\P20_326_Flightlines\P20_326_Flightlines.aprx



Legend

Proposed Development Boundary

SNH Buffer

Bird ID No, Date, Time

87, 14/04/2022, 15:45

88, 14/04/2022, 10:23

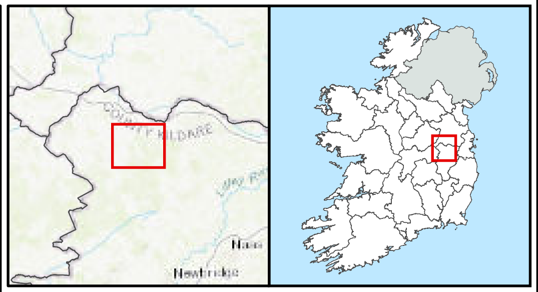
TITLE:	Herring Gull Spring Migration 2022
PROJECT:	Drehid Wind Farm and Substation
FIGURE NO:	--
CLIENT:	North Kildare Wind Farm Ltd.
SCALE: 1:25,000	REVISION: 0
DATE: 20/05/2025	PAGE SIZE: A3

FEHILY TIMONEY
Cork | Dublin | Carlow
www.fehilytimoney.ie

N W E S

0 0.5 1 Kilometers

Path: R:\Map Production\2020\P20-326\Workspaces\P20_326_Flightlines\P20_326_Flightlines.aprx



Legend

Proposed Development Boundary

SNH Buffer

Bird ID No, Date, Time

89, 05/05/2022, 15:35

90, 06/06/2022, 18:29

91, 10/09/2022, 08:52

92, 10/09/2022, 09:36

TITLE:	Herring Gull Summer 2022
PROJECT:	Drehid Wind Farm and Substation
FIGURE NO:	--
CLIENT:	North Kildare Wind Farm Ltd.
SCALE: 1:25,000	**REVISION:** 0
DATE: 20/05/2025	**PAGE SIZE:** A3

FEHILY TIMONEY

Cork | Dublin | Carlow

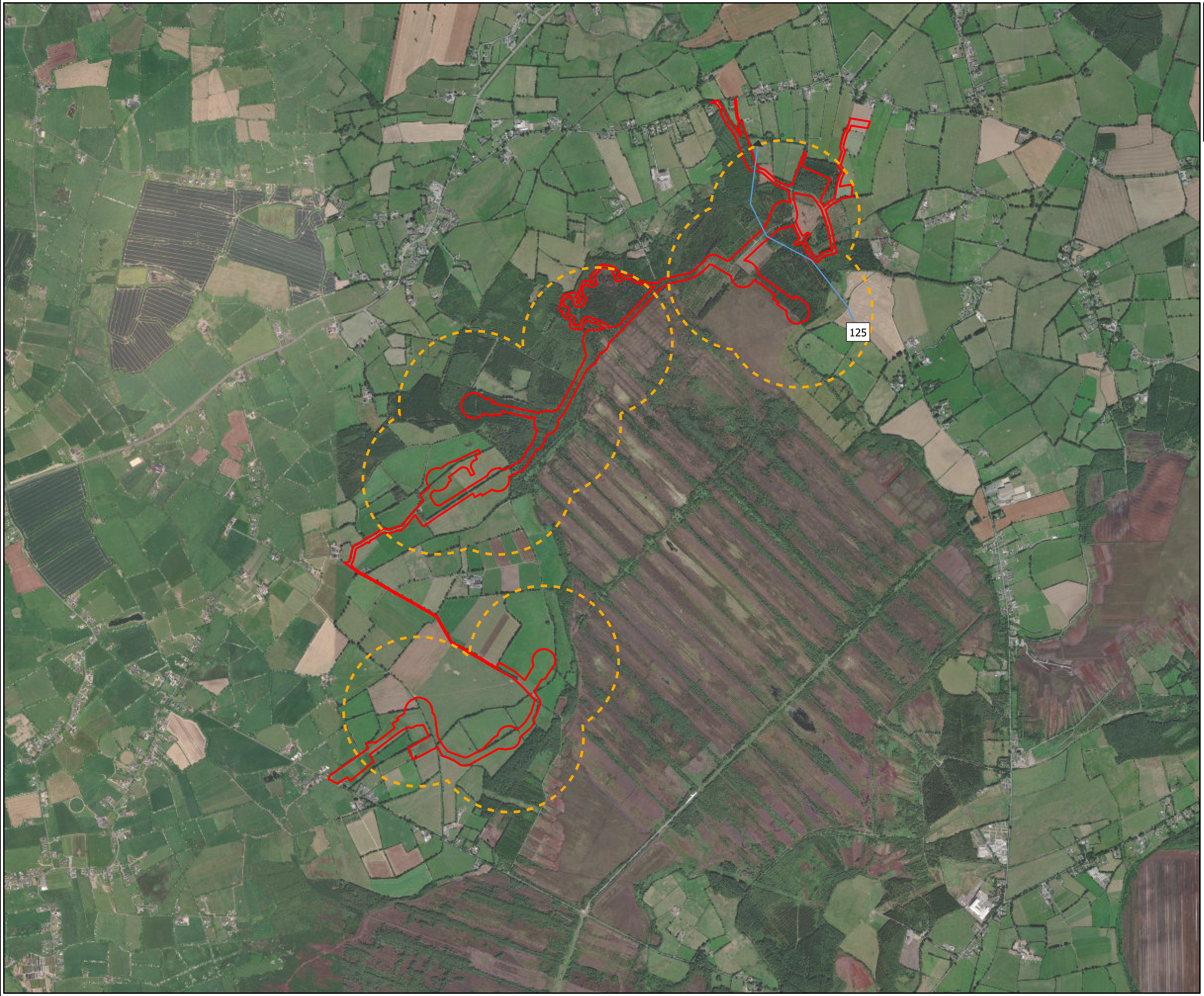
www.fehilytimoney.ie

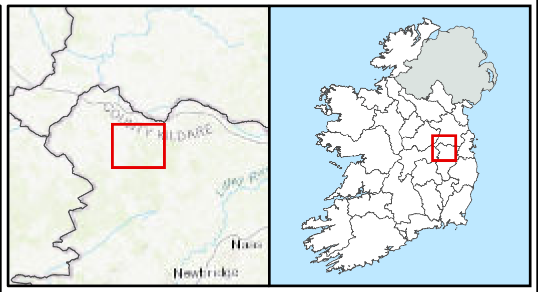
N W E S

0 0.5 1 Kilometers

World Imagery: Maxar, Microsoft
World Topographic Map: Esri, HERE, Garmin, FAO, USGS, NGACreative and Commons Attribution 4.0 International (CC BY 4.0) licence https://creativecommons.org/licenses/by/4.0/
[INPUT SOURCE HERE]; If Applicable: Mapping Reproduced Under Licence from the Ordnance Survey Ireland Licence No. CYAL50368274 © Government of Ireland

Path: R:\Map Production\2020\P20-326\Workspaces\P20_326_Flightlines\P20_326_Flightlines.aprx





Legend

Proposed Development Boundary

SNH Buffer

Bird ID No, Date, Time

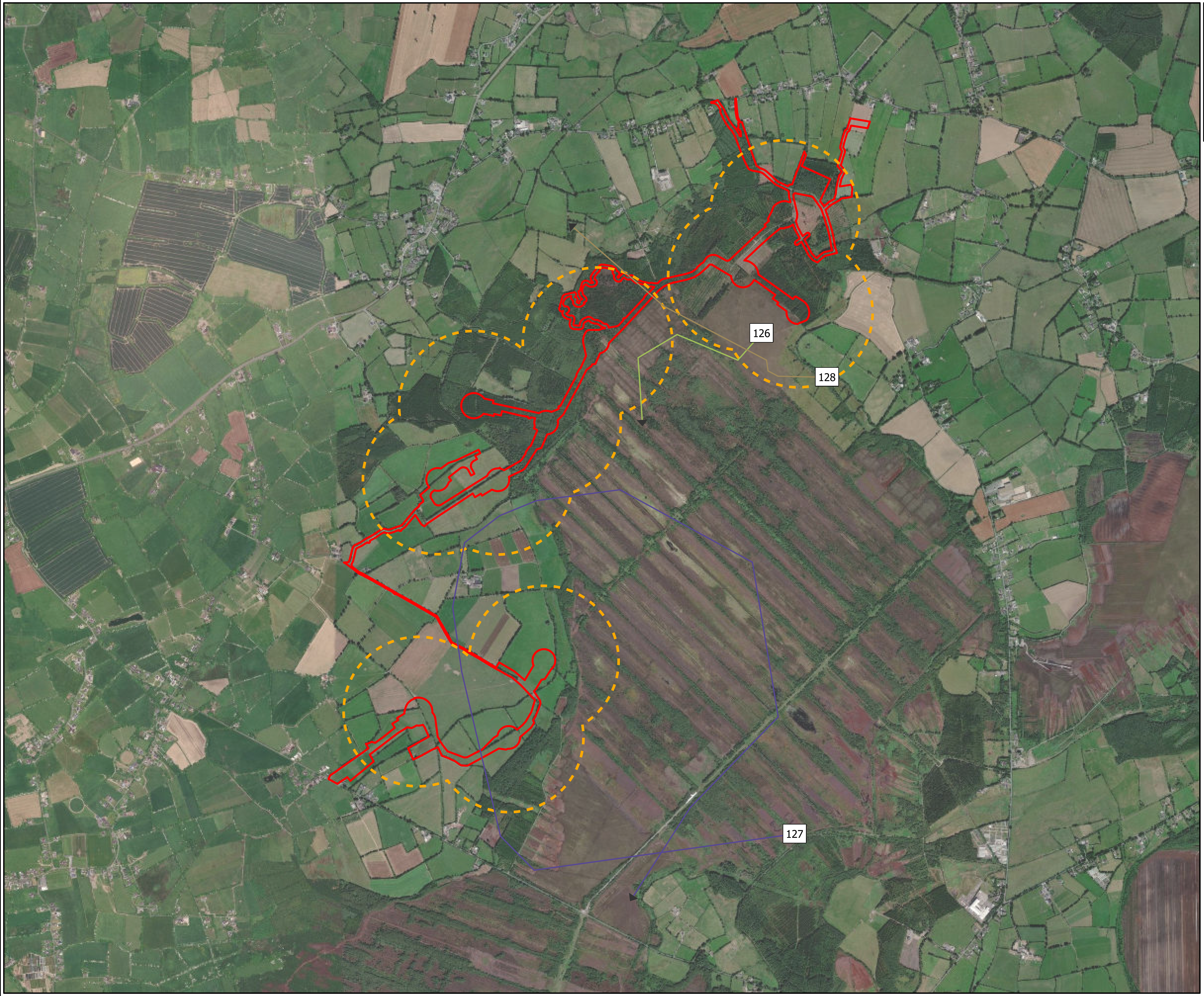
125, 06/04/2023, 11:21

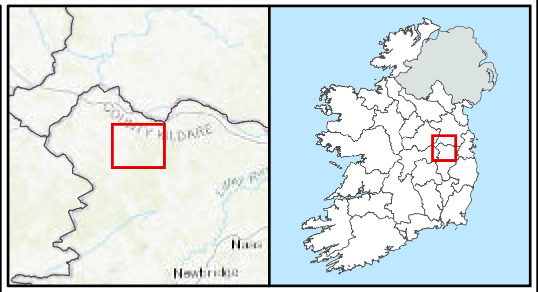
TITLE:	Herring Gull Spring Migration 2023
PROJECT:	Drehid Wind Farm and Substation
FIGURE NO:	--
CLIENT:	North Kildare Wind Farm Ltd.
SCALE: 1:25,000	REVISION: 0
DATE: 20/05/2025	PAGE SIZE: A3

FEHILY TIMONEY
Cork | Dublin | Carlow
www.fehilytimoney.ie

N W E S
0 0.5 1 Kilometers

Path: R:\Map Production\2020\P20-326\Workspaces\P20_326_Flightlines\P20_326_Flightlines.aprx





Legend

Proposed Development Boundary

SNH Buffer

Bird ID No, Date, Time

126, 09/05/2023, 12:29

127, 07/06/2023, 13:14

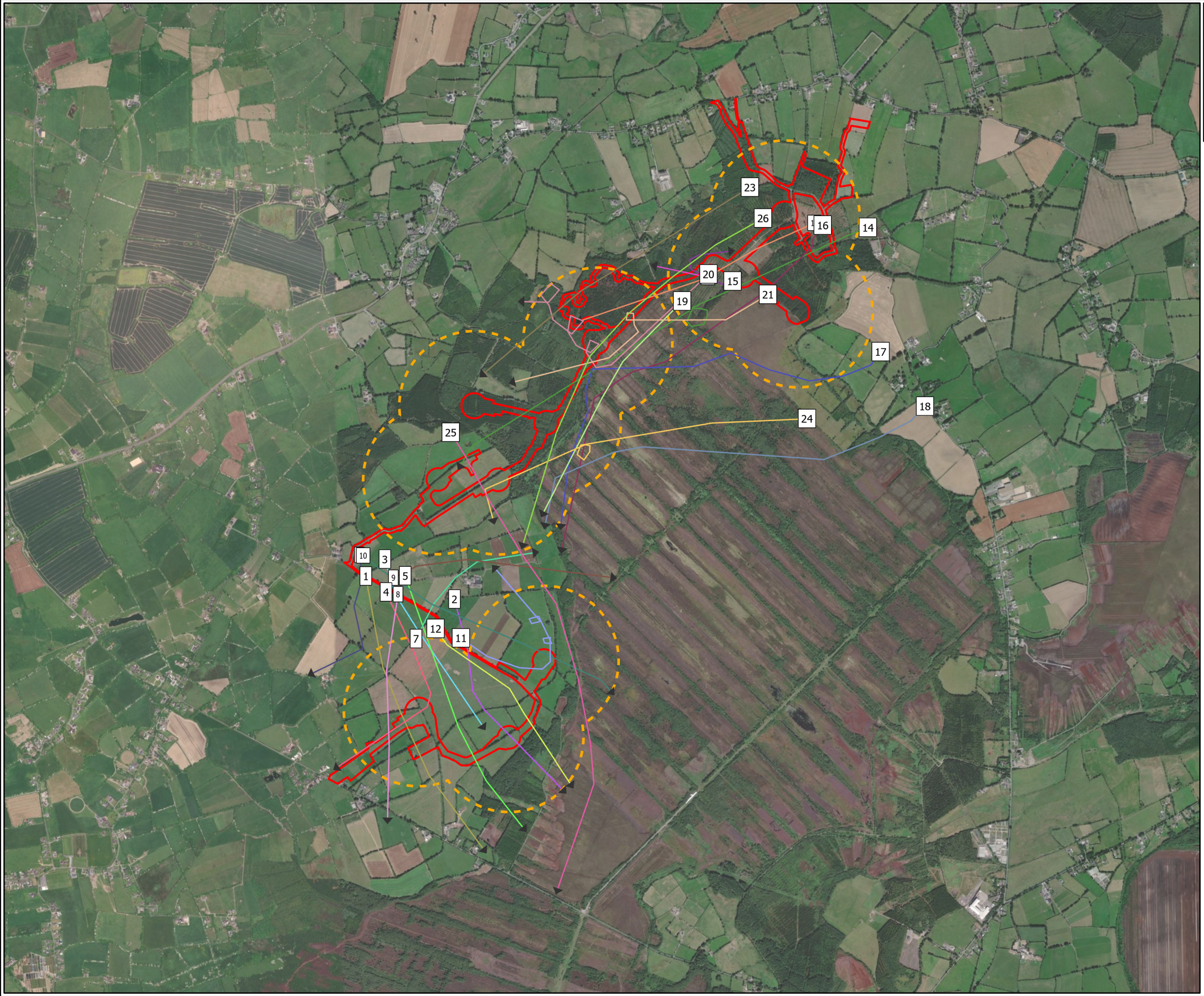
128, 06/07/2023, 11:07

TITLE:	Herring Gull Summer 2023
PROJECT:	Drehid Wind Farm and Substation
FIGURE NO:	--
CLIENT:	North Kildare Wind Farm Ltd.
SCALE: 1:25,000	REVISION: 0
DATE: 20/05/2025	PAGE SIZE: A3

FEHILY TIMONEY
Cork | Dublin | Carlow
www.fehilytimoney.ie

0 0.5 1 Kilometers

Path: R:\Map Production\2020\P20-326\Workspaces\P20_326_Flightlines\P20_326_Flightlines.aprx



Legend

- Proposed Development Boundary
- SNH Buffer

Bird ID No, Date, Time

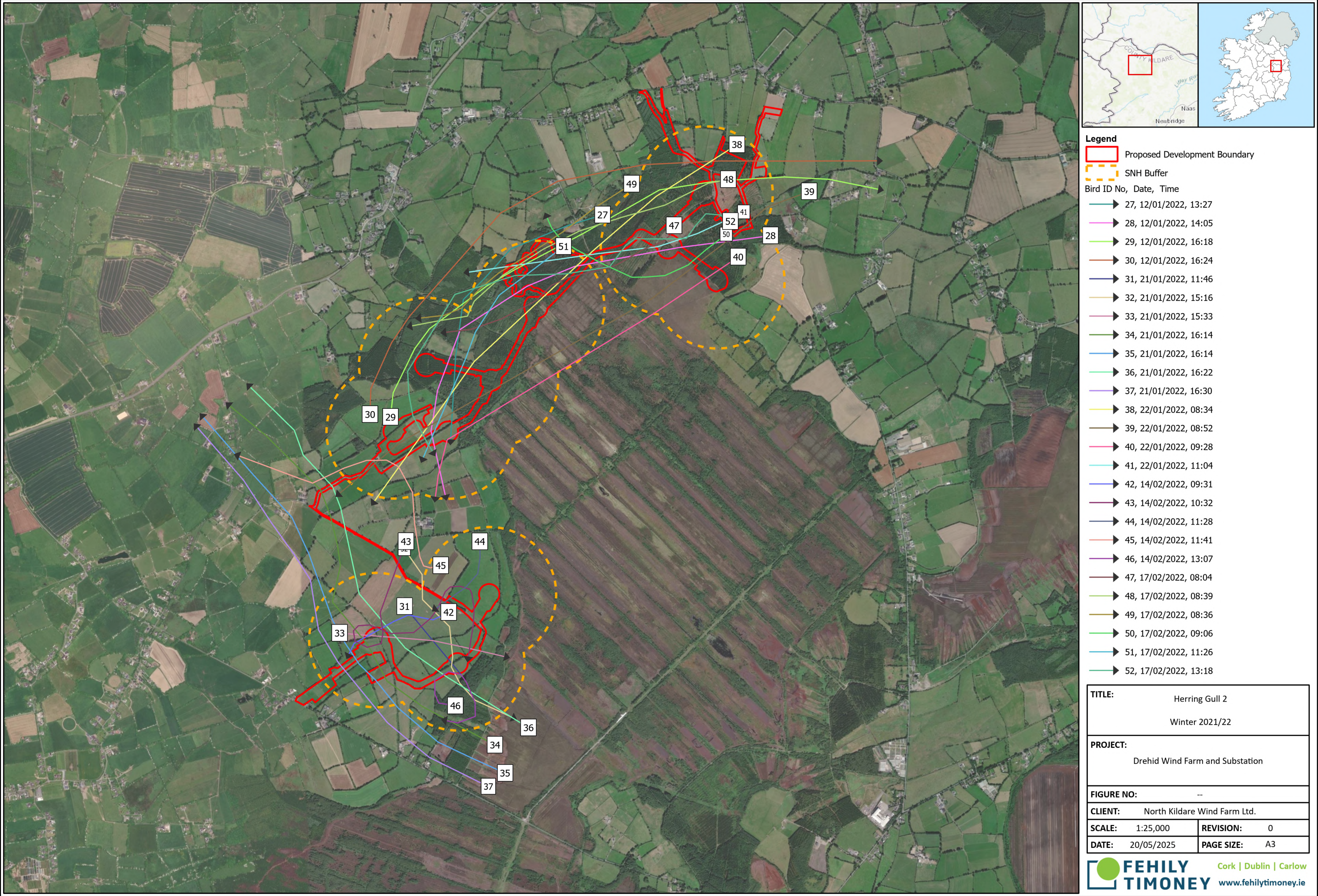
- 1, 29/11/2021, 09:48
- 2, 29/11/2021, 09:55
- 3, 29/11/2021, 10:08
- 4, 29/11/2021, 10:26
- 5, 29/11/2021, 10:36
- 6, 29/11/2021, 10:56
- 7, 29/11/2021, 11:49
- 8, 29/11/2021, 12:08
- 9, 29/11/2021, 12:27
- 10, 29/11/2021, 12:34
- 11, 29/11/2021, 13:53
- 12, 29/11/2021, 13:59
- 13, 29/11/2021, 08:45
- 14, 29/11/2021, 08:53
- 15, 29/11/2021, 09:01
- 16, 29/11/2021, 09:04
- 17, 29/11/2021, 09:17
- 18, 29/11/2021, 09:31
- 19, 30/11/2021, 12:36
- 20, 20/12/2021, 09:53
- 21, 20/12/2021, 10:10
- 22, 20/12/2021, 11:20
- 23, 20/12/2021, 14:44
- 24, 20/12/2021, 15:12
- 25, 21/12/2021, 10:53
- 26, 12/01/2022, 10:41

TITLE:	Herring Gull 1 Winter 2021/22		
PROJECT:	Drehid Wind Farm and Substation		
FIGURE NO:	--		
CLIENT:	North Kildare Wind Farm Ltd.		
SCALE:	1:25,000	REVISION:	0
DATE:	20/05/2025	PAGE SIZE:	A3

FEHILY TIMONEY
Cork | Dublin | Carlow
www.fehilytimoney.ie

0 0.5 1 Kilometers

Path: R:\Map Production\2020\P20-326\Workspaces\P20_326_Flightlines\P20_326_Flightlines.aprx



Legend

Proposed Development Boundary

SNH Buffer

Bird ID No, Date, Time

- 27, 12/01/2022, 13:27
- 28, 12/01/2022, 14:05
- 29, 12/01/2022, 16:18
- 30, 12/01/2022, 16:24
- 31, 21/01/2022, 11:46
- 32, 21/01/2022, 15:16
- 33, 21/01/2022, 15:33
- 34, 21/01/2022, 16:14
- 35, 21/01/2022, 16:14
- 36, 21/01/2022, 16:22
- 37, 21/01/2022, 16:30
- 38, 22/01/2022, 08:34
- 39, 22/01/2022, 08:52
- 40, 22/01/2022, 09:28
- 41, 22/01/2022, 11:04
- 42, 14/02/2022, 09:31
- 43, 14/02/2022, 10:32
- 44, 14/02/2022, 11:28
- 45, 14/02/2022, 11:41
- 46, 14/02/2022, 13:07
- 47, 17/02/2022, 08:04
- 48, 17/02/2022, 08:39
- 49, 17/02/2022, 08:36
- 50, 17/02/2022, 09:06
- 51, 17/02/2022, 11:26
- 52, 17/02/2022, 13:18

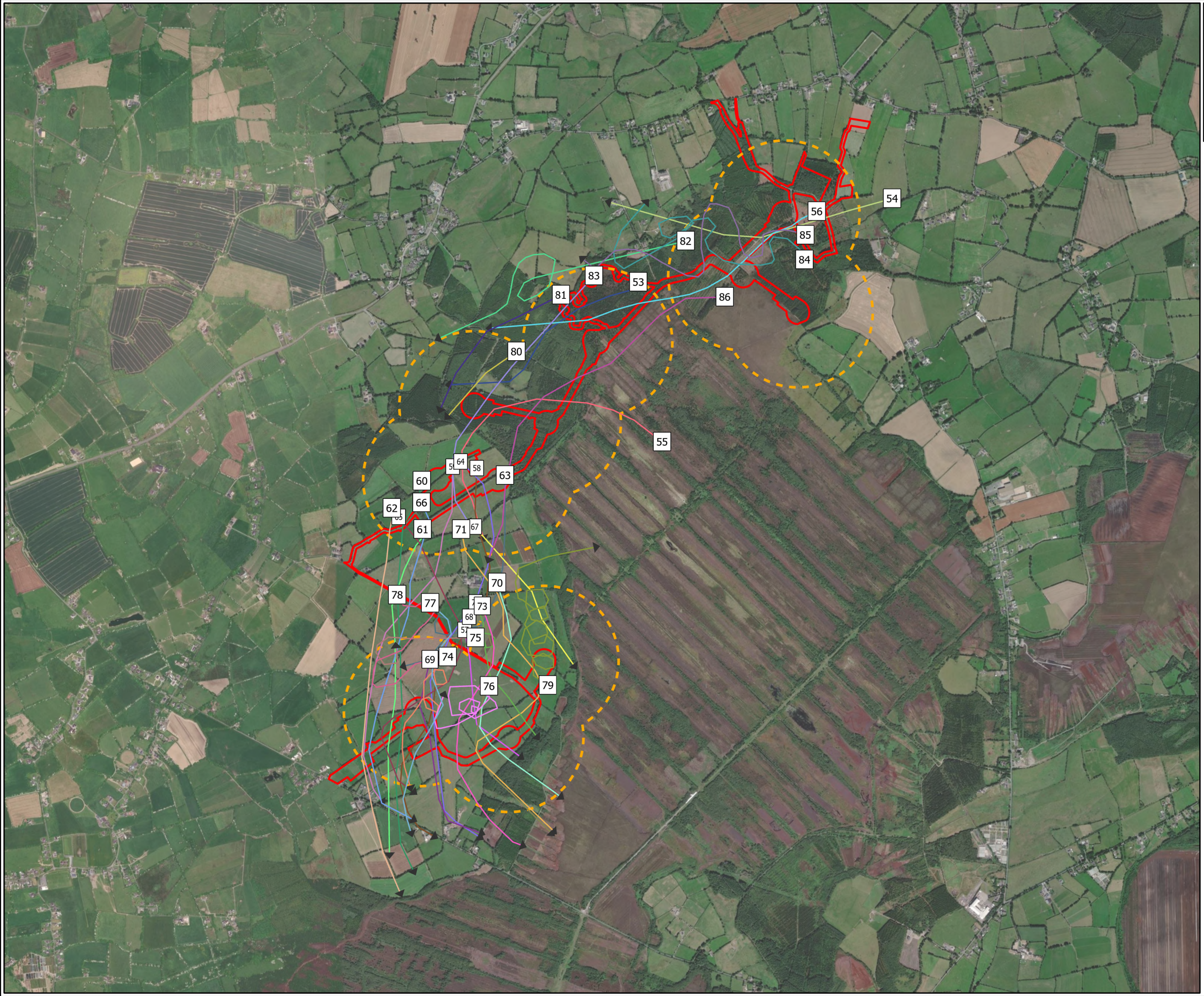
TITLE:	Herring Gull 2 Winter 2021/22
PROJECT:	Drehid Wind Farm and Substation
FIGURE NO:	--
CLIENT:	North Kildare Wind Farm Ltd.

SCALE:	1:25,000	REVISION:	0
DATE:	20/05/2025	PAGE SIZE:	A3

FEHILY TIMONEY
Cork | Dublin | Carlow
www.fehilytimoney.ie

0 0.5 1 Kilometers

Path: R:\Map Production\2020\P20-326\Workspaces\P20_326_Flightlines\P20_326_Flightlines.aprx



Legend

- Proposed Development Boundary
- SNH Buffer

Bird ID No, Date, Time

- 53, 17/02/2022, 08:21
- 54, 17/02/2022, 08:28
- 55, 17/02/2022, 08:52
- 56, 17/02/2022, 09:27
- 57, 25/02/2022, 13:39
- 58, 25/02/2022, 08:34
- 59, 25/02/2022, 08:41
- 60, 25/02/2022, 08:46
- 61, 25/02/2022, 08:51
- 62, 25/02/2022, 09:03
- 63, 25/02/2022, 09:09
- 64, 25/02/2022, 09:17
- 65, 25/02/2022, 09:27
- 66, 25/02/2022, 10:04
- 67, 25/02/2022, 10:23
- 68, 25/02/2022, 10:35
- 69, 25/02/2022, 11:08
- 70, 25/02/2022, 12:21
- 71, 25/02/2022, 14:36
- 72, 25/02/2022, 14:49
- 73, 25/02/2022, 09:35
- 74, 07/03/2022, 13:24
- 75, 07/03/2022, 13:53
- 76, 07/03/2022, 14:25
- 77, 07/03/2022, 14:41
- 78, 07/03/2022, 16:36
- 79, 07/03/2022, 18:05
- 80, 08/03/2022, 07:46
- 81, 08/03/2022, 08:13
- 82, 08/03/2022, 08:19
- 83, 08/03/2022, 08:46
- 84, 08/03/2022, 10:53
- 85, 08/03/2022, 11:00
- 86, 08/03/2022, 12:56

TITLE:	Herring Gull 3 Winter 2021/22
PROJECT:	Drehid Wind Farm and Substation
FIGURE NO:	--
CLIENT:	North Kildare Wind Farm Ltd.
SCALE: 1:25,000	**REVISION:** 0
DATE: 20/05/2025	**PAGE SIZE:** A3

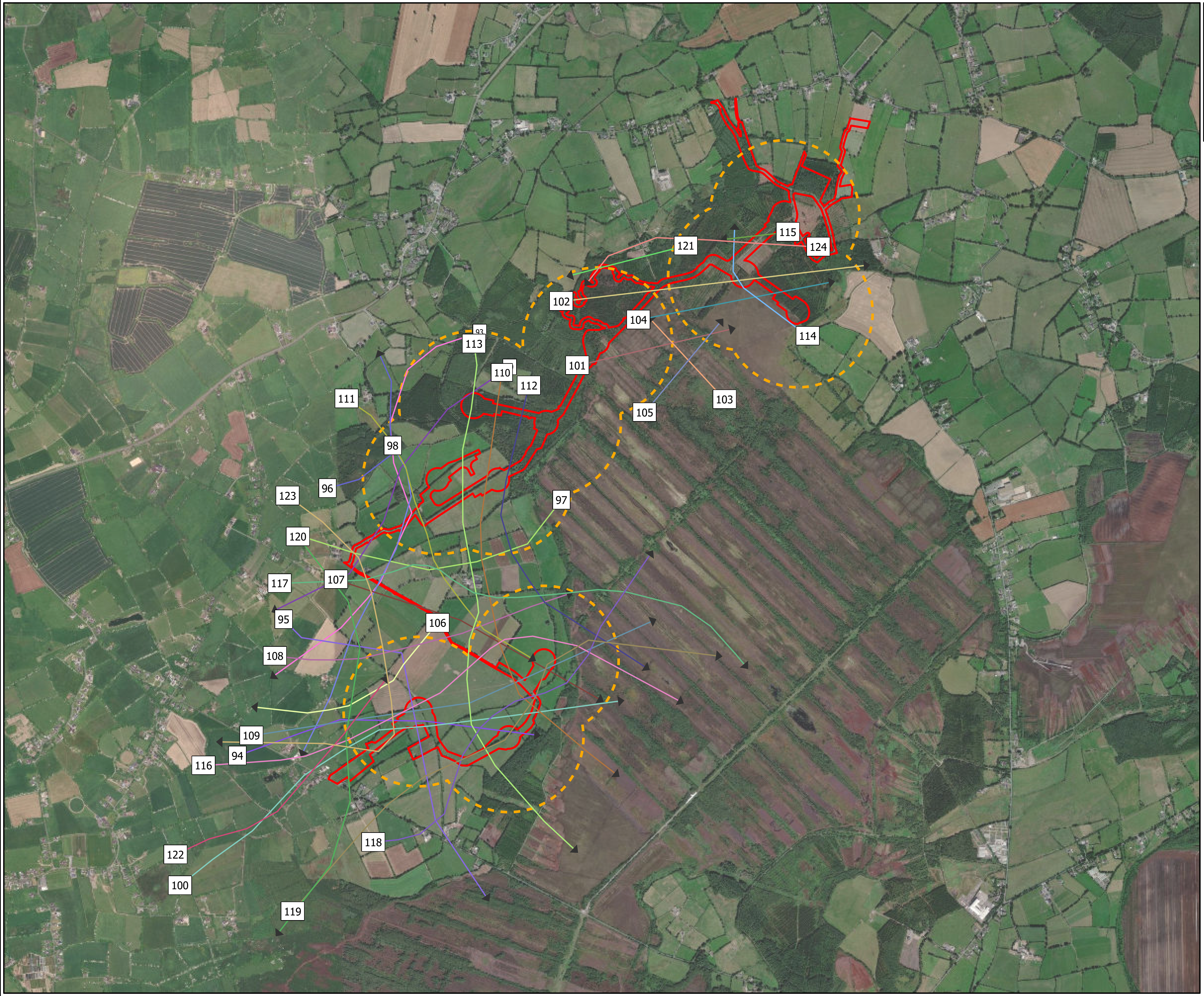
FEHILY TIMONEY
Cork | Dublin | Carlow
www.fehilytimoney.ie

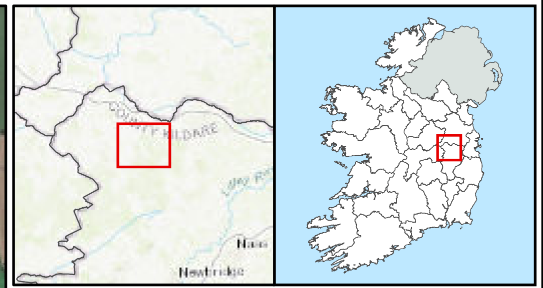
N W E S

0 0.5 1 Kilometers

World Imagery: Maxar, Microsoft
World Topographic Map: Esri, HERE, Garmin, FAO, USGS, NGACreative and Commons Attribution 4.0 International (CC BY 4.0) licence https://creativecommons.org/licenses/by/4.0/
[INPUT SOURCE HERE]; If Applicable: Mapping Reproduced Under Licence from the Ordnance Survey Ireland Licence No. CYAL50368274 © Government of Ireland

Path: R:\Map Production\2020\P20-326\Workspaces\P20_326_Flightlines\P20_326_Flightlines.aprx





Legend

Proposed Development Boundary

SNH Buffer

Bird ID No, Date, Time

- 93, 21/12/2022, 09:38
- 94, 21/12/2022, 09:50
- 95, 21/12/2022, 10:33
- 96, 21/12/2022, 10:48
- 97, 21/12/2022, 11:16
- 98, 21/12/2022, 13:02
- 99, 21/12/2022, 13:16
- 100, 21/12/2022, 14:30
- 101, 22/12/2022, 10:01
- 102, 22/12/2022, 10:04
- 103, 22/12/2022, 10:29
- 104, 22/12/2022, 10:42
- 105, 24/01/2023, 12:27
- 106, 24/01/2023, 09:56
- 107, 24/01/2023, 11:09
- 108, 24/01/2023, 11:19
- 109, 24/01/2023, 11:34
- 110, 24/01/2023, 13:06
- 111, 24/01/2023, 13:53
- 112, 24/01/2023, 14:20
- 113, 24/01/2023, 14:35
- 114, 24/01/2023, 12:29
- 115, 13/02/2023, 10:35
- 116, 13/02/2023, 09:26
- 117, 13/02/2023, 10:04
- 118, 13/02/2023, 10:09
- 119, 13/02/2023, 12:32
- 120, 20/03/2023, 12:32
- 121, 20/03/2023, 10:50
- 122, 22/03/2023, 12:40
- 123, 22/03/2023, 15:40
- 124, 22/03/2023, 12:05

TITLE:	Herring Gull Winter 2022/23		
PROJECT:	Drehid Wind Farm and Substation		
FIGURE NO:	--		
CLIENT:	North Kildare Wind Farm Ltd.		
SCALE:	1:25,000	REVISION:	0
DATE:	20/05/2025	PAGE SIZE:	A3

FEHILY TIMONEY

Cork | Dublin | Carlow

www.fehilytimoney.ie

N S W E

0 0.5 1 Kilometers

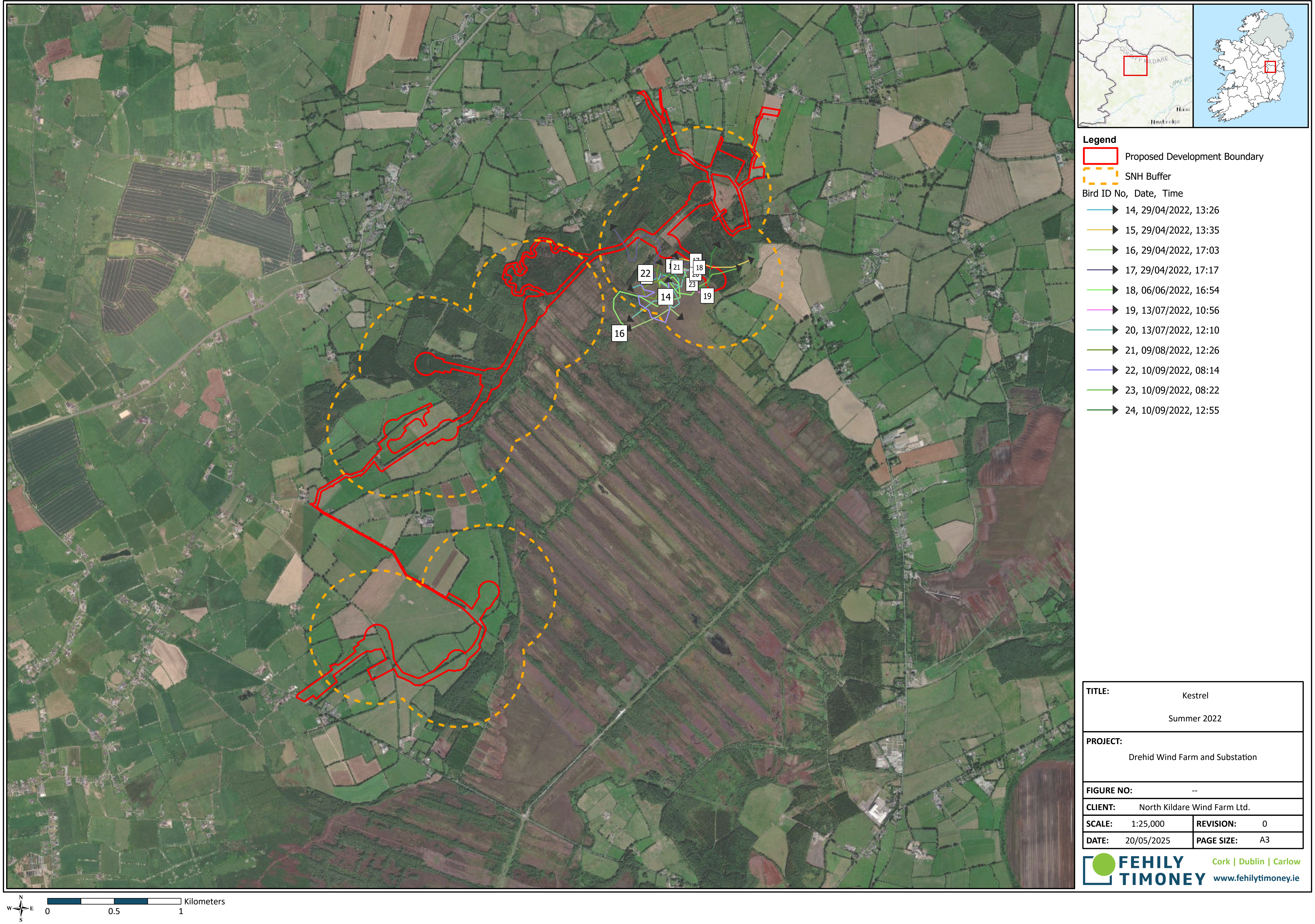
Path: R:\Map Production\2020\P20-326\Workspaces\P20_326_Flightlines\P20_326_Flightlines.aprx

Legend
Proposed Development Boundary
SNH Buffer
Bird ID No, Date, Time
13, 14/04/2022, 12:32

TITLE:	Kestrel Spring Migration 2022
PROJECT:	Drehid Wind Farm and Substation
FIGURE NO:	--
CLIENT:	North Kildare Wind Farm Ltd.
SCALE: 1:25,000	REVISION: 0
DATE: 20/05/2025	PAGE SIZE: A3

FEHILY TIMONEY
Cork | Dublin | Carlow
www.fehilytimoney.ie

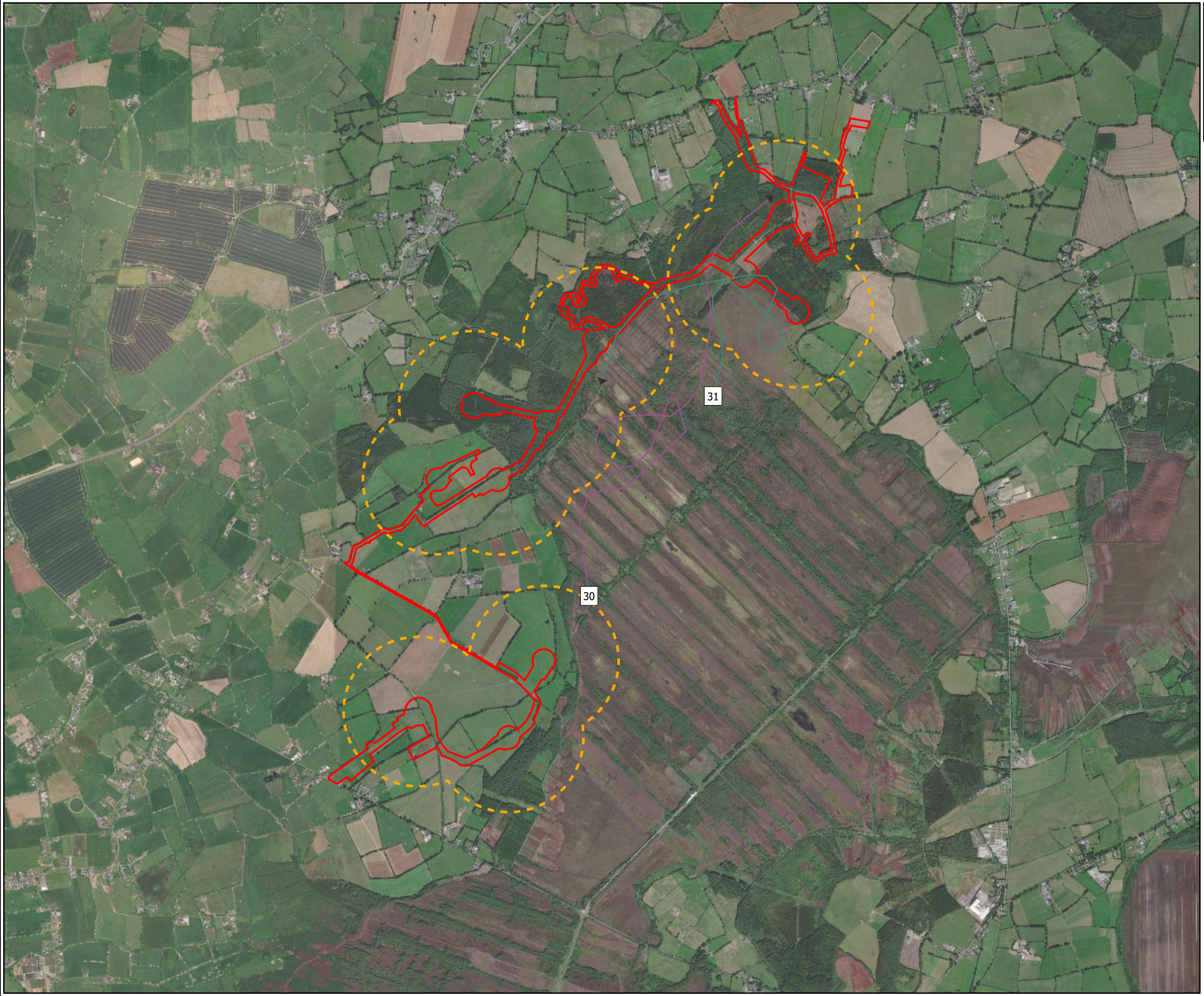
Path: R:\Map Production\2020\P20-326\Workspaces\P20_326_Flightlines\P20_326_Flightlines.aprx

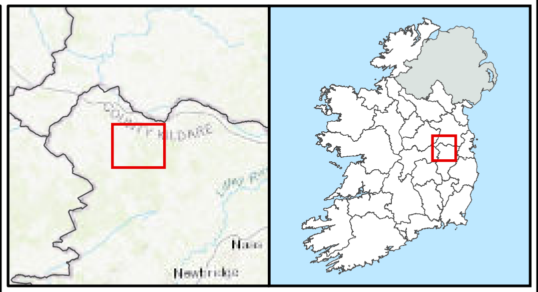


TITLE:	Kestrel Summer 2022
PROJECT:	Drehid Wind Farm and Substation
FIGURE NO:	--
CLIENT:	North Kildare Wind Farm Ltd.
SCALE: 1:25,000	REVISION: 0
DATE: 20/05/2025	PAGE SIZE: A3

FEHILY TIMONEY
Cork | Dublin | Carlow
www.fehilytimoney.ie

Path: R:\Map Production\2020\P20-326\Workspaces\P20_326_Flightlines\P20_326_Flightlines.aprx





Legend

Proposed Development Boundary

SNH Buffer

Bird ID No, Date, Time

30, 06/04/2023, 08:21

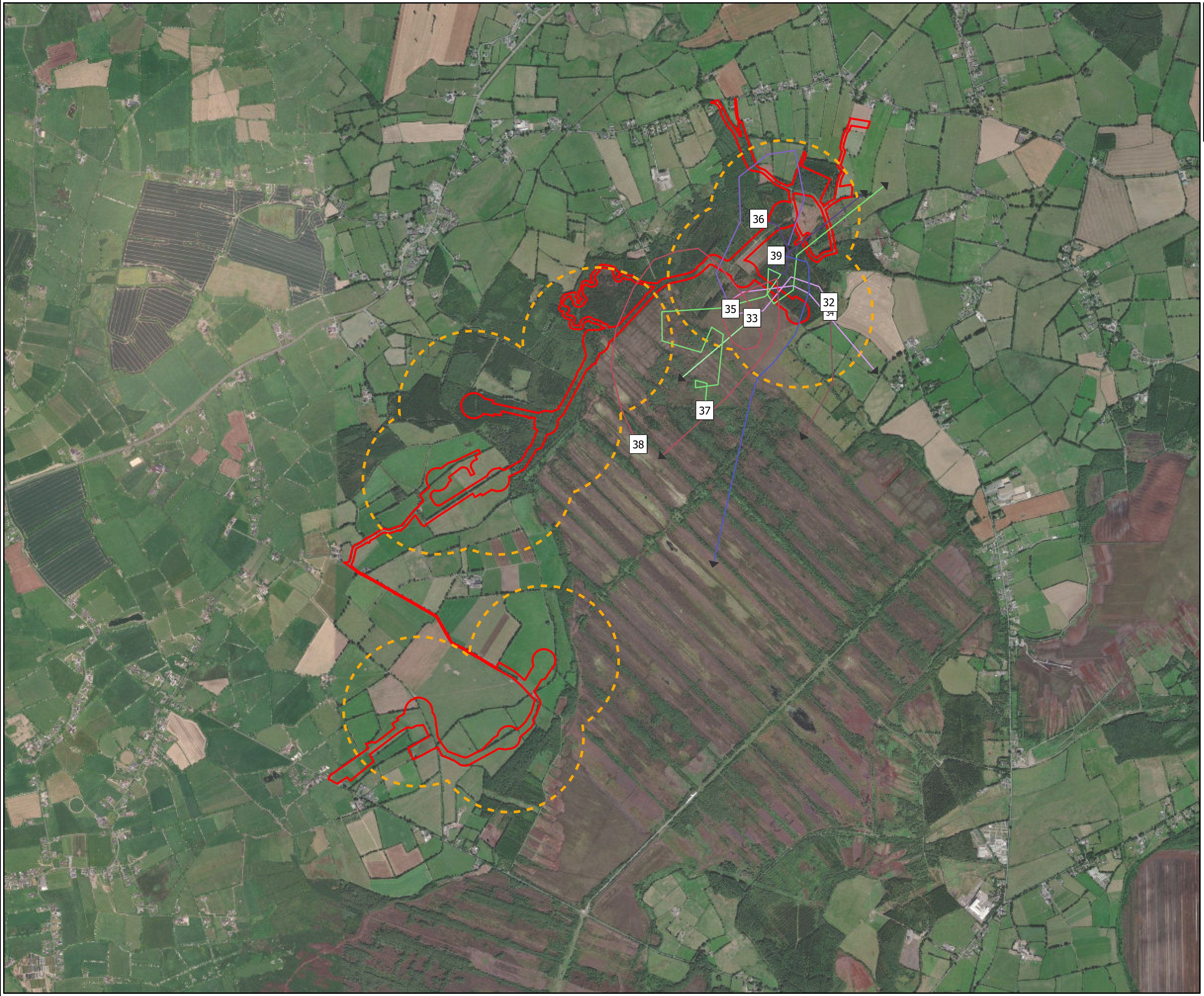
31, 06/04/2023, 13:26

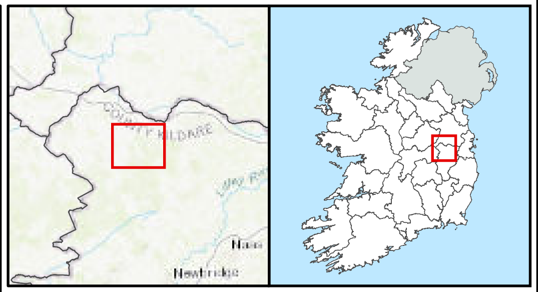
TITLE:	Kestrel Spring Migration 2023
PROJECT:	Drehid Wind Farm and Substation
FIGURE NO:	--
CLIENT:	North Kildare Wind Farm Ltd.
SCALE:	1:25,000
REVISION:	0
DATE:	20/05/2025
PAGE SIZE:	A3

FEHILY TIMONEY
Cork | Dublin | Carlow
www.fehilytimoney.ie

N S W E
0 0.5 1 Kilometers

Path: R:\Map Production\2020\P20-326\Workspaces\P20_326_Flightlines\P20_326_Flightlines.aprx





Legend

Proposed Development Boundary

SNH Buffer

Bird ID No, Date, Time

32, 09/05/2023, 10:37

33, 09/05/2023, 13:35

34, 09/05/2023, 13:36

35, 06/07/2023, 09:33

36, 01/08/2023, 11:07

37, 01/08/2023, 13:15

38, 12/09/2023, 10:53

39, 12/09/2023, 11:01

TITLE:	Kestrel Summer 2023		
PROJECT:	Drehid Wind Farm and Substation		
FIGURE NO:	--		
CLIENT:	North Kildare Wind Farm Ltd.		
SCALE:	1:25,000	**REVISION:**	0
DATE:	20/05/2025	**PAGE SIZE:**	A3

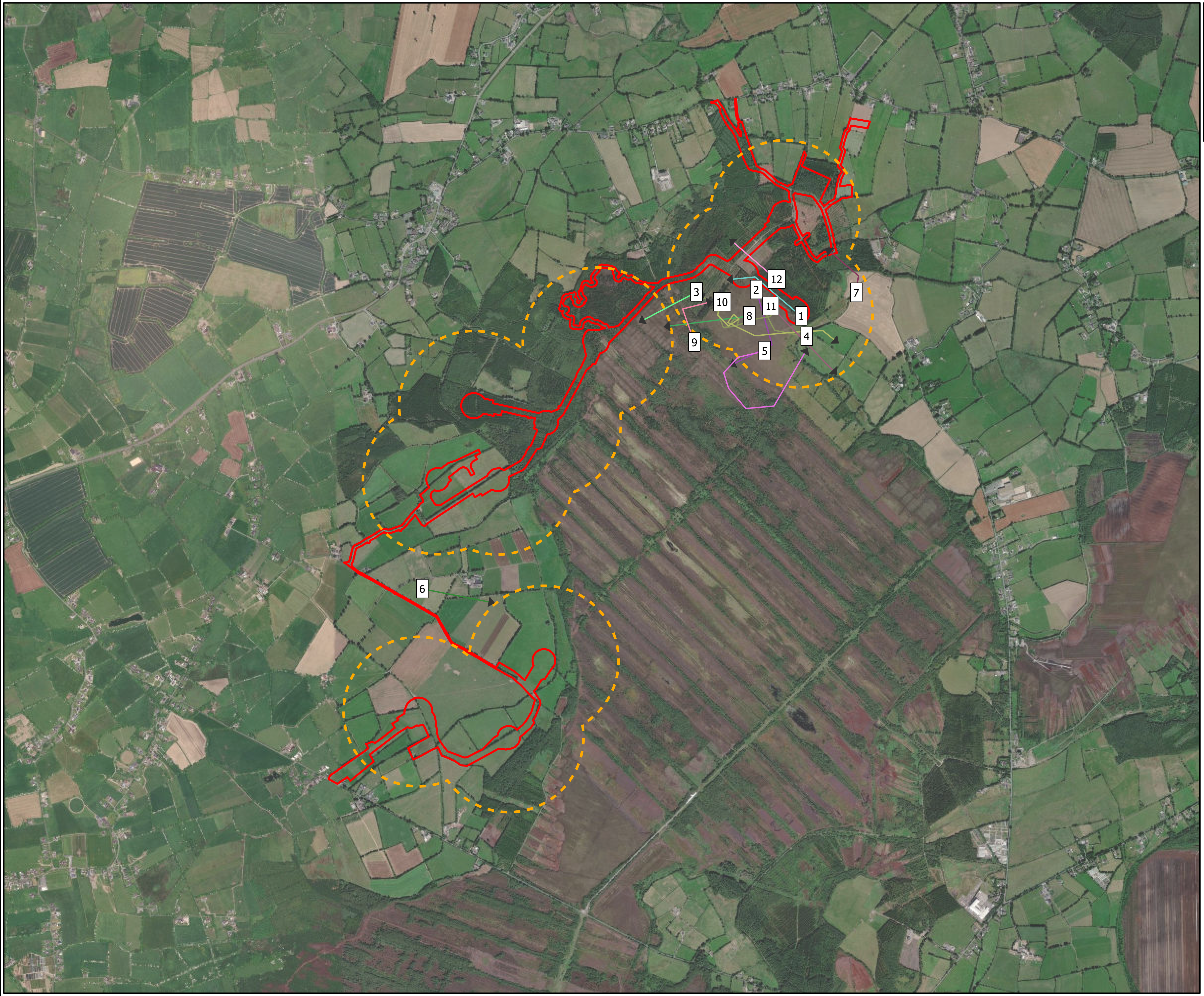
FEHILY TIMONEY

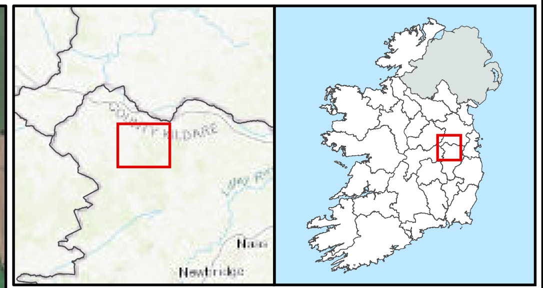
Cork | Dublin | Carlow

www.fehilytimoney.ie

Kilometers
0 0.5 1

Path: R:\Map Production\2020\P20-326\Workspaces\P20_326_Flightlines\P20_326_Flightlines.aprx





Legend

Proposed Development Boundary

SNH Buffer

Bird ID No, Date, Time

1, 30/11/2021, 12:06

2, 30/11/2021, 12:12

3, 30/11/2021, 09:38

4, 20/12/2021, 10:34

5, 20/12/2021, 13:02

6, 21/12/2021, 11:08

7, 12/01/2022, 14:53

8, 12/01/2022, 15:07

9, 12/01/2022, 16:01

10, 22/01/2022, 08:59

11, 22/01/2022, 09:42

12, 08/03/2022, 09:03

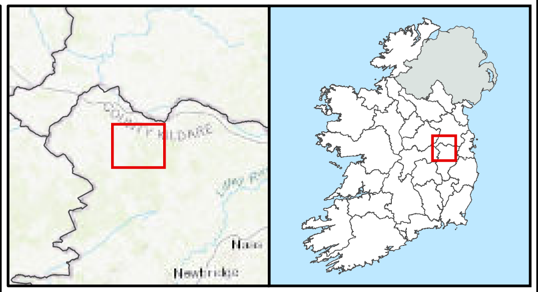
TITLE:	Kestrel Winter 2021/22		
PROJECT:	Drehid Wind Farm and Substation		
FIGURE NO:	--		
CLIENT:	North Kildare Wind Farm Ltd.		
SCALE:	1:25,000	REVISION:	0
DATE:	20/05/2025	PAGE SIZE:	A3

FEHILY TIMONEY
Cork | Dublin | Carlow
www.fehilytimoney.ie

Kilometers
0 0.5 1

World Imagery: Maxar, Microsoft
World Topographic Map: Esri, HERE, Garmin, FAO, USGS, NGACreative and Commons Attribution 4.0 International (CC BY 4.0) licence https://creativecommons.org/licenses/by/4.0/
[INPUT SOURCE HERE]; If Applicable: Mapping Reproduced Under Licence from the Ordnance Survey Ireland Licence No. CYAL50368274 © Government of Ireland

Path: R:\Map Production\2020\P20-326\Workspaces\P20_326_Flightlines\P20_326_Flightlines.aprx



Legend

- Proposed Development Boundary
- SNH Buffer

Bird ID No, Date, Time

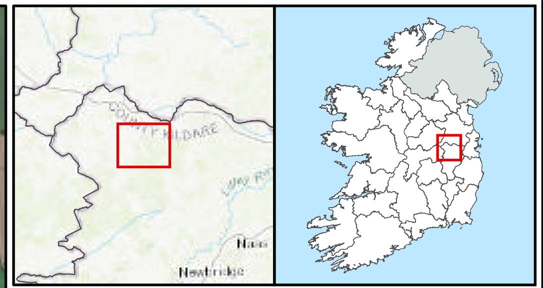
- 25, 22/12/2022, 11:55
- 26, 22/12/2022, 12:48
- 27, 24/01/2023, 11:53
- 28, 20/03/2023, 13:28
- 29, 22/03/2023, 10:31

TITLE: Kestrel Winter 2022/23	
PROJECT: Drehid Wind Farm and Substation	
FIGURE NO: --	
CLIENT: North Kildare Wind Farm Ltd.	
SCALE: 1:25,000	**REVISION:** 0
DATE: 20/05/2025	**PAGE SIZE:** A3

FEHILY TIMONEY
Cork | Dublin | Carlow
www.fehilytimoney.ie

N W E S
0 0.5 1 Kilometers

Path: R:\Map Production\2020\P20-326\Workspaces\P20_326_Flightlines\P20_326_Flightlines.aprx



Legend

Proposed Development Boundary

SNH Buffer

Bird ID No, Date, Time

1, 14/02/2022, 09:48

TITLE:	Lapwing Winter 2021/22
PROJECT:	Drehid Wind Farm and Substation
FIGURE NO:	--
CLIENT:	North Kildare Wind Farm Ltd.
SCALE: 1:25,000	REVISION: 0
DATE: 20/05/2025	PAGE SIZE: A3

FEHILY TIMONEY

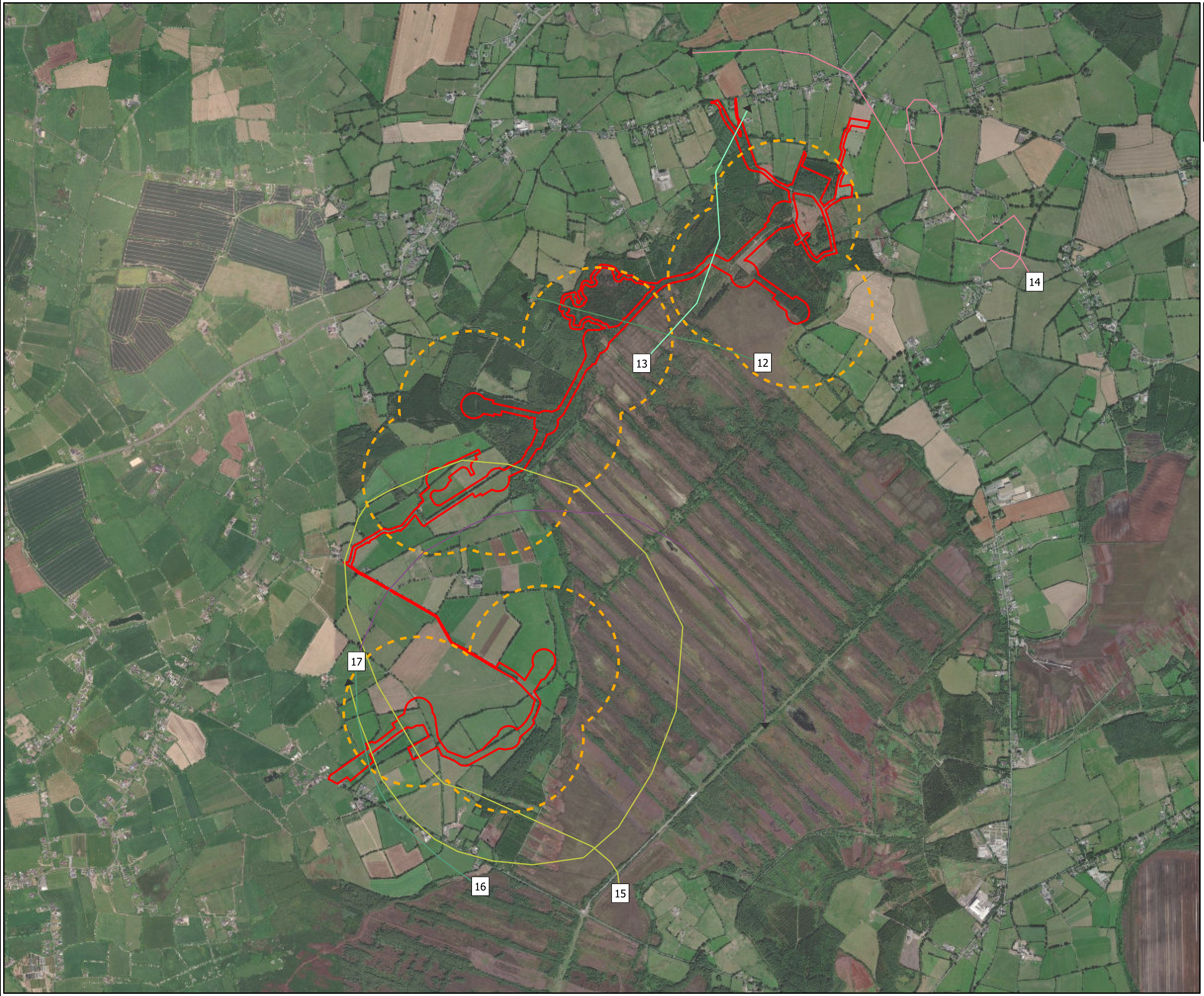
Cork | Dublin | Carlow

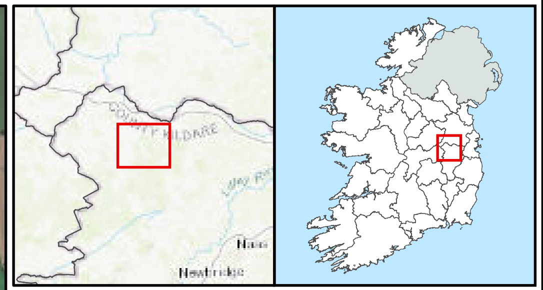
www.fehilytimoney.ie

N W E S

0 0.5 1 Kilometers

Path: R:\Map Production\2020\P20-326\Workspaces\P20_326_Flightlines\P20_326_Flightlines.aprx





Legend

Proposed Development Boundary

SNH Buffer

Bird ID No, Date, Time

12, 06/04/2023, 07:10

13, 06/04/2023, 11:53

14, 06/04/2023, 12:00

15, 06/04/2023, 15:04

16, 06/04/2023, 18:13

17, 06/04/2023, 18:50

TITLE:	Lesser Black-backed Gull Spring Migration 2023
PROJECT:	Drehid Wind Farm and Substation
FIGURE NO:	--
CLIENT:	North Kildare Wind Farm Ltd.
SCALE: 1:25,000	**REVISION:** 0
DATE: 20/05/2025	**PAGE SIZE:** A3

FEHILY TIMONEY

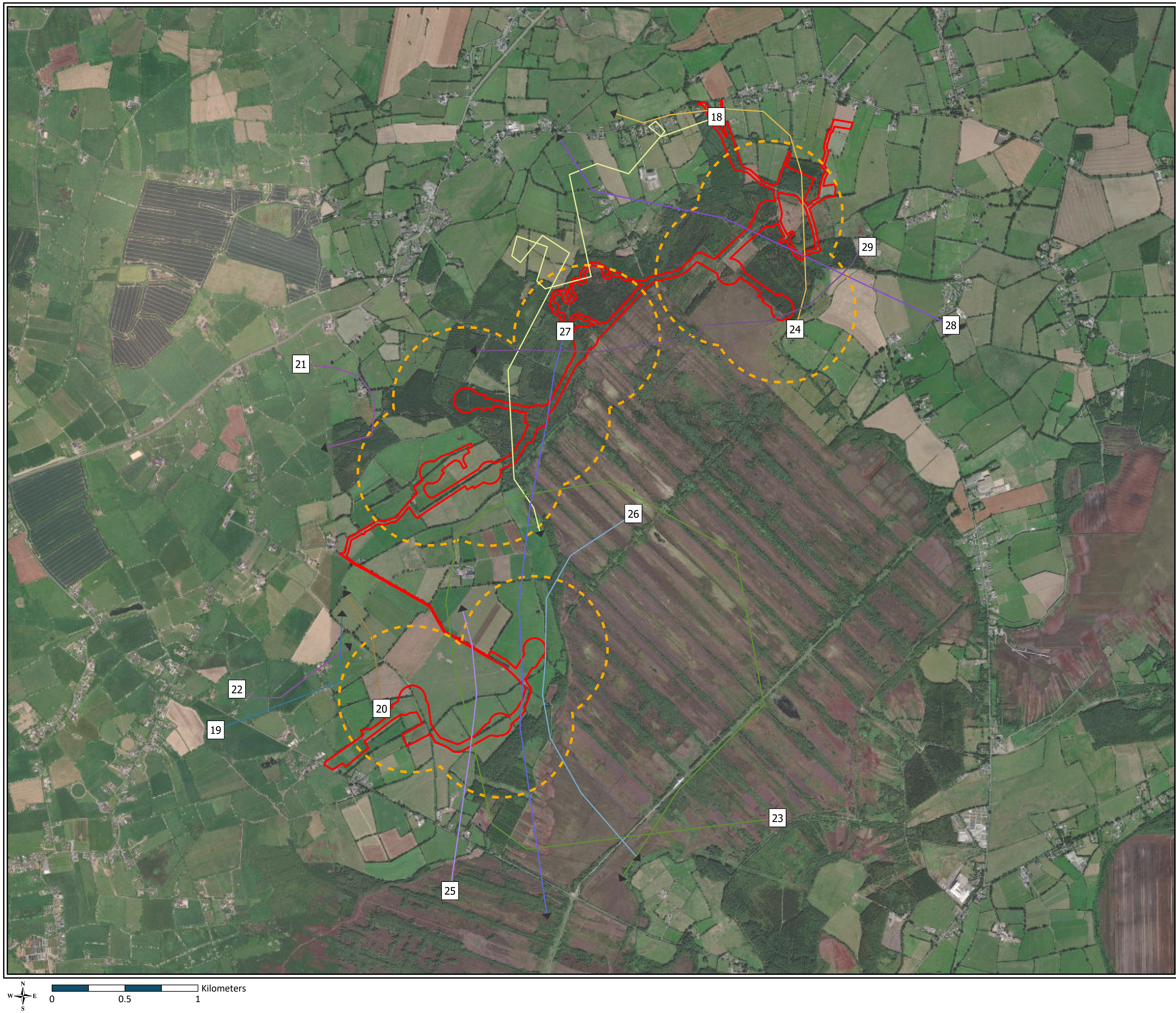
Cork | Dublin | Carlow

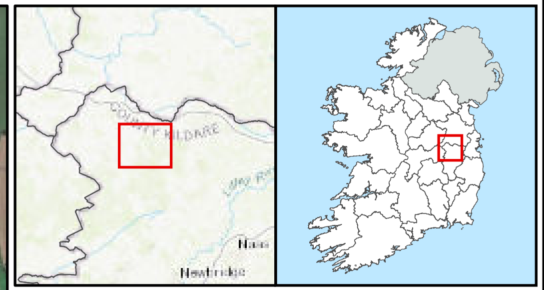
www.fehilytimoney.ie

N W E S

0 0.5 1 Kilometers

Path: R:\Map Production\2020\P20-326\Workspaces\P20_326_Flightlines\P20_326_Flightlines.aprx





Legend

Proposed Development Boundary

SNH Buffer

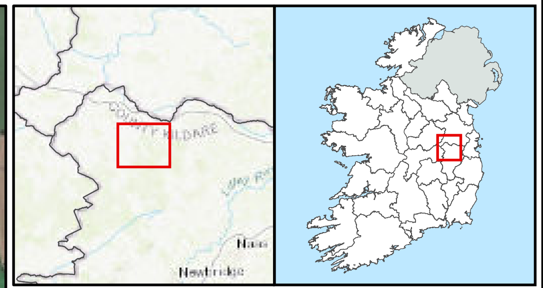
Bird ID No, Date, Time

- 18, 09/05/2023, 12:29
- 19, 07/06/2023, 10:45
- 20, 07/06/2023, 10:48
- 21, 07/06/2023, 11:12
- 22, 07/06/2023, 13:41
- 23, 07/06/2023, 13:14
- 24, 06/07/2023, 11:09
- 25, 06/07/2023, 09:42
- 26, 01/08/2023, 10:45
- 27, 01/08/2023, 11:15
- 28, 01/08/2023, 11:10
- 29, 12/09/2023, 11:33

TITLE:	Lesser Black-backed Gull Summer 2023		
PROJECT:	Drehid Wind Farm and Substation		
FIGURE NO:	--		
CLIENT:	North Kildare Wind Farm Ltd.		
SCALE:	1:25,000	REVISION:	0
DATE:	20/05/2025	PAGE SIZE:	A3

FEHILY TIMONEY
Cork | Dublin | Carlow
www.fehilytimoney.ie

Path: R:\Map Production\2020\P20-326\Workspaces\P20_326_Flightlines\P20_326_Flightlines.aprx



Legend

Proposed Development Boundary

SNH Buffer

Bird ID No, Date, Time

1, 21/01/2022, 16:14

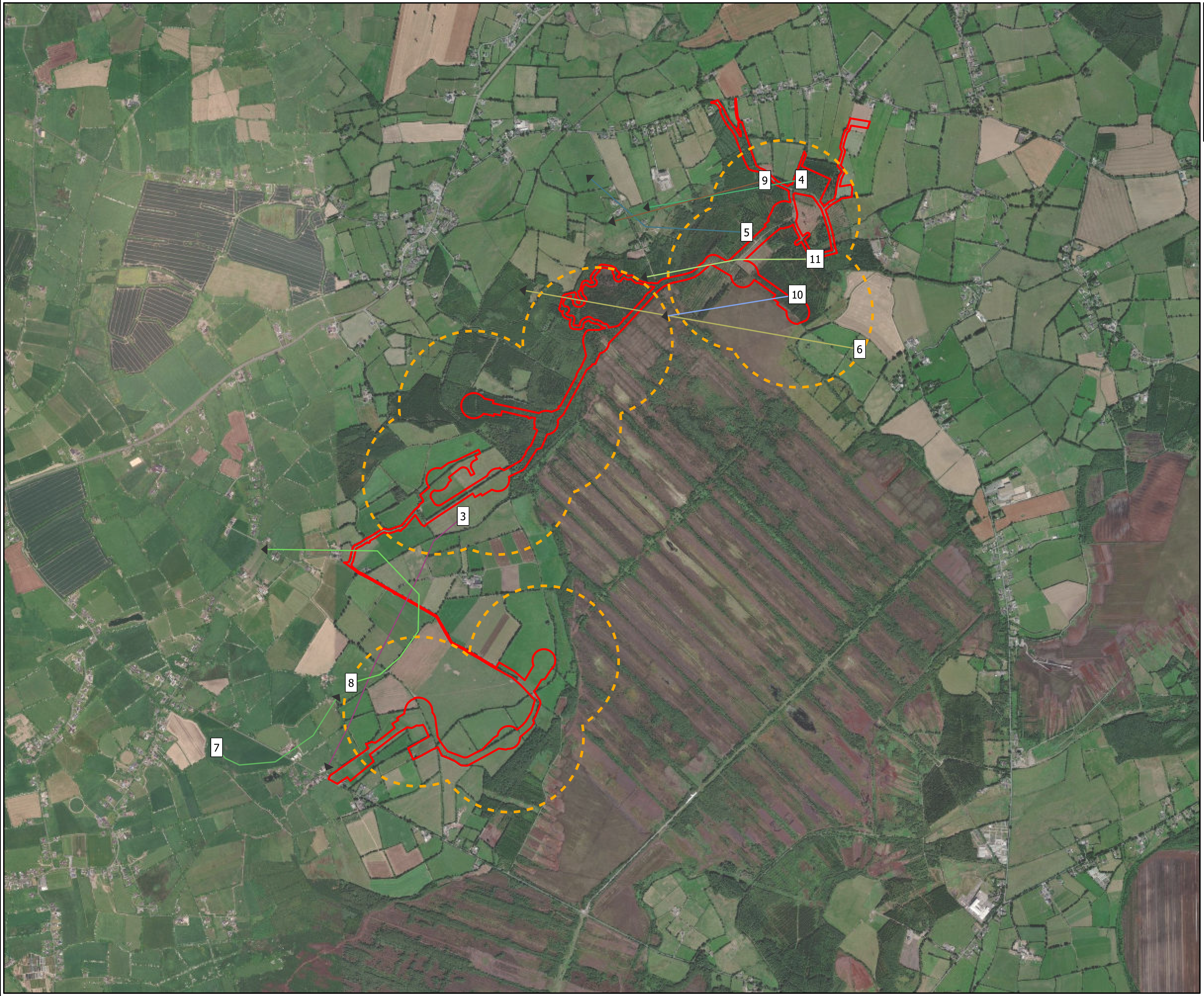
2, 08/03/2022, 11:00

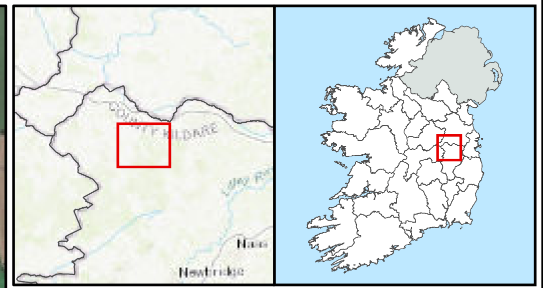
TITLE:	Lesser Black-backed Gull Winter 2021/22
PROJECT:	Drehid Wind Farm and Substation
FIGURE NO:	--
CLIENT:	North Kildare Wind Farm Ltd.
SCALE: 1:25,000	**REVISION:** 0
DATE: 20/05/2025	**PAGE SIZE:** A3

FEHILY TIMONEY
Cork | Dublin | Carlow
www.fehilytimoney.ie

0 0.5 1 Kilometers

Path: R:\Map Production\2020\P20-326\Workspaces\P20_326_Flightlines\P20_326_Flightlines.aprx





Legend

Proposed Development Boundary

SNH Buffer

Bird ID No, Date, Time

- 3, 21/12/2022, 10:51
- 4, 20/03/2023, 11:34
- 5, 20/03/2023, 11:39
- 6, 20/03/2023, 11:42
- 7, 22/03/2023, 09:50
- 8, 22/03/2023, 12:31
- 9, 22/03/2023, 10:53
- 10, 22/03/2023, 12:01
- 11, 22/03/2023, 12:10

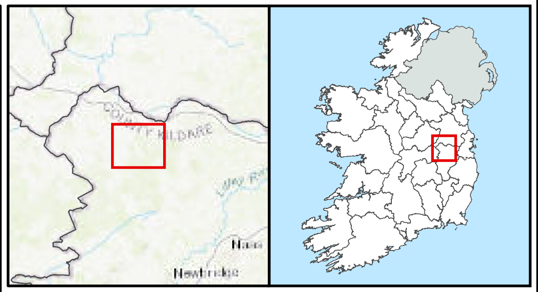
TITLE:	Lesser Black-backed Gull Winter 2022/23		
PROJECT:	Drehid Wind Farm and Substation		
FIGURE NO:	--		
CLIENT:	North Kildare Wind Farm Ltd.		
SCALE:	1:25,000	REVISION:	0
DATE:	20/05/2025	PAGE SIZE:	A3

FEHILY TIMONEY Cork | Dublin | Carlow www.fehilytimoney.ie

N W E S

Kilometers 0 0.5 1

Path: R:\Map Production\2020\P20-326\Workspaces\P20_326_Flightlines\P20_326_Flightlines.aprx



Legend

Proposed Development Boundary

SNH Buffer

Bird ID No, Date, Time

1, 10/09/2022, 16:07

TITLE:	Little Egret Summer 2022
PROJECT:	Drehid Wind Farm and Substation
FIGURE NO:	--
CLIENT:	North Kildare Wind Farm Ltd.
SCALE: 1:25,000	**REVISION:** 0
DATE: 20/05/2025	**PAGE SIZE:** A3

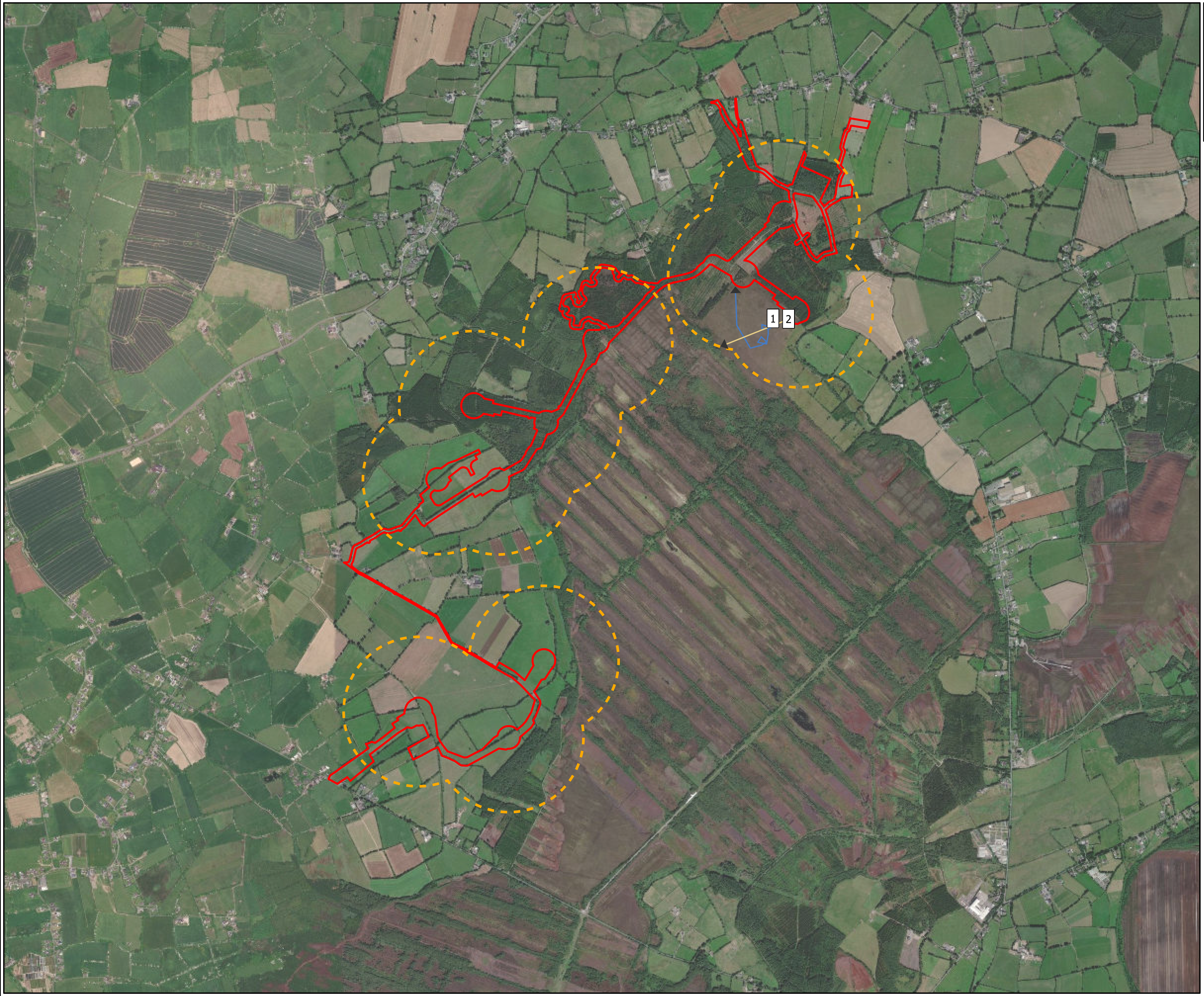
FEHILY TIMONEY

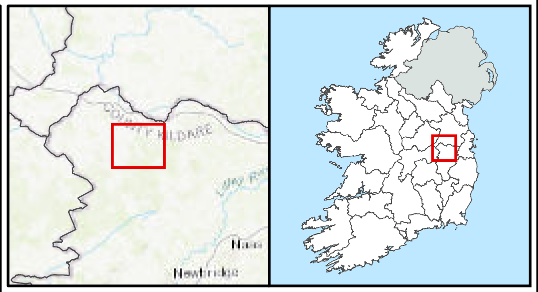
Cork | Dublin | Carlow

www.fehilytimoney.ie

0 0.5 1 Kilometers

Path: R:\Map Production\2020\P20-326\Workspaces\P20_326_Flightlines\P20_326_Flightlines.aprx





Legend

Proposed Development Boundary

SNH Buffer

Bird ID No, Date, Time

1, 29/11/2021, 10:37

2, 30/11/2021, 13:06

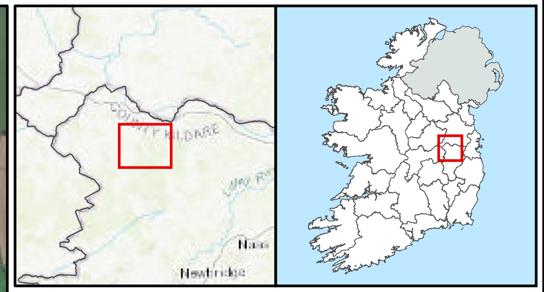
TITLE:	Merlin Winter 2021/22
PROJECT:	Drehid Wind Farm and Substation
FIGURE NO:	--
CLIENT:	North Kildare Wind Farm Ltd.
SCALE: 1:25,000	REVISION: 0
DATE: 20/05/2025	PAGE SIZE: A3

FEHILY TIMONEY
Cork | Dublin | Carlow
www.fehilytimoney.ie

N W E S

0 0.5 1 Kilometers

Path: R:\Map Production\2020\P20-326\Workspaces\P20_326_Flightlines\P20_326_Flightlines.aprx



Legend

Proposed Development Boundary

SNH Buffer

Bird ID No, Date, Time

1, 01/03/2023, 12:32

TITLE:	Peregrine Winter 2022/23
PROJECT:	Drehid Wind Farm and Substation
FIGURE NO:	--
CLIENT:	North Kildare Wind Farm Ltd.
SCALE: 1:25,000	REVISION: 0
DATE: 20/05/2025	PAGE SIZE: A3

FEHILY TIMONEY

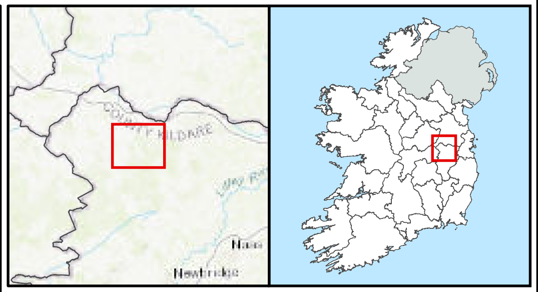
Cork | Dublin | Carlow

www.fehilytimoney.ie

0 0.5 1 Kilometers

N E S W

Path: R:\Map Production\2020\P20-326\Workspaces\P20_326_Flightlines\P20_326_Flightlines.aprx



Legend

Proposed Development Boundary

SNH Buffer

Bird ID No, Date, Time

1, 07/06/2023, 13:10

TITLE:	Red Kite Summer 2023
PROJECT:	Drehid Wind Farm and Substation
FIGURE NO:	--
CLIENT:	North Kildare Wind Farm Ltd.
SCALE: 1:25,000	**REVISION:** 0
DATE: 20/05/2025	**PAGE SIZE:** A3

FEHILY TIMONEY

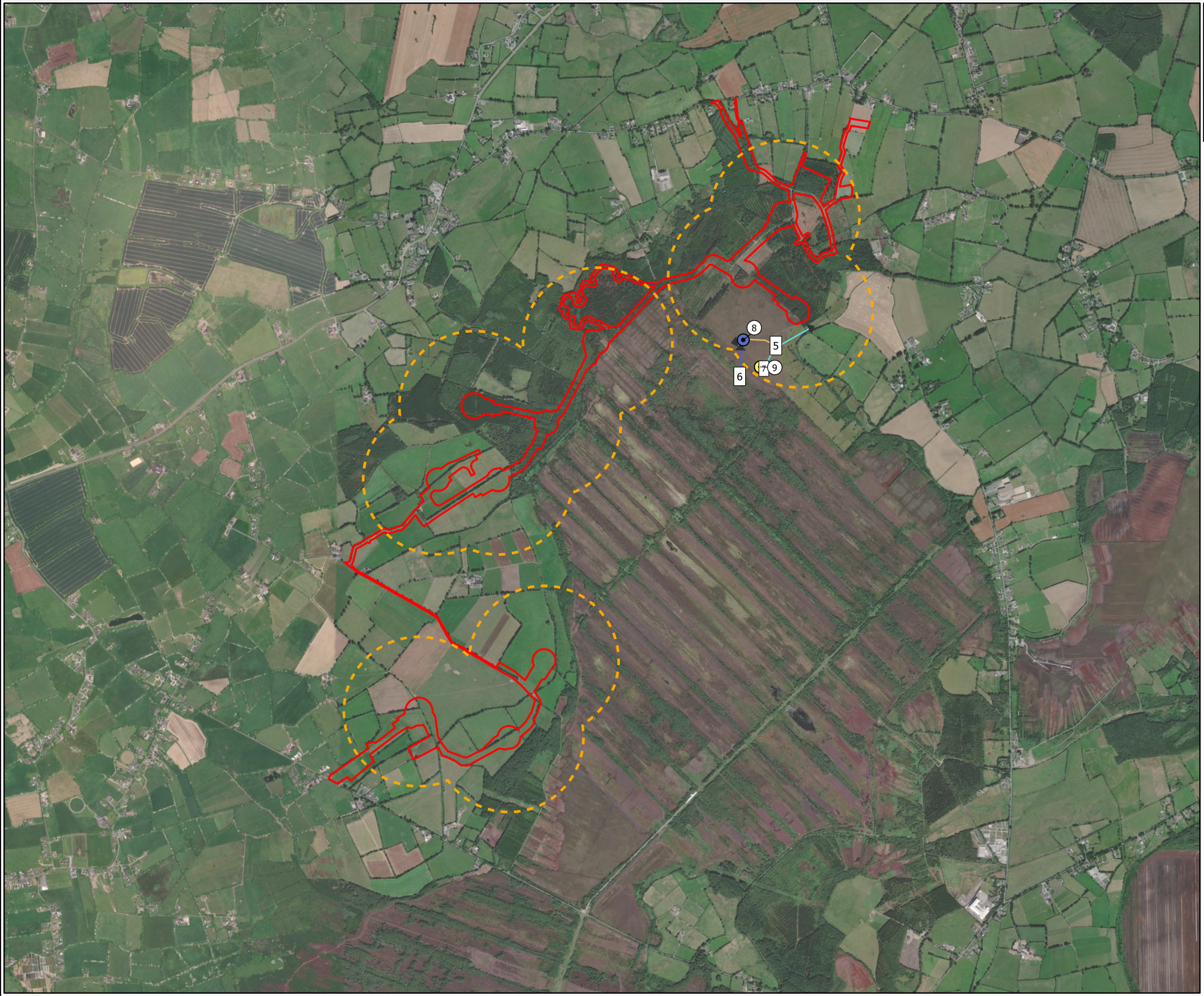
Cork | Dublin | Carlow

www.fehilytimoney.ie

0 0.5 1 Kilometers

World Imagery: Earthstar Geographics
World Topographic Map: Esri, HERE, Garmin, FAO, USGS, NGACreative and Commons Attribution 4.0 International (CC BY 4.0) licence https://creativecommons.org/licenses/by/4.0/
[INPUT SOURCE HERE]; If Applicable: Mapping Reproduced Under Licence from the Ordnance Survey Ireland Licence No. CYAL50368274 © Government of Ireland

Path: R:\Map Production\2020\P20-326\Workspaces\P20_326_Flightlines\P20_326_Flightlines.aprx



Legend

Proposed Development Boundary

SNH Buffer

Bird ID No, Date, Time

5, 14/04/2022, 07:49

6, 14/04/2022, 10:44

7, 14/04/2022, 10:53

8, 14/04/2022, 12:49

9, 14/04/2022, Not Recorded

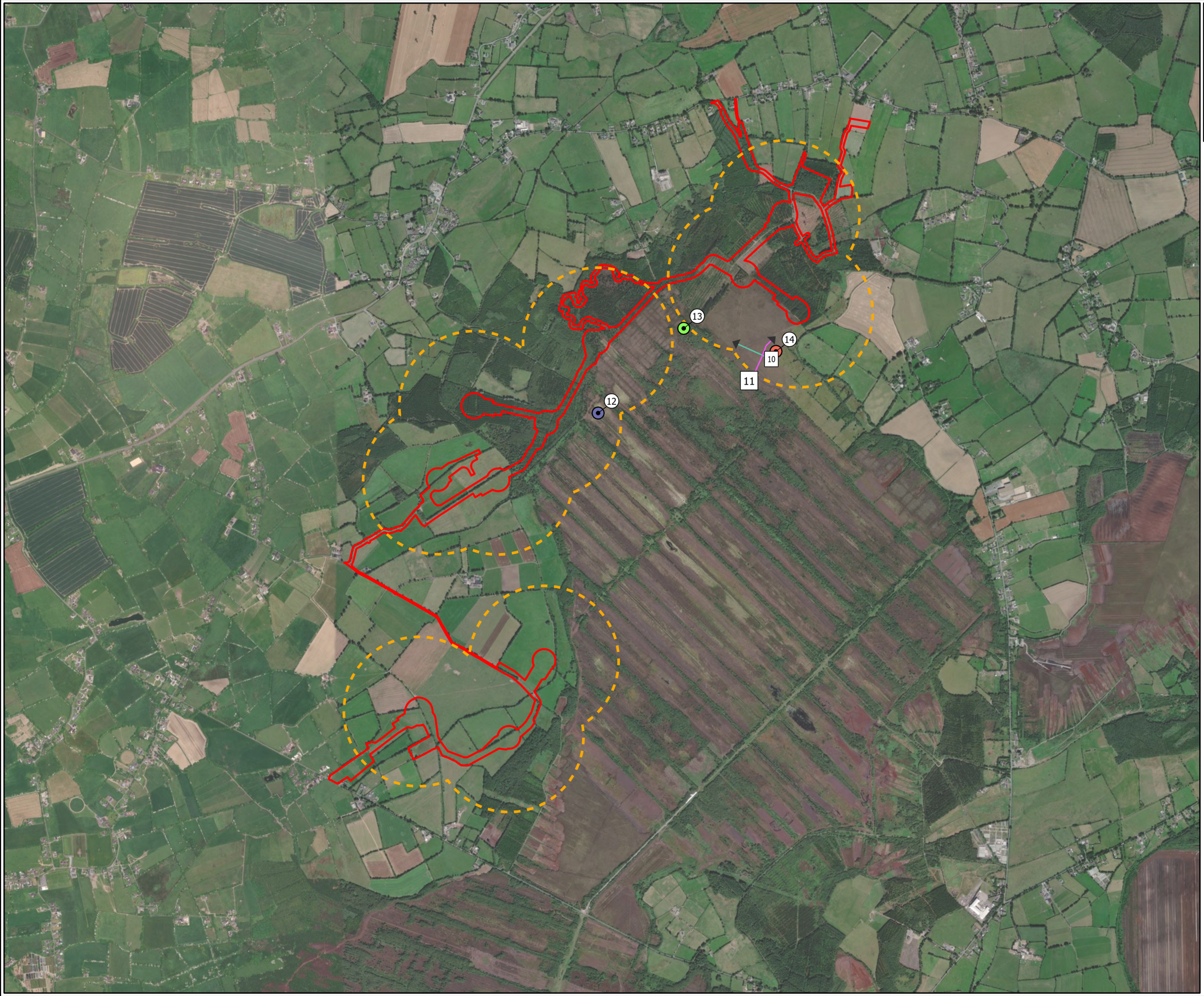
TITLE:	Snipe Spring Migration 2022
PROJECT:	Drehid Wind Farm and Substation
FIGURE NO:	--
CLIENT:	North Kildare Wind Farm Ltd.
SCALE: 1:25,000	REVISION: 0
DATE: 20/05/2025	PAGE SIZE: A3

FEHILY TIMONEY
Cork | Dublin | Carlow
www.fehilytimoney.ie

N W E S
0 0.5 1 Kilometers

World Imagery: Earthstar Geographics
World Topographic Map: Esri, HERE, Garmin, FAO, USGS, NGACreative and Commons Attribution 4.0 International (CC BY 4.0) licence https://creativecommons.org/licenses/by/4.0/
[INPUT SOURCE HERE]; If Applicable: Mapping Reproduced Under Licence from the Ordnance Survey Ireland Licence No. CYAL50368274 © Government of Ireland

Path: R:\Map Production\2020\P20-326\Workspaces\P20_326_Flightlines\P20_326_Flightlines.aprx



Legend

Proposed Development Boundary

SNH Buffer

Bird ID No, Date, Time

10, 29/04/2022, 12:31

11, 05/05/2022, 14:05

12, 05/05/2022, 14:21

13, 05/05/2022, 14:37

14, 06/06/2022, 15:09

TITLE:	Snipe Summer 2022
PROJECT:	Drehid Wind Farm and Substation
FIGURE NO:	--
CLIENT:	North Kildare Wind Farm Ltd.

SCALE:	1:25,000	**REVISION:**	0
DATE:	20/05/2025	**PAGE SIZE:**	A3

FEHILY TIMONEY

Cork | Dublin | Carlow

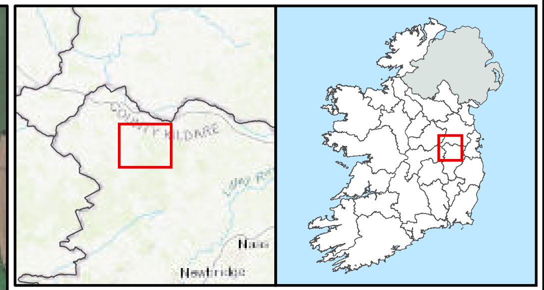
www.fehilytimoney.ie

N W E S

0 0.5 1 Kilometers

World Imagery: Maxar, Microsoft
World Topographic Map: Esri, HERE, Garmin, FAO, USGS, NGACreative and Commons Attribution 4.0 International (CC BY 4.0) licence https://creativecommons.org/licenses/by/4.0/
[INPUT SOURCE HERE]; If Applicable: Mapping Reproduced Under Licence from the Ordnance Survey Ireland Licence No. CYAL50368274 © Government of Ireland

Path: R:\Map Production\2020\P20-326\Workspaces\P20_326_Flightlines\P20_326_Flightlines.aprx



Legend

Proposed Development Boundary

SNH Buffer

Bird ID No, Date, Time

15, 06/04/2023, 13:30

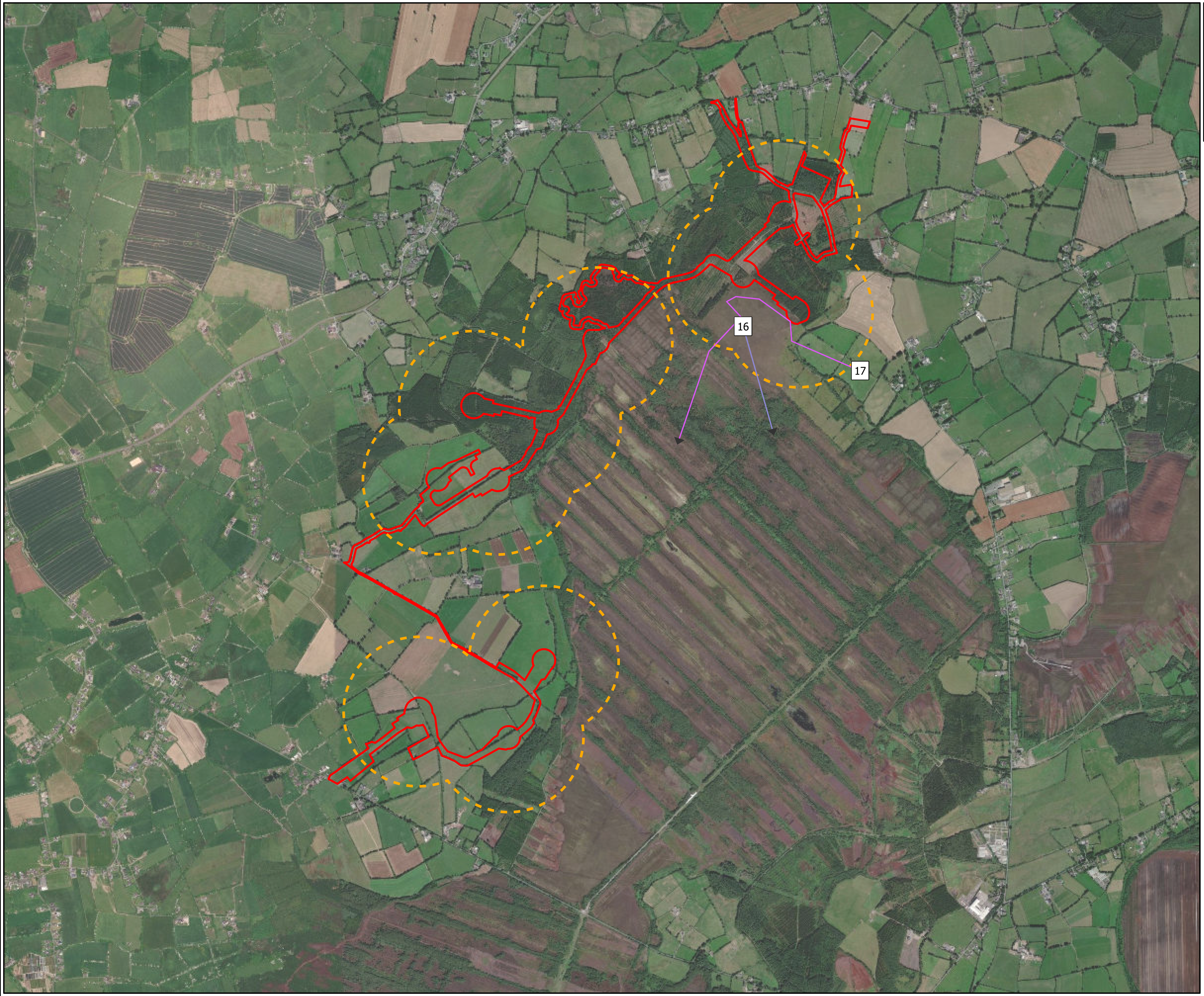
TITLE:	Snipe Spring Migration 2023
PROJECT:	Drehid Wind Farm and Substation
FIGURE NO:	--
CLIENT:	North Kildare Wind Farm Ltd.
SCALE: 1:25,000	REVISION: 0
DATE: 20/05/2025	PAGE SIZE: A3

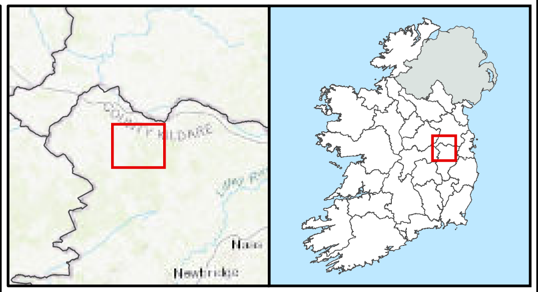
FEHILY TIMONEY Cork | Dublin | Carlow www.fehilytimoney.ie

N W E S

0 0.5 1 Kilometers

Path: R:\Map Production\2020\P20-326\Workspaces\P20_326_Flightlines\P20_326_Flightlines.aprx





Legend

Proposed Development Boundary

SNH Buffer

Bird ID No, Date, Time

16, 07/06/2023, 11:00

17, 07/06/2023, 11:57

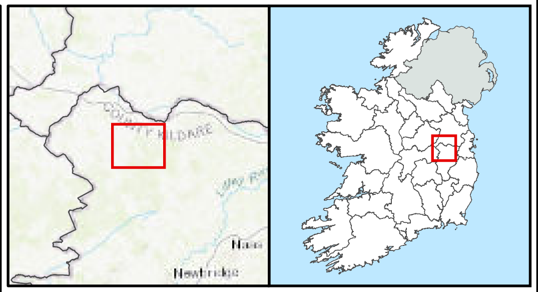
TITLE:	Snipe Summer 2023
PROJECT:	Drehid Wind Farm and Substation
FIGURE NO:	--
CLIENT:	North Kildare Wind Farm Ltd.
SCALE: 1:25,000	REVISION: 0
DATE: 20/05/2025	PAGE SIZE: A3

FEHILY TIMONEY
Cork | Dublin | Carlow
www.fehilytimoney.ie

N W E S

0 0.5 1 Kilometers

Path: R:\Map Production\2020\P20-326\Workspaces\P20_326_Flightlines\P20_326_Flightlines.aprx



Legend

Proposed Development Boundary

SNH Buffer

Bird ID No, Date, Time

1, 20/12/2021, 11:06

2, 20/12/2021, 11:18

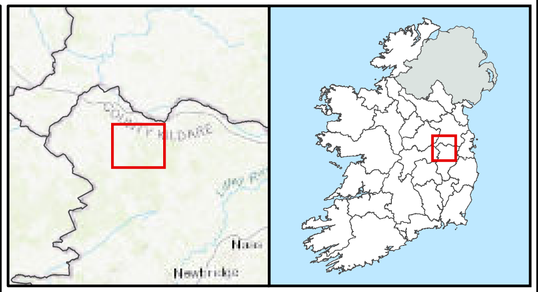
3, 17/02/2022, 11:48

4, 17/02/2022, 11:53

TITLE:	Snipe Winter 2021/22
PROJECT:	Drehid Wind Farm and Substation
FIGURE NO:	--
CLIENT:	North Kildare Wind Farm Ltd.
SCALE: 1:25,000	REVISION: 0
DATE: 20/05/2025	PAGE SIZE: A3

FEHILY TIMONEY
Cork | Dublin | Carlow
www.fehilytimoney.ie

Path: R:\Map Production\2020\P20-326\Workspaces\P20_326_Flightlines\P20_326_Flightlines.aprx



Legend

Proposed Development Boundary

SNH Buffer

Bird ID No, Date, Time

15, 13/04/2022, 17:25

16, 14/04/2022, 10:37

17, 14/04/2022, 12:18

TITLE:	Sparrowhawk Spring Migration 2022
PROJECT:	Drehid Wind Farm and Substation
FIGURE NO:	--
CLIENT:	North Kildare Wind Farm Ltd.
SCALE:	1:25,000
REVISION:	0
DATE:	20/05/2025
PAGE SIZE:	A3

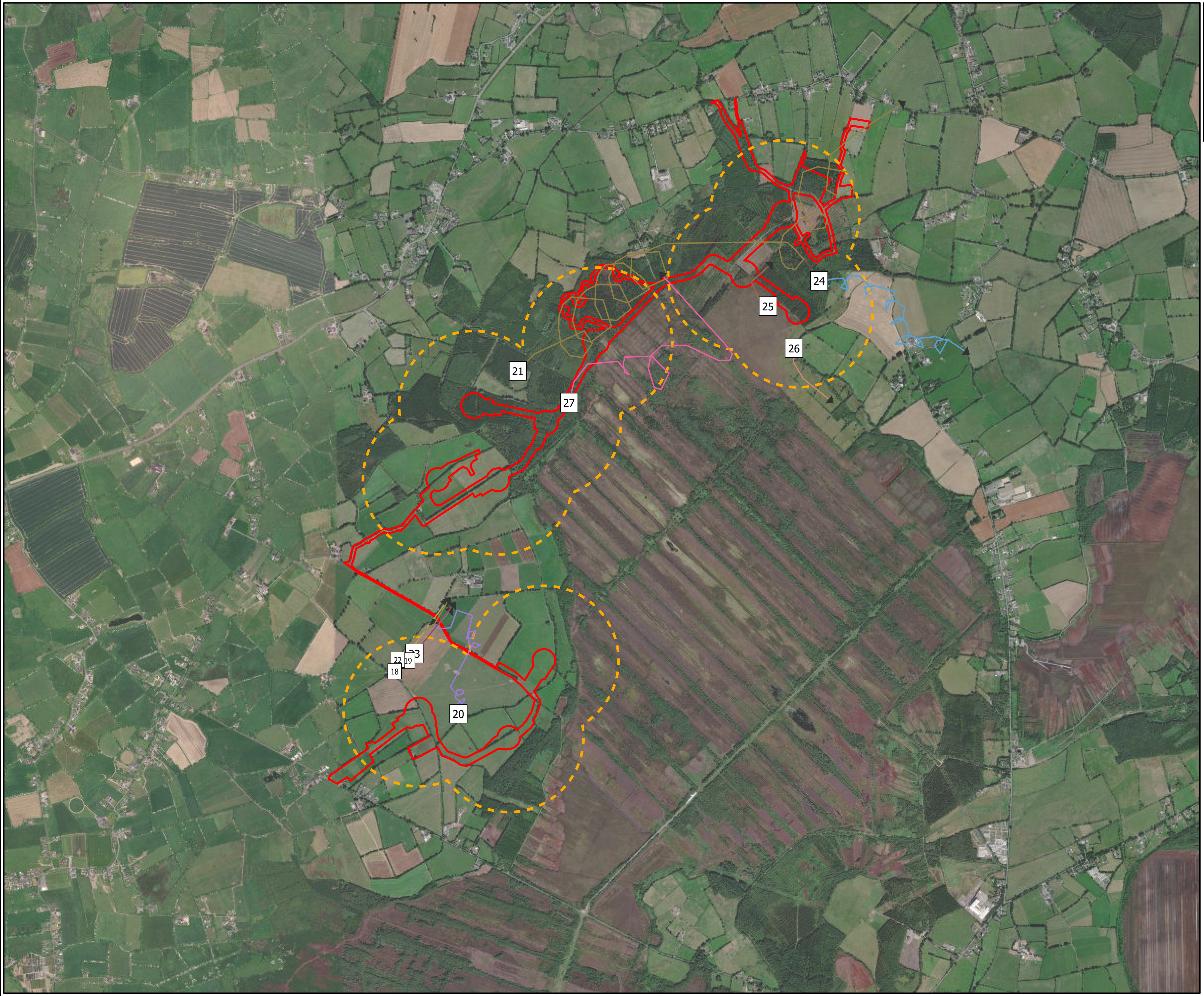
FEHILY TIMONEY

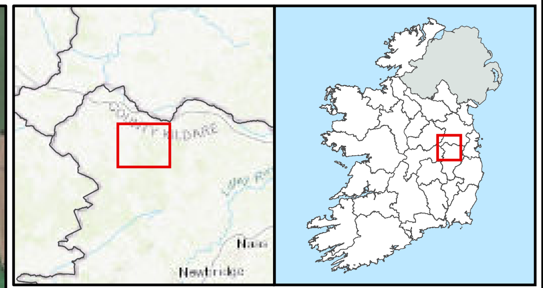
Cork | Dublin | Carlow

www.fehilytimoney.ie

0 0.5 1 Kilometers

Path: R:\Map Production\2020\P20-326\Workspaces\P20_326_Flightlines\P20_326_Flightlines.aprx





Legend

Proposed Development Boundary

SNH Buffer

Bird ID No, Date, Time

18, 20/04/2022, 11:47

19, 04/05/2022, 12:01

20, 04/05/2022, 16:14

21, 05/05/2022, 12:09

22, 09/06/2022, Not Recorded

23, 11/07/2022, 13:46

24, 13/07/2022, 09:38

25, 09/08/2022, 08:53

26, 09/08/2022, 09:45

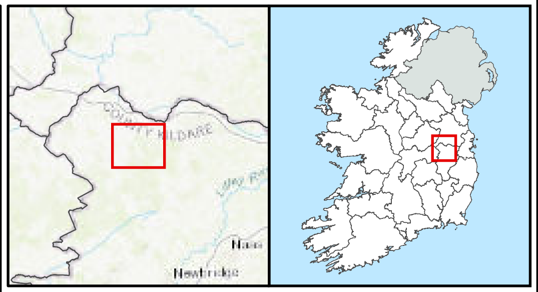
27, 10/09/2022, 11:19

TITLE:	Sparrowhawk Summer 2022		
PROJECT:	Drehid Wind Farm and Substation		
FIGURE NO:	--		
CLIENT:	North Kildare Wind Farm Ltd.		
SCALE:	1:25,000	REVISION:	0
DATE:	20/05/2025	PAGE SIZE:	A3

FEHILY TIMONEY
Cork | Dublin | Carlow
www.fehilytimoney.ie

Kilometers
0 0.5 1

Path: R:\Map Production\2020\P20-326\Workspaces\P20_326_Flightlines\P20_326_Flightlines.aprx



Legend

Proposed Development Boundary

SNH Buffer

Bird ID No, Date, Time

40, 09/05/2023, 13:22

41, 07/06/2023, 14:33

42, 07/06/2023, 10:44

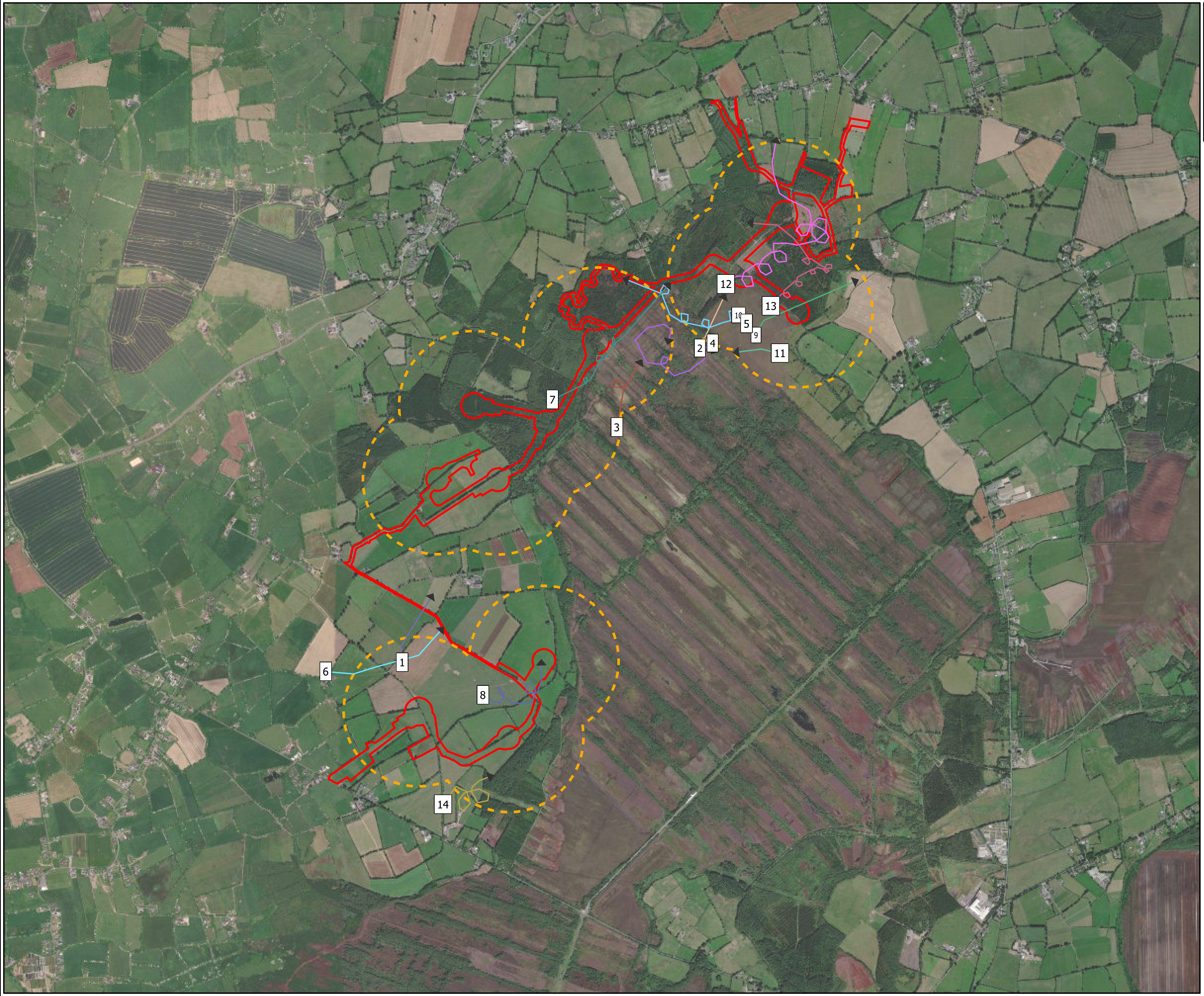
43, 12/09/2023, 13:47

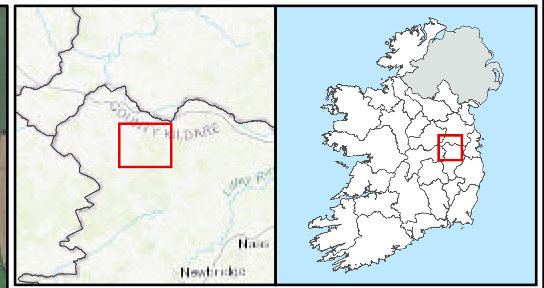
TITLE:	Sparrowhawk Summer 2023		
PROJECT:	Drehid Wind Farm and Substation		
FIGURE NO:	--		
CLIENT:	North Kildare Wind Farm Ltd.		
SCALE:	1:25,000	REVISION:	0
DATE:	20/05/2025	PAGE SIZE:	A3

FEHILY TIMONEY
Cork | Dublin | Carlow
www.fehilytimoney.ie

World Imagery: Maxar, Microsoft
World Topographic Map: Esri, HERE, Garmin, FAO, USGS, NGACreative and Commons Attribution 4.0 International (CC BY 4.0) licence https://creativecommons.org/licenses/by/4.0/
[INPUT SOURCE HERE]; If Applicable: Mapping Reproduced Under Licence from the Ordnance Survey Ireland Licence No. CYAL50368274 © Government of Ireland

Path: R:\Map Production\2020\P20-326\Workspaces\P20_326_Flightlines\P20_326_Flightlines.aprx





Legend

Proposed Development Boundary

SNH Buffer

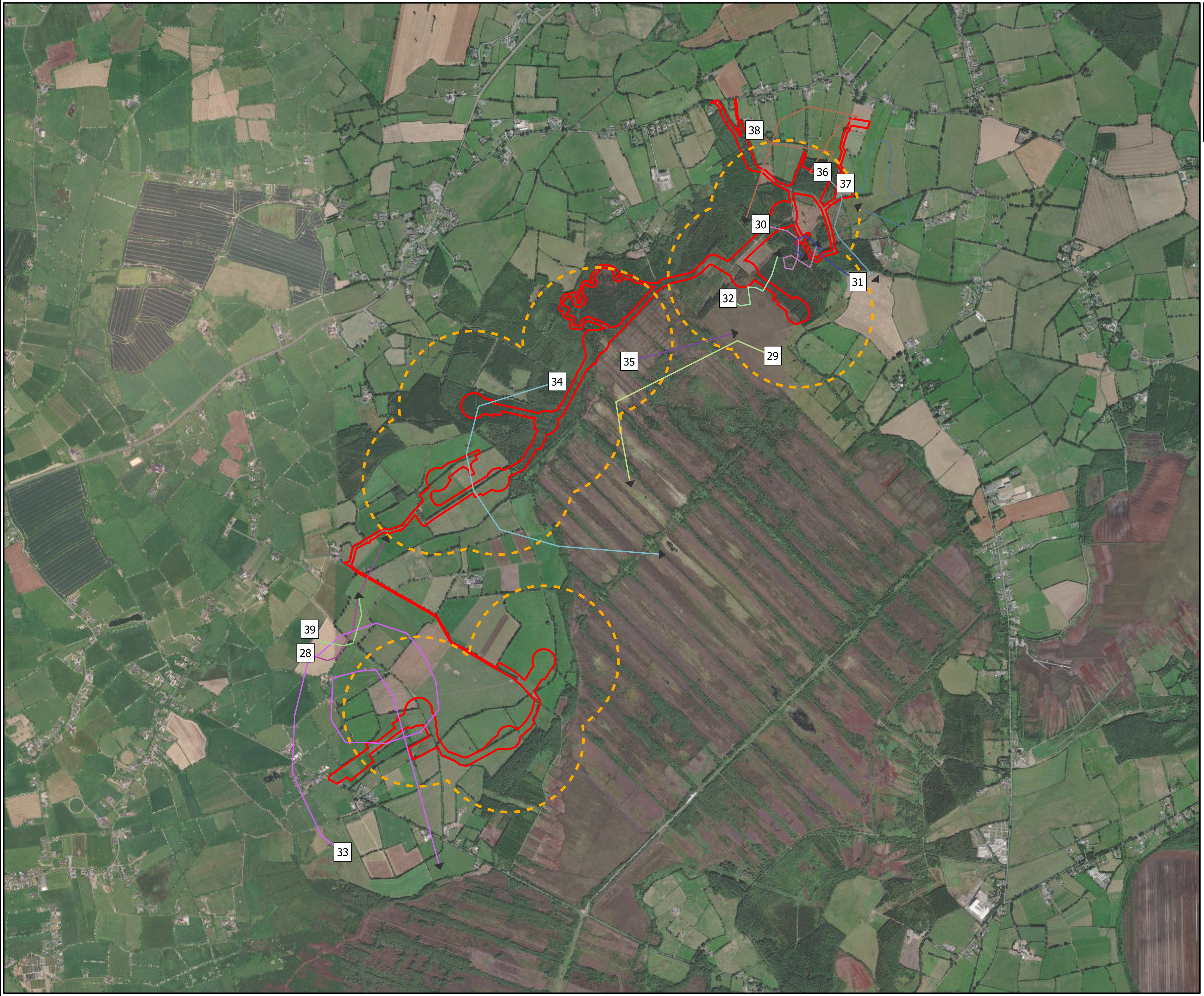
Bird ID No, Date, Time

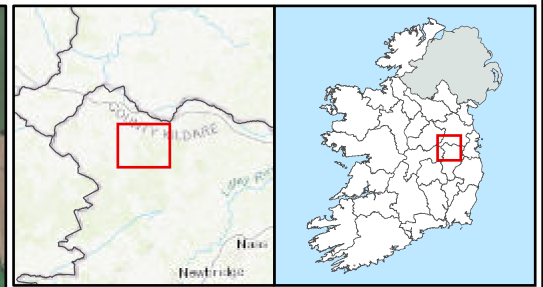
- 1, 29/11/2021, 12:17
- 2, 30/11/2021, 11:23
- 3, 20/12/2021, 09:47
- 4, 20/12/2021, 10:43
- 5, 20/12/2021, 13:56
- 6, 21/12/2021, 16:43
- 7, 12/01/2022, 13:14
- 8, 14/02/2022, 12:25
- 9, 17/02/2022, 09:14
- 10, 17/02/2022, 12:02
- 11, 17/02/2022, 12:29
- 12, 17/02/2022, 12:49
- 13, 17/02/2022, 12:58
- 14, 25/02/2022, 09:13

TITLE:	Sparrowhawk Winter 2021/22		
PROJECT:	Drehid Wind Farm and Substation		
FIGURE NO:	--		
CLIENT:	North Kildare Wind Farm Ltd.		
SCALE:	1:25,000	REVISION:	0
DATE:	20/05/2025	PAGE SIZE:	A3

FEHILY TIMONEY
Cork | Dublin | Carlow
www.fehilytimoney.ie

0 0.5 1 Kilometers





Legend

Proposed Development Boundary

SNH Buffer

Bird ID No, Date, Time

- 28, 21/12/2022, 13:32
- 29, 22/12/2022, 10:28
- 30, 24/01/2023, 12:28
- 31, 13/02/2023, 10:36
- 32, 13/02/2023, 13:32
- 33, 13/02/2023, 12:40
- 34, 20/03/2023, 14:35
- 35, 20/03/2023, 10:11
- 36, 20/03/2023, 10:15
- 37, 20/03/2023, 10:47
- 38, 20/03/2023, 11:03
- 39, 22/03/2023, 11:23

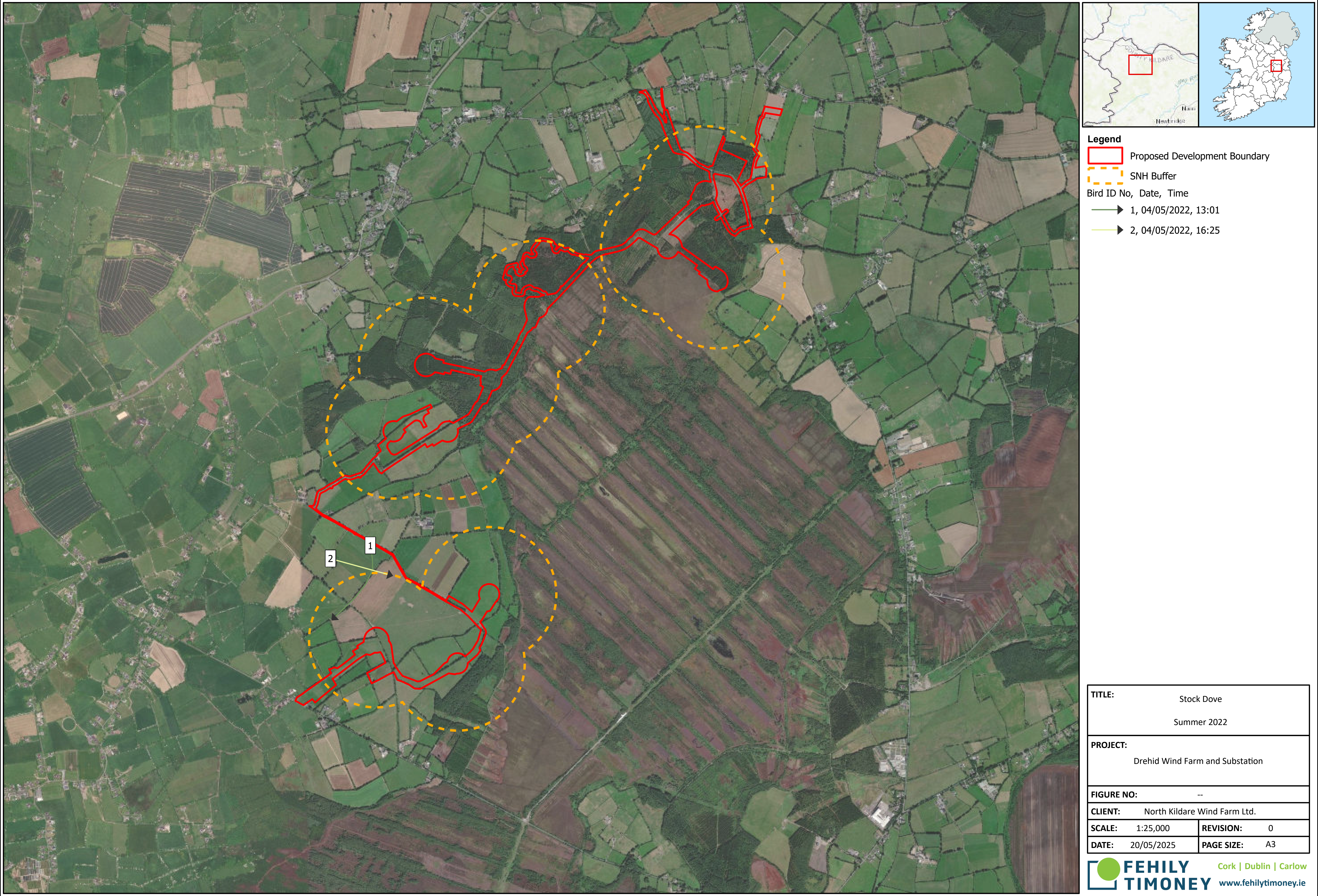
TITLE:	Sparrowhawk Winter 2022/23
PROJECT:	Drehid Wind Farm and Substation
FIGURE NO:	--
CLIENT:	North Kildare Wind Farm Ltd.
SCALE: 1:25,000	REVISION: 0
DATE: 20/05/2025	PAGE SIZE: A3

FEHILY TIMONEY
Cork | Dublin | Carlow
www.fehilytimoney.ie

0 0.5 1 Kilometers

World Imagery: Maxar, Microsoft
World Topographic Map: Esri, HERE, Garmin, FAO, USGS, NGACreative and Commons Attribution 4.0 International (CC BY 4.0) licence https://creativecommons.org/licenses/by/4.0/
[INPUT SOURCE HERE]; If Applicable: Mapping Reproduced Under Licence from the Ordnance Survey Ireland Licence No. CYAL50368274 © Government of Ireland

Path: R:\Map Production\2020\P20-326\Workspaces\P20_326_Flightlines\P20_326_Flightlines.aprx



Legend

Proposed Development Boundary

SNH Buffer

Bird ID No, Date, Time

1, 04/05/2022, 13:01

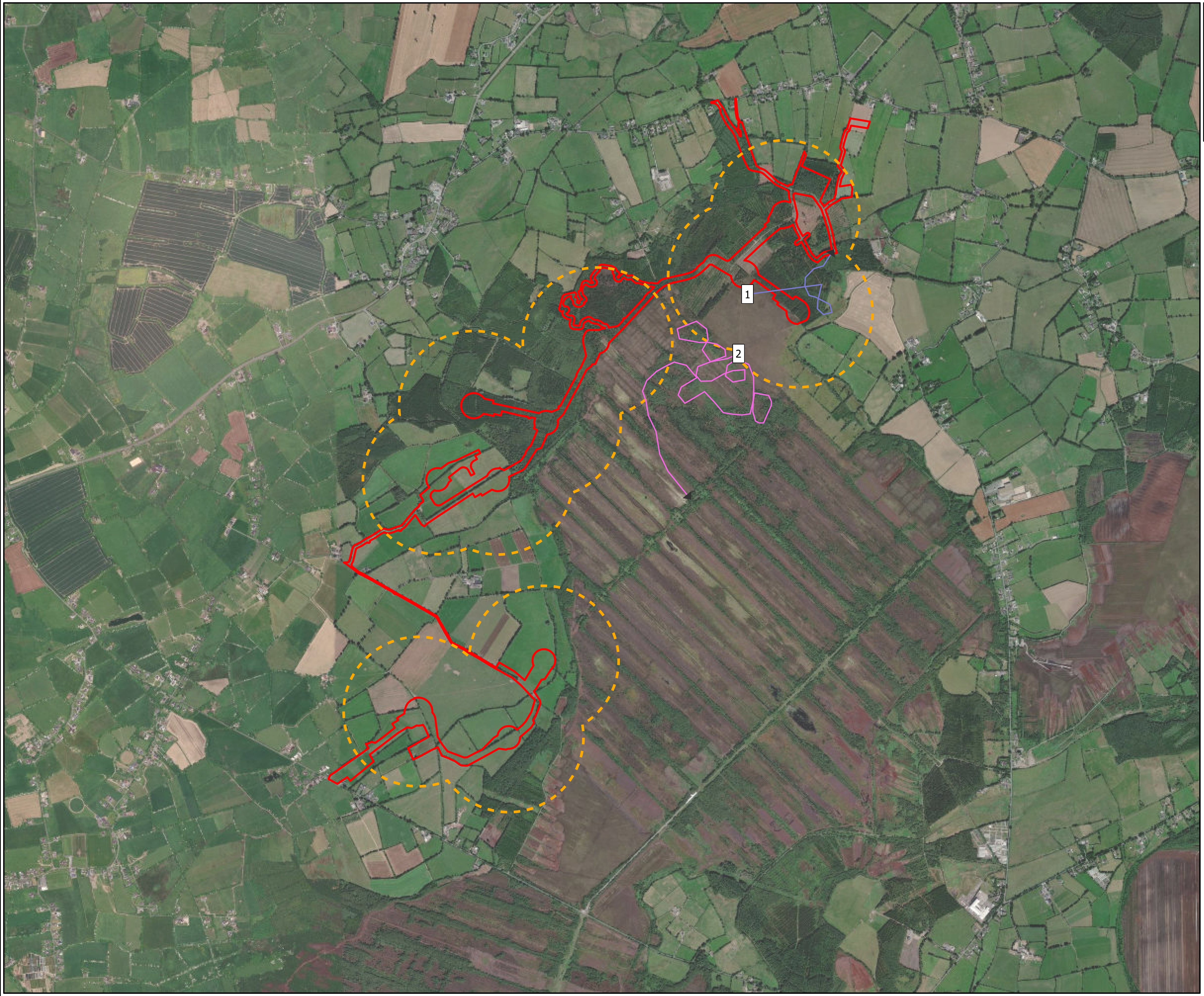
2, 04/05/2022, 16:25

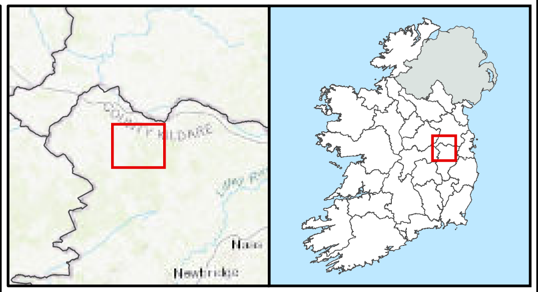
TITLE:	Stock Dove Summer 2022
PROJECT:	Drehid Wind Farm and Substation
FIGURE NO:	--
CLIENT:	North Kildare Wind Farm Ltd.
SCALE: 1:25,000	**REVISION:** 0
DATE: 20/05/2025	**PAGE SIZE:** A3

FEHILY TIMONEY
Cork | Dublin | Carlow
www.fehilytimoney.ie

0 0.5 1 Kilometers

Path: R:\Map Production\2020\P20-326\Workspaces\P20_326_Flightlines\P20_326_Flightlines.aprx





Legend

Proposed Development Boundary

SNH Buffer

Bird ID No, Date, Time

1, 06/06/2022, 16:42

2, 06/06/2022, 18:36

TITLE:	Swift Summer 2022
PROJECT:	Drehid Wind Farm and Substation
FIGURE NO:	--
CLIENT:	North Kildare Wind Farm Ltd.
SCALE: 1:25,000	**REVISION:** 0
DATE: 20/05/2025	**PAGE SIZE:** A3

FEHILY TIMONEY

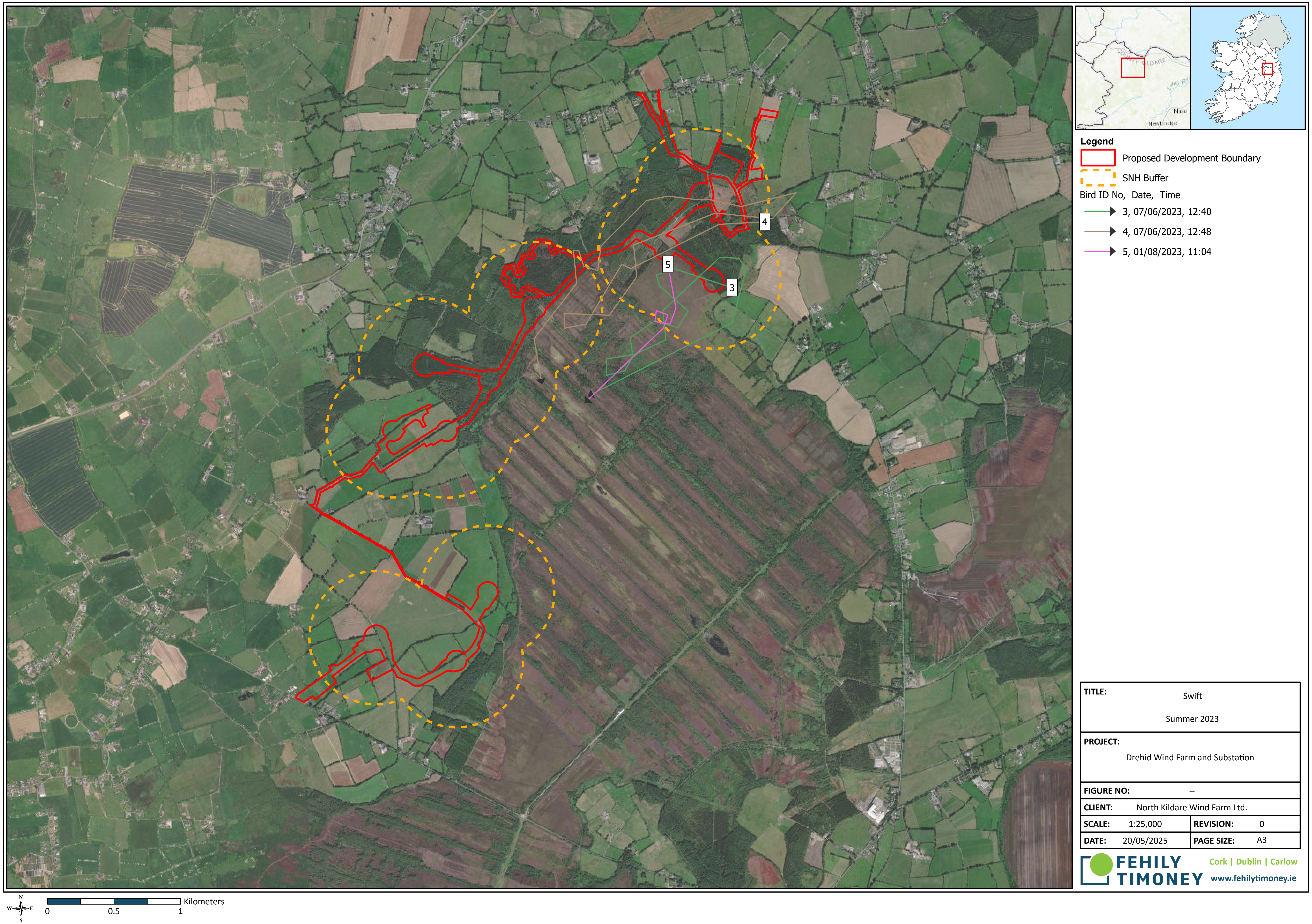
Cork | Dublin | Carlow

www.fehilytimoney.ie

0 0.5 1 Kilometers

World Imagery: Maxar, Microsoft
World Topographic Map: Esri, HERE, Garmin, FAO, USGS, NGACreative and Commons Attribution 4.0 International (CC BY 4.0) licence https://creativecommons.org/licenses/by/4.0/
[INPUT SOURCE HERE]; If Applicable: Mapping Reproduced Under Licence from the Ordnance Survey Ireland Licence No. CYAL50368274 © Government of Ireland

Path: R:\Map Production\2020\P20-326\Workspaces\P20_326_Flightlines\P20_326_Flightlines.aprx



TITLE:	Swift Summer 2023
PROJECT:	Drehid Wind Farm and Substation
FIGURE NO:	--
CLIENT:	North Kildare Wind Farm Ltd.
SCALE: 1:25,000	REVISION: 0
DATE: 20/05/2025	PAGE SIZE: A3

FEHILY TIMONEY
Cork | Dublin | Carlow
www.fehilytimoney.ie

Path: R:\Map Production\2020\P20-326\Workspaces\P20_326_Flightlines\P20_326_Flightlines.aprx

Legend

Proposed Development Boundary

SNH Buffer

Bird ID No, Date, Time

2, 21/12/2021, 16:43

3, 22/01/2022, 08:48

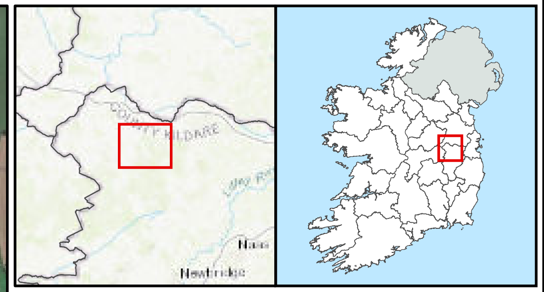
1, 21/12/2021, 11:16

4, 14/02/2022, 09:35

TITLE:	Whooper Swan Winter 2021/22		
PROJECT:	Drehid Wind Farm and Substation		
FIGURE NO:	--		
CLIENT:	North Kildare Wind Farm Ltd.		
SCALE:	1:25,000	REVISION:	0
DATE:	20/05/2025	PAGE SIZE:	A3

FEHILY TIMONEY
Cork | Dublin | Carlow
www.fehilytimoney.ie

Path: R:\Map Production\2020\P20-326\Workspaces\P20_326_Flightlines\P20_326_Flightlines.aprx



Legend

Proposed Development Boundary

SNH Buffer

Bird ID No, Date, Time

5, 21/12/2022, 13:10

6, 24/01/2023, 11:27

7, 13/02/2023, 09:00

TITLE:	Whooper Swan Winter 2022/23
PROJECT:	Drehid Wind Farm and Substation
FIGURE NO:	--
CLIENT:	North Kildare Wind Farm Ltd.
SCALE: 1:25,000	REVISION: 0
DATE: 20/05/2025	PAGE SIZE: A3

FEHILY TIMONEY

Cork | Dublin | Carlow

www.fehilytimoney.ie

0 0.5 1 Kilometers

FEHILY TIMONEY

DESIGNING AND DELIVERING
A SUSTAINABLE FUTURE

APPENDIX 4

Hinterland Survey Schedule

Season	SiteName	Site Code	Date	Surveyor	Start	End	Cloud	Visibility	Precipitation	WindSpeed	WindDirection
Summer 21	Drehid	1	24/04/2021	LB	07:00	10:00	N/A	3-5km	N/A	N/A	N/A
Summer 21	Drehid	1	25/04/2021	LB	07:00	10:00	N/A	3-5km	N/A	N/A	N/A
Summer 21	Drehid	1	11/06/2021	LB	Not Recorded	Not Recorded	N/A	3-5km	Dry	N/A	N/A
Summer 21	Drehid	1	17/06/2021	LB	Not Recorded	Not Recorded	N/A	3-5km	Dry	N/A	N/A
Summer 21	Drehid	1	26/06/2021	LB	Not Recorded	Not Recorded	N/A	3-5km	Dry	N/A	N/A
Summer 21	Lodge Bog	7	25/04/2021	LB	07:00	10:00	N/A	3-5km	N/A	N/A	N/A
Summer 21	Lodge Bog	7	16/05/2021	LB	07:00	11:00	8	3-5km	Dry	0	N/A
Summer 21	Ballynafagh SAC	6	07/05/2021	LB	11:00	15:00	0	3-5km	Dry	1	E
Summer 21	Ballynafagh SAC	6	16/05/2021	LB	07:00	11:00	8	3-5km	Dry	0	N/A
Summer 22	Donadea Forest Park	5	25/05/2022	LB	13:00	14:30	N/A	3-5km	N/A	N/A	N/A
Summer 22	Drehid	1	11/04/2022	LB	10:00	16:00	8	3-5km	Showers	2	SE
Summer 22	Drehid	1	14/04/2022	LB	08:00	11:00	8	3-5km	Dry	2	S
Summer 22	Drehid	1	17/04/2022	LB	08:00	11:00	8	3-5km	Dry	N/A	N/A
Summer 22	Drehid	1	25/05/2022	LB	11:00	13:30	4	3-5km	Dry	4	W
Summer 22	Drehid	1	30/05/2022	LB	07:00	09:30	7	3-5km	Dry	0	N/A
Summer 22	Drehid	1	30/05/2022	LB	10:00	12:00	8	3-5km	Light Showers	0	N/A
Summer 22	Drehid	1	14/06/2022	LB	09:30	11:30	7	3-5km	Dry	1	W
Summer 22	Drehid	1	16/06/2022	LB	12:00	16:00	6	3-5km	Dry	1	S
Summer 22	Lullymore	9	31/05/2022	LB	07:00	11:00	4	3-5km	Dry	0	N/A
Summer 22	Ballnafagh Lake	6	11/04/2022	LB	10:00	16:00	8	3-5km	Showers	2	SE
Summer 22	Ballynafagh Bog	6	11/04/2022	LB	10:00	16:00	8	3-5km	Showers	2	SE
Summer 22	Ballynafagh Bog	6	17/04/2022	LB	10:00	16:00	8	3-5km	Showers	2	SE
Summer 22	Lodge Bog	7	26/04/2022	LB	10:00	16:00	3	3-5km	Dry	1	E
Summer 22	Lodge Bog	7	19/06/2022	LB	09:00	13:00	8	3-5km	Dry	2	SW
Summer 22	Timahoe North Wetlands	3	16/06/2022	LB	12:00	16:00	6	3-5km	Dry	1	S
Summer 22	Ballynafagh SAC	6	19/06/2022	LB	09:00	13:00	8	3-5km	Dry	2	SW
Summer 23	Timahoe North Wetlands	3	15/07/2023	TC	08:00	13:30	6	3-5km	Light Showers	3	W
Summer 23	Timahoe North Wetlands	3	16/07/2023	TC	10:00	13:30	7	3-5km	Light Showers	3	W
Summer 23	Timahoe North Wetlands	3	15/08/2023	TC	09:30	13:00	7	3-5km	Dry	1	NW
Summer 23	Timahoe North Wetlands	3	15/08/2023	CC	10:00	15:00	7	3-5km	Light Drizzle at times	1	NW
Summer 23	Timahoe North Wetlands	3	08/06/2023	TC	11:00	14:30	5	3-5km	Dry	2	NE
Summer 23	Timahoe North Wetlands	3	20/06/2023	TC	10:30	14:10	N/A	3-5km	Showers at times	N/A	S
Summer 23	Timahoe North Wetlands	3	26/06/2023	CC TC	23:00	01:30	N/A	3-5km	Light Drizzle	1	SW
Summer 23	Timahoe North Wetlands	3	13/09/2023	TC	09:40	13:30	N/A	3-5km	Dry	2	S
Summer 23	Timahoe North Wetlands	3	16/05/2023	TC	10:00	14:00	4	3-5km	Dry	2	NW
Summer 23	Timahoe North Wetlands	3	18/05/2023	TC	09:30	13:30	5	3-5km	Dry	2	SW

Season	SiteName	Site Code	Date	Surveyor	Start	End	Cloud	Visibility	Precipitation	WindSpeed	WindDirection
Summer 23	Hortland	4	15/07/2023	TC	08:00	13:30	6	3-5km	Light Showers	3	W
Summer 23	Hortland	4	16/07/2023	TC	10:00	13:30	7	3-5km	Light Showers	3	W
Summer 23	Hortland	4	15/08/2023	TC	09:30	13:00	7	3-5km	Dry	1	NW
Summer 23	Hortland	4	15/08/2023	CC	10:00	15:00	7	3-5km	Light Drizzle at times	1	NW
Summer 23	Hortland	4	08/06/2023	TC	11:00	14:30	5	3-5km	Dry	2	NE
Summer 23	Hortland	4	20/06/2023	TC	10:30	14:10	N/A	3-5km	Showers at times	N/A	S
Summer 23	Hortland	4	16/05/2023	TC	10:00	14:00	4	3-5km	Dry	2	NW
Summer 23	Hortland	4	18/05/2023	TC	09:30	13:30	5	3-5km	Dry	2	SW
Summer 23	Coolree Nature Reserve	2	16/07/2023	TC	10:00	13:30	7	3-5km	Light Showers	3	W
Summer 23	Coolree Nature Reserve	2	08/06/2023	TC	11:00	14:30	5	3-5km	Dry	2	NE
Summer 23	Coolree Nature Reserve	2	13/09/2023	TC	09:40	13:30	N/A	3-5km	Dry	2	S
Summer 23	Coolree Nature Reserve	2	16/05/2023	TC	10:00	14:00	4	3-5km	Dry	2	NW
Summer 23	Lullymore and Lodge Bog	8	16/07/2023	TC	10:00	13:30	7	3-5km	Light Showers	3	W
Summer 23	Lullymore and Lodge Bog	8	15/08/2023	TC	09:30	13:00	7	3-5km	Dry	1	NW
Summer 23	Lullymore and Lodge Bog	8	08/06/2023	TC	11:00	14:30	5	3-5km	Dry	2	NE
Summer 23	Lullymore and Lodge Bog	8	13/09/2023	TC	09:40	13:30	N/A	3-5km	Dry	2	S
Summer 23	Lullymore and Lodge Bog	8	13/09/2023	CC	09:30	14:00	N/A	3-5km	Dry	2	S
Summer 23	Lullymore and Lodge Bog	8	16/05/2023	TC	10:00	14:00	4	3-5km	Dry	2	NW
Summer 23	Lullymore and Lodge Bog	8	18/05/2023	TC	09:30	13:30	5	3-5km	Dry	2	SW
Summer 23	Ballynafagh and Prosperous Bog	6	15/07/2023	TC	08:00	13:30	6	3-5km	Light Showers	3	W
Summer 23	Ballynafagh and Prosperous Bog	6	16/07/2023	TC	10:00	13:30	7	3-5km	Light Showers	3	W
Summer 23	Ballynafagh and Prosperous Bog	6	15/08/2023	TC	09:30	13:00	7	3-5km	Dry	1	NW
Summer 23	Ballynafagh and Prosperous Bog	6	08/06/2023	TC	11:00	14:30	5	3-5km	Dry	2	NE
Summer 23	Ballynafagh and Prosperous Bog	6	13/09/2023	TC	09:40	13:30	N/A	3-5km	Dry	2	S
Summer 23	Ballynafagh and Prosperous Bog	6	18/05/2023	TC	09:30	13:30	5	3-5km	Dry	2	SW
Winter 21/22	Drehid	1	03/01/2022	LB	Not Recorded	Not Recorded	N/A	3-5km	Dry	0	N/A
Winter 21/22	Drehid	1	11/01/2022	LB	Not Recorded	Not Recorded	N/A	3-5km	Dry	0	N/A
Winter 21/22	Drehid	1	13/01/2022	LB	Not Recorded	Not Recorded	N/A	3-5km	Dry	0	N/A
Winter 21/22	Lullymore	9	15/03/2022	LB	08:30	12:30	8	3-5km	Dry	2	SE
Winter 21/22	Ballnafagh Lake	6	22/03/2022	LB	08:00	11:00	1	3-5km	Dry	2	SE
Winter 21/22	Drehid	1	27/12/2022	LB	10:00	14:00	8	3-5km	Dry	0	N/A
Winter 21/22	Ballynafagh SAC	6	28/12/2022	LB	10:00	14:00	8	3-5km	Dry	0	N/A
Winter 21/22	Lullymore	9	29/12/2022	LB	10:00	14:00	8	3-5km	Dry	0	N/A
Winter 21/22	Ballynafagh SAC	6	22/02/2022	LB	08:30	14:00	3	3-5km	Dry	3	N/A
Winter 21/22	Hortland	4	22/02/2022	LB	08:30	14:00	3	3-5km	Dry	3	N/A
Winter 21/22	Ballynafagh SAC	6	22/10/2021	LB	Not Recorded	Not Recorded	2	3-5km	Dry	0	N/A

Season	SiteName	Site Code	Date	Surveyor	Start	End	Cloud	Visibility	Precipitation	WindSpeed	WindDirection
Winter 21/22	Ballynafagh SAC	6	24/10/2021	LB	Not Recorded	Not Recorded	2	3-5km	Dry	0	N/A
Winter 21/22	Hortland	4	30/10/2021	LB	Not Recorded	Not Recorded	2	3-5km	Dry	0	N/A
Winter 21/22	Drehid	1	14/11/2021	LB	Not Recorded	Not Recorded	4	3-5km	Dry	1	N/A
Winter 21/22	Drehid	1	15/11/2021	LB	Not Recorded	Not Recorded	5	3-5km	Dry	1	N/A
Winter 22/23	Timahoe North Wetlands	3	18/01/2023	TC	09:30	12:30	4	3-5km	Not Recorded	3	NW
Winter 22/23	Timahoe North Wetlands	3	19/01/2023	TC	09:00	11:40	N/A	3-5km	Dry	2	N
Winter 22/23	Timahoe North Wetlands	3	14/02/2023	TC	08:30	11:00	N/A	3-5km	Dry	3	S
Winter 22/23	Hortland	4	18/01/2023	TC	09:30	12:30	4	3-5km	Not Recorded	3	NW
Winter 22/23	Hortland	4	19/01/2023	TC	09:00	11:40	N/A	3-5km	Dry	2	N
Winter 22/23	Ballynafagh and Prosperous Bog	6	14/02/2023	TC	08:30	11:00	N/A	3-5km	Dry	3	S

FEHILY TIMONEY

DESIGNING AND DELIVERING
A SUSTAINABLE FUTURE

APPENDIX 5

Hinterland Survey Results

Season	Site Name	Code	Date	Surveyor	Start	End	Cloud	Visibility	Precipitation	WindSpeed	WindDirection
Summer 21	Drehid	1	24/04/2021	LB	07:00	10:00	-	3-5km	-	-	-
Summer 21	Drehid	1	25/04/2021	LB	07:00	10:00	-	3-5km	-	-	-
Summer 21	Lodge Bog	7	25/04/2021	LB	07:00	10:00	-	3-5km	-	-	-
Summer 21	Ballynafagh Lake and Bog	6	07/05/2021	LB	11:00	15:00	0	3-5km	Dry	1	E
Summer 21	Lodge Bog	7	16/05/2021	LB	07:00	11:00	8	3-5km	Dry	0	-
Summer 21	Ballynafagh Lake and Bog	6	16/05/2021	LB	07:00	11:00	8	3-5km	Dry	0	-
Summer 21	Drehid	1	11/06/2021	LB	-	-	-	3-5km	Dry	-	-
Summer 21	Drehid	1	17/06/2021	LB	-	-	-	3-5km	Dry	-	-
Summer 21	Drehid	1	26/06/2021	LB	-	-	-	3-5km	Dry	-	-
Winter 21/22	Ballynafagh Lake and Bog	6	22/10/2021	LB	-	-	2	3-5km	Dry	0	-
Winter 21/22	Ballynafagh Lake and Bog	6	24/10/2021	LB	-	-	2	3-5km	Dry	0	-
Winter 21/22	Hortland	4	30/10/2021	LB	-	-	2	3-5km	Dry	0	-
Winter 21/22	Drehid	1	14/11/2021	LB	-	-	4	3-5km	Dry	1	-
Winter 21/22	Drehid	1	15/11/2021	LB	-	-	5	3-5km	Dry	1	-
Winter 21/22	Drehid	1	03/01/2022	LB	-	-	-	3-5km	Dry	0	-
Winter 21/22	Drehid	1	11/01/2022	LB	-	-	-	3-5km	Dry	0	-
Winter 21/22	Drehid	1	13/01/2022	LB	-	-	-	3-5km	Dry	0	-
Winter 21/22	Ballynafagh Lake and Bog	6	22/02/2022	LB	08:30	14:00	3	3-5km	Dry	3	-

Season	Site Name	Code	Date	Surveyor	Start	End	Cloud	Visibility	Precipitation	WindSpeed	WindDirection
Winter 21/22	Hortland	4	22/02/2022	LB	08:30	14:00	3	3-5km	Dry	3	-
Winter 21/22	Lullymore Wetlands	9	15/03/2022	LB	08:30	12:30	8	3-5km	Dry	2	SE
Winter 21/22	Ballynafagh Lake and Bog	6	22/03/2022	LB	08:00	11:00	1	3-5km	Dry	2	SE
Summer 22	Drehid	1	11/04/2022	LB	10:00	16:00	8	3-5km	Showers	2	SE
Summer 22	Ballynafagh Lake and Bog	6	11/04/2022	LB	10:00	16:00	8	3-5km	Showers	2	SE
Summer 22	Drehid	1	14/04/2022	LB	08:00	11:00	8	3-5km	Dry	2	S
Summer 22	Drehid	1	17/04/2022	LB	08:00	11:00	8	3-5km	Dry	-	-
Summer 22	Ballynafagh Lake and Bog	6	17/04/2022	LB	10:00	16:00	8	3-5km	Showers	2	SE
Summer 22	Lodge Bog	7	26/04/2022	LB	10:00	16:00	3	3-5km	Dry	1	E
Summer 21	Donadea Forest Park	5	25/05/2022	LB	13:00	14:30	-	3-5km	-	-	-
Summer 22	Drehid	1	25/05/2022	LB	11:00	13:30	4	3-5km	Dry	4	W
Summer 22	Drehid	1	30/05/2022	LB	07:00	09:30	7	3-5km	Dry	0	-
Summer 22	Drehid	1	30/05/2022	LB	10:00	12:00	8	3-5km	Light Showers	0	-
Summer 22	Lullymore Wetlands	9	31/05/2022	LB	07:00	11:00	4	3-5km	Dry	0	-
Summer 22	Drehid	1	14/06/2022	LB	09:30	11:30	7	3-5km	Dry	1	W
Summer 22	Drehid	1	16/06/2022	LB	12:00	16:00	6	3-5km	Dry	1	S
Summer 22	Timahoe North Wetlands	3	16/06/2022	LB	12:00	16:00	6	3-5km	Dry	1	S
Summer 22	Lodge Bog	7	19/06/2022	LB	09:00	13:00	8	3-5km	Dry	2	SW
Summer 22	Ballynafagh Lake and Bog	6	19/06/2022	LB	09:00	13:00	8	3-5km	Dry	2	SW

Season	Site Name	Code	Date	Surveyor	Start	End	Cloud	Visibility	Precipitation	WindSpeed	WindDirection
Winter 21/22	Drehid	1	27/12/2022	LB	10:00	14:00	8	3-5km	Dry	0	-
Winter 21/22	Ballynafagh Lake and Bog	6	28/12/2022	LB	10:00	14:00	8	3-5km	Dry	0	-
Winter 21/22	Lullymore Wetlands	9	29/12/2022	LB	10:00	14:00	8	3-5km	Dry	0	-
Winter 22/23	Timahoe North Wetlands	3	18/01/2023	TC	09:30	12:30	4	3-5km	-	3	NW
Winter 22/23	Hortland	4	18/01/2023	TC	09:30	12:30	4	3-5km	-	3	NW
Winter 22/23	Timahoe North Wetlands	3	19/01/2023	TC	09:00	11:40	-	3-5km	Dry	2	N
Winter 22/23	Hortland	4	19/01/2023	TC	09:00	11:40	-	3-5km	Dry	2	N
Winter 22/23	Timahoe North Wetlands	3	14/02/2023	TC	08:30	11:00	-	3-5km	Dry	3	S
Winter 22/23	Ballynafagh Lake and Bog	6	14/02/2023	TC	08:30	11:00	-	3-5km	Dry	3	S
Summer 23	Timahoe North Wetlands	3	16/05/2023	TC	10:00	14:00	4	3-5km	Dry	2	NW
Summer 23	Hortland	4	16/05/2023	TC	10:00	14:00	4	3-5km	Dry	2	NW
Summer 23	Coolree Nature Reserve	2	16/05/2023	TC	10:00	14:00	4	3-5km	Dry	2	NW
Summer 23	Lullymore and Lodge Bog	8	16/05/2023	TC	10:00	14:00	4	3-5km	Dry	2	NW
Summer 23	Timahoe North Wetlands	3	18/05/2023	TC	09:30	13:30	5	3-5km	Dry	2	SW
Summer 23	Hortland	4	18/05/2023	TC	09:30	13:30	5	3-5km	Dry	2	SW
Summer 23	Lullymore and Lodge Bog	8	18/05/2023	TC	09:30	13:30	5	3-5km	Dry	2	SW
Summer 23	Ballynafagh Lake and Bog	6	18/05/2023	TC	09:30	13:30	5	3-5km	Dry	2	SW
Summer 23	Timahoe North Wetlands	3	08/06/2023	TC	11:00	14:30	5	3-5km	Dry	2	NE
Summer 23	Hortland	4	08/06/2023	TC	11:00	14:30	5	3-5km	Dry	2	NE

Season	Site Name	Code	Date	Surveyor	Start	End	Cloud	Visibility	Precipitation	WindSpeed	WindDirection
Summer 23	Coolree Nature Reserve	2	08/06/2023	TC	11:00	14:30	5	3-5km	Dry	2	NE
Summer 23	Lullymore and Lodge Bog	8	08/06/2023	TC	11:00	14:30	5	3-5km	Dry	2	NE
Summer 23	Ballynafagh Lake and Bog	6	08/06/2023	TC	11:00	14:30	5	3-5km	Dry	2	NE
Summer 23	Timahoe North Wetlands	3	16/07/2023	TC	10:00	13:30	7	3-5km	Light Showers	3	W
Summer 23	Hortland	4	16/07/2023	TC	10:00	13:30	7	3-5km	Light Showers	3	W
Summer 23	Coolree Nature Reserve	2	16/07/2023	TC	10:00	13:30	7	3-5km	Light Showers	3	W
Summer 23	Lullymore and Lodge Bog	8	16/07/2023	TC	10:00	13:30	7	3-5km	Light Showers	3	W
Summer 23	Ballynafagh Lake and Bog	6	16/07/2023	TC	10:00	13:30	7	3-5km	Light Showers	3	W
Summer 23	Timahoe North Wetlands	3	15/08/2023	TC	09:30	13:00	7	3-5km	Dry	1	NW
Summer 23	Hortland	4	15/08/2023	TC	09:30	13:00	7	3-5km	Dry	1	NW
Summer 23	Lullymore and Lodge Bog	8	15/08/2023	TC	09:30	13:00	7	3-5km	Dry	1	NW
Summer 23	Ballynafagh Lake and Bog	6	15/08/2023	TC	09:30	13:00	7	3-5km	Dry	1	NW
Summer 23	Timahoe North Wetlands	3	13/09/2023	TC	09:40	13:30	-	3-5km	Dry	2	S
Summer 23	Coolree Nature Reserve	2	13/09/2023	TC	09:40	13:30	-	3-5km	Dry	2	S
Summer 23	Lullymore and Lodge Bog	8	13/09/2023	TC	09:40	13:30	-	3-5km	Dry	2	S
Summer 23	Ballynafagh Lake and Bog	6	13/09/2023	TC	09:40	13:30	-	3-5km	Dry	2	S

FEHILY TIMONEY

DESIGNING AND DELIVERING
A SUSTAINABLE FUTURE

www.fehilytimoney.ie

APPENDIX 8-2.3

Kingfisher Baseline Report

Kingfisher (*Alcedo atthis*) survey of Drehid Wind Farm, Co. Kildare

Prepared by Triturus Environmental Ltd. for Fehily Timoney & Company

October 2023

Please cite as:

Triturus (2023). Kingfisher (*Alcedo atthis*) survey of Drehid Wind Farm, Co. Kildare. Report prepared by Triturus Environmental Ltd. for Fehily Timoney & Company. October 2023.

Triturus

Table of contents

1. Introduction

1.1 Background

Triturus Environmental Ltd. were commissioned by Fehily Timoney & Company to undertake a kingfisher (*Alcedo atthis*) survey of the watercourses and habitats within the vicinity of the proposed Drehid wind farm project, located near the Kildare/Meath border south of Enfield, Co. Meath (**Figure 2.1**).

The EIAR for the project (FTCO, 2018) identified kingfisher as a 'key ecological receptor' with high sensitivity for the Drehid site. The report concluded that it was "*near certain that the proposed impact of habitat loss will be a long-term imperceptible impact*" with regards kingfisher, and that indirect impacts resulting from wind farm construction works had a "*low*" probability. Nevertheless, a dedicated pre-construction kingfisher survey within the development footprint was required to inform the wind farm project and minimise potential direct and indirect impacts to the species, particularly in terms of breeding / feeding habitat loss. Kingfishers are considered especially vulnerable to potential construction-related impacts given their reliance on natural fish stocks as their primary food source and sensitivity to disturbance and pollution, in addition to their short life cycle (average 7 years; Libois & Libois, 2013), small clutch sizes, high winter juvenile mortality (7-8 eggs; Morgan & Glue, 1977) and small territory size of 10-15km (Crowe et al., 2008). Due to their specific requirements in terms of bank composition and structure (Heneberg, 2004), nesting sites are vitally important for kingfisher.

The baseline survey aimed to update previous kingfisher surveys of the site (Triturus, 2019), by identifying the current distribution of kingfisher in vicinity of the proposed project and highlighting any potential breeding (nesting) areas. The recorded presence or absence of kingfisher would help inform the necessary mitigation to prevent impacts to kingfisher populations resulting from the proposed project. Surveys following best practice (see methodology section) were carried out during the late kingfisher breeding season, in the mid-April to mid-June 2022 period, as well as an additional bank walkover survey in August 2022.

1.2 Legislative protection

Kingfishers are protected under Annex I of the EU Birds Directive (79/409/EEC as amended 2009/147/EC) and are Amber-listed (medium conservation concern) in Ireland according to the Birds of Conservation Concern of Ireland (BoCCI; Gilbert et al., 2022) due to a depleted European population. However, very few sites in Ireland have been formally designated for kingfishers despite the legal requirements and, thus, the feeding and breeding territory should be preserved on a precautionary basis where the species is at risk from development.

1.3 Study area description

The c. 393ha landholding in which the Proposed Wind Farm and Substation are located is composed primarily of agricultural pasture (GA1; Fossitt, 2000) to the north and south, with more central areas dominated by coniferous afforestation and associated clear-fell (WS5) over peat soils. To the east of the site boundary sits Timahoe North Bog, a large area of cutaway bog (PB4). Small areas of degraded raised bog (PB1), scrub (WS1), bog woodland (WN7) and mixed broad-leaved woodland (WD1) are also scattered throughout the wider site.

The site is bisected by the Fear English River (aka Ballynamullagh/Coolree River), a tributary of the (Longwood) River Blackwater which has indirect connectivity with the River Boyne and River Blackwater (site code: 002299) site approximately 15km downstream. Both the Kilcooney River (aka Coolree Stream) and Sweep River (aka Clonkeeran Stream), as well as several unnamed adjoining drainage channels, adjoin the Fear English River within the proposed site boundary (**Figure 2.1**). A small, c.1ha dystrophic lake (FL1 habitat) is situated in degraded raised bog (PB1) habitat within the centre of the wind farm site. To the south of the site, the Fear English River channel flows through an agriculture landscape bordered to the east by cutaway bog. The channel has been extensively straightened and deepened historically, with a largely trapezoidal profile of poor hydromorphology (i.e. steep more V-shaped sloping banks with flat uniform bed). Much of the upper and lower survey reaches are heavily scrubbed over by bramble (*Rubus fruticosus* agg.) and hawthorn (*Crataegus monogyna*), with intermittent treelines largely composed of mature ash (*Fraxinus excelsior*). More open areas are often dominated by instream growth of fool's watercress (*Apium nodiflorum*), branched bur reed (*Sparganium erectum*) and common duckweed (*Lemna minor*). Riparian shading is invariably high throughout, particularly in the middle reaches of the survey area where particularly steep banks (up to 4m in height) have promoted arboreal tunnelling of the channel. Basal flow rates are typically slow (glide habitat), with the substrata dominated by silt throughout. Some shallow, higher energy areas of coarse gravels, cobble and limited boulder are present but these are invariably bedded and silted. The lower reaches of the Kilcooney and Sweep rivers, which are also heavily scrubbed, historically straightened and situated in agricultural landscapes, also suffer from hydromorphological and siltation pressures.

2. Methodology

2.1 Desktop review

A desktop review of the available kingfisher-related data for the proposed site boundary and surrounding areas was undertaken (within 5km of the site by water). Data records held by the National Biodiversity Data Centre (NBDC) were also referenced, which primarily included data from the Bird Atlas 2007-2011 (Balmer et al., 2013). Kingfisher data collated during previous ecological surveys of the site (i.e. Triturus, 2019; FTCO, 2018) was also reviewed.

2.2 Presence/absence surveys

2.2.1 Vantage point (VP) surveys

To gather data on kingfisher distribution in the vicinity of the proposed project, vantage point (VP) surveys were undertaken along the Fear English River in mid-April to mid-June 2022 in accordance with best practice (e.g. SNH, 2017; NRA, 2009). A total of 4 no. fixed point VP sites were strategically chosen relative to the proposed project (**Figure 2.1**) and corresponded to the same sites surveyed in 2019 (Triturus, 2019). These VP sites were utilised to document passing and/or feeding kingfisher moving through areas of the Fear English River channel with good visibility. A broad site description of the 4 no. VP locations in context of kingfisher is provided in Triturus (2019).

As per best practice, VP sites were located at accessible sites with higher visibility and probability of kingfisher occurrence such as bridge crossings or along straightened sections of channel. Due to natural site characteristics (e.g. riparian shading), the viewshed for kingfisher VP sites did not exceed 180° visibility nor extend to a distance greater than 2km away (as per SNH, 2017 guidelines). Binoculars (8 x 42) were used as required to enhance bird detection. Alarm calls were also listened for as a cue for approaching kingfisher.

Given that kingfishers are typically most active in the early morning, the timing of VP surveys reflected this (i.e. 7-11am period). One hour was spent at each VP location and each VP site was visited on four occasions with optimal weather conditions during the survey period, i.e. 14th April, 25th April, 19th May and 13th June 2022. The surveys deliberately coincided with both the early and late breeding season for kingfisher (March to June period) and was chosen to maximise the chance of recording kingfisher, and to improve the definition of possible kingfisher territories. Survey effort was divided between two surveyors throughout the monitoring period and VP surveys did not coincide with any other field work activity on site to reduce disturbance.

The following activities were recorded to establish the behavioural usage of habitat by kingfisher;

- Direction & time of flight
- Presence of prey in bill
- Activity (perching, foraging, avoidance behaviour, vocalising etc.)

Table 2.1 Summary of vantage point (VP) survey locations for kingfisher with the vicinity of the proposed Drehid wind farm, Co. Kildare surveyed in mid-April to mid-June 2022

VP site no.	Watercourse	EPA code	Location	X (ITM)	Y (ITM)
1	Fear English River	07C23	Drehid	674681	735166
2	Fear English River	07C23	Drehid	674207	736222
3	Fear English River	07C23	Ballynamullagh	674062	736737
4	Fear English River	07C23	Kilwarden Bridge	674850	738237

2.2.2 Bank walkover transect surveys

Following best practice (i.e. SNH, 2017; Crowe, 2008), in addition to VP surveys, bank walkover transects were undertaken on the 15th August 2022 along the Fear English River and the adjoining lower reaches of the Kilcooney (Coolree) River, Sweep (Clonkeeran) River and unnamed stream (**Figure 2.1)**. Walkover surveys within the vicinity of the proposed site were completed at the same time as the accompanying total corridor otter survey (TCOS) (see Triturus, 2022b), equating to a total linear channel survey distance of 6.9km (**Table 2.2; Figure 2.1**).

Primarily, the walkover survey was completed to assess the potential for such areas as kingfisher nesting (breeding) and foraging habitat. Areas were also assessed in terms of potentially suitable riparian resting perches and prey availability (i.e. small fish). Bank transect surveys facilitated greater kingfisher detection rates compared to VP surveys in isolation. The surveys were carried out under dry and settled conditions. GPS coordinates (ITM) were recorded where a kingfisher was observed (perching, flying, foraging), heard (vocalising) or where nesting sites were identified. If detected, nests were classed as active based on the presence of recent kingfisher droppings at the entrance rather than observed bird arrivals/departures (which may not be routinely observed even when nests are active). Nest sites were recorded whether considered currently active or not. With further regard to nesting sites, the extent of suitable nesting bank and its general physical characteristics were noted in context of the wider survey area. Photographs were taken at each site of interest to aid relocation. Aquatic and terrestrial habitat characteristics in the vicinity of kingfisher sites (nests, flying/foraging observations) were noted.

Table 2.2 Watercourses surveyed for kingfisher via bank transects in the vicinity of the proposed Drehid wind farm site, Co. Kildare, August 2022

Watercourse	EPA code	Alternative name (EPA)	Length of channel surveyed (nearest 0.1km)
Fear English River	07B19, 07C23	Ballynamullagh River, Coolree River	5.7
Fear English River	n/a	n/a	0.2
Fear English River	07C23	Coolree River	0.5
Fear English River	07C26	Clonkeeran Stream	0.5
Total channel length surveyed			**6.9**

2.3 Biosecurity

A strict biosecurity protocol following IFI (2010) and the Check-Clean-Dry approach was adhered to during surveys for all equipment and PPE used. Disinfection of all equipment and PPE before and after use with Virkon™ was conducted to prevent the transfer of pathogens or invasive propagules between survey sites. Surveys were undertaken at sites in a downstream order to minimise the risk of upstream propagule mobilisation of pathogens and invasive species. Where feasible, equipment was also thoroughly dried (through UV exposure) between survey areas. Any aquatic invasive species or pathogens recorded within or adjoining the survey areas were geo-referenced. All Triturus staff are certified in 'Good fieldwork practice: slowing the spread of invasive non-native species' by the University of Leeds.

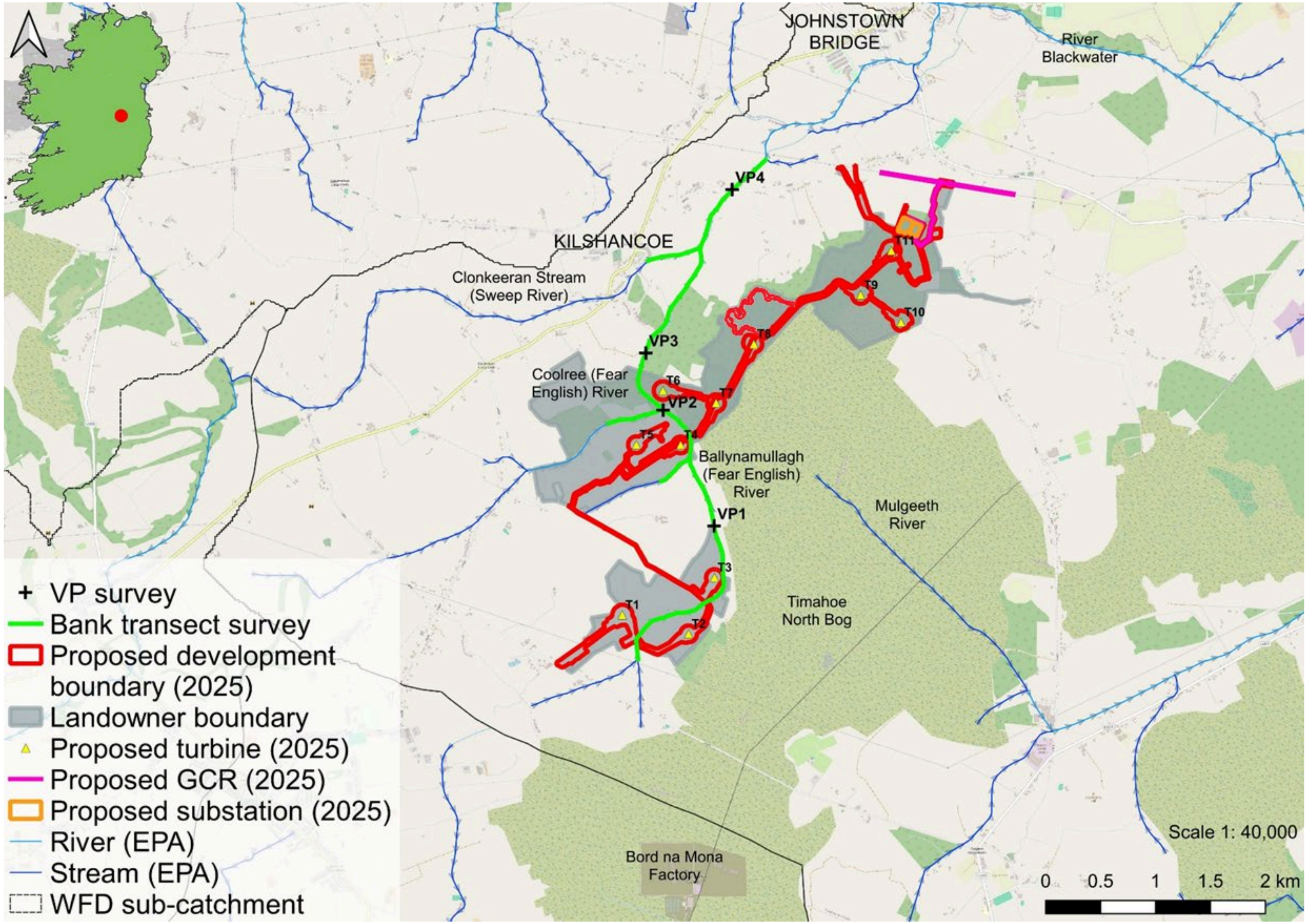


Figure 2.1 Overview of the kingfisher vantage point (VP) and bank transect survey areas in the vicinity of the proposed Drehid Wind Farm, 2022

3. Results

3.1 Desktop review

A desktop review revealed a low number of kingfisher records in the vicinity of the proposed project (contained within 10km grid square N73). Multiple long-term records (*n*=16) existed for grid square N73 (through which the Fear English River channel flows) over the 1981-2022 period (Bird Atlas data via the NBDC). Most of the records were concentrated in 2km grid square N73U near Johnstown Bridge, downstream of VP4 (Kilwarden Bridge).

Avifauna surveys for the Drehid wind farm development also recorded low numbers of kingfisher observations during the December 2012 to 2018 monitoring period (FTCO, 2018). Of these observations, one was recorded during breeding wader surveys in June 2017 and one during winter surveys in December 2017. These observations were made along the Fear English River (north-east of proposed turbine T9, outside of the proposed site boundary) and along drainage channels outside of the site boundary at Hortland, near the downstream-connecting River Blackwater.

A dedicated kingfisher survey undertaken in April-June 2019 recorded a total of 3 no. observations via VP surveys at four sites, in addition to 2 no. records during bank walkover surveys (Triturus, 2019).

No kingfisher breeding or nesting have been identified during previous avifauna surveys of the site.

3.2 Vantage point surveys

A total of 2 no. kingfisher observations were recorded during vantage point (VP) surveys on the Fear English River throughout the monitoring period and are summarised in **Table 3.1** and **Figure 3.1** below. VP surveys resulted in single observations on the 25th April (flying & perching) and 19th May 2022 visits (flying), at VP2 and VP4, respectively (**Table 3.1**). Birds were also recorded at these locations in October and May 2019, respectively (Triturus, 2019; **Figure 3.2**). No kingfishers were observed during the VP surveys in mid-April or mid-June.

3.3 Bank transect surveys

Bank transect surveys undertaken in August 2022 along approximately 6.9km length of riverine channel resulted in a total of 1 no. additional kingfisher observation (**Table 3.2, Figure 3.1**). An adult bird was recorded in flight along the Fear English River channel near the confluence of the Kilcooney River (aka Clonkeeran Stream) on the 15th August 2022.

No kingfisher nesting sites (active or inactive) were located during bank transect surveys in 2022 (this survey) or the 2019 surveys (Triturus, 2019).

Plate 3.1 Representative image of the Fear English River near VP1, August 2022

Plate 3.2 Representative image of the Fear English River at VP2, April 2022

Plate 3.3 Representative image of the Fear English River at VP3, April 2022 (heavily overgrown channel)

Plate 3.4 Representative image of the Fear English River at Kilwarden Bridge (VP4), April 2022 (upstream of road facing downstream from bridge)

Table 3.1 Kingfisher observations recorded during vantage point (VP) surveys on the Fear English River in the vicinity of Drehid wind farm, April-June 2022

VP site	Location	Date	Observation	Time	Notes
VP1	North of T3, Drehid	14th April 2022	No observations	n/a	
		25th April 2022	No observations	n/a	
		19th May 2022	No observations	n/a	
		13th June 2022	No observations	n/a	
VP2	South of T6, Drehid	14th April 2022	No observations	n/a	
		25th April 2022	**Sighting & perching**	**09:50**	**Single adult observed in flight, heading downstream; then perching on riparian branch (no foraging activity observed)**
		19th May 2022	No observations	n/a	
		13th June 2022	No observations	n/a	
VP3	Farm access bridge, Ballynamullagh	14th April 2022	No observations	n/a	
		25th April 2022	No observations	n/a	
		19th May 2022	No observations	n/a	
		13th June 2022	No observations	n/a	
VP4	Kilwarden Bridge	14th April 2022	No observations	n/a	
		25th April 2022	No observations	n/a	
		19th May 2022	**Sighting**	**08:05**	**Single adult observed in flight, heading upstream**
		13th June 2022	No observations	n/a	

Table 3.2 Kingfisher observations recorded during bank walkover surveys on watercourses in the vicinity of Drehid wind farm, August 2022

Location	Date	Observation	ITM x	ITM y	Notes
Kilcooney-Fear English River confluence	14th August 2022	Sighting	674559	737646	Bird in flight, heading downstream whilst vocalising. 50m south of Kilcooney-Fer English River confluence

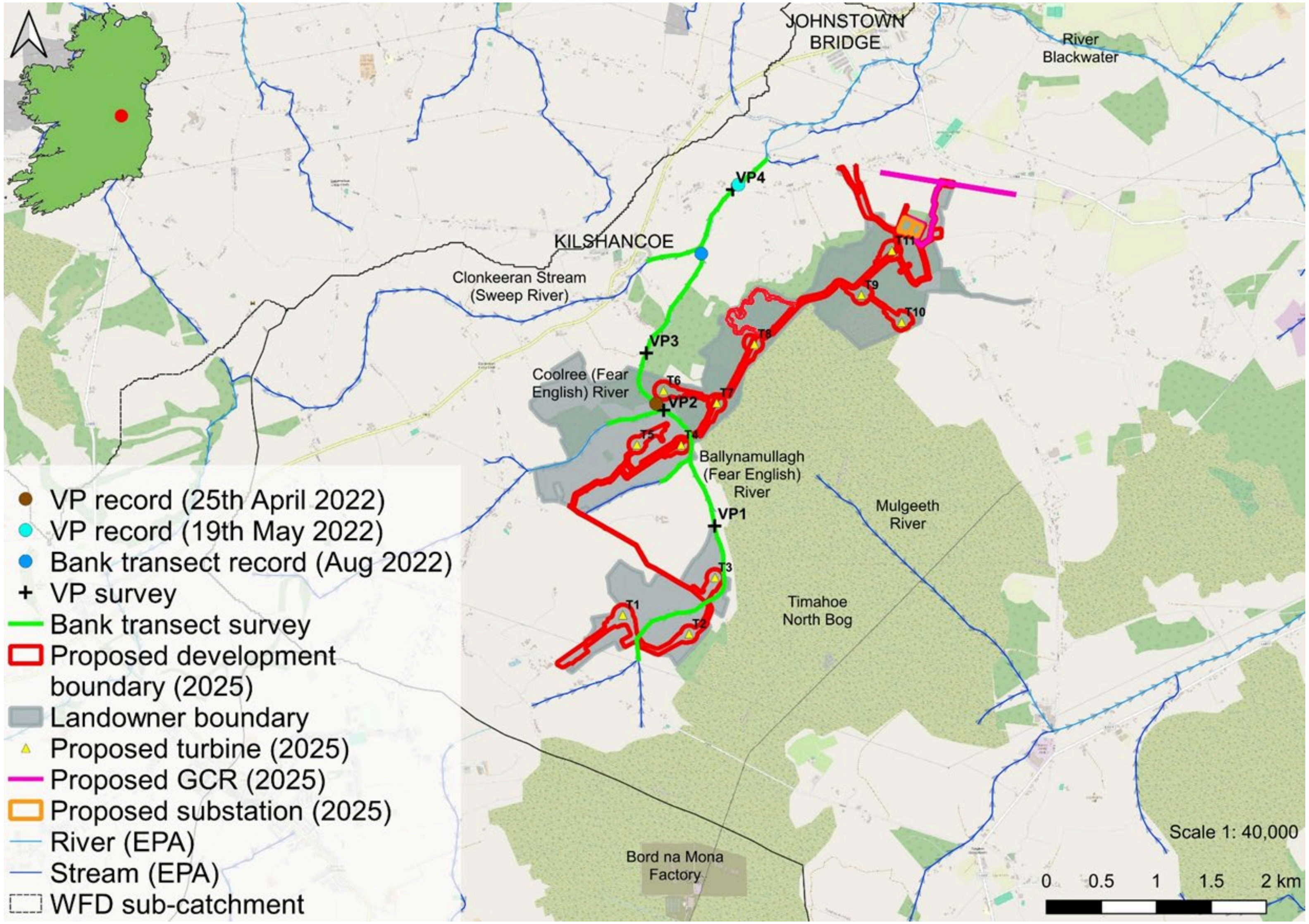


Figure 3.1 Kingfisher observations recorded during vantage point (VP) and bank transect surveys, April-August 2022

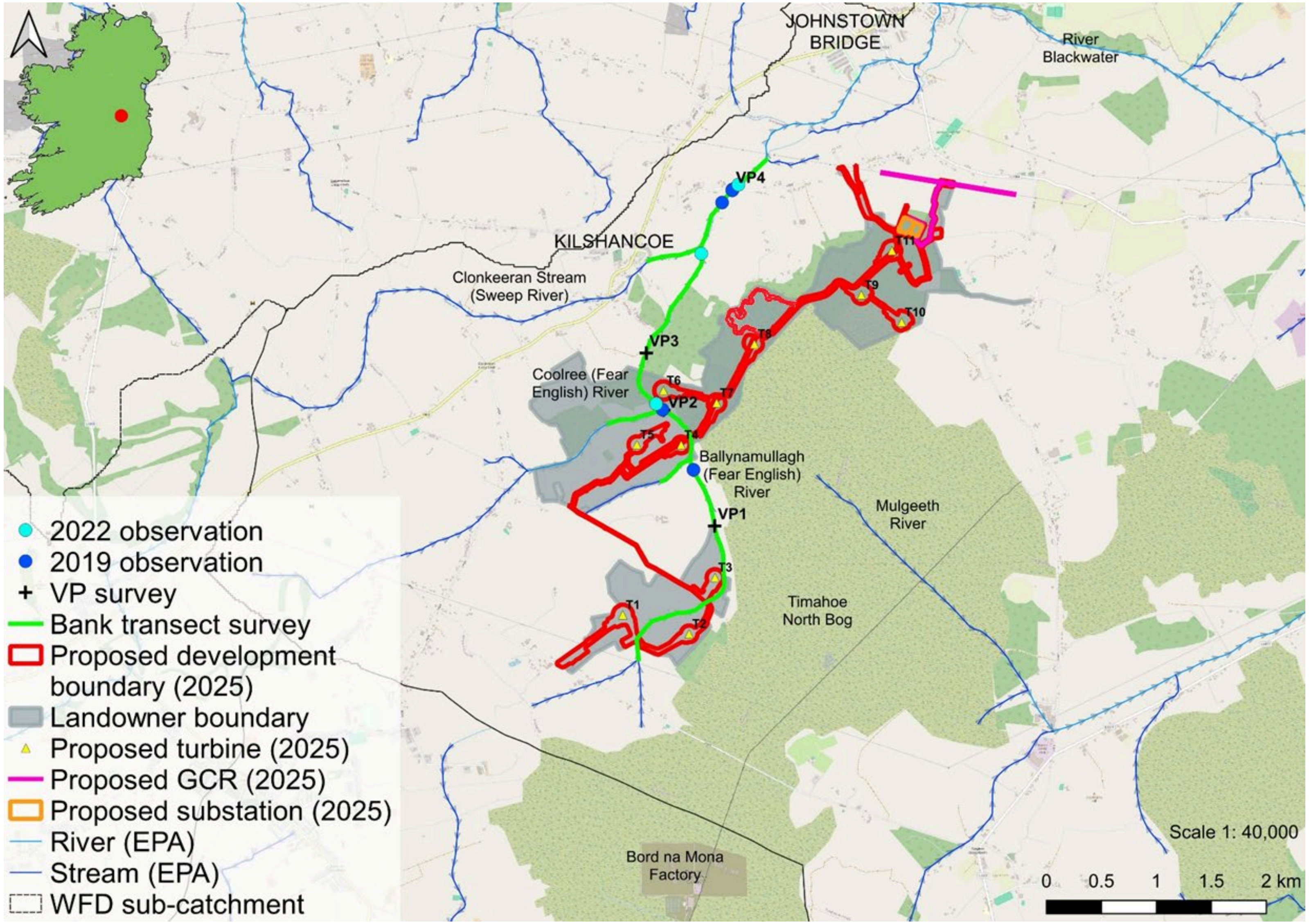


Figure 3.2 Comparison of kingfisher observations recorded during vantage point (VP) and bank transect surveys in 2019 and 2022

4. Discussion

In keeping with previous surveys of the site, a low number of kingfisher observations (3 no.) were made in the mid-April to August 2022 survey period in the vicinity of the proposed Drehid wind farm, through a combination of vantage point (VP) surveys and bank transects (the latter along 6.9km of channel). None of the 3 no. kingfisher observations recorded were within the proposed development boundary; the closest observation was of a perching adult bird near VP2, located approximately 130m south of proposed hardstanding area of turbine T6 (**Figure 3.1**).

Birds were recorded in April, May and August 2022 along the Fear English River[1] near VP2, VP4 (Kilwarden Bridge) and the confluence with the Kilcooney (Clonkeeran) River, respectively (**Figure 3.1**). The number of kingfisher observations in 2022 was slightly less than the 5 no. total recorded in 2019 (Triturus, 2019) but showed a similar distribution (**Figure 3.2**).

No bird sightings or kingfisher activity was recorded on the other adjoining, surveyed watercourses (as per previous surveys; Triturus, 2019; FTCO, 2018). As noted during previous surveys (Triturus, 2019), the Fear English River tributaries in vicinity of the proposed wind farm site, namely an unnamed stream, the Kilcooney River (Coolree Stream) or the Sweep River (Clonkeeran Stream), suffered from low summer flows during the survey period and provided relatively poor quality foraging habitat for kingfisher. Historical drainage (poor hydromorphology) and evident siltation pressures further reduced the suitability and value of these watercourses for kingfisher.

Water quality, availability of suitable perches and adequate fish populations are important in the overall suitability of river corridors for kingfishers (Cummins et al., 2010). There remains a paucity of fisheries data for the Fear English River and tributaries in the vicinity of the proposed site. The Kilcooney River (Coolree Stream), a tributary of the Fear English River, is known to support brown trout (*Salmon trutta*), stone loach (*Barbatula barbatula*), three-spined stickleback (*Gasterosteus aculeatus*), minnow (*Phoxinus phoxinus*) and brook lamprey (*Lampetra planeri*) (Ecofact, 2022, 2018). Walkover surveys in 2019 and 2022 confirmed the presence of brown trout in the Fear English River (at evidently low densities) and three-spined stickleback were recorded previously (Ecofact, 2018). Brook lamprey are likely present (given some localised suitability), along with minnow (pers. obs.).

Whilst kingfishers are opportunistic and typically predate on fish of 4cm to <10cm fork-length (Nessi et al., 2021; Vilches et al., 2019; Čech & Čech, 2011, 2015; Reynolds & Hinge, 1996), smaller species such as stickleback, stone loach and minnow are known to form major components of kingfisher diet (Raven, 1986), with smaller size classes (<5cm) particularly important for newly hatched chicks. A suitable prey resource would, therefore, appear to exist on the Fear English River in the vicinity of the proposed development, although foraging habitat is sub-optimal given the often heavily overgrown nature of the channel (reduces fisheries value and foraging ability of kingfisher), in addition to evident siltation pressures likely impacting fish recruitment (including salmonids and lamprey). The quality of fisheries habitat, and therefore kingfisher foraging habitat, is superior in the downstream connecting (Longwood) River Blackwater (approximately 3km downstream of site VP4).

[1] also known as the Ballynamullagh River and (further downstream) the Coolree River according to EPA nomenclature

No kingfisher nesting sites were identified within the study area during vantage point surveys or bank walkover surveys along 6.9km of riverine channel. The banks of the lower reaches of the Kilcooney and Sweep Rivers were typically steep (historically deepened) and heavily scrubbed-over. Some localised, largely-unvegetated areas of bank were recorded along the Fear English River, particularly along a straightened section near site VP2. However, no nests (active or inactive) were observed, despite kingfisher activity in the area.

Kingfishers usually require soft, loamy banks into which to dig their burrows (Heneberg, 2013; Cummins et al., 2010; Crowe et al., 2008; Boag, 1982) and typically choose fine-particulate banks of at least 1-2 metres high with near-vertical banks for nesting, with a slight preference for some emergent and or fringing vegetation (Heneberg, 2004, 2009). Soil compaction and particle composition are key drivers of kingfisher nest locations (Heneberg, 2004), in addition to bank slope angle (Ward et al., 1994). In general, although superficially suitable areas were present along the middle survey reaches of the Fear English channel, the soils of the historically excavated, sloping banks would appear to be too compacted for kingfisher. Indeed, no active kingfisher nests (breeding areas) have been identified in the vicinity of the proposed wind farm to date (this survey; Triturus, 2019; FTCO, 2018). In support of previous findings, the survey area is largely unsuitable for kingfisher nesting. Although kingfishers can adapt their nest site choice if other suitable conditions (i.e. prey availability, perching sites) are prevalent (Hopkins, 2001; Morgan & Glue, 1977), the watercourses within the vicinity of the proposed Drehid wind farm can be best considered as foraging habitat rather than a breeding area for kingfisher.

5. References

Balmer, D. E., Gillings, S., Caffrey, B. J., Swann, R. L., Downie, I. S., & Fuller, R. J. (2013). Bird Atlas 2007-11: the breeding and wintering birds of Britain and Ireland. Thetford: BTO.

Boag, D. 1982. The Kingfisher. Blandford Press, Dorset. 120pp

Čech M. & Čech P. (2011). Diet of the Common Kingfisher (*Alcedo atthis*) in relation to habitat type: a summary of results from the Czech Republic. Sylvia 47: 33–47

Čech M. & Čech P. (2015). Non-fish prey in the diet of an exclusive fish-eater: the Common Kingfisher *Alcedo atthis*. Bird Study 62: 457–465.

Crowe, O., Webb, G., Collins, E. & Smiddy, P. (2008). Assessment of the distribution and abundance of Kingfisher *Alcedo atthis* and other riparian birds on two SAC river systems in Ireland. Unpublished Bird Watch Ireland report to the National Parks and Wildlife Service. Newtownmountkennedy, Co. Wicklow.

Cummins, S., Fisher, J., Gaj McKeever, R., McNaghtan, L. & Crowe, O. (2010). Assessment of the distribution and abundance of Kingfisher *Alcedo atthis* and other riparian birds on six SAC river systems in Ireland. Bird Watch Ireland report.

Ecofact (2022). Drehid Wind Farm Aquatic Ecology Assessment 2021. March 2022.

Ecofact (2018). Proposed Drehid Wind Farm, Enfield, Co. Meath: Aquatic Ecology Report. October 2018

Fossitt, J. (2000). A Guide to Habitats in Ireland. The Heritage Council, Ireland.

FTCO (2018) Environmental Impact Assessment Report (EIAR) for the proposed Drehid wind farm. Volume 2, Chapter 7. Fehily Timoney & Company, Cork.

Gilbert, G., Stanbury, A., & Lewis, L. (2022). Birds of Conservation Concern in Ireland 4: 2020–2026. Irish Birds, 43, 1-22.

Heneberg, P. (2004). Soil particle composition of Eurasian Kingfishers' (*Alcedo atthis*) nest sites. Acta Zoologica Academiae Scientiarum Hungaricae, 50(3), 185-193.

Heneberg, P. (2009). Soil penetrability as a key factor affecting the nesting of burrowing birds. Ecological Research, 24(2), 453-459.

Heneberg, P. (2013). Decision making in burrowing birds: sediment properties in conflict with biological variables. Quaternary International, 296, 227-230.

Hopkins, L. (2001) Artificial Bank Creation for Sand Martins and Kingfishers. The Environment Agency.

IFI (2010). Biosecurity Protocol for Field Survey Work. Available at http://www.fisheriesireland.ie/Invasive-Species/biosecurity-protocol-for-field-survey-work.html

Libois, R. & Libois, F. (2013) Mortality causes and age structure of the kingfisher *Aceldo atthis* in Europe. Aves 50: 65-79.

Morgan, R. & Glue, D. (1977) Breeding, Mortality and Movements of Kingfishers, Bird Study, 24:1, 15-24

Nessi, A., Balestrieri, A., Winkler, A., Casoni, A. G., & Tremolada, P. (2021). Kingfisher (*Alcedo atthis*) diet and prey selection as assessed by the analysis of pellets collected under resting sites (River Ticino, north Italy). Aquatic Ecology, 55(1), 135-147.

NRA (2008). Ecological surveying techniques for protected flora and fauna during the planning of National Road Schemes. National Roads Authority, Dublin.

Raven, P. (1986). The size of minnow prey in the diet of young kingfishers Alcedo atthis. *Bird Study*, *33*(1), 6-11.

Reynolds, S. J., & Hinge, M. D. C. (1996). Foods brought to the nest by breeding Kingfishers *Alcedo atthis* in the New Forest of southern England. Bird Study, 43(1), 96-102.

SNH (2017). Recommended bird survey methods to inform impact assessment of onshore wind farms. Scottish Natural Heritage.

Triturus (2019). Kingfisher (*Alcedo atthis*) survey of Drehid wind farm, Co. Kildare. Report prepared by Triturus Environmental Ltd. for Fehily Timoney & Company (FTCO). September 2019.

Vilches, A., Miranda, R., & Arizaga, J. (2019). Does the Common Kingfisher (*Alcedo atthis*) select the most energetic fish prey *Ornis Fennica*, *96*(1).

Ward, D., Homes, N. & Jose, P. (1994). The New Rivers and Wildlife Handbook. Sandy: Royal Society for the Protection of Birds.

Triturus

Triturus Environmental Ltd.

42 Norwood Court,

Rochestown,

Co. Cork,

T12 ECF3.

APPENDIX 8-2.4

Ecological Resource Evaluation

Table 1: Ecological Resource Evaluation Criteria

Resource Evaluation	Defining Criteria
International Importance	• 'European Site' including Special Area of Conservation (SAC), Site of Community Importance (SCI), Special Protection Area (SPA), candidate Special Area of Conservation (cSAC) or proposed Special Protection Area (pSPA). • Sites that fulfil the criteria for designation as a 'European Site' (see Annex III of the Habitats Directive, as amended). Features essential to maintaining the coherence of the Natura 2000 Network. • Site containing 'best examples' of the habitat types listed in Annex I of the Habitats Directive. • Resident or regularly occurring populations (assessed to be important at the national level) of the following: Species of bird, listed in Annex I and/or referred to in Article 4(2) of the Birds Directive; and/or Species of animal and plants listed in Annex II and/or IV of the Habitats Directive. • Ramsar Site (Convention on Wetlands of International Importance Especially Waterfowl Habitat 1971). • World Heritage Site (Convention for the Protection of World Cultural and Natural Heritage, 1972). • Biosphere Reserve (UNESCO Man and The Biosphere Programme). • Site hosting significant species populations under the Bonn Convention (Convention on the Conservation of Migratory Species of Wild Animals, 1979). • Site hosting significant populations under the Berne Convention (Convention on the Conservation of European Wildlife and Natural Habitats, 1979). • Biogenetic Reserve under the Council of Europe. European Diploma Site under the Council of Europe. • Salmonid water designated pursuant to the European Communities (Quality of Salmonid Waters) Regulations, 1988, (S.I. No. 293 of 1988).
National Importance	• Site designated or proposed as a Natural Heritage Area (NHA). • Statutory Nature Reserve. • Refuge for Fauna and Flora protected under the Wildlife Acts. • National Park. • Undesignated site fulfilling the criteria for designation as a Natural Heritage Area (NHA) • Statutory Nature Reserve • Refuge for Fauna and Flora protected under the Wildlife Act; and/or a National Park • Resident or regularly occurring populations (assessed to be important at the national level) of the following: Species protected under the Wildlife Acts; and/or Species listed on the relevant Red Data list. • Site containing 'viable areas' of the habitat types listed in Annex I of the Habitats Directive
County Importance	• Area of Special Amenity. • Area subject to a Tree Preservation Order. • Area of High Amenity, or equivalent, designated under the County Development Plan.

Resource Evaluation	Defining Criteria
	• Resident or regularly occurring populations (assessed to be important at the County level) of the following: Species of bird, listed in Annex I and/or referred to in Article 4(2) of the Birds Directive; Species of animal and plants listed in Annex II and/or IV of the Habitats Directive; Species protected under the Wildlife Acts; and/or Species listed on the relevant Red Data list. • Site containing area or areas of the habitat types listed in Annex I of the Habitats Directive that do not fulfil the criteria for valuation as of International or National importance. • County important populations of species, or viable areas of semi-natural habitats or natural heritage features identified in the National or Local BAP, if this has been prepared. • Sites containing semi-natural habitat types with high biodiversity in a county context and a high degree of naturalness, or populations of species that are uncommon within the county. • Sites containing habitats and species that are rare or are undergoing a decline in quality or extent at a national level.
Local Importance (Higher Value)	• Locally important populations of priority species or habitats or natural heritage features identified in the Local BAP, if this has been prepared • Resident or regularly occurring populations (assessed to be important at the Local level) of the following: Species of bird, listed in Annex I and/or referred to in Article 4(2) of the Birds Directive • Species of animal and plants listed in Annex II and/or IV of the Habitats Directive; Species protected under the Wildlife Acts; and/or Species listed on the relevant Red Data list • Sites containing semi natural habitat types with high biodiversity in a local context and a high degree of naturalness, or populations of species that are uncommon in the locality Sites or features containing common or lower value habitats, including naturalised species that are nevertheless essential in maintaining links and ecological corridors between features of higher ecological value.
Local Importance (Lower Value)	• Sites containing small areas of semi natural habitat that are of some local importance for wildlife • Sites or features containing non-native species that are of some importance in maintaining habitat links.

Table 2: Avifauna Receptor Evaluation Criteria

Sensitivity of Key Receptor	Percival 2007 Criteria	NRA Resource Evaluation	NRA Criteria	Combined Criteria
Very High.	Species is cited interest of SPA. Species present in Internationally important numbers.	International Importance.	Resident or regularly occurring populations (assessed to be important at the national level) of the following: Species of bird, listed in Annex I and/or referred to in Article 4(2) of the Birds Directive	Species is cited interest of SPA. Species present in Internationally important numbers. Resident or regularly occurring populations (assessed to be important at the national level) of the following: Species of bird, listed in Annex I and/or referred to in Article 4(2) of the Birds Directive
High	Other non-cited species which contribute to integrity of SPA. Ecologically sensitive species (<300 breeding pairs in UK) and less common birds of prey. Species listed on Annex 1 of the EU Birds Directive. Regularly occurring relevant migratory species which are rare or vulnerable	National Importance	Resident or regularly occurring populations (assessed to be important at the national level) of the following: Species protected under the Wildlife Acts; and/or Species listed on the relevant Red Data list	Other non-cited species which contribute to integrity of SPA. Ecologically sensitive species (<300 breeding pairs nationally) and less common birds of prey. Species listed on Annex 1 of the EU Birds Directive. Regularly occurring relevant migratory species which are rare or vulnerable. Resident or regularly occurring populations (assessed to be important at the national level) of the following: Species protected under the Wildlife Acts; and/or Species listed on the relevant Red Data list (in this case BOCCI Red list).
Medium	Species present in regionally important numbers (>1% of regional population).	County Importance	Resident or regularly occurring populations (assessed to be important at the County level) of the following: Species of bird, listed in Annex I	Species present in regionally important numbers (>1% of regional population). Species occurring within SPA's but not crucial to the integrity of the site.

Sensitivity of Key Receptor	Percival 2007 Criteria	NRA Resource Evaluation	NRA Criteria	Combined Criteria
	Species occurring within SPA's but not crucial to the integrity of the site. Species listed as priority species in the UK BAP subject to special conservation measures		and/or referred to in Article 4(2) of the Birds Directive; County important populations of species. Sites containing habitats and species that are rare or are undergoing a decline in quality or extent at a national level.	Resident or regularly occurring populations (assessed to be important at the County level) of the following: Species of bird, listed in Annex I and/or referred to in Article 4(2) of the Birds Directive; County important populations of species. Species that are rare or are undergoing a decline in quality or extent at a national level.
Low	Species covered above which are present very infrequently or in very low numbers. Any other species of conservation interest not covered above, e.g. species listed on the red or amber lists of the BoCC.	Local Importance (High Value)	Locally important populations of priority species or habitats or natural heritage features identified in the Local BAP, if this has been prepared; Resident or regularly occurring populations (assessed to be important at the Local level) of the following: Species of bird, listed in Annex I and/or referred to in Article 4(2) of the Birds Directive; Species protected under the Wildlife Acts; and/or Species listed on the relevant Red Data list.	Locally important populations of priority species identified in the Local BAP, if this has been prepared; Resident or regularly occurring populations (assessed to be important at the Local level) of the following: Species of bird, listed in Annex I and/or referred to in Article 4(2) of the Birds Directive; Species protected under the Wildlife Acts; and/or Species listed on the relevant Red Data list. Amber listed species.
Negligible	Species that remain common and widespread	Local Importance (Low Value)	n/a	Species that remain common and widespread. Green Listed Species.

Assessing Effect Significance

Once the value of the identified ecological receptors (features and resources) was determined, the next step was to assess the potential effect or impact of the project on the identified key ecological receptors.

Table 3 to Table 9 outline the EPA evaluation criteria utilised in this appraisal of the Environmental Factor, Biodiversity. This criteria is included in the Draft Guidelines on the Information to be contained in Environmental Impact Assessment Reports (EPA, 2022).

Table 3: Probability of Effects (EPA, 2022)

Likely Effects	Unlikely Effects
The effects that can reasonably be expected to occur because of the planned project if all mitigation measures are properly implemented.	The effects that can reasonably be expected not to occur because of the planned project if all mitigation measures are properly implemented.

Table 4: Quality of Effects (EPA, 2022)

Quality of Effect	Description
Positive Effect	A change which improves the quality of the environment (for example, by increasing species diversity; or the improving reproductive capacity of an ecosystem, or removing nuisances or improving amenities)
Neutral Effect	No effects or effects that are imperceptible, within the normal bounds of variation or within the margin of forecasting error.
Negative/Adverse Effect	A change which reduces the quality of the environment (for example, lessening species diversity or diminishing the reproductive capacity of an ecosystem; or damaging health or property or by causing nuisance).

Table 5: Significance of Effects (EPA, 2022)

Significance of Effect	Description
Imperceptible	An effect capable of measurement but without significant consequences
Not Significant	An effect which causes noticeable changes in the character of the environment but without significant consequences
Slight	An effect which causes noticeable changes in the character of the environment without affecting its sensitivities
Moderate	An effect that alters the character of the environment in a manner that is consistent with existing and emerging trends
Significant	An effect which, by its character, magnitude, duration or intensity alters a sensitive aspect of the environment
Very Significant	An effect which, by its character, magnitude, duration or intensity significantly alters most of a sensitive aspect of the environment
Profound	An effect which obliterates sensitive characteristics

Table 6: Duration of Effects (EPA, 2022)

Duration of Effect	Description
Momentary Effects	Effects lasting from seconds to minutes
Brief Effects	Effects lasting less than a day
Temporary Effects	Effects lasting less than a year
Short-term Effects	Effects lasting one to seven years
Medium-term Effects	Effects lasting seven to fifteen years
Long-term Effects	Effects lasting fifteen to sixty years
Permanent Effects	Effects lasting over sixty years

Table 7: Types of Effects (EPA, 2022)

Type of Effect	Description
Effect/Impact	A change resulting from the implementation of a project
Likely Effects	The effects that are specifically predicted to take place – based on an understanding of the interaction of the proposed project and the receiving environment.
Indirect Effects (a.k.a. secondary effects)	Effects on the environment, which are not a direct result of the project, often produced away from the project site or because of a complex pathway
Cumulative Effects	The addition of many minor or significant effects, including effects of other projects, to create larger, more significant effects.
'Do Nothing' Effects	The environment as it would be in the future should the subject project not be carried out.
'Worst Case' Effects	The effects arising from a project in the case where mitigation measures substantially fail
Indeterminable Effects	When the full consequences of a change in the environment cannot be described.
Irreversible Effects	When the character, distinctiveness, diversity or reproductive capacity of an environment is permanently lost.
Reversible Effects	Effects that can be undone, for example through remediation or restoration
Residual Effects	The degree of environmental change that will occur after the proposed mitigation measures have taken effect
Synergistic Effects	Where the resultant effect is of greater significance than the sum of its constituents (e.g. combination of SOx and NOx to produce smog).

Table 8: Definition of Terms – Source, Pathway, Receptor (EPA, 2022)

Term	Description
Source	The activity or place from which an effect originates
Pathway	The route by which an effect is conveyed between a source and a receptor.
Receptor	Any element in the environment which is subject to effects.
Effect/Impact	A change resulting from the implementation of a project

Table 9: Confidence levels of predictions of impacts (NRA, 2009a)

Confidence level category	
Near certain	>95% chance of occurring as predicted
Probably	50-95% chance of occurring as predicted
Unlikely	5-50% chance of occurring as predicted
Extremely unlikely	<5% chance of occurring as predicted

The criteria outlined in Table 10 below has been developed by Percival (2003) to determine the magnitude of potential effects on a species. Methodology for assessing sites outside of European Sites (i.e. SPAs) state '*the test of significance of an impact will be whether the wind farm impact is causing a significant change to the population its range or distribution*' (Percival, 2003). It is important to consider availability of alternative habitat elsewhere during this assessment (Percival, 2003).

Table 10: Determination of Magnitude Effects (Percival, 2003)

Magnitude	Description
Very High	Total loss or very major alteration to key elements/ features of the baseline conditions such that the post development character/ composition/ attributes will be fundamentally changed and may be lost from the site altogether. *Guide: < 20% of population / habitat remains*
High	Major loss or major alteration to key elements/ features of the baseline (pre-development) conditions such that post development character/ composition/ attributes will be fundamentally changed. *Guide: 20-80% of population/ habitat lost*
Medium	Loss or alteration to one or more key elements/features of the baseline conditions such that post development character/composition/attributes of baseline will be partially changed. *Guide: 5-20% of population/ habitat lost*
Low	Minor shift away from baseline conditions. Change arising from the loss/alteration will be discernible but underlying character/composition/attributes of baseline condition will be similar to pre-development circumstances/patterns. *Guide: 1-5% of population/ habitat lost*
Negligible	Very slight change from baseline condition. Change barely distinguishable, approximating to the "no change" situation. *Guide: < 1% population/ habitat lost*

The significance of potential effects is assessed by cross tabulating the magnitude of effects and bird sensitivity to predict significance of each potential effect. Population status, distribution and trends of potentially affected species such as migratory winter birds should be taken into consideration when undertaking the assessment. Significant ratings are interpreted as follows, **very low** and **low** should not normally be of concern however normal design care should be undertaken to minimise effects, **medium** represents a potentially significant effect that requires careful individual assessment, while **very high** and **high** represents a highly significant effect on bird populations. A significance matrix table, combining magnitude and sensitivity to assess overall significance is presented in Table 11.

Table 11: Significance matrix: combining magnitude and sensitivity to assess significance (Percival, 2003)

Significance		Sensitivity			
		Very High	**High**	**Medium**	**Low**
Magnitude	Very High	Very High	Very High	High	Medium
	High	Very High	Very High	Medium	Low
	Medium	Very High	High	Low	Very Low
	Low	Medium	Low	Low	Very Low
	Negligible	Low	Very Low	Very Low	Very Low

APPENDIX 8-2.5

Collision Risk Modelling Report

FEHILY TIMONEY

DESIGNING AND DELIVERING A SUSTAINABLE FUTURE

COLLISION RISK MODEL REPORT FOR DREHID

Drehid Wind Farm Collision Risk Model

Prepared for:

North Kildare Win Farm Ltd.

Date: May 2025

Core House, Pouladuff Road, Cork, T12 D773, Ireland

T: +353 21 496 4133 | E: info@ftco.ie

CORK | DUBLIN | CARLOW

www.fehilytimoney.ie

Collision Risk Model Drehid Wind Farm

REVISION CONTROL TABLE, CLIENT, KEYWORDS AND ABSTRACT

User is responsible for Checking the Revision Status of This Document

Rev. No.	Description of Changes	Prepared by:	Checked by:	Approved by:	Date:
	Final	BOD/NSC/KB	JK	JK	28/05/2025

Client: North Kildare Wind Farm Ltd.

Keywords: Collision Risk Model, Drehid Wind Farm, Avifauna

Abstract: This report details the collision risk modelling approach and results for the eighteen target bird species recorded at the proposed Drehid Wind Farm between November 2021 and September 2023.

TABLE OF CONTENTS

LIST OF APPENDICES

LIST OF TABLES

1. INTRODUCTION

This report presents the results of the collision risk modelling for the proposed Drehid Wind Farm, Co Kildare. This modelling used data from vantage point (VP) surveys carried out in over a two-year period between 2021 - 2023. VP surveys were SNH (Scottish Natural Heritage) compliant (SNH 2017a). A total of 18 target species were recorded within 500m of the turbine layout during VP surveys across the five years: Buzzard, Golden Plover, Goshawk, Great Black-backed Gull, Grey Heron, Herring Gull, Kestrel, Lapwing, Lesser Black-backed Gull, Little Egret, Merlin, Peregrine, Red Kite, Snipe, Sparrowhawk, Stock Dove, Swift and Whooper Swan. Of these, a total of 17 species were recorded within the potential collision height (PCH)/ rotor swept zone and thus the following species proceeded into the modelling stage:

- Buzzard
- Golden Plover
- Goshawk
- Great Black-backed Gull
- Grey Heron
- Herring Gull
- Kestrel
- Lapwing
- Lesser Black-backed Gull
- Little Egret
- Merlin
- Peregrine
- Snipe
- Sparrowhawk
- Stock Dove
- Swift
- Whooper Swan

The modelling was carried out using the NatureScot Collision Risk Model (CRM) (also known as the Band model (Band, 2024; NatureScot, 2024)). The CRM provides a method based on vantage point data to estimate the number of birds likely to collide with turbines at a proposed wind farm. This allows pre-construction assessment of collision impacts on local and national populations. As birds may avoid a wind farm (for example some may be displaced from the area, while others may avoid turbines or take other evasive action to prevent a collision), the CRM accounts for this by applying an avoidance rate.

2. DATA SOURCES

2.1.1 Data Sources

The following data and information were provided for this assessment:

- Spreadsheet data listing all observations of flight activity recorded during the VP surveys.
- GIS mapping of flight lines recorded during the summer 2022, 2023 and winter 2021/22 and 2022/23 VP surveys.
- Mapping of the VP locations.
- Mapping of the proposed turbine locations.
- Technical specifications for the proposed turbines.

2.1.2 Wind Turbine Parameters

Details of the turbine parameters are show including data on blade chord length, and rotational speed were provided by the client. It is noted that T1 has a lower proposed hub height vs. T2-T11. As such, separate sets of dimensions are provided below for T1 and T2-T11.

Table 2-1: Wind Farm and Wind Turbine Parameters (T1)

Parameter	Value	Notes
Model: Nordex N133		
Hub height (m)	81.4	Information provided by client
Blade diameter (m)	133	Information provided by client
Blade radius (m)	66.5	Calculated (blade diameter/2)
Maximum swept height (m)	147.9	Calculated (hub height + blade radius)
Minimum swept height (m)	14.9	Calculated (hub height - blade radius)
Number of blades	3	Information provided by client
Maximum blade chord length (m)	3.94	Information provided by client
Fastest rotational speed (r.p.m)	12.24	Information provided by client
Fastest rotation period	4.9	Calculated (1/RPM/60)
Blade pitch (degrees)	9	Typical value
Number of turbines with these dimensions proposed	1	Information provided by client
Wind farm operation (%)	85	Typical value

Table 2-2: Wind Farm and Wind Turbine Parameters (T2 - T11)

Parameter	Value	Notes
Model: Nordex N133		
Hub height (m)	81.4	Information provided by client
Blade diameter (m)	133	Information provided by client
Blade radius (m)	66.5	Calculated (blade diameter/2)
Maximum swept height (m)	167	Calculated (hub height + blade radius)
Minimum swept height (m)	34	Calculated (hub height - blade radius)
Number of blades	3	Information provided by client
Maximum blade chord length (m)	3.94	Information provided by client
Fastest rotational speed (r.p.m)	12.24	Information provided by client
Fastest rotation period	4.9	Calculated (1/RPM/60)
Blade pitch (degrees)	9	Typical value
Number of turbines with these dimensions proposed	10	Information provided by client
Wind farm operation (%)	85	Typical value

Due to the proposed use of two different hub heights, the approach adopted to collision risk modelling was to define potential collision height (PCH) as ranging from the lowest blade tip height of the lower hub height (14.9m/T1) to the highest blade tip height of the higher hub height (167m/T2-T11).

As such, the CRM assesses the 'worst case scenario' based on PCH ranging from 14.9m to 167m. The hub hight and blade length used for the purposes of modelling were updated accordingly (see Table 2-3).

Table 2-3: Combined Turbine Dimensions for T1-T11

Combined turbine models - worst case scenario	
Hub height (m)	90.95
Bade length (m)	76.05
Maximum swept height (m)	167
Minimum swept height (m)	14.9

3. REVIEW AND ANALYSIS OF THE VP SURVEY COVERAGE AND RESULTS

3.1.1 VP Locations and Viewshed Coverage

Two VP locations were selected to cover the site (VP1 & VP2).

For the purposes of collision risk modelling, a 500 m radius buffer was drawn around each of the proposed turbine locations. This buffer was used as the flight activity survey area, following SNH (2017a) guidance.

A total of 95.91% of the total flight activity survey area (500m radius buffer surrounding the turbine locations) was visible from VP locations (VPs 1-2). For the purposes of collision risk analysis, a correction factor of 1.04 has been applied to the flight durations recorded to achieve 100% viewshed coverage within the model. This provides a more conservative estimate of collision risk at the site.

Table 3-1: VPs used for Avian Surveys

VP Number	Easting, Northing (ITM)	Area (km2)
1	673136, 735084	3.33
2	676257, 736663	2.89

The site and the buffer made a total survey area of around 6.07 km^2. A total of 95.91% of the entire survey area was covered from three vantage point viewpoints. These three VP viewshed overlapped for just under 12% of the survey area.

Table 3-2: Survey Areas

Area of survey area (km2)	Area of survey area covered by viewsheds (km2)	Total Area of the two VPs (km2)
6.07	5.82	6.22

3.1.2 VP Survey Effort

VP surveys were carried out at the site monthly from November 2021 - September 2023. The summer season was defined as running from April to September inclusive (six months) for summer 2022 and 2023 while winter was defined as October to March inclusive (six months) for winter 2021/22 and 2022/23. In addition, extra rounds covering spring migration were carried out in April 2022 and 2023.

Watches were 2 * 3 hours = 6 hours per VP per month. The total survey effort over the 2-year survey period was 315 hours/ 1,134,000 seconds. The total survey effort was also greater than the recommended 72 hours per year required by SNH guidance (SNH, 2017).

Table 3-3 below details the survey effort for each of the four seasons (two years of surveys).

Table 3-3: Survey Effort completed at VPs

Season	VP	Hours	Total Hours
Winter 2021-22	1	36	72
	2	36	
Spring Migration 2022	1	6	12
	2	6	
Summer 2022	1	36	72
	2	36	
Winter 2022-23	1	36	72
	2	36	
Spring Migration 2023	1	6	12
	2	6	
Summer 2023	1	39	75
	2	36	

3.1.3 VP Survey Protocol

The VP surveys recorded flight activity of all target species withing fixed visual envelopes, namely: 0-30m, 30-40m, 40-50m, 50-170m and >170m. Flight durations were not classified in the field as inside and outside of the 500 m buffer boundary surrounding the turbines. Following a more conservative approach, the total duration of any flightline which intersects the boundary of the site is included in full regardless of the percentage time the flightline was outside the site i.e., all time inside and outside the site are included in the model for flightlines that intersect the site at some point.

3.1.4 Post-hoc correction of flight activity data

Flight lines that intersected the 500 m turbine buffer were included for collision risk modelling (CRM) in alignment with SNH (2017) guidance. This is a conservative approach in relation to flightlines that pass both within and outside the 500 m turbine buffer. For flightlines of this nature, the full observation time both inside and outside the buffer has been included for modelling, rather than splitting the observation time retrospectively i.e., all time inside and outside the site are included in the model for flightlines that intersect the site at some point.

3.1.5 Avian Biometrics

The biometrics and flight speed values used in the calculations for each of the target species is shown in Table 3-4. The bird body lengths and wingspans were sourced from the BTO bird facts website (https://www.bto.org/understanding-birds/birdfacts/find-a-species; last accessed 11th February 2025). The flight speeds used come from Alerstam et al., 2007. Birds are assumed to be active for 8 hours a day in winter and 12 hours a day in summer.

Table 3-4: Biometrics of Target Species

Species	Length (m)	Wingspan (m)	Average speed (m/s)	Avoidance rates1 (%)
Buzzard	0.52	1.20	13.3	98
Golden Plover	0.28	0.72	17.9	99.8[2]
Goshawk	0.55	1.5	14.7	98
Great Black-backed gull	0.78	1.65	12	99.56[3]
Grey Heron	0.98	1.60	12.7	98
Herring Gull	0.57	1.35	12.8	99.56[3]
Kestrel	0.34	0.76	10.10	95
Lapwing	0.29	0.69	10	98
Lesser Black-backed Gull	0.58	1.42	11.9	99.56[3]
Little Egret	0.6	0.91	3	98
Merlin	0.29	0.62	10.9	98
Peregrine	0.42	1.02	12.1	98
Snipe	0.26	0.46	17.1	98
Sparrowhawk	0.33	0.62	11.3	98
Stock Dove	0.31	0.63	13.9	98
Swift	0.16	0.45	10.5	98
Whooper Swan	1.52	2.30	10	99.5

[1] Avoidance rates refer to the frequency at which birds may avoid a wind farm. SNH (2018) guidance states that this may be due to displacement from the area, avoidance of turbines or evasive action to prevent a collision. Avoidance rates may be different for different bird species and SNH (2018) guidance provides a list of recommended avoidance rates that should be applied to raw collision risk probabilities.
[2] Based on study of avoidance rates of golden plover from Gittings (2022) – see section 6 for further details.
[3] NatureScot Research Report 1019 - Avoidance rates of herring gull, great black-backed gull and common gull for use in the assessment of terrestrial wind farms in Scotland

4. STAGES OF THE COLLISON RISK MODEL

The model estimates the number of collisions through a process of five stages:

Stage A uses bird survey data to establish the density of flying birds in the vicinity of the turbines, and the proportion flying at a risk height, between the lowest and highest points of the rotors.

Stage B provides an estimate, based on the bird density and proportion at risk height, of the potential number of bird passages through rotors in the period in question.

Stage C calculates the probability of collision during a single bird rotor transit.

Stage D estimates the potential collision rate for a bird species, assuming current levels of bird use of the site, allowing for the proportion of time that turbines are not operational.

Stage E takes account of the proportion of birds likely to avoid the wind farm or its turbines, either because they have been displaced from the site or because they take evasive action or are attracted to the wind farm, e.g. in response to changing habitats.

Further details of Stage A calculations are provided in Section 5. Details of the results of calculations for Stages B to E are provided for each species in Appendix 1 and summarised in Section 6.

5. STAGE A - FLIGHT ACTIVITY

This stage estimates the number of flights which, in the absence of birds being displaced, taking other avoiding action or being attracted to the wind farm, would potentially be at risk from the turbines. It requires field data to determine levels of flight activity within the proposed wind farm.

For non-directional flights, two key parameters derived from survey observations are needed to describe the magnitude of flight activity:

i. Areal bird density (D_A) and
ii. Proportion of birds flying at risk height (Q_{2R})

5.1 Areal bird density (D_A)

Areal bird density (D_A) is the number of birds, in flight at any height at a given point in time, per unit area. D_A is most often recorded in bird seconds, which is particularly appropriate where bird numbers are low, and is usually expressed per square kilometre (km^2).

To calculate the Areal bird density the study area was defined as a 500m buffer of the wind farm site. As a precautionary measure all flightlines which interested this area were included in full in the calculate of Areal bird density.

D_A is calculated as follows:

DA = b / (t x A) bird-seconds m-2

where:

(b) is the number of flight seconds from a vantage point;

(t) is the time (in seconds) that the vantage point is watched;

(A) is the area of the vantage point view-shed (km^2).

The latter two parameters for this calculation are provided below in Table 5-1.

Table 5-1: The time that the vantage point was watched (t) and vantage point viewshed (A)

Years	VPs	A - Area (km2)	t - Total watch time (Seconds)
Year 1	VP1	3.3293	280800
Year 1	VP2	2.8962	280800
Year 2	VP1	3.3293	291600
Year 2	VP2	2.8962	280800

Table 5-2 below provides the Areal bird density (D_A) of species recorded within the proposed Drehid Wind Farm study area over the two years of Vantage Point Surveys.

Table 5-2: Areal bird density (D_A) of species at the proposed Drehid Wind Farm site

Species	Mean bird density (bird-secs/km2)	Standard Deviation
Buzzard	0.00790	0.0021
Golden Plover	0.025657	0.0356
Goshawk	0.00002	0.0000
Great Black-backed gull	0.03639	0.0450
Grey Heron	0.000109	0.0001
Herring Gull	0.137028	0.1389
Kestrel	0.001493	0.0019
Lapwing	0.000184	0.0004
Lesser Black-backed Gull	0.012147	0.0196
Little Egret	0.000013	0.0000
Merlin	0.00002	0.0000
Peregrine	0.00003	0.0001
Snipe	0.0001662	0.00026
Sparrowhawk	0.00121	0.0009
Stock Dove	0.000014	0.0000
Swift	0.000723	0.0010
Whooper Swan	0.000704	0.000374

5.2 Proportion of birds flying at risk height (Q_{2R})

Proportion of birds flying at risk height (Q_{2R}) is the proportion of birds recorded flying between the lowest and highest points of the proposed rotor, measured relative to the rotor base. The Collision Risk Model considered the Nordex N133 turbine with the rotor sweep zone defined as between 14.9m and 167m in order to account for two different hub heights for T1 and T2-T11.

The surveys recorded the flight heights of birds, using bands of 0-30m, 30-40m, 40-50m, 50-170m and >170m. Height band >170m falls outside the rotor sweep zone. All observations of birds flying exclusively within this band are not flying at risk height and are therefore omitted from the model. In instances where a bird was recorded flying both outside and inside the risk height this observation is included in the model. One species Red Kite was not recorded flying at risk height and therefore the Collison Risk for this species is considered to be zero. Table 5-3 provides the proportion of birds flying at risk height for each species

The minimum rotor tip height (14.9m) falls within the height band 0-30m, therefore including all observations which were flying only within this height band would overestimate the proportion of birds flying at risk height as it would also include birds that were flying < 10m in height. This is also the case for the maximum rotor tip height (167m) which intersects the 50-170m flight band The Band (2024) model includes a calculation to refine the proportion of birds flying at risk height in instances where this occurs. Taking Buzzard as an example, 15.1 m of the rotor height span falls within the 0-30 m height range, so 15/30 of the 13.11% of birds flying within that height range would be at rotor risk height.

All 106 birds which intersected the 30-50m band (51.46% of all observations) are fully within the rotor zone. The remaining 117 m (50-167m) of the rotor height is within the 50-170m height range, so 117/120 of the 19.42% in this band would also fall within the rotor risk height. Calculation provided below for Buzzard.

Q_{2R} Buzzard

$$((15/30)*10.88\%)+((20/20)*51.30\%)+((117/120)*20.73\%) = 76.94\%$$

Table 5-3: Proportion of birds flying at risk height

Species	Total No. birds observed	Number of birds flights observed only in the 0 - 30m band	Proportion observed 0 - 30m height band (%)	Number of birds flights observed only in the 30 - 50m band	Proportion observed 30 - 50m height band (%)	Number of birds flights observed only in the 50 - 170m band	Proportion observed 50 - 170m height band (%)	Proportion between 15 m and 167 m
Buzzard	193	21	10.88	99	51.30	40	20.73	76.94%
Golden Plover	529	0	0	0	0	343	64.84	63.22%
Great Black-backed Gull	497	1	0.20	205	41.25	271	54.53	94.51%
Grey Heron	5	0	0.00	4	80.00	1	20.00	99.50%
Kestrel	38	4	10.53	34	89.47	0	0.00	94.74%
Lesser Black-backed Gull	177	1	0.56	78	44.07	40	22.60	66.38%
Peregrine	1	0	0.00	1	100.00	0	0.00	100.00%
Snipe	13	6	46.15	7	53.85	0	0.00	76.92%
Sparrowhawk	47	16	34.04	23	48.94	7	14.89	80.48%
Swift	15	6	40.00	2	13.33	7	46.67	78.83%
Herring Gull	1987	5	0.25	699	35.18	1200	60.39	94.19%
Whooper Swan	25	0	0.00	23	92.00	2	8.00	99.80%
Goshawk	1	0	0.00	1	100.00	0	0.00	100.00%
Merlin	2	0	0.00	1	50.00	1	50.00	98.75%
Little Egret	1	0	0.00	1	100.00	0	0.00	100.00%
Lapwing	4	0	0.00	4	100.00	0	0.00	100.00%
Stock Dove	2	2	100.00	0	0.00	0	0.00	0.00%

6. RESULTS

6.1 Stage B - Projected number of rotor transits

Table 6-1 provides the predicted number of rotor transits per year for each species assuming birds take no avoiding action. The total number of bird transits expected through rotors is proportional to the number and cross-sectional area of the rotors, and to the density of birds in the airspace at risk height. The total rotor frontal area for the 11 turbine wind farm with a rotor radius of 76.05m is 199,867 m^2.

Table 6-1: Projected number of rotor transits (assuming no avoidance)

Species	Predicted number of rotor transits each year[4]
Buzzard	1716.72
Golden Plover	7635.49
Goshawk	5.21
Great Black-backed gull	8760.59
Grey Heron	29.24
Herring Gull	35065.63
Kestrel	303.24
Lapwing	38.96
Lesser Black-backed Gull	2036.83
Little Egret	0.80
Merlin	5.51
Peregrine	7.71
Snipe	46.40
Sparrowhawk	234.26
Stock Dove	2.05
Swift	126.95
Whooper Swan	97.96

6.2 Stage C - Probability of collision for a single rotor transit (assuming no avoidance)

This stage uses information on the size and speed of the turbines and physical details on the size and speed of the bird to compute the risk of collision for a bird flying through a rotating rotor.

[4] Number of rotor transits provided to 2 decimal places to provide more accurate figure than the nearest whole number in the CRM model data sheets in Appendix 1.

It is assumed that birds can avoid stationary infrastructure, so no account is taken of the turbine towers or the blades when stationary. The model evaluates the probability of a bird colliding if it passes at random at any point through the rotor disk on a flight path perpendicular to the rotor plane.

Table 6-2: Single transit risk

Species	Single transit risk - weighted mean (%)
Buzzard	5.75%
Golden Plover	4.30%
Goshawk	5.78%
Great Black-backed gull	7.38%
Grey Heron	8.06%
Herring Gull	6.12%
Kestrel	5.43%
Lapwing	5.18%
Lesser Black-backed Gull	6.39%
Little Egret	19.28%
Merlin	4.96%
Peregrine	5.47%
Snipe	4.16%
Sparrowhawk	5.06%
Stock Dove	4.61%
Swift	4.26%
Whooper Swan	12.77%

6.3 Stage D - Multiplying to yield expected collisions per year (considering operational time of proposed wind farm)

Stage B estimated the likely number of flights through rotors across the wind farm; Stage C calculated the risk of collision for each single bird transit through a rotor. Stage D multiplies these together to yield an estimate of total potential collision risk, including a factor to allow for the proportion of time that the wind turbines are operational. This is before considering avoidance behaviour, which is stage E.

The proportion of time turbines are operational Q_{op} for the proposed wind farm is 85% (year average for all 12 months). This includes down-time for maintenance as well as time inactive because of low-wind or storm conditions.

Table 6-3: Collision rate per year before avoidance

Species	Collision rates / year (before avoidance)[5]
Buzzard	83.94
Golden Plover	278.95
Goshawk	0.26
Great Black-backed gull	549.77
Grey Heron	2.00
Herring Gull	1822.91
Kestrel	13.99
Lapwing	1.71
Lesser Black-backed Gull	110.69
Little Egret	0.13
Merlin	0.23
Peregrine	0.36
Snipe	1.64
Sparrowhawk	10.08
Stock Dove	0.08
Swift	4.59
Whooper Swan	10.64

6.4 Stage E - Applying the avoidance rate

The preceding stages of the model assume that birds take no avoiding action in response to wind turbines. In reality, birds mostly take action to avoid collision with wind turbines.

The avoidance rate factors used are as recommended by Scottish Natural Heritage (SNH, 2010; SNH, 2018; NatureScot, 2019).

Golden plover have been recorded in low numbers as collision fatalities at wind farms (Hoetker et al., 2006; Grunkorn 2011). The SNH guidance (SNH, 2018) does not provide a specific avoidance rate for Golden Plover, but states that for species not covered by the guidance "*we recommend a default value of 98%*".

[5] Collision rates / year provided to 2 decimal places to provide more accurate figure than the nearest whole number in the NatureScot CRM model data sheets in Appendix 1. This limitation in the NatureScot model data sheet does not provide the exact number of results < 1.

However, a review (Gittings, 2022) of the development of the SNH avoidance rate guidance shows that the default avoidance rate of 98% is not based on any published empirical evidence, The trend is for avoidance rates to increase as more data becomes available, and the guidance does not always reflect the latest evidence on species specific avoidance rates. Therefore, the lack of a species-specific avoidance rate for Golden Plover in the SNH avoidance rate guidance does not necessarily mean that there is not any robust data available that could be used to develop a species-specific avoidance rate for Golden Plover.

Based on 3 years of post-construction monitoring at operational wind farm sites (Gittings, 2022) indicates a much higher avoidance rate should be applied for non-breeding Golden Plover populations. The studies had robust survey methodologies and were carried out at wind farm sites with high levels of Golden Plover flight activity. The review considers that an avoidance rate of 99.8% is a suitable precautionary estimate for wintering Golden Plover.

In further support of a high micro-avoidance rate, a study in the Netherlands of three operational wind farms where Golden Plovers were both diurnally and nocturnally active found no fatalities (Krijgsveld et al., 2009). Golden plovers were not recorded breeding within the 500 m turbine envelope during the survey period which reduces magnitude. The 99.8% avoidance rate reflects the high micro-avoidance rate of the species.

Table 6-4: Results of CRM assuming avoidance[6]

Species	No. of predicted collisions per year	No. of years between predicted collisions	No. predicted collisions per 35 years	Rate (%)
Buzzard	1.68	0.60	58.8	98
Golden Plover	0.56	1.79	19.6	99.8
Goshawk	0	0	0	98
Great Black-backed gull	2.4	0.42	84	99.56
Grey Heron	0	0	0	98
Herring Gull	8.02	0.12	280.7	99.56
Kestrel	0.7	1.43	24.5	95
Lapwing	0	0	0	98
Lesser Black-backed Gull	0.49	2.04	17.2	99.56
Little Egret	0	0	0	98
Merlin	0	0	0	98
Peregrine	0	0	0	98
Snipe	0	0	0	98
Sparrowhawk	0.2	5	7	98
Stock Dove	0	0	0	98

[6] With correction factors applied for the following: avoidance rates, operating time, and the fact that 95.24% and not 100% of the study area was visible during surveys. Where the number of predicted collisions is shown as 0.00, it means the number of predicted collisions are <0.01 per year. Species with >1 predicted collisions per year (assuming avoidance) are emboldened.

Species	No. of predicted collisions per year	No. of years between predicted collisions	No. predicted collisions per 35 years	Rate (%)
Swift	0.1	10	3.5	98
Whooper Swan	0.05	20	1.8	99.5

With the exception of Buzzard, Great-black backed gull and Herring Gull, the predicted collisions per year for the remaining target species were less than one. The proposed wind farm is however predicted to result in 1.7 Buzzard collisions, 2.4 Great Black-backed gull collisions and 8 Herring Gull collisions per year according to the CRM. While the predicted collision rates for these species are higher due to recorded bird activity and numbers of gulls observed, it is noted that the model provides a conservative estimate, and the number of actual collisions is likely to be lower.

Kestrel, Golden Plover and Lesser Black-backed gull collisions are predicted to occur at lower rates, respectively 0.7, 0.56 and 0.49 collisions per year.

The numbers of predicted yearly collisions for the remainder of species are either close to or at zero or and are considered negligible.

7. DISCUSSION

The Band CRM model involves making a number of assumptions. The amount of time that a species may be active within the site is also required for the model and must be estimated with respect to the bird species' known behaviour and observations of its occurrence at the study area.

The model assumes that no action is taken by a bird to avoid collision, so that the unadjusted collision risk figures derived are purely theoretical and represent worst case estimates. In reality, birds are able to perceive potential obstacles while in flight and actively take avoiding action. Given the general absence of empirically derived avoidance estimates for individual species, additional assumptions about likely levels of active avoidance on the part of birds are generally made in order to draw conclusions. Available evidence to date (SNH, 2010; SNH, 2017; Fernley *et al*., 2006; Whitfield & Madders, 2006; Whitfield, 2009; Whitfield & Urquhart, 2015) suggests that avoidance rates are well in excess of 95%. Accordingly, outputs from collision risk analysis where precautionary avoidance rates are used must be interpreted with care.

The main influence on the final result of collision risk analysis is the avoidance rate that is applied to the model; and without accurate avoidance rates, the usefulness of the model as a predictor of impact can be badly impaired. The avoidance rate factors used are those that are currently recommended by SNH (SNH, 2010; SNH, 2018; NatureScot, 2019). These avoidance rates are widely considered to be highly precautionary in nature. It should be remembered that the difference between an avoidance factor of 98% and 99% will have the effect of doubling the calculated annual collision rate. In many cases where collision mortality has been monitored for operating wind farms, observed mortality has been below that which was predicted by modelling pre-construction bird survey data.

In the case of the calculations for the proposed Drehid Wind Farm site, a conservative approach was taken in the choice of which bird flights to include in the collision risk calculations. In addition, a worst-case scenario i.e., shortest rotation time (top turbine rotating speed) and birds flapping, rather than gliding has been used. Other studies use the mean of the worst-case scenario and best-case scenario (longest rotation period and bird gliding rather than flapping) probabilities. Finally, the calculations have used the conservative downtime estimate (15%, or turbines rotating 85% of the time), but in reality, this level of downtime may be greater. A conservative correction factor was also applied to the recorded flight durations based on the assumption that 95.91% of the study area was visible during surveys. Therefore, the likely empirical collision mortality figures should be lower than those presented here.

All species where the number of predicted collisions are higher than zero are considered further. The population-level consequences of predicted collision risks can be assessed by considering the additional mortality that would be caused (assuming that the collision risk is non-additive) relative to the population at a national and county level.

The potential increase in annual mortality rates for Buzzard, Golden Plover, Great Black-backed gull, Kestrel, Lesser Black-backed gull, Sparrowhawk, Swift, Herring Gull, and Whooper Swan is shown in Table 7-1 and Table 7-2. This indicates that collision mortality would remain negligible at a national level for all these species. Collision risk at county and local level would also remain negligible for Golden Plover, Swift and Whooper Swan.

Predicted collision effects at county level also remain negligible for Buzzard, Kestrel, Lesser Black-backed gull and Sparrowhawk. Predicted collision effects at county level are identified as low for Great Black-backed gull and Herring Gull.

Predicted collision effects at local level are identified as low for Sparrowhawk, and medium for Buzzard and Herring Gull.

Table 7-1: Calculations of potential increases in annual mortality rates due to the predicted collision mortality (Part 1)

Parameter	Description	Source / Calculation	Buzzard			Golden Plover			Great black-backed gul			Kestrel			Lesser Black-backed gull		
			National Pop.	County Pop.	Local Pop.	National Pop.	County Pop.	Local Pop.	National Pop.	County Pop.	Local Pop.	National Pop.	County Pop.	Local Pop.	National Pop.	County Pop.	Local Pop.
pop	Population size	Various sources (see sources/notes row below)	3000	72	18	80707	5500	100	4890	117	82	16470	395	23	7112	170	21.5
surv	Annual survival rate	Adult survival rates from www.bto.org/understanding-birds/birdfacts accessed 13/04/23	0.9	0.9	0.9	0.73	0.73	0.73	0.864	0.864	0.864	0.69	0.69	0.69	0.913	0.913	0.913
mort(back)	Annual background mortality	pop*(1-surv)	300	7.2	1.8	21790.89	1485	27	665.04	15.912	11.152	5105.7	122.45	7.13	618.744	14.79	1.8705
mort(coll)	Predicted annual collision mortality	Predicted collision rates from CRM	1.7	1.7	1.7	0.6	0.6	0.6	2.4	2.4	2.4	0.7	0.7	0.7	0.5	0.5	0.5
%mort(increase)	Percentage increase in annual mortality rate due to collisions		0.567	23.611	94.444	0.003	0.040	2.222	0.361	15.083	21.521	0.014	0.572	9.818	0.081	3.381	26.731
	% of population potentially affected by collision mortality		0.015	0.620	9.333	0.001	0.010	0.560	0.049	2.051	2.927	0.004	0.177	3.043	0.007	0.288	2.279
Magnitude (Percival, 2003)			<1% (Negligible)	<1% (Negligible)	5-20% (Medium)	<1% (Negligible)	<1% (Negligible)	<1% (Negligible)	<1% (Negligible)	1-5% (Low)	1-5% (Low)	<1% (Negligible)	<1% (Negligible)	1-5% (Low)	<1% (Negligible)	<1% (Negligible)	1-5% (Low)

Parameter	Description	Source / Calculation	Buzzard			Golden Plover			Great black-backed gul			Kestrel			Lesser Black-backed gull		
			National Pop.	County Pop.	Local Pop.	National Pop.	County Pop.	Local Pop.	National Pop.	County Pop.	Local Pop.	National Pop.	County Pop.	Local Pop.	National Pop.	County Pop.	Local Pop.
Sources/Notes:			NPWS (2012) Article 12 Report - Ireland's bird species' status and trends for the period 2008-2012 *** Quality of estimate = Moderate	Estimate based on proportion of national population split by county area, used due to a lack of specific county estimate	Based on VP & hinterland observations (10 km local area)	IWM 106 (2019) Irish Wetland Bird Survey 2009/10 – 2015/16;	Co. Kildare I-WeBS Counts (sum of 5-year site means for Co. Kildare)	50% of largest flock size observed	NPWS (2012) Article 12 Report - Ireland's bird species' status and trends for the period 2008-2012 *** Quality of estimate = Poor	Estimate based on proportion of national population split by county area, used due to a lack of specific county estimate	50% of largest flock size observed	NPWS (2012) Article 12 Report - Ireland's bird species' status and trends for the period 2008-2012 *** Quality of estimate = Moderate	Estimate based on proportion of national population split by county area, used due to a lack of specific county estimate	Based on county estimate, with wind farm site occupying an approximate local area of 10 km2	JNCC website accessed May 2023 - https://jncc.gov.uk/our-work/lesser-black-backed-gull-larus-fuscus/#annual-abundance-and-productivity-by-geographical-area-republic-of-ireland	Estimate based on proportion of national population split by county area, used due to a lack of specific county estimate	50% of largest flock size observed

Table 7-2: Calculations of potential increases in annual mortality rates due to the predicted collision mortality (Part 2)

Parameter	Description	Source / Calculation	Sparrowhawk			Swift			Herring Gull			Whooper Swan		
			National Population	County Population	Local Population (Max)	National Population	County Population	Local Population	National Population	County Population	Local Population	National Population	County Population	Local Population
pop	Population size	Various sources (see sources/notes row below)	11965	287	17	78030	1873	110	9734	234	145	10520	344	27
surv	Annual survival rate	Adult survival rates from www.bto.org/understanding-birds/birdfacts accessed 13/04/23	0.69	0.69	0.69	0.81	0.81	0.81	0.88	0.88	0.88	0.8	0.8	0.8
mort(back)	Annual background mortality	pop*(1-surv)	3709.15	88.97	5.27	14825.7	355.8168	20.9	1168.08	28.03392	17.4	2104	68.8	5.4
mort(coll)	Predicted annual collision mortality	Predicted collision rates from CRM	0.2	0.2	0.2	0.1	0.1	0.1	8	8	8	0.1	0.1	0.1
%mort(increase)	Percentage increase in annual mortality rate due to collisions		0.005	0.225	3.795	0.001	0.028	0.478	0.685	28.537	45.977	0.005	0.145	1.852
	% of population potentially affected by collision mortality		0.002	0.070	1.176	0.0001	0.005	0.091	0.082	3.433	5.531	0.001	0.015	0.185
Magnitude (Percival, 2003)			<1% (Negligible)	<1% (Negligible)	1-5% (Low)	<1% (Negligible)	<1% (Negligible)	<1% (Negligible)	<1% (Negligible)	1-5% (Low)	5-20% (Medium)	<1% (Negligible)	<1% (Negligible)	<1% (Negligible)
Sources/Notes:			NPWS (2012) Article 12 Report - Ireland's bird species' status and trends for the period 2008-2012 *** Quality of estimate = Moderate	Estimate based on proportion of national population split by county area, used due to a lack of specific county estimate	Based on county estimate, with wind farm site occupying an approximate local area of 10 km2	NPWS (2012) Article 12 Report - Ireland's bird species' status and trends for the period 2008-2012 *** Quality of estimate = Moderate	Estimate based on proportion of national population split by county area, used due to a lack of specific county estimate	Based on county estimate, with wind farm site occupying an approximate local area of 10 km2	NPWS (2012) Article 12 Report - Ireland's bird species' status and trends for the period 2008-2012 *** Quality of estimate = Moderate	Estimate based on proportion of national population split by county area, used due to a lack of specific county estimate	Based on county estimate, with wind farm site occupying an approximate local area of 10 km2	NPWS (2012) Article 12 Report - Ireland's bird species' status and trends for the period 2008-2012 *** Quality of estimate = Moderate	Co. Kildare I-WeBS Counts (sum of 5-year site means for Co. Kildare)	Max observed grazing during surveys

8. REFERENCES

Alerstam, T., Rosén, M., Bäckman, J., Ericson P.G.P. & Hellgren, O. (2007). Flight speeds among bird species: allometric and phylogenetic effects. PLoS Biol 5(8): e197. doi:10.1371/journal.pbio.0050197.

Band, W. (2024). Using a collision risk model to assess bird collision risks for onshore wind farms. NatureScot Research Report 909.

Chamberlain, D.E., Freeman, S.N., Rehfisch, M.R., Fox, T. & Desholm, M. (2005). Appraisal of Scottish Natural Heritage's Wind Farm Collision Risk Model and its Application. BTO Research Report 401. British Trust for Ornithology, Thetford.

Chamberlain, D.E., Rehfisch, M.R., Fox, A.F., Desholm, M & Anthony, S.J. (2006). The effect of avoidance rates on bird mortality predictions made by wind turbine collision risk models. Ibis 148:198202.

Fernley, J., Lowther, S & Whitfield, P. (2006). A review of goose collisions at operating wind farms and estimation of the goose avoidance rate. Natural Research / West Coast Energy / Hyder Consulting.

Gittings, T (2022), Ballivor Wind Farm: Golden Plover Avoidance Rates Collision Risk Assessment (pleanala.ie) Bord Pleanála Case reference: PA25M.316212

Grunkorn, T. (2011). Proceedings: Conference on wind energy and wildlife impacts, 2-5 May 2011, Trondheim, Norway. Trondheim: NINA.

Hoetker, H., Thompson, K.H., Jeromin, H. (2006), Impacts on biodiversity of exploitation of renewable energy sources: the example of birds and bats- facts, gaps in knowledge, demands for further research, and ornithological guidelines for the development of renewable energy exploitation. Bergenheim: Michael-Otto-Institut im NABU.

JNCC (2018). Seabird Monitoring Programme Report 1986 -2018. https://jncc.gov.uk/our-work/smp-report-1986-2018/ Accessed 12/05/2023.

NatureScot (2019). NatureScot Research Report 1019 - Avoidance rates of herring gull, great black-backed gull and common gull for use in the assessment of terrestrial wind farms in Scotland

Percival, SM. (2003). Birds and Wind Farms in Ireland: A Review of Potential Issues and Impact Assessment.

Scottish Natural Heritage, (2010, September). Avoidance Rate Information and Guidance Note. Use of avoidance rates in the SNH wind farm collision risk model.

Scottish Natural Heritage, (2017a, March). Recommended bird survey methods to inform impact assessment of onshore wind farms.

Scottish Natural Heritage, (2018 v2). Guidance Note. Avoidance rates for the onshore SNH wind farm collision risk model.

Whitfield, D.P. (2009). Collision avoidance of golden eagles at wind farms under the 'Band' collision risk model. Report to SNH.

Whitfield, D.P. & Madders, M. (2006). Deriving collision avoidance rates for red kites Milvus. Natural Research Information Note 3. Natural Research Ltd, Banchory, UK.

Whitfield, D.P. & Urquhart, B. (2015). Deriving an avoidance rate for swans suitable for onshore wind farm collision risk modelling. Natural Research Information Note 6. Natural Research Ltd, Banchory, UK.

FEHILY TIMONEY

DESIGNING AND DELIVERING
A SUSTAINABLE FUTURE

APPENDIX 1

CRM Species Sheets

Buzzard

COLLISION RISK MODEL

Required input data is in	orange	boxes
Calculated output is in	blue	boxes
	green	boxes are for information only, to show variables used at each stage

Bird data		Value	Units	Windfarm data		Value	Units	Turbine data		Value	Units
Species name		Buzzard		Site name		Drehid		Model		Vesta 162 6.2MW	
Bird length	L	0.52	m	Latitude		53.379	degrees	Hub height		90.95	m
Wingspan	W	1.2	m	No of turbines	T	11		Rotor radius	R	76.05	m
Bird flight speed	v	13.3	m s⁻¹	Width of windfarm	w	2	km	No of blades	b	3	
Flight type, flapping or gliding		flapping						Rotation speed	Ω	12.24	rpm
% of flights upwind/downwind		50%	50%					Max blade width	C	3.94	m
Nocturnal activity ranking 1-5		1						Blade pitch	λ	9	degrees
Nocturnal activity factor	f_{night}	0%						Risk height range		15-167	m

normal approach

Set to 'normal approach' to use survey data on bird density

Set to 'birds on migration' to use 'Migrant collision risk' sheet in place of Stage A

Stage A				Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	year avge
Daytime bird density	D_A		birds/km²	0.00821	0.00821	0.00821	0.00821	0.00821	0.00821	0.00821	0.00821	0.00821	0.00821	0.00821	0.00821	0.0082
Proportion at rotor risk height	Q_{2R}	76.94%														
At latitude 53.4		Daylight hours per month		251.6	273.7	366.3	418.6	491.4	507.2	510.1	458.9	382.6	329.7	261.1	235.7	4487.0
		Nighttime hours per month		492.4	398.3	377.7	301.4	252.6	212.8	233.9	285.1	337.4	414.3	458.9	508.3	4273.0

Stage B				Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	year total
No of turbines	T	11														
Rotor radius	R	76.05	m													
		Total rotor frontal area m²	199867													
Nocturnal activity factor	f_{night}	0%														
Bird flight speed	v	13.3	m s⁻¹													
		Projected number of rotor transits		100.0	108.8	145.6	166.4	195.3	201.6	202.7	182.4	152.1	131.0	103.8	93.7	**1783**

Stage C							
No of blades	b	3		Bird length	l	0.52	m
Rotation speed	Ω	12.24	rpm	Wingspan	w	1.2	m
Rotor radius	R	76.05	m	Bird flight speed	v	13.3	m s⁻¹
Max blade width	C	3.94	m	Flight type		flapping	
Pitch	λ	9	degrees	% of flights upwind/downwind		50%	50%
Blade profile		see Blade profile sheet					
		Single transit risk	upwind	7.27%			
			downwind	4.23%			
			weighted mean	**5.75%**			

Stage D		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	year avge
Proportion of time operational	Q_{op}	85.0%	85.0%	85.0%	85.0%	85.0%	85.0%	85.0%	85.0%	85.0%	85.0%	85.0%	85.0%	85.0%
		Collision rates before avoidance												year total
		4.89	5.32	7.12	8.13	9.55	9.86	9.91	8.92	7.43	6.41	5.07	4.58	**87**

Stage E				Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	per year
Allow for large array correction?		No														
Width of windfarm	w	2	km													
			large array correction	Collision rates allowing for avoidance												
Avoidance rates modelled		95.00%	100.00%	0.24	0.27	0.36	0.41	0.48	0.49	0.50	0.45	0.37	0.32	0.25	0.23	**4.4**
		98.00%	100.00%	0.10	0.11	0.14	0.16	0.19	0.20	0.20	0.18	0.15	0.13	0.10	0.09	**1.7**
		99.00%	100.00%	0.05	0.05	0.07	0.08	0.10	0.10	0.10	0.09	0.07	0.06	0.05	0.05	**0.9**
		99.50%	100.00%	0.02	0.03	0.04	0.04	0.05	0.05	0.05	0.04	0.04	0.03	0.03	0.02	**0.4**

Golden Plover

COLLISION RISK MODEL	Required input data is in	orange	boxes
	Calculated output is in	blue	boxes
		green	boxes are for information only, to show variables used at each stage

Bird data		Value	Units	Windfarm data		Value	Units	Turbine data		Value	Units
Species name		Golden Plover		Site name		Drehid		Model		Vesta 162 6.2MW	
Bird length	L	0.28	m	Latitude		53.379	degrees	Hub height		90.95	m
Wingspan	W	0.72	m	No of turbines	T	11		Rotor radius	R	76.05	m
Bird flight speed	v	17.9	$m\ s^{-1}$	Width of windfarm	w	2	km	No of blades	b	3	
Flight type, flapping or gliding		flapping						Rotation speed	Ω	12.24	rpm
% of flights upwind/downwind		50%	50%					Max blade width	C	3.94	m
Nocturnal activity ranking 1-5		2						Blade pitch	λ	9	degrees
Nocturnal activity factor	f_{night}	25%						Risk height range		15-167	m

normal approach	Set to 'normal approach' to use survey data on bird density
	Set to 'birds on migration' to use 'Migrant collision risk' sheet in place of Stage A

Stage A				Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	year avge
Daytime bird density	D_A		birds/km²	0.025677	0.025677	0.025677	0.025677	0.025677	0.025677	0.025677	0.025677	0.025677	0.025677	0.025677	0.025677	0.0257
Proportion at rotor risk height	Q_{2R}	63.35%														
At latitude 53.4		Daylight hours per month		251.6	273.7	366.3	418.6	491.4	507.2	510.1	458.9	382.6	329.7	261.1	235.7	4487.0
		Nighttime hours per month		492.4	398.3	377.7	301.4	252.6	212.8	233.9	285.1	337.4	414.3	458.9	508.3	4273.0

Stage B				Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	year total
No of turbines	T	11														
Rotor radius	R	76.05	m													
		Total rotor frontal area m²	199867													
Nocturnal activity factor	f_{night}	25%														
Bird flight speed	v	17.9	$m\ s^{-1}$													
		Projected number of rotor transits		516.1	514.1	634.6	680.3	763.8	771.9	783.2	730.3	643.2	596.8	517.6	499.7	7652

Stage C								
No of blades	b	3			Bird length	l	0.28	m
Rotation speed	Ω	12.24	rpm		Wingspan	w	0.72	m
Rotor radius	R	76.05	m		Bird flight speed	v	17.9	$m\ s^{-1}$
Max blade width	C	3.94	m		Flight type		flapping	
Pitch	λ	9	degrees		% of flights upwind/downwind		50%	50%
Blade profile		see Blade profile sheet						
		Single transit risk	upwind	5.43%				
			downwind	3.16%				
			weighted mean	4.30%				

Stage D			Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	year avge
Proportion of time operational	Q_{op}		85.0%	85.0%	85.0%	85.0%	85.0%	85.0%	85.0%	85.0%	85.0%	85.0%	85.0%	85.0%	85.0%
			Collision rates before avoidance												year total
			18.86	18.78	23.19	24.85	27.90	28.20	28.61	26.68	23.50	21.80	18.91	18.26	280

Stage E				Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	per year
Allow for large array correction?		No														
Width of windfarm	w	2	km													
			large array correction	Collision rates allowing for avoidance												
Avoidance rates modelled		95.00%	100.00%	0.94	0.94	1.16	1.24	1.40	1.41	1.43	1.33	1.17	1.09	0.95	0.91	14.0
		98.00%	100.00%	0.38	0.38	0.46	0.50	0.56	0.56	0.57	0.53	0.47	0.44	0.38	0.37	5.6
		99.00%	100.00%	0.19	0.19	0.23	0.25	0.28	0.28	0.29	0.27	0.23	0.22	0.19	0.18	2.8
		99.80%	100.00%	0.04	0.04	0.05	0.05	0.06	0.06	0.06	0.05	0.05	0.04	0.04	0.04	0.6

Goshawk

COLLISION RISK MODEL

Required input data is in	orange	boxes
Calculated output is in	blue	boxes
	green	boxes are for information only, to show variables used at each stage

Bird data

		Value	Units
Species name		Goshawk	
Bird length	L	0.55	m
Wingspan	W	1.5	m
Bird flight speed	v	14.7	$m\ s^{-1}$
Flight type, flapping or gliding		flapping	
% of flights upwind/downwind		50%	50%
Nocturnal activity ranking 1-5		1	
Nocturnal activity factor	f_{night}	0%	

Windfarm data

		Value	Units
Site name		Drehid	
Latitude		53.379	degrees
No of turbines	T	11	
Width of windfarm	w	2	km

Turbine data

		Value	Units
Model		Vesta 162 6.2MW	
Hub height		90.95	m
Rotor radius	R	76.05	m
No of blades	b	3	
Rotation speed	Ω	12.24	rpm
Max blade width	C	3.94	m
Blade pitch	λ	9	degrees
Risk height range		15-167	m

normal approach — Set to 'normal approach' to use survey data on bird density
Set to 'birds on migration' to use 'Migrant collision risk' sheet in place of Stage A

Stage A

				Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	year avge
Daytime bird density	D_A		birds/km^2	1.67E-05	1.67E-05	1.67E-05	1.67E-05	1.67E-05	1.67E-05	1.67E-05	1.67E-05	1.67E-05	1.67E-05	1.67E-05	1.67E-05	0.0000
Proportion at rotor risk height	Q_{2R}	100.00%														
At latitude 53.4		Daylight hours per month		251.6	273.7	366.3	418.6	491.4	507.2	510.1	458.9	382.6	329.7	261.1	235.7	4487.0
		Nighttime hours per month		492.4	398.3	377.7	301.4	252.6	212.8	233.9	285.1	337.4	414.3	458.9	508.3	4273.0

Stage B

				Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	year total
No of turbines	T	11														
Rotor radius	R	76.05	m													
		Total rotor frontal area m^2	199867													
Nocturnal activity factor	f_{night}	0%														
Bird flight speed	v	14.7	$m\ s^{-1}$													
		Projected number of rotor transits		0.3	0.3	0.4	0.5	0.6	0.6	0.6	0.5	0.4	0.4	0.3	0.3	5

Stage C

No of blades	b	3		Bird length	l	0.55	m
Rotation speed	Ω	12.24	rpm	Wingspan	w	1.5	m
Rotor radius	R	76.05	m	Bird flight speed	v	14.7	$m\ s^{-1}$
Max blade width	C	3.94	m	Flight type		flapping	
Pitch	λ	9	degrees	% of flights upwind/downwind		50%	50%
Blade profile		see Blade profile sheet					
		Single transit risk	upwind	7.16%			
			downwind	4.40%			
			weighted mean	5.78%			

Stage D

		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	year avge
Proportion of time operational	Q_{op}	85.0%	85.0%	85.0%	85.0%	85.0%	85.0%	85.0%	85.0%	85.0%	85.0%	85.0%	85.0%	85.0%
	Collision rates before avoidance													year total
		0.01	0.02	0.02	0.02	0.03	0.03	0.03	0.03	0.02	0.02	0.01	0.01	0

Stage E

				Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	per year
Allow for large array correction?		No														
Width of windfarm	w	2	km													
			large array correction	Collision rates allowing for avoidance												
Avoidance rates modelled		95.00%	100.00%	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
		98.00%	100.00%	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
		99.00%	100.00%	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
		99.50%	100.00%	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0

Great Black-backed Gull

COLLISION RISK MODEL

Required input data is in	orange	boxes
Calculated output is in	blue	boxes
	green	boxes are for information only, to show variables used at each stage

Bird data		Value	Units	Windfarm data		Value	Units	Turbine data		Value	Units
Species name		Great Black-backed Gull		Site name		Drehid		Model		Vesta 162 6.2MW	
Bird length	L	0.78	m	Latitude		53.379	degrees	Hub height		90.95	m
Wingspan	W	1.65	m	No of turbines	T	11		Rotor radius	R	76.05	m
Bird flight speed	v	12	m s^{-1}	Width of windfarm	w	2	km	No of blades	b	3	
Flight type, flapping or gliding		flapping						Rotation speed	Ω	12.24	rpm
% of flights upwind/downwind		50%	50%					Max blade width	C	3.94	m
Nocturnal activity ranking 1-5		1						Blade pitch	λ	9	degrees
Nocturnal activity factor	f_{night}	0%						Risk height range		15-167	m

normal approach — Set to 'normal approach' to use survey data on bird density

Set to 'birds on migration' to use 'Migrant collision risk' sheet in place of Stage A

Stage A				Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	year avge
Daytime bird density	D_A		birds/km^2	0.03654	0.03654	0.03654	0.03654	0.03654	0.03654	0.03654	0.03654	0.03654	0.03654	0.03654	0.03654	0.0365
Proportion at rotor risk height	Q_{2R}	94.56%														
At latitude 53.4		Daylight hours per month		251.6	273.7	366.3	418.6	491.4	507.2	510.1	458.9	382.6	329.7	261.1	235.7	4487.0
		Nighttime hours per month		492.4	398.3	377.7	301.4	252.6	212.8	233.9	285.1	337.4	414.3	458.9	508.3	4273.0

Stage B				Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	year total
No of turbines	T	11														
Rotor radius	R	76.05	m													
		Total rotor frontal area m^2	199867													
Nocturnal activity factor	f_{night}	0%														
Bird flight speed	v	12	m s^{-1}													
		Projected number of rotor transits		493.5	536.8	718.5	821.0	963.8	994.9	1000.6	900.2	750.4	646.7	512.1	462.4	**8801**

Stage C							
No of blades	b	3		Bird length	l	0.78	m
Rotation speed	Ω	12.24	rpm	Wingspan	w	1.65	m
Rotor radius	R	76.05	m	Bird flight speed	v	12	m s^{-1}
Max blade width	C	3.94	m	Flight type		flapping	
Pitch	λ	9	degrees	% of flights upwind/downwind		50%	50%
Blade profile		see Blade profile sheet					
		Single transit risk	upwind	9.04%			
			downwind	5.73%			
			weighted mean	**7.38%**			

Stage D		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	year avge
Proportion of time operational	Q_{op}	85.0%	85.0%	85.0%	85.0%	85.0%	85.0%	85.0%	85.0%	85.0%	85.0%	85.0%	85.0%	85.0%
		Collision rates before avoidance												year total
		30.97	33.69	45.09	51.52	60.48	62.43	62.79	56.49	47.09	40.58	32.14	29.02	**552**

Stage E				Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	per year
Allow for large array correction?		No														
Width of windfarm	w	2	km													
			large array correction	Collision rates allowing for avoidance												
Avoidance rates modelled		95.00%	100.00%	1.55	1.68	2.25	2.58	3.02	3.12	3.14	2.82	2.35	2.03	1.61	1.45	**27.6**
		98.00%	100.00%	0.62	0.67	0.90	1.03	1.21	1.25	1.26	1.13	0.94	0.81	0.64	0.58	**11.0**
		99.00%	100.00%	0.31	0.34	0.45	0.52	0.60	0.62	0.63	0.56	0.47	0.41	0.32	0.29	**5.5**
		99.56%	100.00%	0.14	0.15	0.20	0.23	0.27	0.27	0.28	0.25	0.21	0.18	0.14	0.13	**2.4**

Grey Heron

COLLISION RISK MODEL

Required input data is in	orange	boxes
Calculated output is in	blue	boxes
	green	boxes are for information only, to show variables used at each stage

Bird data		Value	Units		Windfarm data		Value	Units	Turbine data		Value	Units
Species name		Heron			Site name		Drehid		Model		Vesta 162 6.2MW	
Bird length	L	0.98	m		Latitude		53.379	degrees	Hub height		90.95	m
Wingspan	W	1.6	m		No of turbines	T	11		Rotor radius	R	76.05	m
Bird flight speed	v	12.7	$m\ s^{-1}$		Width of windfarm	w	2	km	No of blades	b	3	
Flight type, flapping or gliding		flapping							Rotation speed	Ω	12.24	rpm
% of flights upwind/downwind		50%	50%						Max blade width	C	3.94	m
Nocturnal activity ranking 1-5		1							Blade pitch	λ	9	degrees
Nocturnal activity factor	f_{night}	0%							Risk height range		15-167	m

normal approach

Set to 'normal approach' to use survey data on bird density
Set to 'birds on migration' to use 'Migrant collision risk' sheet in place of Stage A

Stage A				Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	year avge
Daytime bird density	D_A		birds/km^2	0.000109	0.000109	0.000109	0.000109	0.000109	0.000109	0.000109	0.000109	0.000109	0.000109	0.000109	0.000109	0.0001
Proportion at rotor risk height	Q_{2R}	99.50%														
At latitude 53.4		Daylight hours per month		251.6	273.7	366.3	418.6	491.4	507.2	510.1	458.9	382.6	329.7	261.1	235.7	4487.0
		Nighttime hours per month		492.4	398.3	377.7	301.4	252.6	212.8	233.9	285.1	337.4	414.3	458.9	508.3	4273.0

Stage B				Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	year total
No of turbines	T	11														
Rotor radius	R	76.05	m													
		Total rotor frontal area m^2	199867													
Nocturnal activity factor	f_{night}	0%														
Bird flight speed	v	12.7	$m\ s^{-1}$													
		Projected number of rotor transits		1.6	1.8	2.4	2.7	3.2	3.3	3.3	3.0	2.5	2.1	1.7	1.5	29

Stage C								
No of blades	b	3			Bird length	l	0.98	m
Rotation speed	Ω	12.24	rpm		Wingspan	w	1.6	m
Rotor radius	R	76.05	m		Bird flight speed	v	12.7	$m\ s^{-1}$
Max blade width	C	3.94	m		Flight type		flapping	
Pitch	λ	9	degrees		% of flights upwind/downwind		50%	50%
Blade profile		see Blade profile sheet						
		Single transit risk	upwind	9.64%				
			downwind	6.48%				
			weighted mean	**8.06%**				

Stage D		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	year avge
Proportion of time operational	Q_{op}	85.0%	85.0%	85.0%	85.0%	85.0%	85.0%	85.0%	85.0%	85.0%	85.0%	85.0%	85.0%	85.0%
		Collision rates before avoidance												year total
		0.11	0.12	0.16	0.19	0.22	0.23	0.23	0.20	0.17	0.15	0.12	0.11	2

Stage E				Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	per year
Allow for large array correction?		No														
Width of windfarm	w	2	km													
			large array correction	Collision rates allowing for avoidance												
Avoidance rates modelled		95.00%	100.00%	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	**0.1**
		98.00%	100.00%	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	**0.0**
		99.00%	100.00%	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	**0.0**
		99.50%	100.00%	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	**0.0**

Herring Gull

COLLISION RISK MODEL

Required input data is in	orange	boxes
Calculated output is in	blue	boxes
	green	boxes are for information only, to show variables used at each stage

Bird data		Value	Units	Windfarm data		Value	Units	Turbine data		Value	Units
Species name		Herring Gull		Site name		Drehid		Model		Vesta 162 6.2MW	
Bird length	L	0.57	m	Latitude		53.379	degrees	Hub height		90.95	m
Wingspan	W	1.355	m	No of turbines	T	11		Rotor radius	R	76.05	m
Bird flight speed	v	12.8	m s⁻¹	Width of windfarm	w	2	km	No of blades	b	3	
Flight type, flapping or gliding		flapping						Rotation speed	Ω	12.24	rpm
% of flights upwind/downwind		50%	50%					Max blade width	C	3.94	m
Nocturnal activity ranking 1-5		1						Blade pitch	λ	9	degrees
Nocturnal activity factor	f_{night}	0%						Risk height range		15-167	m

normal approach — Set to 'normal approach' to use survey data on bird density

Set to 'birds on migration' to use 'Migrant collision risk' sheet in place of Stage A

Stage A				Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	year avge
Daytime bird density	D_A		birds/km²	0.137184	0.137184	0.137184	0.137184	0.137184	0.137184	0.137184	0.137184	0.137184	0.137184	0.137184	0.137184	0.1372
Proportion at rotor risk height	Q_{2R}	94.20%														
At latitude 53.4		Daylight hours per month		251.6	273.7	366.3	418.6	491.4	507.2	510.1	458.9	382.6	329.7	261.1	235.7	4487.0
		Nighttime hours per month		492.4	398.3	377.7	301.4	252.6	212.8	233.9	285.1	337.4	414.3	458.9	508.3	4273.0

Stage B				Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	year total
No of turbines	T	11														
Rotor radius	R	76.05	m													
		Total rotor frontal area m²	199867													
Nocturnal activity factor	f_{night}	0%														
Bird flight speed	v	12.8	m s⁻¹													
		Projected number of rotor transits		1968.9	2141.7	2866.6	3275.2	3844.8	3968.9	3991.7	3591.2	2993.8	2580.0	2042.9	1844.6	35110

Stage C								
No of blades	b	3			Bird length	l	0.57	m
Rotation speed	Ω	12.24	rpm		Wingspan	w	1.355	m
Rotor radius	R	76.05	m		Bird flight speed	v	12.8	m s⁻¹
Max blade width	C	3.94	m		Flight type		flapping	
Pitch	λ	9	degrees		% of flights upwind/downwind		50%	50%
Blade profile		see Blade profile sheet						
		Single transit risk	upwind	7.69%				
			downwind	4.55%				
			weighted mean	6.12%				

Stage D		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	year avge
Proportion of time operational	Q_{op}	85.0%	85.0%	85.0%	85.0%	85.0%	85.0%	85.0%	85.0%	85.0%	85.0%	85.0%	85.0%	85.0%
		Collision rates before avoidance												year total
		102.36	111.34	149.02	170.27	199.87	206.33	207.51	186.69	155.63	134.12	106.20	95.89	1825

Stage E				Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	per year
Allow for large array correction?		No														
Width of windfarm	w	2	km													
			large array correction	Collision rates allowing for avoidance												
Avoidance rates modelled		95.00%	100.00%	5.12	5.57	7.45	8.51	9.99	10.32	10.38	9.33	7.78	6.71	5.31	4.79	91.3
		98.00%	100.00%	2.05	2.23	2.98	3.41	4.00	4.13	4.15	3.73	3.11	2.68	2.12	1.92	36.5
		99.00%	100.00%	1.02	1.11	1.49	1.70	2.00	2.06	2.08	1.87	1.56	1.34	1.06	0.96	18.3
		99.56%	100.00%	0.45	0.49	0.66	0.75	0.88	0.91	0.91	0.82	0.68	0.59	0.47	0.42	8.0

Kestrel

COLLISION RISK MODEL

Required input data is in	orange	boxes	
Calculated output is in	blue	boxes	
	green	boxes are for information only, to show variables used at each stage	

Bird data		Value	Units	Windfarm data		Value	Units	Turbine data		Value	Units
Species name		Kestrel		Site name		Drehid		Model		Vesta 162 6.2MW	
Bird length	L	0.34	m	Latitude		53.379	degrees	Hub height		90.95	m
Wingspan	W	0.76	m	No of turbines	T	11		Rotor radius	R	76.05	m
Bird flight speed	v	10.1	$m\ s^{-1}$	Width of windfarm	w	2	km	No of blades	b	3	
Flight type, flapping or gliding		flapping						Rotation speed	Ω	12.24	rpm
% of flights upwind/downwind		50%	50%					Max blade width	C	3.94	m
Nocturnal activity ranking 1-5		1						Blade pitch	λ	9	degrees
Nocturnal activity factor	f_{night}	0%						Risk height range		15-167	m

normal approach — Set to 'normal approach' to use survey data on bird density

Set to 'birds on migration' to use 'Migrant collision risk' sheet in place of Stage A

Stage A				Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	year avge
Daytime bird density	D_A		$birds/km^2$	0.001496	0.001496	0.001496	0.001496	0.001496	0.001496	0.001496	0.001496	0.001496	0.001496	0.001496	0.001496	0.0015
Proportion at rotor risk height	Q_{2R}	93.59%														
At latitude 53.4		Daylight hours per month		251.6	273.7	366.3	418.6	491.4	507.2	510.1	458.9	382.6	329.7	261.1	235.7	4487.0
		Nighttime hours per month		492.4	398.3	377.7	301.4	252.6	212.8	233.9	285.1	337.4	414.3	458.9	508.3	4273.0

Stage B					Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	year total
No of turbines	T	11															
Rotor radius	R	76.05	m														
		Total rotor frontal area m^2		199867													
Nocturnal activity factor	f_{night}	0%															
Bird flight speed	v	10.1	$m\ s^{-1}$														
		Projected number of rotor transits			16.8	18.3	24.5	28.0	32.9	33.9	34.1	30.7	25.6	22.1	17.5	15.8	**300**

Stage C							
No of blades	b	3		Bird length	l	0.34	m
Rotation speed	Ω	12.24	rpm	Wingspan	w	0.76	m
Rotor radius	R	76.05	m	Bird flight speed	v	10.1	$m\ s^{-1}$
Max blade width	C	3.94	m	Flight type		flapping	
Pitch	λ	9	degrees	% of flights upwind/downwind		50%	50%
Blade profile		see Blade profile sheet					
		Single transit risk	upwind	7.31%			
			downwind	3.55%			
			weighted mean	**5.43%**			

Stage D		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	year avge
Proportion of time operational	Q_{op}	85.0%	85.0%	85.0%	85.0%	85.0%	85.0%	85.0%	85.0%	85.0%	85.0%	85.0%	85.0%	85.0%
		Collision rates before avoidance												year total
		0.78	0.84	1.13	1.29	1.52	1.56	1.57	1.42	1.18	1.02	0.81	0.73	**14**

Stage E																
Allow for large array correction?		No														
Width of windfarm	w	2	km													
			large array correction	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	per year
				Collision rates allowing for avoidance												
Avoidance rates modelled		95.00%	100.00%	0.04	0.04	0.06	0.06	0.08	0.08	0.08	0.07	0.06	0.05	0.04	0.04	**0.7**
		98.00%	100.00%	0.02	0.02	0.02	0.03	0.03	0.03	0.03	0.03	0.02	0.02	0.02	0.01	**0.3**
		99.00%	100.00%	0.01	0.01	0.01	0.01	0.02	0.02	0.02	0.01	0.01	0.01	0.01	0.01	**0.1**
		99.50%	100.00%	0.00	0.00	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.00	0.00	**0.1**

Lapwing

COLLISION RISK MODEL

Required input data is in	orange	boxes
Calculated output is in	blue	boxes
	green	boxes are for information only, to show variables used at each stage

Bird data		Value	Units	Windfarm data		Value	Units	Turbine data		Value	Units
Species name		Lapwing		Site name		Drehid		Model		Vesta 162 6.2MW	
Bird length	L	0.295	m	Latitude		53.379	degrees	Hub height		90.95	m
Wingspan	W	0.695	m	No of turbines	T	11		Rotor radius	R	76.05	m
Bird flight speed	v	10	$m\ s^{-1}$	Width of windfarm	w	2	km	No of blades	b	3	
Flight type, flapping or gliding		flapping						Rotation speed	Ω	12.24	rpm
% of flights upwind/downwind		50%	50%					Max blade width	C	3.94	m
Nocturnal activity ranking 1-5		1						Blade pitch	λ	9	degrees
Nocturnal activity factor	f_{night}	0%						Risk height range		15-167	m

normal approach

Set to 'normal approach' to use survey data on bird density

Set to 'birds on migration' to use 'Migrant collision risk' sheet in place of Stage A

Stage A				Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	year avge
Daytime bird density	D_A		birds/km^2	0.000184	0.000184	0.000184	0.000184	0.000184	0.000184	0.000184	0.000184	0.000184	0.000184	0.000184	0.000184	0.0002
Proportion at rotor risk height	Q_{2R}	100.00%														
At latitude 53.4		Daylight hours per month		251.6	273.7	366.3	418.6	491.4	507.2	510.1	458.9	382.6	329.7	261.1	235.7	4487.0
		Nighttime hours per month		492.4	398.3	377.7	301.4	252.6	212.8	233.9	285.1	337.4	414.3	458.9	508.3	4273.0

Stage B																
No of turbines	T	11														
Rotor radius	R	76.05	m													
		Total rotor frontal area m^2	199867													
Nocturnal activity factor	f_{night}	0%														
Bird flight speed	v	10	$m\ s^{-1}$	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	year total
		Projected number of rotor transits		2.2	2.4	3.2	3.6	4.3	4.4	4.4	4.0	3.3	2.9	2.3	2.0	39

Stage C							
No of blades	b	3		Bird length	l	0.295	m
Rotation speed	Ω	12.24	rpm	Wingspan	w	0.695	m
Rotor radius	R	76.05	m	Bird flight speed	v	10	$m\ s^{-1}$
Max blade width	C	3.94	m	Flight type		flapping	
Pitch	λ	9	degrees	% of flights upwind/downwind		50%	50%
Blade profile		see Blade profile sheet					
		Single transit risk		upwind	7.07%		
				downwind	3.28%		
				weighted mean	**5.18%**		

Stage D				Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	year avge
Proportion of time operational	Q_{op}			85.0%	85.0%	85.0%	85.0%	85.0%	85.0%	85.0%	85.0%	85.0%	85.0%	85.0%	85.0%	85.0%
				Collision rates before avoidance												year total
				0.10	0.10	0.14	0.16	0.19	0.19	0.19	0.18	0.15	0.13	0.10	0.09	2

Stage E																
Allow for large array correction?		No														
Width of windfarm	w	2	km													
			large array correction	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	per year
				Collision rates allowing for avoidance												
Avoidance rates modelled		95.00%	100.00%	0.00	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.00	0.00	**0.1**
		98.00%	100.00%	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	**0.0**
		99.00%	100.00%	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	**0.0**
		99.50%	100.00%	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	**0.0**

Lesser Black-backed gull

COLLISION RISK MODEL	Required input data is in	orange	boxes
	Calculated output is in	blue	boxes
		green	boxes are for information only, to show variables used at each stage

		Value	Units			Value	Units			Value	Units
Bird data				**Windfarm data**				**Turbine data**			
Species name		**esser Black-backed Gull**		Site name		**Drehid**		Model		**Vesta 162 6.2MW**	
Bird length	L	0.58	m	Latitude		53.379	degrees	Hub height		90.95	m
Wingspan	W	1.42	m	No of turbines	T	11		Rotor radius	R	76.05	m
Bird flight speed	v	11.9	$m\ s^{-1}$	Width of windfarm	w	2	km	No of blades	b	3	
Flight type, flapping or gliding		flapping						Rotation speed	Ω	12.24	rpm
% of flights upwind/downwind		50%	50%					Max blade width	C	3.94	m
Nocturnal activity ranking 1-5		1						Blade pitch	λ	9	degrees
Nocturnal activity factor	f_{night}	0%						Risk height range		15-167	m

normal approach — Set to 'normal approach' to use survey data on bird density

Set to 'birds on migration' to use 'Migrant collision risk' sheet in place of Stage A

Stage A				Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	year avge
Daytime bird density	D_A		birds/km²	0.012496	0.012496	0.012496	0.012496	0.012496	0.012496	0.012496	0.012496	0.012496	0.012496	0.012496	0.012496	0.0125
Proportion at rotor risk height	Q_{2R}	66.40%														
At latitude 53.4		Daylight hours per month		251.6	273.7	366.3	418.6	491.4	507.2	510.1	458.9	382.6	329.7	261.1	235.7	4487.0
		Nighttime hours per month		492.4	398.3	377.7	301.4	252.6	212.8	233.9	285.1	337.4	414.3	458.9	508.3	4273.0

Stage B																
No of turbines	T	11														
Rotor radius	R	76.05	m													
		Total rotor frontal area m²	199867													
Nocturnal activity factor	f_{night}	0%														
Bird flight speed	v	11.9	$m\ s^{-1}$	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	year total
		Projected number of rotor transits		117.5	127.8	171.1	195.5	229.5	236.9	238.3	214.4	178.7	154.0	121.9	110.1	**2096**

Stage C							
No of blades	b	3		Bird length	l	0.58	m
Rotation speed	Ω	12.24	rpm	Wingspan	w	1.42	m
Rotor radius	R	76.05	m	Bird flight speed	v	11.9	$m\ s^{-1}$
Max blade width	C	3.94	m	Flight type		flapping	
Pitch	λ	9	degrees	% of flights upwind/downwind		50%	50%
Blade profile		see Blade profile sheet					
		Single transit risk	upwind	8.06%			
			downwind	4.73%			
			weighted mean	**6.39%**			

Stage D		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	year avge
Proportion of time operational	Q_{op}	85.0%	85.0%	85.0%	85.0%	85.0%	85.0%	85.0%	85.0%	85.0%	85.0%	85.0%	85.0%	85.0%
		Collision rates before avoidance												year total
		6.39	6.95	9.30	10.62	12.47	12.87	12.95	11.65	9.71	8.37	6.63	5.98	**114**

Stage E																
Allow for large array correction?		No														
Width of windfarm	w	2	km													
			large array correction	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	per year
				Collision rates allowing for avoidance												
Avoidance rates modelled		95.00%	100.00%	0.32	0.35	0.46	0.53	0.62	0.64	0.65	0.58	0.49	0.42	0.33	0.30	**5.7**
		98.00%	100.00%	0.13	0.14	0.19	0.21	0.25	0.26	0.26	0.23	0.19	0.17	0.13	0.12	**2.3**
		99.00%	100.00%	0.06	0.07	0.09	0.11	0.12	0.13	0.13	0.12	0.10	0.08	0.07	0.06	**1.1**
		99.56%	100.00%	0.03	0.03	0.04	0.05	0.05	0.06	0.06	0.05	0.04	0.04	0.03	0.03	**0.5**

Little Egret

COLLISION RISK MODEL

Required input data is in		orange	boxes
Calculated output is in		blue	boxes
		green	boxes are for information only, to show variables used at each stage

Bird data		Value	Units	Windfarm data		Value	Units	Turbine data		Value	Units
Species name		Little egret		Site name		Drehid		Model		Vesta 162 6.2MW	
Bird length	L	0.6	m	Latitude		53.379	degrees	Hub height		90.95	m
Wingspan	W	0.915	m	No of turbines	T	11		Rotor radius	R	76.05	m
Bird flight speed	v	3	$m\ s^{-1}$	Width of windfarm	w	2	km	No of blades	b	3	
Flight type, flapping or gliding		flapping						Rotation speed	Ω	12.24	rpm
% of flights upwind/downwind		50%	50%					Max blade width	C	3.94	m
Nocturnal activity ranking 1-5		1						Blade pitch	λ	9	degrees
Nocturnal activity factor	f_{night}	0%						Risk height range		15-167	m

normal approach

Set to 'normal approach' to use survey data on bird density

Set to 'birds on migration' to use 'Migrant collision risk' sheet in place of Stage A

Stage A

				Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	year avge
Daytime bird density	D_A		birds/km^2	1.25E-05	1.25E-05	1.25E-05	1.25E-05	1.25E-05	1.25E-05	1.25E-05	1.25E-05	1.25E-05	1.25E-05	1.25E-05	1.25E-05	0.0000
Proportion at rotor risk height	Q_{2R}	100.00%														
At latitude 53.4		Daylight hours per month		251.6	273.7	366.3	418.6	491.4	507.2	510.1	458.9	382.6	329.7	261.1	235.7	4487.0
		Nighttime hours per month		492.4	398.3	377.7	301.4	252.6	212.8	233.9	285.1	337.4	414.3	458.9	508.3	4273.0

Stage B

					Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	year total
No of turbines	T	11															
Rotor radius	R	76.05	m														
		Total rotor frontal area m^2		199867													
Nocturnal activity factor	f_{night}	0%															
Bird flight speed	v	3	$m\ s^{-1}$														
		Projected number of rotor transits			0.0	0.0	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.0	0.0	1

Stage C

No of blades	b	3			Bird length	l	0.6	m
Rotation speed	Ω	12.24	rpm		Wingspan	w	0.915	m
Rotor radius	R	76.05	m		Bird flight speed	v	3	$m\ s^{-1}$
Max blade width	C	3.94	m		Flight type		flapping	
Pitch	λ	9	degrees		% of flights upwind/downwind		50%	50%
Blade profile		see Blade profile sheet						
		Single transit risk		upwind	22.16%			
				downwind	16.41%			
				weighted mean	19.28%			

Stage D

		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	year avge
Proportion of time operational	Q_{op}	85.0%	85.0%	85.0%	85.0%	85.0%	85.0%	85.0%	85.0%	85.0%	85.0%	85.0%	85.0%	85.0%
		Collision rates before avoidance												year total
		0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0

Stage E

				Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	per year
Allow for large array correction?		No														
Width of windfarm	w	2	km													
			large array correction	Collision rates allowing for avoidance												
Avoidance rates modelled		95.00%	100.00%	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
		98.00%	100.00%	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
		99.00%	100.00%	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
		99.50%	100.00%	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0

Merlin

COLLISION RISK MODEL

Required input data is in	orange	boxes	
Calculated output is in	blue	boxes	
	green	boxes are for information only, to show variables used at each stage	

Bird data

		Value	Units
Species name		Merlin	
Bird length	L	0.295	m
Wingspan	W	0.62	m
Bird flight speed	v	10.9	m s^{-1}
Flight type, flapping or gliding		flapping	
% of flights upwind/downwind		50%	50%
Nocturnal activity ranking 1-5		1	
Nocturnal activity factor	f_{night}	0%	

Windfarm data

		Value	Units
Site name		Drehid	
Latitude		53.379	degrees
No of turbines	T	11	
Width of windfarm	w	2	km

Turbine data

		Value	Units
Model		Vesta 162 6.2MW	
Hub height		90.95	m
Rotor radius	R	76.05	m
No of blades	b	3	
Rotation speed	Ω	12.24	rpm
Max blade width	C	3.94	m
Blade pitch	λ	9	degrees
Risk height range		15-167	m

normal approach

Set to 'normal approach' to use survey data on bird density

Set to 'birds on migration' to use 'Migrant collision risk' sheet in place of Stage A

Stage A

			Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	year avge
Daytime bird density	D_A	birds/km^2	2.41E-05	2.41E-05	2.41E-05	2.41E-05	2.41E-05	2.41E-05	2.41E-05	2.41E-05	2.41E-05	2.41E-05	2.41E-05	2.41E-05	0.0000
Proportion at rotor risk height	Q_{2R}	98.75%													
At latitude 53.4		Daylight hours per month	251.6	273.7	366.3	418.6	491.4	507.2	510.1	458.9	382.6	329.7	261.1	235.7	4487.0
		Nighttime hours per month	492.4	398.3	377.7	301.4	252.6	212.8	233.9	285.1	337.4	414.3	458.9	508.3	4273.0

Stage B

No of turbines	T	11	
Rotor radius	R	76.05	m
		Total rotor frontal area m^2	199867
Nocturnal activity factor	f_{night}	0%	
Bird flight speed	v	10.9	m s^{-1}

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	year total
Projected number of rotor transits	0.3	0.3	0.4	0.5	0.6	0.6	0.6	0.6	0.5	0.4	0.3	0.3	6

Stage C

No of blades	b	3		Bird length	l	0.295	m
Rotation speed	Ω	12.24	rpm	Wingspan	w	0.62	m
Rotor radius	R	76.05	m	Bird flight speed	v	10.9	m s^{-1}
Max blade width	C	3.94	m	Flight type		flapping	
Pitch	λ	9	degrees	% of flights upwind/downwind		50%	50%
Blade profile		see Blade profile sheet					

Single transit risk		
	upwind	6.74%
	downwind	3.17%
	weighted mean	4.96%

Stage D

		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	year avge
Proportion of time operational	Q_{op}	85.0%	85.0%	85.0%	85.0%	85.0%	85.0%	85.0%	85.0%	85.0%	85.0%	85.0%	85.0%	85.0%

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	year total
Collision rates before avoidance	0.01	0.01	0.02	0.02	0.03	0.03	0.03	0.02	0.02	0.02	0.01	0.01	0

Stage E

Allow for large array correction?		No	
Width of windfarm	w	2	km

		large array correction	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	per year
			Collision rates allowing for avoidance												
Avoidance rates modelled	95.00%	100.00%	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
	98.00%	100.00%	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
	99.00%	100.00%	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
	99.50%	100.00%	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0

Peregrine

COLLISION RISK MODEL

Required input data is in orange boxes
Calculated output is in blue boxes
green boxes are for information only, to show variables used at each stage

Bird data		Value	Units	Windfarm data		Value	Units	Turbine data		Value	Units
Species name		Peregrine		Site name		Drehid		Model		Vesta 162 6.2MW	
Bird length	L	0.42	m	Latitude		53.379	degrees	Hub height		90.95	m
Wingspan	W	1.02	m	No of turbines	T	11		Rotor radius	R	76.05	m
Bird flight speed	v	12.1	$m\ s^{-1}$	Width of windfarm	w	2	km	No of blades	b	3	
Flight type, flapping or gliding		flapping						Rotation speed	Ω	12.24	rpm
% of flights upwind/downwind		50%	50%					Max blade width	C	3.94	m
Nocturnal activity ranking 1-5		1						Blade pitch	λ	9	degrees
Nocturnal activity factor	f_{night}	0%						Risk height range		15-167	m

normal approach

Set to 'normal approach' to use survey data on bird density
Set to 'birds on migration' to use 'Migrant collision risk' sheet in place of Stage A

Stage A				Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	year avge
Daytime bird density	D_A		birds/km^2	0.00003	0.00003	0.00003	0.00003	0.00003	0.00003	0.00003	0.00003	0.00003	0.00003	0.00003	0.00003	0.0000
Proportion at rotor risk height	Q_{2R}	100.00%														
At latitude 53.4		Daylight hours per month		251.6	273.7	366.3	418.6	491.4	507.2	510.1	458.9	382.6	329.7	261.1	235.7	4487.0
		Nighttime hours per month		492.4	398.3	377.7	301.4	252.6	212.8	233.9	285.1	337.4	414.3	458.9	508.3	4273.0

Stage B				Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	year total
No of turbines	T	11														
Rotor radius	R	76.05	m													
		Total rotor frontal area m^2	199867													
Nocturnal activity factor	f_{night}	0%														
Bird flight speed	v	12.1	$m\ s^{-1}$													
		Projected number of rotor transits		0.4	0.5	0.6	0.7	0.8	0.9	0.9	0.8	0.7	0.6	0.4	0.4	8

Stage C							
No of blades	b	3		Bird length	l	0.42	m
Rotation speed	Ω	12.24	rpm	Wingspan	w	1.02	m
Rotor radius	R	76.05	m	Bird flight speed	v	12.1	$m\ s^{-1}$
Max blade width	C	3.94	m	Flight type		flapping	
Pitch	λ	9	degrees	% of flights upwind/downwind		50%	50%
Blade profile		see Blade profile sheet					
		Single transit risk	upwind	7.11%			
			downwind	3.82%			
			weighted mean	5.47%			

Stage D		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	year avge
Proportion of time operational	Q_{op}	85.0%	85.0%	85.0%	85.0%	85.0%	85.0%	85.0%	85.0%	85.0%	85.0%	85.0%	85.0%	85.0%
		Collision rates before avoidance												year total
		0.02	0.02	0.03	0.03	0.04	0.04	0.04	0.04	0.03	0.03	0.02	0.02	0

Stage E				Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	per year
Allow for large array correction?		No														
Width of windfarm	w	2	km													
			large array correction	Collision rates allowing for avoidance												
Avoidance rates modelled		95.00%	100.00%	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
		98.00%	100.00%	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
		99.00%	100.00%	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
		99.50%	100.00%	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0

Snipe

COLLISION RISK MODEL

Required input data is in	orange	boxes
Calculated output is in	blue	boxes
	green	boxes are for information only, to show variables used at each stage

Bird data

		Value	Units
Species name		Snipe	
Bird length	L	0.26	m
Wingspan	W	0.46	m
Bird flight speed	v	17.1	m s^{-1}
Flight type, flapping or gliding		flapping	
% of flights upwind/downwind		50%	50%
Nocturnal activity ranking 1-5		1	
Nocturnal activity factor	f_{night}	0%	

Windfarm data

		Value	Units
Site name		Drehid	
Latitude		53.379	degrees
No of turbines	T	11	
Width of windfarm	w	2	km

Turbine data

		Value	Units
Model		Vesta 162 6.2MW	
Hub height		90.95	m
Rotor radius	R	76.05	m
No of blades	b	3	
Rotation speed	Ω	12.24	rpm
Max blade width	C	3.94	m
Blade pitch	λ	9	degrees
Risk height range		15-167	m

normal approach — Set to 'normal approach' to use survey data on bird density
Set to 'birds on migration' to use 'Migrant collision risk' sheet in place of Stage A

Stage A

				Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	year avge
Daytime bird density	D_A		birds/km^2	0.000166	0.000166	0.000166	0.000166	0.000166	0.000166	0.000166	0.000166	0.000166	0.000166	0.000166	0.000166	0.0002
Proportion at rotor risk height	Q_{2R}	76.92%														
At latitude 53.4		Daylight hours per month		251.6	273.7	366.3	418.6	491.4	507.2	510.1	458.9	382.6	329.7	261.1	235.7	4487.0
		Nighttime hours per month		492.4	398.3	377.7	301.4	252.6	212.8	233.9	285.1	337.4	414.3	458.9	508.3	4273.0

Stage B

No of turbines	T	11	
Rotor radius	R	76.05	m
		Total rotor frontal area m^2	199867
Nocturnal activity factor	f_{night}	0%	
Bird flight speed	v	17.1	m s^{-1}

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	year total
Projected number of rotor transits	2.6	2.8	3.8	4.3	5.1	5.2	5.3	4.7	4.0	3.4	2.7	2.4	46

Stage C

No of blades	b	3		Bird length	l	0.26	m
Rotation speed	Ω	12.24	rpm	Wingspan	w	0.46	m
Rotor radius	R	76.05	m	Bird flight speed	v	17.1	m s^{-1}
Max blade width	C	3.94	m	Flight type		flapping	
Pitch	λ	9	degrees	% of flights upwind/downwind		50%	50%
Blade profile		see Blade profile sheet					

Single transit risk		
	upwind	5.34%
	downwind	2.97%
	weighted mean	4.16%

Stage D

		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	year avge
Proportion of time operational	Q_{op}	85.0%	85.0%	85.0%	85.0%	85.0%	85.0%	85.0%	85.0%	85.0%	85.0%	85.0%	85.0%	85.0%

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	year total
Collision rates before avoidance	0.09	0.10	0.13	0.15	0.18	0.19	0.19	0.17	0.14	0.12	0.10	0.09	2

Stage E

Allow for large array correction?		No	
Width of windfarm	w	2	km

Collision rates allowing for avoidance

		large array correction	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	per year
Avoidance rates modelled	95.00%	100.00%	0.00	0.00	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.00	0.00	0.1
	98.00%	100.00%	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
	99.00%	100.00%	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
	99.50%	100.00%	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0

Sparrowhawk

COLLISION RISK MODEL

Required input data is in	orange	boxes
Calculated output is in	blue	boxes
	green	boxes are for information only, to show variables used at each stage

		Value	Units			Value	Units			Value	Units
Bird data				**Windfarm data**				**Turbine data**			
Species name		**Sparrowhawk**		Site name		**Drehid**		Model		**Vesta 162 6.2MW**	
Bird length	L	0.33	m	Latitude		53.379	degrees	Hub height		90.95	m
Wingspan	W	0.62	m	No of turbines	T	11		Rotor radius	R	76.05	m
Bird flight speed	v	11.3	$m\ s^{-1}$	Width of windfarm	w	2	km	No of blades	b	3	
Flight type, flapping or gliding		flapping						Rotation speed	Ω	12.24	rpm
% of flights upwind/downwind		50%	50%					Max blade width	C	3.94	m
Nocturnal activity ranking 1-5		1						Blade pitch	λ	9	degrees
Nocturnal activity factor	f_{night}	0%						Risk height range		15-167	m

normal approach

Set to 'normal approach' to use survey data on bird density

Set to 'birds on migration' to use 'Migrant collision risk' sheet in place of Stage A

Stage A

				Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	year avge
Daytime bird density	D_A		$birds/km^2$	0.00132	0.00132	0.00132	0.00132	0.00132	0.00132	0.00132	0.00132	0.00132	0.00132	0.00132	0.00132	0.0013
Proportion at rotor risk height	Q_{2R}	79.95%														
At latitude 53.4		Daylight hours per month		251.6	273.7	366.3	418.6	491.4	507.2	510.1	458.9	382.6	329.7	261.1	235.7	4487.0
		Nighttime hours per month		492.4	398.3	377.7	301.4	252.6	212.8	233.9	285.1	337.4	414.3	458.9	508.3	4273.0

Stage B

No of turbines	T	11														
Rotor radius	R	76.05	m													
		Total rotor frontal area m^2	199867													
Nocturnal activity factor	f_{night}	0%														
Bird flight speed	v	11.3	$m\ s^{-1}$	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	year total
		Projected number of rotor transits		14.2	15.4	20.7	23.6	27.7	28.6	28.8	25.9	21.6	18.6	14.7	13.3	**253**

Stage C

No of blades	b	3			Bird length	l	0.33	m
Rotation speed	Ω	12.24	rpm		Wingspan	w	0.62	m
Rotor radius	R	76.05	m		Bird flight speed	v	11.3	$m\ s^{-1}$
Max blade width	C	3.94	m		Flight type		flapping	
Pitch	λ	9	degrees		% of flights upwind/downwind		50%	50%
Blade profile		see Blade profile sheet						
		Single transit risk	upwind	6.80%				
			downwind	3.33%				
			weighted mean	**5.06%**				

Stage D

		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	year avge
Proportion of time operational	Q_{op}	85.0%	85.0%	85.0%	85.0%	85.0%	85.0%	85.0%	85.0%	85.0%	85.0%	85.0%	85.0%	85.0%
		Collision rates before avoidance												year total
		0.61	0.66	0.89	1.02	1.19	1.23	1.24	1.11	0.93	0.80	0.63	0.57	**11**

Stage E

Allow for large array correction?		No													
Width of windfarm	w	2	km												
			large array correction	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	per year
				Collision rates allowing for avoidance												
Avoidance rates modelled		95.00%	100.00%	0.03	0.03	0.04	0.05	0.06	0.06	0.06	0.06	0.05	0.04	0.03	0.03	**0.5**
		98.00%	100.00%	0.01	0.01	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.01	0.01	**0.2**
		99.00%	100.00%	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	**0.1**
		99.50%	100.00%	0.00	0.00	0.00	0.01	0.01	0.01	0.01	0.01	0.00	0.00	0.00	0.00	**0.1**

Stock Dove

COLLISION RISK MODEL

Required input data is in	orange	boxes
Calculated output is in	blue	boxes
	green	boxes are for information only, to show variables used at each stage

Bird data

		Value	Units
Species name		Stock Dove	
Bird length	L	0.31	m
Wingspan	W	0.63	m
Bird flight speed	v	13.9	$m\ s^{-1}$
Flight type, flapping or gliding		flapping	
% of flights upwind/downwind		50%	50%
Nocturnal activity ranking 1-5		1	
Nocturnal activity factor	f_{night}	0%	

Windfarm data

		Value	Units
Site name		Drehid	
Latitude		53.379	degrees
No of turbines	T	11	
Width of windfarm	w	2	km

Turbine data

		Value	Units
Model		Vesta 162 6.2MW	
Hub height		90.95	m
Rotor radius	R	76.05	m
No of blades	b	3	
Rotation speed	Ω	12.24	rpm
Max blade width	C	3.94	m
Blade pitch	λ	9	degrees
Risk height range		15-167	m

normal approach — Set to 'normal approach' to use survey data on bird density

Set to 'birds on migration' to use 'Migrant collision risk' sheet in place of Stage A

Stage A

				Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	year avge
Daytime bird density	D_A		birds/km²	1.39E-05	1.39E-05	1.39E-05	1.39E-05	1.39E-05	1.39E-05	1.39E-05	1.39E-05	1.39E-05	1.39E-05	1.39E-05	1.39E-05	0.0000
Proportion at rotor risk height	Q_{2R}	50.00%														
At latitude 53.4		Daylight hours per month		251.6	273.7	366.3	418.6	491.4	507.2	510.1	458.9	382.6	329.7	261.1	235.7	4487.0
		Nighttime hours per month		492.4	398.3	377.7	301.4	252.6	212.8	233.9	285.1	337.4	414.3	458.9	508.3	4273.0

Stage B

				Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	year total
No of turbines	T	11														
Rotor radius	R	76.05	m													
		Total rotor frontal area m²	199867													
Nocturnal activity factor	f_{night}	0%														
Bird flight speed	v	13.9	$m\ s^{-1}$													
		Projected number of rotor transits		0.1	0.1	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.1	0.1	2

Stage C

No of blades	b	3		Bird length	l	0.31	m	
Rotation speed	Ω	12.24	rpm	Wingspan	w	0.63	m	
Rotor radius	R	76.05	m	Bird flight speed	v	13.9	$m\ s^{-1}$	
Max blade width	C	3.94	m	Flight type		flapping		
Pitch	λ	9	degrees	% of flights upwind/downwind		50%		50%
Blade profile		see Blade profile sheet						
		Single transit risk	upwind	6.07%				
			downwind	3.16%				
			weighted mean	4.61%				

Stage D

		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	year avge
Proportion of time operational	Q_{op}	85.0%	85.0%	85.0%	85.0%	85.0%	85.0%	85.0%	85.0%	85.0%	85.0%	85.0%	85.0%	85.0%
		Collision rates before avoidance												year total
		0.00	0.00	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.00	0.00	0

Stage E

				Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	per year
Allow for large array correction?		No														
Width of windfarm	w	2	km													
			large array correction	Collision rates allowing for avoidance												
Avoidance rates modelled		95.00%	100.00%	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
		98.00%	100.00%	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
		99.00%	100.00%	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
		99.50%	100.00%	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0

Swift

COLLISION RISK MODEL

Required input data is in	orange	boxes
Calculated output is in	blue	boxes
	green	boxes are for information only, to show variables used at each stage

Bird data		Value	Units	Windfarm data		Value	Units	Turbine data		Value	Units
Species name		Swift		Site name		Drehid		Model		Vesta 162 6.2MW	
Bird length	L	0.16	m	Latitude		53.379	degrees	Hub height		90.95	m
Wingspan	W	0.45	m	No of turbines	T	11		Rotor radius	R	76.05	m
Bird flight speed	v	10.5	$m\ s^{-1}$	Width of windfarm	w	2	km	No of blades	b	3	
Flight type, flapping or gliding		flapping						Rotation speed	Ω	12.24	rpm
% of flights upwind/downwind		50%	50%					Max blade width	C	3.94	m
Nocturnal activity ranking 1-5		1						Blade pitch	λ	9	degrees
Nocturnal activity factor	f_{night}	0%						Risk height range		15-167	m

normal approach

Set to 'normal approach' to use survey data on bird density

Set to 'birds on migration' to use 'Migrant collision risk' sheet in place of Stage A

Stage A

				Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	year avge
Daytime bird density	D_A		birds/km^2	0.000723	0.000723	0.000723	0.000723	0.000723	0.000723	0.000723	0.000723	0.000723	0.000723	0.000723	0.000723	0.0007
Proportion at rotor risk height	Q_{2R}	78.83%														
At latitude 53.4		Daylight hours per month		251.6	273.7	366.3	418.6	491.4	507.2	510.1	458.9	382.6	329.7	261.1	235.7	4487.0
		Nighttime hours per month		492.4	398.3	377.7	301.4	252.6	212.8	233.9	285.1	337.4	414.3	458.9	508.3	4273.0

Stage B

					Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	year total
No of turbines	T	11															
Rotor radius	R	76.05	m														
		Total rotor frontal area m^2		199867													
Nocturnal activity factor	f_{night}	0%															
Bird flight speed	v	10.5	$m\ s^{-1}$														
		Projected number of rotor transits			7.1	7.7	10.4	11.8	13.9	14.4	14.4	13.0	10.8	9.3	7.4	6.7	127

Stage C

No of blades	b	3		Bird length	l	0.16	m	
Rotation speed	Ω	12.24	rpm	Wingspan	w	0.45	m	
Rotor radius	R	76.05	m	Bird flight speed	v	10.5	$m\ s^{-1}$	
Max blade width	C	3.94	m	Flight type		flapping		
Pitch	λ	9	degrees	% of flights upwind/downwind		50%	50%	
Blade profile		see Blade profile sheet						
		Single transit risk	upwind	6.09%				
			downwind	2.42%				
			weighted mean	4.26%				

Stage D

		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	year avge
Proportion of time operational	Q_{op}	85.0%	85.0%	85.0%	85.0%	85.0%	85.0%	85.0%	85.0%	85.0%	85.0%	85.0%	85.0%	85.0%
		Collision rates before avoidance												year total
		0.26	0.28	0.37	0.43	0.50	0.52	0.52	0.47	0.39	0.34	0.27	0.24	5

Stage E

Allow for large array correction?		No														
Width of windfarm	w	2	km													
			large array correction	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	per year
				Collision rates allowing for avoidance												
Avoidance rates modelled		95.00%	100.00%	0.01	0.01	0.02	0.02	0.03	0.03	0.03	0.02	0.02	0.02	0.01	0.01	0.2
		98.00%	100.00%	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.00	0.1
		99.00%	100.00%	0.00	0.00	0.00	0.00	0.01	0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.0
		99.50%	100.00%	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0

Whooper Swan

COLLISION RISK MODEL

Required input data is in	orange	boxes
Calculated output is in	blue	boxes
	green	boxes are for information only, to show variables used at each stage

Bird data		Value	Units	Windfarm data		Value	Units	Turbine data		Value	Units
Species name		Whooper Swan		Site name		Drehid		Model		Vesta 162 6.2MW	
Bird length	L	1.525	m	Latitude		53.379	degrees	Hub height		90.95	m
Wingspan	W	2.305	m	No of turbines	T	11		Rotor radius	R	76.05	m
Bird flight speed	v	10	m s^-1	Width of windfarm	w	2	km	No of blades	b	3	
Flight type, flapping or gliding		flapping						Rotation speed	Ω	12.24	rpm
% of flights upwind/downwind		50%	50%					Max blade width	C	3.94	m
Nocturnal activity ranking 1-5		1						Blade pitch	λ	9	degrees
Nocturnal activity factor	f_{night}	0%						Risk height range		15-167	m

normal approach

Set to 'normal approach' to use survey data on bird density
Set to 'birds on migration' to use 'Migrant collision risk' sheet in place of Stage A

Stage A				Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	year avge
Daytime bird density	D_A		birds/km²	0.000704	0.000704	0.000704	0.000704	0.000704	0.000704	0.000704	0.000704	0.000704	0.000704	0.000704	0.000704	0.0007
Proportion at rotor risk height	Q_{2R}	99.90%														
At latitude 53.4		Daylight hours per month		251.6	273.7	366.3	418.6	491.4	507.2	510.1	458.9	382.6	329.7	261.1	235.7	4487.0
		Nighttime hours per month		492.4	398.3	377.7	301.4	252.6	212.8	233.9	285.1	337.4	414.3	458.9	508.3	4273.0

Stage B					Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	year total
No of turbines	T	11															
Rotor radius	R	76.05	m														
		Total rotor frontal area m²		199867													
Nocturnal activity factor	f_{night}	0%															
Bird flight speed	v	10	m s^-1														
		Projected number of rotor transits			8.4	9.1	12.2	13.9	16.4	16.9	17.0	15.3	12.7	11.0	8.7	7.8	149

Stage C								
No of blades	b	3		Bird length	l	1.525	m	
Rotation speed	Ω	12.24	rpm	Wingspan	w	2.305	m	
Rotor radius	R	76.05	m	Bird flight speed	v	10	m s^-1	
Max blade width	C	3.94	m	Flight type		flapping		
Pitch	λ	9	degrees	% of flights upwind/downwind		50%	50%	
Blade profile		see Blade profile sheet						
		Single transit risk	upwind	14.67%				
			downwind	10.88%				
			weighted mean	12.77%				

Stage D		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	year avge
Proportion of time operational	Q_{op}	85.0%	85.0%	85.0%	85.0%	85.0%	85.0%	85.0%	85.0%	85.0%	85.0%	85.0%	85.0%	85.0%
		Collision rates before avoidance												year total
		0.91	0.99	1.32	1.51	1.78	1.83	1.84	1.66	1.38	1.19	0.94	0.85	16

Stage E																
Allow for large array correction?		No														
Width of windfarm	w	2	km													
			large array correction	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	per year
				Collision rates allowing for avoidance												
Avoidance rates modelled		95.00%	100.00%	0.05	0.05	0.07	0.08	0.09	0.09	0.09	0.08	0.07	0.06	0.05	0.04	0.8
		98.00%	100.00%	0.02	0.02	0.03	0.03	0.04	0.04	0.04	0.03	0.03	0.02	0.02	0.02	0.3
		99.00%	100.00%	0.01	0.01	0.01	0.02	0.02	0.02	0.02	0.02	0.01	0.01	0.01	0.01	0.2
		99.50%	100.00%	0.00	0.00	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.00	0.00	0.1

FEHILY
TIMONEY

DESIGNING AND DELIVERING
A SUSTAINABLE FUTURE

www.fehilytimoney.ie