Appendix 7A

ORNITHOLOGICAL MONITORING RESULTS REPORT

Brittas Wind Farm, Co. Tipperary

Appendix 7A:

Ornithological monitoring - results report:

October 2021 to September 2023

Brittas Wind Farm Limited, Ørsted Onshore Ireland Midco Limited

Report prepared by APEM Group Woodrow

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Statement of Authority

This report was compiled by Adrian Walsh and Julieta Pedrana, where were assisted by Conn Barry and Bruno Mels. The report has been reviewed and approved by Mike Trewby. Ornithological surveys were carried out by experienced ornithological surveyors including Andre Robinson (AR), Seán Doyle (SD), Ken Westman (KW), Joe Kelly (JK), Ed Morris (EM), John Hehir (JH), Mike Trewby (MT), Patrick Devereaux (PDEV), Simon Mitchell (SM), Ciarán Smyth (CS), Tom Ryan (TR), Andrea Parisi (AP), Ajay Cheruthon (AC), Geoff Oliver (GO). Surveyor initials are used to indicate who was responsible for undertaking a given survey.

Adrian is an Ecologist with Woodrow Sustainable Solutions Ltd (APEM Group Woodrow). He has completed an honours BSc with a focus on Zoology and an MSc in Wildlife Conservation and Management at University College Dublin. He is a Qualifying Member of the Chartered Institute of Ecology and Environmental Management (CIEEM). He has experience in bird surveys, bat surveys, terrestrial mammal surveys and regularly contributes to Appropriate Assessment and Ecological Impact Assessment reports. He volunteers as a surveyor for Birdwatch Ireland for the Irish Wetland Bird Survey (I-WeBS) and the Countryside Bird Survey (CBS).

Julieta is a Senior Ecologist with APEM Group Woodrow. She has completed a B.Sc. in Biological Science at University of Mar del Plata, Argentina and a Ph.D. in Conservation Biology at the University of Southern Patagonia, Argentina. From 2017 to 2023, Julieta worked as a Senior Scientist researcher of the National Council of Scientific Research from Argentina at the Department of Environmental Science, National Technological University, Argentina. The main themes of her research have been the application of GIS-based modelling in nature conservation focusing on the predictive models for species occurrence and habitat suitability. She regularly carries out ornithological surveys and compiles ornithological reports, including carrying out Collision Risk Modelling to inform wind farm planning.

Mike is an Assistant Director with APEM Group Woodrow and is the Division's lead ornithologist and field work manager. Mike worked for Birdwatch Ireland from 2003 to 2010 conducting research on red-billed chough, red grouse and breeding seabirds. Prior to joining Woodrow in 2016, Mike worked as an independent ornithological consultant, and he has over 20 years fieldwork and research experience in the field of ecology. Mike regularly undertakes impact assessments for large scale developments and is a full member of CIEEM (MCIEEM).

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7A.1. OVERVIEW

APEM Group Woodrow was commissioned by Brittas Wind Farm Limited, a subsidiary of Ørsted Onshore Ireland Midco Limited, to undertake ornithological survey work for the proposed Brittas Wind Farm in Co. Tipperary. As shown in Figure 7A.1, the Proposed Project includes a 10-turbine wind farm site, with associated access tracks, cabling and other infrastructure including an on-site 110kV electrical substation (hereafter referred to as the proposed Wind Farm Site), which is located within the townlands of Brittas, Rossestown, Clobanna, Brownstown, Kilkillahara and Killeenleigh, approximately 3 km north of Thurles town and centred on Irish National Grid Reference: S 13463 62522 (ITM: 613412, 662553).

The Proposed Project also includes a turbine delivery route (TDR) and a grid connection route (GCR). The TDR runs from the Port of Foynes in Co. Limerick to the proposed Wind Farm Site via the national, regional and local road network. The GCR exits the proposed Wind Farm Site from the on-site electrical substation in the northeast of the site and runs south for approximately 7 km, following the public road to the existing Thurles 110kV electrical substation, located in the townland of Ballygammane, Co. Tipperary. As the cabling for the grid connection will be laid underground, primarily within the public road, there will be no avian collision risk associated with the GCR and impacts will be limited to potential disturbance during construction. Similarly, the potential for ornithological impacts to arise due to the use of the proposed TDR is minimal and impacts due to vegetation clearance are restricted to two locations within the townlands of Brittas and Brittasroad, Co. Tipperary and these were included in the survey area for the proposed Wind Farm Site.

The ornithological study focused on the area of the proposed Wind Farm Site and a range of study areas were applied depending on the different aspects of avian ecology being investigated; with the aim of identifying the occurrence, status and distribution of any sensitive bird species potentially affected by collision risk, disturbance and displacement due to the proposed Wind Farm.

Avian collision risk for the 10 wind turbines proposed is assessed in Appendix 7H, which runs collision risk models that account for the range in turbine specifications proposed, including:

- Blade tip height up to 180 m;
- Hub height ranging from 102.5 m to 105.5 m; and,
- Rotor diameter ranging from 149 m to 155 m.

The River Suir flows in a southerly direction through the proposed Wind Farm Site and the associated floodplain, although relatively constrained by rising ground and only flooding periodically, does provide a range of wetland habitats, with some areas retaining natural and semi-natural vegetation types. The banks along this section of the River Suir have been modified, with much of the river's flood plain converted to improved agricultural grasslands that are heavily drained. Improved agricultural grassland is the dominant habitat within the proposed Wind Farm Site, which largely supports beef and some dairy production. The northwestern part of the proposed Wind Farm Site includes an area of particularly intensively managed grassland. Other activities occurring within the proposed Wind Farm Site include shooting of wildfowl along the banks of the River Suir and in the southern part of the site there is an archery club. In the southern part of the proposed Wind Farm Site, blocks of coniferous and broadleaf plantations, which support some veteran and specimen trees, are a more prominent feature adjacent to the agricultural grasslands. There is a network of treelines and hedgerows providing nesting and foraging opportunities, as well as connectivity through the area.

Ornithological surveys compliant with the 2017 SNH (NatureScot) guidelines for informing the impact assessment of onshore wind farms on avian populations were carried out for the proposed Wind Farm

Site. Surveying commenced in October 2021 and was completed in September 2023. SNH (2017) recommends that two years of bird data be collected. A third study year covering a slightly smaller study area was undertaken from October 2020 to August 2021, the results of which are presented Appendix 7I.

Survey requirements were informed by a desk study, investigating the occurrence of conservation sites designated for bird species (Special Protection Areas – SPAs), bird sensitivity mapping and records of birds historically occurring in the area.

Breeding season surveys undertaken included:

- Vantage point (VP) watches recording flight activity through the 500 m turbine buffer
- Breeding bird surveys covering the 500 m turbine buffer, including:
  - Territory mapping applying reduced effort common bird census (CBC) methodology to sample the range of different habitats occurring, as described in Gilbert *et al*. (1998)
  - Breeding waders, incorporating an adapted O'Brien & Smith (1992) methodology incorporating timings for optimal detection of breeding snipe
  - Dusk surveys for crepuscular/nocturnal species, in particular woodcock and long-eared owls
  - Riverine survey along the River Suir, including habitat suitability assessment for breeding kingfisher
- Wider area breeding raptor surveys covering the 2 km turbine buffer
- Wider area searches for barn owl sites covering the 1 km turbine buffer

Non-breeding season surveys undertaken included:

- Vantage point (VP) watches recording flight activity through the 500 m turbine buffer
- Winter site walkover surveys covering the 500 m turbine buffer
- Wider area wintering waterbird surveys
- Hen harrier roost searches

The range of ornithological study areas initially set up extend further than is required to assess the final proposed turbine layout, as the extent of the viable area constricted over time, as various constraints emerged and were avoided during the design phase. Maps used throughout this report illustrate the ornithological study areas in relation the final proposed turbine layout and where relevant are referred to as the 500 m, 2 km and 5-6 km turbine buffers. The 500 m turbine buffer encompasses the proposed Wind Farm Site. Appendix 7D provides a map showing the extent of the original study area in relation to the final buffers applied for the ornithological impact assessment.

This report documents the results from the desk study and surveys to provide the baseline ornithological information required to inform an ornithological impact assessment for the Proposed Project.

The use of species names within this report will be the generally accepted common names in English, following those in normal usage in Ireland. Where appropriate prefixes such as common, European, Eurasian or other geographic nomenclature are not used, e.g. golden plover as opposed to European golden plover, lapwing as opposed to northern lapwing, buzzard as opposed to common buzzard. Where species are listed, these are typically ordered by conservation status with species listed alphabetically, as opposed to taxonomically, unless tables or text have been reproduced from other sources. BTO species codes may be used on maps and Appendix 7B provides the list of BTO species codes and common names. Use of scientific names is kept to a minimum within the body of text and a list of both scientific and common names of birds covered in this report is provided in Table 7A.1.

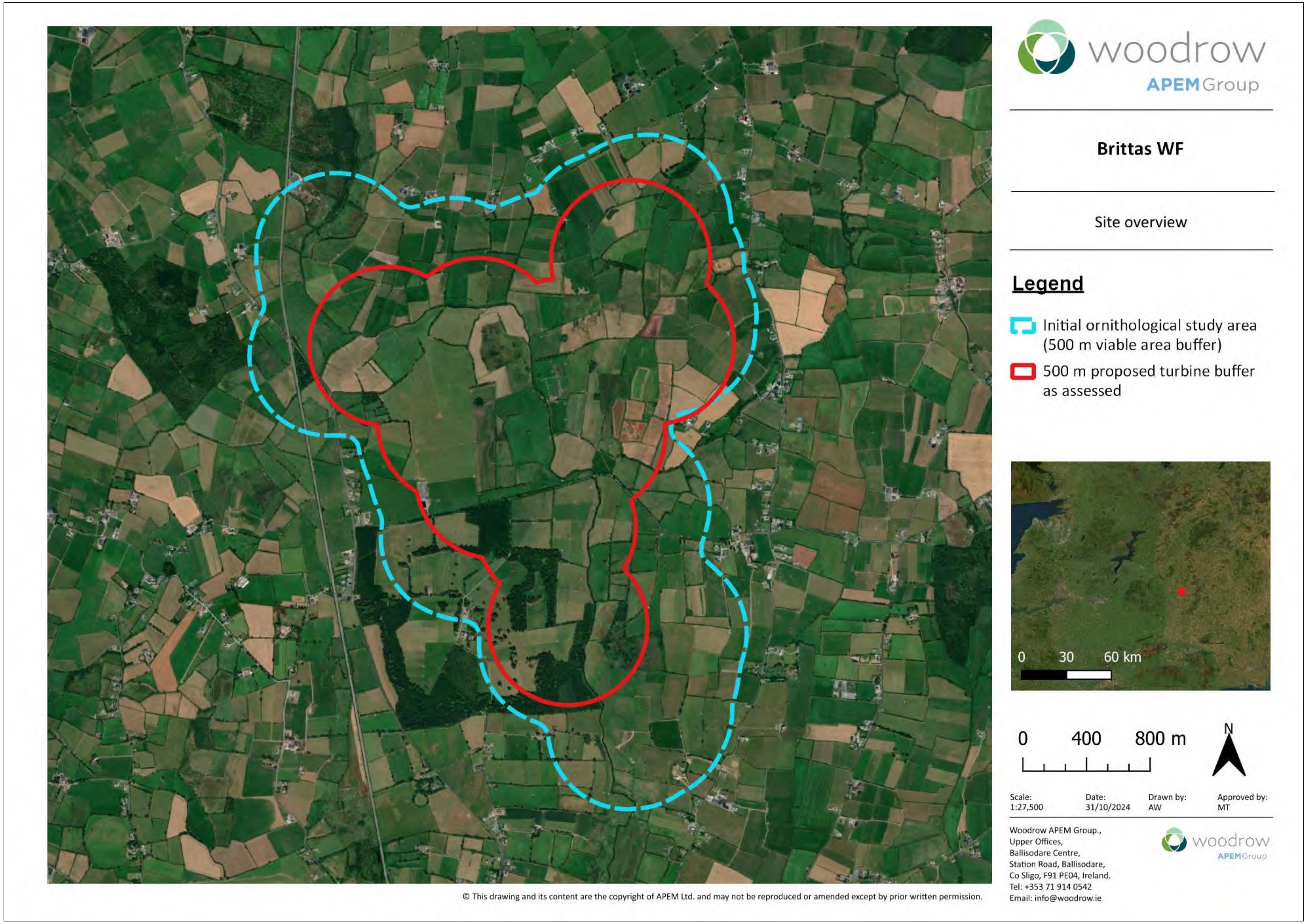

Figure 7A.1: Overview map showing ornithological study area – 500 m turbine buffer

7A.2. DESK STUDY

An initial desk-based review of the ornithological information available for the viable area identified for the potential installation of wind turbines and the surrounding wider area was undertaken. This review takes account of appropriate distances for potential species ranges and connectivity to designated areas, and the findings were compiled to identify target species and determine the appropriate surveys required to inform any potential for ornithological constraints and ornithological impact assessment.

7A.2.1. Scope and approach for ornithological desk study

A preliminary assessment of avian habitat suitability and availability was undertaken using ortho-imagery and 6-inch mapping, which was viewed using Bing Maps, Google EarthPro, Google Maps, and Ordnance Survey Ireland – GeoHive. This was further informed by scoping visits to the area. In addition, the results of previous surveys carried out for the proposed Wind Farm Site were consulted including one year of ornithological data collected between October 2020 and August 2021 in adherence with SNH (2017) guidelines – see Appendix 7I (Fehily Timoney, 2022).

The National Parks and Wildlife Services (NPWS) Designations Viewer was used to identify any nearby Special Protection Areas (SPAs), and respective species listed as Special Conservation Interest (SCI) for which these sites have been designated. The NPWS Designation Viewer was also used to identify nationally important sites for biodiversity, including Natural Heritage Areas (NHAs) and proposed Natural Heritage Areas (pNHAs) and to review these sites to determine whether they are recognised as supporting any features ornithological interest. Shapefiles and metadata for designated sites have been downloaded and are updated annually for use by APEM Group Woodrow ecologists on local Geographic Information Systems (GIS). The Environmental Protection Agency's (EPA) map viewer (EPA Maps) was used to investigate hydrological connectivity to SPAs using the "River Flow Direction" tool.

SNH (2016) guidelines on assessing SPA connectivity with proposed developments recommends that core ranges of species listed as Special Conservation Interests (SCIs) should be examined to assess connectivity between proposed developments and any surrounding SPAs. The largest core ranges presented in SNH (2016) are 15-20 km for certain geese species, including greylag geese and pink-footed geese. SNH (2023) provides similar screening distances for breeding seabirds, and while these were consulted, it is noted that the distances provides are for application in the marine environment for assessment potential connectivity between coastal seabird colonies and offshore wind farms.

Bird records were collated from the National Biodiversity Data Centre (NBDC) database, using the report function on Biodiversity Maps to generate a biological records data report. The search area selected was the 10 km Irish national grid square [S16], which encompassed the proposed Wind Farm Site – see Figure 7A.2. Most of the records generated by the report are based on the results of the Bird Atlas 2007-2011 (Balmer *et al*., 2013). In addition, a records request was made to the Centre for Environmental Data and Recording (CEDaR) for ecological records within the same 10 km Irish national grid square [S16]. These historical ornithological records are listed in Table 7A.1 and were reviewed to investigate the target species potentially occurring within the proposed Wind Farm Site and wider area to inform survey design and identify any potential ornithological constraints, at an early stage.

The BirdWatch Ireland Bird Sensitivity Mapping for Wind Energy Development (Mc Guinness *et al*., 2015), as presented on NBDC Biodiversity Maps was examined. For the 22 species assessed in Mc Guinness *et al.* (2015), the proposed Wind Farm Site was classified as having a low sensitivity – see Figure 7A.2. This was driven by proximity to areas identified as hotspots for breeding barn owl.

Based on SNH (2017) guidelines, migratory populations of wintering geese and swans are considered as species notably sensitive to wind farm developments. To characterise the distribution of these populations in relation to the proposed Wind Farm Site, data from recent population monitoring has been reviewed, including:

- Lewis *et al*. (2019b) for Irish Wetland Bird Survey (I-WeBS) counts and Kennedy *et al*. (2022) for I-WeBS site trends;
- Boland & Crowe (2008) and Burke *et al*. (2022) for greylag goose and pink-footed goose distribution;
- Burke *et al*. (2021) for whooper swan distribution; and,
- Fox *et al*. (2021) for Greenland white-fronted goose distribution.

A search for any Irish Wetland Bird Survey (I-WeBS) sites in the vicinity of the proposed Wind Farm Site was undertaken via the BirdWatch Ireland website I-WeBS page. This identified three I-WeBS site within 15 km of the proposed Wind Farm – see Figure 7A.5, including the River Suir Middle (0J301) *c*. 13.5 km to SSW, Cabragh Wetlands (0J307) *c*. 6.5 km to the south and River Suir Upper (0J302) encompassing an area of flood plain within the proposed Wind Farm Site. Annual peak count data for these I-WeBS sites was reviewed – see Table 7A.2, Table 7A.3, Table 7A.4 and Table 7A.5.

Hen harrier breeding distribution in relation to the proposed Wind Farm Site was investigated using the results of national surveys, including surveys conducted between 1998-2000 and in 2005, 2010, 2015 and 2022; as reported in Norriss *et al*, 2002, Barton *et al*., 2006 Ruddock *et al*., 2012, Ruddock *et al*., 2016, Ruddock *et al*., 2024, respectively. The distribution of known hen harrier roosts was reviewed using maps available in NPWS (2022).

The review of breeding seabird numbers in Ireland in Cummin *et al*. (2019) was used to investigate the distribution of breeding seabird colonies and numbers of breeding seabirds. As the proposed Wind Farm Site is located more than 65 km from the closest coastline, the desk study focused on species that can breed at inland colonies and/or exhibit onshore foraging ranges, i.e. those seabird species with potential connectivity to the proposed Wind Farm Site, which includes cormorants, gulls and certain species of tern.

When required Sharrock (1976) was used to investigate historic bird records and changes in the breeding ranges of species. More recent historic data from Gibbons *et al*. (1993) was reviewed using NBDC Biodiversity Maps

7A.2.2. Desk study findings

7A.2.2.1. International and European sites with an ornithological interest

Ramsar sites and SPAs

Based on geographical separation and the core ranges of species listed in SNH (2016), there are no SPAs or Ramsar sites within the Zone of Influence of the proposed Wind Farm Site. There is also no downstream hydrological connectivity between the proposed Wind Farm Site and any SPA or Ramsar sites. Therefore, it can be conclusively determined that there is no potential for possible or likely significant effects on any SPAs. Likewise, there is no potential for negative effects to any Ramsar sites.

There are no Ramsar sites within 30 km of the proposed Wind Farm Site. As shown in Figure 7A.3, the closest SPA is Slievefelim to Silvermines Mountains SPA, which is designated for hen harrier and is located between 18 km and 21 km from the proposed Wind Farm Site. There are no other SPAs within 20 km of the proposed Wind Farm Site and notably no SPAs where geese species are listed as SCI.

As recommended by NatureScot guidelines (SNH, 2016), core foraging ranges of species listed as SCI for SPAs have been reviewed to assess connectivity between the proposed Wind Farm Site and any surrounding SPAs. Breeding hen harrier is the only SCI of the Slievefelim to Silvermines Mountains SPA, which based on SNH (2016) has a core breeding season foraging range of 6 km, with a maximum of 10 km. The proposed Wind Farm Site lies well beyond the reported core or maximum foraging ranges for hen harriers breeding within the SPA and therefore it can be conclusively determined that there is no potential for possible or likely significant effects.

The closest SPAs designated for wintering waterbirds are clustered along the River Shannon to the northwest of the proposed Wind Farm Site and include Lough Derg SPA (37 km), Dovegrove Callows SPA (44 km), River Little Brosna Callows SPA (46 km), Middle Shannon Callows SPA (47 km). The wintering SCI species for these SPA are listed below along with core/maximum wintering foraging ranges, if reported.

[A017]	Cormorant	*Phalacrocorax carbo*	no foraging range reported
[A395]	Greenland white-fronted goose	*Anser albifrons flavirostris*	5-8 km core foraging range (SNH, 2016)
[A038]	Whooper swan	*Cygnus cygnus*	< 5 km core foraging range SNH (2016)
[A050]	Wigeon	*Anas penelope*	no foraging range reported
[A052]	Teal	*Anas crecca*	no foraging range reported
[A054]	Pintail	*Anas acuta*	no foraging range reported
[A056]	Shoveler	*Anas clypeata*	no foraging range reported
[A061]	Tufted duck	*Aythya fuligula*	no foraging range reported
[A067]	Goldeneye	*Bucephala clangula*	no foraging range reported
[A140]	Golden plover	*Pluvialis apricaria*	no foraging range reported
[A142]	Lapwing	*Vanellus vanellus*	no foraging range reported
[A156]	Black-tailed godwit	*Limosa limosa*	no foraging range reported
[A179]	Black-headed gull	*Chroicocephalus ridibundus*	no foraging range reported

For breeding seabirds NatureScot (2023) provides recommended breeding season foraging ranges for use in determining potential connectivity between SPAs and proposed offshore wind farm developments, i.e. screening distances. These species specific foraging ranges along with distance to the closest SPAs are listed below for species that can breed at inland colonies and/or exhibit onshore foraging ranges, i.e. those seabird species with potential connectivity to the proposed Wind Farm Site, which is located more than 65 km from the coast.

It is important to note that these screening distances are provided here, in the absence of comparable data sets for inland breeding seabird colonies, as an indicative measure to screen for potential connectivity between SPAs designated for breeding seabirds and the proposed Wind Farm Site. The values provided are based on foraging behaviour recorded at coastal seabird colonies, as the intended application is screening for potential connectivity in the coastal/marine environment and foraging ranges reported are representative of the maximum foraging distances, either as the mean maximum plus standard deviation (MM+SD) or maximum/mean maximum (Max/MM).

Cormorant	33.9 km foraging range	MM+SD	Closest SPA:	37 km	Lough Derg SPA
Black-headed gull	18.5 km foraging range	Max/MM	Closest SPA:	110 km	Lady's Island Lake SPA
Common gull	50.0 km foraging range	Max/MM	Closest SPA:	105 km	Lough Corrib SPA
Great black-backed gull	73.0 km foraging range	Max/MM	Closest SPA:	N/A	No designated sites
Herring gull	85.6 km foraging range	MM+SD	Closest SPA:	68 km	Mid-Waterford Coast SPA
Lesser black-backed gull	236.0 km foraging range	MM+SD	Closest SPA:	100 km	Saltee Islands SPA
Common tern	26.9 km foraging range	MM+SD	Closest SPA:	37 km	Lough Derg SPA
Arctic tern	40.5 km foraging range	MM+SD	Closest SPA:	110 km	Lady's Island Lake SPA

As listed above, SPAs designated for breeding cormorant, black-headed gull, common gull, common tern and Arctic tern are all beyond the screening distances; and therefore, there is no potential for significant effects anticipated for these SPA. Based on Cummins *et al*. (2019) any non-designated colonies for these species are also located beyond the screening distances, apart from one small black-headed gull colony (10 pairs or less), located near Lisheen Mine within 11 km of the proposed Wind Farm Site.

The NatureScot (2023) screening distance given for breeding herring gull is 85.6 km. Two SPAs where herring gulls are listed as SCIs fall within this zone, including the Mid-Waterford Coast SPA and Helvick Head to Ballyquinn SPA, which are located along the south coast, 68 km and 75 km away, respectively. Given the separation distance (> 50 km) between these coastal SPAs and the proposed Wind Farm Site it is anticipated that there will be no or very limited ecological connection and therefore no potential for significant effects. Ornithological surveys covering the proposed Wind Farm Site will determine the level of herring gull activity associated with area, in order to conclusively rule out potential for significant effects.

The NatureScot (2023) screening distance given for breeding lesser black-backed gull is 236 km. For the onshore environment this zone is extensive and would encompass almost all the SPAs designated for the species in the Republic of Ireland[1]. In reality the breeding season foraging range is likely to be considerably lower, with the review by Thaxter *et al*. (2012) giving a mean foraging range of 71.9 km, a mean maximum of 141 km and a maximum of 181 km for lesser black-backed gull, and if more recent studies using GPS trackers were included, e.g. Green *et al*. (2023) Thaxter *et al*. (2015), mean and mean maximum distances would be revised downwards.

The closest SPA with lesser black-backed gull listed as a SCI is the Saltee Islands SPA, where the Great Saltee, approximately 100 km to the southeast of the proposed Wind Farm Site, supports *c*. 250 pairs (Cummins *et al*., 2019). Distances to the next closest designated lesser black-backed colonies within the Lough Mask SPA and the Lambay Island SPA are just beyond the mean maximum foraging ranging (141 km), as reviewed in Thaxter *et al*. (2012). There are non-designated colonies which are closer including low densities (10 pairs or less) at Lough Derg, 37 km to the west, and significantly larger numbers at Lough Ree, 90 km to the north, which has held over > 1000 pairs in recent years and is considered to be the second largest colony in the country (Cummins *et al*., 2019).

[1] The exception being the Inishboffin, Inishdooey and Inishbeg SPA in Co. Donegal, approximately 275 km to the north

Overall, it is anticipated that separation distances of 90 km or more between lesser black-backed breeding colonies and the proposed Wind Farm Site, puts the development beyond the core foraging range for this species and there will be no potential for likely significant effects to any designated sites. Ornithological surveys covering the proposed Wind Farm Site will determine the level of lesser black-backed gull activity associated with area, in order to conclusively rule out potential for significant effects.

The only other SPA in the area surrounding the proposed Wind Farm Site is the River Nore SPA, which is 25 km away at its closest point and there is no direct hydrologically connection. The River Nore is designated for kingfisher. The closest reported territory to the proposed Wind Farm Site was 26 km north-east, at Borris-in-Ossory and based on this separation distance, the proposed Wind Farm Site is well beyond the reported core and maximum breeding season foraging range reported for kingfisher (Cummins *et al*. 2010). Therefore, there is no potential for any likely significant effects to occur.

7A.2.2.2. Nationally recognised sites with an ornithological interest

Natural Heritage Areas (NHAs) and proposed Natural Heritage Areas (pNHAs)

The only nationally important site in the vicinity of the proposed Wind Farm Site with an ornithological interest is the Cabragh Wetlands pNHA [Site Code: 001934]. As shown in Figure 7A.4, this pNHA is split between two subsites that are approximately 5 km apart. The closest part of the pNHA to the proposed Wind Farm Site is between 0.9 km and 4 km away and is located north of Thurles, between the Racecourse Road and the Dublin–Cork Main line railway. This northern area, referred to as the Tank wetland, is historically prone to flooding and also encompasses a small reservoir. The main ecological features of interest pertain to the florist communities associated with wetland habitats fed by springs releasing lime-rich groundwater. This catchment is not hydrologically linked to the proposed Wind Farm Site. This part of the pNHA is not monitored for wintering waterbirds through I-WeBS and the desk-based information available suggested that the Tank wetland is unlikely to support any significant wintering waterbird populations that have the potential to be affected by the proposed Wind Farm Site. However, given the close proximity and the occurrence of wetland habitats, the area was covered as part of the wider area wintering waterbird surveys conducted.

The other section of the Cabragh Wetlands pNHA, often referred to as the Cabragh Marshes, is located to the south of Thurles, and is between 6.5 km and 9.3 km from the proposed Wind Farm Site. Wintering waterbird populations within this part of the pNHA are monitored through counts of the I-WeBS Site 0J307 (Cabragh Wetlands). At this location the pNHA is encompassed entirely within the Lower River Suir SAC and supports a range of semi-natural floodplain habitats. Historically the area had several discharge lagoons utilised by the Thurles Sugar Factory up until the 1980s, when refining of sugar ceased and the plant closed, the lagoons were subsequently removed. Since the early 1990s a significant proportion of land within the pNHA has been bought or is leased by the Cabragh Wetlands Trust (*c*. 24 ha) and is actively managed for wetland habitats, as well as the birds and other wildlife that they support (Muyllaert, 2006 and Collins, 2017). In terms of birds, the wintering waterbird assemblage is reported as regularly exceeding 1,000, supports a number of red listed species, and therefore, was assessed as regionally important (Collins, 2017 and Lauder, 2020). Mirroring national declines in waterbird populations, peak annual counts in recent years have rarely surpassed 1,000 birds (2014-2021 I-WeBS data) – see Table 7A.3 and Table 7A.4.

The Cabragh Marshes are noted as particularly suitable for surface feeding ducks and these contribute to core numbers of birds, including (with peak count recorded between 1994-95 to 2020-21 in parenthesis) gadwall (17), mallard (160), pintail (24), shoveler (78), teal (670) and wigeon (590). Sizeable flocks of several wader species are noted as periodically occurring at Cabragh Marshes including curlew (310), golden plover (2,000) and lapwing (2,100). Lauder (2020) suggests that as these wader flocks tend to range widely over farmland habitats, they utilise the Cabragh Marshes part of the pNHA as a safe daytime loafing site and that utilisation especially for lapwing and golden plover is dependent on water levels and surrounding land use. Given the ranging tendencies of these species it is possible that golden plover and lapwing utilising the pNHA could also utilise suitable habitat within or adjacent to the proposed Wind Farm Site. Regularly occurring flocks of migratory geese and swan are an important ornithological constraints to consider for wind farm developments. As shown in Table 7A.3 and Table 7A.4 whooper swans (85) and greylag geese (25) are only periodically recorded at Cabragh Marsh, with Greenland white-fronted geese (45) recorded much less frequently.

In terms of breeding birds, Cabragh Marsh has historically supported breeding lapwing and also of local significance a pair of barn owls regularly breeds in a nest box installed on the site (Lauder, 2020).

7A.2.2.3. Wintering waterbirds

A review of wetlands monitored as part I-WeBS identified three I-WeBS sites within 15 km of the proposed Wind Farm Site – see Figure 7A.5, and included:

- River Suir Upper (0J302) within the proposed Wind Farm Site
- Cabragh Wetlands (0J307) – Cabragh Marshes (part of the Cabragh Wetlands pNHA), *c*. 6.5 km to the south
- River Suir Middle (0J301), *c*. 13.5 km to the SSW

Additional wetland habitats in the wider area previously identified and monitored over winter 2020/21 included the following areas – see Appendix 7I (Fehily Timoney, 2022):

- The Tank wetland (part of the Cabragh Wetlands pNHA), *c*. 1 km to SSW
- River Suir at Clonamuckoge Beg/Kilkillahara, adjacent to northwestern boundary
- Lisheen Bog, cut-away raised bog between the Lisheen wind farms and M8, *c*. 8 km to east
- Ballydavid, Littleton, *c*. 8 km to SSE
- Littleton Bog, c. 10 km to SSE
- Liathmore, *c*. 10 km to southeast

7A.2.2.3.1. <u>I-WeBS sites</u>

For the three I-WeBS sites the River Suir Upper (0J302) – Brittas (0J397), Cabragh Wetlands (0J307) and the River Suir Middle (0J301) peak count data is provided in Table 7A.2, Table 7A.3, Table 7A.4 and Table 7A.5. Note: The count data for River Suir Middle includes data for the more southerly subsite Newcastle – Caher (0J301), not just the subsite located closer to Thurles Ballycamasc Bridge - Camus Bridge (0J399)

The wintering waterbird populations associated with the Cabragh Wetlands were discussed in Section 7A.2.2.2 in relation to the pNHA of the same name, which highlighted the regional importance of this wetland in regularly supporting over 1,000 wintering waterbirds. The Cabragh Wetlands or Marshes are primarily noted for usage by surface feeding ducks (Lauder, 2020). With regards to migratory swans, a relatively small numbers of whooper swan (mean peak 23 birds) were recorded in most winters from 1994/95 up until 2011/12, however only a single bird was reported over the following eight seasons, and it appears that the site is no longer regularly utilised by this species. In terms of migratory geese, there is a relatively small flock of greylag geese recorded at Cabragh Marshes in some winters (mean peak 14 birds), with numbers recorded always remaining below thresholds for national importance. Greenland white-fronted geese do not regularly occur and were only recorded in two winters between 1994/95 and 2020/21. Flocks of golden plover and lapwing are periodically recorded in nationally important numbers, along with small numbers of curlew (Lauder, 2020). It is possible that the wader flocks associated with the Cabragh Wetlands pNHA also utilise suitable habitat within or adjacent to the proposed Wind Farm Site, notably the River Suir Upper I-WeBS site.

The River Suir Upper I-WeBS site (0J397) - Brittas covers a section of the River Suir flood plain within the proposed Wind Farm Site and based on I-WeBS data this area supports variable numbers of wintering waterbirds – see Table 7A.2; however has rarely been reported as supporting more than 500 birds. Notable species recorded include regular flocks of lapwing (12-300 birds), with only small numbers of golden plover (1-4 birds) and curlew (1-30 birds) occasionally recorded over winters 2011/12 to 2020/21. Over this period greylag geese were only recorded once. Similar to the trend for the Cabragh Marshes, a small whooper swan flock (10-28 birds) were historically reported in the area with utilisation appearing to cease after winter 2016/17. Numbers of ducks recorded, specifically mallard, teal and wigeon, also appear to have tailed off in recent winters (Kennedy *et al*., 2022). Utilisation of the River Suir Upper is likely to be linked to seasonal flooding, which many explain the sporadic usage of the area.

The Upper River Suir - Brittas and Middle River Suir sites are approximately *c* 15 km apart. Interestingly, while whooper swan usage totally dropped off at the River Suir Upper I-WeBS site, there was marked increased at the River Suir Middle I-WeBS site over the same period – see Table 7A.5. Apart from the whooper swan flock (28-120 birds), other core species associated with the River Suir Middle I-WeBS sites include mallard (2-84 birds), teal (25-150 birds) and wigeon (8-191 birds), with flocks of lapwing (4-90 birds) and curlew (59-112 birds). There are no flocks of golden plover recorded and greylag geese occur periodically and in small numbers.

7A.2.2.3.2. Other wetland sites

As part of wintering waterbirds survey conducted over winter 2020/21 - see Appendix 7I (Fehily Timoney, 2022), another part of the floodplain at Clonamuckoge Beg/Kilkillahara, approximately 500 m upstream of the River Suir Upper - Brittas I-WeBS site and adjacent to the proposed Wind Farm Site, was regularly monitored, along with the other wetland in close proximity, the Tank wetland (northern section of the Cabragh Wetalnds pNHA). The Tank wetland was surveyed five times over winter2020/21 and was found to regularly support wintering snipe (5-15 birds) and grey heron (1-5 birds), with mute swan (2 birds) recorded once. The Clonamuckoge Beg/Kilkillahara area was monitored on six occasions over winter 2020/21. A small numbers of whooper swans (3 to 5 birds) were recorded on three visits, with an additional observation of a flock of 12 birds recorded foraging in the area during VP watches. On four of the visits, flocks of golden plover (150-700 birds) and lapwing (26-300 birds) were recorded. Other species recorded included mute swan (4-6 birds), mallard (2 birds), teal (14 birds) and moorhen (2 birds).

In terms of wetlands further away from the proposed Wind Farm Site (> 8 km) that were monitored over winter 2020/21 - see Appendix 7I (Fehily Timoney, 2022), including Lisheen Bog, Ballydavid, (Littleton), Littleton Bog and Liathmore, there were no significant numbers of wintering water birds recorded. The only noteworthy numbers occurred at Liathmore, which consistently supported a flock of whooper swans (22-95 birds) and Ballydavid (Littleton), where flocks of lapwing (40-75 birds) were regularly recorded.

7A.2.2.3.3. Regional occurrence of migratory swan and geese

Based on 2020 swan census (Burke *et al*., 2021), the Liathmore whooper swan flock and smaller flocks (< 50 birds) associated with the Middle River Suir, south of Thurles were the only areas supporting flocks of whooper swans in this region of Co. Tipperary. Lough Derg, approximately 36 km northwest of the proposed Wind Farm Site is the closest location identified as supporting internationally number of whooper swans, with the River Suir valley in Co. Waterford to the south supporting several nationally important flocks.

Likewise, a review of Burke *et al*. (2022) and Fox *et al*. (2021) found that Co. Tipperary, aside from Lough Derg and Little Brosna Callows, does not regularly support any significant populations of migratory grey geese, including Icelandic greylag geese, pink-footed geese and Greenland white-fronted geese. Pink footed geese are not regularly recorded in Co. Tipperary and the small flocks of greylag geese associated with the Middle River Suir and occasionally at the Cabragh Wetlands are reported as feral flocks or flocks of unknown origin (Burke *et al*. 2021). The closest traditional Greenland white-fronted goose sites are the River Nore, in Co. Kilkenny and Little Brosna Callows both located over 30 km from the proposed Wind Farm Site.

7A.2.2.3.4. Regional occurrence of wintering waders

Overall, the proposed Wind Farm Site and environs are considered to provide a mosaic of suitable habitats for wintering waders, especially the large areas of grassland and wetland habitat along the River Suir. In terms of wintering waders, several species can often be found inland away from coastal hotspots, in particular snipe, golden plover and lapwing, as well as curlew, black-tailed godwit, redshank and ringed plover. The presence of forestry in the proposed Wind Farm Site has the potential to support wintering woodcock.

A review of wintering wader distribution, based on I-WeBS data presented in Crowe (2005), Boland & Crowe (2012), Burke *et al*. (2018) and Lewis *et al*. (2019), shows that the middle region of Co. Tipperary where the proposed Wind Farm Site is located does not regularly support any internationally or nationally important wintering wader populations. The northern part of the county including Lough Derg and the River Shannon valley, located > 30 km to the north and north-west of the proposed Wind Farm Site, are the closest areas supporting internationally or nationally important numbers of wintering waders.

Based on I-WeBS count data for the Cabragh Wetlands and the Upper River Suir , covering the northern part of the proposed Wind Farm Site, the wader species regularly occurring the area include (with highest peak count since winter 2011/12 in parentheses) lapwing (1,100 birds), golden plover (250 birds), curlew (154 birds) and snipe (under recorded) - see Table 7A.2 and Table 7A.4. While lapwing are recorded in most winters, albeit in variable numbers and occasionally counts exceed thresholds for national importance (1% threshold: 850 birds), golden plover and curlew are not always observed. Cabragh Wetlands appears to be the more regularly utilised site compared to the Upper River Suir and overall the wader flocks occurring in this region are reported as being relatively mobile (Lauder 2020) and moving over a wider area to capitalise on a range of resource, some of which like flooding are only periodically available.

7A.2.2.3.5. Regional occurrence of wintering gulls

In terms of overall numbers of wintering waterbirds, gull species often contribute significantly to counts for I-WeBS sites. On reviewing count data from I-WeBS sites, including the the River Suir Upper (0J302) and Cabragh Wetland (0J307), as well as counts undertaken over winter 2020/21 (Fehily Timoney, 2022), black-head gulls and lesser black-backed gulls were the only regularly occurring species, with herring gulls only very occasionally observed and typically only single birds recorded. The maximum counts for black headed gull was 200 birds and for lesser black-backed gull was 310 birds, however smaller numbers were more typically encountered and, in some winters, no or very few gulls were counted. While it is noted that under I-WeBS methodology counting of gulls is optional and may not have been undertaken in some years, the count data is suggestive of a relatively mobile and sporadically occurring populations of wintering gulls in the region.

7A.2.2.4. Breeding waders

Areas of wet grassland, fen type habitat and marsh associated with River Suir floodplain provide habitat potentially suitable for breeding lowland waders in particular snipe, lapwing and possibly curlew and redshank. Balmer *et al*. (2013) recorded snipe as possibly breeding within the proposed Wind Farm Site and more recently during the 2021 breeding season six territories were identified in the northern part (Fehily Timoney, 2022). Lapwing and curlew have historically bred within the 10 km square covering the proposed Wind Farm Site (Sharrock, 1976 and Gibbons *et al*., 1993). Based on Colhoun *et al*. (2022) and Balmer *et al*. (2013), curlew are no longer recorded as breeding in any of the 10 km Irish national grid square encompassing the proposed Wind Farm Site [S16] or closely bordering squares [S05], [S06] and [S15]. The closest known breeding sites are > 10 km away to the southeast [S25] and > 20 km away to the west [R86] (O'Donoghue *et al*, 2019, Colhoun *et al*., 2022).

Lapwing were recorded within the proposed Wind Farm Site during the 2021 breeding season (Fehily Timoney, 2022), with a maximum of 8 birds recorded; however it is unknown if successful breeding occurred. Aerial and topographic imagery indicates that habitat suitability for upland breeding waders is non-existent in this part of Co. Tipperary, and therefore, species like golden plover and dunlin (also a machair/coastal breeder in Ireland) are highly unlikely to breed in the area. This assertion is supported by breeding distribution maps for these species presented in Sharrock (1976), Gibbons *et al*. (1993), and Balmer *et al*. (2013)

The section of the River Suir passing through the proposed Wind Farm site does not provide the sand/shingle banks that would be suitable for common sandpiper. Likewise, suitable habitat for breeding ring plover was lacking. In this region ring plover have been recorded in small numbers, utilising areas of exposed peat on cut-away bogs and in June 2021 pairs were recorded > 7 km from the proposed Wind Farm Site at Lisheen Bog and Littleton Bog (Fehily Timoney, 2022). These two locations in the wider area, along with Cabragh Marsh were also found to hold small numbers of other breeding waders, including lapwing, curlew and redshank (Fehily Timoney, 2022).

Woodcock nest in woodland and scrub, and parts of the proposed Wind Farm Site providing suitable cover, especially in the south. There is only historic data of woodcock probably breeding in the 10 km square encompassing the proposed Wind Farm Site (Sharrock, 1976). A recent reduction in the breeding range of woodcock in Ireland means that the breeding population is red listed, although the winter component, which sees an influx of continental birds, remains green-listed (Gilbert *et al*., 2021). Breeding woodcock are now largely confined to the midlands and east of Ireland (Balmer *et al*., 2013) and are therefore potentially present within the proposed Wind Farm Site; however they were not detected during the 2021 breeding season (Fehily Timoney, 2022).

7A.2.2.5. Other breeding waterbirds

Based on analysis reported in Lauder & Lauder (2020), which identifies breeding waterbird hotspots using species distribution data combined with scoring criteria based on aspects of each species' ecology, conservation status and social value, the closest hotspots are over 30 km away to the west and northwest and are associated withLough Derg and the River Shannon. The 10 km Irish grid square encompassing the proposed Wind Farm Site [S16] and closely neighbouring squares [S05], [S06], [S15] scored at the lower end of the scale in this analysis. While this desk-based finding does not preclude potential impacts on specific wetland species that may breeding in the environs of the proposed Wind Farm Site, it can be concluded that important wetland areas supporting high species diversity or abundance will not affect by virtue of separation distances.

7A.2.2.5.1. <u>Kingfisher</u>

Kingfisher are likely to forage along the River Suir and its tributaries within the proposed Winds Farm Site. Assessment of the River Suir during the 2021 breeding season for breeding kingfisher (Fehily Timoney, 2022) noted some potential old nesting holes along the banks within the proposed Wind Farm Site and therefore the species may be breeding on this stretch of the river. This assertion is supported by historic breeding records (Gibbons *et al*. 1993). The River Suir flows in a southerly direction through the proposed Wind Farm Site and approximately 6.8 km downstream, south of Thurles, the river is designated within the Lower River Suir SAC. Whilst there are no kingfisher breeding territories reported within the Site Synopsis for this SAC (NPWS, 2023), this species is noted as regularly occurring within the catchment, including Cabragh Wetalnd (Lauder, 2000). Riverine bird surveys, incorporating kingfisher habitat suitability assessments, were employed in subsequent breeding seasons (2022 and 2023) to investigate the potential for this species to breed within the proposed Wind Farm Site.

As kingfisher are listed on Annex I of the EU Birds Directive, the distances from the proposed Wind Farm Site to SPAs designated for this species was reviewed – see Section 7A.2.2.1. The closest kingfisher SPA is the River Nore SPA, which is approximately 25 km east of the proposed Wind Farm Site at its closest point. This SPA supported 16 probable kingfisher territories according to Cummins *et al*. (2010) and the closest reported territory to the proposed Wind Farm Site was 26 km north-east, at Borris-in-Ossory. Based on this separation distance, the proposed Wind Farm Site is well beyond the reported core and maximum breeding season foraging range reported for kingfisher (Cummins *et al*. 2010), and therefore, there is no potential for any likely significant effects to occur. Furthermore, given the low flight trajectory of kingfishers, collision risk for this species is considered to be very low.

7A.2.2.5.2. Grey heron

Grey heron is a common and widespread species in Ireland, with a population that is assessed as relatively stable and therefore is green listed (Gilbert *et al*. 2021). Given the affinity of grey herons to wetland habitats and the occurrence of the River Suir, activity for this species is anticipated to be elevated within the proposed Wind Farm Site. In addition surveys in 2020-2021 (Fehily Timoney, 2022) identified a heronry in the woodland just south of the proposed Wind Farm Site. This introduces a potential localised sensitivity for this species, which requires further monitoring.

7A.2.2.5.3. Breeding gulls

A review of breeding gull colonies based on Cummins *et al*., (2019) found that the closest breeding sites supporting nationally/internationally important numbers were either located some distance away on the south coast or at Lough Derg. These locations are > 30 km from the proposed Wind Farm Site. There is a small black head gull colony (10 pairs or less) within 11 km of the proposed Wind Farm Site, located to the east, near Lisheen Mine. Section 7A.2.2.1 provides a review of breeding gull colonies in relation to potential connectivity to Natura 2000 sites (SPAs).

7A.2.2.6. Birds of prey

Buzzard, sparrowhawk and kestrel are widespread resident species in Ireland and, based on habitat availability, are likely to be breeding within the 2 km proposed turbine buffer. During the preliminary study year (2020-2021) – see Appendix 7I (Fehily Timoney, 2022), buzzard and kestrel were the most commonly recorded raptor species. Sparrowhawk and peregrine were also regularly recoded; however significantly less frequently than buzzards or kestrels, and this would be expected for more secretive species like sparrowhawk and given the flight behaviour of peregrine. Surveys over the 2021 breeding season found peregrine, kestrel and buzzard breeding adjacent to the proposed Wind Farm Site. The peregrines were nesting on Brittas Castle, approximately 350 m from the proposed Wind Farm site. The kestrel breeding site was located just beyond the eastern boundary and fledged three young in 2021. Buzzards were recorded nesting approximately 1 km to the west of the proposed Wind Farm Site. No breeding behaviour for sparrowhawk was observed, however were considered likely to be breeding in the area.

The only other raptors species recorded over the 2020-2021 study year were sporadic observations of hen harrier and merlin (Fehily Timoney, 2022). Based on the lowland nature of the area (< 100 m) and dominance of improved agricultural grassland and cultivated land, there is very limited potential for upland breeding species to occur, including hen harrier, merlin and the rare breeding species - short-eared owl.

Wooded areas, particularly in the south of the proposed Wind Farm Site, have the potential to support long-eared owls. Barn owls are known to occur in the area, with a breeding site identified in a building approximately 1.1 km to the northwest of the proposed Wind Farm Site (Fehily Timoney, 2022).

Release sites for the red kite *Milvus milvus* re-introductions in Ireland have been in Co. Wicklow and Co. Down, and while the dispersal has been relatively protracted, it is possible that the breeding population has started to expand into Co. Tipperary, where there is potentially suitable habitat for this species. Habitat suitability for the two species of eagle re-introduced back into Ireland, golden eagle *Aquila chrysaetos* and white-tailed eagle *Haliaeetus albicilla* is limited in this part of Co. Tipperary and these species are considered as unlikely to regularly occur in the area.

Other rarer species of raptor occurring in Ireland including goshawk *Accipiter gentilis*, osprey *Pandion haliaetus*, marsh harrier *Circus aeruginosus* and hobby *Falco subbuteo*, are highly unlikely to have any meaningful association with the proposed Wind Farm Site, based on habitat availability in the general area, geographic location and reported occurrences of these rarer species.

As important Annex I species in Ireland with potential population sensitivities to wind farm development, further desk-based assessment is provided for hen harrier and merlin in the following sections. This done to highlight that the proposed Wind Farm Site is emerging as not being important for these species. Additional information is also provided for peregrine, kestrel and barn owl, as other bird of prey historical noted as breeding in the area and being of conservation concern

7A.2.2.6.1. Hen harrier

The 10 km grid square [S16] encompassing the study area is not covered by the National Hen Harrier Surveys, due to limited habitat suitability and lack of historical records (Ruddock *et al*., 2024). Based on Ruddock *et al*. (2024) the closest 10 km grid squares where hen harriers have been recorded breeding since monitoring began in the lates 1990s is [R95] and [R96], which are located more than 10 km west of the proposed Wind Farm Site. As discussed in Section 7A.2.2.1, these breeding territories are associated with the Slievefelim to Silvermines Mountains SPA, which is located between 18 km and 21 km from the proposed Wind Farm Site.

Irish hen harriers have traditionally favoured nesting within dense heather, though following the decline of this habitat in Ireland, pairs are being increasingly recorded utilising young conifer plantations (Wilson *et al.,* 2006). Afforestation, including felling and re-planting cycles, is now a major factor in determining the current distribution of breeding hen harrier in Ireland. While there is forestry within the proposed Wind Farm Site and surrounding wider area that has the potential to provide cover for nesting; a significant limiting factor is the lack of extensive open areas of less improved, and typically upland habitats supporting high density of ground nesting prey species, like meadow pipits and skylark. Therefore, the proposed Wind Farm Site and surrounding hinterland (out to 2 km) is assessed as not being suitable for breeding hen harrier.

NPWS (2022) provides a map showing the winter distribution and known hen harrier roosts within 10 km Irish national grid squares, based on Balmer *et al*. (2013) and roost monitoring undertaken by the Irish Winter Hen Harrier Survey. This map indicates that there are no known hen harrier roosts within the 10 km grid square [S16] encompassing the proposed Wind Farm Site. Roosting has been recorded to the south in the 10 km grid square [S15], however this falls just beyond the 2 km turbine buffer for the proposed Wind Farm Site. Hen harriers roost in a range of habitats (Clarke & Watson, 1990, O'Donoghue, 2012, 2019 and Hardey *et al*., 2013) and there are patches of woodland edge, scrub and wetlands within the proposed Wind Farm Site and out to 2 km that have the potential to support a hen harrier roost. Based on surveys conducted over 2020 and 2021 (Feehily Timony, 2022), there was a very low incidence of hen harrier activity detected and records were limited to a single male flying approximately 2 km west of the proposed Wind Farm Site.

Based on the desk-based review of existing information, it is anticipated that ongoing surveys will conclude that the proposed Wind Farm Site and associated wider area (2 km proposed turbine buffer) is not important for breeding or wintering hen harrier populations.

7A.2.2.6.2. Merlin

Merlin is a species that breeds in a range of different upland habitats and typically occurs at higher altitudes (Ewing & Rebecca, 2011), although lowland regions in Ireland with substantial areas of raised bog can support breeding territories, particularly where woodland/scrub occurs adjacent to open bog or heathland, which provides access to ground nesting prey species, such as meadow pipits. Like hen harrier, merlin is traditionally a ground-nesting species. However, due to there being limited suitable ground cover in Irish upland habitats, this species is now more regularly recorded nesting in trees, where they utilise the nests of other species, in particular those of corvids, (Lusby *et al*., 2017).

There is a historic record of probable breeding merlin (Bird Atlas 2007-2011) within the 10 km Irish national grid square [S16] that encompasses the proposed Wind Farm Site (Balmer *et al*., 2013). This record was found to be associated with the forestry and raised bog approximately 6 km to the northwest, in the vicinity of wind farms around the Lisheen Mine where there is some semblance of suitable breeding habitat. Aside from the area in and around Lisheen Bog there is no suitable breeding habitat within or in the wider area surrounding the proposed Wind Farm Site.

In Ireland, merlin typically leave upland breeding sites over the winter following prey species to areas where they congregate, such as estuaries and areas of cereal productions. Numbers are swelled by an influxes of breeding birds from Iceland. As the River Suir floodplain periodically attracts waterbirds over the winter, it is possible that merlin utilise the proposed Wind Farm Site out of the breeding season. This is supported by the preliminary year of baseline surveys conducted over 2020 and 2021 (Feehily Timony, 2022) when merlin were observed seven times over winter 2020/21 and there were no merlin sightings during the breeding season; however the majority of the observations were recorded beyond the 500 m proposed turbine buffer – see Appendix 7I.

As merlin are listed on Annex I of the EU Birds Directive, the distances from the proposed Wind Farm Site to SPAs designated for this species was reviewed. The closest merlin SPA is the Slieve Aughty Mountains SPA, which is over 40 km north-west from the proposed Wind Farm Site. Based on this separation distance, the proposed Wind Farm Site is well beyond the reported core and maximum breeding season foraging range reported for merlin (SNH, 2016, Lusby *et al*. 2017), and therefore, there is no potential for any likely significant effects to occur.

7A.2.2.6.3. Peregrine

In Ireland, away from the coast, cliffs quarries can provide suitable nesting ledges for breeding peregrines (Moore *et al.,* 1997), along with ruined buildings, churches and other man-made structures that offer relatively high (> 10 m), inaccessible locations. A single historic (Bird Atlas 2007-2011) peregrine breeding sites was confirmed within the 10 km Irish national grid square [S16] that encompasses the proposed Wind Farm Site (Balmer *et al*., 2013). This site is a castle situated approximately 3.7 km north of the proposed Wind Farm Site. There are a number of other ruined castles that have the potential to support peregrine, however most of these are more than 2 km from the proposed Wind Farm Site, including one 2.7 km to east, one 3.5 km to the west, one 4.1 km to the northeast and one 5.0 km to the west.

In 2021 peregrine were recorded nesting in Brittas Castle (Fehily Timoney, 2022), which is located approximately 350 m from the proposed borrow pit and within 600 m of the closest turbine (T10). The core foraging range for breeding peregrines is 2 km, with a maximum of 18 km reported (SNH, 2016) and the proposed Wind Farm Site is likely to form part of the home range for this pair. Availability of nesting locations in this region will be a factor limited peregrine breeding densities and it is likely that the some of the other castle sites listed above support neighbouring pairs.

7A.2.2.6.4. Kestrel

While buzzard and sparrowhawk are both green listed, the BoCCI conservation status for kestrel was upgraded over the course of the baseline study from amber to red (Colhoun & Cummins, 2013; Gilbert *et al.*, 2021). Both breeding numbers and distribution of kestrels have declined significantly, which is thought to have been driven by changes in prey availability due to agricultural intensification (Wilson-Parr & O'Brien, 2019), as well as secondary rodenticide poisoning. Flight behaviour means kestrels are also a species emerging as notably susceptible to collision with turbines and this is acknowledged within the Collision Risk Model (CRM) for this species, which SNH (2018a) recommend running with a lowered avoidance rate for kestrels (95% avoidance). If flight activity for kestrels within the 500 m turbine buffer is high, this will result in a level of collision risk for this species, and it is important to assess what magnitude of population level effects could result based on predicted collision risk.

7A.2.2.6.5. Barn owls

The habitats within 2 km of the proposed Wind Farm Site, including the patchwork of woodland, rough/unimproved areas, treelines and hedges, along with derelict buildings provide suitable nesting and foraging habitat for barn owls; and bird sensitivity mapping (Mc Guinness *et al*., 2015) ranks the regions sensitivity to wind farm development as low, due to the proximity (within 2 km) of barn owl breeding hotspots – see Figure 7A.2. There are contemporary records for the species in the wider area (Balmer *et al.*, 2013), and in 2021 a breeding site was identified in an abandoned building approximately 1.1 km to the northwest of the proposed Wind Farm Site (Fehily Timoney, 2022). There is also another traditional barn owl site at the Cabragh Wetlands, within 7 km (Lauder, 2020).

In Ireland, foraging distances from nest sites can extend up to 6 km and even as far as 9 km; however, the core breeding home range is documented to be 4 to 5 km from the nest (Lusby & Cleary, 2014, TII 2021, Lusby *et al*. 2021). This is further than the 1 km search area recommended by the SNH (2017) survey guidelines for breeding barn owls (owls other than short-eared owls). In terms of sensitivity to wind farm developments, barn owls are reported as successfully breeding at a large wind farm in Scotland, with the number of pairs increasing after the provision of nest boxes, e.g., Crystal Rig Wind

Farm[2]. It is generally considered that low level flight behaviour of barn owls (typically < 3-4 m) limits collision risk with larger turbines in the UK (and Ireland) where lattice towers are not commonly employed (Barn Owl Trust, 2015). As such, impacts are more likely to be associated with any land use change and loss of breeding territories due to the proposed development.

7A.2.2.7. Other species of conservation concern

7A.2.2.7.1. Swift

The conservation status of swift was upgraded from amber to red in Ireland, due to recent severe declines in breeding populations (Colhoun & Cummins, 2013; Gilbert *et al.*, 2021). Swifts show strong fidelity to their nest sites, and it is possible that the continuous decline in numbers is related to the loss of traditional nest cavities in buildings which have been renovated or demolished (Whelan *et al*. 2018). There is potential for swifts to forage through the proposed Wind Farm Site over the summer months while nesting in the buildings of nearby towns and villages. The closest reported swift nests are at Thurles town approximately 2 km south of the proposed Wind Farm Site (Birdwatch Ireland, 2023)[3].

Depending on weather conditions, swifts often forage at heights of 50 to 100 m placing them within the collision risk zone of wind turbines. As swifts are habituated to manmade structures, it is considered unlikely that foraging birds will be displaced by operational turbines. Conversely, this species (along with swallows and other hirundines) may be actively drawn towards turbines to glean insects that are attracted to/more active around turbine towers and hardstands (Rydell *et al.*, 2012). While the mechanism and potential effects are poorly understood at this stage, it is considered likely that this behaviour leads to heightened collision risk for this species (Rydell *et al.*, 2012).

7A.2.2.7.2. Rare passerines

As detailed in SNH (2017), it is considered that most passerines are at low risk of collision with wind turbines due to flight behaviour. Population dynamics (e.g. high fecundity and rapidly attaining sexual maturity) also make passerines less vulnerable to displacement effects. This means that the proposed Wind Farm development is unlikely to impact passerine communities at the population level. The exception may be rarer breeding passerines, which in an Irish context would include whinchat *Saxicola rubetra*, ring ouzel *Turdus torquatus*, tree sparrow and yellowhammer.

The combination of pastural agriculture, with some cultivated fields, which is typical of the region, as well as the occurrence of wet grasslands and marshy habitats along the floodplain provides suitable habitat for whinchat, tree sparrow and yellowhammer, with the latter two species recorded within the 10 km Irish national grid square [S16] encompassing the proposed Wind Farm Site - see Table 7A.1. Other red listed species likely to occur within the proposed Wind Farm Site are meadow pipit and grey wagtail. Despite declines in grey wagtail and meadow pipit, thought to be related to harsh winters following the 2009 and 2010 breeding seasons, both species have remained relatively common and widespread. Based on Lewis *et al*. (2020), grey wagtail numbers have not recovered and continue to decline, whereas meadow pipit numbers are reported to have stabilised.

Based on habitat availability, some less regularly occurring non-passerine species like stock dove and quail could also breed in the area and are both red listed species.

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[2] As reported at: http://www.pes.eu.com/wind/ornithological-plan-leads-to-barn-owl-success/

[3] As reported by BirdWatch Ireland online Swift Survey – Nest Records (2012-2022). Accessed via: https://bwi.maps.arcgis.com/apps/MapJournal/index.html?appid=81ddc38cfcde40ffab699be638ee5b20

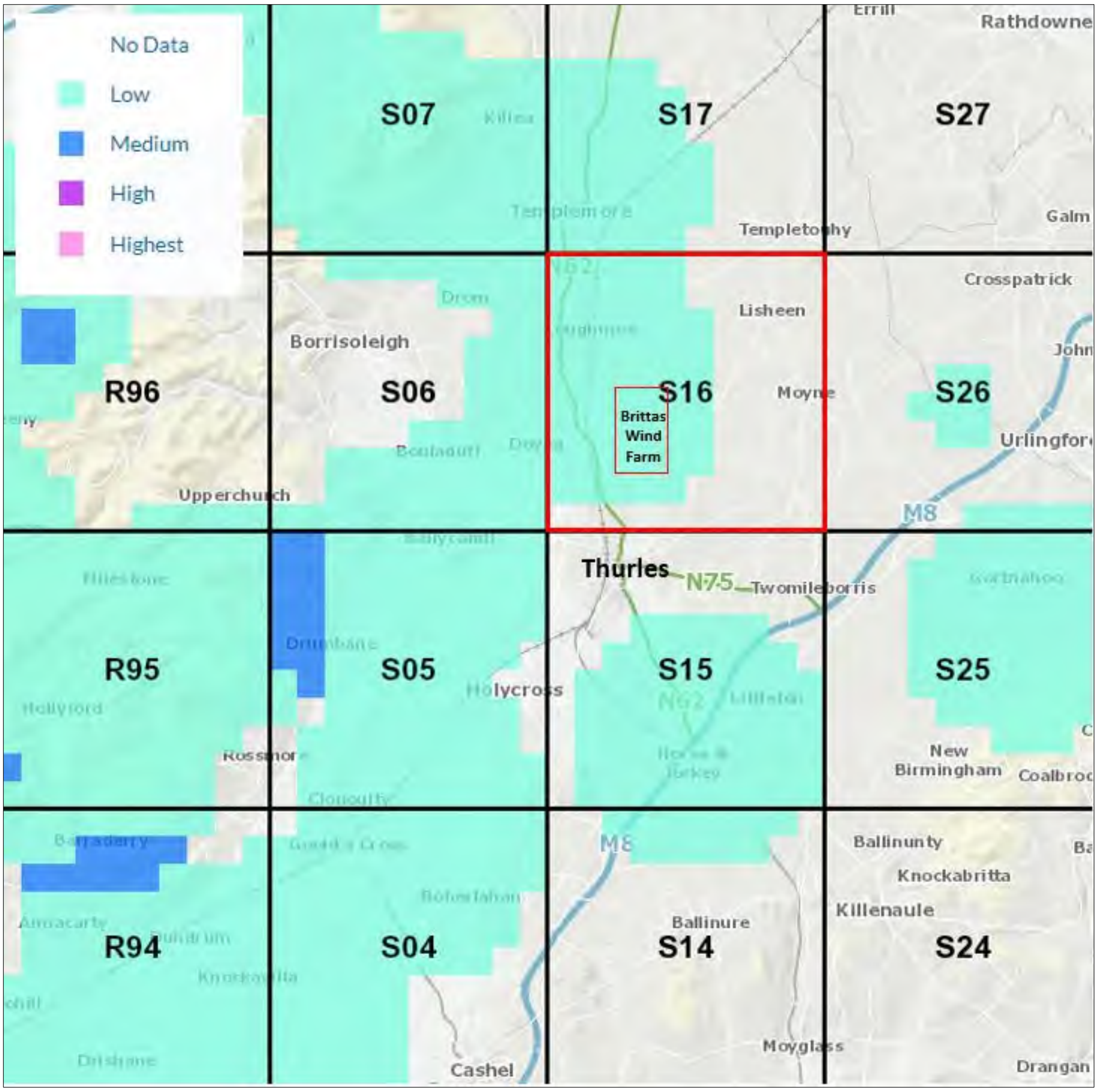

Figure 7A.2: Bird sensitivity to wind energy

Source: Mc Guinness *et al*. (2015), as displayed on Biodiversity Maps: https://maps.biodiversityireland.ie/Map

Table 7A.1: Bird records within the 10 km national grid square S16

Source: NBDC Biodiversity Maps, with additional species included if recorded in 2020/21 (FTC - Fehily Timoney, 2022)
Species are listed aphetically by conservation status, with the BoCCI4 column referring to whether conservation concern status applies to wintering (Win) or breeding (Br) populations.

Common Name	Scientific Name	Annex I species	BoCCI4 status	Most recent	Data source
Barn owl	*Tyto alba*		Red Br	2009	CeDAR
Bewick's swan	*Cygnus columbianus*	✓	Red Br&Win	2001	NBDC
Corncrake	*Crex crex*	✓	Red Br	1972	NBDC
Curlew	*Numenius arquata*		Red Br&Win	2020	I-WeBS
Dunlin	*Calidris alpina*	✓	Red Br&Win	2018	I-WeBS
Grey partridge	*Perdix perdix*		Red B	1972	NBDC
Grey wagtail	*Motacilla cinerea*		Red Br	2011	NBDC
Golden plover	*Pluvialis apricaria*	✓	Red Br&Win	2021	I-WeBS
Kestrel	*Falco tinnunculus*		Red Br	2023	NBDC
Lapwing	*Vanellus vanellus*		Red Br&Win	2020	I-WeBS
Meadow pipit	*Anthus pratensis*		Red Br	1991	NBDC
Redshank	*Tringa totanus*		Red Br&Win	2001	NBDC
Redwing	*Turdus iliacus*		Red Win	2011	NBDC
Shoveler	*Anas clypeata*		Red Br&Win	2020	I-WeBS
Snipe	*Gallinago gallinago*		Red Br&Win	2020	I-WeBS
Stock dove	*Columba oenas*		Red Br	2011	NBDC
Swift	*Apus apus*		Red Br	1991	NBDC
Woodcock	*Scolopax rusticola*		Red Br	1972	NBDC
Yellowhammer	*Emberiza citrinella*		Red Br	2020	NBDC
Barn swallow	*Hirundo rustica*		Amber Br	1991	NBDC
Black-headed gull	*Larus ridibundus*		Amber Br&Win	2021	I-WeBS
Coot	*Fulica atra*		Amber Br&Win	2021	I-WeBS
Cormorant	*Phalacrocorax carbo*		Amber Br&Win	2021	I-WeBS
Gadwall	*Anas strepera*		Amber Br&Win	2021	I-WeBS
Goldcrest	*Regulus regulus*		Amber Br	1991	NBDC
Greenfinch	*Carduelis chloris*		Amber Br	1991	NBDC
Greylag goose	*Anser anser*		Amber Win	2021	I-WeBS
Hen harrier	*Circus cyaneus*		Amber Br	1972	NBDC
Herring gull	*Larus argentatus*		Amber Br&Win	2021	FTC
House sparrow	*Passer domesticus*		Amber Br	2011	NBDC
House martin	*Delichon urbicum*		Amber Br	2021	FTC
Kingfisher	*Alcedo atthis*	✓	Amber Br	2015	I-WeBS
Lesser black-backed gull	*Larus fuscus*		Amber Br&Win	2021	I-WeBS
Linnet	*Carduelis cannabina*		Amber Br	1991	NBDC
Mallard	*Anas platyrhynchos*		Amber Br&Win	2020	I-WeBS
Merlin	*Falco columbarius*	✓	Amber Br	2011	NBDC
Mute swan	*Cygnus olor*		Amber Br&Win	2021	I-WeBS
Pintail	*Anas acuta*		Amber Win	2021	I-WeBS
Ringed plover	*Charadrius hiaticula*		Amber Br&Win	2021	FTC
Skylark	*Alauda arvensis*		Amber Br	1991	NBDC
Spotted flycatcher	*Muscicapa striata*		Amber Br	2011	NBDC
Starling	*Sturnus vulgaris*		Amber Br	2011	NBDC
Sand martin	*Riparia riparia*		Amber Br	2011	NBDC
Teal	*Anas crecca*		Amber Br&Win	2020	I-WeBS
Tree sparrow	*Passer montanus*		Amber Br	2021	FTC
Tufted duck	*Aythya fuligula*		Amber Br&Win	2021	I-WeBS
Whooper swan	*Cygnus cygnus*	✓	Amber Br&Win	2017	I-WeBS
Wigeon	*Anas penelope*		Amber Br&Win	2020	I-WeBS
Willow warbler	*Phylloscopus trochilus*		Amber Br	1991	NBDC
Blackbird	*Turdus merula*		Green	1991	NBDC
Blackcap	*Sylvia atricapilla*		Green	2011	NBDC
Blue tit	*Cyanistes caeruleus*		Green	1991	NBDC

Common Name	Scientific Name	Annex I species	BoCCI4 status	Most recent	Data source
Bullfinch	*Pyrrhula pyrrhula*		Green	2011	NBDC
Buzzard	*Buteo buteo*		Green	2019	NBDC
Chaffinch	*Fringilla coelebs*		Green	1991	NBDC
Chiffchaff	*Phylloscopus collybita*		Green	1991	NBDC
Collard dove	*Streptopelia decaocto*		Green	2011	NBDC
Cuckoo	*Cuculus canorus*		Green	1991	NBDC
Dipper	*Cinclus cinclus*		Green	1972	NBDC
Dunnock	*Prunella modularis*		Green	1991	NBDC
Fieldfare	*Turdus pilaris*		Green	2011	NBDC
Goldfinch	*Carduelis carduelis*		Green	2011	NBDC
Grasshopper warbler	*Locustella naevia*		Green	1991	NBDC
Grey heron	*Ardea cinerea*		Green	2021	I-WeBS
Great tit	*Parus major*		Green	2011	NBDC
Hooded crow	*Corvus cornix*		Green	2018	NBDC
Jay	*Garrulus glandarius*		Green	2011	NBDC
Lesser redpoll	*Carduelis flammea cabaret*		Green	1991	NBDC
Little egret	*Egretta garzetta*		Green	2021	I-WeBS
Little grebe	*Tachybaptus ruficollis*		Green	2021	I-WeBS
Long-eared owl	*Asio otus*		Green	2011	NBDC
Long-tailed tit	*Aegithalos caudatus*		Green	2011	NBDC
Magpie	*Pica pica*		Green	1991	NBDC
Mistle thrush	*Turdus viscivorus*		Green	2011	NBDC
Moorhen	*Gallinula chloropus*		Green	2021	I-WeBS
Peregrine	*Falco peregrinus*		Green	2016	NBDC
Pheasant	*Phasianus colchicus*		Green	1991	NBDC
Pied wagtail	*Motacilla alba yarrellii*		Green	1991	NBDC
Raven	*Corvus corax*		Green	2011	NBDC
Reed bunting	*Emberiza schoeniclus*		Green	1991	NBDC
Reed warbler	*Acrocephalus scirpaceus*		Green	2021	FTC
Rock dove (feral pigeon)	*Columba livia*		Green	1991	NBDC
Robin	*Erithacus rubecula*		Green	1991	NBDC
Rook	*Corvus frugilegus*		Green	1991	NBDC
Sedge warbler	*Acrocephalus schoenobaenus*		Green	1991	NBDC
Siskin	*Carduelis spinus*		Green	2011	NBDC
Song thrush	*Turdus philomelos*		Green	1991	NBDC
Sparrowhawk	*Accipiter nisus*		Green	2011	NBDC
Stonechat	*Saxicola torquata*		Green	2011	NBDC
Treecreeper	*Certhia familiaris*		Green	1991	NBDC
Water rail	*Rallus aquaticus*		Green	2021	I-WeBS
Whitethroat	*Sylvia communis*		Green	1991	NBDC
Woodpigeon	*Columba palumbus*		Green	1991	NBDC
Wren	*Troglodytes troglodytes*		Green	1991	NBDC
Vagrant species					
American golden plover	*Pluvialis dominica*		n/a	2010	NBDC
American wigeon	*Anas americana*		n/a	2009	NBDC

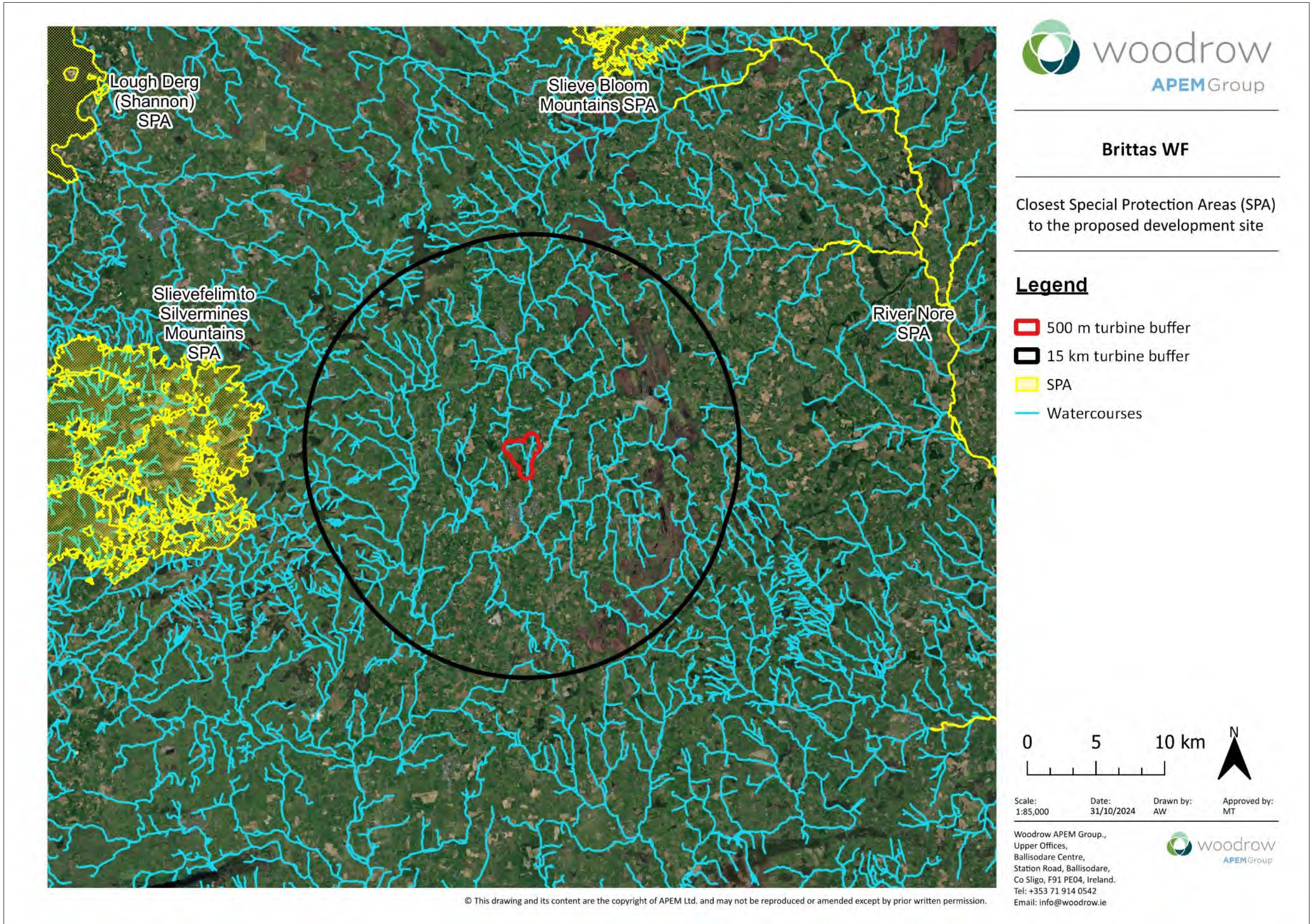

Figure 7A.3: Location of SPAs in relation the proposed Wind Farm Site

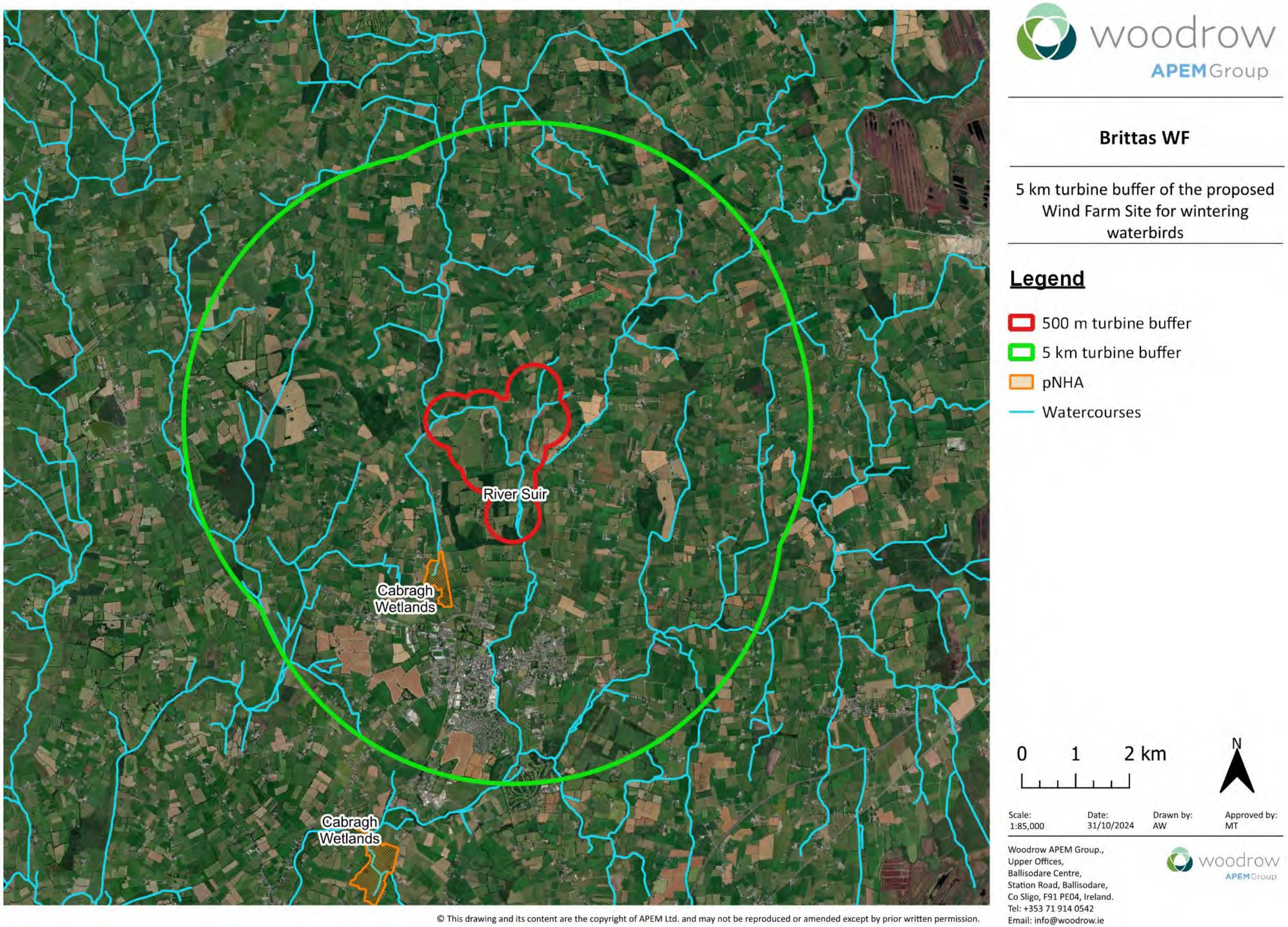

Figure 7A.4: Location of pNHAs with an ornithological interest in the vicinity of the proposed Wind Farm Site

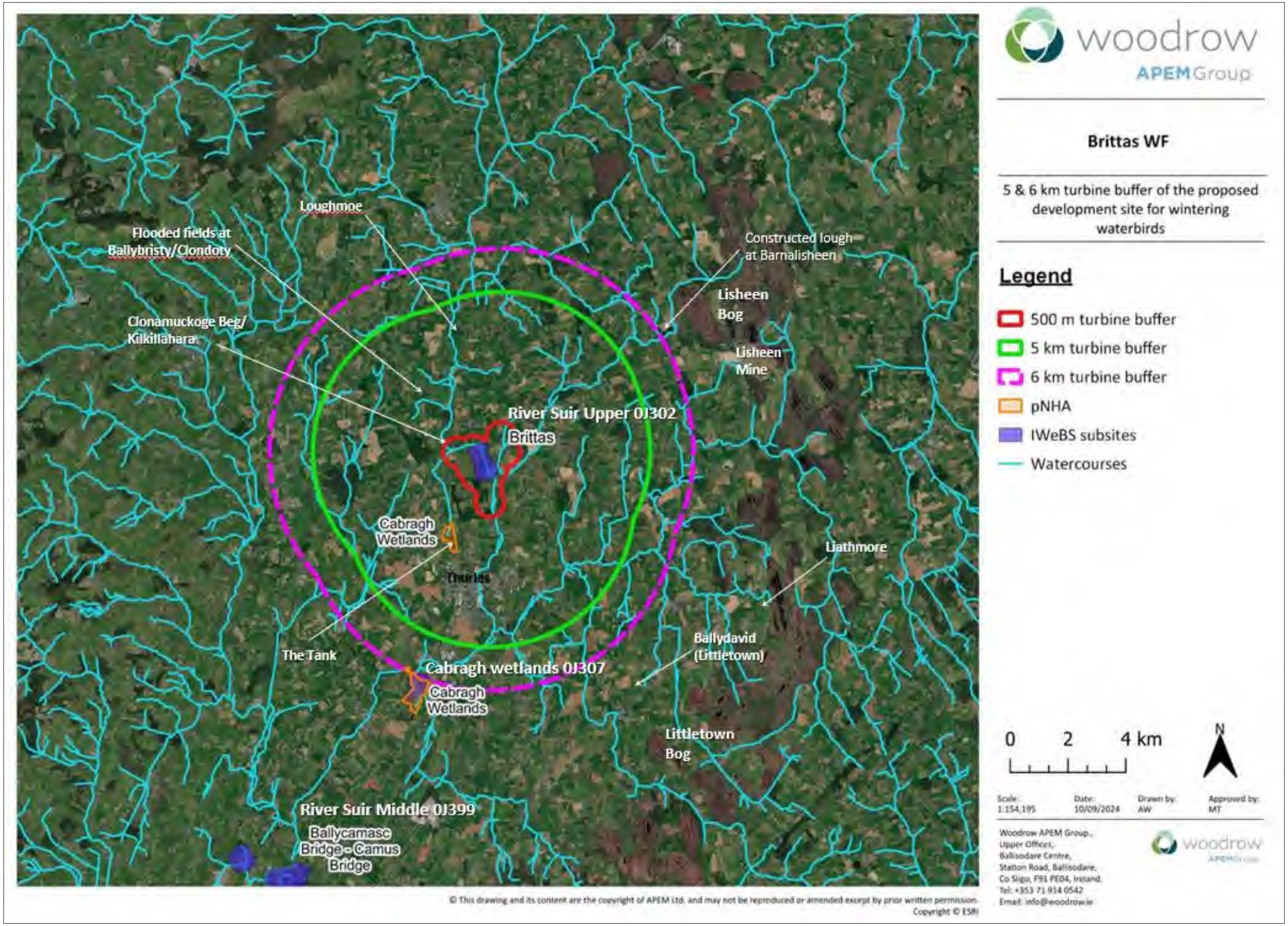

Figure 7A.5: I-WeBS count sections and other wetlands identified for monitoring

Table 7A.2: I-WeBS peak counts for River Suir Upper (0J302) – winter 2011/12 to 2020/21

Source: Irish Wetland Bird Survey, BirdWatch Ireland accessed via: https://birdwatchireland.ie/our-work/surveys-research/research-surveys/irish-wetland-bird-survey/

Species	1% National	1% International	2011 /12	2012 /13	2013 /14	2014 /15	2015 /16	2016 /17	2017 /18	2018 /19	2019 /20	2020 /21
Mute swan	90	100	3	6	5	6	2	5	2	No count	3	5
Whooper swan	150	340	28	16	17	24	10	21				
Greylag goose	35	980	2									
Wigeon	560	14,000	6		10		2					
Teal	360	5,000	50		27	50	1					25
Mallard	280	53,000	7	2								
Cormorant	110	1,200							1			
Little egret	20	1,100	1	2			2		1		1	3
Grey heron	25	5,000	1			1		1	1			4
Moorhen					2							
Golden plover	920	9,300			4							1
Lapwing	850	72,300	200		300	90	220		12		65	170
Dunlin	460	13,300							3			
Snipe					1							
Curlew	350	7,600	12			30	1		5			
Black-headed gull			21			4					7	1
Lesser black-backed gull					200	4	5		200			

Table 7A.3: I-WeBS peak counts for Cabragh Wetlands (0J307) – winters 1994/95 to 2010/11

Source: Irish Wetland Bird Survey, BirdWatch Ireland accessed via: https://birdwatchireland.ie/our-work/surveys-research/research-surveys/irish-wetland-bird-survey/

Species	1% National	1% International	1994 /95	1995 /96	1996 /97	1997 /98	1998 /99	1999 /00	2000 /01	2001 /02	2002 /03	2003 /04	2004 /05	2005 /06	2006 /07	2007 /08	2008 /09	2009 /10	2010 /11
Mute swan	90	100	7	8	6	8	6	5	16	4	3	9	5	4	7	2	11	3	6
Bewick's swan	20	220			P														
Whooper swan	150	340		6	12	21	13		9		5	12		24	5		64	85	
Eur white-fronted goose					2														
Gr white-fronted goose	100	190			10												45		
Greylag goose	35	980			17	25	16	13	10		6	16	1	9	10	8	19	22	25
Canada goose	Non-native				1														
Wigeon	560	14,000	83	200	400	590	425	350	300	350	180	320	420	400	305	240	120	180	120
Gadwall	20	1,200	9	2	1	2	2	6	4	2	3	3	7	14	4	16	17	10	4
Teal	360	5,000	250	100	200	670	560	420	570	400	310	450	370	350	600	250	520	500	500
Mallard	280	53,000	80	50	100	140	160	125	125	68	150	130	160	120	140	100	60	80	120
Pintail	20	600	17	4	20	14	6	6	24	4	9	12	3	1	2	4	16	3	9
Shoveler	20	650	14	40	20	58	78	50	12	32	36	28	36	21	38	22	11	30	12
Pochard	110	2,000			P	2	4				1	1							
Tufted Duck	270	8,900			P						1		1	1					
Little Grebe	20	4,700			2	7	2	1	1	1	2	1	4	1	1	1			
Great crest grebe	30	6,300			P														
Cormorant	110	1,200		3		1		13			3		12		2				3
Bittern					1														
Little egret	20	1,100											1	1	3	4	6	3	1
Grey heron	25	5,000	3	6	4	7	2	4	5	2	1	1	2	3	2	1	3	1	1
Water rail			2	2	4	4	4	3	7	4	5	5	4	3	2	5	2	4	1
Moorhen			10	6	6	8	6	6	5	6	5	4	4	3	3	2	3	3	2
Coot	190	15,500	30	5	12	17	16	2	1	2	2			2	1		5		
Golden plover	920	9,300		50	200	900	200	400	200	400	100	400	1,300	2,000	120		700		
Lapwing	850	72,300	450	120	400	700	500	480	475	420	700	800	2,100	1,500	250	750	750	50	400
Dunlin	460	13,300				1											1		
Ruff					1														
Snipe			10	10	39	36	25	55	5	8	6	39	168	20	15	7	20	60	10
Woodcock					P														
Black-tailed godwit	200	1,100											1			1		1	
Curlew	350	7,600		30	30	151	112	58	140	210	195	170	310	102	165	50	200	200	55
Redshank	240	2,400													1		1		
Kingfisher					P	1	1						1						1
Black-headed gull			3		200	200	8	12		15	50	80	30	26	52	130	50	10	20
Lesser black-backed gull						310							50	4		10			
Herring gull					P														

Table 7A.4: I-WeBS peak counts for Cabragh Wetlands (0J307) - winters 2011/12 to 2020/21

Source: Irish Wetland Bird Survey, BirdWatch Ireland accessed via: https://birdwatchireland.ie/our-work/surveys-research/research-surveys/irish-wetland-bird-survey/

Species	1% National	1% International	2011 /12	2012 /13	2013 /14	2014 /15	2015 /16	2016 /17	2017 /18	2018 /19	2019 /20	2020 /21
Mute swan	90	100	6	6	3	5	2	5	8	nc	2	4
Bewick's swan	20	220								nc		
Whooper swan	150	340	22					1		nc		
Eur white-fronted goose										nc		
Gr white-fronted goose	100	190								nc		
Greylag goose	35	980	15	11	18		6			nc	20	9
Canada goose	Non-native									nc		
Wigeon	560	14,000	270	101	170	150	15	150	250	nc	130	185
Gadwall	20	1,200	4	16	17	10	4	8	3	nc		8
Teal	360	5,000	410	600	350	450	250	200	300	nc	150	280
Mallard	280	53,000	70	44	100	90	40	50	46	nc	2	45
Pintail	20	600	9			1				nc		8
Shoveler	20	650	7	7	12	7	4	6	20	nc		8
Pochard	110	2,000								nc		
Tufted Duck	270	8,900			1					nc		2
Little Grebe	20	4,700	1	1						nc		1
Great crest grebe	30	6,300								nc		
Cormorant	110	1,200	1					1		nc		2
Bittern										nc		
Little egret	20	1,100	1	6	1	5	8	3	2	nc	2	2
Grey heron	25	5,000	1	1	1	1	1	1	2	nc	2	13
Water rail			1	2	2	4	2	2	2	nc	1	3
Moorhen			1	3	5	1	2	2		nc		3
Coot	190	15,500	2	1						nc		2
Golden plover	920	9,300	250	80		50	10	15	40	nc		13
Lapwing	850	72,300	1,100	370	4	90	320	17	200	nc	400	150
Dunlin	460	13,300								nc		
Ruff										nc		
Snipe			5	6	4	1	25	2	12	nc		8
Woodcock										nc		
Black-tailed godwit	200	1,100								nc		
Curlew	350	7,600	120	70	7	110	145	65	154	nc	130	80
Redshank	240	2,400								nc		
Kingfisher						1				nc		
Black-headed gull			80	20	70	4	30	50	20	nc	6	12
Lesser black-backed gull					3	25	10			nc		30
Herring gull										nc		

Table 7A.5: I-WeBS peak counts for River Suir Middle (0J301) – winter 2011/12 to 2020/21

Source: Irish Wetland Bird Survey, BirdWatch Ireland accessed via: https://birdwatchireland.ie/our-work/surveys-research/research-surveys/irish-wetland-bird-survey/

Note: Site has two separate sections along River Suir including, Subsite: 0J399 - Ballycamasc Bridge - Camus Bridge (closest to Thurles) & Subsite: 0J396 – Newcastle -Caher (further south)

Species	1% National	1% International	2011 /12	2012 /13	2013 /14	2014 /15	2015 /16	2016 /17	2017 /18	2018 /19	2019 /20	2020 /21
Mute Swan	90	100		9	9	31	22	41	45	40	52	34
Whooper swan	150	340		42	70	38	50	102	120	103	107	66
Greylag goose	35	980					2	2	4			
Shelduck	100	25,00					1					
Wigeon	560	14,000		20		40	135	29	130	12	191	8
Teal	360	5,000				120	60	47	150	73	25	42
Mallard	280	53,000	2	13	20	84	48	34	48	42	23	26
Shoveler	20	650						1		4	3	4
Little grebe	20	4,700				1		3				
Cormorant	110	1,200	6	15	3	2	37	12	27	17	24	7
Little egret	20	1,100			1		11	1	7	6	13	14
Grey heron	25	5,000	1		1	1	2	4	3	7	13	8
Moorhen					3	6	1	2	5	5	4	1
Grey plover	30	2,000										50
Lapwing	850	72,300		50	70	25	6	4	90	70	62	75
Snipe					3	8	12	9	11	18	6	16
Black-tailed godwit	200	1,100									2	
Curlew	350	7,600		70	76	60	112	66	110	66	59	2
Green sandpiper										1	2	1
Common sandpiper							1					
Kingfisher			1				1			1	1	
Black-headed gull					48	62	2	50		40	3	50
Common gull								100	47	9	5	1
Lesser Black-backed gull					15	45	4		16	45	5	25

7A.3. METHODOLOGY AND SURVEY EFFORT

SNH (2017) guidelines provide recommended survey methodologies for the assessment of avian populations within and adjacent to onshore wind farms. Methodologies utilised for ornithological surveys are outlined in the following sections and adhere to the relevant SNH guidance.

Two years of ornithological surveys are recommended by the SNH guidelines unless it can be demonstrated that a single year of data is sufficiently robust and appropriate for assessing the potential impacts of the proposed Wind Farm Site. In this case, four full seasons of data were collected, spanning from October 2021 to September 2023.

A preliminary year of surveying was undertaken between October 2020 and August 2021. Methodology, survey effort and results for this study year are present in Appendix 7I (Fehily Timoney, 2022).

7A.3.1. Vantage Point (VP) watches

VP watches record flight-line activity in relation to the 500 m turbine buffer (proposed Wind Farm Site) to provide data on selected target species for assessing avian collision risk. Target species are those identified as being at risk from displacement effects caused by wind farm developments or from collision with turbines. Target species for which flight-line data was captured included the following species groups:

- All waterbird species, with particular attention to species listed as Special Conservation Interests (SCIs) of any SPAs considered to be within the potential zone of influence of proposed turbine locations
- All birds of prey
- Any species listed on Annex I of the Birds Directive
- Any species listed as Red or Amber on the BoCCI 2020-26 (Gilbert *et al.*, 2021), where collision risk presents potential for population level effects. During Year 2 of the study, swifts were upgraded to red listed and, consequently, over the breeding season 2021 swifts were included as target species during VP surveys.

Four VPs were used to cover the 500 m turbine buffer, the locations of which are shown in Figure 7A.3. Based on viewshed analysis conducted for a 15 m elevation above ground level, these four VPs provide sufficient coverage (100%) of the 500 m buffer around proposed wind turbine locations. The output maps from viewshed analysis are provided in Appendix 7D and it is worth noting that VPs were set up to cover a larger area, which reduced in size as the number of proposed turbines was reduced. The VPs selected to cover the proposed Wind Farm are compliant with the SNH (2017) guidelines, which stipulate that viewsheds from VPs should not extend more than 2 km and that the angle of view should also not be extended beyond an arc of 180 degrees.

Based on viewsheds extending 2 km, some of the viewsheds of the VPs overlap – see viewshed maps provided in Appendix 7D. Therefore, it is acknowledged that as a function of coverage (survey effort), the flight seconds reported cumulatively for all the VP watches will provide an overestimate for flight times. To avoid any duplication of flight records, an effort was made to limit conducting VP surveys simultaneously by two or more surveyors from VPs with overlapping viewsheds. To limit observer fatigue, surveyors did not typically undertake VP watches of more than 3 hours in duration without a break unless inclement periods of weather meant watches were paused for short durations until conditions improved.

VP watches involve the surveyor observing birds from a stationary position using binoculars and a telescope. In accordance with SNH (2017), the viewshed of the VP is scanned continuously. When a target species is seen, the surveyor estimates the height of the bird and its usage of the area by drawing its flight path on a map and noting its behaviour. Flight heights are estimated visually using known heights of features within the viewsheds, such as telegraph poles, plantations and contours as a reference. Other data collected includes the number of birds, time of detection and duration of flight, as well as sex and age class if relevant. A list of all non-target species encountered within the environs of the proposed Wind Farm Site is also compiled during VP watches, though priority is given to recording target species when busier periods of flight activity occur.

The aim for a given season, i.e. breeding season (typically mid-March/April to August/September) and non-breeding season (typically September/October to mid-March), is to conduct a minimum of 36 hours of watches per VP per season, ensuring that watches are spread relatively evenly over the study period. This target was reached for each of the vantage point locations for the duration of the four seasons of monitoring, with some VPs receiving an excess of 36 hours. Therefore, the flightline data collected is considered sufficient to identify any potential ornithological constraints arising from potential collision risk.

A summary of dates that VP watches were undertaken, and the duration of watches completed at each VP location us given in Table 7A.6. Further details on survey effort for VP watches and weather conditions are provided in Appendix 7C.

7A.3.2. Collision Risk Modelling

Appendix 7H provides a detailed method statement for the collision risk modelling applied along with results.

VP watches are conducted to collect flight line data which can then be used to model collision risk. The flight risk volume applied in this analysis is derived from a buffer extending 500 m from the proposed turbine locations, which for the proposed Wind Farm Site equates to an area of 490.53 ha. Flights occurring within the 500 m turbine buffer and at heights of between 25 m and 180 m above ground level were defined as being within the collision risk zone (CRZ). A height band of 25-180 m was selected as it this represents the minimum and maximum rotor swept heights of all turbine types being assessed, as derived from blade length and hub height. Three sets of turbine specifications were assessed, hereafter referred to as Turbine Type A, Turbine Type B and Turbine Type C, and the following specifications:

- Turbine Type A - rotor swept dimensions: 30 m to 180 m (rotor diameter 150 m)
- Turbine Type B - rotor swept dimensions: 25 m to 180 m (rotor diameter 155 m)
- Turbine Type C - rotor swept dimensions: 31 m to 180 m (rotor diameter 149 m)

For target species generating sufficient levels of flight time within the CRZ, data sets were run through a collision risk model (CRM), as detailed in Scottish Natural Heritage (SNH, 2000) and Band *et al*. (2007), employing avoidance rates as given in SNH (2018a). This provides estimates of the number of collisions per annum and for the lifetime of the proposed Wind Farm (35 years).

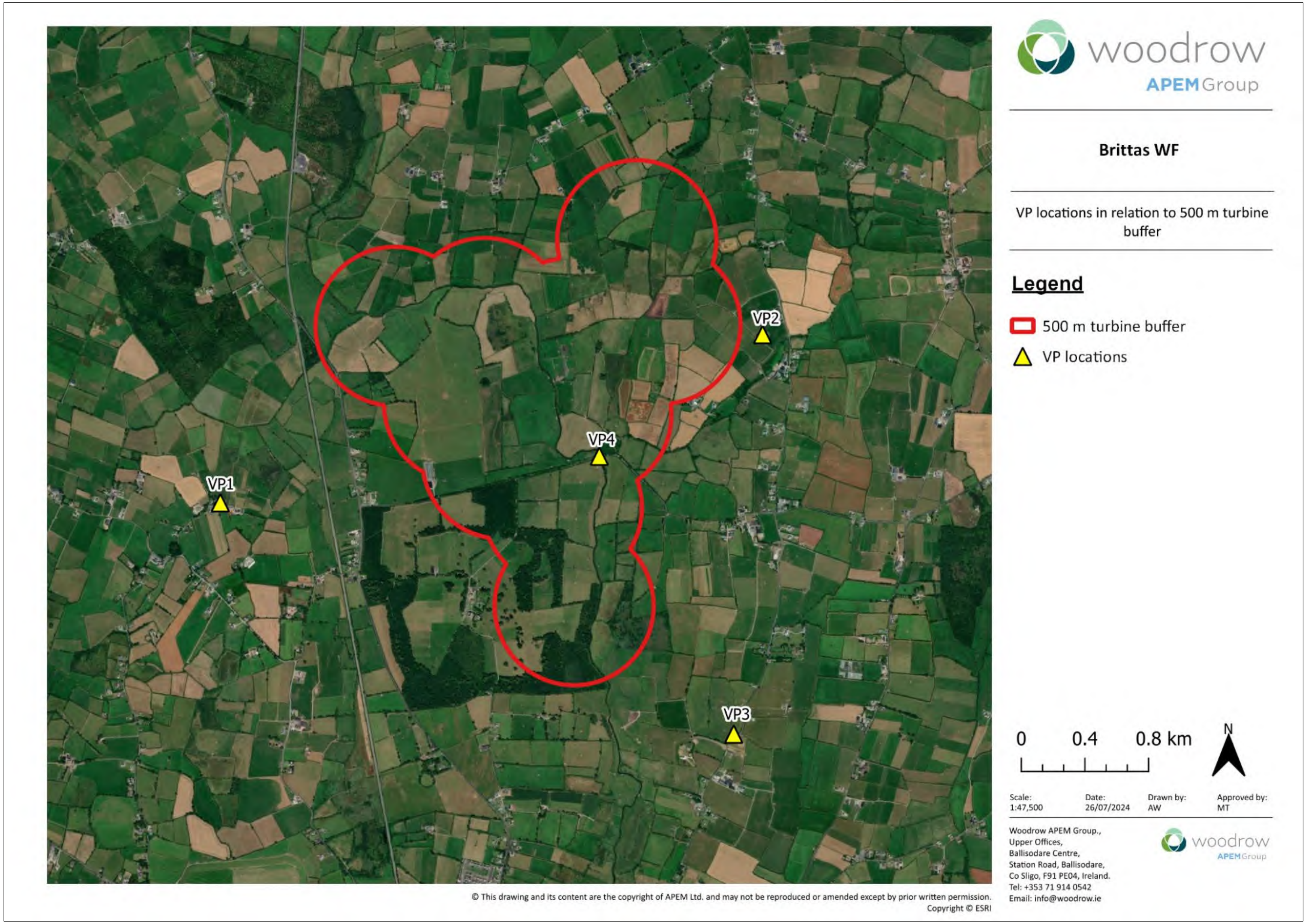

Figure 7A.6: Vantage point (VP) locations showing extent of 500 m turbine buffer

Table 7A.6: Dates and duration for VP watches

Non-breeding season 2021-2022				
Date	**VP1**	**VP2**	**VP3**	**VP4**
23/10/2021		6		
24/10/2021	6			3
25/10/2021				3
26/10/2021			6	
11/11/2021	6			
12/11/2021		3		3
13/11/2021	3			3
22/11/2021		6		
23/11/2021			3	
24/11/2021			3	
01/12/2021	3	3		
02/12/2021			3	3
16/12/2021	3		3	
17/12/2021				3
20/12/2021		3		3
21/12/2021			3	
09/01/2022				3
18/01/2022	3	3		
19/01/2022			3	3
20/01/2022	3			
22/01/2022		3		
23/01/2022			3	
08/02/2022	3	3		
24/02/2022	3		3	3
26/02/2022		3	3	3
07/03/2022	3		3	3
13/03/2022		3		
Total	**36**	**36**	**36**	**36**

Breeding season 2022				
Date	**VP1**	**VP2**	**VP3**	**VP4**
11/04/2022	6			
12/04/2022				6
13/04/2022	6			
18/04/2022			6	
05/05/2022	6			
06/05/2022				6
12/05/2022			6	
13/05/2022		6		
02/06/2022	3			
03/06/2022	3			
20/06/2022		3	3	
24/06/2022		3	3	
25/06/2022			3	
02/07/2022				3
04/07/2022	3			3
06/07/2022		6		
16/07/2022	3			3
24/07/2022			9	
05/08/2022	3	3		
08/08/2022		3	3	
22/08/2022				6
25/08/2022	6			
28/08/2022		6		
30/08/2022	3		3	
31/08/2022				3
Total	**36**	**36**	**36**	**36**

Non-breeding season 2022-2023				
Date	**VP1**	**VP2**	**VP3**	**VP4**
24/10/2022	1.5			
27/10/2022	2			3
29/10/2022		3	3	
31/10/2022		3	3	
27/11/2022	6			
28/11/2022		6		
29/11/2022			6	
30/11/2022				6
09/12/2022	3			3
12/12/2022	3	3		
27/12/2022		3	3	
29/12/2022			3	3
15/01/2023		6		
21/01/2023	6			
22/01/2023				6
25/01/2023	3	3		
29/01/2023			6	
05/02/2023	6			
06/02/2023		6		
18/02/2023			6	
19/02/2023				6
01/03/2023			3	3
04/03/2023	6			
05/03/2023			6	
06/03/2023		3		3
24/03/2023				2.5
26/03/2023				1
Total	**36**	**36**	**39**	**36.5**

Breeding season 2023				
Date	**VP1**	**VP2**	**VP3**	**VP4**
06/03/2023		3	3	
25/03/2023	3	3	3	
26/03/2023				3
22/04/2023			6	
23/04/2023	6			
29/04/2023		6		3
30/04/2023				3
14/05/2023	6			
01/06/2023		3	3	
09/06/2023	3			
12/06/2023	3			
16/06/2023				3
19/06/2023		3	3	
26/06/2023				3
27/06/2023		6		3
28/06/2023			6	3
05/07/2023	3			
06/07/2023	3			
18/07/2023			6	
19/07/2023				6
31/07/2023		6		
03/08/2023	3			
09/08/2023		6		
10/08/2023				6
16/08/2023			6	
21/08/2023	3			
27/08/2023			3	
28/08/2023		3		3
19/09/2023	3			
20/09/2023				3
Total	**36**	**39**	**39**	**39**

7A.3.3. Breeding bird surveys

The purpose of the site walkovers or point counts, according to SNH (2017) guidelines, is to give a broad overview of bird activity within the 500 m turbine buffer using a route which is representative of the important ornithological features/habitats present. Breeding bird surveys aim to provide information on the distribution of breeding birds throughout the 500 m turbine buffer, highlighting the locations of potentially sensitive species to be flagged as ecological constraints, e.g. breeding waders or raptors. Various methods are employed depending on the habitat type and the expected species, information which is highlighted in the desk study. As such, the survey methodology employed a range of survey techniques determined by desk study such as proximity to designated sites, habitat availability and associated avian assemblages. The study area for breeding bird walkovers encompasses the 500 m buffer of the turbine locations within the proposed Wind Farm Site.

Based on topography and habitat availability, the desk study determined that the proposed Wind Farm Site had the potential to support a range of target species, including raptors (e.g. peregrine, kestrel, buzzard and sparrowhawk), lowland breeding waders (e.g. snipe, lapwing, redshank, curlew), riverine species (e.g. kingfisher) and crepuscular/nocturnal woodland species (e.g. woodcock and long-eared owls).

Two seasons (2022 and 2023) of breeding bird walkover surveys were carried out, with survey visits taking place at least seven days apart. The dates of these surveys are shown in Table 7A.7, further details such as weather conditions available in Appendix 7C. Additional visits were undertaken in 2024 to cover the proposed location for the onsite electrical substation, and the area was surveyed on 31 May and 05 June 2024, with the main focus being coverage for breeding snipe and potential usage by other waders. Appendix 7I provides details for breeding bird surveys undertaken over the 2020 breeding season (Fehily Timoney, 2022).

7A.3.3.1. Adapted common bird census (CBC) methodology

Breeding bird surveys were undertaken following common bird census (CBC) methodology, as described in Gilbert *et al*. (1998) - summarising Marchant (1983) and Marchant *et al*. (1990). This approach, which employs territory mapping, is typically used where there is a requirement to map the distribution of breeding birds across an entire site. Strict application of CBC methodology, which is undertaken for long-term population monitoring and high levels of accuracy in mapping breeding distribution, requires a minimum of 10 visits between March and July, conducted at intervals of at least 10 days apart. As outline in SNH (2017), this level of detail is not required for proposed wind farm developments; and the purpose of the walkovers is to identify and then survey habitats potentially supporting target species and also to sample the range of different habitat types present within the proposed Wind Farm site to generate a general description of avian assemblages occurring that is used inform the ornithological baseline. Survey dates are provided in Table 7A.7 and for this lowland site the minimum number of site visits undertaken was three.

CBC surveys can commence from sunrise and are undertaken over the early morning period for a duration of up to four hours. While it is advised that surveyors avoid the hour before sunrise (i.e. the dawn to sunrise period), this time period was incorporated into surveys for snipe, as detailed in O'Brien & Smith (1992) that also allows for lowland wader surveys to be conducted through the day on some visits. For CBC methodology it is also suggested that incorporating evening visits can be useful for more accurately mapping the occurrence of certain species, e.g. woodcock that display around dusk or grasshopper warblers that tend to be more vocal at dusk.

The survey area is covered at a slow pace and the routes selected cover all suitable breeding wader habitat within the 500 m turbine buffer including the River Suir and associated wetland habitats on the floodplain, with consideration given to any suitable habitat for curlew out to 800 m. The route adopted also allowed for sampling of all the other distinct habitat types occurring within the proposed Wind Farm Site, including the woodland and pastural grassland with treelines/hedgerows. Systematic point counts were not employed to cover the blocks of woodland/forestry plantations, as these were relatively small and could be adequately covered by walking slowly through them or around the periphery.

Appendix 7C provides details on weather conditions encountered during walkover surveys and ideally, to ensure bird activity is not suppressed and to facilitate optimal detection, surveys should not be undertaken in unfavourable weather conditions, specifically moderate to strong winds (greater than Beaufort Force 5), persistent rain and/or in poor visibility.

While walkover surveys covered habitats within the proposed Wind Farm Site that were suitable for breeding raptors, including: buzzard, sparrowhawk, kestrel, and peregrine, the time required to detect breeding sites for these species, as outlined in Hardey *et al*. (2013), is not facilitated during walkovers. As such, any raptor observations recorded during walkovers were examined together with observations from VP watches and breeding raptor surveys covering a search area out to 2 km to identify breeding territories.

7A.3.3.2. Breeding snipe surveys

Suitably wet areas within the 500 m turbine buffer were covered for breeding snipe, including wetlands associated with the River Suir floodplain. Additional breeding snipe surveys were conducted in 2024 to cover a small area of fen/wet grassland at the proposed location for the onsite electrical substation.

As detailed in Gilbert *et al*. (1998), summarising O'Brien & Smith (1992), surveys running from dawn to three hours after, or late afternoon to dusk, were employed to increase the chances of detecting breeding behaviour, including chipping, or drumming snipe. These surveys would also detect the occurrence of other lowland breeding waders, including lapwing, redshank and curlew, all other bird species encountered were also noted, along with an indication of behaviour so that breeding status could be determined.

Suitable areas of habitat were covered three times over the breeding season between mid-April and early June, with visits at least seven days apart. To maximum detection of displaying birds surveying on cold, very wet and windy (> Beaufort Force 3) was avoided.

Discretion is required on interpretation of early spring breed behaviour in snipe, as sometimes these can be birds on passage, simply gearing for the breeding season and will move on set up territories elsewhere. Likewise, lapwing and often start displaying early in the season and then move on.

7A.3.3.3. Dusk surveys

Dusk surveys targeting woodland areas within the 500 m turbine buffer were carried out on calm, dry nights specifically to identify any roding woodcock (territorial males) and long-eared owls, as detailed in Gilbert *et al.* (1998) and Hardey *et al*. (2013). Survey would also detect other crepuscular/nocturnal species if occurring, such as nightjar. Dates for dusk surveys are listed in Table 7A.9. Further details on weather and survey efforts are provided in Appendix 7C.

For woodcock surveys commenced roughly 15 minutes before sunset and continued up until 60 minutes after sunset between May and June, as recommended by UCC Irish Woodcock Project (UCC

Ornithology Group, 2021). Surveyors targeted relatively short sections of woodland edge with associated scrub/forestry rides during each survey.

Dusk/dawn surveys for long-eared owl were carried out during targeted periods, when this species is most vocal, specifically early in the season (late March to May) when males and females tend to be most actively calling and late in the season (late June and into August) when young can be detected begging loudly. One survey was undertaken before dawn and incorporated with a short walkover at a wetland to check for breeding snipe. During dusk/dawn surveys, surveyors also listened for other crepuscular/nocturnal species, such as barn owls and possibly nightjars, as well as species that are known to be more active over this period, like snipe, water rail and grasshopper warblers.

Dusk/dawn surveys would detect barn owl activity, however surveying for this species involves assessing any buildings and veteran trees within 1 km of proposed turbines for potential to support barn owls. Any incidental records of crepuscular/nocturnal bird species were noted during bat surveys that were undertaken by APEM Group Woodrow; this included internal inspection of buildings and veteran trees within the proposed Wind Farm Site.

7A.3.3.4. Kingfisher surveys

Due to the presence of kingfisher along the River Suir, riverine bird surveys incorporating kingfisher habitat suitability assessments for kingfisher were undertaken as part of site walkover surveys. Kingfisher habitat suitability assessments were carried out to determine the quality of the foraging habitat and the extent riverbank with the material, structure and form favoured by this species for excavating nest holes – essentially taller, vertical banks with friable materials that are not susceptible to flooding during the summer months.

The methodology employed to assess kingfisher habitat suitability followed criteria outline in Cummins *et al*. (2010) and used in other baseline kingfisher surveys conducted in Ireland (Crowe *et al*., 2008 & Thomas *et al*. 2007). The survey area, defined as the River Suir flowing through the 500 m turbine buffer was divided into sections, each *c*. 600 m. The following characteristics of the sections were noted to provide an assessment of potential for breeding and foraging kingfisher:

- Nesting habitat - bank profile, height and material (typically kingfisher require tall vertical banks with soft material for excavating nest burrows, although existing holes e.g. amongst tree roots, in solid structures and in dead sections of trees are occasionally utilised). The extent of suitable nesting banks was defined for each section as:
    1. less than 10 m of suitable bank;
    2. 10-100 m of suitable bank; or
    3. more than 100 m of suitable bank
- Foraging habitat - water quality and flow, occurrence of fishing perches (e.g. overhanging trees)
- Potential disturbance factors

Kingfisher habitat assessments were conducted on 12 May 2022 (River Suir south of Rossestown Bridge) and on 06 June 2022 (River Suir north of Rossestown Bridge).

7A.3.3.5. Data capture for walkover surveys

During site walkovers georeferenced data was collected using Survey123 and routes/coverage were tracked using the Outdoor Active application (previously ViewRanger). In addition to target species, point data on the occurrence of non-target species was recorded to provide an indication of the bird assemblages occurring within the proposed Wind Farm Site. Surveyors identify and record the activity of birds and at the end of the season the maps for the series of visits are analysed together. This highlights concentrations or clusters in breeding activity for species and a picture emerges showing the location of breeding territories across the site. If required, the number of territories for each species can be reported.

Table 7A.7: Survey effort for breeding bird walkover surveys covering proposed Wind Farm Site

Breeding season 2022		
Date	**Survey type**	**Surveyor**
28/04/2022	Walkover	SM
29/04/2022	Walkover	SM
11/05/2022	Walkover	MT
12/05/2022	Walkover (O'B&S)	MT
16/06/2022	Walkover	MT
26/06/2022	Walkover (O'B & S)	SM
27/06/2022	Walkover	SM
26/07/2022	Walkover	SM

Breeding season 2023		
Date	**Survey type**	**Surveyor**
13/04/2023	Walkover	EM
26/04/2023	Walkover (O'B & S)	EM
09/05/2023	Walkover	PDEV
22/05/2023	Walkover	PDEV
28/06/2023	Walkover (O'B & S)	EM
29/06/2023	Walkover	EM
24/07/2023	Walkover	JH

Table 7A.8: Survey effort for dusk/dawn surveys for owl and woodcock (WK)

Breeding season 2022		
Date	**Survey type**	**Surveyor**
11/05/2022	Dusk survey (WK/Owl)	SM
11/05/2022	Dusk survey (WK/Owl)	MT
12/05/2022	Dawn survey (Owl/SN)	MT
22/05/2022	Dusk survey (WK/Owl)	SM
23/06/2022	Dusk survey (WK/Owl)	SM

Breeding season 2023		
Date	**Survey type**	**Surveyor**
23/03/2023	Dusk survey (Owl)	JH
09/05/2023	Dusk survey (WK/Owl)	PDEV
22/05/2023	Dusk survey (WK/Owl)	PDEV
09/06/2023	Dusk survey (WK/Owl)	EM
28/06/2023	Dusk survey (WK/Owl)	EM
25/07/2023	Dusk survey (Owl)	EM
16/08/2023	Dusk survey (Owl)	KW

7A.3.4. Wider area breeding raptor surveys

SNH (2017) recommends surveying the wider area (hinterland) for up to 2 km from a proposed wind farm development for most breeding raptor species, including hen harrier and merlin. Surveys for breeding eagle require a larger search area (6 km buffer); however based on the desk study, this region is beyond the current Irish breeding range for white-tailed eagle and golden eagle. The search area can also be extended, if the site lies within the potential zone of influence to any SPAs (SNH, 2016). The proposed Wind Farm Site was considered to be too distant to be associated with any SPAs designated for raptors and therefore, using a 2 km buffer on the proposed turbine as the breeding season search area was deemed appropriate and is shown in Figure 7A.7. For barn owl a search area covering the 1 km turbine buffer was established, based on SNH (2017) guidelines, and searches targeted old buildings and veteran trees for potential usage by breeding barn owls.

A combination of 'mini-VPs', as well as driven and walked transects were used to search potential nesting habitats within the hinterland over the 2022 and 2023 breeding seasons. Survey methods for breeding raptors follow those outlined in Hardey *et al.* (2013). The dates of the wider area raptor surveys are shown in Table 7A.9. Further details on weather and survey efforts are provided in Appendix 7C.

Raptor observations recorded during VP watches and site walkovers were examined together with observations from wider area breeding raptor surveys to identify breeding territories.

Table 7A.9: Survey effort for wider area breeding raptors

Breeding season 2022		
Date	**Survey**	**Surveyor**
28/04/2022	Breeding raptor	SM
29/04/2022	Breeding raptor	SM
11/05/2022	Breeding raptor	SM
24/06/2022	Breeding raptor	SM
26/07/2022	Breeding raptor	SM
25/08/2022	Breeding raptor	SM
28/08/2022	Breeding raptor	SM

Breeding season 2023		
Date	**Survey**	**Surveyor**
21/03/2023	Breeding raptor	JH
22/03/2023	Breeding raptor	JH
23/03/2023	Breeding raptor	JH
11/04/2023	Breeding raptor	JH
20/04/2023	Breeding raptor	JH
26/05/2023	Breeding raptor	PDEV
27/06/2023	Breeding raptor	EM
25/07/2023	Breeding raptor	EM
28/07/2023	Breeding raptor	EM

7A.3.5. Winter walkovers of proposed Wind Farm Site

Winter walkovers of the proposed Wind Farm Site were undertaken during winter 2021-22 and 2022-23, during which surveyors walked the proposed Wind Farm Site noting down all species encountered and ensuring that coverage sampled of all important habitat types present. As such, winter walkovers provide useful contextual information on the distribution of winter bird species occurring within the site, how habitats are being utilised and can provide additional information on numbers of birds, especially for flocking species like golden plover and lapwing. As mentioned in Section 2, walkovers are also a more suitable survey method for species which are difficult to detect during VP watches, such as wintering woodcock and snipe.

During winter site walkovers georeferenced data was collected using Survey123 and routes/coverage were tracked using the Outdoor Active application (previously ViewRanger). Point data on the occurrence and behaviour of target and non-target species was recorded.

The dates of the winter site walkovers carried out during winter 2021-22 and winter 2022-23 are listed in Table 7A.10, with further detail on weather and survey effort provided in Appendix 7C.

Table 7A.10: Survey effort for non-breeding season site walkover surveys

Non-breeding season 2021-22		
Date	**Survey type**	**Surveyor**
18/12/2021	Winter walkover	AR
19/12/2021	Winter walkover	AR
21/01/2022	Winter walkover	AR
22/01/2022	Winter walkover	AR
30/01/2022	Winter walkover	AR
27/02/2022	Winter walkover	AR
28/02/2023	Winter walkover	AR

Non-breeding season 2022-23		
Date	**Survey type**	**Surveyor**
23/01/2023	Winter walkover	JH
24/01/2023	Winter walkover	JH
16/03/2023	Winter walkover	JH

7A.3.6. Winter hen harrier roost searches

During the initial desk-based review it was noted that there were no known hen harrier roost within the 10 km Irish nation grid square [S16] encompassing the proposed Wind Farm Site (NPWS, 2022). However, scrub often associated with wetland areas had some limited cover that may superficially appear to be capable of supporting a hen harrier winter roost. SNH (2017) guidance stipulates in relation to surveying for communal raptor roosts, including those of hen harriers, that roost sites within 2 km of a proposed Wind Farm Site should be identified. The dates of winter hen harrier roost searches are shown in Table 7A.11, with further detail on weather and survey effort provided in Appendix 7C.

The approach to surveying for hen harrier roosts was determined by two factors:

- Availability of potentially suitable roosting habitat in the vicinity of the proposed Wind Farm Site, as described by Clarke & Watson (1990) and in the Irish national hen harrier winter roost survey guidelines (O'Donoghue, 2019); and
- Hen harrier activity was observed during VP watches, site walkovers and wider area surveys.

SNH (2017) defers to Hardey *et al*. (2013) for specific roost survey methodology requiring surveyors to employ professional judgement in identifying and targeting potential roosts based on observed flight activity within or adjacent to the proposed development. Hardey *et al*. (2013) recommend locating birds in the late afternoon and then attempting to track them back to roosts. O'Donoghue (2019) notes that the best time to conduct a roost watch is at least 40 minutes before sunset until dark or 30 minutes before sunrise until at least 30 minutes after sunrise.

If a roost is identified, then further monitoring is required to describe roost attendance and to track flight lines to and from the roost in relation to the proposed Wind Farm Site. Further monitoring is typically undertaken on a monthly basis or twice a month, depending on the frequency of occupancy and how affiliated roosting birds are to the proposed Wind Farm Site.

Table 7A.11: Survey effort for hen harrier roost watch surveys

Non-breeding season 2021-22			Non-breeding season 2022-23		
Date	**Survey**	**Surveyor**	**Date**	**Survey**	**Surveyor**
25/10/2021	HH roost search	AR	14/09/2022	HH roost search	TR
12/11/2021	HH roost search	AR	17/10/2022	HH roost search	TR
16/12/2021	HH roost search	AR	21/01/2023	HH roost search	GO
19/01/2022	HH roost search	AR	14/02/2023	HH roost search	GO
25/02/2022	HH roost search	AR	23/03/2023	HH roost search	JH
13/03/2022	HH roost search	AR	23/03/2023	HH roost search	JH

7A.3.7. Wider area wintering waterbird surveys

In assessing the impact of the proposed development, it can be important to provide contextual data on the numbers of wintering waterbirds in the wider area relative to the usage of the proposed Wind Farm Site by these species. SNH (2017) survey guidelines require monitoring of swan and geese foraging and roosting locations when occurring in the environs of the proposed Wind Farm Site, and specifically where SPAs are designated for these species. Study areas of up to 500 m from the proposed Wind Farm Site for foraging locations and up to 1 km from the site for roost locations are recommended, although this may be extended where high levels of activity are anticipated and if investigating connectivity with designated sites.

In Ireland, swan and goose distribution is not well documented beyond designated sites and many wintering waterbirds occur outside of SPAs, with distribution often changing over time in response to changes in land use and other pressures such as hunting. Seasonal availability of resources also affects distribution, such as availability of stubbles in the autumn, as do more stochastic events such as flooding. The results of the desk study (see Section 7A.1) highlighted the availability of wetland habitat along the floodplain of the River Suir, including the River Suir Upper, a count area monitored by I-WeBS which is within the proposed Wind Farm Site. Consequently, two seasons of wider area wintering waterbird surveys were carried out in winter 2021-22 and winter 2022-23.

Survey methodology was based on the approach employed by I-WeBS, with modifications for recording locations and behaviours of birds based on Lewis & Tierney (2014), involving monthly survey visits to cover the survey area, which was extended up to 5-6 km beyond the proposed Wind Farm Site (see Figure 7A.8). As outlined in the desk study (Section 7A.1), the initial wider area wintering waterbirds surveys conducted over winter 2020/21 (Fehily Timoney, 2022) surveyed wetlands further afield, such as Littleton Bog and Liathmore, which are > 9 km away from the proposed Wind Farm Site – see Figure 7A.5. The relatively low numbers of winter waterbirds recorded at these locations and the separation distance meant that further surveying of these more distance wetlands over winters 2021/22 and 2022/23 was not warranted.

The aim was to cover any suitable wetland or other habitat in the wider area that was considered suitable for foraging and/or roosting wintering waterbirds. Surveyors recorded the location of waterbirds and associated behaviour using Surevy123, with survey routes/coverage tracked using the Outdoor Active application (previously ViewRanger). While waterbirds are the focus of this survey, other species are recorded, in particular birds of prey which often start displaying over the late winter/early spring. It should be noted that waterbird activity along the course of the River Suir, as it flows through the proposed Wind Farm Site, was also viewable from all of the VPs used during the study period.

The dates of the surveys are shown in Table 7A.12, with further detail on weather and survey effort provided in Appendix 7C.

Table 7A.12: Survey effort for wider area wintering waterbird surveys

Non-breeding 2021-22				Non-breeding 2022-23			
Visit no.	Date	Survey	Surveyor	Visit no.	Date	Survey	Surveyor
1	25/10/2021	I-WeBS	AR	1	18/10/2022	I-WeBS	CS
2	23/11/2021	I-WeBS	AR	2	28/11/2022	I-WeBS	SM
3	17/12/2021	I-WeBS	AR	2	30/11/2022	I-WeBS	SM
4	20/01/2022	I-WeBS	AR	2	02/12/2022	I-WeBS	SM
5	25/02/2022	I-WeBS	AR	3	18/12/2022	I-WeBS	GO
6	13/03/2022	I-WeBS	AR	3	31/12/2022	I-WeBS	GO
				4	21/01/2023	I-WeBS	GO
				4	22/01/2023	I-WeBS	GO
				5	14/02/2023	I-WeBS	GO
				6	06/03/2023	I-WeBS	GO
				6	07/03/2023	I-WeBS	GO
				6	13/03/2023	I-WeBS	GO

7A.3.8. Statement on survey limitations

Given that there are three years of survey data are available to inform the ornithological baseline and impact assessment, any gaps in survey effort for site walkover surveys or wider area surveys are compensated for and importantly, it is considered that overall the surveys completed allows for all sensitive ornithological receptors to be identified and potential for likely significant effects to be robustly assessed.

In relation to walkover surveys, it is considered that the most important habitats occurring within the 500 m turbine buffer, namely wetlands potentially utilised by breeding and wintering waterbirds were adequately covered. Likewise, coverage of the wider area for wintering waterbirds was comprehensive. For VP watches no limitations are identified in terms of coverage the site and as shown by viewshed maps in Appendix 7D, the VPs covered 100% of the 500 m turbine buffer and in fact the use of VP4 results in considerable overlap in viewsheds.

The main survey limitation pertains to flight line data for swifts which was not recorded systematically by all surveyors. Survey approaches differed for recording swift flight times because swift were considered a secondary target species by most surveyors, as prior to Gilbert et al. (2021) swift were amber listed. To account for this limitation a precautionary approach to assessing swift collision risk is required.

Inclement weather conditions, especially during the winter can result in limitations for the ornithological data collected by limiting detectability of birds or supressing bird activity. This is avoided in the first instance, by attempting to undertake surveys within the permitted weather parameters as specified by survey guidelines and as such surveys are scheduled around poor weather conditions. Secondly, weather conditions are monitored throughout surveys to ensure that when poor weather conditions are unexpectedly encountered, these do not dominate the data set, in particular for VP watch data. One of the main weather limitations for VP watch data is reduced visibility across the viewshed. Over the two year study visibility during VP watches was categorised as good 80% of the time, changeable good-moderate 8% of the time, moderate 12% of the time and changeable good-poor only 1% of the time. In addition, wind speeds in excess of Beaufort Force 5 were only encountered on 4% of the VP watches and the majority, 71%, were conducted in Beaufort Force 3 or less. In terms of precipitation, 58% of the VP watches were noted as dry, with periodic rainfall ranging from drizzle to heavy passing showers recorded on the remaining watches and only two VP watches recorded prolonged rainfall. Only one VP watch encountered snow at times. Therefore, there are no significant weather related limitations, and the surveys conditions are considered representative a range of weather parameters.

Overall, despite the minor limitations identified, it is concluded that sufficient data was collected over the study period to identify any ornithological constraints that may arise for the proposed Wind Farm and inform the ornithological impact assessment.

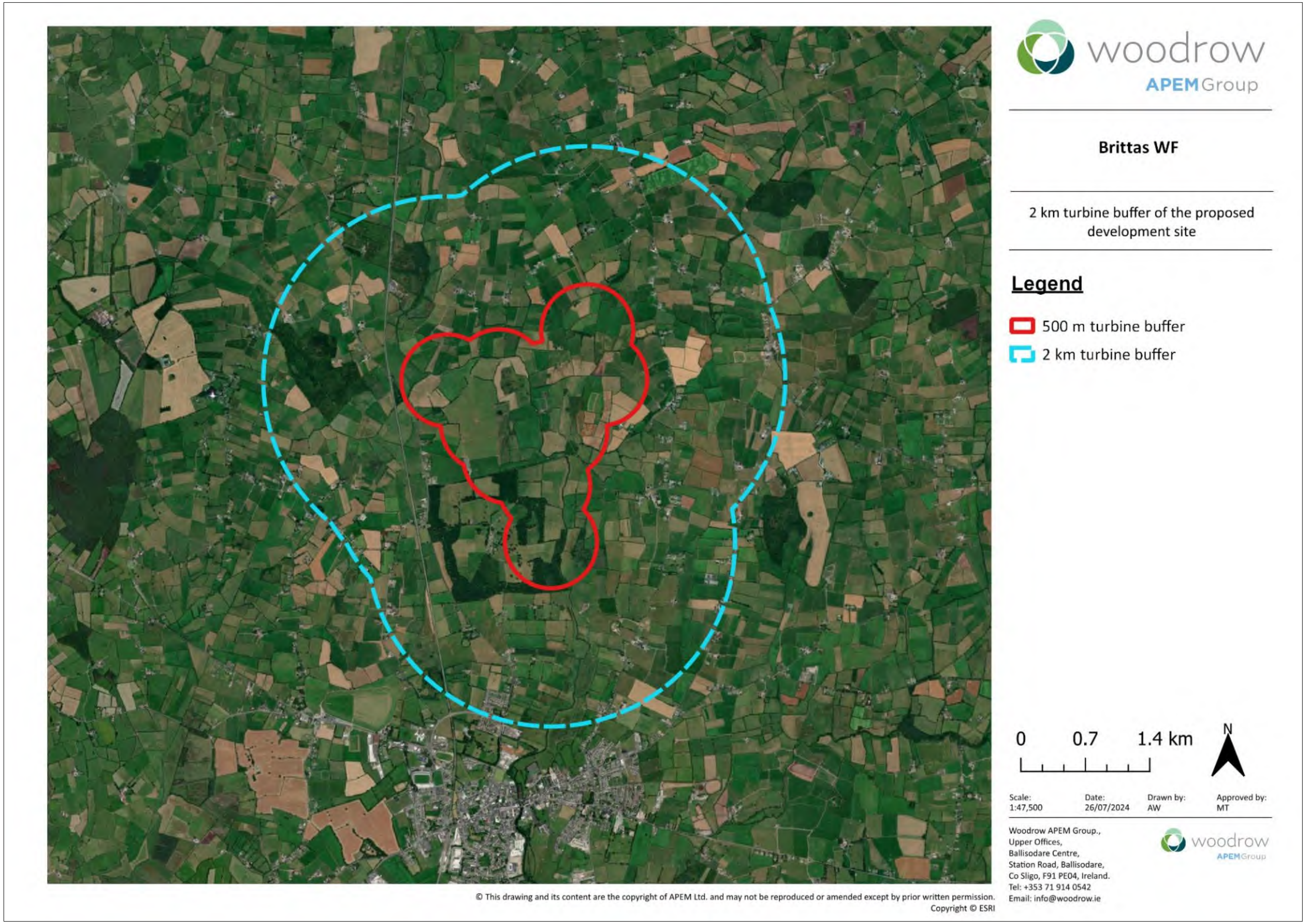

Figure 7A.7: Extent of 2 km turbine buffer monitored for breeding raptors and hen harrier roosts

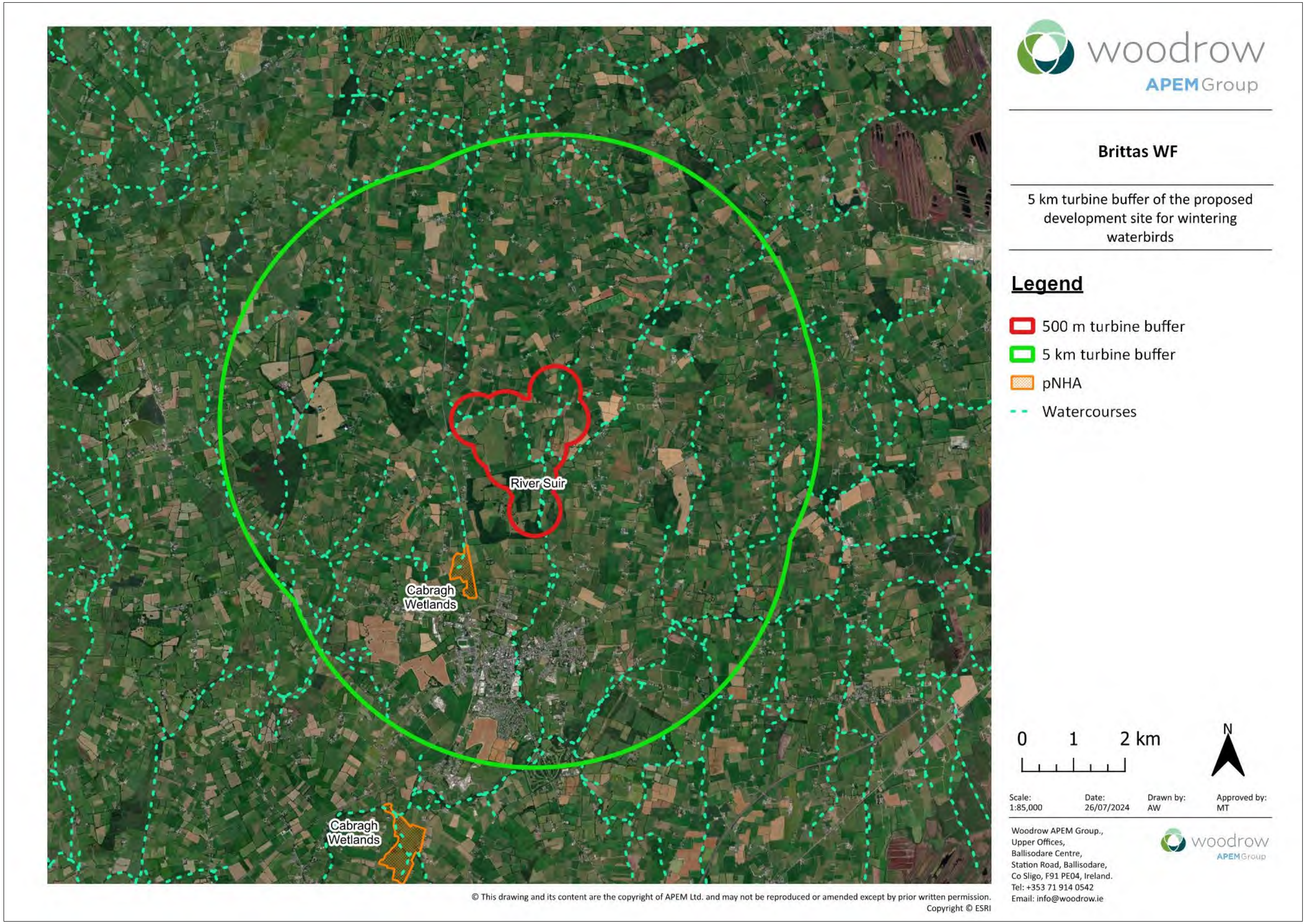

Figure 7A.8: Extent of 5-6 km turbine buffer monitored for wintering waterbird surveys

7A.4. SURVEY RESULTS

7A.4.1. Results – Vantage Point (VP) watches

A total of 23 target species were recorded during VP watches over two years of surveys between October 2021 and September 2023. Flight times for target species recorded within the 500 m turbine buffer over the two year study are provided in Table 7A.13. Flightline maps are provided in Appendix 7E, where individual flightlines shown on the maps can be cross-referenced via identification numbers to additional data on flight behaviour within attribute tables. Table 7A.14 shows seasonal variation in the occurrence of target species and flight activity data.

Flight time is split into different altitudinal levels in order to better understand the extent to which target species fly within the Collision Risk Zone (CRZ). The flight height range of the CRZ was defined as 25 m to 180 m, which was a rotor swept range representative of the lowest minimum rotor swept height and highest tip height for the turbine specifications being assessed, and for two of the turbine types being assessed, with slightly smaller rotor swept ranges, 30 m to 180 m, this was precautionary.

The flight times provided in Table 7A.13 and Table 7A.14 should be viewed as raw flight data that has been clipped to include only flight time within the 500 m turbine buffer. This treatment of the data does not control for overlapping survey effort, as occurs extensively across the viewsheds for VP2, VP3 and VP4, and therefore, the values for flights times are considered as inflated activity values. Analysis conducted through the collision risk modelling weights survey effort to account for overlapping viewsheds.

Species highlighted in bold text in Table 7A.13 are those for which collision risk models have been run. Generally, Collision Risk Modelling (CRM) is run for target species with a total aggregate flight time (i.e., number of individuals x flight time) of > 200 seconds within the CRZ and more than two flights recorded in the CRZ, over the study period.

CRMs were not run for several species recording flight time > 200 seconds within the CRZ (indicated by green text in Table 7A.13), as the flight time was generated by a small number of observations including:

- Dunlin 720 secs generated by 1 observation of 16 birds
- Mallard 431 secs generated by 2 observations of 6 and 4 birds
- Mute swan 1,080 secs generated by 1 observation of 9 birds
- Wigeon 2,420 secs generated by 1 observation of 22 birds

In spite of generating high flight times within the 500 m turbine buffer (325,575 secs) no CRM was run for swift, as flights were not recorded systematically by surveyors over the survey period.

A summary of the results for the collision risk modelling is provided in Section 7A.4.2 and the full collision risk modelling report is included in Appendix 7H.

Table 7A.13: Target species flight time recorded within the 500 m turbine buffer

- Aggregated flight seconds is derived from the sum of all the observed flights, where flight time (seconds) is multiplied by the number of birds recorded for each observation
- Values in **Bold** in Band B (CRZ: 25-180 m) indicate the flight seconds inputted into the collision risk model (CRM)
- Values in **Green** in Band B (CRZ: 25-180 m) indicate that although flight seconds were > 200 secs, CRMs were not run for these species, as the number of flight observations generating the flight time was notably low - only one or three observations at collision risk height recorded over the two-year study period

Target species BoCCI (Gilbert *et al.*, 2021) Red, Amber & Green listed *Species listed on Annex I	**No. of obs.**	**No of bird**		**Aggregated flight secs in the 500 m turbine buffer**		
		Min	**Max**	**Band A** < 25 m	**Band B** 25-180 m (CRZ)	**Band C** >180 m
Black-headed gull	6	2	22	1,190	**1,035**	-
Buzzard	193	1	4	2,613	**41,192**	1,149
Common gull	2	1	2	43	70	-
Cormorant	33	1	3	855	**989**	-
Dunlin*	1	16	16	-	**720**	-
Golden plover*	42	3	400	10,100	**719,967**	-
Green sandpiper	1	1	1	11	-	-
Grey heron	54	1	3	1,226	**1,306**	-
Greylag goose	1	1	1	10	-	-
Hen harrier*	1	1	1	89	-	-
Kestrel	83	1	1	2,077	**5,225**	-
Lapwing	153	1	200	50,258	**531,730**	
Lesser black-backed gull	53	1	70	4,661	**52,161**	715
Little egret*	48	1	5	1,960	**721**	-
Mallard	16	1	60	3,047	**431**	-
Mute swan	11	1	9	620	**1,080**	-
Peregrine*	9	1	1	43	**1,107**	-
Snipe	13	1	7	662	**480**	-
Sparrowhawk	7	1	1	53	**785**	-
Swift	6	2	25	324,040	1,575	-
Whimbrel	2	3	3	174	157	-
Whooper swan*	1	2	2	Foraging	-	-
Wigeon	1	22	22	-	**2,420**	-

Table 7A.14: Seasonal breakdown for flight time (aggregated flight seconds)

	Non-breeding season 2021-21				Non-breeding season 2022-23			
Species	**A: 0-25 m**	**B: 25-180 m**	**C: > 180 m**	**Seasonal Total**	**A: 0-25 m**	**B: 25-180 m**	**C: > 180 m**	**Seasonal Total**
Black-headed gull	1,190	570		**1,760**		465		**465**
Buzzard	549	729		**1,278**	9	2,088	3,040	**5,138**
Common gull		70		**70**				
Cormorant	721	275		**996**	42	180		**222**
Dunlin						720		**720**
Golden plover	10,100	178,986		**189,086**		467,592		**467,592**
Grey heron	353	332		**685**	91			**91**
Greylag goose	10			**10**				
Kestrel	437	229		**666**	161	151		**312**
Lapwing	42,642	109,758		**152,401**	1,995	418,395		**420,390**
Lesser black-backed gull	4,167	4,877		**9,043**	195	2,752		**2,947**
Little egret	238	52		**290**	94	140		**234**
Mallard	150	360		**510**		71		**71**
Mute swan	333			**333**	116	1,080		**1,196**
Peregrine	43	96		**139**		9		**9**
Snipe		470		**470**	72			**72**
Sparrowhawk	53			**53**				
Whooper swan	Foraging (2 birds)			**0**				
Wigeon						2,420		**2,420**

	Breeding season 2022				Breeding season 2023			
Species	**A: 0-25 m**	**B: 25-180 m**	**C: > 180 m**	**Seasonal Total**	**A: 0-25 m**	**B: 25-180 m**	**C: > 180 m**	**Seasonal Total**
Buzzard	1,153	31,691	1,109	**33,953**	902	6,684		**7,586**
Common gull					43			**43**
Cormorant		38		**38**	92	496		**588**
Green sandpiper					11			**11**
Golden plover		73,389		**73,389**				
Grey heron	268	748		**1,016**	514	225		**740**
Hen harrier					89			**89**
Kestrel	1,163	1,072		**2,236**	316	3,772		**4,088**
Lapwing	5,606	480		**6,086**	15	3,097		**3,112**
Lesser black-backed gull	180	43,724	715	**44,619**	119	807		**926**
Little egret	949	442		**1,391**	679	87		**766**
Mallard	90			**90**	2,807			**2,807**
Mute swan	171			**771**				
Peregrine		960		**960**		42		**42**
Snipe	590	10		**600**				
Sparrowhawk		29		**29**		756		**756**
Swift		1,530		**1,530**	324,040	45		**324,085**
Whimbrel					174	157		**331**

7A.4.2. Summary results for Collision Risk Modelling

Appendix 7H provides the detailed methodology and results for the Collision Risk Models (CRMs) that were run for selected target species. A summary of the outputs is provided in Table 7A.15.

Models were run for target species with a total aggregate flight time of > 200 seconds and more than three flights within the Collision Risk Zone (CRZ) over the two-year study period (October 2021 to September 2023). The CRZ was defined as all flights recorded within the 500 m turbine buffer and at flight heights ranging from 25 to 180 m, which was based on the lowest rotor swept height and highest tip height for the turbine specifications proposed. No CRMs were run for target species recorded with an aggregated flight time of less than 200 seconds, as low flight activity generates imperceptible levels of predicted collision risk over the lifetime of the proposed wind farm. Based on the criteria outlined above, CRMs were run for the following 12 species:

- Black-headed gull: 1,035 flight seconds in CRZ
- Buzzard: 41,192 flight seconds in CRZ
- Cormorant: 989 flight seconds in CRZ
- Golden plover: 719,967 flight seconds in CRZ
- Grey heron: 1,306 flight seconds in CRZ
- Kestrel: 5,225 flight seconds in CRZ
- Lapwing: 531,730 flight seconds in CRZ
- Lesser black-backed gull: 52,161 flight seconds in CRZ
- Little egret: 721 flight seconds in CRZ
- Peregrine: 1,107 flight seconds in CRZ
- Snipe: 480 flight seconds in CRZ
- Sparrowhawk: 785 flight seconds in CRZ

Models were run for three turbine types with the following specifications:

- Turbine Type A: Rotor - swept dimensions: 30 m to 180 m diameter: 150 m Max cord: 4.2 m
- Turbine Type B: Rotor - swept dimensions: 25 m to 180 m diameter: 155 m Max cord: 4.5 m
- Turbine Type C: Rotor - swept dimensions: 31 m to 180 m diameter: 149 m Max cord: 4.2 m

For the three turbine types, CRMs were run inputting the same operating parameters, including a rotational period of 6.85 seconds and blade pitch of 6 degrees. A range in rotational period was also tested (5.5 to 8.0 seconds) and was found to have minimal effect on the modelled outputs. Therefore, the outputs can be considered representative of a range operational conditions that may be encountered by birds flying through the proposed Wind Farm Site. For the dimensions and operational specifications inputted, the outputs for predicted collision risk are comparable for the three turbines assessed, with only marginally higher values generated by Turbine Type B – see Table 7A.15.

The CRMs outputs are considered to represent precautionary levels of theoretical collision risk, as the parameters entered in the models were notably precautionary, including the turbine dimensions, especially the max chord for the blades, relatively high rotational period and selecting flapping flight behaviour for each species. It is also important to note that for certain species, namely wintering golden plover and lapwing, default avoidance rates were applied, which will inflate predicted collision risk to unrepresentative levels.

The CRMs generated notably low levels of theoretical collision risk for four of the 12 target species analysed, including:

- Black-headed gull
- Peregrine
- Snipe
- Sparrowhawk

For these four species the levels of collision risk predicted is negligible and will not affect these species at the population level, i.e. collision-mediated mortality would not add significantly (>1%) to background levels of mortality.

The CRMs predicated collisions risk of one or more collision over 35 years for eight species, including buzzard, cormorant, golden plover, grey heron, kestrel, lapwing, lesser black-backed gull and little egret, with the outputs shown for worst-case scenario - Turbine Type B, being as follows:

- Buzzard 1 collision every 1.2 years (weighted, 98.0% avoidance)
- Cormorant 1 collision every 31.2 years (weighted, 98.0% avoidance)
- Golden plover 1 collision every 0.1 years (weighted, 98.0% avoidance)
- Grey heron 1 collision every 27.6 years (weighted, 98.0% avoidance)
- Kestrel 1 collision every 4.8 years (weighted, 95.0% avoidance)
- Lapwing 1 collision every 0.1 years (weighted, 98.0% avoidance)
- Lesser black-backed gull 1 collision every 3.2 years (weighted, 99.5% avoidance)
- Little egret 1 collision every 36.5 years (weighted, 98.0% avoidance)

Predicted collision risk for three of these species, including cormorant, grey heron and little egret was one or close to one collision over the 35 years, and this relatively low level of predicted collision risk is considered unlikely to have any significant population level effects. For the other species, buzzard, golden plover, kestrel, lapwing and lesser black-backed gull, while the CRM outputs are representative of high levels of flight activity within the CRZ, it is important to acknowledge that the application of a default avoidance rate (0.98), as suggested by SNH (2018a), is notably low for some species and leads to inflated estimates, in particular for wintering golden plover and lapwing. Application of higher avoidance rate, if it can be justified in certain cases, provides more realistic outputs for predicted collision risk. For golden plover and lapwing, CRMs were re-run to investigate the appropriateness of applying default avoidance rates, as well as annual and seasonal variation in collision risk for lapwing. Details of this analysis are included in Appendix 7H – see Section 7H.5.

Based on emerging evidence from post-construction monitoring at operational wind farms sites supporting wintering golden plover and lapwing (see review in Gittings, 2022), one of the main findings of the review was that it is appropriate to apply of higher avoidance rates for golden plover, and re-running the models with more appropriate avoidance rates gives the following outputs, with outputs default (98%) avoidance included for reference (results shown for Turbine Type B):

- Golden plover 599 collisions over 35 years at 98.0% avoidance
  150 collisions over 35 years at **99.5%** avoidance
  60 collisions over 35 years at **99.8%** avoidance
  30 collisions over 35 years at **99.9%** avoidance
- Lapwing 351 collisions over 35 years at 98.0% avoidance
  88 collisions over 35 years at **99.5%** avoidance
  35 collisions over 35 years at **99.8%** avoidance
  18 collisions over 35 years at **99.9%** avoidance

For lapwing the model was re-run to investigate seasonal difference in collision risk. Significantly lower flight activity over the breeding season results in lower levels of predicted collision risk compared to the winter seasons. The outputs from the breeding season models run for lapwing (see Appendix 7H, Table 7H.19) showed that collision risk becomes negligible for breeding birds once avoidance is set to 99.5%. Higher recorded aggregate flight times resulted in predicated collision risk being higher in the second breeding season (2023), with estimated collisions over 35 years for both breeding seasons ranging from:

- Lapwing 0.7 to 4.3 collisions over 35 years at 98.0% avoidance
  0.2 to 1.1 collisions over 35 years at **99.5%** avoidance
  0.1 to 0.4 collisions over 35 years at **99.8%** avoidance

In both breeding seasons (2022 & 2023), while a small number of pairs attempted to breed within the proposed Wind Farm site; these attempts failed entirely in 2022 and in 2023 only a single pair persisted, which contributed to relatively low levels of flight activity overall. Therefore, it is acknowledged that these outputs are not representative of flight activity if more pairs were breeding successfully; however, the results are considered representative of the prevailing conditions on site, which result in high failure rates for breeding lapwing. Seasonal analysis also showed that predicted collision risk over the two winter seasons was variable for lapwing, due to large differences in flight time recorded between the two seasons– see Table 7A.14, with estimated collisions over 35 years for each non-breeding season ranging from:

- Lapwing 116 to 425 collisions over 35 years at 98.0% avoidance
  29 to 106 collisions over 35 years at **99.5%** avoidance
  12 to 43 collisions over 35 years at **99.8%** avoidance

The additional analysis for lesser black-backed gulls found that flight activity was significantly different between the study years. Therefore, the model was re-run for the year exhibiting highest levels of flight activity only, which showed that predicted collision risk almost doubles from one collision every one collision every 3.2 years to one collision every 1.6 years. Adoption of the higher estimate is considered appropriate, rather than taking the average between a higher activity year and a lower activity year. This precautionary approach is supported by similar levels of activity being recorded over the preliminary study year, (October 2020 to August 2021).

For the five target species generating the highest levels of predicted collision risk, further analysis was undertaken to investigate the potential for population level effects to arise due to predicted collision risk. The results of this analysis are provided in Appendix 7H – see Table 7H.20 to Table 7H.25 in Section 7H.6. The ornithological baseline sections covering each target species investigate the potential for predicted collision risk to have a > 1% population level effects above background mortality. The range of predicted annual collision values considered within the analysis for population level effects for each species were as follows:

<u>Buzzard</u>
- 0.86 collision/year (98.0% avoidance) - no adjustment

<u>Golden plover</u>
- 17.10 collision/year (98.0% avoidance) - default avoidance too low
- 4.28 collision/year (99.5% avoidance) - precautionary assessment
- 1.71 collision/year (99.8% avoidance) - anticipated collision rate likely to be lower

<u>Lapwing</u> - all year
- 10.02 collision/year (98.0% avoidance) - default avoidance too low
- 2.15 collision/year (99.5% avoidance) - precautionary assessment
- 1.00 collision/year (99.8% avoidance) - anticipated collision rate likely to be lower

<u>Lapwing</u> - breeding
- 0.12 collision/year (98.0% avoidance) - default avoidance too low
- 0.03 collision/year (99.5% avoidance) - precautionary assessment
- 0.01 collision/year (99.8% avoidance) - anticipated collision rate likely lower

<u>Lesser black-backed gull</u>

- 0.31 collision/year (99.5% avoidance) - estimate for two study years
- 0.64 collision/year (99.5% avoidance) - collision rate busier year, precautionary

<u>Kestel</u>

- 0.21 collision/year (95.0% avoidance) - no adjustment

Table 7A.15: CRM weighted results (with avoidance) for three turbine types

CRM outputs inputting flight seconds recorded between 25 m and 180 m, a 6.85 second rotational period and pitch of 6 degrees
*indicates species for which there is no species specific avoidance rate available and default avoidance at 98% has been applied, as suggested by SNH (2018a). Higher avoidance rates are likely to be more appropriate for most species.
The turbine models/specifications with the highest and lowest predicted collision risk are highlighted in red and green, respectively
Species in listed **bold** exhibit predicted collision risk values of one or more collisions over the 35 years life span of the proposed Wind Farm site

	Collisions/year			Collisions per decade			Collisions per 35 years (WF life span)			Equivalent to 1 bird every x years		
	Turbine Type			Turbine Type			Turbine Type			Turbine Type		
Species	**A**	**B**	**C**	**A**	**B**	**C**	**A**	**B**	**C**	**A**	**B**	**C**
Black-headed gull	0.007	0.008	0.007	0.07	0.08	0.07	0.3	0.3	0.3	135.20	128.20	135.30
Buzzard*	0.818	0.861	0.817	8.18	8.61	8.17	28.6	**30.1**	28.6	1.2	1.2	1.2
Cormorant*	0.031	0.032	0.030	0.31	0.32	0.30	1.1	**1.1**	1.1	32.8	31.2	32.8
Golden plover*	16.153	17.104	16.120	161.53	171.04	161.20	565.4	**598.6**	564.2	0.1	0.1	0.1
Grey heron*	0.035	0.036	0.035	0.35	0.36	0.35	1.2	**1.3**	1.2	28.9	27.6	29.0
Kestrel	0.199	0.21	0.198	1.99	2.1	1.98	6.9	**7.3**	6.9	5.0	4.8	5.0
Lapwing*	9.478	10.022	9.475	94.78	100.22	94.75	331.7	**350.8**	331.6	0.1	0.1	0.1
Lesser black-backed gull	0.299	0.314	0.298	2.99	3.14	2.98	10.5	**11.0**	10.4	3.3	3.2	3.4
Little egret*	0.026	0.027	0.026	0.26	0.27	0.26	0.9	**1.0**	0.9	38.5	36.5	38.6
Peregrine*	0.021	0.022	0.021	0.21	0.22	0.21	0.7	0.8	0.7	47.2	44.8	47.3
Snipe*	0.010	0.011	0.010	0.10	0.11	0.10	0.4	0.4	0.4	99.0	93.2	99.4
Sparrowhawk*	0.012	0.012	0.012	0.12	0.12	0.12	0.4	0.4	0.4	86.1	81.5	86.4

7A.4.3. Results – Breeding bird surveys

Lowland breeding wader surveys following methodology detailed in O'Brien & Smith (1992), as summarised in Gilbert *et al*. (1989), were undertaken over the 2022 and 2023 breeding seasons. Surveys conducted around dusk/dawn were conducted for crepuscular species and covered woodland/scrubby habitats, with a focus on detecting displaying (roding) woodcock and calling long-eared owls. A kingfisher habitat suitability assessment was conducted along the River Suir.

Table 7A.16 lists red and amber listed species recorded and gives details of breeding status within the proposed Wind Farm Site based on surveys conducted in 2022 and 2023. A list of all species recorded, including green-listed species, is provided in Appendix 7F, along with distribution maps showing the distribution of red and amber listed species recorded. Maps in Appendix 7G shows the locations of breeding wader and raptor territories that were identified based on surveying.

Walkover surveys conducted over the 2022 breeding season recorded 54 bird species, with 57 species recorded during the 2023 breeding bird surveys. The assemblage of birds recorded in both years was comparable and were considered to be representative of the habitats available within the proposed Wind Farm Site.

As summarised in Table 7A.17, dusk surveys found that there were no territorial (roding) woodcock, although there was potential breeding habitat available. Long-eared owls were heard calling from the woodland on the southern boundary of the 500 m turbine buffer and were considered likely to be breeding in the vicinity.

Breeding season walkover surveys highlighted a number of key areas associated with the River Suir floodplain that are utilised by lowland breeding waders including:

- Lapwing: up to 6 territorial birds recorded, however land management, especially field improvement in 2021 and 2022 were thought to have negatively affected productivity and sites were abandoned early in the season.
- Snipe: several wetland habitats, including marshy, wet grassland support breeding snipe, and it was estimated that there are up to 6 territories within the 500 m turbine buffer

No curlew breeding site were detected.

The results of the kingfisher habitat suitability survey found that in all sections of the River Suir within the 500 m turbine buffer, the extent of suitable nesting banks was less than 10 m of suitable bank (Score 1, as per Cummin *et al*., 2010). The assessment only identified very localised points where banks appeared to be superficially suitable. While the material forming the banks was found to be suitable for nesting, exposed steep face were limited and the banks themselves were prone to inundation due to low height (< 1.5 m) and fluctuating water levels. The only other area classed as possibly offer potential nesting opportunities was some older growth woodland in the southern extent of the 500 m turbine buffer, where dead wood could offer nesting holes that are occupied on occasion by kingfishers (Morgan & Glue, 1977). This area coincided with the highest level of kingfisher activity detected in 2023, including a bird carrying prey and possibly provisioning young at a nest to the south of the 500 m turbine buffer.

Table 7A.16: Summary of findings for breeding bird walkover - red and amber listed species

† Indicates species possibly breeding within the 500 m turbine buffer
†† Indicates species confirmed breeding within the 500 m turbine buffer
[X] Indicates species not breeding in the 500 m turbine buffer, but recorded over the breeding season and may have a nest site nearby

Species	BTO code	Breeding status in 2022	Breeding status in 2022	Pres. in 2021
BoCCI (2020-2026) Red listed species				
Grey wagtail ††	GL	Recorded on River Suir at Rossestown Bridge. No nest observed - possible breeding within the within the 500 m turbine buffer.	No nest observed – confirmed breeding within the 500 m turbine - family group recorded along the River Suir upstream of Rossestown Bridge.	✓
Kestrel [X]	K	Foraging within the 500 m turbine buffer. Breeding in the wider area.	Foraging within the 500 m turbine buffer. Breeding in the wider area.	✓
Lapwing ††	L	Breeding/territorial behaviour noted at a minimum of four sites within suitable habitat in the 500 m turbine buffer. Breeding attempts failed/did not persist.	Breeding/territorial behaviour noted at 5-6 sites within suitable habitat in the 500 m turbine buffer. Breeding attempts failed, one still active June/July	
Meadow pipit ††	MP	Confirmed breeding within the 500 m turbine buffer – mostly associated with less heavily managed grassland.	Confirmed breeding within the 500 m turbine buffer – mostly associated with less heavily managed grassland	✓
Snipe ††	SN	Suitable habitat in the 500 m turbine buffer associate with wetter areas - chipping and drumming snipe recorded.	Suitable habitat in the 500 m turbine buffer associate with wetter areas - chipping and drumming snipe recorded. An influx of individuals in March/early April were considered birds on passage, as they were not recorded on later survey visits.	✓
Stock dove †	SD	One record of an individual in the southern woodland – possible breeding within the 500 m turbine buffer.	Not recorded	
Swift [X]	SI	Single observation (2 birds) foraging/flying through 500 m turbine buffer - no potential breeding opportunities.	Three observation of single birds foraging/flying through 500 m turbine buffer – no potential breeding opportunities	✓
Yellowhammer ††	Y	Possible (singing) breeding in the 500 m turbine buffer. Single territory associated with hedgerow.	Possible (singing) breeding in the 500 m turbine buffer. Single territory associated with hedgerow.	
BoCCI (2020-2026) Amber listed species				
Black-headed gull [X]	BH	Not recorded on breeding season walkovers	Flock of 80 birds roosting along River Suir floodplain in March just south of 500 m turbine buffer, the flock of 6 birds roosting in same area in July	
Cormorant [X]	CA	Not recorded on breeding season walkovers	Foraging/flying along the River Suir. Not breeding in 500 m turbine buffer.	
Goldcrest ††	GC	Common and widespread breeding in suitable woodland/hedgerow habitat within the 500 m turbine buffer.	Common and widespread breeding in suitable woodland/hedgerow habitat within the 500 m turbine buffer.	✓

Species	BTO code	Breeding status in 2022	Breeding status in 2022	Pres. in 2021
House martin X	HM	Recorded foraging/flying through 500 m turbine (1-2 birds). No breeding behaviour recorded	Recorded foraging/flying through 500 m turbine, with flocks of up to 20 birds. No breeding behaviour recorded	✓
House sparrow †	HS	Recorded beyond the 500 m turbine buffer. Likely breeding in suitable structures.	Recorded beyond the 500 m turbine buffer. Likely breeding in suitable structures.	
Kingfisher X	KF	One record of single bird flying along River Suir to north of 500 m turbine buffer. Banks assessed as offering limited suitability for nesting, but river likely to form part of territory.	Two consecutive records, probably same bird, in southern part of 500 m turbine buffer. Recorded carrying fish, possibly provisioning young to south of proposed Wind Farm Site	
Linnet †	LI	Possible (singing) breeding in the 500 m turbine buffer. Associated with areas of scrub.	Possible (singing) breeding in the 500 m turbine buffer. Associated with areas of scrub.	✓
Mallard †	MA	Recorded during breeding season - likely to be nesting in areas with suitable cover within the 500 m turbine buffer.	Recorded during breeding season - likely to be nesting in areas with suitable cover within the 500 m turbine buffer.	✓
Mute swan ††	MS	Confirmed breeding within the 500 m turbine buffer, with nest located in emergent vegetation along River Suir, north (upstream) of Rossestown Bridge.	Present throughout breeding season – no nest site located.	✓
Sand martin X	SM	Small number (1-2 birds) foraging along floodplain of River Suir within the 500 m turbine buffer. No nesting colonies located, and banks were assessed as offering limited suitability for nesting.	Flocks of 6 to 8 birds recorded foraging along floodplain of River Suir within the 500 m turbine buffer. No nesting colonies located, and banks were assessed as offering limited suitability for nesting.	✓
Skylark ††	S	Confirmed breeding within the 500 m turbine buffer – mostly associated with less heavily managed grassland.	Confirmed breeding within the 500 m turbine buffer – mostly associated with less heavily managed grassland.	✓
Spotted flycatcher ††	SF	Confirmed (provisioning) breeding at two locations, with possible (singing) breeding at another two locations within/adjacent to the 500 m turbine buffer. Breeding in south associated with woodland/parkland.	Not recorded	✓
Starling †	SG	Only recorded outside the 500 m turbine buffer in 2022; however considered likely to be breeding in tree cavities or buildings.	Only recorded outside the 500 m turbine buffer in 2022; however considered likely to be breeding in tree cavities or buildings.	✓
Swallow †	SL	Only foraging birds recorded within 500 m turbine buffer, with up to 9 birds recorded - breeding confirmed adjacent to buffer.	Only foraging birds recorded within 500 m turbine buffer, with up to 10 birds recorded.	✓
Willow warbler ††	WW	Widespread breeding species within 500 m turbine buffer nesting associated with scrub and hedges.	Widespread breeding species within 500 m turbine buffer nesting associated with scrub and hedges.	✓

Table 7A.17: Dusk surveys results - owls and woodcock (WK) observations

Date	Survey type	Species
Breeding season 2022		
11/05/2022	Dusk survey (WK/owl)	No target species recorded
22/05/2022	Dusk survey (WK/owl)	No target species recorded – buzzard flushed from roost
23/06/2022	Dusk survey (WK/owl)	No target species recorded
Breeding season 2023		
23/03/2023	Dusk survey (Owl)	No owls detected – woodcock active, however wintering/passage birds
09/05/2023	Dusk survey (WK/owl)	Long-eared owls heard calling from southern woodland
22/05/2023	Dusk survey (WK/owl)	No target species recorded
09/06/2023	Dusk survey (WK/owl)	No target species recorded
28/06/2023	Dusk survey (WK/owl)	No target species recorded
25/07/2023	Dusk survey (Owl)	No target species recorded
16/08/2023	Dusk survey (Owl)	No target species recorded

7A.4.4. Results – Wider area breeding raptor surveys

Table 7A.18 gives an overview the results of breeding raptor survey conducted in 2022 and 2023. Maps in Appendix 7G show the locations of raptor records recorded during specific raptor surveys in 2022 and 2023. These observations were then analysed in conjunction with flight behaviour recorded during VP watches, other surveys and incidental records to create a map showing breeding raptor territories – see Figure 7G.4 in Appendix 7G.

Buzzard and kestrel were the most frequently recorded raptors during the wider area surveys, with both species confirmed to be breeding within or adjacent to the proposed Wind Farm Site. Three buzzard territories were identified within the 500 m turbine buffer, with two territories (BZ.5, BZ.6 - see Appendix 7G: Figure 7G.4) recorded in the southern woodland and another pair recorded utilising a smaller section of woodland in the north-east section of the proposed Wind Farm Site (BZ.4 - see Appendix 7G: Figure 7G.4). These breeding site were confirmed by observations of young buzzards calling for food from these locations. A further three buzzard breeding territories were identified beyond the 500 m turbine buffer in areas of woodland/forestry and fledglings were observed from these sites (BZ.1, BZ.2, BZ.3 - see Appendix 7G: Figure 7G.4).

Kestrels were recorded utilising the proposed Wind Farm Site for hunting and where regularly recorded commuting through the area over summer 2022 and 2023. A pair of kestrels were regularly observed perching atop an old, ruined church (Templeshyane) located directly beside VP2 (K.2 - see Appendix 7G: Figure 7G.4), just outside the 500 m turbine buffer; however no breeding was confirmed. Based on observation over the 2021 breeding season (see Appendix 7I - Fehily Timoney, 2022), the nest is located further southeast and is likely to be located with the nearby farm buildings. Breeding was confirmed at a second nest site located in an area of forestry to the south of the 500 m turbine buffer and within the 2 km turbine buffer area (K.3 - see Appendix 7G: Figure 7G.4), confirming at least one kestrel breeding pair in the wider area.

Peregrines were confirmed breeding at one location and observed as possibly breeding at an additional two locations, within the 2 km turbine buffer. All these locations were castles and were beyond the 500 m turbine buffer.

As shown in Figure 7G.5 in Appendix 7G, peregrines were confirmed nesting on Brittas Castle immediately adjacent to the proposed Wind Farm Site, with young heard begging on several occasions. Loughmore Castle, *c.* 2.8 km north of the proposed Wind Farm Site, was noted as a possible breeding site based on a suspected pair roosting the site; and likewise, Rahealty Castle, *c.* 2.6 km east of the proposed Wind Farm Site was classed as a possible breeding site, as another pair was observed perching.

Sparrowhawk were recorded less frequently, and the limited amount of breeding behaviour observed, such as soaring or actively displaying birds, did not facilitate identification of breeding sites beyond the general blocks of woodland in the south of the proposed Wind Farm Site. This was still the case on examining supplementary sources of data collected, including observations from VP watches. Potential nesting habitat in tree/scrub cover in the northern part of the proposed Wind Farm Site was limited and it is considered that sparrowhawk breeding sites are likely to occur in the southern woodland.

7A.4.5. Results – Barn owl site searches

No new barn owl breeding sites were identified during surveys conducted from October 2021 to August 2023. Barn owls occur in the area, with a breeding site identified in abandoned farm building approximately 1.1 km to the northwest of the proposed Wind Farm Site – see Appendix 7H (Fehily Timoney, 2022). The Cabragh Wetlands, south of Thurles is also a known site for barn owls where the utilise a nest box. There is suitable foraging habitat for barn owls within the proposed Wind Farm Site and it is likely that this species utilises the less agriculturally improved grasslands along the floodplain of the River Suir.

Table 7A.18: Summary of breeding raptor survey results

	Season	Breeding season 2022							Breeding season 2023									
	Visit	1		2	3	4	5		1			2	3	4	5	6	
	Survey date	28 Apr 2022	29 Apr 2022	11 May 2022	22 May 2022	26 Jul 2022	25 Aug 2022	28 Aug 2022	21 Mar 2023	22 Mar 2023	23 Mar 2023	11 Apr 2023	20 Apr 2023	26 May 2023	27 Jun 2023	25 Jul 2023	28 Jul 2023
Kestrel	K	5		1					4		1	1	4	1		1	1
Buzzard	BZ		7	12		1			2	6	5	2	9	9	1	3	5
Peregrine	PE					3											
Sparrowhawk	SH		1			1		2						1		1	

Notes

Species	BTO code	Breeding season 2022	Breeding season 2023
Kestrel	K	Kestrel were recorded primarily in April 2022, with at several birds hunting to the north of the 500 m turbine buffer. Two kestrels were noted interacting with each other during these surveys – possible breeding behaviour.	Kestrels were observed frequently from March-July 2023 within the 2 km turbine buffer. Observations included single birds flying or hunting. Breeding behaviour between three birds was noted to the north of the 2 km turbine buffer within an area of forestry. While a nest site was not located, kestrel are breeding in the wider area.
Buzzard	BZ	Buzzards were recorded from April to May 2022 in several areas within the 2 km turbine buffer. Breeding behaviour was identified within the expanse of woodland present in the south-west area of the site.	Buzzards were observed during each visit in the period March-July 2023 within the 2 km turbine buffer. Breeding was confirmed in the western part of the 2 km turbine buffer, the area of woodland in the south-west area of the 500 m turbine buffer and to the north-east of the 2 km turbine buffer in July. Juveniles were noted making food begging calls in these areas. Additionally, although no fledgling birds were recorded, a further two buzzard breeding territories were identified in the west part of the 2 km turbine buffer in separate woodland areas. An occupied nest (no chicks) was identified in addition to buzzards exhibiting breeding/territorial displays in these areas.
Peregrine	PE	Peregrines were recorded confirmed nesting on Brittas Castle with two juvenile birds observed begging calls and mobbing parents for food in July 2022. Brittas Castle is located directly adjacent to the 500 m turbine buffer.	Confirmed breeding at Brittas Castle, possible breeding at Loughmoe Castle, with an additional site at Rahealty Castle
Sparrowhawk	SH	Four observations of sparrowhawks were made from April-August 2022, primarily hunting within the 2 km turbine buffer, however, no breeding behaviour was detected during these surveys.	Two observations of sparrowhawk were made in May and July in flight within the 2 km turbine buffer, however, no breeding behaviour was detected during these surveys.

7A.4.6. Results – Winter site walkovers

Winter site walkovers covering the proposed Wind Farm Site were undertaken over the 2021-22 and 2022-23 non-breeding seasons, Table 7A.19 and Table 7A.20 provide the list of species recorded with red and amber conservation status (Gilbert *et al.*, 2021) for each season respectively, along the number of individuals for each visit. The combined distribution of birds recorded during walkovers is shown in Figure 7A.9 (swans, geese & ducks), Figure 7A.10 (waders), Figure 7A.11 (other waterbirds), Figure 7A.12 (birds of prey), Figure 7A.13 (red listed passerines) and Figure 7A.14 (amber listed passerines).

A total of 21 different bird species were recorded during the walkover surveys over the 2021-22 non-breeding season compared to 19 different bird species recorded over the 2022-23 non-breeding season. This result was driven by more visits being conducted over winter 2021-22. An interesting record was the occurrence of relatively large foraging flocks of redwing and starling utilising the proposed Wind Farm Site. In addition a short-eared owl was flushed from cover on the flood plain during Visit 1 conducted in December 2022.

A list of all species recorded on each visit, including green-listed species, is provided in Appendix 7F – see Table 7F.3.

Table 7A.19: Summary of winter walkover surveys carried out in non-breeding season 2021-22

Species	BTO code	No. individuals				Location within 500 m turbine buffer
		Visit 1 18 & 19 Dec-22	Visit 2 21 & 22 Jan-22	Visit 3 30 Jan-22	Visit 4 27 & 28 Feb-22	
BoCCI (2020-2026) Red listed						
Curlew	CU	-	-	-	1	One bird was recorded in flying within the 500 m turbine buffer, calling adjacent to the River Suir in February
Golden plover	GP	7	-	-		One observation of 7 birds flying over improved grassland in the northern part of the 500 m turbine buffer
Grey wagtail	GL	1	1	1	5	Most records of this species of birds utilising the River Suir within the 500 m turbine buffer. One record was made in the northern area of the site *c.* 310 m north of the River Suir.
Kestrel	K	-	3	2	2	Kestrel were recorded in the northern section of the 500 m turbine buffer – hunting and commuting
Lapwing	L	-	120	-	5	Flock of 120 birds (Visit 2) were flushed up by a peregrine from in fields adjacent to the River Suir at the northwestern extent of the 500 m turbine buffer - Clonamuckoge. The other birds recorded (Visit 3) were observed in flight just outside the eastern edge of the 500 turbine buffer.
Meadow pipit	MP	63	16	19	45	Winter birds were found to be ubiquitous throughout the 500 m turbine buffer, with greatest concentration associated with the River Suir floodplain
Redwing	RE	683	869	195	301	This species was primarily observed foraging in large flocks (up to 300 birds) along treelines and hedgerows within the 500 m turbine buffer
Snipe	SN	36	28	9	26	Winter birds were mainly recorded present in agricultural fields and rough grassland directly adjacent the River Suir as it flows the 500 m turbine buffer
Woodcock	WK	2	3	-	1	Small numbers were flushed in the south section of the 500 m turbine buffer
BoCCI (2020-2026) Amber listed						

Species	BTO code	No. individuals				Location within 500 m turbine buffer
		Visit 1 18 & 19 Dec-22	Visit 2 21 & 22 Jan-22	Visit 3 30 Jan-22	Visit 4 27 & 28 Feb-22	
Brambling	BL	1	-	-	-	One bird was recorded flying over the 500 m turbine buffer area
Cormorant	CA	3	3	-	13	All observations were of birds in flight or roosting along the course of the River Suir within the 500 m turbine buffer
Goldcrest	GC	4	5	-	8	Recorded throughout the 500 m turbine buffer
House sparrow	HS	60	35	20	62	Mainly recorded in and around agricultural sheds in within and adjacent to the 500 m turbine buffer
Kingfisher	KF	-	-	-	1	One kingfisher observation was made along the River Suir in the southern section of the 500 m turbine buffer area
Linnet	LI	3	26	-		Birds recorded in flight moving through 500 m turbine buffer area, including flock of 26 birds
Mallard	MA	-	14	-	8	Small numbers (1-6 birds) recorded swimming along the River Suir within the 500 m turbine buffer area. A small number were utilising the small pond in the southern woodland
Mute swan	MS	12	3	-	2	Observations mainly concentrated within and along the banks of the River Suir within the 500 m turbine buffer with 1-6 birds recorded
Short-eared owl	SE	1	-	-	-	One individual was flushed from rushy habitat within the 500 m turbine buffer, then landed again. No other observations were made. Suitable winter habitat along floodplain
Skylark	S	-	3	-	8	Recorded in open areas throughout the 500 m turbine buffer
Starling	SG	470	479	207	847	Large flocks (up to 400 birds) recorded on all visits throughout the 500 m turbine buffer area
Teal	T	-	33	-	1	Small number (1-4 birds) recorded in the River Suir within the 500 turbine buffer, with a flock of 26 birds utilising were utilising the small pond in the southern woodland

Table 7A.20: Summary of winter walkover surveys carried out in non-breeding season 2022-23

Species	BTO code	No. individuals		Location within 500 m turbine buffer
		Visit 1 23 & 24 Jan-23	Visit 2 16 Mar-23	
BoCCI (2020-2026) Red listed				
Golden plover	GP	-	18	A group of six birds were recorded in flight in the centre of the 500 turbine buffer and another group of 12 birds were recorded in flight in the southern part of the 500 m buffer.
Grey wagtail	GL	1	-	One individual grey wagtail was recorded perched in a field adjacent to the River Suir in the centre of the 500 m buffer.
Kestrel	K	1	-	One male observed flying south through 500 m turbine buffer
Lapwing	L	222	14	Only 15 birds on Visit 1 were foraging on fields within 500 m buffer, two flocks were flying (87 birds), and 120 birds roosting off site approx. 2.5 km NW in flooded field at Ballybristy
Meadow pipit	MP	34	4	Ubiquitous throughout the 500 m turbine buffer, with greatest concentration associated with the River Suir floodplain.
Redwing	RE	185	27	Flocks recorded within 500 m turbine buffer, foraging in agricultural fields and hedgerows/treelines – numbers slightly lower than previous winter
Shoveler	SV		4	Four recorded roosting in a flood field directly east of the River Suir main channel, in the south part of the 500 m turbine buffer
Snipe	SN	7	6	Winter birds were mainly recorded present in agricultural fields and rough grassland directly adjacent the River Suir as it flows the 500 m turbine buffer
BoCCI (2020-2026) Amber listed				

Species	BTO code	No. individuals		Location within 500 m turbine buffer
		Visit 1 23 & 24 Jan-23	**Visit 2** 16 Mar-23	
Black-headed gull	BH	-	83	Birds roosting in flooded fields east of the River Suir main channel, just south of the 500 m buffer
Cormorant	CA	1	-	One individual cormorant recorded flying high (180m) heading west within the 500 m buffer
Goldcrest	GC	1	-	One bird recorded in the 500 m buffer
House sparrow	HS	6	-	A small group (6 birds) recorded perching NE of the 500 m turbine buffer
Linnet	LI	3	6	Small flocks 2-4 birds fly-land/perching within 500 m turbine buffer
Mallard	MA	2	-	Male and female were flushed from a drainage ditch from within the 500 m turbine buffer
Mute swan	MS	4	2	All observations were of male and female (paired birds), with one observation of birds in flight, one observation of a pair within the 500 turbine buffer at Rossestown Bridge and one observation approx. 2.5 km NW in flooded field at Ballybristy
Skylark	S	-	4	Recorded within the 500 m turbine buffer
Starling	SG	386	340	Large flocks (up to 350 birds) recorded on all visits throughout the 500 m turbine buffer area.
Teal	T	-	1	One bird flushed from River Suir in the southern part of the 500 m turbine buffer – also incidental record of 120 birds utilising flooded are just south of buffer on 28-Nov-22
Wigeon	WN	80	-	A flock (80 birds) recorded foraging in a field directly east of the River Suir, south of 500 m turbine buffer

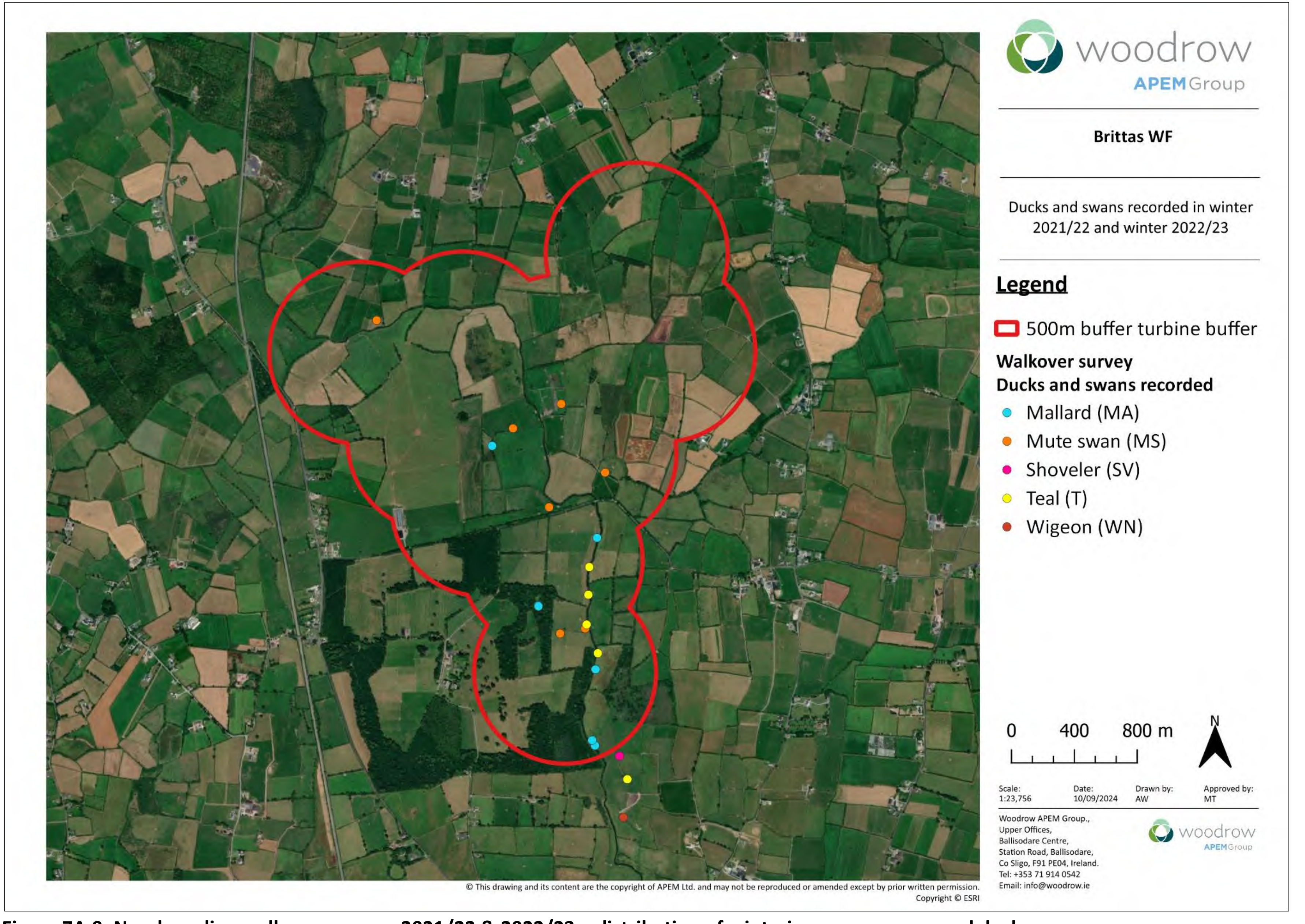

Figure 7A.9: Non-breeding walkover surveys 2021/22 & 2022/23 – distribution of wintering swans, geese and ducks

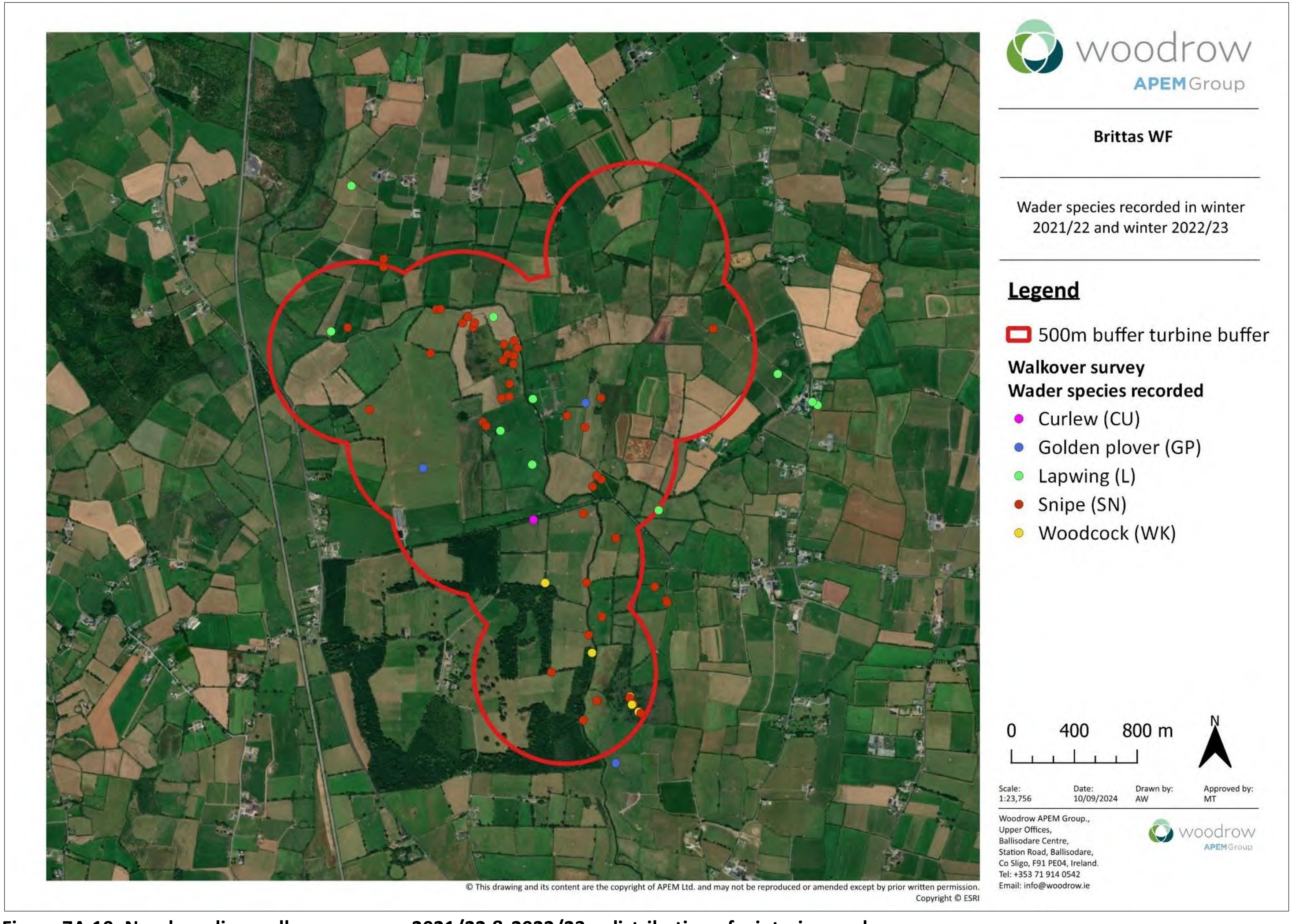

Figure 7A.10: Non-breeding walkover surveys 2021/22 & 2022/23 – distribution of wintering waders

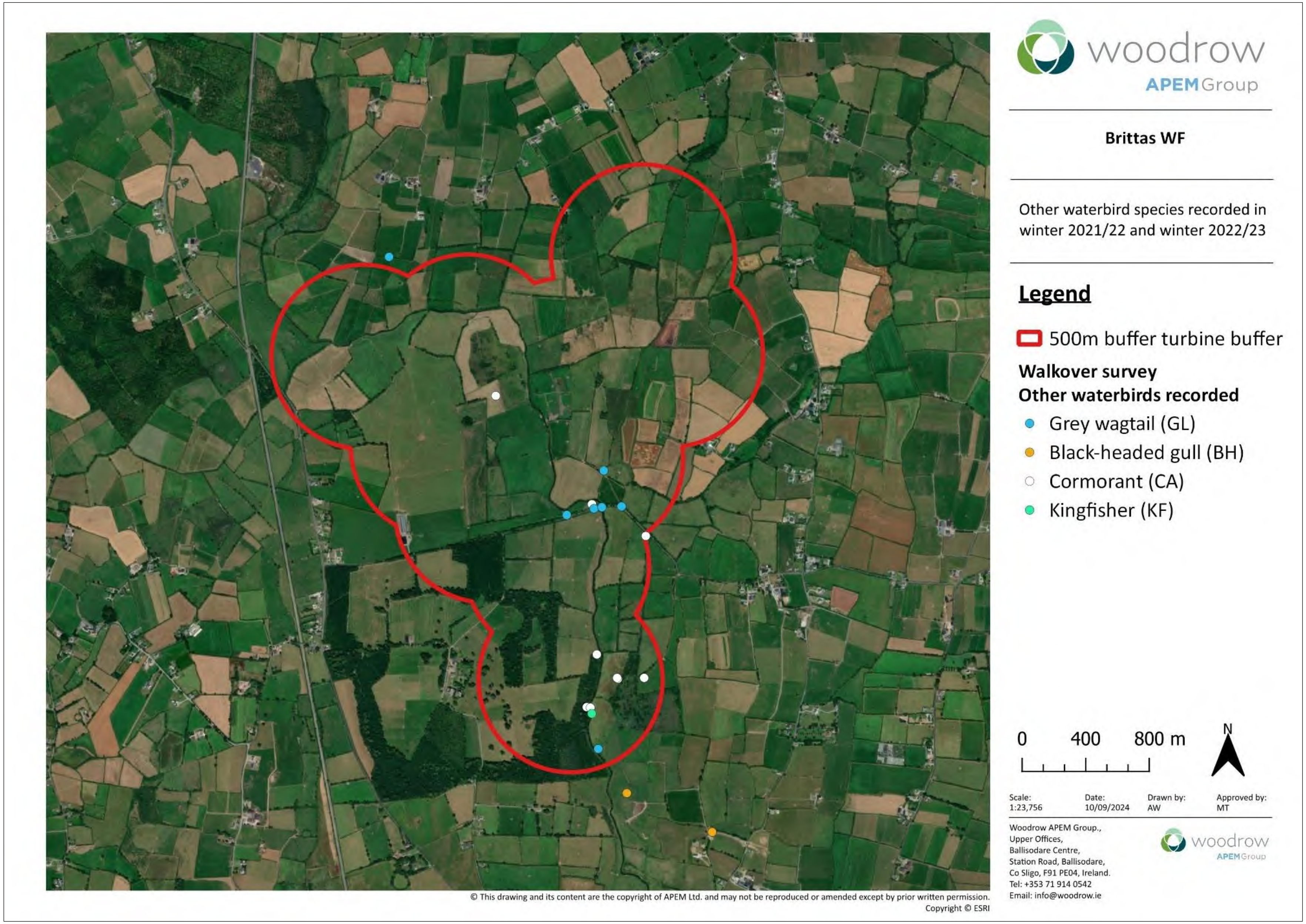

Figure 7A.11: Non-breeding walkover surveys 2021/22 & 2022/23 – distribution of other wetland/riverine birds

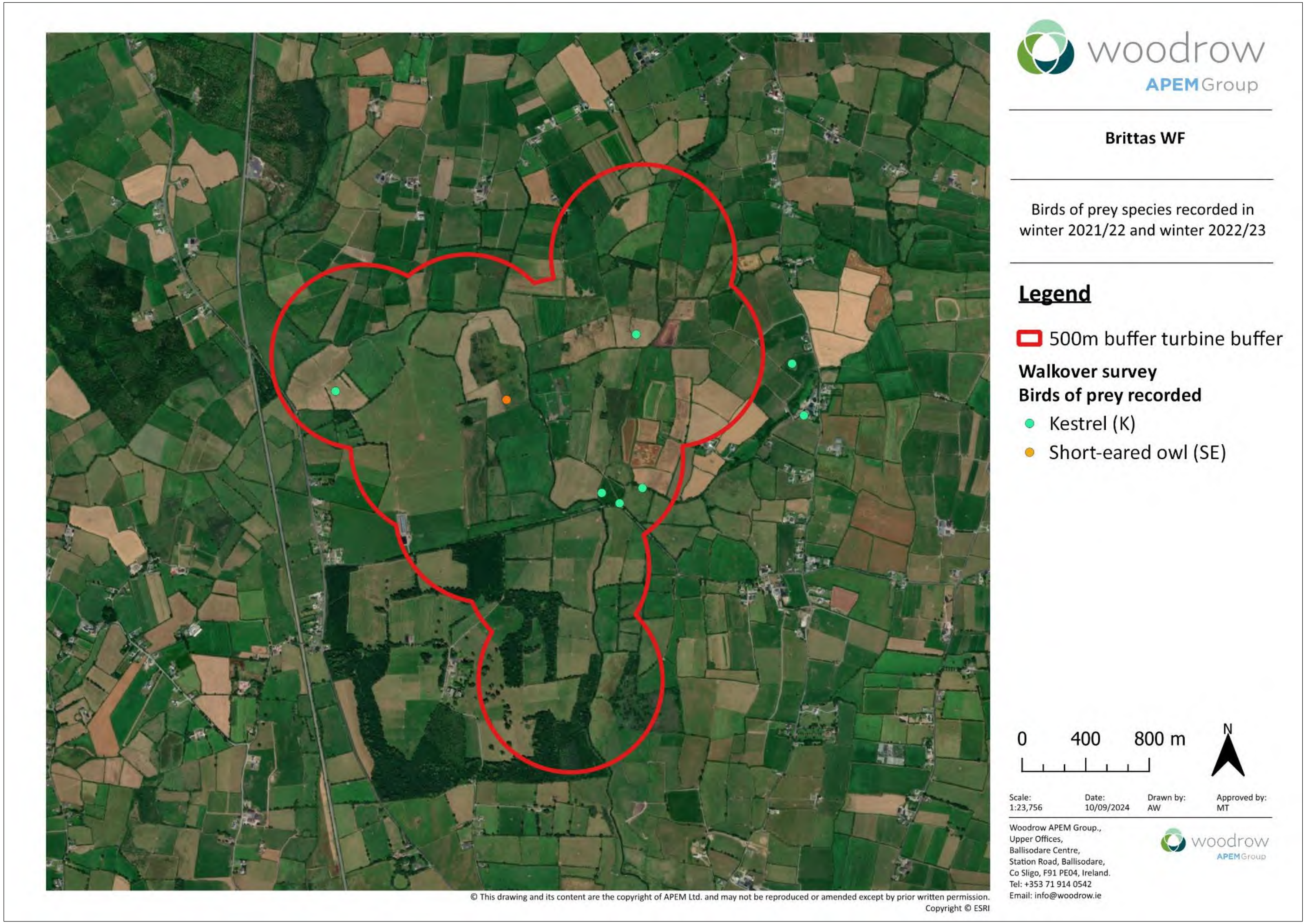

Figure 7A.12: Non-breeding walkover surveys 2021/22 & 2022/23 – distribution for birds of prey

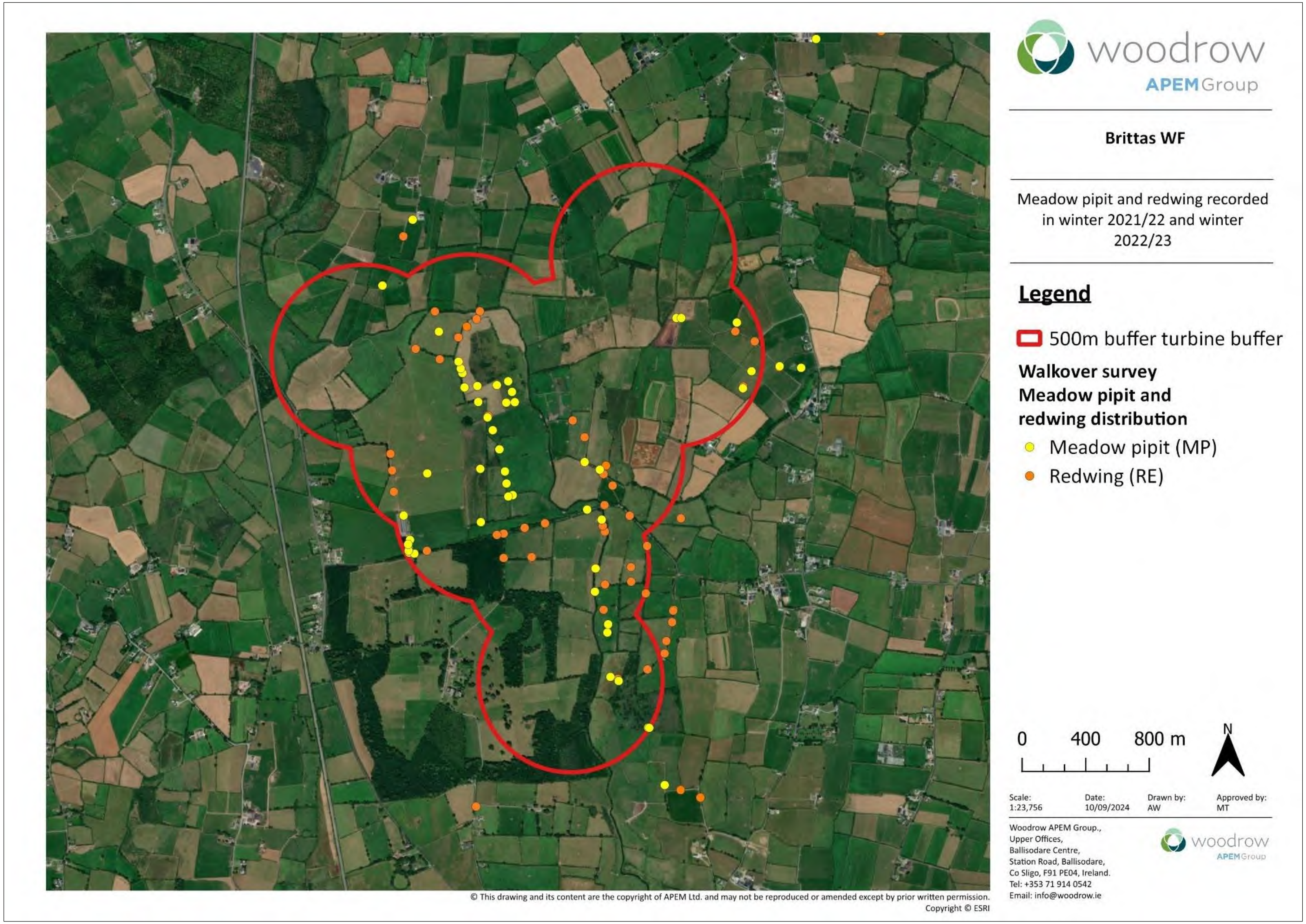

Figure 7A.13: Non-breeding walkover surveys 2021/22 & 2022/23 – distribution of wintering red listed passerines

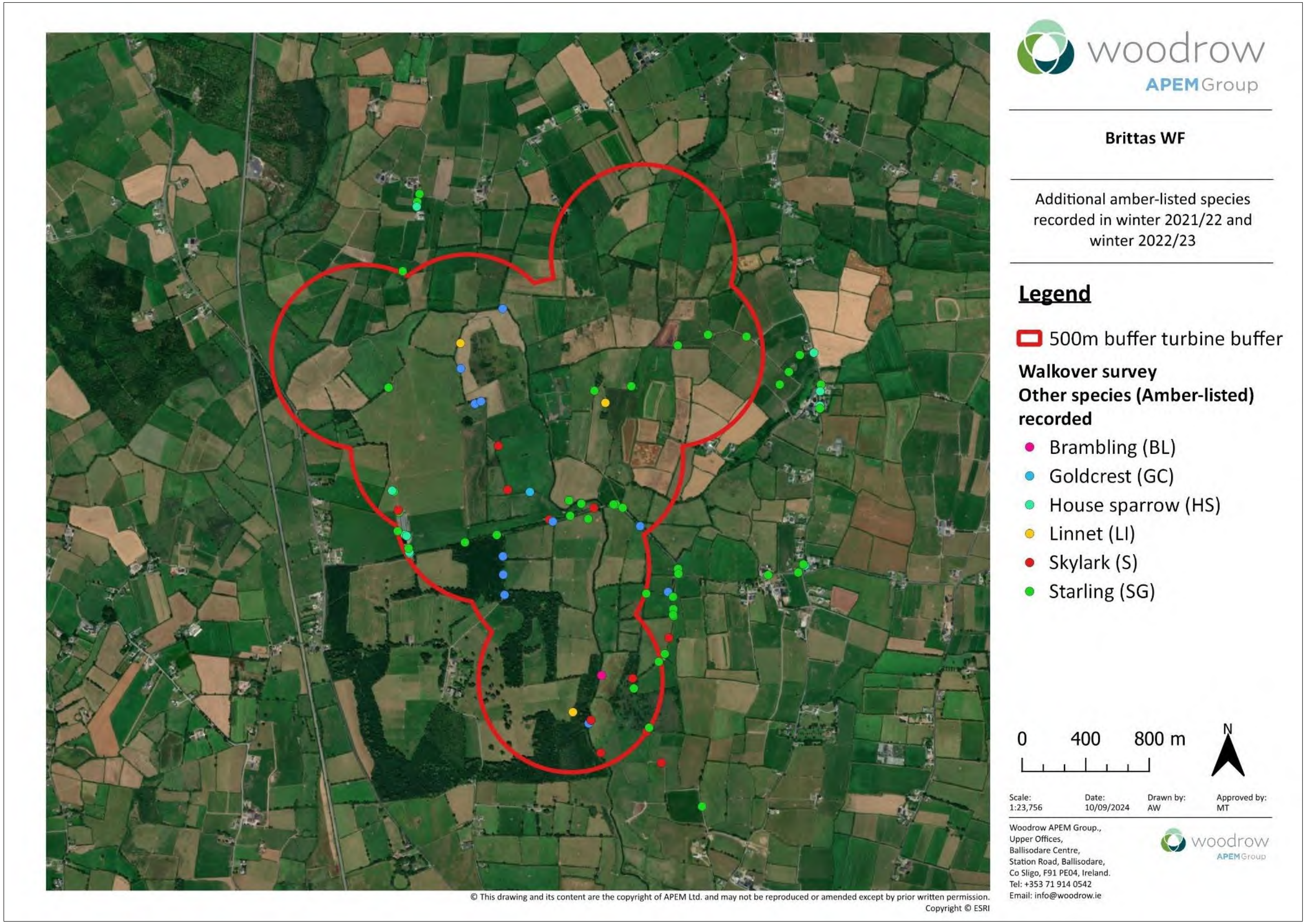

Figure 7A.14: Non-breeding walkover surveys 2021/22 & 2022/23 – distribution of wintering amber listed passerines

7A.4.7. Results – Wider area wintering waterbird surveys

Wider area wintering waterbird surveys were carried out in winter 2021-22 and winter 2022-23, largely focusing on the floodplain of the River Suir and any other wetlands identified within the wider area (5-6 km turbine buffer). Table 7A.21 and Table 7A.22 provide the waterbird counts recorded during wider area wintering water surveys conducted over the 2021-22 and 2022-23 non-breeding season, respectively, with the distribution of different groups of wetland birds, combined for all visits, shown in Figure 7A.15 (swans, geese & ducks), Figure 7A.16 (waders), Figure 7A.17 (gulls) and Figure 7A.18 (other waterbirds species).

Over winter 2021/22 a total of 11 waterbird species were recorded, compared to 13 over winter 2022/23, with golden plover, teal and wigeon not recorded over the first winter and cormorant going unrecorded in the second winter. No roosts or foraging sites utilised by migratory swans or geese were recorded during wider area wintering waterbird surveys in 2021/22 or 2022/23; although it is noted that a small flock of whooper swans (3-5 birds) was present over winter 2022/21 along the River Suir to the north of the 500 m turbine buffer - see Appendix 7I (Fehily Timoney, 2022). Wader populations in this region appear to be highly mobile and these snapshot counts need be examined in the context provided by other surveys undertaken, including VP watches which involve more regular and prolonged monitoring of the proposed Wind Farm Site.

The aggregate species counts were low for each visit and did not exceed nationally important thresholds, as shown in Table 7A.21 and Table 7A.22. The maximum number of waterbirds recorded on any visit did not exceed 600 birds, which is relatively low considering the size of the search area. It is acknowledged that over the two years counts were influenced by survey effort and improving surveyor knowledge of the search area over time. Coverage was expanded over the second winter and detection rates increased as surveyors became more familiar with the area.

Other target species recorded during the wider area wintering waterbird surveys included hunting buzzards and kestrels. Peregrines were recorded perching/prospecting/paring up on two ruined castles, one *c.* 2.7 km east and other *c*. 3.7 km north of the proposed Wind Farm Site.

7A.4.8. Results – Hen harrier roost searches

There is some suitable hen harrier roost habitat within the 2 km turbine buffer; however, no hen harrier roosts, or individual birds were recorded during the targeted hen harrier roost searches that were undertaken over the non-breeding seasons 2021/22 and 2022/23.

During all the surveys conducted over three years hen harriers were only recorded twice during VP watches including:

- 24-Dec-2020 11:18 Adult male flying S, *c*. 2 km W of buffer 137 sec at 100-200 m
- 28-Aug-2023 12:58 Adult male hunting though the buffer 89 sec at 1-4 m

Based on the low levels of hen harrier activity recorded it can be concluded that the 2 km turbine buffer is not heavily utilised by this species and therefore it is highly unlikely that a regularly occupied communal roost exists in the area.

Table 7A.21: Wider area wintering waterbird counts for 2021-2022 non-breeding season

Species	BTO Code	No. individuals						1% National
		Visit 1 25-Oct-21	Visit 2 23-Nov-21	Visit 3 17-Dec-21	Visit 4 20-Jan-22	Visit 5 25-Feb-22	Visit 6 13-Mar-22	
Red listed								
Lapwing	L	54	2	-	42	35	8	**850**
Snipe	SN	-	-	1	-	-	-	**-**
Amber listed								
Black-headed gull	BH	-	-	-	-	-	32	**-**
Coot	CO	-	-	-	-	1	2	**190**
Cormorant	CA	-	-	-	-	-	6	**110**
Lesser black-backed gull	LB	26	-	-	-	7	14	**-**
Mallard	MA	42	112	98	2	8	26	**280**
Mute swan	MS	-	4	2	1	2	2	**90**
Green listed								
Grey heron	H	-	-	1	-	-	-	**25**
Little egret	ET	-	-		-	2	-	**20**
Moorhen	MH	-	4	3	-	-	3	**-**

Table 7A.22: Wider area wintering waterbird counts for 2022-2023 non-breeding season

Species	BTO Code	No. individuals						1% National
		Visit 1 18-Oct-22	Visit 2 28-Nov-22 30-Nov-22 02-Dec-22	Visit 3 18-Dec-22 31-Dec-22	Visit 4 21-Jan-23 22-Jan-23	Visit 5 14-Feb-23	Visit 6 06-Mar-23 07-Mar-23 13-Mar-23	
Red listed								
Golden plover	GP	245	-	-	200	-	-	**920**
Lapwing	L	1	240	8	153	350	-	**850**
Snipe	SN	1	-	-	-	-	-	**-**
Amber listed								
Black-headed gull	BH	-	-	-	50	-	-	**-**
Coot	CO	-	-	-	-	4	4	**190**
Lesser black-backed gull	LB	115	-	-	-	-	-	**-**
Mallard	MA	-	-	-	2	4	-	**280**
Mute swan	MS	-	-	4	-	2	-	**90**
Teal	T	-	-	-	185	94	22	**360**
Wigeon	WN	-	80	-	-	-	4	**560**
Green listed								
Grey heron	H	1	1	-	-	3	-	**25**
Little egret	ET	-	-	-	-	9	-	**20**
Moorhen	MH	-	-	1	3	2	1	**-**

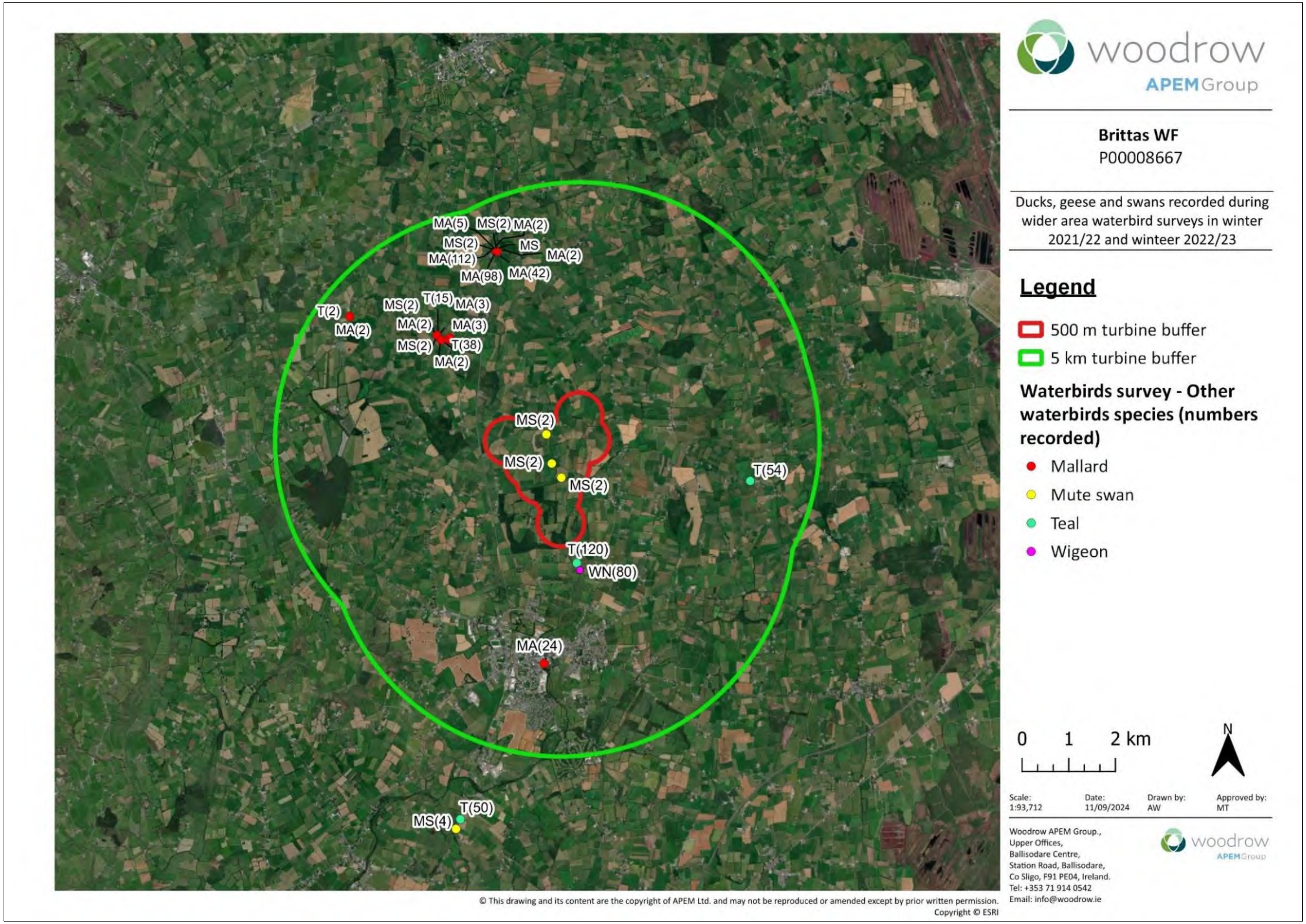

Figure 7A.15: Wider area distribution of wintering swans, geese and ducks - non-breeding seasons 2021/22 & 2022/23

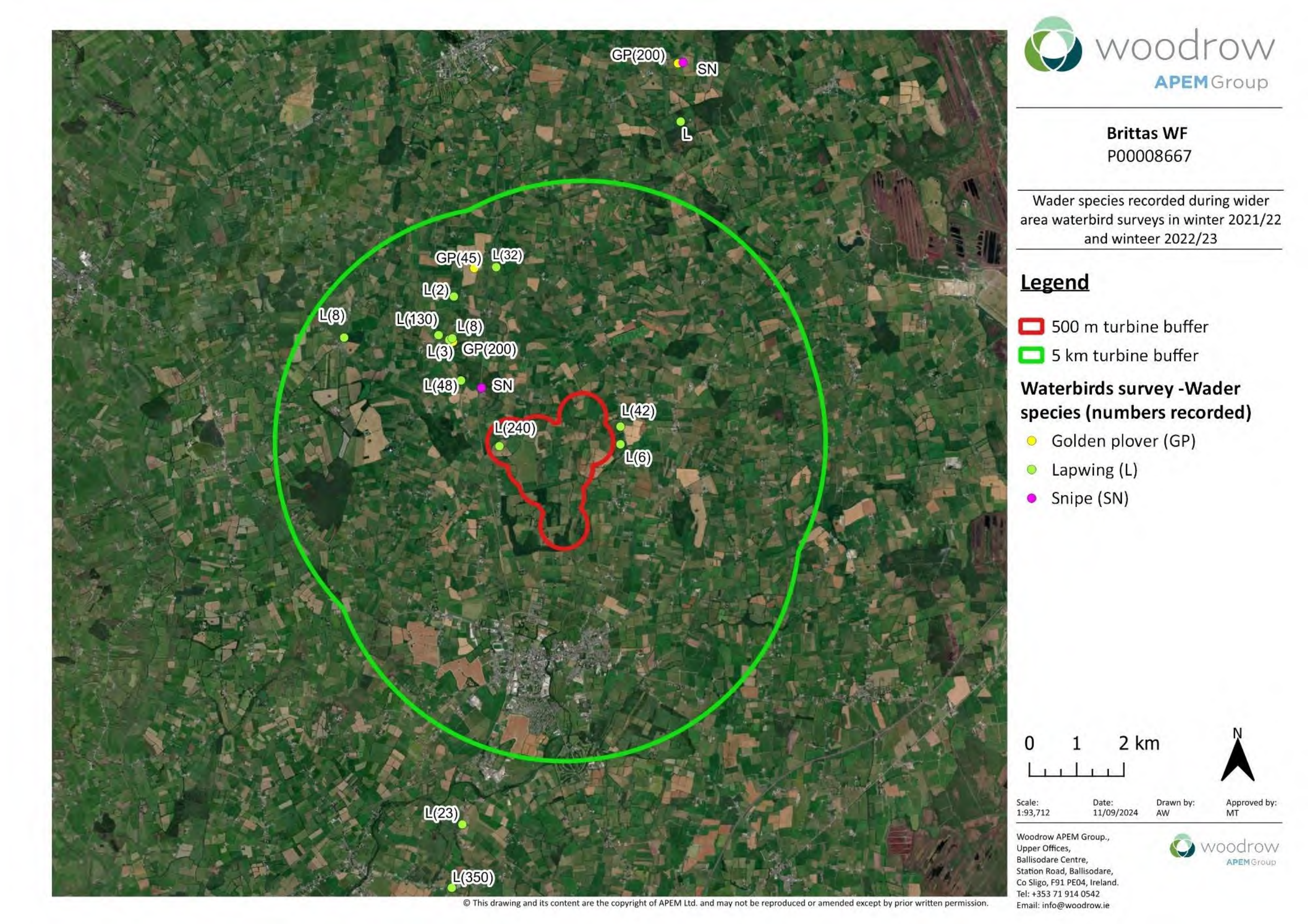

Figure 7A.16: Wider area distribution of wintering waders - non-breeding seasons 2021/22 & 2022/23

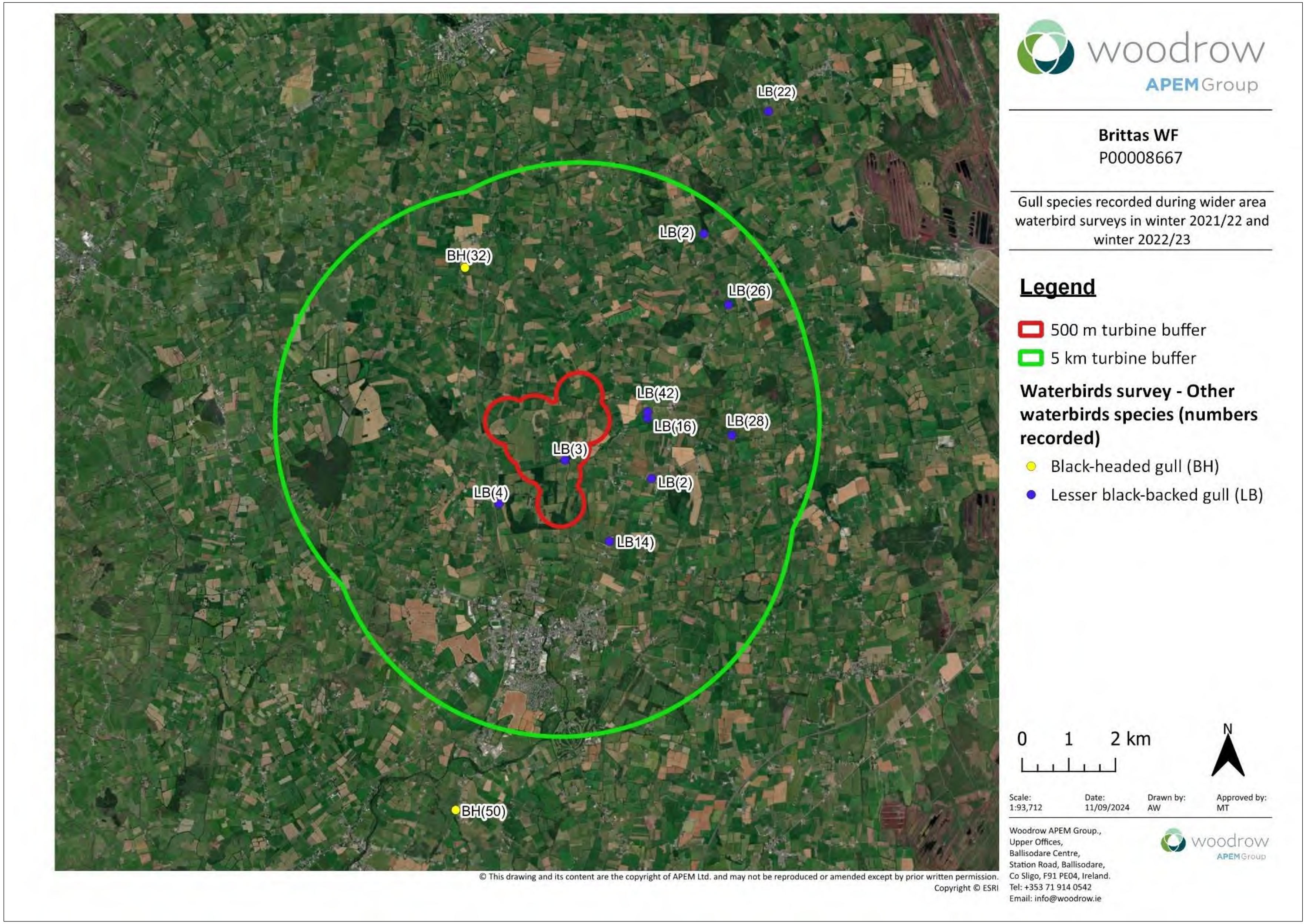

Figure 7A.17: Wider area distribution of wintering gulls - non-breeding seasons 2021/22 & 2022/23

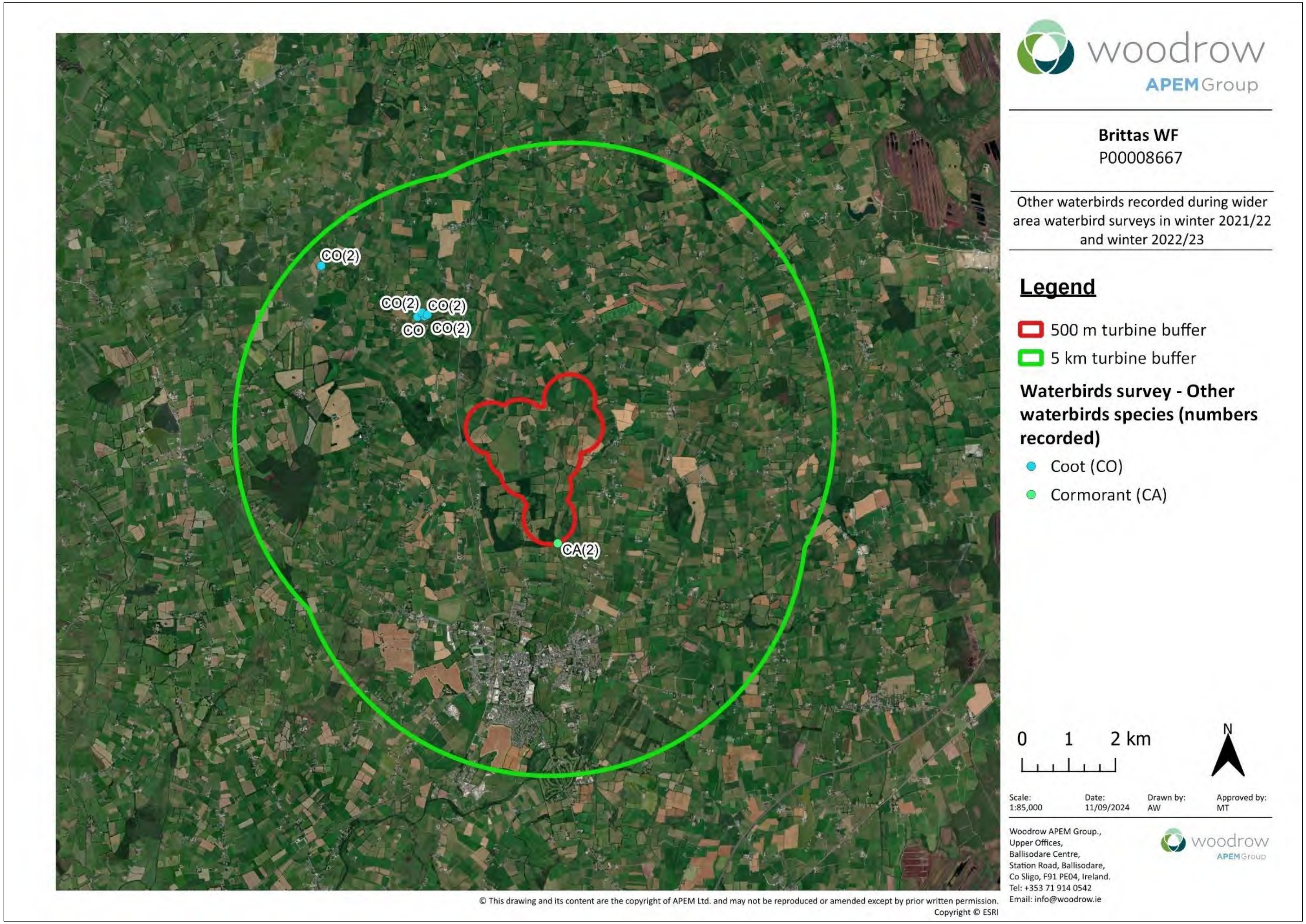

Figure 7A.18: Wider area distribution of other wintering waterbirds - non-breeding seasons 2021/22 & 2022/23

7A.5. ORNITHOLOGICAL BASELINE

The following sections provide the baseline assessment for the occurrence of target species in relation to the proposed Wind Farm Site. These baseline species accounts assimilate all the ornithological information collected for target species and the avian assemblages over three years of surveying, spanning the period October 2020 to September 2023, with additional location specific surveys conducted over breeding season 2024. Where appropriate the finding from the desk study are included. The aim is to provide species accounts that allow for the identification of important ornithological features and determination of whether or not there is potential for likely significant effects.

7A.5.1. Wetland birds

The following waterbird species were recorded utilising or flying through the 500 m turbine buffer or in close vicinity to the proposed Wind Farm Site:

- Swans, geese and ducks
  - Greylag goose, mute swan, whooper swan, shoveler, wigeon mallard, teal
- Waders
  - Lapwing, golden plover, curlew, whimbrel, dunlin, snipe, jack snipe, woodcock, green sandpiper
- Gulls
  - Black-headed gull, common gull, great black-backed gull, herring gull
- Other waterbirds
  - Cormorant, grey heron, little egret, kingfisher

The following sections provide baseline accounts for each of these species, with Section 7A.5.1.5 and Section 7A.5.1.6, respectively providing an overview at the end for the winter waterbird assemblage and the breeding lowland wader population associated with the proposed Wind Farm Site.

7A.5.1.1. Swans, geese & ducks

For all the surveys conducted covering the proposed Wind Farm Site, the following species of geese, swans and ducks were recorded utilising or flying through the 500 m turbine buffer or in close vicinity:

- Greylag goose, mute swan, whooper swan, shoveler, wigeon, mallard, teal

The following sections provide baseline accounts for each of these species.

7A.5.1.1.1. Greylag goose

The desk study determined that the proposed Wind Farm Site is beyond the potential zone of influence of any SPAs where migratory Icelandic greylag geese are listed as a SCI (NPWS, 2013). In addition, no wetlands supporting nationally important flocks (1% threshold: 35 birds) were identified within 30 km of the proposed Wind Farm Site (Burke *et al*., 2022).

During VP watches the only record for greylag goose was a single bird flying through the 500 m turbine buffer at *c*. 15 m on 31 November 2021. No CRM was run for this species and based on observed usage of the 500 m turbine buffer, collision risk for greylag goose is assessed as negligible. Based on I-WeBS counts and wider area wintering waterbird surveys (winters 2020/21, 2021/22, 2022/23), greylag geese have only been recorded within the proposed Wind Farm Site in one season since winter 2011/12, with a maximum count of 2 birds.

The desk study and wider area wintering waterbird surveys, show that usage of the hinterland by this species is infrequent, with counts never exceeding nationally important numbers (1% threshold: 35 birds). The closest occasionally occurring flock to the proposed Wind Farm Site is recorded at the Cabragh Wetlands pNHA, south of Thurles and approximately 6.5 km from the proposed Wind Farm Site, where numbers over the last 10 years have not exceeded 20 birds. The provenance of the flocks occurring, feral or Icelandic, is unknown and it is likely that at least some of the records, if not all, relate to the feral population[4].

Therefore, it can be objectively concluded that the proposed Wind Farm Site is not important for this species and there is no potential for any likely significant effect on the migratory Icelandic greylag goose population wintering in Ireland.

7A.5.1.1.2. <u>Mute swan</u>

The desk study determined that there are no SPAs or other wetland sites supporting nationally or internationally important numbers this species (1% threshold: 90 birds)[5] within the zone of influence of the proposed Wind Farm Site (NPWS, 2013, Lewis *et al*. 2019b).

During VP watches, 10 mute swan flights were recorded within the 500 m turbine buffer, with numbers ranging from 1 to 9 birds. Flights occurred in all seasons, but activity was higher over the winter, which was associated with slightly more birds occurring in the general area during the winter months. Only one flight (9 birds) was recorded within the CRZ, equating to a total of 1,080 aggregated flight seconds. No regular flight paths between foraging and roosting locations were identified. As only a single flight occurred within the CRZ, no CRM was run for this species and no significant (> 1%) population level effects due to collision risk is anticipated for mute swan.

Based on I-WeBS counts and wider area wintering waterbird surveys (winters 2020/21, 2021/22, 2022/23), relatively small numbers of wintering mute swan (2-6 birds) are regularly recorded within the proposed Wind Farm Site, with utilisation of the site associated with River Suir and adjacent floodplain. In addition, a pair have been recorded breeding along the River Suir within the 500 m turbine buffer.

The wintering population of mute swans recorded across the hinterland, out to 5 km, consists of equally small numbers that utilise most available wetland sites that have some open water. Cumulatively, wintering numbers within the 5 km turbine buffer are estimated at less than 20 birds, which is below nationally/internationally important numbers (1% threshold: 90 birds). If assuming Co. Tipperary supports a mute swan population of 1,200 birds based on I-WeBS counts, the 1% threshold for county importance can be taken as 12 birds.

Based on the data presented, it can be objectively concluded that the proposed Wind Farm Site is utilised by locally important numbers of wintering mute swan. Likewise, taking 13-14 pairs as an informed estimate of the 1% threshold for national importance[6], then the pair utilising the proposed Wind Farm Site is assessed as locally important.

7A.5.1.1.3. <u>Whooper swan</u>

[4] The feral greylag goose population in Ireland is listed on the Third Schedule of EC (Birds and Natural Habitats) Regulations 2011, as an invasive species subject to restrictions under Regulations 49 and 50.

[5] As the Irish mute swan population is considered to be largely a resident population, 1% thresholds for national and international importance are the same (90 birds).

[6] There is no estimate for the Irish mute swan breeding population. Therefore, taking an all-Ireland mute swan wintering population as approximately 9,000 birds (Lewis *et al*. 2019b) and assuming these are mostly resident birds, and that 40% of these breed annually, generates an estimated breeding population of 1,350 pairs.

The desk study determined that the proposed Wind Farm Site is beyond the potential zone of influence of any SPAs where whooper swans are listed as a SCI (NPWS, 2013). In addition, no wetlands supporting nationally important flocks (1% threshold: 150 birds) were identified within 30 km of the proposed Wind Farm Site (Burke *et al*., 2021).

During VP watches the only record for whooper swan were two birds foraging in grassland, adjacent to the River Suir on 07 March 2022 and no flights were detected. No CRM was run for this species and based on observed usage of the 500 m turbine buffer, collision risk for whooper is assessed as highly unlikely to result in any significant (> 1%) population level effects. Over winters 2021/22 and 2022/23 there were no regular flight paths between roosts and foraging areas identified for whooper swan, and this species was not recorded during wider area surveys extending out to 5 km from the proposed Wind Farm Site. Over winter 2020/21, a small flock (3-5 birds) was regularly recorded along the River Suir, just north of the 500 m turbine buffer at Clonamuckoge Beg/Killkillahra. Based on I-WeBS data for the area (Upper River Suir I-WeBS site) historically supported a flock of whooper swans, with annual peak counts ranging from 10 to 28 birds. However, apart from usage recorded over 2020/21, no birds have been recorded in the area since winter 2016/17.

Historic maximum counts are below the threshold for national importance (1% threshold: 150 birds). The most recent whooper swan population estimate for Co. Tipperary is 441 birds (Burke *et al*. 2021); therefore, based on a 1% threshold, a regularly occurring population of 4 or more birds is classed as being of county importance. A precautionary assessment, given the sporadic usage of the area by whooper swans in recent years, is that the proposed Wind Farm site occasionally supports numbers of county importance, however it is noted that birds are not regularly occurring.

7A.5.1.1.4. Shoveler

The desk study determined that the proposed Wind Farm Site is beyond the potential zone of influence of any SPAs where shoveler are listed as a SCI (NPWS, 2013). The Cabragh Wetlands pNHA south of Thurles and approximately 6.5 km south of the proposed Wind Farm Site is the closest wetland noted as historically supporting nationally important numbers of this species (1% threshold: 20 birds) – see Crowe (2005).

During all the surveys conducted, shoveler were only recorded once during winter site walkovers with four birds recorded on 16 March 2023, and were utilising flood waters along the southern extent of the 500 m turbine buffer. Therefore, it considered that shovelers may occasionally utilise the proposed Wind Farm Site when the River Suir is under certain flood conditions, with numbers likely to be lower than the requisite for nationally importance (1% threshold: 20 birds).

7A.5.1.1.5. Wigeon

The desk study determined that the proposed Wind Farm Site is beyond the potential zone of influence of any SPAs where wigeon are listed as a SCI (NPWS, 2013). In addition, there are no wetlands within the 5 km turbine buffer regularly supporting nationally important numbers (1% threshold: 560 birds) – see Lewis *et al*. (2019b). The Cabragh Wetlands pNHA, south of Thurles and approximately 6.5 km south of the proposed Wind Farm Site is the closest wetland noted as supporting numbers of county importance, with a maximum count of 350 birds (winter 2020/21).

During VP watches one wigeon flight consisting of 22 birds was recorded flying through the proposed Wind Farm Site on 29 December 2022 and the flock was detected flying within the CRZ at 40-50 m, with flight time equating to 2,420 aggregated flight seconds. As only a single flight was recorded no CRM was run for this species and based on observed usage of the 500 m turbine buffer, collision risk for wigeon is assessed as highly unlikely to result in any significant (> 1%) population level effects.

The only other record of wigeon in the vicinity of the proposed Wind Farm Site was a flock of 80 birds recorded during a site walkover on 16 March 2023, when the flock were foraging in flooded fields on the eastern bank of the River Suir, just south of the 500 m turbine buffer. These numbers are lower than the threshold for nationally important numbers (1% threshold: 560 birds).The baseline assessment for wigeon finds low levels of periodic usage for the proposed Wind Farm Site, as recorded over three winters (2020/21, 2021/22, 2022/23), and this is supported by I-WeBS counts for the River Suir Upper, where small numbers of wigeon (2 to 10 birds) were only recorded in three out of nine of the most recent winters of monitoring.

7A.5.1.1.6. Mallard

The desk study determined that the proposed Wind Farm Site is beyond the potential zone of influence of any SPAs where mallard are listed as a SCI (NPWS, 2013). There are no wetlands within the 5 km turbine buffer regularly supporting nationally important numbers (1% threshold: 280 birds). The Cabragh Wetlands pNHA, south of Thurles and approximately 6.5 km south of the proposed Wind Farm Site is the closest wetland noted as supporting numbers of county importance, with a maximum count of 250 birds (winter 2017/18).

Mallards were found to be a regularly occurring wetland species within the proposed Wind Farm Site during both the winter and breeding season. During VP watches a total of 16 flight observations were recorded within the 500 turbine buffer, with numbers recorded ranging from 1 to 60 birds and generating 3,478 aggregate flight seconds. However, only two flights were recorded at heights above 25 m, equating to 431 aggregate flight seconds within the CRZ. As only two flight were recorded within the CRZ, no CRM was run for this species and based on observed usage of the 500 m turbine buffer, collision risk for mallard is assessed as assessed as highly unlikely to result in any significant (> 1%) population level effects.

The numbers of mallard utilising or flying through the proposed Wind Farm Site over the winter months was low, ranging from 1 to 6 birds across all the monitoring completed over three winters (2020/21, 2021/22, 2022/23), and this is supported by I-WeBS counts for the River Suir Upper, where small numbers of mallard (2 to 7 birds) were only recorded in two out of nine of the most recent winters of monitoring.

Mallard numbers over breeding season 2022 were low (1-2 birds), with higher numbers recorded over breeding season 2023, when on three dates counts of 12, 16 and 60 birds were recorded. Higher counts in 2023 were associated with flooding along the River Suir late in the season (July and August), when most young birds would be fully fledged and therefore mobile with potential to have moved away from natal sites. As a widespread breeding species in Ireland, it is likely that that several mallards will nest within the proposed Wind Farm Site. Based on an all-Ireland breeding population of 15,400 pairs (NPWS, 2019), the 1% threshold for national importance is estimated at 154 pairs.

7A.5.1.1.7. Teal

The desk study determined that the proposed Wind Farm Site is beyond the potential zone of influence of any SPAs where teal are listed as a SCI (NPWS, 2013). There are no wetlands within the 5 km turbine buffer regularly supporting nationally important numbers (1% threshold: 360 birds). The Cabragh Wetlands pNHA, south of Thurles and approximately 6.5 km south of the proposed Wind Farm Site is the closest wetland noted as supporting numbers of national importance in the last 10 years, with a maximum count of 450 birds (winter 2014/15). Based on I-WeBS count data, a notional county/regional wintering teal population is estimated at 2,000 to 3,000 birds and the 1% threshold for county importance can be taken as a regularly occurring population of 20-30 birds.

No teal flights within the 500 m proposed turbine buffer were recorded during VP watches. Typically, small numbers (1-4 birds) were recorded along the River Suir over the winter, with the highest numbers recorded in the small pond in the southern woodland where 26 birds were recorded on 21 January 2022, in addition to 7 birds recorded along the river. An incidental record on 28 November 2022 recorded 120 teal along the River Suir, just south of the 500 m turbine buffer. Highest numbers recorded during I-WeBS counts of the River Suir Upper count area covering the northern part of the proposed Wind Farm Site is 50 birds, with teal recorded on five out of nine of the most recent winters of monitoring.

No teal were recorded during the breeding season and Co. Tipperary has recorded some of the lowest breeding densities for teal in the country (Balmer *et al*., 2013). There were a small number of potentially suitable nesting sites noted, including the pond in the southern woodland and some of the denser vegetation associated with the River Suir floodplain.

7A.5.1.2. Waders

For all the surveys conducted covering the proposed Wind Farm Site, the following wader species were recorded utilising or flying through the 500 m turbine buffer or in close vicinity:

- Lapwing, golden plover, curlew, whimbrel, dunlin, snipe, jack snipe, woodcock and green sandpiper

The following sections provide baseline accounts for each of these species.

7A.5.1.2.1. Lapwing

The desk study determined that the proposed Wind Farm Site is beyond the potential zone of influence of any SPAs where lapwing are listed as a SCI (NPWS, 2013). In addition, there are no wetlands identified as regularly supporting nationally important numbers (1% threshold: 850 birds) within 30 km of the proposed Wind Farm Site (Lewis *et al*., 2019b).

Based on I-WeBS data for the count site covering the northern part of the proposed Wind Farm Site (River Suir Upper), lapwings were recorded in seven out of nine of the most recent winters of monitoring, with peak counts ranging from 12 to 300 birds. Over the three winters covering the proposed Wind Farm Site lapwing were recorded flying through the 500 m turbine buffer in most winter months, with peak counts of 500 birds, 160 birds and 200 birds recorded over winters 2020/21, 2020/21 and 2022/23, respectively. These flocks of lapwing were often moving through the 500 m turbine buffer, appearing to favour the area around Clonamuckoge Beg/Kilkillahara, which is just northwest of the 500 m turbine buffer, as well as some flooded fields at Ballybristy/Clondoty, approximately 2.5 km further to the northwest. This was especially the case over winters 2020/21 and 2021/22, whereas over winter 2022/23 flight activity was more centred along the stretch of the River Suir north of the Rossestown Bridge. The change in flight activity was mirrored by golden plover usage of the area.

Numbers of wintering birds recorded fall below the 1% threshold for national importance (850 birds). Based on I-WeBS data the lapwing population for Co. Tipperary was estimated at 2,000 to 3,000 birds and applying a 1% threshold, the wintering population of lapwing occurring within the proposed Wind Farm Site is classified as being of county importance, as an area regularly supporting more than 20-30 birds.

Lapwing were recorded breeding within the proposed Wind Farm Site, and although it was difficult to differentiate between birds displaying on passage and genuine breeders, due high failure rates it is estimated that there were a maximum of 6 pairs was recorded. This is classed as nationally important based on an Irish breeding population estimate of 476 to 620 pairs (NPWS, 2019), i.e. 1% threshold of 4-6 pairs. As mentioned, breeding success was exceptionally low and in 2022 no birds were recorded after May indicating complete failure. Surveyors noted that site abandonment may have been related to active land management occurring the area, as well as nest site de-predation by hooded crows. In 2023, of the 5-6 pairs attempting to breed, only a single pair was recorded later in the season as potentially raising chicks. It is likely that implementing some basic habitat management measures, e.g. allowing some areas to develop longer and tussocky vegetation for nesting cover and controlling hooded crow numbers would have a positive effect on this population.

During VP watches 153 flight observations were recorded within the 500 m turbine buffer, with numbers ranging from 1 to 200 birds and generating 581,988 aggregate flight seconds. A high proportion of the flight time was recorded above 25 m and 531,730 aggregate flight seconds were recorded within the CRZ. As detailed in Appendix 7H, several CRMs were run for lapwing to account for different seasonal usage of the 500 m turbine buffer and also to test the effects of different avoidance rates on predicted collision risk. Application of the default avoidance rate (0.98) is considered too low for lapwing and higher avoidance, closer to 99.8%, is consider more appropriate for this species.

Applying 98.0% default avoidance results in 351 predicted collision over 35 years and applying 99.8% avoidance results in 35 predicted collisions over 35 years. Running CRMs to examine differences in seasonal collision risk, finds that substantial reduced flight activity within the CRZ during the breeding season generated lower levels of collision risk, which emerges as negligible once avoidance is set to 99.5%, with outputs predicting 0.2 to 1.1 collisions over 35 years (Turbine Type B). The wide range between outputs was due to higher aggregate flight times recorded in the second breeding season (2023), which was reflective of a slightly more successful breeding season compared to the first breeding season (2022), when breeding attempts had failed by May and the site was abandoned early in the season.

The CRM run for the non-breeding seasons showed that lapwing flight activity over the winter drives higher collision risk, with winter 2022/23 resulting in the highest predicted collision risk. Estimated collisions over 35 years for each non-breeding season analysed ranges from:

- 166 to 425 collisions over 35 years with avoidance at 98.0%
- 29 to 106 collisions over 35 years with avoidance at 99.5%
- 12 to 43 collisions over 35 years with avoidance at 99.8%

Potential for predicted collision risk to have a > 1% population level effects above background mortality are tested by applying an annual adult survival rate of 0.71 (BTO BirdFacts[7]) to the all-Ireland lapwing wintering population of 84,690 birds (Lewis *et al*. 2019b), an estimated county/regional wintering population of 2,000-3,000 birds (estimated using I-WeBS data) and a local population of 200-500 birds. For additional annual turbine mediated mortality to have a 1% effect on the:

- All-Ireland population (84,690 birds) would require: 245 collisions per year
- Country population (2000-3000 birds) would require: 5 to 8 collisions per year
- Local population (200-500 birds) would require: 0.5 to 1 collisions per year

Taking an intermediate modelled output for predicted annual lapwing collision risk of 2.51 collisions per annum (precautionary, 99.5% avoidance for Turbine Type B), any additional mortality due to predicted collision risk would have a less than 1% effect on the all-Ireland population (0.01%, excluding cumulative effects) and the county population (0.29-0.43%). In terms of the local lapwing population (200-500 birds) regularly utilising the proposed development site over the winter, applying the intermediate modelled output for predicted lapwing collision risk, 2.51 collisions per annum, would expresses an effect > 1% above background mortality, ranging from 1.7 to 4.3% depending on the size of the local population assessed.

[7] BTO BirdFacts – Lapwing: https://www.bto.org/understanding-birds/birdfacts/lapwing

To test magnitude of effect on the lapwing breeding population, an annual adult survival rate of 0.71 (BTO BirdFacts[8]) is applied to the low and high all-Ireland lapwing breeding population estimates of 952 to 1,240 birds (NPWS, 2019), and the local breeding population of 12 birds. For additional annual turbine mediated mortality to have a 1% effect on the:

- All-Ireland breeding population - high est. (1,240 birds) would require: 4 collisions per year
- All-Ireland breeding population - low est. (952 birds) would require: 3 collisions per year
- Local breeding population (12 birds/6 pairs) would require: 0.03 collisions per year

Applying 0.03 collisions per annum for breeding season predicted collision risk, based on the intermediate output from the 2023 breeding season (precautionary, 99.5% avoidance for Turbine Type B), which accounts for highest levels of flight activity recorded over the study period, would expresses an effect very close to 1% of background mortality.

In summary, the proposed Wind Farm Site supports nationally important numbers of breeding lapwing, all be it a struggling one, and a wintering population that is classed as regionally (county) important. The outputs from CRMs, assessed at an intermediate avoidance rate (0.995) indicate that collision risk over the breeding season has the potential for low level (*c*. 1%) effect on the lapwing breeding in the area. Similarly for wintering lapwing applying intermediate outputs for predicted collision risk indicates that any population level effects would be expressed at the local population level and the magnitude of effect is anticipated to be low (1-5%).

7A.5.1.2.2. Golden plover

The desk study determined that the proposed Wind Farm Site is beyond the potential zone of influence of any SPAs where golden plover are listed as a SCI (NPWS, 2013). In addition, there are no wetlands identified as regularly supporting nationally important numbers (1% threshold: 920 birds) within 30 km of the proposed Wind Farm Site (Lewis *et al*., 2019b).

Based on I-WeBS data for the count site covering the northern part of the proposed Wind Farm Site (River Suir Upper), golden plover were recorded in two out of nine of the most recent winters of monitoring, with peak counts ranging from 1 to 4 birds. Over the three winters covering the proposed Wind Farm Site golden plovers were recorded flying through the 500 m turbine buffer in most winter months, with peak counts of 700 birds, 200 birds and 400 birds recorded over winters 2020/21, 2020/21 and 2022/23, respectively. These flocks of golden plover were often moving through the 500 m turbine buffer, appearing to favour the area around Clonamuckoge Beg/Kilkillahara, which is just northwest of the 500 m turbine buffer, as well as some flooded fields at Ballybristy, approximately 2.5 km further to the northwest. This was especially the case over winters 2020/21 and 2021/22, whereas over winter 2022/23 flight activity was more centred along the stretch of the River Suir north of the Rossestown Bridge. The change in flight activity was mirrored by lapwing usage of the area.

Numbers of wintering birds recorded did not exceed the 1% threshold for national importance (920 birds). Based on I-WeBS data the golden plover population for Co. Tipperary was estimated at 3,000 to 5,000 birds and applying a 1% threshold, the wintering population of golden plover occurring within the proposed Wind Farm Site is classified as being of county importance, as an area regularly supporting more than 30-50 birds. Golden plover usage of the proposed Wind Farm Site did not extend beyond April and there is no suitable breeding habitat for this species, which has an Irish breeding range that is restricted to the uplands of the mid-west and northwest (Sharrock, 1976, Hutchinson, 1989, Gibbons *et al*., 1993, Balmer *et al*. 2013).

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[8] BTO BirdFacts – Lapwing: https://www.bto.org/understanding-birds/birdfacts/lapwing

During VP watches 42 flight observations were recorded within the 500 m turbine buffer, with numbers ranging from 3 to 400 birds and generating 730,067 aggregate flight seconds. A high proportion of the flight time was recorded above 25 m and 719,967 aggregate flight seconds were recorded within the CRZ. As detailed in Appendix 7H, several CRMs were run for golden plover to test the effects of different avoidance rates on predicted collision risk. Application of the default avoidance rate (0.98) is considered too low for golden plover and higher avoidance, closer to 99.8%, is consider more appropriate for this species.

Applying 98.0% default avoidance results in 599 predicted collision over 35 years and applying 99.8% avoidance results in 60 predicted collisions over 35 years. Potential for predicted collision risk to have a > 1% population level effects above background mortality are tested by applying an annual adult survival rate of 0.73 (BTO BirdFacts[9]) to the all-Ireland golden plover wintering population of 92,060 birds (Lewis *et al*. 2019b), an estimated county/regional wintering population of 3,000-5,000 birds (estimated using I-WeBS data) and a local population of 200-700 birds. For additional annual turbine mediated mortality to have a 1% effect on the:

- All-Ireland population (92,060 birds) would require: 248 collisions per year
- Country population (3,000-5,000 birds) would require: 8 to 13 collisions per year
- Local population (200-700 birds) would require: 0.5 to 2 collisions per year

Taking an intermediate modelled output for predicted annual golden plover collision risk of 4.28 collisions per annum (precautionary, 99.5% avoidance for Turbine Type B), any additional mortality due to predicted collision risk would have a less than 1% effect on the all-Ireland population (0.02%, excluding cumulative effects) and the county population (0.3-0.5%). In terms of the local golden plover population (200-700 birds) regularly utilising the proposed development site over the winter, applying the intermediate modelled output for predicted golden plover collision risk, 4.28 collisions per annum, would express an effect > 1% above background mortality, ranging from 2.3 to 7.9% depending on the size of the local population assessed.

In summary, the proposed Wind Farm Site supports a wintering golden plover population that is classed as regionally (county) important. The outputs from CRMs, assessed at an intermediate avoidance rate (0.995) indicate that collision risk has the potential for low to moderate level effects (2 to 8%) on the golden plover population wintering in the area.

7A.5.1.2.3. Curlew

The desk study determined that the proposed Wind Farm Site is beyond the potential zone of influence of any SPAs where curlew are listed as a SCI (NPWS, 2013). In addition, there are no wetlands identified as regularly supporting nationally important numbers (1% threshold: 350 birds) within 30 km of the proposed Wind Farm Site (Lewis *et al*., 2019b).

Based on I-WeBS data (2011/12 to 2020/21) for the count site covering the northern part of the proposed Wind Farm Site (River Suir Upper), curlew were recorded in four out of nine of the most recent winters of monitoring, with peak counts ranging from 1 to 30 birds. Even for previous monitoring periods peak count remained < 100 birds, with Crowe (2005) reporting a peak count of 88 birds for this I-WeBS count site for winters 1996/97 to 2000/01. A flock of up to 200 birds is more regularly recorded at the Cabragh Wetlands pNHA, south of Thurles and approximately 6.5 km from the proposed Wind Farm Site. This wintering population falls below the 1% threshold (350 birds) for consideration as nationally important but qualifies as being of county importance.

[9] BTO BirdFacts – Golden plover: https://www.bto.org/understanding-birds/birdfacts/golden-plover

Over the three winters covering the proposed Wind Farm Site (2020/21, 2020/21 and 2022/23) only a single curlew was recorded flying within the 500 m turbine buffer during a winter site walkover in February 2022. The only other curlew observations in the vicinity of the proposed Wind Farm Site were two flight records from VP watches, both of single birds flying outside to the 500 m turbine buffer over the summer, including:

- 10 August 2021: 1 bird flying south, *c*. 1 km from the proposed Wind Farm Site close to VP3
- 09 June 2023: 1 bird flying south, *c*. 2 km from the proposed Wind Farm Site east of VP1

Although recorded during the breeding season, no breeding behaviour was associated with these two observation and birds were noted as commuting through the area. There were no breeding curlew encountered within the 2 km of the proposed Wind Farm Site and the closest documented breeding sites are over 10 km away to the southeast and over 20 km away to the west (O'Donoghue *et a*l., 2019, Fehily Timoney, 2022, Colhoun *et al*., 2022).

Therefore, in summary based on sporadic recorded usage of the River Suir Upper I-WeBS count site by wintering curlew since 2011/12 and the near lack of usage over the study period, it can be objectively concluded on a precautionary basis that the proposed Wind Farm Site is only very occasionally utilised by curlew in numbers of county importance over the winter and there is no contemporary breeding population associated with this area.

7A.5.1.2.4. Whimbrel

Whimbrel do not breed in Ireland, they are spring and autumn passage migrants, with very limited numbers over wintering (Lewis *et al*., 2019b). A small number of whimbrel were recorded on autumn passage commuting through the proposed Wind Farm Site. Three birds were observed on 09 August 2023 and 157 aggregate flight seconds was recorded within the 500 m turbine buffer and at collision risk height (> 25 m). The low level of flight activity did not warrant a CRM, and it is considered highly unlikely that the proposed Wind Farm poses any significant population level risks to whimbrel, which are green listed in Ireland (Gilbert *et al*., 2021).

7A.5.1.2.5. Dunlin

This species is predominately coastal over the winter and is only regularly recorded at a small number of inland I-WeBS sites (Lewis *et al*., 2019b). Based on I-WeBS data for the count site covering the northern part of the proposed Wind Farm Site (River Suir Upper), dunlin were recorded in one out of nine of the most recent winters of monitoring, with peak counts of 3 birds. The I-WeBS counts for the Carbragh Wetland site show similarly low levels of limited usage and these counts indicate that this species does not regularly occur in this region. The desk study determined that the proposed Wind Farm Site is beyond the potential zone of influence of any SPAs where dunlin are listed as a SCI (NPWS, 2013), either wintering or breeding. In addition, there are no wetlands identified as regularly supporting nationally important wintering numbers (1% threshold: 460 birds) within 30 km of the proposed Wind Farm Site (Lewis *et al*., 2019b). A small population of dunlin breed in Ireland approximately 50 pairs and the breeding range is restricted to coastal machair sites and a few upland site along west coast of Ireland (Suddaby *et al*. 2020).

There was only one observation of dunlin, which was recorded during VP watch on 29 December 2022, when 16 birds were observed flying for 720 seconds within the 500 m turbine buffer at 30-40 m. As only a single flight was recorded no CRM was run for this species and based on observed usage of the 500 m turbine buffer, collision risk for dunlin is assessed as negligible. It is considered highly unlikely that the proposed Wind Farm poses any significant (> 1%) population level risks to this species.

7A.5.1.2.6. Snipe

Snipe are not listed as SCIs of any SPAs in Ireland (NPWS, 2013). It is difficult to effectively count this cryptic species over the winter, as birds tend to spend the majority of the day hidden away in long vegetation, only becoming visible in flight, typically when flushed or at dusk/dawn when commuting between roosting and foraging areas or on spring/autumn passage when more cohesive flocks are often observed. Due to the difficulty in counting snipe no population estimate for the number of snipe wintering in Ireland is given in Lewis *et al*. (2019b), and therefore, there is no 1% threshold for national importance; although previous I-WeBS reporting (Crowe, 2005) used a notional value, based on professional judgement, and applied an estimate of 100 birds for national importance, i.e. a wintering population of 10,000 birds.

Based on I-WeBS data (2011/12 to 2020/21) for the count site covering the northern part of the proposed Wind Farm Site (River Suir Upper), snipe were only recorded once out of nine of the most recent winters of monitoring, and only one bird was recorded. However, for the reasons outlined above, counting from a fixed point, as is typically employed by I-WeBS, will underestimate snipe numbers. Walked surveys, counting flushed birds provide better estimates of numbers utilising a given area. Walkover surveys conducted over winters 2021/22 and 2022/23 covering suitable habitat within the proposed Wind Farm Site generated the following flush counts: 36 birds (18 & 19 December 2021), 28 birds (21 & 22 January 2022), 26 birds (27 & 28 February 2022) and 7 birds (23 & 24 January 2023), with records concentrated along the River Suir and flood plain. Taking into account the species widespread distribution over the winter and noting that there is a high degree of uncertainty regarding the size of the wintering population (Lewis *et al*. 2019b), the proposed Wind Farm Site is considered to support wintering snipe in numbers of county importance.

Snipe were recorded breeding within the proposed Wind Farm Site and based on breeding behaviour observed (drumming and chipping), it is estimated that there are up to six territories, located in three areas. These breeding sites were associated with very distinct areas holding wetland habitats and the locations where territorial birds were recorded is shown in Appendix 7G – see Figure 7G.1, including:

- Wetland adjacent to T2, west bank of River Suir supporting:
  - 4 territories in 2021, 1-2 territories in 2022
- Field of wet grassland between T7 and T5, east of River Suir supporting:
  - 2 territories in 2021, 3-4 territories in 2022
- Wetland in southeast of 500 m turbine buffer, SE of T10, supporting:
  - 1 possible territory in 2022

Taking an Irish breeding population estimate of 4,275 pairs, i.e. 1% threshold of 42 pairs, based on NPWS (2019) applying findings of a review by Lauder & Donaghy (2008) and also reported in BWI (2010), the proposed Wind Farm Site does not support a nationally important breeding population. There are no county population estimates for breeding snipe; however assuming a relatively even distribution across the country, an appropriate threshold for county importance is taken as 1-2 pairs. The fact that suitable areas of breeding snipe habitat are so distinctly separated from the significantly poorer areas of improved grasslands, highlights that habitat management measures could easily be targeted at these areas to enhance habitat quality for snipe. Several locations in the wider area were also identified as supporting good numbers of wintering and breeding snipe, including the Cabragh pNHA, both the Marshes (south of Thurles) and Tank subsites.

During VP watches 13 flight observations were recorded within the 500 m turbine buffer, with numbers ranging from 1 to 7 birds and generating 1,142 aggregate flight seconds. A low proportion of the flight time was recorded above 25 m and only 480 aggregate flight seconds were recorded within the CRZ. As detailed in Appendix 7H, although snipe were recorded year round a CRM was only run for wintering flight activity, as only 10 seconds was recorded within the CRZ during the breeding season. The CRM for snipe found that predicted collision risk was low, with only 1 collision every 93 years (weighted, 98.0% avoidance). As discussed in Appendix 7H, flight activity for this species is largely crepuscular and VP surveys are carried out during daylight hours, and therefore, VP surveys are not always an effective method of estimating snipe flight activity. In addition, being a small, cryptic species flights at distance can easily go undetected. As such, flight time within the 500 m turbine buffer is likely to be underestimated (see Madders & Whitfield, 2006). A correction factor of 25% can be applied to account for nocturnal flight times. However, in this instance applying this factor still generates low outputs, with only 1 collision every 74 years (weighted, 98.0% avoidance).

Potential for predicted collision risk to have a > 1% population level effects above background mortality are tested by applying an annual adult survival rate of 0.48 (BTO BirdFacts[10]) to an estimated all-Ireland snipe population of 10,000 birds (based on Crowe, 2005), a notional county/regional population of 380 birds and a local breeding population of 12 birds. For additional annual turbine mediated mortality to have a 1% effect on the:

- All-Ireland population (10,000 birds) would require: 51 collisions per year
- County population (380 birds) would require: 2 collisions per year
- Local breeding population (12 birds) would require: 0.06 collisions per year (2 over 35 years)

Due to low annual survivorship, background mortality for snipe is notably high and the generational timeframe is also relatively short with the typical lifespan given as 3 years, with breeding occurring at two years (BTO BirdFacts).

In summary the proposed Wind Farm Site is assessed as supporting a wintering (up to 36 birds) and breeding (up to 6 territories) snipe population of county importance. While the CRM suggests low predicted collision risk, there is uncertainty around the use of CRMs for this species and it is also noted that typically, displacement effects are more of concern for this species than collision risk, especially displacement of breeding birds.

7A.5.1.2.7. Jack snipe

Jack snipe are often recorded in similar habitat to snipe over the winter, although typically occurring at lower densities. A single jack snipe was flushed from wetland habitat on the west bank of the River Suir during a winter site walkover on 22 January 2022. This species does not breed in Ireland and was downgraded from the amber to green list in the latest BoCCI (2020-2026) assessments (Colhoun & Cummins, 2013 and Gilbert *et al.*, 2021). Given the low level of activity it is considered highly unlikely that the proposed Wind Farm poses any significant population level risks to jack snipe.

7A.5.1.2.8. Woodcock

Woodcock were not recorded within the proposed Wind Farm Site during dusk survey undertaken over the breeding season. Despite adequate potential nesting cover identified in the southern woodlands, surveys indicate that the species does not breed in the area. The breeding component of the Irish woodcock population currently has an unfavourable (red listed) conservation status, whereas the wintering population is assessed as relatively stable (Gilbert *et al.*, 2021). Small numbers of overwintering woodcock were flushed during winter walkover surveys covering the 500 m turbine buffer. Woodcock are quarry species in Ireland and can be hunted each winter over the open season, November to January inclusive. Therefore, it is considered highly unlikely that the proposed Wind Farm poses any significant population level risks to wintering woodcock utilising the area, although there will be some loss of potential habitat.

7A.5.1.2.9. Green sandpiper

[10] BTO BirdFacts – Snipe: https://www.bto.org/understanding-birds/birdfacts/snipe

Green sandpiper do not breed in Ireland, they are mainly passage migrants, with small numbers over wintering. During VP watches one observation of a single green sandpiper was recorded on 28 August 2023 flying for 11 seconds within the 500 m turbine buffer. The low level of flight activity did not warrant a CRM, and it is considered highly unlikely that the proposed Wind Farm poses any significant population level risks to green sandpiper, which have a favourable (green listed) conservation status in Ireland (Gilbert *et al*., 2021).

7A.5.1.3. Gulls

For all the surveys conducted covering the proposed Wind Farm Site, the following gull species were recorded utilising or flying through the 500 m turbine buffer or in close vicinity:

- Black-headed gull, common gull, great black-backed gull, herring gull, lesser black-backed gull

The following sections provide baseline accounts for each of these species. It is important to note that gull counts are conducted on optional basis for I-WeBS and therefore data on gull numbers is not always representative of actual populations trends.

7A.5.1.3.1. Black-headed gull

Black-headed gulls are reported as the most numerous and widespread wintering gull species in Ireland and regularly venture inland from the coast (Lewis *et al*., 2019b). This species also breeds in Ireland and does establish colonies in wetlands away from the coast Cummins *et al*., 2019). The desk study, see Section 7A.2.2.1, determined that the proposed Wind Farm Site is beyond the potential zone of influence of any SPAs where black-headed gull is listed as a SCI, either wintering or breeding (NPWS, 2013).

The exact size of the Irish winter population is not accurately reported (Lewis *et al*., 2019b), although NPWS (2019) provides an estimate for the wintering population of 48,821 birds based on I-WeBS mean peak counts (2011/12 to 2015/16). Based on this estimate, a regularly occurring wintering population of 488 birds would be considered nationally important. I-WeBS data for count sites in Co. Tipperary, including River Suir Upper, Cabragh Wetland and River Suir Middle, is considered unreliable for gulls and on face value suggests there are no locations within 30 km of the proposed Wind Farm Site regularly supporting more than 100 birds. On reviewing the wider I-WeBS data set, the size of the black-headed gull population likely to be ranging widely across Co. Tipperary over the winter has been estimated at 1,000 to 2,000 birds, and applying a 1% threshold, a regularly occurring wintering population of more than 10-20 birds is taken as being of county importance.

Across three winters of monitoring (2022/21, 2021/22 and 2022/23) black-headed gull were regularly recorded in most months, within or directly around the proposed Wind Farm Site, with peak monthly counts ranging from 2 to 80 birds, and a flock of 200 birds was recorded on one survey day (29 December 2020). Therefore, the wintering population is assessed as being of county importance.

Based on Cummins *et al*. (2019), the closest black-headed gull colony is within 11 km of the proposed Wind Farm Site, located to the east, near Lisheen Mine and supported 10 or less pairs. One of the largest colonies is located at Lough Derg, which is > 30 km from the proposed Wind Farm Site and over the last monitoring period (2016-2018) supported 400 breeding pairs. Based on NatureScot (2023) the maximum/mean maximum breeding season foraging range for black-headed gull is 18.5 km, so this colony is assessed as being beyond the potential zone of influence. The Irish black-headed gull breeding population is reported as 7,810 pairs and therefore, a site supporting 78 pairs is considered nationally important (Cummins *et al*., 2019). The only significant breeding numbers in Co. Tipperary are on Lough Derg (400 pairs) and therefore 4 pairs (8 birds) is considered to be of county importance.

Across three breeding seasons of monitoring (2021, 2022 and 2023), black-headed gulls were observed less frequently than over the winter months, and the numbers recorded was also lower, ranging from 1 to 8 birds. The record of 8 birds was only recorded on one date (30 May 2021) and lower counts, 1-4 birds, were more typical. Therefore, based on the small numbers recorded, the population utilising the proposed Wind Farm Site over the breeding season is assessed as locally important, which in combination with the lower frequency of use and the distance from the closest known breeding colony (> 10 km) means that any potential for likely significant effects is considered unlikely.

During VP watches 6 flight observations were recorded within the 500 m turbine buffer, with numbers ranging from 2 to 22 birds and generating 2,225 aggregate flight seconds. Approximately half of the flight time was recorded above 25 m and 1,035 aggregate flight seconds were recorded within the CRZ. As detailed in Appendix 7H, the CRM for black-headed gull was run allowing for year-round utilisation of the 500 m turbine buffer and found that predicted collision risk was low, with only 1 collision every 128 years (weighted, 99.2% avoidance). This level of turbine mediated mortality would be totally imperceptible to background levels and no significant population level effects are anticipated based on the measured level of predicted collision risk for the proposed Wind Farm Site.

In summary, the proposed Wind Farm Site is assessed as being utilised by a wintering black-headed gull population (up to 200 birds) of county importance and smaller numbers (up to 8 birds) over the breeding season assessed as locally important.

7A.5.1.3.2. Common gull

Over a three year period (October 2020 to September 2021) there were only two common gull observations recorded within or adjacent to the 500 m turbine buffer. These observations were both recorded during VP watches and included two bird flying through the area in December 2021 and a single juvenile (1st calendar year) flying through the area over the summer, in July 2023. These flights amounted to 113 aggregated flight seconds within the 500 m turbine buffer, however only 70 seconds were recorded above 25 m, i.e. within the CRZ. Common gulls were not recorded during wider area surveys and the lack of I-WeBS data for this species from the River Suir Upper and Cabragh Wetlands suggests that area is not regularly utilised by common gulls. Based on Cummins *et al*. (2019), the closest breeding common gull colony is a small colony (10 pairs or less) at Lough Derg, more than 30 km away from the proposed Wind Farm Site.

No CRM was run for this species, as only two flights amounting to 70 seconds within the CRZ were recorded. Based on observed usage of the 500 m turbine buffer, collision risk for common gull is as assessed as highly unlikely to result in any significant (> 1%) population level effects. In addition low overall usage of the wider area out to 5 km from the proposed Wind Farm Site, means it can be objectively concluded that this area is not important for common gulls and the proposed Wind Farm does not poses any significant population level risks to this species.

7A.5.1.3.3. Great black-backed gull

Over a three year period (October 2020 to September 2021) there was only one great black-backed gull observations recorded adjacent to the 500 m turbine buffer. This observation was recorded during VP watches and included two bird recorded over 1 km from the 500 m turbine buffer, flying northeast in April 2022 and amounted to 160 aggregated flight seconds at *c*. 20 m, i.e. out of the CRZ. Great black-backed gull were not recorded during wider area surveys and the lack of I-WeBS data for this species from the River Suir Upper and Cabragh Wetlands suggests that area is not regularly utilised by great black-backed gull. Based on Cummins *et al*. (2019), the closest breeding sites are located at the coast or Lough Ree, more than 60 km away from the proposed Wind Farm Site.

No CRM was run for this species, as there were no flights recorded within the CRZ. Based on a lack of observed usage of the 500 m turbine buffer, collision risk for great black-backed gulls is assessed as highly unlikely to result in any significant (> 1%) population level effects. In addition low overall usage of wider area out to 5 km from the proposed Wind Farm Site, means it can be objectively concluded that this area is not important for great black-backed gulls and the proposed Wind Farm does not poses any significant population level risks to this species.

7A.5.1.3.4. Herring gull

Over a three year period (October 2020 to September 2021) there were only two herring gull observations recorded within or adjacent to the 500 m turbine buffer. These observations were both recorded during VP watches and included one bird flying within the 500 m turbine buffer in April 2021 and was heading south along River Suir at 20-50 m (Fehily Timoney, 2022). The other observations was another single bird, identified as a juvenile (2nd calendar year) flying just beyond the 500 m turbine buffer, in August 2023 and was recorded for 204 seconds at approximately 60 m. Herring gull were not recorded during wider area surveys and the lack of I-WeBS data for this species from the River Suir Upper and Cabragh Wetlands suggests that the area is not regularly utilised by herring gulls. Based on Cummins *et al*. (2019), the closest breeding sites are located at the coast, more than 60 km away from the proposed Wind Farm Site.

No CRM was run for this species, as no flights were within the CRZ during the two year study. Based on observed usage of the 500 m turbine buffer, collision risk for herring gull is assessed as highly unlikely to result in any significant (> 1%) population level effects. In addition low overall usage of wider area out to 5 km from the proposed Wind Farm Site, means it can be objectively concluded that this area is not important for herring gulls and the proposed Wind Farm does not poses any significant population level risks to this species.

7A.5.1.3.5. Lesser black-backed gull

Over the last 50 year the number lesser black-backed gulls overwintering in Ireland has increased significantly (Crème *et al*., 2014, Ross-Smith *et al*., 2015, Lewis *et al*., 2019b). This species also breeds in Ireland and does establish colonies in wetlands away from the coast. The desk study, see Section 7A.2.2.1, determined that the proposed Wind Farm Site is beyond the potential zone of influence of any SPAs where lesser black-backed gull is listed as a SCI, either wintering or breeding (NPWS, 2013).

The exact size of the Irish winter population is not accurately reported (Lewis *et al*., 2019b), although NPWS (2019) provides an estimate for the wintering population of 11,842 birds based on I-WeBS mean peak counts (2011/12 to 2015/16). Based on this estimate, a regularly occurring wintering population of 118 birds would be considered nationally important. I-WeBS data for count sites in Co. Tipperary, including River Suir Upper, Cabragh Wetland and River Suir Middle, is considered unreliable for gulls and on face value suggests the area periodically supports up to 200 lesser black-backed gulls. On reviewing the wider I-WeBS data set, the size of the lesser black-backed gull population likely to be ranging widely across Co. Tipperary over the winter has been estimated at 500 birds, and applying a 1% threshold, a regularly occurring wintering population of more than 5 birds is taken as being of county importance.

Across three winters of monitoring (2022/21, 2021/22 and 2022/23) lesser black-backed gulls were regularly recorded in most months, within or directly around the proposed Wind Farm Site, with peak monthly counts during VP watches ranging from 1 to 70 birds, although smaller numbers were typically recorded as shown by the following monthly peak counts:

Oct 2021	Nov 2021	Dec 2021	Jan 2022	Feb 2022	Mar 2022	Apr 2022	May 2022	Jun 2022	Jul 2022	Aug 2022	Sep 2022	Oct 2022	Nov 2022	Dec 2022	Jan 2023	Feb 2023	Mar 2023	Apr 2023	May 2023	Jun 2023	Jul 2023	Aug 2023
37	24	2	6	21	14	12	10	-	2	70	-	16	25	-	2	-	-	-	-	2	2	2

Therefore, the wintering population is assessed as being of county importance.

The Irish lesser black-backed gull breeding population is reported as 7,112 pairs and therefore, a site regularly supporting 71 pairs is considered nationally important (Cummins *et al*., 2019). There are no significant breeding numbers reported for Co. Tipperary, with the closest site being low densities (10 pairs or less) at Lough Derg, 37 km to the west. The closest large colony is at Lough Ree, 90 km to the north, which has held over > 1000 pairs in recent seasons (Cummins *et al*., 2019). As this species ranges widely over the breeding season (NatureScot, 2023), an estimate of breeding numbers within approximately 100 km of the proposed Wind Farm Site (*c*. 1,500 pairs) is used to provide a notional value for county/regional importance, which gives a 1% threshold of 15 pairs (30 birds).

Across three breeding seasons of monitoring (2021, 2022 and 2023), lesser blacked gulls were observed less frequently than over the winter months, especially during the 2023 breeding season. Generally the numbers recorded also appeared to be lower, ranging from 1 to 12 birds, with a flock of 70 birds recorded once in August 2022, possibly a post-breeding flock dispersing from a breeding colony. Therefore, based on the small numbers recorded, the population utilising the proposed Wind Farm Site over the breeding season is assessed as locally important.

During VP watches 53 flight observations were recorded within the 500 m turbine buffer, with numbers ranging from 1 to 70 birds and generating 57,536 aggregate flight seconds. The majority of the flight time was recorded between 25 m and 180 m, with 52,161 aggregate flight seconds recorded within the CRZ. As detailed in Appendix 7H, the CRM for lesser black-backed gull was run allowing for year-round utilisation of the 500 m turbine buffer. The outputs from this model generated predicted collision risk of 1 collision every 3.2 years (weighted, 99.5% avoidance), equivalent to 11 collisions over 35 years.

Examination of the temporal distribution of flight time over the two year study found that flight activity was different between the study years, with October 2021 to August 2022 generating significantly higher values when compared with October 2022 to August 2023. Therefore, the model was re-run for the year exhibiting highest levels of flight activity only, which found that predicted collision risk almost doubles to one collision every 1.6 years.

Potential for predicted collision risk to have a > 1% population level effects above background mortality are tested by applying an annual adult survival rate of 0.913 (BTO BirdFacts[11]) to the Irish lesser black-backed gull wintering population of 11,842 birds (Lewis *et al*. 2019b, NPWS, 2019), breeding population of 14,224 birds (Cummins *et al*. 2019), an estimated county/regional wintering population of 500 birds (estimated using I-WeBS data) and a local population of 100 birds. For additional annual turbine mediated mortality to have a 1% effect on the:

- Irish population (11,842/14,224 birds) would require: 10 to 12 collisions per year
- Country population (500 birds) would require: 0.4 collisions per year
- Local population (100 birds) would require: 0.1 collisions per year

Taking the highest modelled output for predicted lesser black-backed gull collision risk, 0.64 collisions per annum, any additional mortality due to predicted collision risk would have a less than 1% effect on the Irish breeding population (0.05%, excluding cumulative effects) and the Irish wintering population (0.06%, excluding cumulative effects). Predicted collision risk expresses an effect > 1% above background mortality on the county population and the local population with the potential magnitude of effects estimated at 1.5% and 7.4%, respectively.

[11] BTO BirdFacts – Lesser black-backed gull: https://www.bto.org/understanding-birds/birdfacts/lesser-black-backed-gull

In summary, the proposed development site is assessed as being utilised by a wintering lesser black-backed gull population (up to 37 birds) of county importance and smaller numbers (up to 12 birds) over the breeding season assessed as locally important, with usage by a flock of 70 birds recorded in August 2023 (post-breeding). For lesser black-backed gull the worst-case scenario for predicted collision risk, (0.64 collisions/year), indicates that any population level effects would be expressed at the county population and local population level, with the magnitude of effect estimated to low (1.5%) and moderate (7.4%), respectively.

7A.5.1.4. Other waterbirds

For all the surveys conducted covering the proposed Wind Farm Site, the following other waterbird species were recorded utilising or flying through the 500 m turbine buffer or in close vicinity:

- Cormorant, grey heron, little egret and kingfisher

The following sections provide baseline accounts for each of these species.

7A.5.1.4.1. <u>Cormorants</u>

The desk study determined that the proposed Wind Farm Site is beyond the potential zone of influence of any SPAs where cormorant are listed as a SCI (NPWS, 2013), either breeding or wintering – see Section 7A.2.2.1.

The closest nationally important wetland for cormorant is Lough Derg, which is *c*. 37 km away. The Lough Derg (Shannon) SPA supports several colonies of breeding cormorant and based on Cummins *et al*. (2019) held 272 pairs over the last monitoring period (2015-18). The size of the national breeding population is estimated at 4,688 pairs, and therefore 47 pairs would be considered nationally important. Taking the Lough Derg cormorant population as representative of Co. Tipperary, then the 1% threshold for county/regional importance is the regular occurrence of 2-3 pairs (4-6 birds).

According to Lewis *et al*. (2019b), in Ireland coastal bays support the largest concentrations of wintering cormorant; however the species is also widespread inland, particularly on the larger loughs and parts of the north midlands and west of the country where there are high densities of waterbodies with fish. There are no wetlands identified as regularly supporting nationally important wintering numbers (1% threshold: 110 birds) within 30 km of the proposed Wind Farm Site and again the closest nationally important wetland is Lough Derg, which has supported a peak count of 163 wintering birds (Lewis *et al*., 2019b). On reviewing I-WeBS data for Co. Tipperary the wintering cormorant population is estimated to be 100-200 birds; therefore, a regularly occurring population of 1-2 birds can be classed as being of county importance.

Most of the observed utilisation of the proposed Wind Farm Site by cormorants, was birds commuting through the area along the River Suir; however small numbers of birds were also recorded loafing and foraging along the river. During VP watches 32 flight observations were recorded within the 500 m turbine buffer, with numbers ranging from 1 to 3 birds and generating 1,844 aggregate flight seconds. Approximately half the flight time was recorded between 25 m and 180 m, with 989 aggregate flight seconds recorded within the CRZ. As detailed in Appendix 7H, the CRM for cormorant was run allowing for year-round utilisation of the 500 m turbine buffer. The outputs from this model generated predicted collision risk of 1 collision every 31 years (weighted, 98% default avoidance). This level of turbine mediated mortality would be totally imperceptible to background levels and no significant population level effects are anticipated based on the measured level of predicted collision risk for the proposed Wind Farm Site. Based on an adult survival rate of 0.88 for cormorant (BTO BirdFacts[12]) and taking an estimated Irish

[12] BTO BirdFacts – Cormorant: https://www.bto.org/understanding-birds/birdfacts/cormorant

breeding population of 4,688 pairs (Cummins *et al*., 2019) and a wintering population of 10,870 birds (Lewis *et al*., 2019b), additional annual mortality required to have a 1% population effect would be in the region of 11 to 13 collisions per year.

In summary, the proposed Wind Farm Site is assessed as being of county importance for small numbers of cormorants (1-3 birds) during the wintering and breeding season, with the River Suir noted as the route taken by commuting birds and also providing a resource for foraging birds. Based on documented evidence of habituation to turbines and the measured level of predicted collision risk no population level effects are anticipated.

7A.5.1.4.2. Grey heron

Grey herons are resident in Ireland, with the country hosting an influx of migrants over the winter, and this species is widely distributed, typically occurring in low densities (Lewis *et al*., 2019). Therefore, only large areas of wetland support nationally important numbers (1% threshold: 25 birds). The proposed Wind Farm Site is beyond the potential zone of influence of any nationally important wetlands or SPAs where grey herons are listed as a SCI (NPWS, 2013). The closest SPA is Inner Galway Bay SPA, *c*. 90 km to the NW, which supports a mean peak of 140 birds (Lewis *et al*., 2019b). On reviewing I-WeBS data for Co. Tipperary and allowing for the dispersed distribution of this species, i.e. occurring beyond I-WeBS sites, the wintering grey heron population was estimated to be 50 to 100 birds; therefore, on a precautionary basis a regularly occurring population of 1 birds can be classed as being of county importance.

Surveys in 2020-2021 (Fehily Timoney, 2022) identified a heronry in the woodland south of the proposed Wind Farm Site and approximately 540 m from the closest turbine [ITM 613090 661048]. The heronry was not located in subsequent seasons and was assumed not to have been occupied. Most of the observed utilisation of the proposed Wind Farm Site by grey herons, was birds commuting along the River Suir in the area north of the Rossestown Bridge and birds were also recorded foraging along the river and in adjacent flood plain habitats. The maximum number of birds recorded within the proposed Wind Farm Site was 6 birds, however peak counts of 5-6 birds were only noted occasionally during winter 2020/21 and over the subsequent two survey years, the maximum count was 3 birds, with 1-2 birds most regularly recorded.

During VP watches 51 flight observations were recorded within the 500 m turbine buffer, with numbers ranging from 1 to 3 birds and generating 2,532 aggregate flight seconds. Approximately half the flight time was recorded between 25 m and 180 m, with 1,306 aggregate flight seconds recorded within the CRZ. As detailed in Appendix 7H, the CRM for grey heron was run allowing for year-round utilisation of the 500 m turbine buffer. The outputs from this model generated predicted collision risk of 1 collision every 27 years (weighted, 98% default avoidance). This level of turbine mediated mortality would be totally imperceptible to background levels and no significant population level effects are anticipated based on the measured level of predicted collision risk for the proposed Wind Farm Site. Based on an adult survival rate of 0.732 for grey heron (BTO BirdFacts[13]) and taking an acknowledged underestimate of the Irish wintering population of 2,610 birds (Lewis *et al*., 2019b), additional annual mortality required to have a 1% population effect would have to be higher than 7 collisions per year.

In summary, the proposed Wind Farm Site is assessed as being of county importance for grey herons naturally occurring at low densities (typically 1-3 birds) throughout the year, with the River Suir noted as the route taken by commuting birds and also providing a resource for foraging birds. No population level effects are anticipated, based on the measured level of predicted collision risk.

7A.5.1.4.3. Little egret

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[13] BTO BirdFacts – Grey heron: https://www.bto.org/understanding-birds/birdfacts/grey-heron

Having only relatively recently colonised Ireland, little egret is not listed as a SCI of any SPAs in spite of its European conservation status as an Annex I species (NPWS, 2013). Since becoming established in Ireland over the late 1990s the little egret population has experienced a notable expansion in range and abundance, with the Irish population estimated at 1,390 birds; and similar to grey heron, this species is now widely distributed across the country, typically occurring in low densities (Lewis *et al*., 2019b). Therefore, only large areas of wetland support nationally important numbers (1% threshold: 20 birds). The proposed Wind Farm Site is beyond the potential zone of influence of any nationally important wetlands, with the closest and most important site being Cork Harbour, *c*. 90 km to the south, which supports a mean peak of over 100 birds (Lewis *et al*., 2019b). On reviewing I-WeBS data for Co. Tipperary and allowing for the dispersed distribution of this species, i.e. occurring beyond I-WeBS sites, the wintering little egret population was estimated to be 50 birds; therefore, on a precautionary basis a regularly occurring population of 1 birds can be classed as being of county importance.

No little egret heronries were identified within or adjacent to the proposed Wind Farm Site. It is possible that the heronry, which has not been active since the 2021 breeding season, also supported little egret, as these two species often nest together; however this was not confirmed. Most of the observed utilisation of the proposed Wind Farm Site by little egrets, was birds commuting along the River Suir in the area north of the Rossestown Bridge and birds were also recorded foraging along the river and in adjacent flood plain habitats. This is remarkably similar with the grey heron activity recorded for the site. The maximum number of little egrets recorded within the proposed Wind Farm Site was 5 birds, however observations of more than 3 birds were only noted occasionally, with 1-2 birds more regularly recorded.

During VP watches 45 flight observations were recorded within the 500 m turbine buffer, with numbers ranging from 1 to 3 birds and generating 2,681 aggregate flight seconds. Only about a quarter of the flight time was recorded between 25 m and 180 m, with 721 aggregate flight seconds recorded within the CRZ. As detailed in Appendix 7H, the CRM for little egret was run allowing for year-round utilisation of the 500 m turbine buffer. The outputs from this model generated predicted collision risk of 1 collision every 36 years (weighted, 98% default avoidance). This level of turbine mediated mortality would be totally imperceptible to background levels and no significant population level effects are anticipated based on the measured level of predicted collision risk for the proposed Wind Farm Site. Based on an adult survival rate of 0.712 for little egret (BTO BirdFacts[14]) and taking the estimate of the Irish wintering population as 1,390 birds (Lewis *et al*., 2019b), additional annual mortality required to have a 1% population effect would have to be higher than 4 collisions per year.

In summary, the proposed Wind Farm Site is assessed as being of county importance for little egret naturally occurring at low densities (typically 1-3 birds) throughout the year, with the River Suir noted as the route taken by commuting birds and also providing a resource for foraging birds. No population level effects are anticipated, based on the measured level of predicted collision risk.

7A.5.1.4.4. Kingfisher

Kingfisher are listed as an Annex I species on the EU Birds Directive. The desk study determined that the proposed Wind Farm Site is beyond the potential zone of influence of any SPAs where kingfisher are listed as a SCI (NPWS, 2013). The national kingfisher population is estimated at 368 to 1,031 pairs (NPWS,2019) and has an unfavourable (amber list) conservation status (Gilbert *et al*., 2021). Therefore, a waterbody supporting a minimum of 3-4 pairs would be considered nationally important.

[14] BTO BirdFacts – Little egret: https://www.bto.org/understanding-birds/birdfacts/little-egret

Kingfisher were recorded foraging along the River Suir within the 500 m turbine buffer. No kingfishers were recorded from VP4, located on the Rossestown Bridge and covering part of the River Suir, indicating that there was limited movement up and down the river at this location. Birds were recorded during both winter and breeding season site walkover surveys, with birds detected along the river in the southern extent of the 500 m turbine buffer and also to the north of the buffer.

No breeding sites were identified, and the results of the kingfisher habitat suitability survey found that there was limited nesting bank along the section of the River Suir within the 500 m turbine buffer. The old nesting holes identified by Fehily Timoney (2022) - see Appendix 7I, were south of the 500 m turbine buffer. Based on observations of kingfisher during the breeding season, the section of the River Suir occurring within the 500 m turbine buffer is considered to be within the breeding territory of 1 pair nesting somewhere downstream of the proposed Wind Farm Site, with a second territory possibly located upstream.

The low flight trajectory typically employed by this species, as well as the associated flight paths largely following waterbodies, means that the risk of kingfishers colliding with turbines is highly unlikely. Therefore, as is the case for all infrastructural projects potentially affecting watercourses, any activities with the potential for causing a deterioration in water quality leading to a reduction in availability of prey species for kingfishers is the main consideration for mitigation measures aimed at protecting water quality.

In summary, the River Suir within the 500 m turbine buffer is assessed as being of county importance for being within the territories of 1-2 pairs of kingfishers. Potential for likely significant effects relate to prevention of any deterioration in water quality.

7A.5.1.5. Assessment of wintering waterbird assemblage

The baseline accounts for waterbirds provide information on how each species utilises the proposed Wind Farm Site, however it is also important to assess the overall importance of the area for the full assemblage of wintering waterbirds found to be regularly utilising the area. Table 7A.23 lists all the wintering waterbird species recorded and provides data on the typical numbers recorded, maximum counts and frequency of occurrence counts. Count data and frequency of occurrence are used to assess the importance of the population using 1% thresholds for regularly occurring species.

This analysis determined that the section of the River Suir and associated flood plain within the 500 m turbine buffer for the proposed Wind Farm Site is part of a wetland that regularly supports numbers of county (regional) importance for eight species of wintering waterbird, including:

- three red listed species: golden plover, lapwing and snipe;
- three amber listed species: black-headed gull, cormorant and lesser black-backed gull; and,
- two green-listed species: grey heron and little egret.

The wetland also regularly supports numbers of local importance for five species of wintering waterbird, including:

- three amber listed species: mallard, mute swan and teal; and,
- two green listed species: jack snipe, woodcock (wintering population).

Several species were found to utilise the wetland relatively infrequently and therefore while numbers periodically recorded exceeded 1% thresholds, utilisation was not regular enough to be fully considered as populations of county or local importance. This included curlew, kingfisher, shoveler, whooper swan and wigeon. As detailed in species for curlew and whooper swan there has been measured decline in usage of the area in recent winters. For shoveler and wigeon periodic usage of the area appeared to be linked to flood events, which saw increase the numbers of other duck species recorded including mallard and teal.

Regardless of low frequency usage by kingfisher over the winter, the section of the River Suir within the proposed Wind Farm Site is assessed as being of county importance for being within the territory of 1, possibly 2 pairs of kingfishers.

Very infrequent occurrence was noted for a further seven waterbird species, including common gull, dunlin, great black-backed gull, greylag goose, green sandpiper, herring gull and whimbrel. For these species, based on frequency of utilisation and relatively small numbers being recorded, it can be objectively concluded that this area is not important for these species and therefore the proposed Wind Farm does not pose any significant population level risks. On this basis it is advised that these species do not need to be carried forwarded into the ornithological impact assessment, as they are not important ecological features for the proposed Wind Farm Site.

Table 7A.23: Wintering waterbirds ranked by geographical importance of populations

Thresholds for 1% national importance were taken from Lewis *et al*. (2019b) or were based on population estimates from NPWS (2019) - when available all-Ireland estimates have been reported in favour of Republic of Ireland estimates. Thresholds for 1% county importance were derived by reviewing I-WeBS data for Co. Tipperary and applying a precautionary approach.
*denotes species listed on Annex I of EU Birds Directive
Red, Amber & Green as listed in BoCCI (2020-2026) - birds of conservation concern in Ireland, as per Gilbert *et al*. (2021)

Species	Level of importance	Typical numbers	Max. count	Frequency of occurrence	1% county	1% national
Black-headed gull	County importance	2-80	200	regularly occurring	10-20	488
Cormorants	County importance	1-2	3	regularly occurring	1-2	110
Golden plover*	County importance	10-200	700	regularly occurring	30-50	920
Grey heron	County importance	1-2	6	regularly occurring	1	25
Lapwing	County importance	10-200	500	regularly occurring	20-30	850
Lesser black-backed gull	County importance	1-37	70	regularly occurring	5	118
Little egret*	County importance	1-2	5	regularly occurring	1	20
Snipe	County importance	n/a	36	regularly occurring	n/a	100
Curlew	County importance	1-30 (I-WeBS)	1	infrequent	n/a	350
Kingfisher	County importance	1	1	infrequent	1 pr	3-4 prs
Shoveler	County importance	n/a	4	infrequent - limited to flood conditions	n/a	20
Whooper swan*	County importance	3-5	5	infrequent - in recent seasons	4	150
Jack snipe	Local importance	1	1	regularly occurring	n/a	n/a
Mallard	Local importance	1-7	60	regularly occurring	n/a	280
Mute swan	Local importance	2-6	6	regularly occurring	12	90
Teal	Local importance	1-4	120	regularly occurring	n/a	360
Woodcock	Local importance	n/a	3	regularly occurring	n/a	n/a
Wigeon	Local importance	< 20	80	infrequent	n/a	560
Common gull	Not important	n/a	2	very infrequent	n/a	n/a
Dunlin*	Not important	3	16	very infrequent	n/a	460
Great black-backed gull	Not important	n/a	1	very infrequent	n/a	n/a
Green sandpiper	Not important	n/a	1	very infrequent	n/a	n/a
Greylag goose	Not important	1-2	2	very infrequent	n/a	30
Herring gull	Not important	n/a	1	very infrequent	n/a	n/a
Whimbrel	Not important	n/a	3	very infrequent	n/a	20

7A.5.1.6. Assessment of breeding waterbird population

Three waterbird species were recorded breeding within the proposed wind farm site including mute swan, lapwing and snipe, with two species potentially breeding including mallard and teal. The section of the River Suir within the 500 m turbine buffer was assessed as being within the territory of 1, possible 2 pairs of kingfishers.

A pair of mute swan bred along the River Suir within the 500 m turbine buffer and this pair was assessed as locally important. As a widespread breeding species in Ireland, it is likely that that several mallard will nest within the proposed Wind Farm Site. It is also considered possibly that a smaller number of teal have the potential to nest, with the small pond in the southern woodland or denser vegetation cover associated with River Suir flood plain offering suitable habitat.

Two species of wader were recorded breeding within the 500 m turbine buffer, including lapwing and snipe, with breeding densities estimated at 5-6 pairs for lapwing and 6 territories for snipe. The areas where breeding activity was recorded is shown in Appendix 7G – see Figure 7G.1.

Based on the population assessment in Section 7A.5.1.2.6 the breeding snipe population supported by the proposed Wind Farm Site was assessed being of county importance (1% threshold for national important taken as 4-6 pairs). Based on the population assessment in Section 7A.5.1.2.1 breeding lapwing population supported by the proposed Wind Farm Site was assessed being of national importance (1% threshold for national important taken as 42 pairs).

As shown in Appendix 7G - see Figure 7G.1, breeding areas supporting both these species were associated with the least improved habitats within the proposed Wind Farm Site. These less intensively managed areas, which are wetter due to proximity to areas that are prone to flooding can be easily identified and avoid by any proposed development. In addition, identify areas of habitat favoured by these species highlights that habitat enhancement measures could be effectively targeted to improve habitat quality for breeding snipe and lapwing, as well as other lowland breeding wader species.

7A.5.2. Birds of prey

For all the surveys conducted covering the proposed Wind Farm Site, the following birds of prey were recorded utilising or flying through the 500 m turbine buffer or in close vicinity:

- Sparrowhawk, hen harrier, buzzard, kestrel, merlin, peregrine, barn owl, long-eared owl and short-eared owl

The following sections provide baseline accounts for each of these species.

7A.5.2.1. Accipitridae – eagles, kites, hawks, harriers, buzzards

7A.5.2.1.1. Sparrowhawk

Sparrowhawks are one of the most common and widespread resident species of raptor occurring in Ireland, and although there appears to have been a medium-term (18 year) decline in abundance, the population is reported as exhibiting relative stability in recent years, with 8,746-14,252 birds estimated for the Republic of Ireland (Lewis *et al*, 2019a). As such, the conservation status for sparrowhawk has been assessed as favourable (green listed) by Gilbert *et al*. (2021). Sparrowhawk is not listed on Annex I of the EU Birds Directive and there are no SPAs where this species is listed as a SCI. Being a dispersed species, sparrowhawk are unlikely to reach densities required for consideration as nationally important (1% threshold: 87-142 birds). As a widespread and regularly occurring resident breeding species of raptor, with consideration given to the species' favourable conservation status, the sparrowhawk population associated with the proposed Wind Farm Site is assessed as important at the local level.

A limited amount of breeding behaviour, such as soaring or actively displaying birds, was observed for sparrowhawks during the baseline surveys for the proposed Wind Farm Site. This did not facilitate the identification of any specific breeding sites beyond the blocks of woodland in the south of the proposed Wind Farm Site, where the presence of birds in suitable habitat over the breeding was indicative of possibly breeding. In this area it is understood that this species, which often nests in commercial forestry plantation, will be relatively tolerant of felling operations (outside of the breeding season) and should readily relocate in the remaining woodland adjacent to any felled areas. Potential nesting habitat in tree/scrub cover in the northern part of the proposed Wind Farm Site was more limited, and it is considered that only one possible sparrowhawk breeding site occurs in the southern woodland. There are likely to be several other pairs nesting on the periphery of the proposed Wind Farm Site, which will utilise the area for foraging, and it is judged that the proposal has the potential to have an effect on 2-3 pairs (4-6 birds), which in this assessment is classed as a population of local importance.

As shown by the flight line map in Appendix 7E - see Figure 7E.33, during VP watches the majority of sparrowhawk activity was recorded beyond the 500 m turbine buffer and in close proximity to VP1, VP2 and VP3. There were limited observations detected in the northern part of the proposed Wind Farm Site covered by VP4, as well as VP2 and more distantly by VP3. This pattern of usage probably reflects, in part, habitat availability and the more open areas in the north part of the proposed Wind Farm Site would typically be considered less suitable for sparrowhawk. In addition, the inherent difficulty of detecting this species, especially over longer distance and in habitats with a complex structure means that there will generally be a sharp drop off in sparrowhawk detection rates as distance from the VPs increases.

During VP watches there were only 7 flight observations recorded within the 500 m turbine buffer, with all the observations involving single birds and generating 838 aggregate flight seconds. The majority of the flight time was recorded between 25 m and 180 m, with 785 aggregate flight seconds recorded within the CRZ. As detailed in Appendix 7H, the CRM for sparrowhawk was run allowing for year-round utilisation of the 500 m turbine buffer. The outputs from this model generated predicted collision risk of 1 collision every 1,185 years (weighted, 98% default avoidance). Notwithstanding the limitations associated with CRMs and sparrowhawk detectability, this level of turbine mediated mortality would be totally imperceptible to background levels.

On balance this species tends to fly relatively low (below rotor swept height), especially when hunting; however, display flights and when commuting over longer distances does result in flight time within the collision risk zone. Running a CRM to account for potential under detection of flight time within the CRZ requires an over two fold increase in the amount of flight time recorded within the CRZ, i.e. 1,800 seconds (785 seconds actually recorded) to result in a predicted collision risk of 1 collision every 35 years. Based on an adult survival rate of 0.69 for sparrowhawk (BTO BirdFacts[15]) and taking a notional population estimate of 350 birds for Co. Tipperary, additional annual mortality required to exert a 1% effect at the county level would have to be at least 1 collision per year. This would require inputting an eighty fold increase in flight time (6,280 seconds). Therefore, it can be objectively concluded that predicted levels of collision risk, even with adjustments to account for the difficulties associated with sparrowhawk detectability, will almost certainly be negligible in effect.

In summary, woodland habitats within the proposed Wind Farm Site are important for this widespread and commonly occurring species of raptor, and the population recorded is assessed being of local importance. Restricting the timing for proposed felling operations to periods outside the breeding season, would limit any potential for direct impacts to this species. No population level effects are anticipated, based on the measured and adjusted level of predicted collision risk.

7A.5.2.1.2. Hen harrier

Hen harriers are an important Annex I species to consider in relation to wind farm developments. The desk study provides a detailed assessment for hen harrier and determined that the proposed Wind Farm Site is

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[15] BTO BirdFacts - Sparrowhawk: https://www.bto.org/understanding-birds/birdfacts/sparrowhawk

beyond the potential zone of influence of any SPAs where hen harrier are listed as a SCI (NPWS, 2013) – see Section 7A.2.2.1. Section 7A.2.2.6.1. of the desk study assessed habitat availability within the proposed Wind Farm Site and surrounding hinterland (out to 2 km) as largely unsuitable for breeding hen harrier, an assertion which is support by the reported breeding range of hen harriers in Ireland (NPWS, 2022, Ruddock *et al*., 2024). Based on NPWS (2022) there are no known hen harrier roosts within 2 km of the proposed Wind Farm Site.

The baseline surveys undertaken over three years did not record hen harriers breeding or roosting within the 2 km turbine buffer. For all the surveys conducted over the three years hen harriers were only recorded twice, both during VP watches and included the following observations:

- 24-Dec-2020 11:18 Adult male flying S, *c*. 2 km W of buffer 137 sec at 100-200 m
- 28-Aug-2023 12:58 Adult male hunting though the buffer 89 sec at 1-4 m

Based on the low levels of activity recorded no CRM was run for hen harrier and it can be concluded that the 2 km turbine buffer is not heavily utilised by this species and therefore it is highly unlikely that a regularly occupied communal roost exists in the area. Likewise, there are no breeding sites within 2 km of the proposed Wind Farm Site. The Irish hen harrier breeding population is estimated at 106 pairs (Ruddock *et al*., 2024) and the wintering population is estimated at 311 birds (NPWS, 2019), therefore the 1% threshold of international (if associated with an SPA)/national importance is a regularly occurring population of 1 breeding pair (2 birds) and/or 3 wintering birds. Even for a dispersed species like hen harrier, two records over three years is representative of exceptionally low levels of activity and does not warrant assessment as a regularly occurring population.

In summary, the baseline study concurs with the findings of the desk study, and it can be objectively concluded that the proposed Wind Farm Site and associated wider area (2 km proposed turbine buffer) is not important for breeding or wintering hen harrier populations. Based on exceptionally low recorded usage over a three period no further assessment for this species is required.

7A.5.2.1.3. Buzzard

The Irish buzzard population has increased exponentially over the last 25 years (Lusby, 2011, Balmer *et al*. 2013) and on the basis of an expanding population the species has a favourable (green listed) conservation status (Gilbert *et al*., 2021). Buzzard is not listed on Annex I of the EU Birds Directive and there are no SPAs where this species is listed as a SCI. The size of the population is unknown, with NPWS (2019) giving a best estimate of 1,938 pairs, which is broadly in line with the figure of 3,500-4,000 birds, as review by Mee (2012). Being a dispersed species, buzzards are unlikely to reach densities required for consideration as nationally important (1% threshold: 20 pairs or 40 birds), unless considered over a wide geographic area. As a widespread and regularly occurring resident breeding species of raptor, with consideration given to the species' favourable conservation status, the buzzard population associated with the proposed Wind Farm Site is assessed as important at the local level.

The success of buzzards in Ireland can be attributed to the species having relatively high fecundity for a raptor, capable of fledging broods of up to 4 young (Brown & Amadon, 1986); as well as the ability to exploit numerous food sources, ranging from carrion, worms and larger more mobile prey items like rabbits. Buzzards also employ a variety of foraging techniques (e.g. sitting in tree or active hunting flights), depending on habitat, seasonality and prey types, which has allowed them to expand into a wider range of ecological niches when compared to other raptors occurring in Ireland (Rooney & Montgomery, 2013).

As shown in Appendix 7G – see Figure 7G.4, the proposed Wind Farm Site and surrounding 2 km turbine buffer was found to support up to four breeding territories, with three of these located within the 500 m turbine buffer, including the woodland in the southern part of the buffer and a the small T-shaped woodland in the north-east of the buffer. Not all the territories were occupied simultaneously within the same breeding season and young birds just entering the breeding population are often detected prospecting for potential nesting sites. It is considered that the proposed Wind Farm Site and associated 2 km turbine buffer supports three pairs. One of the breeding sites, located within the T-shaped woodland, will be impacted by the proposed infrastructure. However, a single pair of buzzards can have 10 or more alternative nest sites within its breeding season home range, with two to four alternative nests being more typical (Brown & Amadon, 1986). Therefore, as with sparrowhawk, buzzards are considered to be relatively tolerant of felling operations (out of the breeding season) and should readily relocate to an alternative site in the remaining woodland/treelines adjacent to any felled areas.

Buzzards were the most frequently recorded raptor species during VP watches, with 188 flight observations within the 500 m turbine buffer, which generated a total of 47,955 aggregated flight seconds over the two-year study period - see Figure 7E.34, Figure 7E.35, Figure 7E.36 and Figure 7E.37 in Appendix 7E. Numbers ranged from 1 to 4 birds and the majority of flight time was recorded at heights between 25 m to 180 m and a total of 41,192 aggregated flight seconds was recorded within the CRZ.

As detailed in Appendix 7H, the CRM for buzzard was run allowing for year-round utilisation of the 500 m proposed turbine buffer. The outputs from this model generated predicted collision risk of 1 collision every 1.2 years (weighted, 98% default avoidance). The potential for predicted buzzard collision risk at a rate of 0.86 collision per annum to have a > 1% population level effects above background mortality is tested by applying an annual survival rate of 0.9 for adult birds and 0.63 for juveniles (BTO BirdFacts[16]) to a local population estimated at 6 adult birds and 6 juveniles (< 3 years old). For the local population the high rate of adult survivorship for buzzard drives a 144% increase in annual mortality, with a lower level of 39% increased mortality generated for juvenile birds. If considering magnitude of effect at a regional level on a population notionally estimated at > 90 buzzards, then any population level effects diminishes in significance around 10% additional mortality – see Table 7H.24 in Appendix 7H.

In summary, the buzzard population associated with the proposed Wind Farm Site is assessed as important at the local level. Woodland habitats, including treelines are important for this species and limiting the timing for proposed felling operations to outside the breeding season, would limit any potential for direct impacts to this species. Predicted collision risk is anticipated to have likely significant effects on the local breeding population; however in the context of an expanding population any additional mortality will have a moderate impact (c. 10%) on the regional buzzard population, which will recruit into the local area and replace any birds occasionally lost to turbine mediated mortality.

7A.5.2.2. Falcons

7A.5.2.2.1. Kestrel

The unfavourable conservation status of the Irish kestrel population was upgraded from to amber to red listed by the most recent BoCCI assessment (Colhoun & Cummins, and Gilbert *et al*. 2021), due to recent severe declines both in terms of breeding numbers and range (Lewis *et al*. 2019a). Despite declining numbers, kestrel remains the most widespread raptor in Ireland (Balmer *et al*., 2013), with a best estimate of 13,500 birds or min-max estimate of 9,918 to 17,393 birds (NPWS, 2019, Lewis *et al*., 2019a). Being a dispersed species, kestrels are unlikely to reach densities required for consideration as nationally important (1% threshold: 99-173 birds). Given the species unfavourable conservation status, a precautionary approach is applied and the occurrence of one pair is considered to meet the threshold for county importance.

[16] BTO BirdFacts – Buzzard: https://www.bto.org/understanding-birds/birdfacts/buzzard

Breeding raptor surveys identified at least two breeding territories within the 2 km turbine buffer, with no nest sites located within the 500 m turbine buffer – see Appendix 7G: Figure 7G.4. Based on flight activity recorded during VP watches the proposed Wind Farm Site is within the breeding season home ranges for these two pairs. As shown by kestrel flight line mapping in Appendix 7E, flight activity was concentrated in the vicinity of the breeding territories to the north-east and south of the 500 m turbine buffer.

After buzzard, kestrel was the most active raptor species within the proposed Wind Farm Site during VP watches, with 82 flights observations recorded within the 500 m turbine buffer which generated 7,302 aggregate flight seconds. All observations were of single birds and the majority of flight time was recorded at heights between 25 m to 180 m, with a total of 5,225 aggregated flight seconds recorded within the CRZ. As detailed in Appendix 7H, the CRM for kestrel was run allowing for year-round utilisation of the 500 m turbine buffer. The outputs from this model generated predicted collision risk of 1 collision every 67 years (weighted, 95% avoidance).

The potential magnitude of effect on the local kestrel population due to predicted collision risk was tested on a local population estimate of 6 adult birds and 4 juvenile subadult birds, using the measured rate of 0.21 collision per annum and applying an annual survival rate of 0.69 to the adult population and 0.32 to the subadult population (BTO BirdFacts[17]). This generates a 11% and 8% increase in mortality above background levels, for the adult and subadults components of the population respectively.

In summary, the kestrel population associated with the proposed Wind Farm Site is assessed as important at the county level. Breeding sites were located beyond the 500 m turbine buffer and the predicted collision risk is anticipated to have a moderate (8-11%) effect on the local breeding population.

7A.5.2.2.2. Merlin

The desk study provides a detailed assessment for merlin and determined that the proposed Wind Farm Site is beyond the potential zone of influence of any SPAs designated for merlin (NPWS, 2013) – see Section 7A.2.2.6.2. Being a highly secretive species the exact size of the population is unknown, with NPWS (2019) giving a best estimate of 200-400 pairs, and therefore 2-4 pairs would be considered consideration as nationally important. As a rarer breeding raptor species listed on Annex I of the EU Birds Directive, with an unfavourable (amber listed) conservation status in Ireland (Gilbert *et al*. 2021), any breeding activity beyond an SPA would be assessed as important at the county/regional level. Over the winter merlin populations are more mobile, with numbers inflated by migrants from Iceland and regularly recorded activity over the winter occurring beyond an SPA would be assessed as important at the county/regional level, with national importance assigned should a regularly occupied winter roost be identified.

No merlin breeding activity was recorded within the proposed Wind Farm Site or associated 2 km turbine buffer. The availability of suitable nesting locations supported by suitably open, and prey abundant foraging habitat was assessed as very limited and considered unlikely to support any pairs. Based on a historic record of probable breeding merlin (Bird Atlas 2007-2011), the closest breeding site was found to be associated with the forestry and raised bog approximately 6 km to the northwest, in the vicinity of Lisheen Mine. This distance exceeds the 5 km core foraging range given for breeding merlin in SNH (2016), which is used in assessing potential connectivity with SPAs, as well as the 2 km breeding merlin search area recommended by SNH (2017) for assessing potential impacts of onshore wind farms.

Over three years merlin were recorded on six dates during VP watches, including:

• 11 December 2020	10:55	flying 10 sec at 25-50 m	- in/out of 500 m turbine buffer	(VP2)
	Not rec	flying 17 sec at 25-50 m	- out of 500 m turbine buffer	(VP2)

[17] BTO BirdFacts – Kestrel: https://www.bto.org/understanding-birds/birdfacts/kestrel

	14:00	flying 18 sec at 0-20 m	- out of 500 m turbine buffer	(VP3)
	14:09	flying 9 sec at 0-20 m	- out of 500 m turbine buffer	(VP3)
• 24 December 2020	09:45 male	flying 14 sec at 0-20 m	- in 500 m turbine buffer	(VP2)
• 28 December 2020	10:01	flying 15 sec at 0-20 m	- out of 500 m turbine buffer	(VP3)
• 16 January 2021	14:54	flying 22 sec at 0-20 m	- out of 500 m turbine buffer	(VP3)
• 02 December 2021	13:04 female	flying 10 sec at 0-20 m	- out of 500 m turbine buffer	(VP3)
	13:11 female	flying 10 sec at 0-20 m	- out of 500 m turbine buffer	(VP3)
• 11 April 2022	13:20 female	flying 20 sec at 0-20 m	- out of 500 m turbine buffer	(VP1)

As shown by flight line maps in Appendix 7E and Appendix 7I, the majority of the merlin observations were recorded out of the 500 m turbine buffer and were also low, below the rotor swept area which is typical flight behaviour for this species. There was only one observation recorded during in the breeding season, which was likely to be a bird commuting through the area on route to breeding grounds. Given the low frequency of activity recorded no CRM was run for merlin. Typically, merlin occupy lower ground during the winter months where prey is more abundant, and breed in remoter upland locations. Whilst the proposed Wind Farm Site does have some suitable wintering foraging habitat for merlin, it is not considered that merlin are regularly utilising the area beyond sporadic hunting forays into the surrounding area over the winter.

In summary, it can be objectively concluded that the proposed Wind Farm Site and associated wider area are not utilised by merlin during the breeding season, with the low and irregular frequency of utilisation over the winter meaning the area is of limited importance to the species. Therefore, based on exceptionally low recorded usage over a three period, no likely significant effects are anticipated, and no further impact assessment is required for this species.

7A.5.2.2.3. Peregrine

Peregrine is listed on Annex I of the EU Birds Directive, and the closest SPA designated populations to the proposed Wind Farm Site are along the south coast of Waterford and Cork over 60 km away and in the Wicklow Mountains over 90 km away. These SPA populations are assessed as being beyond the potential zone of influence of the proposed Wind Farm Site, based on SNH (2016), which gives the core foraging range for breeding peregrines as 2 km, with a maximum of 18 km and it is noted that depending on local availability of prey, breeding peregrine can travel significant distances from nest sites (Enderson & Craig, 1997). In Ireland peregrine are a widespread resident species, which has achieved a favourable (green listed) conservation status (Gilbert *et al*., 2021), since the severe population crashed over the 1950s, 60s and 70s, induced by the extensive application of organo-chlorine pesticides. Based on NPWS (2019) the conservative estimated population is given as 425 pairs, therefore a regularly occurring population of four pairs is nationally important. Given the peregrines Annex I status, the occurrence of a single pair, which is not associated with an SPA or nationally important population, the pair associated with the proposed Wind Farm Site is classed as being of county importance.

The baseline study for the proposed Wind Farm Site confirmed Brittas Castle as a peregrine nest site and the site is located approximately 350 m from southern borrow pit and within 600 m of the closest turbine, i.e. beyond the 500 m turbine buffer. The core foraging range for breeding peregrines is 2 km, (SNH, 2016) and the proposed Wind Farm Site is likely to form part of the home range for this pair. Availability of nesting locations in this region will be a factor limiting peregrine breeding densities and it is likely that the some of the other castle sites in the area support neighbouring pairs or may be used as alterative nesting/roosting options by the Brittas Castle pair.

Of note, although the nest is in close proximity to the proposed Wind Farm Site, peregrines were only recorded occasionally during most of the surveys, including VP watches, walkovers, wider area breeding raptors and on wider area wintering waterbird surveys. During VP watches a total of 9 peregrine observations were recorded. All the observation were of single birds which generated 1,150 flight seconds within the 500 m turbine buffer, the majority of which were recorded at flight heights with the CRZ, i.e. between 25 and 180 m and amounted to 1,107 seconds. As detailed in Appendix 7H, a CRM for peregrine was run allowing for year-round utilisation of the 500 m turbine buffer. The outputs from this model generated predicted collision risk of 1 collision every 44 years (weighted, 98% default avoidance). This level of turbine mediated mortality would be virtually imperceptible to background levels and no significant population level effects are anticipated based on the measured level of predicted collision risk for the proposed Wind Farm Site. However, the CRM was run for adult birds and does not take into account the initial flight period for fledgling birds, which are likely to be more susceptible to turbine collision than adult peregrines.

The potential for predicted peregrine collision risk at a rate of 0.021 collision per annum to have a > 1% population level effects above background mortality is tested by applying an annual survival rate of 0.81 for adult birds and 0.6 for juveniles (BTO BirdFacts[18]) to a local population estimated at 2 adult birds and 3 juveniles (< 1 year). At the local population level, relatively low recorded usage of the site predicts that any additional turbine mediated mortality will be 5.5% for adult birds and 1.8% for juveniles above background levels.

In summary, the pair breeding at Brittas Castle are considered of county importance. Predicted collision risk has the potential for a low magnitude of effect (1-5%) on the local breeding population; and in the context of a stable or expanding national peregrine population any additional turbine mortality will have an imperceptible impact (< 1%) on the regional peregrine population, which will recruit into the local area and replace any birds occasionally lost to turbine mediated mortality. Nevertheless, the proximity of the nest to the proposed turbines introduces a level of uncertainty for collision risk to recently fledged birds, especially if dispersal flight behaviour changes from that observed over the baseline. Post-construction monitoring around fledging time is advised to ensure that young peregrines fledge and disperse safely.

7A.5.2.3. Owls

7A.5.2.3.1. <u>Barn owl</u>

The estimated population for barn owl provided in NPWS (2019) is 562 to 702 pairs. As a dispersed breeding species and given the species unfavourable (red listed) conservation status in Ireland (Gilbert *et al*., 2021), a precautionary approach is applied and the occurrence of one pair is considered to meet the threshold for county importance. It is generally considered that low level flight behaviour of barn owls (typically < 3-4 m) limits collision risk with larger turbines in the UK (and Ireland) where lattice towers are not commonly employed (Barn Owl Trust, 2015). As such, impacts are more likely to be associated with any land use change potentially resulting in loss of breeding territories due to proposed wind farm infrastructure. Collisions associated with traffic, along with secondary poisoning from rodenticide and loss of nest sites are factors affecting barn owl populations in Ireland (Lusby et al., 2021, TII, 2021) and enhancement measures implemented at wind farm sites can have a positive effect, such as erecting nest boxes.

There is a known barn owl breeding site within 1.1 km of the proposed Wind Farm Site, and there is also a breeding site at the Cabragh Wetlands, south of Thurles. The core breeding home range for barn owls in Ireland is reported as 4 to 5 km (9 km max) from the nest (Lusby & Cleary, 2014, TII 2021, Lusby *et al*. 2021). The proposed Wind Farm Site provides suitable foraging habitat for barn owls, and it is likely that this species utilises the less agriculturally improved grasslands along the floodplain of the River Suir. The availability of suitable nesting cavities, e.g. hollows in mature trees within the 500 m turbine buffer, was

[18] BTO BirdFacts – Peregrine: https://www.bto.org/understanding-birds/birdfacts/peregrine

assessed as limited, based on features surveyed for bat roost/nesting owl potential and no evidence of breeding was identified in any of the veteran trees surveyed. Built structures only occur at one location within the 500 m turbine buffer and are associated with a relatively busy farmyard consisting of a series of large, cattle sheds, that although potentially suitable for barn owl have notably poor connectivity to the wider landscape.

In summary, the proposed Wind Farm Site is likely to be utilised by pairs breeding in the surrounding area, which are assessed as being of county importance. Enhancement measures, through the erection of nest boxes could be employed to improve nesting opportunities for this species.

7A.5.2.3.2. Long-eared owl

Long-eared owls are a widespread resident in Ireland and are the most commonly occurring species of owl. Over winter numbers can be increased with continental migrants moving into the country to escape periods of cold weather. Long-eared owls are not listed on Annex I of the EU Birds Directive and have a favourable (green-listed) conservation status in Ireland (Gilbert *et al*., 2021). Woodland habitats are important of this species, which nests in dense cover, with woodlands adjacent to open areas providing habitat edge for hunting being optimal (Mikkola, 1983). The Irish population is estimated at 1,484 to 2,703 pairs (NPWS, 2019). Being a dispersed species in Ireland, long-eared owls are unlikely to reach densities required for consideration as nationally important (1% threshold: 14-27 pairs), although they can gather at communal roosts over the winter, with numbers of 5 to 30 birds reported.

During dusk surveys long-eared owls were heard calling from the woodland on the southern boundary of the 500 m turbine buffer and were considered likely to be breeding in the vicinity, with the area of woodland in the southern extent of the proposed Wind Farm Site being suitable for this species. As a widespread and regularly occurring resident breeding species, with consideration given to the species' favourable conservation status, the long-eared owl population associated with the proposed Wind Farm Site is assessed as important at the local level. It is also worth noting that this species does not build nests and reuses the old nests of other species like crows, magpies and sparrowhawks (Snow & Perrins, 1998), which means suitably erected nest boxes will also be used.

7A.5.2.3.3. Short-eared owl

Short-eared owls are classed as a rare and very occasional breeder in Ireland, with a breeding population of 0-5 pairs that breeds sporadically across Ireland selecting upland habitats (Crowe *et al*., 2021). The breeding population has been assessed as having an unfavourable (amber listed) conservation status (Gilbert *et al*., 2021) and breeding in Ireland is thought to be limited by low availability of rodent prey, specifically voles. Short-eared owls are listed on Annex I of the EU Birds Directive; however in Ireland, due to the unpredictable and exceptional low breeding densities, there are no SPAs where this species is specifically listed as a SCI. Over the winter there can be an influx of migrants, and small numbers of these winter visitors are typically located where rough grasslands back the coastline (Balmer *et al*. 2013).

The proposed Wind Farm Site is not considered suitable for breeding short-eared owl. The wet, marshy grasslands along the River Suir do offer some potential foraging habitat for wintering birds, which can be described as nomadic wonders, moving widely between suitable blocks of habitat in search of prey.

During winter walkover surveys in December 2022, one individual was flushed from rushy habitat within the 500 m turbine buffer, north of Rossestown Bridge and landed in the area again. There were no other observations over the survey period, including three winter (2020/21, 2021/22, 2022/23). Short-eared owls are diurnal, as well as crepuscular, often hunting during the day and if the individual remained in the area for a prolonged period or short-eared owls returned to the area annually, birds would have been recorded more than once. Therefore, based on sporadic occurrence it is assessed that the proposed Wind Farm Site is not important for short-eared owl, which may utilise the area opportunistically along with similar such habitat patches in the wider area. Furthermore, short-eared owls, like hen harriers, hunt at low flight heights over the ground and are therefore considered to be at low risk of collision with turbines.

7A.5.3. Other species of conservation concern

7A.5.3.1. Red listed other non-passerines

7A.5.3.1.1. Swift

Swifts are a summer visitor to Ireland. The conservation status for swift was upgraded from amber to red listed in the most recently published BoCCI (Gilbert *et al.*, 2021) and as detailed in the desk study swifts are emerging as species susceptible to colliding with turbines (Rydell *et al.*, 2012) – see Section 7A.2.2.7.1. The closest reported breeding population to the proposed Wind Farm Site is located in Thurles, approximately 2.5 km to the south and the proposed Wind Farm Site is within the breeding season foraging range for swift, which can travel considerable distances from breeding sites to forage at profitable locations, up to 20 km. Lewis *et al*. (2019a) give a population estimate of 51,728 birds (range: 19,154 to 97,976) for swift, which gives a 1% threshold for nationally importance in the range of 191 to 979 birds. There is no population estimate for Co Tipperary and taking a conservative county estimate of 500 birds, means a regularly occurring population of 5 birds qualifies for County Importance.

During VP watches flight line data for swifts was not recorded systematically by all surveyors and the data presented is considered to be an underestimate of overall flight time. Swifts were recorded foraging within the 500 m turbine buffer during both breeding seasons 2022 and 2023. Six observations of mostly foraging swifts were recorded during VP watches with flocks ranging in size from two to 25 birds generating a total of 325,615 flight seconds, with a limited amount registered within the CRZ (1,575 seconds).

The high amount of flight time was almost entirely generated by two observations of 20 and 25 swifts foraging for up to one hour at a time, which generated 324,000 seconds of flight time. Both observations were recorded in June and during these foraging bouts relatively low flight height were recorded, with activity concentrated of over the River Suir, north of Rossestown Bridge on one occasion and in the north-east of the 500 m turbine buffer on the other – Appendix 7E: Figure 7E.38. For both foraging bouts a flight height range was reported (4-25 m), which put the majority of the flight time below 25 m; however it is likely that birds were also entering the lower limits of the CRZ for a proportion of this time.

To give a purely modelled indication of potential levels of collision risk for swift, CRM outputs can be generated assuming different amounts of flight time within the CRZ, including:

- 1,575 seconds - flight time as reported within the CRZ
- 162,853 seconds - approximately half the overall flight time added into the CRZ
- 325,575 seconds - all the recorded flight time added into the CRZ, excluding time definitely below

Inputting the default avoidance rate (0.98) and the standard parameters for Turbine Type A (rotational period: 6.85 secs, pitch: 6°), gives following modelled outputs:

- Flight time as reported: 0.081 collision per annum, equivalent to 1 collision every 12 years
- Half the flight time: 8.36 collision per annum, equivalent to 1 collision every 0.12 years
- All the flight time: 16.7 collision per annum, equivalent to 1 collision every 0.06 years

The potential magnitude of effect on the notional regional swift population due to predicted collision risk was tested on a population estimate of 500 birds, using the three outputs for collisions per annum and applying an annual survival rate of 0.808 (BTO BirdFacts[19]). This generated the following indicative results for magnitude of effect:

- For flight time as reported: 0.08% increase in mortality above background levels
- For half the flight time: 8.71% increase in mortality above background levels
- For all the flight time: 17.4% increase in mortality above background levels

For a population of 500 birds the magnitude for population level effects increases above 5% once additional flight time is added to the model, suggesting that the proposed Wind Farm has the potential to present a moderate effect on the regional swift population.

In summary, the proposed Wind Farm Site is within the breeding season foraging range of swift breeding sites in surrounding towns and villages and periodically supports foraging birds of county importance (> 5 birds). CRMs run on assumed levels of flight time within CRZ indicate that there is potential for moderate (6-20%) population levels effects on the regional swift population.

7A.5.3.1.2. Stock dove

Stock doves are resident species in Ireland. The conservation status for stock dove was upgraded from amber to red listed in the most recently published BoCCI (Gilbert *et al.*, 2021), having experienced severe declines in abundance and contraction in range, thought to be due to a loss of mixed agricultural production, particular cereal crops, across parts the species' former range (Balmer *et al*., 2013). Based on Lewis *et al*. (2019a), the national stock dove population is estimated at 27,486 birds (range: 14,934-43,039 birds). This gives a 1% threshold for nationally importance in the range of 149 to 430 birds. There is no population estimate for Co Tipperary and taking a conservative county estimate of 600 birds, means a regularly occurring population of 6 birds (3 pairs) qualifies for County Importance.

Over the study period there was only one record of an individual bird in the southern woodland noted as possibly breeding within the 500 m turbine buffer. Based on a record of one possible breeding pair the proposed Wind Farm Site is assessed as locally important for stock dove. Overall it was noted that arable production was limited in the immediate area, which is likely to limit the occurrence of this species at higher densities.

7A.5.3.2. Red listed passerines

Four species of passerine with unfavourable (red listed) conservation status were recorded during the baseline study period, including redwing, meadow pipit, grey wagtail and yellowhammer.

7A.5.3.2.1. Redwing

The favourable (green-listed) conservation status for redwing in Ireland was upgraded to red (Colhoun & Cummins, 2013 and Gilbert *et al*., 2021), due to recent consideration as a European species of global conservation concern (SPEC 1). There are no population estimates for redwing wintering in Ireland, however they are generally considered a common and widespread winter visitor. Flocks ranging from two to 300 birds were frequently recorded within the 500 m turbine buffer during the non-breeding season. Hedgerows, in particular fruit bearing shrubs provide foraging opportunities over the winter, including hawthorn, elder, rowan and holly. The proposed Wind Farm Site is assessed as supporting a wintering redwing population of local importance.

7A.5.3.2.2. Meadow pipit

[19] BTO BirdFacts – Swift: https://www.bto.org/understanding-birds/birdfacts/swift

Meadow pipits have an unfavourable (red listed) conservation status in Ireland (Gilbert *et al*., 2021) due to severe population declines. Declines were thought to be related to harsh winters following the 2009 and 2010 breeding seasons, and despite the crash in numbers, the species has remained relatively common and widespread. Based on Lewis *et al*. (2019a), the Irish meadow pipit population is estimated at 1,351,995 birds (range: 1,007,407 to 1,726,880 birds) and numbers are reported to have stabilised and may be recovering (Lewis *et al*., 2020). The 1% threshold for national importance is in the range of 10,000 to 17,000 birds. There is no population estimate for Co Tipperary and taking a conservative county estimate of 30,000 birds, means a regularly occurring population of 300 birds (150 pairs) qualifies for County Importance.

Meadow pipit were the most abundant and widespread passerine recorded during the breeding season (up to 40 birds) and were also regularly recorded during the winter (up to 45 birds). Meadow pipits are ground nesting, breeding within less intensively managed grassland habitat within the 500 m turbine buffer. Based on the numbers recorded, the proposed Wind Farm Site is assessed as supporting a breeding and wintering meadow pipit population of local importance.

7A.5.3.2.3. Grey wagtail

Grey wagtails have an unfavourable (red listed) conservation status in Ireland (Gilbert *et al*., 2021) due to severe population declines. As for meadow pipit, severe winters during the last Bird Atlas (Balmer *et al*., 2013) were thought to contribute to the observed population decline in this species, although grey wagtails remained relatively widespread and common on waterways and other waterbodies across Ireland. While noting continued decline Crowe *et al*. (2014) suggested that this may be stabilising; however based on more recent analysis, Lewis *et al*. (2020) found that grey wagtail numbers have not recovered and continue to decline. Based on Lewis *et al*. (2019a), the Irish grey wagtail population is estimated at 50,768 birds (range: 36,949 to 66,035 birds). The 1% threshold for national importance is in the range of 370 to 660 birds. There is no population estimate for Co Tipperary and taking a conservative county estimate of 1,000 birds, means a regularly occurring population of 10 birds (5 pairs) qualifies for County Importance.

Grey wagtails were observed foraging along the River Suir within the 500 m turbine buffer area and were regularly recorded in small numbers (1 to 4 birds) during breeding and non-breeding seasons. Though no nest sites were identified, a family group of four birds were recorded feeding along the banks of the River Suir during the breeding season (2023), therefore classed as probably breeding within the area. The steep sided, densely vegetated banks of the River Suir within the 500 m turbine buffer which are without rapids or shingle banks were assessed as largely unsuitable for this species.

In relation to development projects, grey wagtails regularly utilise holes/crevices in man-made structures as nest sites, including bridges and rock armouring around culverts, but are sensitive to deterioration in water quality. Based on the numbers recorded, the proposed Wind Farm Site is assessed as supporting a breeding and wintering grey wagtail population of local importance.

7A.5.3.2.4. Yellowhammer

Yellowhammers are a resident species in Ireland and have an unfavourable (red listed) conservation status (Gilbert *et al*., 2021), due to a server contraction in range and are now largely restricted to areas with tillage. Based on Lewis *et al*. (2019a), the Irish yellowhammer population is estimated at 217,252 birds (range: 145,092 to 294,597 birds). The 1% threshold for national importance is in the range of 1,450 to 2,945 birds. There is no population estimate for Co Tipperary and taking a conservative county estimate of 1,000-2,000 birds, means a regularly occurring population of 10-20 birds (5-10 pairs) qualifies for County Importance.

Yellowhammer were not abundant within the 500 m turbine buffer, probably due to the lack of arable crops in the immediate vicinity. Based on breeding season site walkovers there were two territories on the eastern boundary of the 500 m turbine buffer and similarly low numbers were recorded over the winter.

Yellowhammers are a species that responded well to habitat enhancement measures, including hedgerow management to improve structure and introduction of some tillage, including leaving winter stubbles and planting plots of wild bird cover. Based on the numbers recorded the proposed Wind Farm Site is assessed as supporting a breeding and wintering yellowhammer population of local importance.

7A.5.3.3. Amber listed passerines

There were 11 amber listed passerines recorded during survey period and included (* indicates breeding in 500 m turbine buffer) brambling, goldcrest*, house martin, house sparrow, linnet*, sand martin, skylark*, spotted flycatcher*, starling, swallow and willow warbler*.

Most of the breeding species indicated with * nest within scrub and woodland habitats, and therefore are potentially affected by vegetation clearance occurring during the breeding season. Skylarks are the only ground nesting species, nesting in open grassland habitats and like meadow pipits will select the less intensively managed grasslands. Based on the occurrence of the amber listed passerines recorded within the 500 m turbine buffer the proposed Wind Farm Site was assessed as supporting populations of local importance.

7A.6. CONCLUSIONS

This report provides the ornithological baseline information required to undertake a robust ornithological impact assessment for the proposed Wind Farm Site. Ornithological surveys conducted between October 2021 and September 2023 comply fully with the SNH (2017) guidelines for informing impact assessment of onshore wind farms. The information contained in this report includes robust baseline data, which can be used to assess the likely significant effects of the proposed Wind Farm on the avifauna in the area. No substantial limitations were identified in terms of scale, scope or context in the preparation of this report.

The baseline study allows for the identification of avian features associated with the proposed Wind Farm Site that are Important Ecological Features (IEFs), which includes regularly occurring population of birds. The baseline study identifies the following IEFs:

Winter waterbirds assemblage

The River Suir and associated flood plain within the 500 m turbine buffer for the proposed Wind Farm Site is part of a wetland that regularly supports numbers of county (regional) importance for eight species of wintering waterbird, including:

- three red listed species: golden plover, lapwing and snipe;
- three amber listed species: black-headed gull, cormorant and lesser black-backed gull; and,
- two green-listed species: grey heron and little egret.

The wetland also regularly supports numbers of local importance for five species of wintering waterbird, including:

- three amber listed species: mallard, mute swan and teal; and,
- two green-listed species: jack snipe, woodcock (wintering population).

Several species were found to utilise the wetland relatively infrequently and therefore while numbers periodically recorded exceeded 1% thresholds, utilisation was not regular enough to be fully considered as populations of county or local importance. This included curlew, kingfisher, shoveler, whooper swan and wigeon.

Very infrequent occurrence was noted for a further seven waterbird species, including common gull, dunlin, great black-backed gull, greylag goose, green sandpiper, herring gull and whimbrel. For these species, based on frequency of utilisation and relatively small numbers being recorded, it can be objectively concluded that this area is not important for these species and therefore the proposed Wind Farm does not pose any significant population level risks. On this basis these species do not need to be carried forwarded into the ornithological impact assessment, as they are not IEFs for the proposed Wind Farm Site.

Breeding waterbirds

Three waterbird species were recorded breeding within the proposed wind farm site including lapwing (5-6 pairs), snipe (6 territories) and mute swan (1 pairs), with population assessments identifying that proposed Wind Farm Site supports nationally, regionally (county) and locally important breeding populations of these species, respectively. Two additional waterbird species were identified as potentially breeding which included mallard and teal. The section of the River Suir within the proposed Wind Farm Site is assessed as being of county importance for being within the territory of 1, possibly 2 pairs of kingfishers

Birds of prey

The baseline study recorded nine birds of prey, with six species considered to be regularly occurring within the 2 km turbine buffer, including:

- four resident green-listed breeding species: sparrowhawk (2-3 pairs), buzzard (3 pairs) and long-eared owl (1 pair) assessed as locally important, and peregrine (1 pair) assessed as regionally (county) important; and,
- two resident red listed breeding species: kestrel (1-2 pairs) and barn owl (1 pair), both assessed as regionally (county) important.

Based on exceptionally low recorded usage over a three year study period, no likely significant effects are anticipated, and no further impact assessment is required for three birds of prey that were only recorded over the winter, including hen harrier (2 observations), merlin (observed on 6 dates) and short-eared owl (1 observation).

Other species

Other red listed non-passerines that were recorded included foraging swift (up to 25 birds) assessed as regionally (county) important and possibly breeding stock dove (1 pair) assessed as locally important.

Regularly occurring red listed and amber listed passerines were all assessed as locally important, this included the following breeding species, which are notably due the habitat association:

- Ground nesting species, including: meadow pipit and skylark;
- Riverine species, including: grey wagtail;
- Farmland birds - hedgerow nest, including: yellowhammer;
- Scrub nesting species, including: linnets and willow warbler; and,
- Hedgerow and woodland species: including: goldcrest and spotted flycatcher.

Collision risk modelling

Collision risk modelling (Appendix 7H) identified eight species where predicted collision risk was 1 or more collision over the 35 year operational period for the proposed Wind Farm Site, including: buzzard, cormorant, lapwing, golden plover, grey heron, kestrel, lesser black-backed gull and little egret. No official CRM was run for swift, as flight line data was not collected systematically for this species; however indicative modelling was undertaken applying a range of flight seconds to examine hypothetical collision risk for this species, which utilising the lowest and medium amount of flight seconds, suggested that predicted collision risk was between 3 and 293 collisions over 35 years.

Applying default avoidance the rates for lapwing and golden plover resulted in over-inflated predicted collision risk and avoidance rate was increased within the CRMs to test this variable.

The CRMs generated notably low levels of theoretical collision risk for four of the 12 target species analysed, including: black-head gull, peregrine, snipe and sparrowhawk. As part of the assessment, further consideration was given to collision risk for snipe and sparrowhawk, as CRMs are noted as unreliable for these species, due to potential for under recorded of flight time. In spite of the CRM for peregrine generating low predicted collision risk, in view of a breeding site in relatively close proximity to the proposed turbines, as a precaution collision risk was assessed in the context of young birds fledging in an area adjacent turbines.

Assessment for potential population level effects due predicted collision risk found that:

- For buzzard predicted collision risk is anticipated to have likely significant effects on the local breeding population, with recently fledged birds identified as being particularly at risk. The application of default avoidance (98%) in the CRM, while precautionary, acknowledges the susceptibility of buzzards to colliding with turbines and is considered to accurately represent the risk based on recorded flight activity. Predicted collision risk was broadly in line with the results of post-construction collision monitoring studies. The magnitude of effect for any turbine mediated mortality, additional to background levels, is assessed precautionarily as a moderate: 6-20% effect (Percival, 2003) on the regional buzzard population, which in the context of an expanding population, will see birds readily recruit into the local area and replace any birds occasionally lost to turbine mediated mortality.

- For cormorant, grey heron and little egret modelled outputs predicted one or close to one collision over the 35 years. In the context grey heron and little egret having favourable (green listed) conservation status and the cormorant population not considered threatened at this location, these relatively low levels of predicted collision risk are considered unlikely to have any significant (> 1%) population level effects.
- For kestrel predicted collision risk is anticipated to have a moderate: 6-20% effect (Percival, 2003) on the local breeding population.
- For wintering lapwing the worst-case scenario for predicted collision risk, i.e. applying 98% default avoidance, indicates that any population level effects would be expressed at the local population level and the magnitude of effect is assessed low: 1-5 (Percival, 2003) for the local breeding the population and moderate: 6-20% (Percival, 2003) if assessed with the wintering population. Magnitude of effect is moderated by increasing the avoidance rate to 0.995, which is a more realistic yet still precautionary rate as justified in the species account (Section 7A.5.1.2.1).
- For wintering golden plover the worst-case scenario for predicted collision risk, i.e. applying 98% default avoidance, indicates that any population level effects would be expressed at the county and local population level and the magnitude of effect is assessed low: 1-5% and high: 21-80%, respectively (Percival, 2003). Magnitude of effect is moderated by increasing the avoidance rate to 0.995, which is a more realistic yet still precautionary rate as justified in the species account (Section 7A.5.1.2.2).
- For lesser black-backed gull the worst-case scenario for predicted collision risk, (0.64 collisions/year), indicates that any population level effects would be expressed at the county population level and the magnitude of effect is anticipated to be low: 1-5% (Percival, 2003).
- For swift, based on the hypothetical flight times applied within the CRM, as detailed in the species account (Section 7A.5.3.1.1), taking the middle scenario for flight time indicates that there is potential for moderate: 6-20% (Percival, 2003) population level effects on the regional swift population.

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Appendix 7B

BTO SPECIES CODES

Appendix 7B: BTO Species Codes

BTO SPECIES CODES

AC	Arctic Skua	GA	Gadwall	LE	Long-eared Owl	SM	Sand Martin
AE	Arctic Tern	GX	Gannet	LT	Long-tailed Tit	SS	Sanderling
AV	Avocet	GW	Garden Warbler	MG	Magpie	TE	Sandwich Tern
BO	Barn Owl	GY	Garganey	MA	Mallard	VI	Savi's Warbler
BY	Barnacle Goose	GC	Goldcrest	MN	Mandarin Duck	SQ	Scarlet Rosefinch
BA	Bar-tailed Godwit	EA	Golden Eagle	MX	Manx Shearwater	SP	Scaup
BR	Bearded Tit	OL	Golden Oriole	MR	Marsh Harrier	CY	Scottish Crossbill
BS	Berwick's Swan	GF	Golden Pheasant	MT	Marsh Tit	SW	Sedge Warbler
BI	Bittern	GP	Golden Plover	MW	Marsh Warbler	NS	Serin
BK	Black Grouse	GN	Goldeneye	MP	Meadow Pipit	SA	Shag
TY	Black Guillemot	GO	Goldfinch	MU	Mediterranean Gull	SU	Shelduck
BX	Black Redstart	GD	Goosander	ML	Merlin	SX	Shorelark
BJ	Black Tern	GI	Goshawk	M.	Mistle Thrush	SE	Short-eared Owl
B.	Blackbird	GH	Grasshopper Warbler	MO	Montagu's Harrier	SV	Shoveler
BC	Blackcap	GB	Great Black-backed Gull	MH	Moorhen	SK	Siskin
BH	Black-headed Gull	GG	Great Crested Grebe	MS	Mute Swan	S.	Skylark
BN	Black-necked Grebe	ND	Great Northern Diver	N.	Nightingale	SZ	Slavonian Grebe
BW	Black-tailed Godwit	NX	Great Skua	NJ	Nightjar	SN	Snipe
BV	Black-throated Diver	GS	Great Spotted Woodpecker	NH	Nuthatch	SB	Snow Bunting
BT	Blue Tit	GT	Great Tit	OP	Osprey	ST	Song Thrush
BU	Bluethroat	GE	Green Sandpiper	OC	Oystercatcher	SH	Sparrowhawk
BL	Brambling	G.	Green Woodpecker	PX	Peafowl/Peacock	AK	Spotted Crake
BG	Brent Goose	GR	Greenfinch	PE	Peregrine	SF	Spotted Flycatcher
BF	Bullfinch	GK	Greenshank	PH	Pheasant	DR	Spotted Redshank
BZ	Buzzard	H.	Grey Heron	PF	Pied Flycatcher	SG	Starling
CG	Canada Goose	P.	Grey Partridge	PW	Pied Wagtail	SD	Stock Dove
CP	Capercaillie	GV	Grey Plover	PG	Pink-footed Goose	SC	Stonechat
C.	Carrion Crow	GL	Grey Wagtail	PT	Pintail	TN	Stone-curlew
CW	Cetti's Warbler	GJ	Greylag Goose	PO	Pochard	TM	Storm Petrel
CH	Chaffinch	GU	Guillemot	PM	Ptarmigan	SL	Swallow
CC	Chiffchaff	FW	Guineafowl (Helmeted)	PU	Puffin	SI	Swift
CF	Chough	HF	Hawfinch	PS	Purple Sandpiper	TO	Tawny Owl
CL	Cirl Bunting	HH	Hen Harrier	Q.	Quail	T.	Teal
CT	Coal Tit	HG	Herring Gull	RN	Raven	TK	Temminck's Stint
CD	Collared Dove	HY	Hobby	RA	Razorbill	TP	Tree Pipit
CM	Common Gull	HZ	Honey Buzzard	RG	Red Grouse	TS	Tree Sparrow
CS	Common Sandpiper	HC	Hooded Crow	KT	Red Kite	TC	Treecreeper
CX	Common Scoter	HP	Hoopoe	ED	Red-backed Shrike	TU	Tufted Duck
CN	Common Tern	HM	House Martin	RM	Red-breasted Merganser	TT	Turnstone
CO	Coot	HS	House Sparrow	RQ	Red-crested Pochard	TD	Turtle Dove
CA	Cormorant	JD	Jackdaw	FV	Red-footed Falcon	TW	Twite
CB	Corn Bunting	J.	Jay	RL	Red-legged Partridge	WA	Water Rail
CE	Corncrake	K.	Kestrel	NK	Red-necked Phalarope	W.	Wheatear
CI	Crested Tit	KF	Kingfisher	LR	Redpoll (Lesser)	WM	Whimbrel
CR	Crossbill (Common)	KI	Kittiwake	RK	Redshank	WC	Whinchat
CK	Cuckoo	KN	Knot	RT	Redstart	WG	White-fronted Goose
CU	Curlew	LM	Lady Amherst's Pheasant	RH	Red-throated Diver	WH	Whitethroat
DW	Dartford Warbler	LA	Lapland Bunting	RE	Redwing	WS	Whooper Swan
DI	Dipper	L.	Lapwing	RB	Reed Bunting	WN	Wigeon
DO	Dotterel	TL	Leach's Petrel	RW	Reed Warbler	WT	Willow Tit
DN	Dunlin	LB	Lesser Black-backed Gull	RZ	Ring Ouzel	WW	Willow Warbler
D.	Dunnock	LS	Lesser Spotted Woodpecker	RP	Ringed Plover	OD	Wood Sandpiper
EG	Egyptian Goose	LW	Lesser Whitethroat	RI	Ring-necked Parakeet	WO	Wood Warbler
E.	Eider	LI	Linnet	R.	Robin	WK	Woodcock
FP	Feral Pigeon	ET	Little Egret	DV	Rock Dove (not feral)	WL	Woodlark
ZL	Feral/hybrid goose	LG	Little Grebe	RC	Rock Pipit	WP	Woodpigeon
ZF	Feral/hybrid mallard type	LU	Little Gull	RO	Rook	WR	Wren
FF	Fieldfare	LO	Little Owl	RS	Roseate Tern	WY	Wryneck
FC	Firecrest	LP	Little Ringed Plover	RY	Ruddy Duck	YW	Yellow Wagtail
F.	Fulmar	AF	Little Tern	RU	Ruff	Y.	Yellowhammer

Appendix 7C

SURVEY EFFORT & WEATHER CONDITIONS

Appendix 7C: Survey effort & weather conditions

List of Tables

Table 7C.1 VP watches – survey effort and weather conditions

Date	VP	Visit No.	Duration (hr)	Start Time	Target species BTO codes - collision risk spp.	Surveyor	Wind Force	Wind Dir.	Vis.	Cloud (oktas)	Temp (C)	Ground Cond.	Rain	Disturbance	Factors affecting visibility
Non-breeding season 2021-22															
24/10/2021	1	1	3.00	800	BZ, GP, L, LB, PE, SH	AR	1	SW	Good	1-4	11	Wet	None	None	None
24/10/2021	1	2	3.00	1130	BZ, LB, PE	AR	1-3	SW	Good	3-6	13	Dry	None	None	None
11/11/2021	1	3	3.00	915	BZ, L, LB	AR	3	SES	Good	8	11	Wet	Light drizzle	None	None
11/11/2021	1	4	3.00	1245	BZ, H, LB, SN	AR	3-4	S	Good	8	12	Wet	Light drizzle	None	None
13/11/2021	1	5	3.00	730	BZ, K, MA	AR	1	SW	Good	8	10	Wet	None	None	None
01/12/2021	1	6	3.00	800	K, PE	AR	3	NW	Good	6	6	Wet	None	None	None
16/12/2021	1	7	3.00	830	SN, SH	AR	1	SE	Good	8	8	Wet	None	None	None
18/01/2022	1	8	3.00	1000	BH, BZ, L, SH	AR	1	SSW	Good	8	8	Dry	None	None	None
20/01/2022	1	9	3.00	1300	BH, BZ, CA, K	AR	1	N	Good	8	8	Dry	None	None	None
08/02/2022	1	10	3.00	900	BZ, CA, LB, SN	AR	1	SW	Good	8	9	Wet	Drizzle	None	None
24/02/2022	1	11	3.00	730	BZ, CA, K, LB	AR	1	W	Good	8	4	Wet	Snow at times	None	Snow at times
07/03/2022	1	12	3.00	800	CA	AR	1	SE	Good	7	5	Frost	None	None	None
23/10/2021	2	1	3.00	1200	K, L, LB	AR	3-4	SW	Good	8	14	Wet	Light rain at times	None	None
23/10/2021	2	2	3.00	1530	BZ, GP, K, LB, PE	AR	4	W	Good	8	13	Wet	Occ. light rain, heavy last 30 min	None	None
12/11/2021	2	3	3.00	1100	BZ, ET, K, LB	AR	3	SW	Good	8	12	Wet	None	None	None
22/11/2021	2	4	3.00	745	BZ, L, LB	AR	1	N	Good	0	2	Wet/Frost	None	None	None
22/11/2021	2	5	3.00	1115	BZ, L, SH, SN	AR	1	N	Good	1	7	Dry	None	None	None
01/12/2021	2	6	3.00	1130	K, L, LB	AR	4	NW	Good	8	7	Dry	None	None	None
20/12/2021	2	7	3.00	900	BZ, L, MS	AR	1	ESE	Good	8	8	Dry	None	None	Light fog 1st hr
18/01/2022	2	8	3.00	1330	BZ, ET, K	AR	1	SW	Good	8	8	Dry	Drizzle last hr	None	None
22/01/2022	2	9	3.00	1330	BZ, H, K	AR	1	W	Good	8	8	Dry	None	None	None
08/02/2022	2	10	3.00	1230	CA, H, K, L	AR	1	SW	Good	8	9	Wet	Light rain/drizzle	None	None
26/02/2022	2	11	3.00	1430	BZ, CA, H, K, L, LB	AR	3	SE	Good	8	9	Dry	None	None	None
13/03/2022	2	12	3.00	1130	BH, BZ, CA, K, LB, K	AR	2	SW	Good	7	11	Wet	Light rain	None	None
26/10/2021	3	1	3.00	815	GP, L, SN	AR	1-2	SW	Good	8	11	Wet	None	None	None
26/10/2021	3	2	3.00	1145	BZ, GP, L, LB	AR	1-2	SW	Good	8	13	Wet	Occ. light rain	None	None
23/11/2021	3	3	3.00	1230	BH, BZ, GP, L	AR	1	N-NW	Good	8	7	Dry	None	None	None
24/11/2021	3	4	3.00	800	BZ, GP, L	AR	1	W	Good	8	4	Wet	Light rain	None	None
02/12/2021	3	5	3.00	1200	L, ML, PE	AR	1	W-SW	Good	8	5	Wet	None	None	None
16/12/2021	3	6	3.00	1200	BZ, CA, K, L	AR	1	SE	Good	8	10	Wet	None	None	None
21/12/2021	3	7	3.00	900	BH, BZ, CM, GP, L	AR	1	SE	Good	8	9	Dry	None	None	None
19/01/2022	3	8	3.00	800	BZ, CA, K, L, MA	AR	1	NNW	Good	6-8	7	Wet	None	None	None
23/01/2022	3	9	3.00	830	BH, BZ, CA, L, LB, SH	AR	1	SE	Good	8	8	Dry	None	None	None
24/02/2022	3	10	3.00	1430	BZ, CA, H, LB, MS, SH	AR	1	W	Good	8	5	Wet	Light rain	None	Snow shower
26/02/2022	3	11	3.00	1100	CA, LB, PE, SH	AR	3	S	Good	8	11	Dry	None	None	None
07/03/2022	3	12	3.00	1500	BZ, CA, PE	AR	2	SE	Good	8	8	Dry	None	None	None
24/10/2021	4	1	3.00	1500	BZ, GP, H, K, L, LB	AR	3	SW	Good	7	13	Dry	Light showers	None	None
25/10/2021	4	2	3.00	800	H, GP, L, LB, MA, MS, SN	AR	1	SW	Good	2-6	9	Dry-wet	None	None	None
12/11/2021	4	3	3.00	730	ET, GP, H, L, MA, SN	AR	3	SW	Good	8	11	Wet	Light drizzle	None	None

Date	VP	Visit No.	Duration (hr)	Start Time	Target species BTO codes - collision risk spp.	Surveyor	Wind Force	Wind Dir.	Vis.	Cloud (oktas)	Temp (C)	Ground Cond.	Rain	Disturbance	Factors affecting visibility
13/11/2021	4	4	3.00	1100	ET, GJ, H, LB, SN	AR	1	SW	Good	8	12	Wet	None	Hunters x 2 with 4 dogs - looked to be training the dogs - had live birds (11.20-12.30). No signs/gunshots after 12.30.	None
02/12/2021	4	5	3.00	830	ET, L	AR	1	NW	Good	8	5	Wet	None	None	None
17/12/2021	4	6	3.00	1300	L, MA	AR	1	SE	Good	8	9	Dry	None	None	None
20/12/2021	4	7	3.00	1230	H, L, MS	AR	1	ESE	Good	8	9	Dry	None	None	None
09/01/2022	4	8	3.00	1230	BZ, H, L, LB	AR	3	W	Good	7	9	Wet	None	None	None
19/01/2022	4	9	3.00	1130	BZ, H, K, L, MS	AR	2	NNW	Good	3	8	Dry	None	None	None
24/02/2022	4	10	3.00	1100	BZ, CA, ET, L, LB	AR	1	W	Good	7	5	Wet	None	None	None
26/02/2022	4	11	3.00	730	BZ, CA, ET, H, LB	AR	3	S	Good	8	9	Dry	None	None	None
07/03/2022	4	12	3.00	1130	BZ, CA, MS, SH, WS	AR	2	SE	Good	7	8	Dry	None	None	None
Breeding season 2022															
11/04/2022	1	1	3.00	1100	BZ, ET, K, LB, ML	TR	4	SE	Good-Mod	6	10	Wet	light showers	None	None
11/04/2022	1	2	3.00	1430	BZ, GB, K, LB, MA,	TR	4	SE	Good	7	10	Wet	light showers	None	None
05/05/2022	1	3	3.00	1100	BZ	TR	3	SW	Good	3	14	Dry	dry	None	None
05/05/2022	1	4	3.00	1430	BZ, K, PE	TR	3	SW	Good	3	15	Dry	dry	Agriculture	None
02/06/2022	1	5	3.00	845	None	JK	2	SW	Good	6-7	12	Dry	None	None	None
03/06/2022	1	6	3.00	1200	CA, K	JK	3	NW	Good	7-8	14	Dry	None	None	None
04/07/2022	1	7	3.00	845	BZ	JK	3	W	Good	7-8	15	Dry	dry	None	None
16/07/2022	1	8	3.00	1100	BZ	JK	3	SE	Good	3-4	22	Dry	dry	None	None
05/08/2022	1	9	3.00	1230	BZ, K	JK	3	NW	Good	5-6	17	Dry	None	None	None
25/08/2022	1	10	6.00	1100	BZ, K,SH	SM	10	SW	Good	4-8	18	Dry	dry	None	None
30/08/2022	1	11	3.00	1300	BZ, K	JK	3	E	Good	6-7	18-20	Dry	None	None	None
13/05/2022	2	1	3.00	1100	K, BZ, ET, L, LB, GP, SH	TR	2	SW	Good	2	14	Wet	None	None	None
13/05/2022	2	2	3.00	1430	K, BZ	TR	2	SW	Good	2	13	Wet	None	None	None
13/05/2022	2	3	3.00	1000	BZ, L, BZ, SI, ET	TR	3	W	Good	0	14	Dry	None	None	None
13/05/2022	2	4	3.00	1330	K, BZ, L, MS, ET, MA	TR	3	W	Good	3	15	Dry	None	None	None
20/06/2022	2	5	3.00	830	BZ, K	JK	2	NW	Good	2-3	14	Dry	None	None	None
24/06/2022	2	6	3.00	1145	K	JK	3	SE	Moderate	9-10	17	Wet	Showers- Rain	None	None
06/07/2022	2	7	3.00	1500	BZ, LB, ET	TR	3	NW	Good	4	18	Dry	None	None	None
06/07/2022	2	8	3.00	1130	BZ	TR	3	NW	Good	5	17	Dry	light showers	None	None
05/08/2022	2	9	3.00	0900	None	JK	3	NW	Good	6-7	14-15	Dry	None	None	None
08/08/2022	2	10	3.00	800	CA	JK	2	SW	Good	2-3	16-18	Dry	None	None	None
28/08/2022	2	11	6.00	1200	BZ, K	SM	10	E	Good	2	20-22	Dry	None	None	None
18/04/2022	3	1	3.00	1100	BZ, GP, K, MA	TR	3	W	Good-Mod	7	12	Wet	light showers	None	None
18/04/2022	3	2	3.00	1430	BZ, K, GP	TR	3	SW	Good	3	12	Wet	light showers	None	None
12/05/2022	3	3	3.00	1100	BZ, H, K, L, LB	TR	3	W	Good	4	15	Dry	showers	None	None
12/05/2022	3	4	3.00	1430	BZ, K, LB	TR	3	SW	Good	4	14	Dry	light showers	Agriculture - grass mowing	None
20/06/2022	3	5	3.00	1200	BZ, K	JK	2	NW	Good	2-3	18	Dry	None	None	None
24/06/2022	3	6	3.00	815	None	JK	3	SE	Moderate	9-10	15	Wet	Showers- Rain	None	None

Date	VP	Visit No.	Duration (hr)	Start Time	Target species BTO codes - collision risk spp.	Surveyor	Wind Force	Wind Dir.	Vis.	Cloud (oktas)	Temp (C)	Ground Cond.	Rain	Disturbance	Factors affecting visibility
25/06/2022	3	7	3.00	1430	BZ, ET, K	SM		SW	Good-Mod	8	12	Dry-wet	Heavy unavoidable rain all day	None	None
24/07/2022	3	8	9.00	1200	BH	SM	4	SW	Moderate	8	16	dry	Heavy showers	None	None
08/08/2022	3	9	3.00	1130	BZ, K	JK	2	SW	Good	2-3	19-21	dry	dry	None	None
30/08/2022	3	10	3.00	930	None	JK	3	SE	Good	6-7	12-15	dry	dry	None	None
12/04/2022	4	1	3.00	1230	BZ, H, GP, K, L	TR	2	SW	Good	3	13	Wet	dry	None	None
12/04/2022	4	2	3.00	1600	BZ, ET, GP, H, L, LB, MA, MS	TR	2	SW	Good	3	13	Wet	light showers	None	None
06/05/2022	4	3	3.00	900	BZ, ET, H, L, SN	TR	3	NW	Moderate	7	15	Dry	heavy periods of rain	None	low cloud, heavy rain periods
06/05/2022	4	4	3.00	1230	H, L, MA	TR	3	NW	Moderate	7	15	Dry	heavy periods of rain	None	low cloud, heavy rain periods
02/06/2022	4	5	3.00	1215	ET, H	JK	2	SW	Good	6-7	16	Dry	None	None	None
03/06/2022	4	6	3.00	830	H, SI	JK	3	NW	Good	6-7	11	Dry	None	None	None
02/07/2022	4	7	3.00	1045	H	JK	3	SW	Good	5-6	15	Wet	showers	None	None
04/07/2022	4	8	3.00	1200	ET, K	JK	3	NW	Good	3	17	Dry	None	None	None
16/07/2022	4	9	3.00	730	H	JK	2	SE	Good	2	18	Dry	None	None	None
22/08/2022	4	10	3.00	1230	BZ, H, K, LB	TR	4	W	Good	4	20	dry	dry	none	none
22/08/2022	4	11	3.00	1600	BZ, LB, SN	TR	3	W	Good	4	20	dry	dry	none	none
31/08/2022	4	12	3.00	1800	K, LB	TR	1	E	Good	3	17	dry	dry	Tractors - farming	none
Non-breeding season 2022-23															
24/10/2022	1	1	1.50	1600	L, SH	AJ	3	NE	Moderate	8	10	Damp	Intermittent	None	Haze
27/10/2022	1	2	2.00	945	LB	JK	4	SE	Good	8	12-14	Wet	Showers	None	None
27/11/2022	1	3	6.00	1020	LB	SM	3	SSW	Good	3-7	11	Very Wet (floods)	None after 1030	None	None
09/12/2022	1	4	3.00	1200	None	JK	2	NW	Good	8	1	Frost	None	None	Fog
12/12/2022	1	5	3.00	930	SH, SN	JK	2	SE	Good-Mod	9-10	-2	Frost	None	None	Fog
21/01/2023	1	6	6.00	1000	BZ, K	SD	2	NW	Moderate	6	5	Wet	None	None	None
25/01/2023	1	7	3.00	1145	BZ, CA, GP, H, LB, MA	JH	2-4	SW-NW	Good-Mod	7-8	8	Dry	Light mist/ rain	None	Light mist/rain
05/02/2023	1	8	6.00	1000	K	SD	2	S	Moderate	3	-2	Frozen	None	None	None
04/03/2023	1	9	6.00	930	BZ, K, SH	SD	1	NE	Good	8	5	Wet	None	None	None
29/10/2022	2	1	3.00	1330	K	JK	4-5	SE	Good	9-10	15	Wet	Showers	None	None
31/10/2022	2	2	3.00	1015	None	JK	3	S-SW	Good-Mod	9-10	12	Wet	Showers	None	None
28/11/2022	2	3	6.00	930	GP, SN, L	SM	3	WNW	Good	1	8	River flooded	None	None	None
12/12/2022	2	4	3.00	1215	None	JK	2	SE	Moderate	1	1	None	Frost	None	Fog
27/12/2022	2	5	3.00	1315	None	JK	3-4	SW	Good-Mod	9-10	9	Wet	Showers-Drizzle	None	Mist
15/01/2023	2	6	6.00	1000	BZ, K, L	SD	2	NW	Moderate	4	6	Wet	None	None	None
25/01/2023	2	7	3.00	815	CA, ET, MS	JH	2	SW	Good	8	8	Dry	Mainly dry-light drizzle	None	Occ. light drizzle/ mist
06/02/2023	2	8	6.00	1000	BH, BZ, L	SD	2	S	Moderate	4	0	Frozen	Na	None	None
06/03/2023	2	9	3.00	930	BZ, K, L	EM	2-3	WNW	Good	4-7	8	Dry	None	None	None

Date	VP	Visit No.	Duration (hr)	Start Time	Target species BTO codes - collision risk spp.	Surveyor	Wind Force	Wind Dir.	Vis.	Cloud (oktas)	Temp (C)	Ground Cond.	Rain	Disturbance	Factors affecting visibility
29/10/2022	3	1	3.00	1000	LB, SH,SN	JK	4-5	SE	Good	9-10	12	Wet	Showers	None	None
31/10/2022	3	2	3.00	1345	SH	JK	3	SW	Good-Mod	9-10	13	Wet	Showers	None	None
29/11/2022	3	3	6.00	1020	GP, L	SM	2	S-SE	Good	7-8	-	-	-	None	None
27/12/2022	3	4	3.00	945	None	JK	3-4	SW	Good	9-10	9	Wet	Showers	None	Mist
29/12/2022	3	5	3.00	1220	L, SN	JK	4	SW	Good	7-8	6	Wet	Showers	None	None
29/01/2023	3	6	6.00	1000	K	SD	1	W	Good	7	5	Wet	None	None	None
18/02/2023	3	7	6.00	1000	BZ	SD	1	W	Moderate	6	7	Wet	Showers	None	None
01/03/2023	3	8	3.00	1145	SH	JK	4	NE	Good	7-8	6	Dry	None	None	None
05/03/2023	3	9	6.00	1100	BZ, K	SD	1	NW	Good	6	9	Wet	Drizzle	None	None
27/10/2022	4	1	3.00	1200	None	JK	4	SE	Good	8	14	Wet	Showers	None	None
30/11/2022	4	2	6.00	930	DN, GP, H, L, MS, SN	SM	2-3	S-SSE	Good	6-8	7	Wet Floods	One very light shower 1100am	None	None
09/12/2022	4	3	3.00	845	ET, SN	JK	2	N-NW	Moderate	1-2	-2	Frost	None	None	Fog
29/12/2022	4	4	3.00	915	CA, DN, GP, L, WN	JK	4	SW	Good	7-8	5	Wet	Showers	None	None
22/01/2023	4	5	6.00	1000	BZ, K, L	SD	-	-	Moderate	5	5	Wet	None	None	None
19/02/2023	4	6	6.00	1000	K, L, PE	SD	2	SW	Moderate	8	8	Wet	Showers	None	None
01/03/2023	4	7	3.00	810	CA	JK	3	NE	Good	7-8	5	Dry	None	None	None
06/03/2023	4	8	3.00	1145	BZ, K, L	JK	3	NW	Good	7-8	7	Dry	None	None	None
24/03/2023	4	9	2.50	1700	K	SD	3	SW	Moderate	8	7	Wet	Constant Heavy	None	None
26/03/2023	4	10	1.00	1745	K, L	SD	2	NW	Moderate	4	12	Wet	Na	None	None
Breeding season 2023															
25/03/2023	1	1	3.00	1000	K	SD	2	SW	Moderate	5	11	Wet	Showers	None	None
09/06/2023	1	6	3.00	1745	CU, K	EM	3	E	Good	7	20	Dry	None	None	None
12/06/2023	1	7	3.00	1730	BH	EM	2	NW	Good	7	20	Dry	None	None	None
05/07/2023	1	8	3.00	800	None	JK	4	SW	Mod-Good	7	12	Wet	Heavy showers	None	None
06/07/2023	1	9	3.00	1215	BH	JK	5	S	Good	8	15	Wet	Showers	None	None
03/08/2023	1	10	3.00	930	K, LB	JK	4	NW	Good	8	14	Wet	Showers	None	None
21/08/2023	1	11	3.00	1145	None	JK	6	SW	Good	4-5	18	Dry	None	None	None
19/09/2023	1	12	3.00	1145	K	JK	5-6	SW	Good	8	16	Wet	Drizzle and showers	None	None
23/04/2023	1	2	3.00	600	BZ	SD	1	NE	Good	4	13-15	Dry	Showers	None	None
23/04/2023	1	3	3.00	900	BZ, L	SD	1	NE	Good	4	13-15	Dry	Showers	None	None
14/05/2023	1	4	6.00	1000	BZ, K	SD	3-4	W	Moderate	8	16	Dry	Showers	None	None
06/03/2023	2	1	3.00	1400	BZ, L	EM	2-3	WNW	Good-Mod	7-8	8	Wet	Intermittent rain	None	Distant rain/cloud
25/03/2023	2	2	3.00	1315	BZ, L	SD	2	SW	Moderate	5	11	Wet	Showers	None	None
01/06/2023	2	5	3.00	1015	BZ, K	JK	3	NE	Good	1-2	16	Dry	None	None	None
19/06/2023	2	6	3.00	745	None	JK	4	SW	Good	5-6	16	Wet	None	None	None
27/06/2023	2	7	3.00	730	BZ, K	KW	2-4	SSW	Moderate	8	17	Wet	None	None	None
27/06/2023	2	8	3.00	1100	BZ, H, K, SH	KW	5	SW	Good	8	23	Dry	None	None	None
31/07/2023	2	9	3.00	845	CA, MA	KW	3	SW	Good-Mod	7-8	17	Wet	Mist/light rain	None	None
31/07/2023	2	10	3.00	1215	BZ, K, LB	KW	4-5	W	Poor-Good	7-8	18	Wet	Showers	None	None
09/08/2023	2	11	3.00	1030	BZ, HG, MA, PE	KW	2	S	Good	5-6	23	Dry	None	None	None
09/08/2023	2	12	3.00	1400	BZ, K, WM	KW	2	S	Good	7	24	Dry	None	None	None
28/08/2023	2	13	3.00	1600	K, SH	KW	3	W	Good	8	18	Dry	None	None	None

Date	VP	Visit No.	Duration (hr)	Start Time	Target species BTO codes - collision risk spp.	Surveyor	Wind Force	Wind Dir.	Vis.	Cloud (oktas)	Temp (C)	Ground Cond.	Rain	Disturbance	Factors affecting visibility
29/04/2023	2	3	3.00	1010	BZ, K, L	SD	1	W	Moderate	8	12	Dry	None	None	None
29/04/2023	2	4	3.00	1310	BZ	SD	1	W	Moderate	8	12	Dry	None	None	None
06/03/2023	3	1	3.00	820	BZ, PE, SH	JK	3	NW	Good	7-8	5	Dry	None	None	None
25/03/2023	3	2	3.00	1615	L	SD	2	SW	Moderate	5	11	Wet	Showers	None	None
01/06/2023	3	5	3.00	645	BZ	JK	3	NE	Good	1-2	10	Dry	None	None	None
19/06/2023	3	6	3.00	1115	BZ, K	JK	4	SW	Good	5-6	18-20	Dry	None	None	None
28/06/2023	3	7	3.00	1100	BZ, H, PE	KW	3	W	Good	5-8	14-19	Wet	None	None	None
28/06/2023	3	8	3.00	1430	BZ, K, SH	KW	3-4	W	-	5-7	19	Wet	Showers	None	None
18/07/2023	3	9	3.00	1300	BZ, K	KW	2	N	Good	6-7	19	Wet	Light showers	None	None
18/07/2023	3	10	3.00	1630	BZ, K, SH	KW	2-3	NNW	Good	4-6	19	Wet	None	None	None
16/08/2023	3	11	3.00	1400	H, K, SH	KW	2	SE	Good	6-8	18	Dry	None	None	None
16/08/2023	3	12	3.00	1730	LB, SH	KW	2-4	S	Good	1	19	Dry	None	None	None
27/08/2023	3	13	3.00	845	LB	KW	1	-	Poor	8	16	Wet	Mist	None	None
22/04/2023	3	3	3.00	1200	None	SD	1	SW	Good	6	15	Wet	Showers	None	None
22/04/2023	3	4	3.00	1500	L, PE	SD	1	SW	Good	6	15	Wet	Showers	None	None
16/06/2023	4	4	3.00	700	BH, BZ, H, L, LB, MA, MS, SI	AR	2-5	SE	Good	7-8	14-17	Dry	Light shower	None	None
26/06/2023	4	5	3.00	1730	BH, BZ, H, K, SI, SN	AR	3	W	Good	8	18	Dry	None	None	None
27/06/2023	4	6	3.00	1430	ET, H, K	KW	4-5	SW	-	8	22	Dry	None	None	None
28/06/2023	4	7	3.00	730	H	KW	-	S	Moderate	8	14	Wet	Shower	None	None
19/07/2023	4	8	3.00	1100	ET, K, MA	KW	2-3	NW	Good	6-8	19	Dry	None	Tractor on field	None
19/07/2023	4	9	3.00	1430	CM, H, LB, MA	KW	3-5	W	Good	5-7	18	Dry	None	None	None
10/08/2023	4	10	3.00	800	BZ, ET, H	KW	4	SE	Good-Mod	5-8	20	Wet	None	None	None
10/08/2023	4	11	3.00	1130	BZ, CA, H	KW	4	SE	Good	8	21	Wet	Shower of mist	None	None
28/08/2023	4	12	3.00	1230	ET, H, HH, K, GE	KW	3	-	Good	-	11	Dry	None	None	None
20/09/2023	4	13	3.00	1500	BZ, CA, ET, H, K	KW	3-4	-	Good	-	16	Wet	Shower	None	None
29/04/2023	4	2	3.00	1617	BZ, ET, L, SH	SD	2	SW	Good	6	18	Wet	Shower	None	None
30/04/2023	4	3	3.00	830	BZ, L	SD	5	SE	Good	7	14	Dry	None	None	None

Table 7C.2: Site walkovers – survey effort & weather conditions

Date	Start time	End time	Duration (hr)	Surveyor	Wind Force	Wind Dir	Cloud (oktas)	Temp. (C)	Rain
Non-breeding season 2021-22									
18/12/2021	0830	1700	8.50	AR	1	SE	8	7	Nil
19/12/2021	0830	1506	6.50	AR	-	-	7	6	Nil
21/01/2022	0900	1658	8.00	AR	1	W	8	8	Nil
22/01/2022	0900	1311	4.00	AR	1	SW	8	8	Nil
30/01/2022	0900	1304	4.00	AR	1	S	7	8	Nil
27/02/2022	1000	1430	4.50	AR	2	SE	6	10	Nil
28/02/2022	0730	1452	7.50	AR	1	W	8	8	Nil
Breeding season 2022									
28/04/2022	1200	1800	6.00	SM	-	-	-	-	-
29/04/2022	0945	1745	8.00	SM	-	-	-	-	-
11/05/2022	1430	1845	4.25	MT	3	W	7	13	Nil
12/05/2022	0850	1250	4.00	MT	3	SW	4-6	10-13	Nil
16/06/2022	1047	1820	7.50	MT	1-2	S	4	12-18	Nil
26/06/2022	1400	2130	7.50	SM	-	-	-	-	-
27/06/2022	1015	1300	2.75	SM	-	-	-	-	-
26/07/2022	1400	1700	3.00	SM	-	-	-	-	-
Non-breeding season 2022-23									
23/01/2023	0930	1530	6.00	JH	2	S	8	10	Nil
24/01/2023	0915	1530	6.25	JH	2	SW	8	9	Nil
16/03/2023	0730	1615	8.75	JH	4	SW	8	12	Showers
Breeding season 2023									
13/04/2023	0930	1600	6.50	EM	3	W	6	10	Showers
26/04/2023	0945	1245	3.00	EM	3	SE	7	11	Nil
09/05/2023	1230	1930	6.50	PDEV	-	-	-	-	-
22/05/2023	1600	1830	2.50	PDEV	-	-	-	-	-
28/06/2023	1800	2100	3.00	EM	3	W	3	17	Nil
29/06/2023	1030	1500	4.50	EM	3	W	5	18	Light showers
24/07/2023	0730	1600	8.50	JH	3	N	8	17	Nil

Table 7C.3: Breeding raptor surveys – survey effort & weather conditions

Date	Start time	End time	Duration (hr)	Surveyor	Wind Force	Wind Dir	Cloud (oktas)	Temp (C)	Rain
Breeding season 2022									
28/04/2022	1915	2015	1.00	SM	2	E	4	-	Nil
29/04/2022	1630	1700	1.50	SM	1	-	1	13	Nil
29/04/2022	1710	1730	1.50	SM	-	-	1	13	Nil
29/04/2022	1815	1900	0.75	SM	-	-	1	12	Nil
11/05/2022	1230	1645	4.25	SM	5	WSW	6	14	Showers
24/06/2022	1300	1600	3.00	SM	4	W-SW	6-8	10-12	Showers
26/07/2022	1200	1900	7.00	SM	3	SW	8	16	Nil
25/08/2022	1700	1900	2.00	SM	3	SW	4	18	Nil
28/08/2022	1800	2000	2.00	SM	3	SW	2	22	Nil
Breeding season 2023									
21/03/2023	830	1145	3.25	JH	3	SW	8	10	Drizzle
22/03/2023	715	1315	6.00	JH	4-5	SW	2	7-10	Nil
23/03/2023	1315	1945	6.00	JH	4-5	S	6-8	14-12	Heavy showers
11/04/2023	1000	1530	5.50	JH	4	S	8	7-9	Heavy rain
20/04/2023	845	1530	6.50	JH	4	E	0	12	Nil
26/05/2023	06:00	12:00	6.00	PDEV	-	-	-	-	-
27/06/2023	1100	1700	6.00	EM	3	SW	7	21	Nil
25/07/2023	1430	2030	6.00	EM	2	W	4-6	18	Nil
28/07/2023	1100	1700	6.00	EM	3	SW	5-8	17-18	Showers

Table 7C.4: Breeding season dusk/dawn surveys – survey effort & weather conditions

Date	Start time	End time	Duration	Surveyor	Wind Force	Wind Dir	Cloud (oktas)	Temp. (C)	Rain
Breeding season 2022									
11/05/2022	1950	2330	3.75	SM	2	SW-S	5-6	12-11	Nil
11/05/2022	2030	2215	1.75	MT	1-2	SW	5	12	Nil
12/05/2022	0430	0630	2.00	MT	1	S	3	7-8	Nil
22/05/2022	2000	2340	3.75	SM	-	-	-	-	-
23/06/2022	2100	300	6.00	SM		W	5	14.5	Shower at 0030
Breeding season 2023									
23/03/2023	1645	1945	3.00	JH	4-5	S	8-4	12	Heavy showers
09/05/2023	2050	2250	2.00	PDEV	-	-	-	-	-
22/05/2023	2130	2330	2.00	PDEV	-	-	-	-	-
09/06/2023	2100	2300	2.00	EM	2	E	7	17	Nil
28/06/2023	2100	2300	2.00	EM	2	W	2	12	Nil
25/07/2023	2030	2230	2.00	EM	2	SW	5	16	Nil
16/08/2023	2100	2400	3.00	KW	2	SE	1	10	Nil

Table 7C.5: Wider area wintering waterbird surveys – survey effort & weather conditions

Date	Surveyor	Wind Force	Wind Dir	Cloud (oktas)	Temp. (C)	Rain
Non-breeding 2021-22						
25/10/2021	AR	1	SW	4	14-15	None
23/11/2021	AR	1	N	7	4	None
17/12/2021	AR	1	SE	8	9	None
20/01/2022	AR	1	N	7	7	None
25/02/2022	AR	1	SW	5	10	None
13/03/2022	AR	2	SW	7	11	Showers
Non-breeding 2022-23						
18/10/2022	CS	3	E	6	14	None
28/11/2022	SM	2	NW	1	8	None
30/11/2022	SM	3	S	8	7	None
02/12/2022	SM	-	-	-	-	-
18/12/2022	GO	-	-	-	-	-
31/12/2022	GO	-	-	-	-	-
21/01/2023	GO	-	-	-	-	-
22/01/2023	GO	-	-	-	-	-
14/02/2023	GO	4	S	6	11	None
06/03/2023	GO	3	NW	4	7	Showers
07/03/2023	GO	3	NE	4	4	None
13/03/2023	GO	-	-	-	-	-

Appendix 7D

VIEWSHED ANALYSIS

Appendix 7D: Viewshed Analysis

List of figures

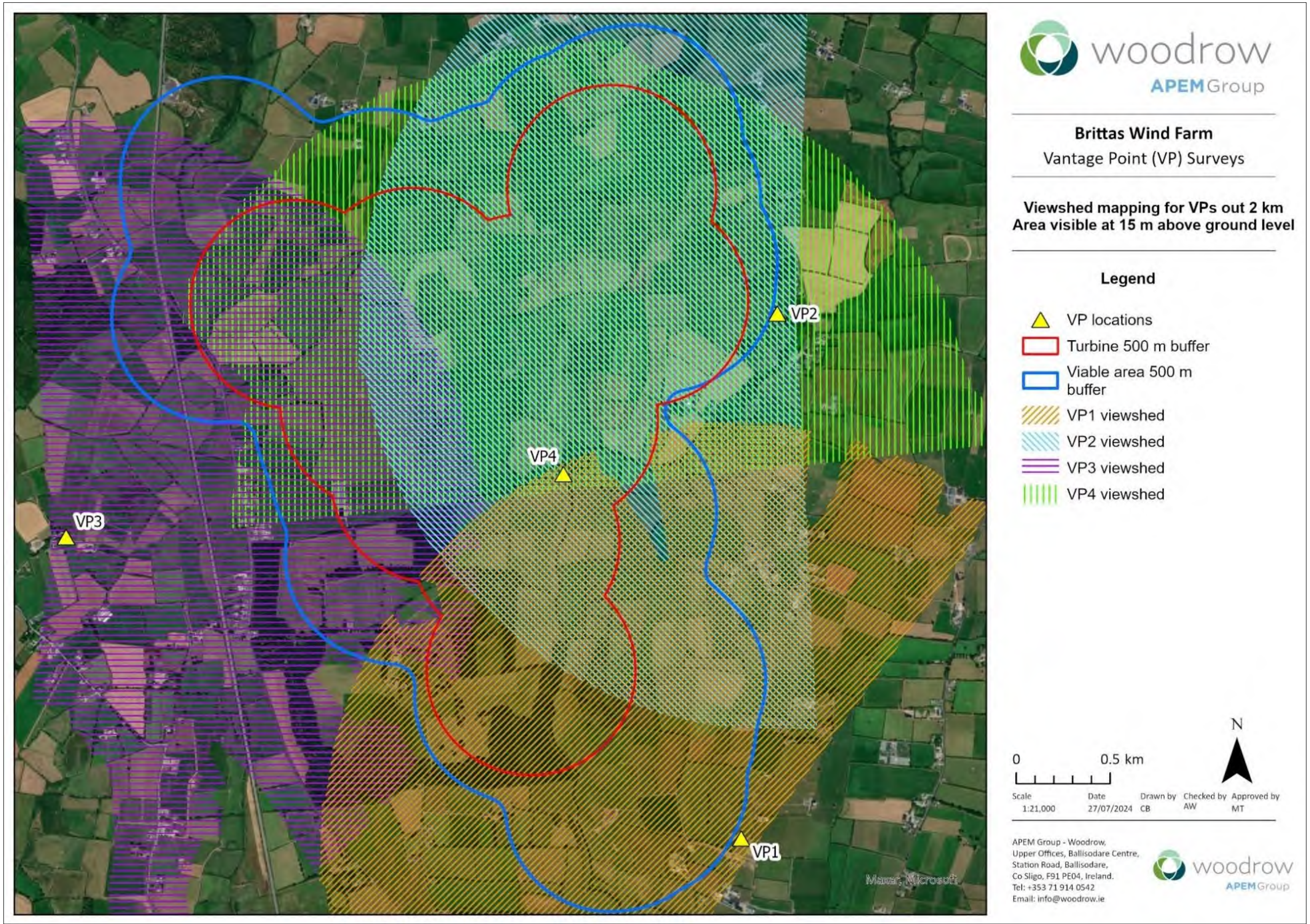

Figure 7D.1: Viewsheds for all the VPs at 15 m above ground level and out to 2 km

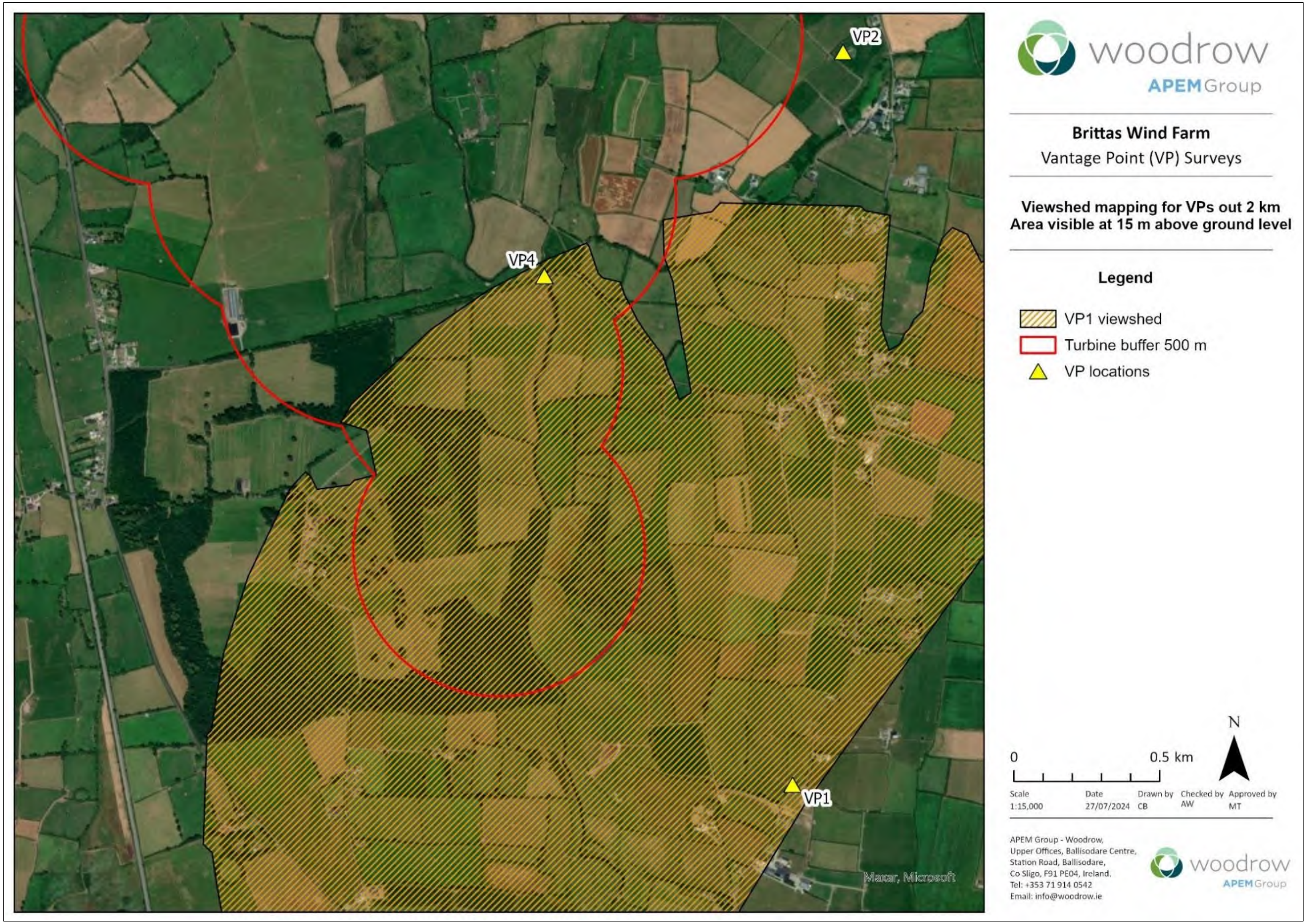

Figure 7D.2: Viewshed from VP1 at 15 m above ground level and out to 2 km

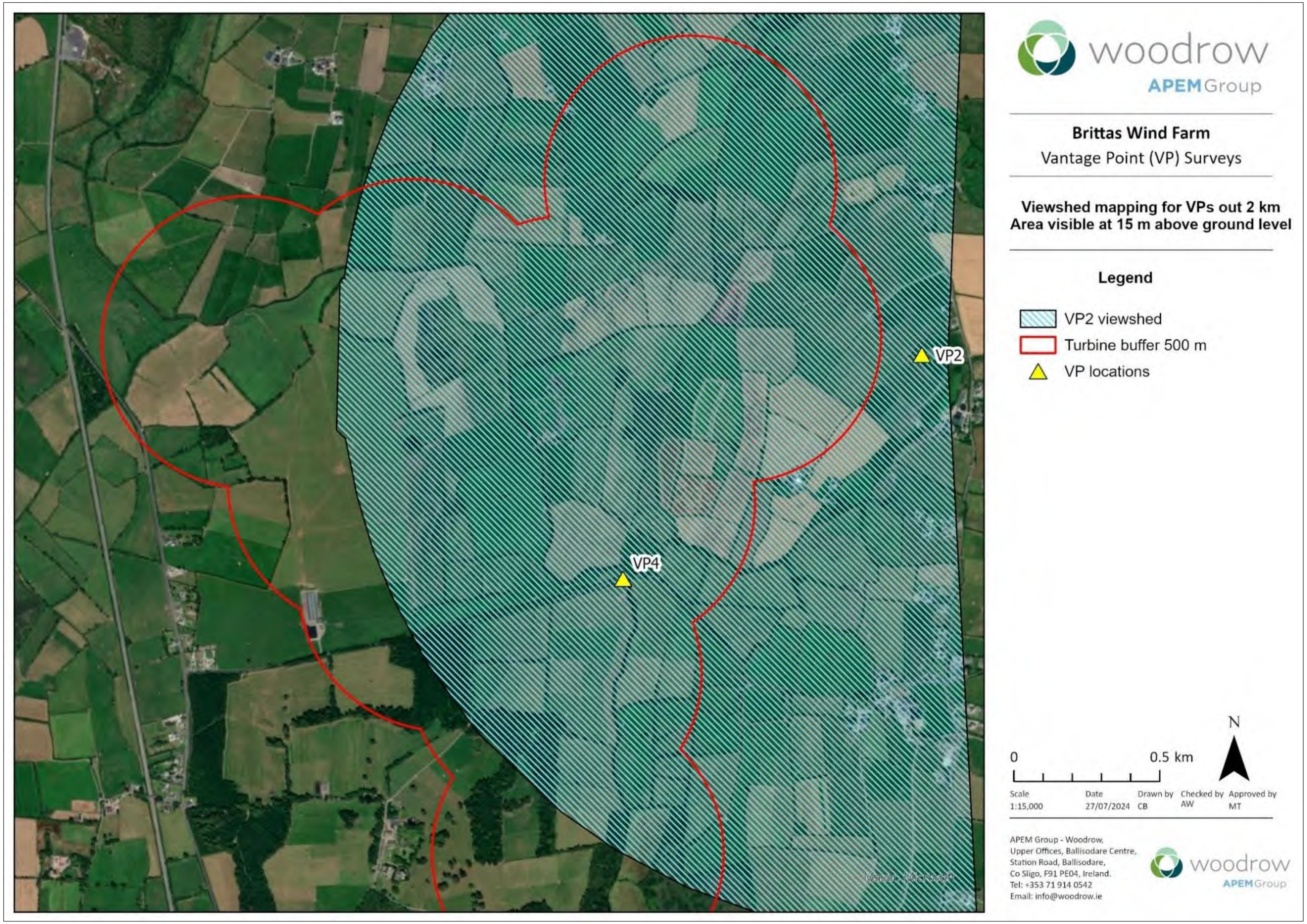

Figure 7D.3: Viewshed from VP2 at 15 m above ground level and out to 2 km

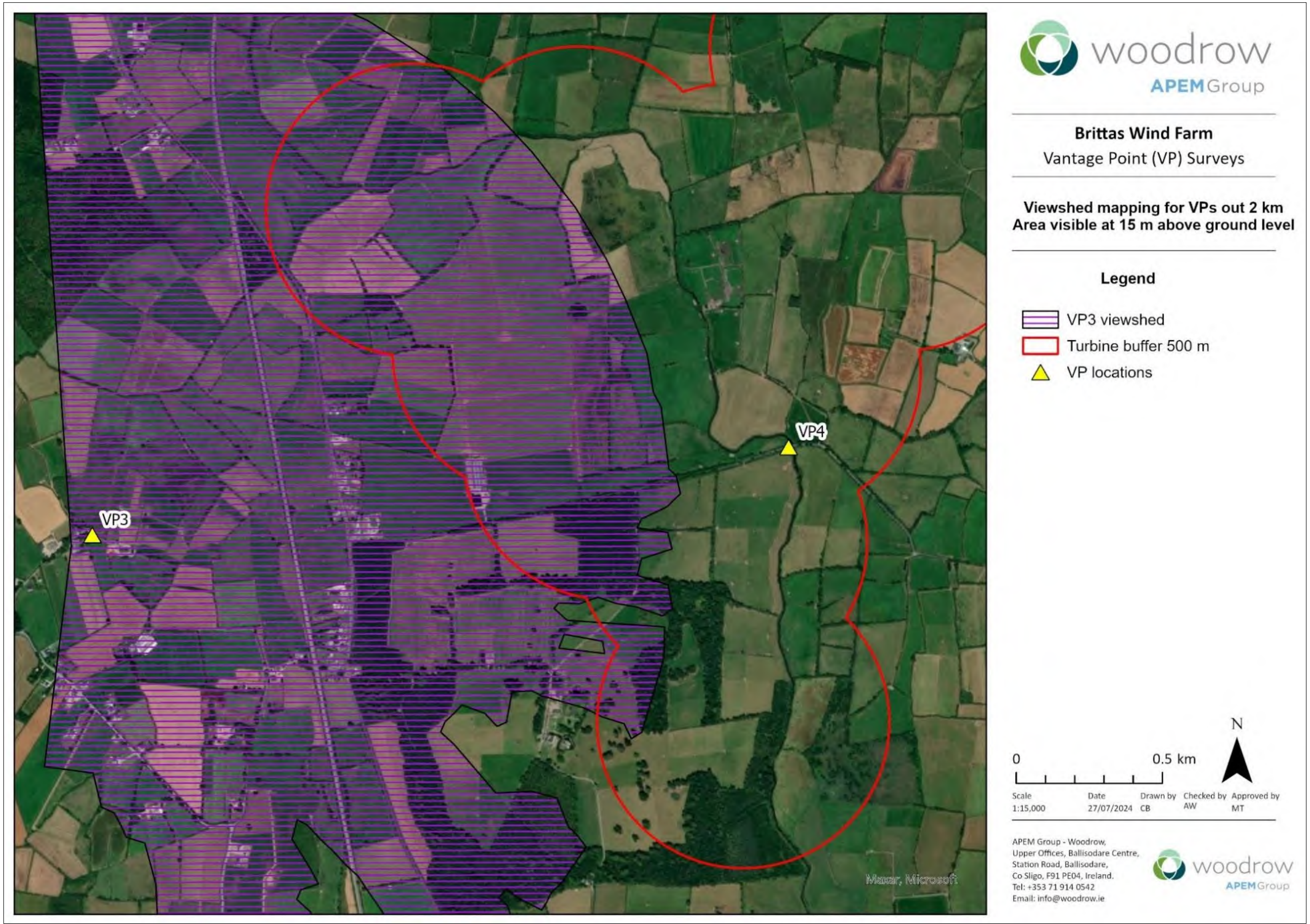

Figure 7D.4: Viewshed from VP3 at 15 m above ground level and out to 2 km

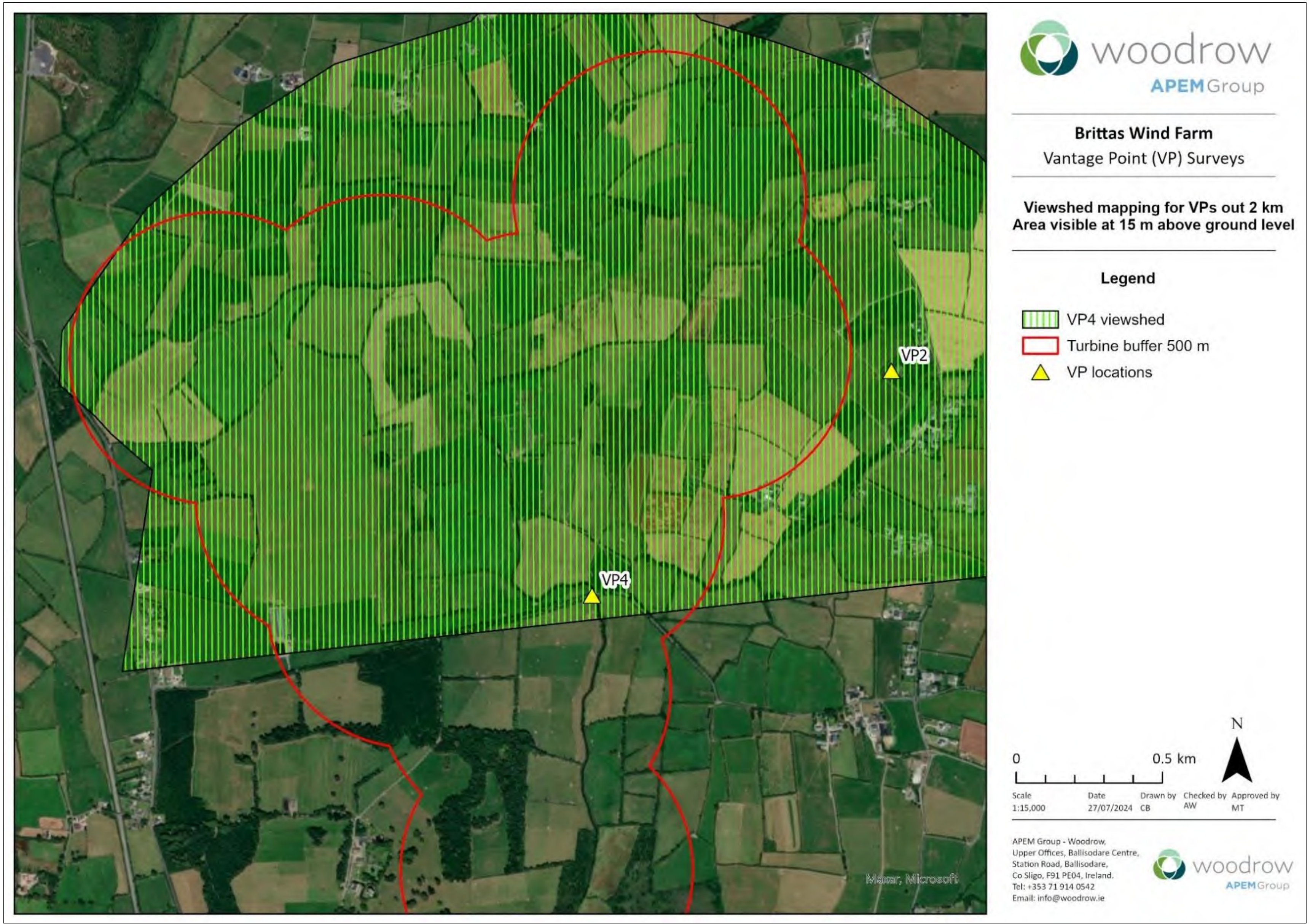

Figure 7D.5: Viewshed from VP4 at 15 m above ground level and out to 2 km

Appendix 7E

VP DATA FOR TARGET SPECIES

Appendix 7E: VP data for target species - maps & tables

List of figures

List of tables

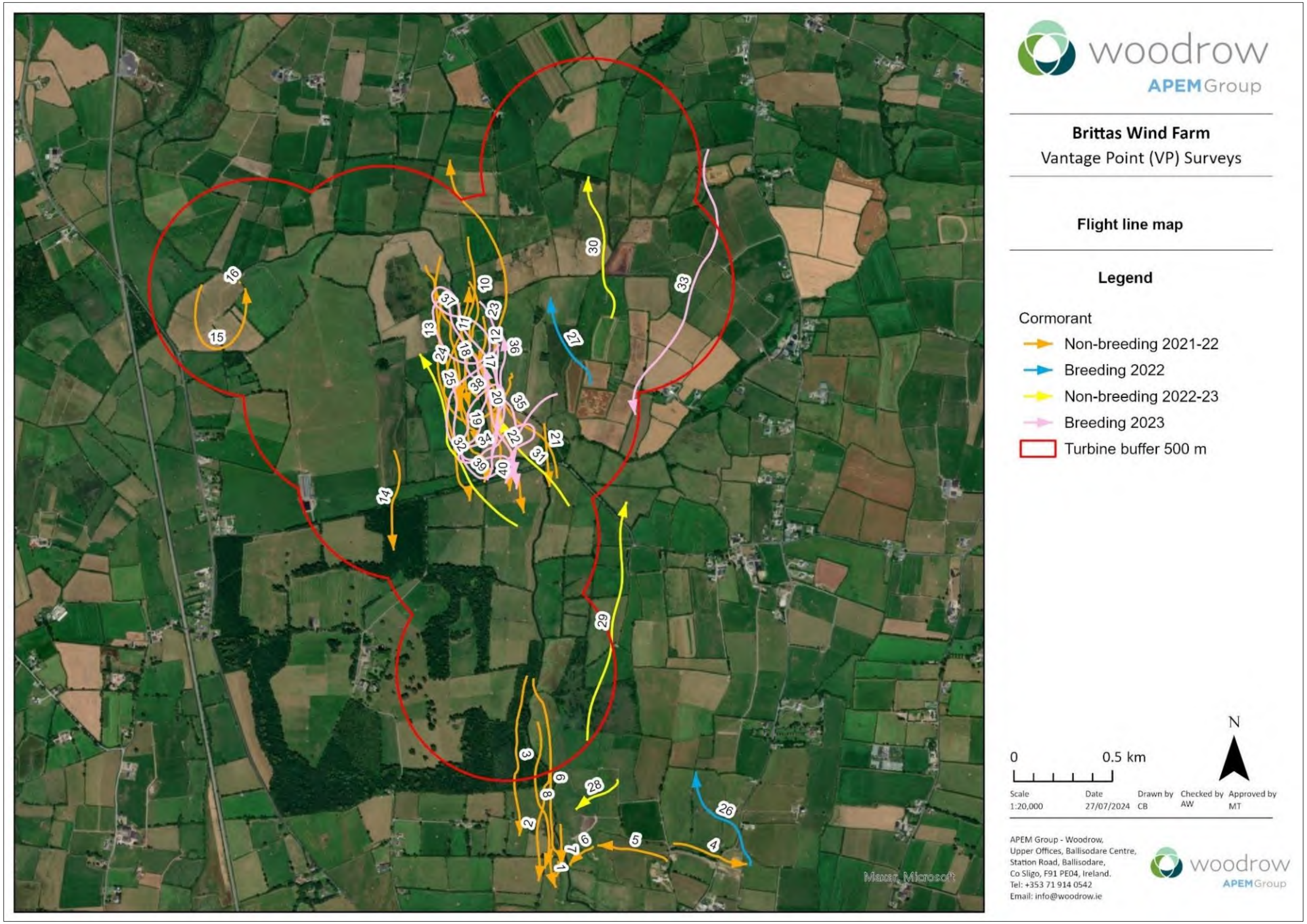

Figure 7E.1: Cormorant observations recorded during VP watches

Table 7E.1: Cormorant data collected during VP watches

Aggregate seconds = flight/observation time x by the number of birds recorded

Green	Recorded within 500 m turbine buffer
Yellow	Recorded on boundary of 500 m turbine buffer – flight seconds will be clipped
Red	Recorded beyond 500 m turbine buffer – flight seconds will be excluded from CRM

Map ID	Season	VP No.	Date	Time	No. of birds	Aggregate seconds recorded	Height (m)	Flight range	Sex	Age	Behaviour	Comments
1	Non-breeding 2021-22	1	20/01/2022	1405	1	10	25	25		Ad	Commuting	
2	Non-breeding 2021-22	1	08/02/2022	0912	1	30	15	15		Ad	Commuting	
3	Non-breeding 2021-22	1	08/02/2022	1116	2	80	15	15			Flying	
4	Non-breeding 2021-22	1	24/02/2022	0916	1	20	15	15		Ad	Commuting	
5	Non-breeding 2021-22	1	24/02/2022	0942	1	20	15	15-5		Ad	Flying	
6	Non-breeding 2021-22	1	24/02/2022	0942	1	10	5	5-0		Ad	Flying	
7	Non-breeding 2021-22	1	24/02/2022	1004	1	10	15	15		2CY	Flying	
8	Non-breeding 2021-22	1	07/03/2022	0836	1	30	15	15		Ad	Commuting	
9	Non-breeding 2021-22	1	07/03/2022	916	2	80	20	20		Ad	Commuting	
10	Non-breeding 2021-22	2	08/02/2022	1310	3	180	25	25			Commuting	
11	Non-breeding 2021-22	2	26/02/2022	1436	1	60	15	15		Ad	Commuting	
12	Non-breeding 2021-22	2	26/02/2022	1438	1	50	15	15		Ad	Commuting	
13	Non-breeding 2021-22	2	13/03/2022	1238	1	60	25	25		2CY	Commuting	
14	Non-breeding 2021-22	3	16/12/2021	1310	1	20	15	15			Commuting	
15	Non-breeding 2021-22	3	19/01/2022	1003	2	100	20	20			Flying	
16	Non-breeding 2021-22	3	19/01/2022	1004	2	0	20	20-0			Landed	
17	Non-breeding 2021-22	3	23/01/2022	1038	1	40	25	25		Ad	Commuting	
18	Non-breeding 2021-22	3	24/02/2022	1638	1	60	20	20			Flying	
19	Non-breeding 2021-22	3	26/02/2022	1110	2	80	15	15			Commuting	
20	Non-breeding 2021-22	3	07/03/2022	1508	2	80	20	20			Commuting	
21	Non-breeding 2021-22	4	24/02/2022	1110	2	40	15	15		Ad	Commuting	
22	Non-breeding 2021-22	4	26/02/2022	0836	1	30	10	10		2CY	Flying	
23	Non-breeding 2021-22	4	07/03/2022	1228	1	40	10	10		2CY	Commuting	
24	Non-breeding 2021-22	4	07/03/2022	1308	1	20	15	15		2CY	Flying	
25	Non-breeding 2021-22	4	07/03/2022	1402	1	30	15	15		Ad	Flying	
26	Breeding 2022	1	03/06/2022	1237	1	38	30	30-40		Ad	Flying	Moving north
27	Breeding 2022	2	08/08/2022	0836	1	38	40	40-50			Flying	Travelling flying
28	Non-breeding 2022-23	1	25/01/2023	1153	2	56	20	0-20			Flying	Flying, possibly landing on river
29	Non-breeding 2022-23	1	25/01/2023	1348	1	92	55	0-60			Commuting	Travelling N
30	Non-breeding 2022-23	2	25/01/2023	0846	1	42	20	0-20			Commuting	Flying- travelling N

Map ID	Season	VP No.	Date	Time	No. of birds	Aggregate seconds recorded	Height (m)	Flight range	Sex	Age	Behaviour	Comments
31	Non-breeding 2022-23	4	29/12/2022	1106	3	96	30	30-40		Ad	Flying	Descending onto flooded area
32	Non-breeding 2022-23	4	01/03/2023	0958	1	46	30	30-35		Ad	Flying	Moving N.
33	Breeding 2023	2	31/07/2023	0910	1	48	30	30-0			Flying	
34	Breeding 2023	4	10/08/2023	1149	1	44	15	15		Ad	Flying	
35	Breeding 2023	4	10/08/2023	1209	1	48	5	15-		Juv	Flying	
36	Breeding 2023	4	10/08/2023	1247	1	44	30	5-0		Ad	Flying	
37	Breeding 2023	4	10/08/2023	1340	2	312	50	50-0		Juv	Flying	
38	Breeding 2023	4	10/08/2023	1418	1	29	30	30-		Juv	Flying	
39	Breeding 2023	4	20/09/2023	1601	1	39	15	39-0		Juv	Flying	
40	Breeding 2023	4	20/09/2023	1724	1	24	30	0-30		Juv	Flying	

Wader species with low incidence rate

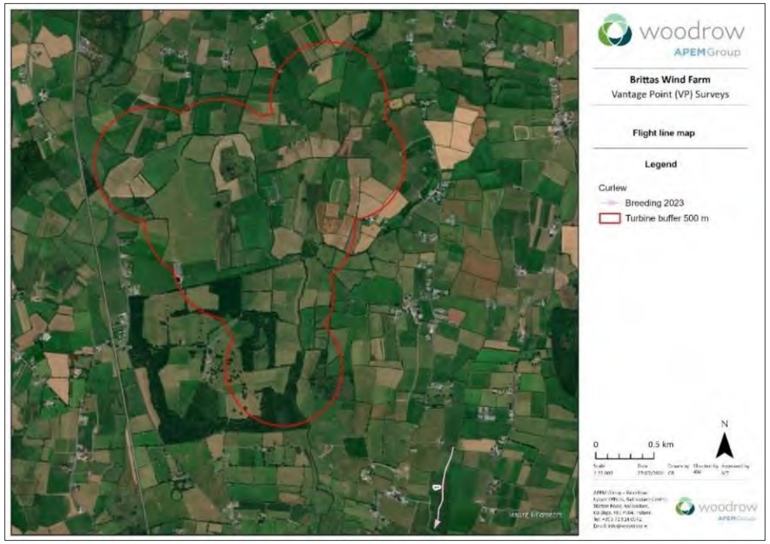

Figure 7E.2: Curlew observations recorded during VP watches

Figure 7E.4: Green sandpiper observations recorded during VP watches

Figure 7E.3: Dunlin observations recorded during VP watches

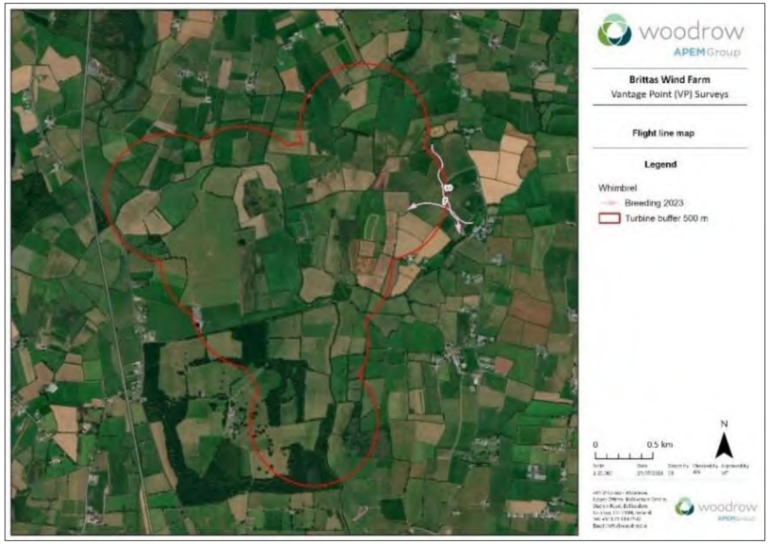

Figure 7E.5: Whimbrel observations recorded during VP watches

Wader species with low incidence rate

Aggregate seconds = flight/observation time x by the number of birds

Green	Recorded within 500 m turbine buffer
Yellow	Recorded on boundary of 500 m turbine buffer – flight seconds will be clipped
Red	Recorded beyond 500 m turbine buffer – flight seconds will be excluded from CRM

Table 7E.2: Curlew data collected during VP watches

Map ID	Season	VP No	Date	Time	No. of birds	Aggregate seconds recorded	Height (m)	Flight range	Sex	Age	Behaviour	Comments
1	Breeding 2023	1	09/06/2023	2006	1	35	60	60		Ad	Flying	Flying and calling outside the 500 m turbine buffer

Table 7E.3: Dunlin data collected during VP watches

Map ID	Season	VP No	Date	Time	No. of birds	Aggregate seconds recorded	Height (m)	Flight range	Sex	Age	Behaviour	Comments
	Non-breeding 2022-23	4	30/11/2022	1100	?							Heard calling ONLY – not marked on map
1	Non-breeding 2022-23	4	29/12/2022	1048	16	720	30	30-40		Ad	Flying	Short flight then dropped back down onto flooded area

Table 7E.4: Green sandpiper data collected during VP watches

Map ID	Season	VP No	Date	Time	No. of birds	Aggregate seconds recorded	Height (m)	Flight range	Sex	Age	Behaviour	Comments
1	Breeding 2023	4	28/08/2023	1523	1	11	10			Ad	Flying	

Table 7E.5: Whimbrel data collected during VP watches

Map ID	Season	VP No	Date	Time	No. of birds	Aggregate seconds recorded	Height (m)	Flight range	Sex	Age	Behaviour	Comments
1	Breeding 2023	2	09/08/2023	1509	3	174	20	0-20		Ad	Flying	Possibly curlew
2	Breeding 2023	2	09/08/2023	1638	3	219	35	0-35		Ad	Flying	Possibly curlew

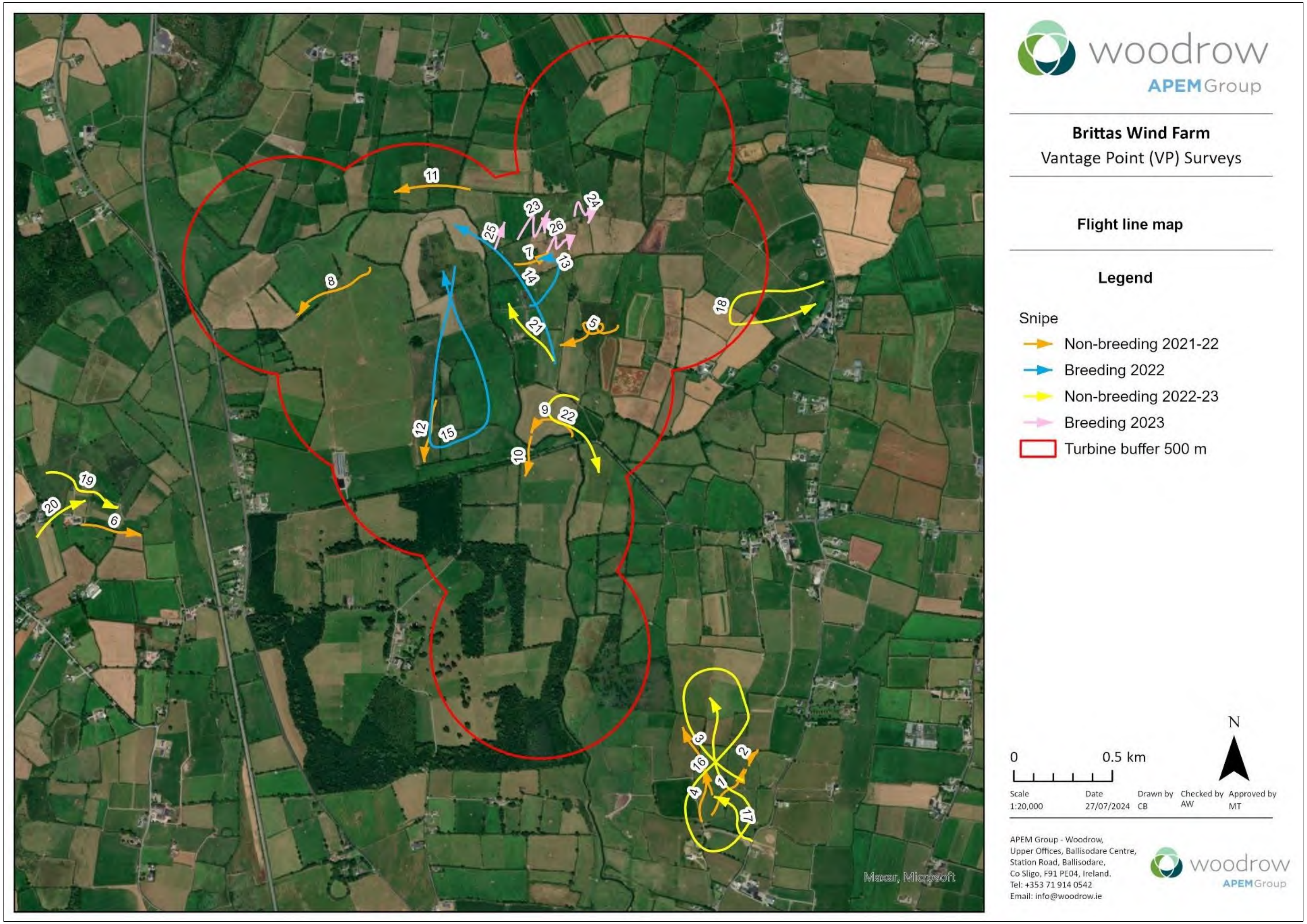

Figure 7E.6: Snipe observations recorded during VP watches

Table 7E.6: Snipe data collected during VP watches

Aggregate seconds = flight/observation time x by the number of birds

Green	Recorded within 500 m turbine buffer
Yellow	Recorded on boundary of 500 m turbine buffer – flight seconds will be clipped
Red	Recorded beyond 500 m turbine buffer – flight seconds will be excluded from CRM

Map ID	Season	VP No.	Date	Time	No. of birds	Aggregated seconds recorded	Height (m)	Flight range	Sex	Age	Behaviour	Comment
1	Non-breeding 2021-22	1	11/11/2021	1349	1	20	25	10-25			Commuting	
2	Non-breeding 2021-22	1	11/11/2021	1350	1	5	10	10			Commuting	
3	Non-breeding 2021-22	1	16/12/2021	1012	1	20	35	35			Flying	
4	Non-breeding 2021-22	1	08/02/2022	1028	1	10	20	20		A	Flying	
5	Non-breeding 2021-22	2	22/11/2021	1303	7	70	45	45			Commuting	
6	Non-breeding 2021-22	3	26/10/2021	1004	1	30	35	35			Commuting	
7	Non-breeding 2021-22	4	25/10/2021	0942	3	30	25	25			Commuting	
8	Non-breeding 2021-22	4	12/11/2021	0849	4	240	35	35			Commuting	
9	Non-breeding 2021-22	4	12/11/2021	1018	4	40	3	3-25			Commuting	
10	Non-breeding 2021-22	4	12/11/2021	1019	4	40	25	25			Commuting	
11	Non-breeding 2021-22	4	13/11/2021	1201	1	30	25	25			Commuting	
12	Non-breeding 2021-22	4	13/11/2021	1215	2	20	25	25			Commuting	
13	Breeding 2022	4	06/05/2022	1125	1	10	25	0-25			landed	in wet grassland
14	Breeding 2022	4	22/08/2022	1625	1	30	20	1-20			Flying	landed in wet field
15	Breeding 2022	4	22/08/2022	1800	2	560	20	1-20			Flying	circling area, landed
16	Non-breeding 2022-23	1	27/11/2022	1434	19	1,330	40	10-50			Circling	Wheeling flock circled multiple times then landed near fen area
17	Non-breeding 2022-23	1	12/12/2022	1020	2	32	10	10-50		Ad	Flying	Flying through fog out of site. See map
18	Non-breeding 2022-23	2	28/11/2022	1054	1	25	12	10-20			Circling	Circled into buffer and back
19	Non-breeding 2022-23	3	29/10/2022	1020	2	110	40	40-50		Ad	Flying	Commuting flight see map SN
20	Non-breeding 2022-23	3	29/12/2022	1407	2	32	30	30-40	M+F	Ad	Flying	Quick flight
21	Non-breeding 2022-23	4	30/11/2022	1043	1	5	10	10			Flying	
22	Non-breeding 2022-23	4	09/12/2022	1048	3	42	10	10-15		Ad	Flying	Moving S
23	Breeding season 2023	4	26/06/2023	1736	1	120	80	40-80		Ad	Displaying	
24	Breeding season 2023	4	26/06/2023	1751	1	180	80	40-80			Displaying	
25	Breeding season 2023	4	26/06/2023	1914	1	10	30	30			Flying	
26	Breeding season 2023	4	26/06/2023	1936	1	120	60	60			Displaying	

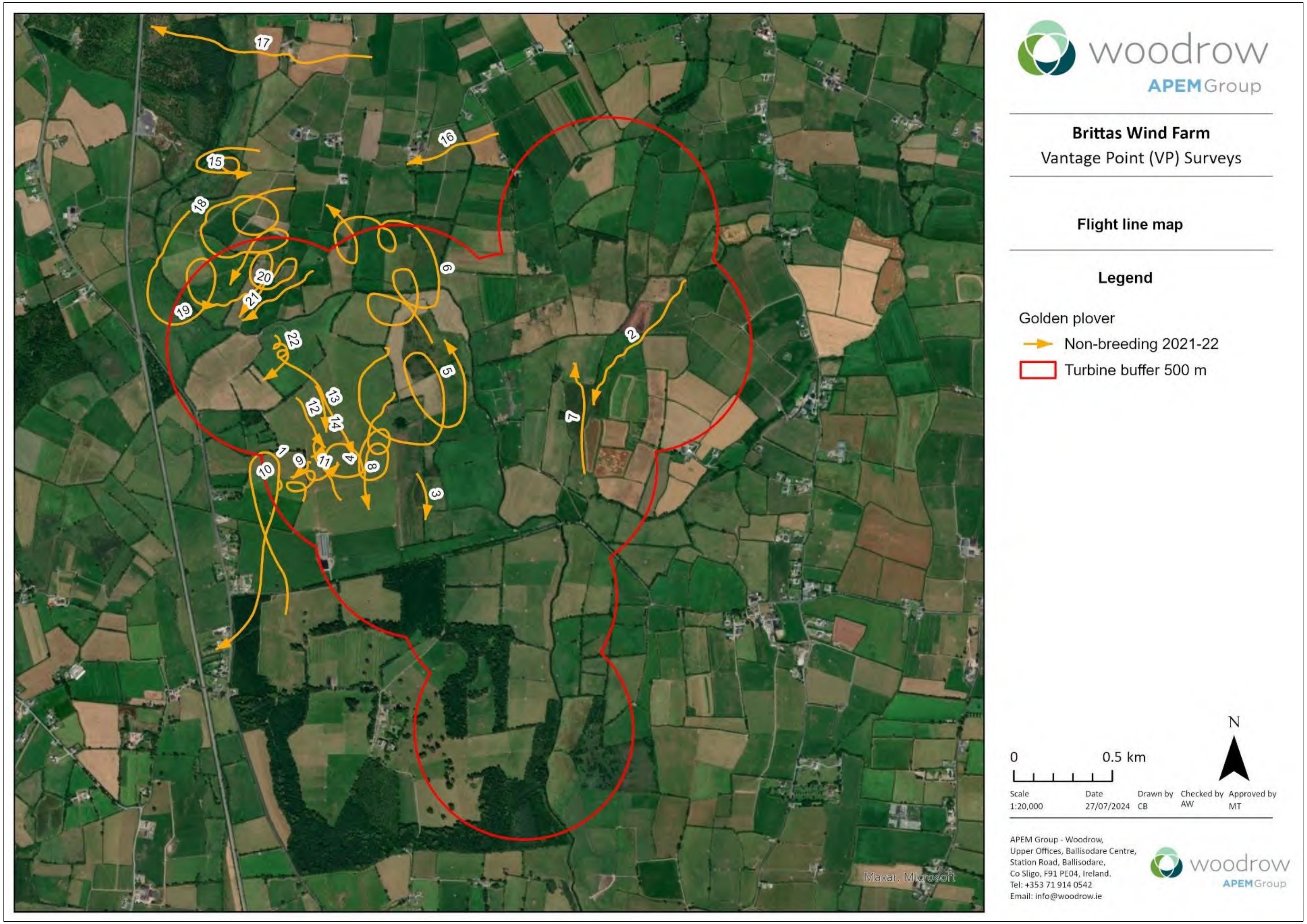

Figure 7E.7: Golden plover observations recorded during VP watches - non-breeding season 2021-22

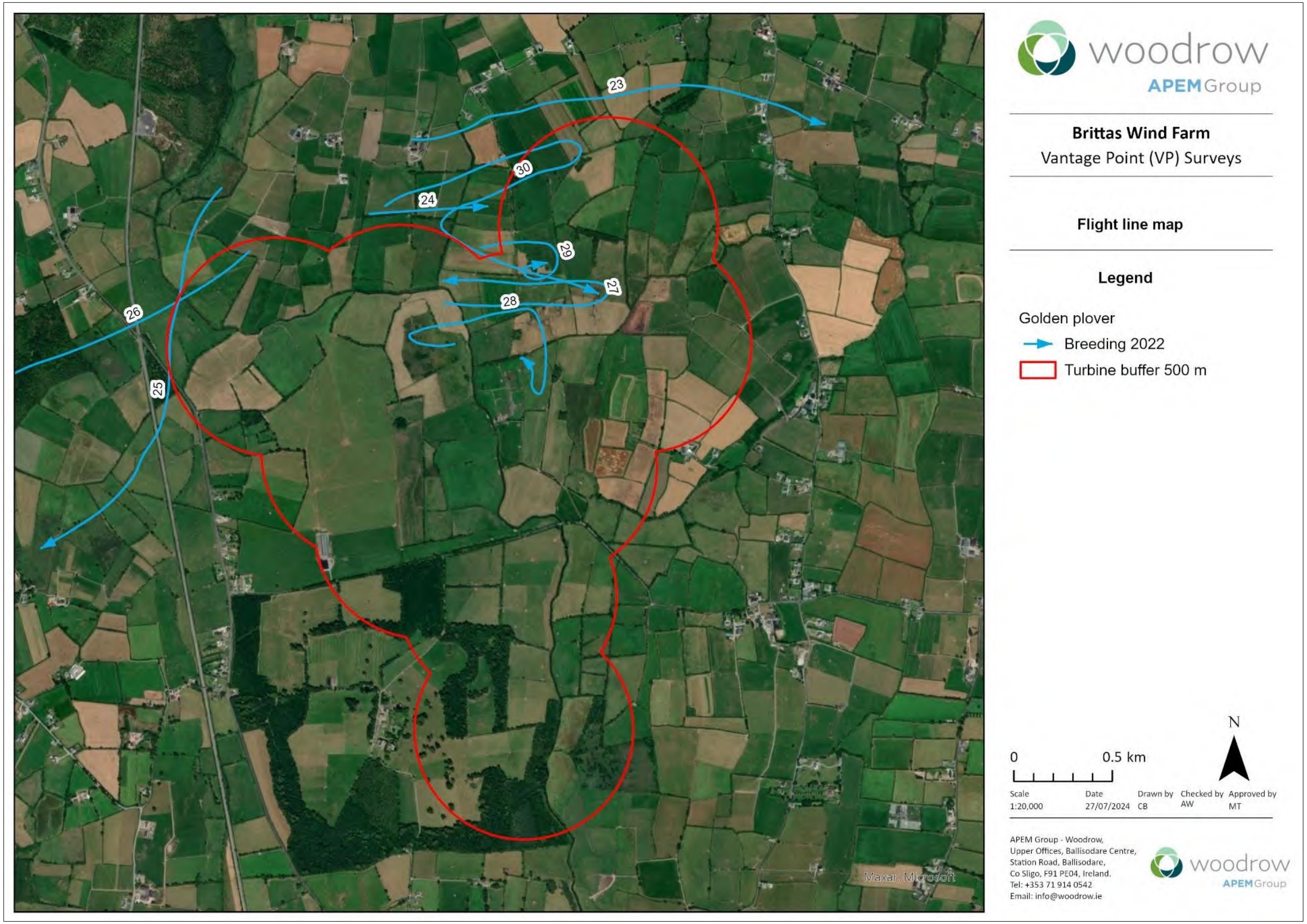

Figure 7E.8: Golden plover observations recorded during VP watches - breeding season 2022

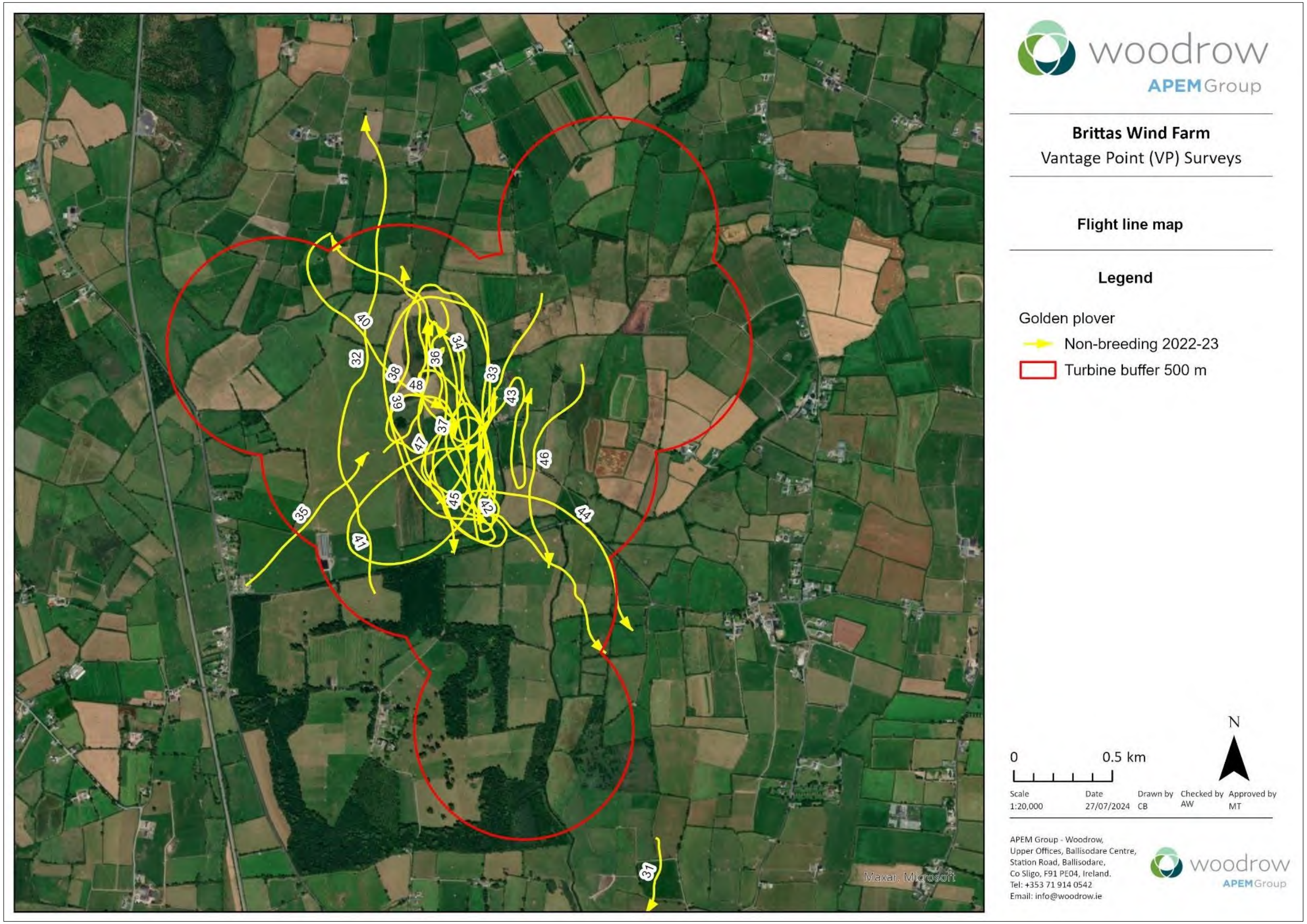

Figure 7E.9: Golden plover observations recorded during VP watches - non-breeding season 2022-23

Table 7E.7: Golden plover data collected during VP watches

Aggregate seconds = flight/observation time x by the number of birds recorded
Recorded within 500 m turbine buffer
Recorded on boundary of 500 m turbine buffer – flight seconds will be clipped
Recorded beyond 500 m turbine buffer or non-flight observation – time will be excluded from CRM

Map ID	Season	VP No	Date	Time	No. of birds	Aggregate seconds recorded	Height (m)	Flight range	Sex	Age	Behaviour	Comments
1	Non-breeding 2021-22	1	24/10/2021	1033	94	16,920	50	50			Commuting	Circling high and then left area
2	Non-breeding 2021-22	2	23/10/2021	1717	14	840	50	50			Commuting	
3	Non-breeding 2021-22	3	26/10/2021	0907	5	75	30	30			Commuting	
4	Non-breeding 2021-22	3	26/10/2021	1011	62	11,160	50	50			Circling	
5	Non-breeding 2021-22	3	26/10/2021	1015	120	28,800	100	100			Circling	
6	Non-breeding 2021-22	3	26/10/2021	1308	72	9,360	60	60			Commuting	
7	Non-breeding 2021-22	3	23/11/2021	1318	19	570	40	40			Commuting	
8	Non-breeding 2021-22	3	23/11/2021	1356	72	2,880	50	30-50			Circling	
9	Non-breeding 2021-22	3	23/11/2021	1357	72	720	30	0-30			Circling	
10	Non-breeding 2021-22	3	23/11/2021	1357	72	720	0	0			Landed	Flock lands over period of c. 10 seconds
11	Non-breeding 2021-22	3	23/11/2021	1419	24	480	25	25			Circling	
12	Non-breeding 2021-22	3	24/11/2021	1046	17	340	10	10			Commuting	
13	Non-breeding 2021-22	3	24/11/2021	1051	47	2,820	25	25			Commuting	
14	Non-breeding 2021-22	3	21/12/2021	1013	4	80	40	40			Commuting	
15	Non-breeding 2021-22	4	24/10/2021	1654	3	180	30	30			Circling	
16	Non-breeding 2021-22	4	24/10/2021	1705	5	150	50	50			Commuting	
17	Non-breeding 2021-22	4	25/10/2021	0855	160	19,200	100	100			Commuting	
18	Non-breeding 2021-22	4	25/10/2021	0901	80	9,600	40	40			Circling	
19	Non-breeding 2021-22	4	25/10/2021	0915	120	54,000	50	30-50			Circling	Flock circling over area for 15 mins
20	Non-breeding 2021-22	4	25/10/2021	0930	120	54,000	30	30-50			Circling	
21	Non-breeding 2021-22	4	25/10/2021	1012	110	3,300	20	20			Commuting	
22	Non-breeding 2021-22	4	12/11/2021	0835	100	6,000	15	15			Circling	
23	Breeding 2022	2	13/04/2022	1140	40	4,600	50	40-50			Commuting	Two groups landed off site total 70-80 birds
24	Breeding 2022	3	18/04/2022	1145	60	18,000	100	80-100			Commuting	At edge of 500 m buffer
25	Breeding 2022	3	18/04/2022	1240	33	2,640	40	10-40			Commuting	SW away from site
26	Breeding 2022	3	18/04/2022	1547	30	1,800	25	10-25			Commuting	Through site
27	Breeding 2022	4	12/04/2022	1700	18	3,240	40	30-40			Circling	
28	Breeding 2022	4	12/04/2022	1715	40	9,200	80	50-80			Circling	
29	Breeding 2022	4	12/04/2022	1823	45	18,900	30	10-30			Circling	Landed, likely roosting
30	Breeding 2022	4	12/04/2022	1422	60	39,600	210	150-210			Circling	High up going out of view behind cloud

Map ID	Season	VP No	Date	Time	No. of birds	Aggregate seconds recorded	Height (m)	Flight range	Sex	Age	Behaviour	Comments
31	Non-breeding 2022-23	1	25/01/2023	1354	7	210	30	0-30			Flying	Landing into improved grassland
32	Non-breeding 2022-23	2	28/11/2022	1045	30	1,350	50	40-60			Flying	Flew north along river
33	Non-breeding 2022-23	2	28/11/2022	1125	40	800	50	40-60			Flying	Mixed flock of GP & L, flying along river flood plain
34	Non-breeding 2022-23	2	28/11/2022	1127	120	6,000	60	50-70			Flying	Mixed flock of GP & L
35	Non-breeding 2022-23	2	28/11/2022	1151	350	35,000	100	100-140			Flying	Mixed flock of GP & L
36	Non-breeding 2022-23	2	28/11/2022	1152	350	22,750	60	50-70			Flying	Flock continuing north
37	Non-breeding 2022-23	2	28/11/2022	1156	20	600	20	15-25			Flying	Mixed flock took flight, looped around, returning to roughly same spot
38	Non-breeding 2022-23	2	28/11/2022	1210	400	192,000	50	40-120			Circling	Big mixed flocks circling for 8 minutes, many separate flocks at different heights, tough to track
39	Non-breeding 2022-23	2	28/11/2022	1210	120	57,600	50	40-120			Circling	Big mixed flocks circling for 8 minutes, many separate flocks at different heights, tough to track
40	Non-breeding 2022-23	2	28/11/2022	1305	200	48,000	40	30-50			Flying	Sub-flock relocating in floodplain
41	Non-breeding 2022-23	2	28/11/2022	1430	50	4,000	80	70-100			Flying	Mixed flock of GP & L, flying along river flood plain
42	Non-breeding 2022-23	3	29/11/2022	1057	250	30,000	200	100-250			Circling	Circling flock around floods NW of VP4
43	Non-breeding 2022-23	3	29/11/2022	1120	70	6,300	80	70-90			Circling	Circling flock around floods NW of VP4
44	Non-breeding 2022-23	3	29/11/2022	1210	120	28,800	200	150-250			Flying	Flew SE along river valley
45	Non-breeding 2022-23	3	29/11/2022	1307	60	7,200	80	60-100			Flying	Flying SE along river
46	Non-breeding 2022-23	4	30/11/2022	1112	27	810	30	30			Flying	
47	Non-breeding 2022-23	4	30/11/2022	1319	3	120	40	30-60			Flying	
48	Non-breeding 2022-23	4	29/12/2022	1143	70	8,750	30	30-60			Flying	Flying up then settling back on flooded area

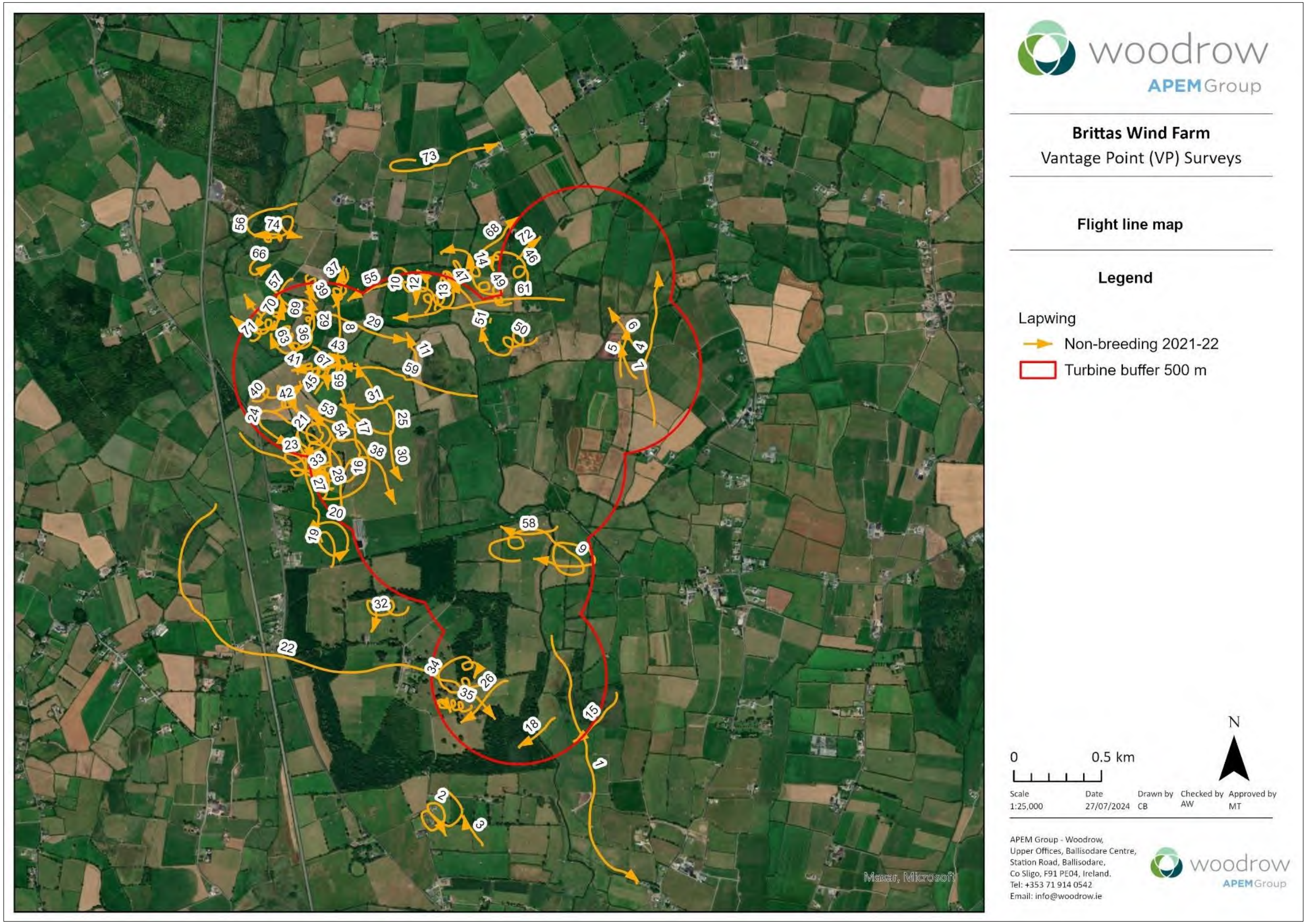

Figure 7E.10: Lapwing observations recorded during VP watches - non-breeding season 2021-22

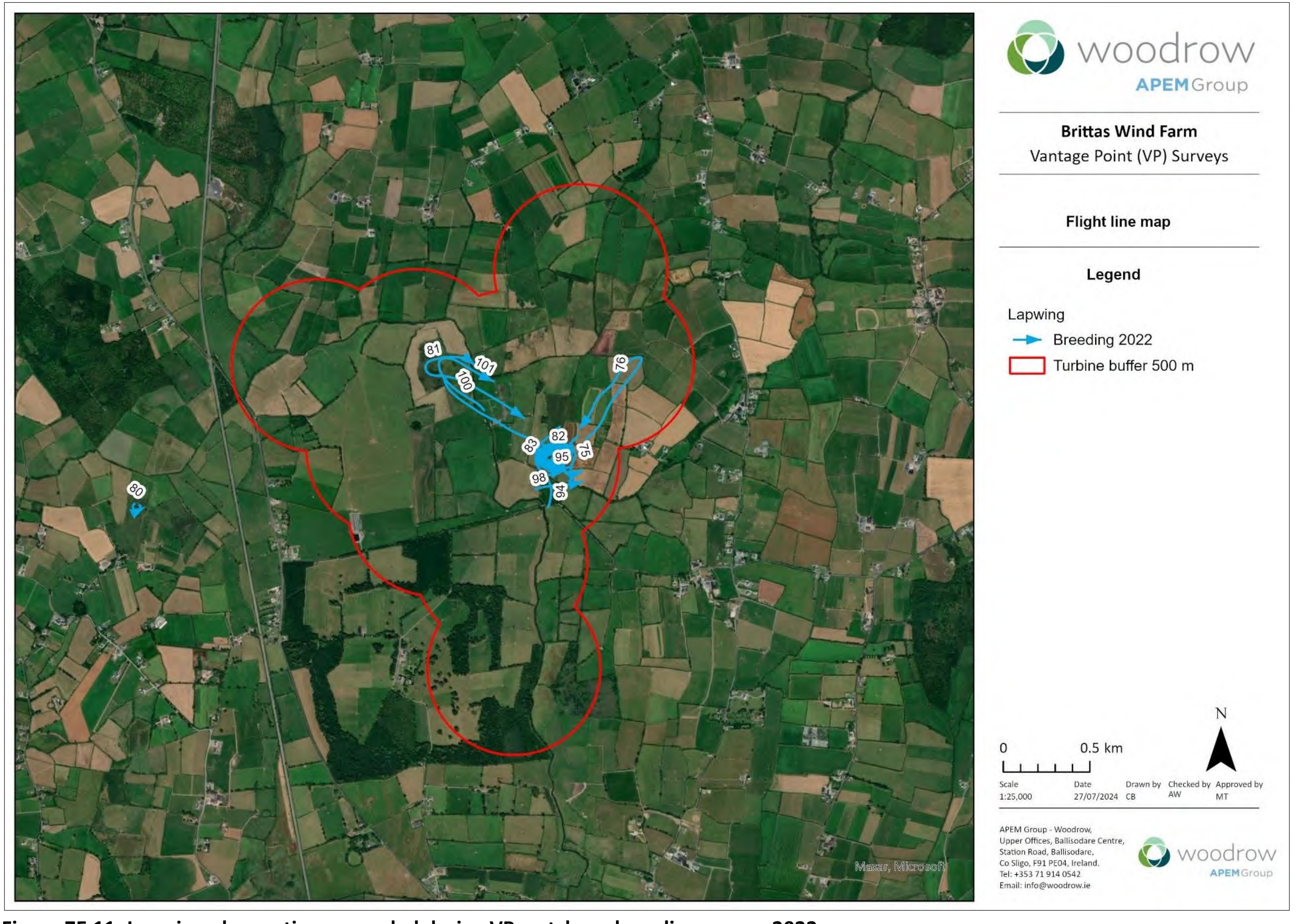

Figure 7E.11: Lapwing observations recorded during VP watches - breeding season 2022

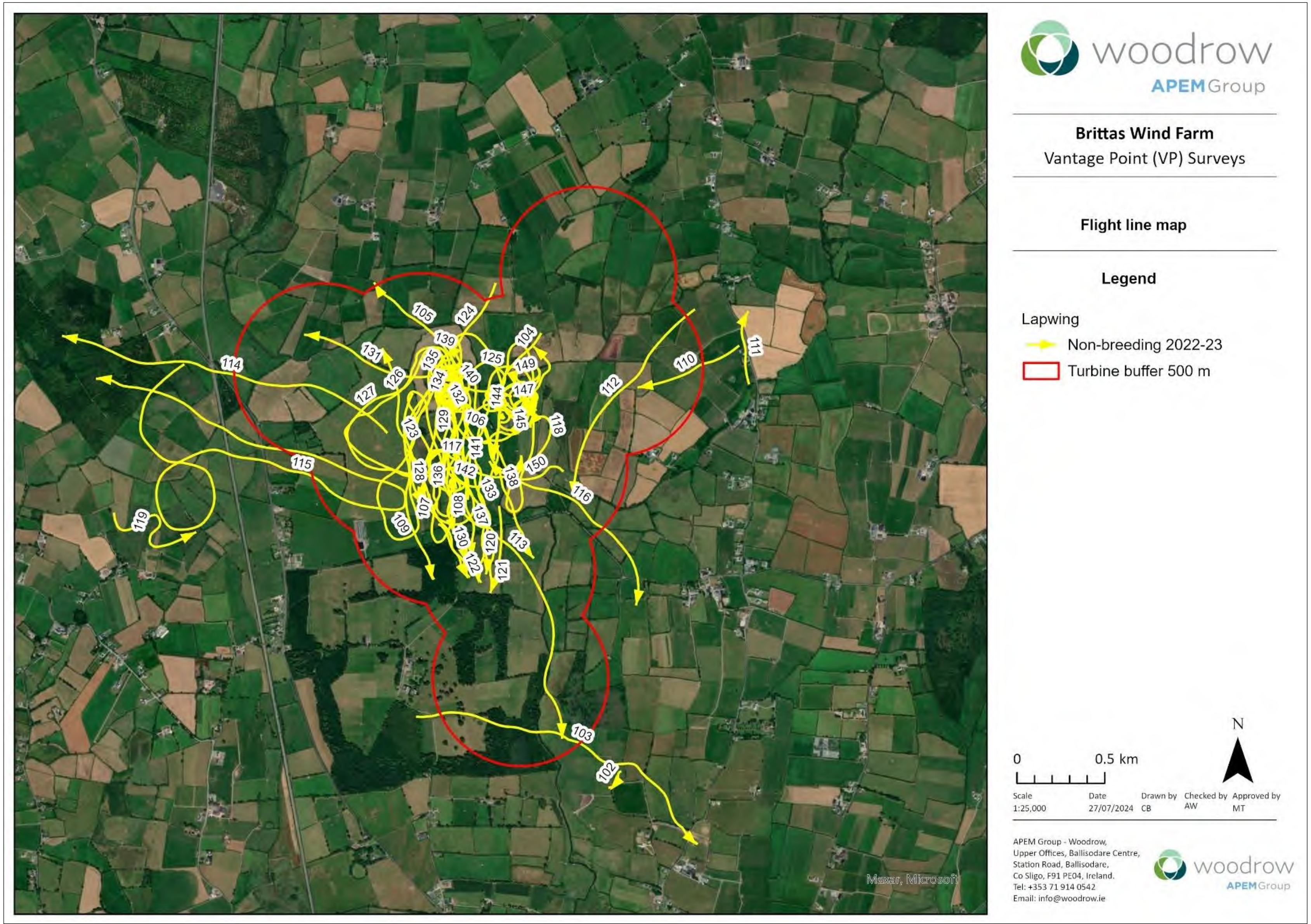

Figure 7E.12: Lapwing observations recorded during VP watches - non-breeding season 2022-23

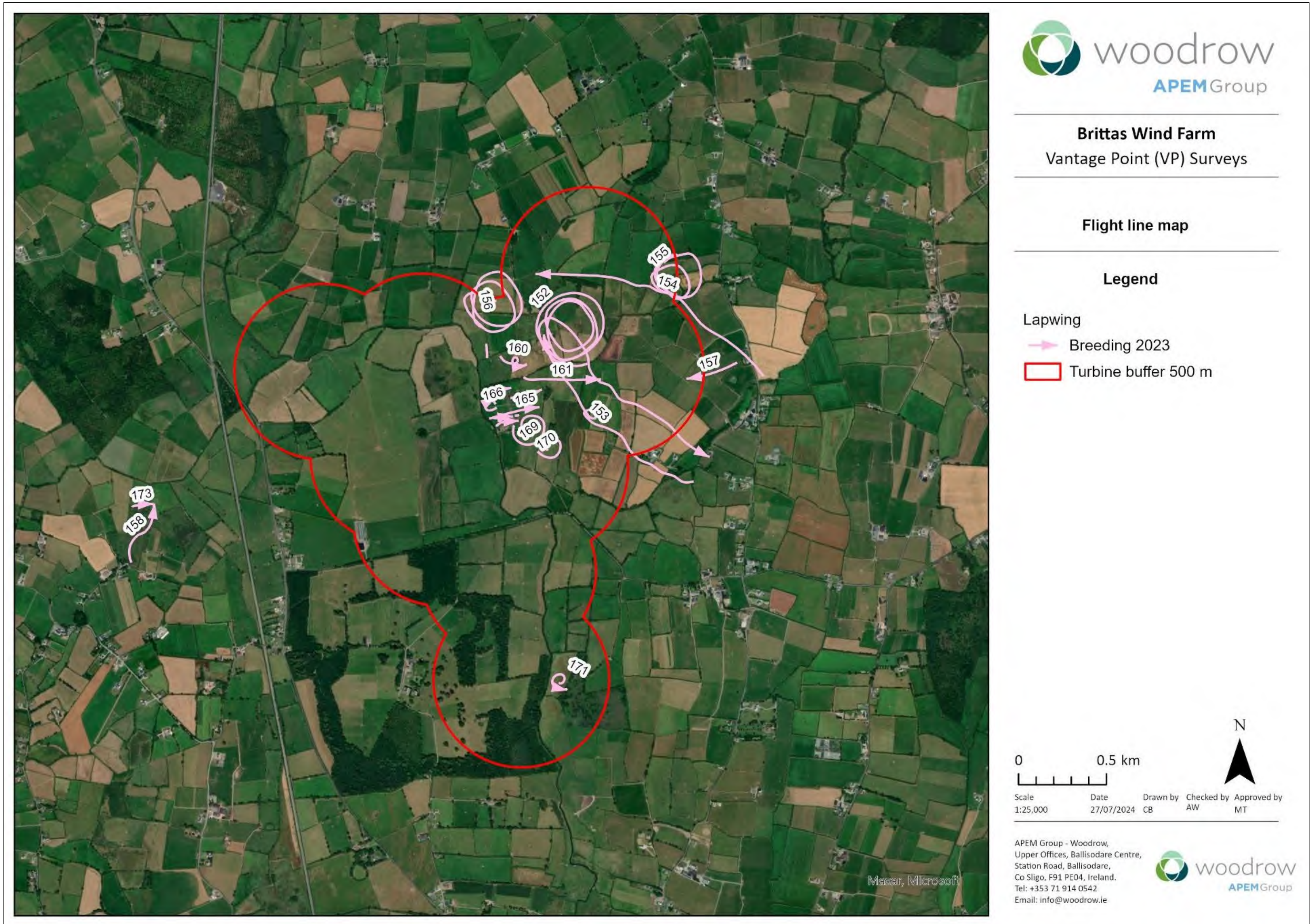

Figure 7E.13: Lapwing observations recorded during VP watches - breeding season 2023

Table 7E.8: Lapwing data collected during VP watches

Aggregate seconds = flight/observation time x by the number of birds recorded
Recorded within 500 m turbine buffer
Recorded on boundary of 500 m turbine buffer – flight seconds will be clipped
Recorded beyond 500 m turbine buffer or non-flight observation – time will be excluded from CRM

Map ID	Season	VP No.	Date	Time	No. of birds	Aggregated seconds recorded	Height (m)	Flight range	Sex	Age	Behaviour	Comment
1	Non-breeding 2021-22	1	24/10/2021	0927	9	810	15	15			Commuting	
2	Non-breeding 2021-22	1	11/11/2021	1046	40	2,400	35	35			Circling	
3	Non-breeding 2021-22	1	18/01/2022	1216	4	80	30	30			Commuting	
4	Non-breeding 2021-22	2	23/10/2021	1402	11	1,320	30	30			Commuting	
5	Non-breeding 2021-22	2	23/10/2021	1438	6	90	20	20			Commuting	
6	Non-breeding 2021-22	2	22/11/2021	0917	3	180	35	35			Commuting	
7	Non-breeding 2021-22	2	22/11/2021	0946	1	60	40	40			Commuting	
8	Non-breeding 2021-22	2	22/11/2021	1149	28	3,360	40	40			Commuting	
9	Non-breeding 2021-22	2	22/11/2021	1242	112	13,440	40	40			Circling	
10	Non-breeding 2021-22	2	01/12/2021	1237	37	370	20	20			Circling	
11	Non-breeding 2021-22	2	01/12/2021	1402	6	60	20	20			Commuting	
12	Non-breeding 2021-22	2	20/12/2021	0958	36	720	35	35			Circling	
13	Non-breeding 2021-22	2	20/12/2021	1127	48	2,880	25	25			Circling	
14	Non-breeding 2021-22	2	26/02/2022	1546	32	1,920	40	40			Circling	
15	Non-breeding 2021-22	3	26/10/2021	0850	90	5,400	40	40			Commuting	
16	Non-breeding 2021-22	3	26/10/2021	0939	33	2,640	20	20-40			Circling	
17	Non-breeding 2021-22	3	26/10/2021	0941	33	330	40	40			Circling	
18	Non-breeding 2021-22	3	26/10/2021	0944	42	2,520	30	30			Commuting	
19	Non-breeding 2021-22	3	26/10/2021	0957	56	3,360	20	0-20			Circling	
20	Non-breeding 2021-22	3	26/10/2021	0958	56	0	0	0			Landed	
21	Non-breeding 2021-22	3	26/10/2021	1005	36	4,320	25	25			Circling	
22	Non-breeding 2021-22	3	26/10/2021	1014	42	6,720	25	25			Commuting	
23	Non-breeding 2021-22	3	26/10/2021	1050	36	2,160	40	40			Circling	
24	Non-breeding 2021-22	3	26/10/2021	1206	46	11,040	40	40			Circling	
25	Non-breeding 2021-22	3	26/10/2021	1307	44	2,640	40	40			Commuting	
26	Non-breeding 2021-22	3	26/10/2021	1353	11	110	40	40			Commuting	
27	Non-breeding 2021-22	3	23/11/2021	1232	56	1,680	40	40			Commuting	
28	Non-breeding 2021-22	3	23/11/2021	1419	80	2,400	10	10			Circling	

Map ID	Season	VP No.	Date	Time	No. of birds	Aggregated seconds recorded	Height (m)	Flight range	Sex	Age	Behaviour	Comment
29	Non-breeding 2021-22	3	23/11/2021	1436	60	3,600	40	40			Commuting	
30	Non-breeding 2021-22	3	24/11/2021	0827	14	420	35	35			Commuting	
31	Non-breeding 2021-22	3	24/11/2021	0914	36	720	20	20			Commuting	
32	Non-breeding 2021-22	3	24/11/2021	1035	11	660	20	20			Circling	
33	Non-breeding 2021-22	3	24/11/2021	1039	86	10,320	20	20			Circling	
34	Non-breeding 2021-22	3	02/12/2021	1413	44	7,040	20	20			Circling	
35	Non-breeding 2021-22	3	02/12/2021	1425	27	810	20	20			Circling	
36	Non-breeding 2021-22	3	16/12/2021	1314	160	6,400	20	20			Circling	
37	Non-breeding 2021-22	3	16/12/2021	1345	160	4,800	45	45			Circling	
38	Non-breeding 2021-22	3	16/12/2021	1352	72	2,880	25	25			Commuting	
39	Non-breeding 2021-22	3	16/12/2021	1422	80	2,400	20	20			Circling	
40	Non-breeding 2021-22	3	21/12/2021	0946	82	4,920	35	0-35			Circling	
41	Non-breeding 2021-22	3	21/12/2021	0947	82	0	0	0			Landed	
42	Non-breeding 2021-22	3	21/12/2021	1033	36	360	20	20			Circling	
43	Non-breeding 2021-22	3	21/12/2021	1041	96	2,880	25	20-25			Circling	
44	Non-breeding 2021-22	3	21/12/2021	1042	96	2,880	20	0-20			Circling	
45	Non-breeding 2021-22	3	21/12/2021	1042	96	960	0	0			Landed	Flock landing over c. 10 secs
46	Non-breeding 2021-22	3	19/01/2022	0852	30	900	25	25			Circling	
47	Non-breeding 2021-22	3	19/01/2022	0945	90	2,700	30	30			Flying	
48	Non-breeding 2021-22	3	19/01/2022	0945	20	200	20	20			Flying	
49	Non-breeding 2021-22	3	19/01/2022	0954	60	10,800	50	50			Circling	
50	Non-breeding 2021-22	3	19/01/2022	1026	120	3,600	30	30			Flying	
51	Non-breeding 2021-22	3	19/01/2022	1027	120	0	30	0-30			Landed	
52	Non-breeding 2021-22	3	23/01/2022	0849	20	600	30	30			Commuting	
53	Non-breeding 2021-22	3	23/01/2022	0932	4	80	15	15			Flying	
54	Non-breeding 2021-22	3	23/01/2022	0942	3	60	15	15			Flying	
55	Non-breeding 2021-22	4	24/10/2021	1502	14	840	35	35			Commuting	
56	Non-breeding 2021-22	4	24/10/2021	1654	46	2,760	30	30			Circling	46 L. and 3 GP Associated
57	Non-breeding 2021-22	4	24/10/2021	1712	38	2,280	40	40			Commuting	
58	Non-breeding 2021-22	4	24/10/2021	1725	22	660	20	20			Commuting	
59	Non-breeding 2021-22	4	24/10/2021	1728	44	4,400	15	15-30			Commuting	
60	Non-breeding 2021-22	4	24/10/2021	1729	44	1,100	30	30			Commuting	
61	Non-breeding 2021-22	4	25/10/2021	1028	78	7,020	25	25			Commuting	
62	Non-breeding 2021-22	4	12/11/2021	0949	146	2,190	10	10-15			Circling	

Map ID	Season	VP No.	Date	Time	No. of birds	Aggregated seconds recorded	Height (m)	Flight range	Sex	Age	Behaviour	Comment
63	Non-breeding 2021-22	4	12/11/2021	0950	146	2,190	15	0-15			Circling	
64	Non-breeding 2021-22	4	12/11/2021	0951	146	0	0	0			Landed	
65	Non-breeding 2021-22	4	13/11/2021	1235	40	1,600	15	15			Circling	
66	Non-breeding 2021-22	4	02/12/2021	1032	32	160	10	10			Flying	Up and back down
67	Non-breeding 2021-22	4	17/12/2021	1432	67	2,010	20	20			Circling	
68	Non-breeding 2021-22	4	17/12/2021	1452	30	1,200	35	35			Commuting	
69	Non-breeding 2021-22	4	20/12/2021	1312	86	5,160	25	25			Circling	
70	Non-breeding 2021-22	4	20/12/2021	1436	32	320	10	10			Flying	Up and back down
71	Non-breeding 2021-22	4	09/01/2022	1320	54	1,080	20	20			Circling	
72	Non-breeding 2021-22	4	19/01/2022	1206	38	1,520	35	35			Commuting	
73	Non-breeding 2021-22	4	19/01/2022	1355	120	14,400	50	50			Circling	
74	Non-breeding 2021-22	4	24/02/2022	1314	46	1,380	25	25			Circling	
75	Breeding 2022	2	13/04/2022	1130	1	45	15	6-15			Displaying	
76	Breeding 2022	2	13/04/2022	1220	2	120	20	6-20			Displaying	
77	Breeding 2022	2	13/05/2022	1025	1	10	5	2-6			Flying	Low over breeding area
78	Breeding 2022	2	13/05/2022	1105	2	30	5	5			Mobbing	Territorial breeding behaviour, mobbing HC
79	Breeding 2022	2	13/05/2022	1540	1	20	5	5			Alarm call	Aggressive towards buzzard
80	Breeding 2022	3	12/05/2022	1116	2	0	0	0			Breeding/territorial	Male copulation with female, outside 500m buffer
81	Breeding 2022	4	12/04/2022	1617	2	320	20	6-20			Displaying	Brief display
82	Breeding 2022	4	12/04/2022	1625	2	60	25	6-25			Displaying	calling
83	Breeding 2022	4	12/04/2022	1640	1	20	15	6-15			Displaying	
84	Breeding 2022	4	12/04/2022	1705	2	60	10	5-10			Displaying	
85	Breeding 2022	4	12/04/2022	1735	5	300	25	6-25			Displaying	
86	Breeding 2022	4	12/04/2022	1745	1	20	5	5			Displaying	Landed
87	Breeding 2022	4	12/04/2022	1845	2	200	20	6-20			Displaying	Landed, breeding attempt in this area.
88	Breeding 2022	4	12/04/2022	1235	5	600	15	6-15			Displaying	Cultivated land - breeding probable
89	Breeding 2022	4	12/04/2022	1250	5	300	15	6-15			Displaying	3-4 pairs
90	Breeding 2022	4	12/04/2022	1251	2	400	15	6-15			Displaying	Mobbing predators/calling/displaying
91	Breeding 2022	4	12/04/2022	1321	2	80	5	5			Alarm call	At predator
92	Breeding 2022	4	12/04/2022	1340	4	560	15	6-15			Displaying	
93	Breeding 2022	4	12/04/2022	1344	4	760	15	6-15			Displaying	calling
94	Breeding 2022	4	12/04/2022	1410	10	800	15	6-15			Displaying	Up to 5 pairs present
95	Breeding 2022	4	12/04/2022	1420	7	840	15	6-15			Alarm call	Mobbing hc/displaying/alarm
96	Breeding 2022	4	12/04/2022	1436	2	120	15	6-15			Alarm call	Displaying/ alarm

Map ID	Season	VP No.	Date	Time	No. of birds	Aggregated seconds recorded	Height (m)	Flight range	Sex	Age	Behaviour	Comment
97	Breeding 2022	4	12/04/2022	1452	2	120	25	6-25			Alarm call	Displaying/ alarm
98	Breeding 2022	4	06/05/2022	1045	2	90	5	1-6	M		Displaying	Brief display, went put of view
99	Breeding 2022	4	06/05/2022	1328	1	30	10	1-10	M		Landed	Flying around field
100	Breeding 2022	4	06/05/2022	1335	2	180	20	1-20			circling	Landed on cultivated field
101	Breeding 2022	4	06/05/2022	1450	1	80	20	1-20			circling	Landed on cultivated field
102	Non-breeding 2022-23	1	24/10/2022	1619	1	6	12	10-15			Present	
103	Non-breeding 2022-23	1	27/11/2022	1533	28	1,400	40	30-50			Flying	
104	Non-breeding 2022-23	2	28/11/2022	1125	25	500	50	40-60			Flying	Mixed flock of GP and L, flying along river flood plain
105	Non-breeding 2022-23	2	28/11/2022	1127	7	350	60	50-70			Flying	Mixed flock
106	Non-breeding 2022-23	2	28/11/2022	1156	80	2,400	20	15-25			Flying	Mixed flock took flight and looped around, returning to roughly same spot
107	Non-breeding 2022-23	2	28/11/2022	1320	40	1,200	20	10-25			Flying	Low flying flock along floods
108	Non-breeding 2022-23	2	28/11/2022	1332	80	7,200	25	20-40			Flying	
109	Non-breeding 2022-23	2	28/11/2022	1407	60	5,400	80	70-100			Circling	Circling floodwater
110	Non-breeding 2022-23	2	15/01/2023	1341	1	12	40	40-50			Commuting	Commute Flight
111	Non-breeding 2022-23	2	06/02/2023	1532	6	9	40	30-40			Commuting	Commute
112	Non-breeding 2022-23	2	06/03/2023	0938	3	150	150	120-150			Commuting	
113	Non-breeding 2022-23	3	29/11/2022	1210	200	120,000	80	80-120			Flying	Flock flew SE along river valley
114	Non-breeding 2022-23	3	29/11/2022	1231	30	3,600	120	100-150			Flying	Flocked headed NW, split from 6 continued W
115	Non-breeding 2022-23	3	29/11/2022	1227	90	43,200	120	100-150			Flying	Flocked headed NW, split from 5 looped SE, headed NW
116	Non-breeding 2022-23	3	29/11/2022	1305	40	3,600	150	120-180			Flying	Headed SE along river valley
117	Non-breeding 2022-23	3	29/11/2022	1357	35	7,000	60	50-80			Flying	
118	Non-breeding 2022-23	3	29/11/2022	1609	120	57,600	75	60-80			Flying	
119	Non-breeding 2022-23	3	29/12/2022	1320	62	5,890	40	40-50			Commuting	Slow commuting flight through area
120	Non-breeding 2022-23	4	30/11/2022	1034	50	1,150	15	15				
121	Non-breeding 2022-23	4	30/11/2022	1103	130	39,000	20	20-40				
122	Non-breeding 2022-23	4	30/11/2022	1143	7	245	15	15				
123	Non-breeding 2022-23	4	30/11/2022	1144	47	3,525	25	20-40				
124	Non-breeding 2022-23	4	30/11/2022	1230	18	1,170	30	20-40				
125	Non-breeding 2022-23	4	30/11/2022	1241	15	600	15	10-20				
126	Non-breeding 2022-23	4	30/11/2022	1242	110	8,800	30	40-60				
127	Non-breeding 2022-23	4	30/11/2022	1320	60	14,400	240	3-10				
128	Non-breeding 2022-23	4	30/11/2022	1325	20	800	40	35-60				
129	Non-breeding 2022-23	4	30/11/2022	1319	50	2,000	40	30-60				

Map ID	Season	VP No.	Date	Time	No. of birds	Aggregated seconds recorded	Height (m)	Flight range	Sex	Age	Behaviour	Comment
130	Non-breeding 2022-23	4	30/11/2022	1326	8	360	30	20-40				
131	Non-breeding 2022-23	4	30/11/2022	1326	120	18,000	110	100-120				
132	Non-breeding 2022-23	4	30/11/2022	1403	150	36,000	70	40-120			Circling	Circling area A
133	Non-breeding 2022-23	4	30/11/2022	1407	15	600	90	80-120			Flying	Flying south along river
134	Non-breeding 2022-23	4	30/11/2022	1420	95	14,250	75	0-75			Circling	Circling area A
135	Non-breeding 2022-23	4	30/11/2022	1428	60	5,400	80	60-90			Circling	Circling area A
136	Non-breeding 2022-23	4	30/11/2022	1429	5	250	90	80-100			Flying	Flying south along flood plain
137	Non-breeding 2022-23	4	30/11/2022	1430	20	1,400	50	40-60			Flying	Flying south to west of river
138	Non-breeding 2022-23	4	30/11/2022	1446	40	2,000	90	80-100			Flying	Flying south along river
139	Non-breeding 2022-23	4	30/11/2022	1447	30	3,600	50	30-60			Circling	Circling area A
140	Non-breeding 2022-23	4	30/11/2022	1542	90	21,600	60	50-70			Circling	Circling area A
141	Non-breeding 2022-23	4	29/12/2022	0958	80	19,200	50	50-60			Circling	Circling flight, settling back down on flooded field
142	Non-breeding 2022-23	4	29/12/2022	1048	120	8,400	30	30-40			Flying	Flying, circling wit DN, dropping back down on site
143	Non-breeding 2022-23	4	22/01/2023	1116	40	320	40	0-40			Flying	Disturbed, took flight and eventually settled again
144	Non-breeding 2022-23	4	22/01/2023	1426	45	2,250	90	50-80			Circling	Circling wetland, likely disturbed
145	Non-breeding 2022-23	4	19/02/2023	1015	60	960	50	0-50			Flying	Disturbed, lifted from ground
145	Non-breeding 2022-23	4	19/02/2023	1015	60	960	50	0-50			Flying	Disturbed, lifted from ground
147	Non-breeding 2022-23	4	19/02/2023	1121	55	660	50	0-50			Flying	Disturbed, lifted from ground
148	Non-breeding 2022-23	4	19/02/2023	1305	40	800	50	0-50			Flying	Disturbed, lifted from ground
149	Non-breeding 2022-23	4	19/02/2023	1321	60	720	50	0-50			Flying	Disturbed, lifted from ground
150	Non-breeding 2022-23	4	06/03/2023	1408	2	1,090	25	25-30			Flying	Descending on to GS4
151	Non-breeding 2022-23	4	26/03/2023	1758	8	96	40	0-40			Flying	Disturbed, flew and resettled
152	Breeding 2023	2	06/03/2023	1410	3	945	100	10-200			Displaying	Displaying over fields then left area
153	Breeding 2023	2	06/03/2023	1440	1	120	50	40-60			Commuting	Towards display area
154	Breeding 2023	2	06/03/2023	1440	19	1,710	100	90-110			Commuting	Towards display area
155	Breeding 2023	2	06/03/2023	1449	2	240	100	50-150			Displaying	Tumbling/diving/calling
156	Breeding 2023	2	06/03/2023	1541	3	270	25	20-30			Displaying	Tumbling/diving/calling
157	Breeding 2023	2	25/03/2023	1420	3	24	60	50-60			Commuting	
158	Breeding 2023	3	25/03/2023	1629	1	12	70	60-70			Commuting	Commute Flight
162	Breeding 2023	4	29/04/2023	1716	1	15	8	1-15			Flying	
163	Breeding 2023	4	29/04/2023	1726	2	0	0	0			On ground	
164	Breeding 2023	4	30/04/2023	0842	3	135	13	1-25			Displaying	
165	Breeding 2023	4	30/04/2023	0910	2	60	13	1-25			Displaying	
166	Breeding 2023	4	30/04/2023	0925	2	120	15	1-30			Displaying	

Map ID	Season	VP No.	Date	Time	No. of birds	Aggregated seconds recorded	Height (m)	Flight range	Sex	Age	Behaviour	Comment
167	Breeding 2023	4	30/04/2023	0938	4	196	38	30-45			Displaying	
168	Breeding 2023	4	30/04/2023	1001	4	120	25	0-50			Displaying	
169	Breeding 2023	2	29/04/2023	1059	3	60	95	80-110			Displaying	
170	Breeding 2023	2	29/04/2023	1116	3	138	100	80-120			Circling	
172	Breeding 2023	3	22/04/2023	1509	1	27	20	10-30			Flying	
173	Breeding 2023	3	22/04/2023	1513	2	30	60	10-80			Mobbing	
159	Breeding 2023	4	16/06/2023	0838	1	10	15	15			Mobbing	Mobbing two HC
160	Breeding 2023	4	16/06/2023	0929	6	360	30	30-40			Circling	
161	Breeding 2023	4	16/06/2023	0937	4	360	50	50			Flying	Different birds to flightline 17 all four birds in heavy moult
171	Breeding 2023	1	23/04/2023	1029	1	45	25	20-30			Displaying	

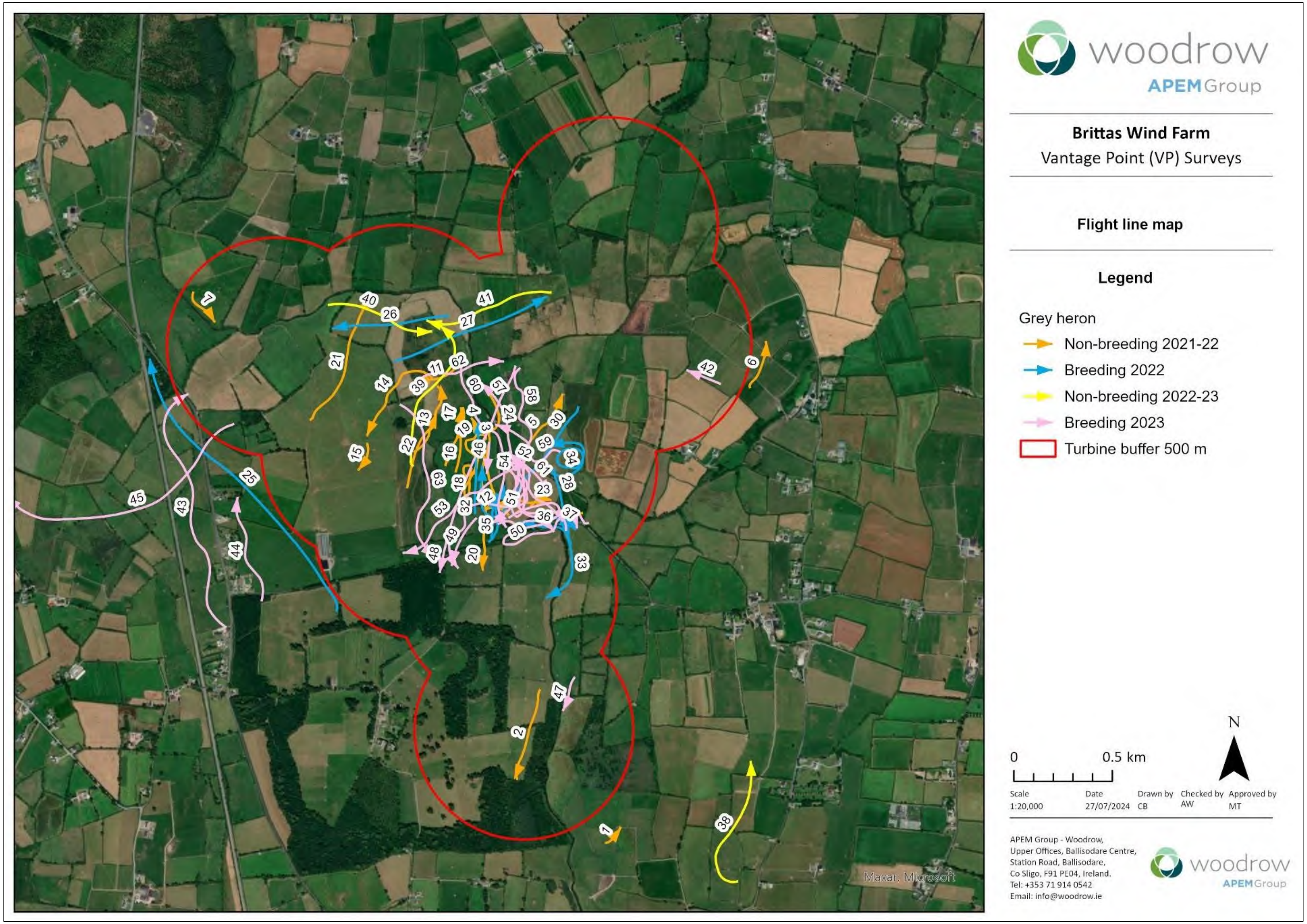

Figure 7E.14: Grey heron observations recorded during VP watches

Table 7E.9: Grey heron data collected during VP watches

Aggregate seconds = flight/observation time x by the number of birds recorded
Recorded within 500 m turbine buffer
Recorded on boundary of 500 m turbine buffer – flight seconds will be clipped
Recorded beyond 500 m turbine buffer or non-flight observation – time will be excluded from CRM

Map ID	Season	VP No	Date	Time	No. of birds	Aggregated seconds recorded	Height (m)	Flight range	Sex	Age	Behaviour	Comments
1	Non-breeding 2021-22	1	11/11/2021	1444	1	5	10	10			Commuting	
2	Non-breeding 2021-22	1	20/01/2022	1510	1	70	30	30			Commuting	
3	Non-breeding 2021-22	2	22/01/2022	1444	2	240	30	30			Commuting	
4	Non-breeding 2021-22	2	22/01/2022	1541	1	30	25	25			Commuting	
5	Non-breeding 2021-22	2	08/02/2022	1406	1	30	20	20		Ad	Flying	
6	Non-breeding 2021-22	2	26/02/2022	1658	2	80	25	25		Ad	Commuting	
7	Non-breeding 2021-22	3	24/02/2022	1644	1	30	15	15			Flying	
8	Non-breeding 2021-22	4	24/10/2021	1500	3	30	3	3-0			Flying	
9	Non-breeding 2021-22	4	24/10/2021	1501	3	0	0	0			Landed	
10	Non-breeding 2021-22	4	25/10/2021	0830	1	10	5	5		Ad	Commuting	
11	Non-breeding 2021-22	4	12/11/2021	0819	1	10	5	5			Flying	
12	Non-breeding 2021-22	4	12/11/2021	0844	1	30	5	5			Flying	
13	Non-breeding 2021-22	4	13/11/2021	1135	1	20	15	15-5			Commuting	Coming into land saw hunters and away
14	Non-breeding 2021-22	4	13/11/2021	1136	1	10	5	5-20			Commuting	
15	Non-breeding 2021-22	4	13/11/2021	1136	1	20	20	20			Commuting	
16	Non-breeding 2021-22	4	13/11/2021	1259	1	15	3	3-0			Flying	
17	Non-breeding 2021-22	4	13/11/2021	1300	1	0	0	0			Landed	
18	Non-breeding 2021-22	4	20/12/2021	1243	1	30	15	15-0			Flying	
19	Non-breeding 2021-22	4	20/12/2021	1244	1	0	0	0			Landed	
20	Non-breeding 2021-22	4	09/01/2022	1244	1	30	25	25		Ad	Commuting	
21	Non-breeding 2021-22	4	09/01/2022	1458	2	80	15	15			Flying	
22	Non-breeding 2021-22	4	19/01/2022	1209	1	20	15	15			Flying	
23	Non-breeding 2021-22	4	26/02/2022	810	1	10	5	5-0		Ad	Flying	
24	Non-breeding 2021-22	4	07/03/2022	1255	1	15	5	5		Ad	Commuting	Mobbed by HC
25	Breeding 2022	3	12/05/2022	1115	1	90	10	10			Commuting	
26	Breeding 2022	4	12/04/2022	1645	1	60	30	20-30			Commuting	
27	Breeding 2022	4	12/04/2022	1659	1	30	80	70-80			Commuting	
28	Breeding 2022	4	12/04/2022	1751	1	20	10	10			Commuting	
29	Breeding 2022	4	12/04/2022	1253	1	70	5	5-5			Commuting	landed
30	Breeding 2022	4	12/04/2022	1332	2	640	150	5-150			soaring	males displaying

Map ID	Season	VP No	Date	Time	No. of birds	Aggregated seconds recorded	Height (m)	Flight range	Sex	Age	Behaviour	Comments
31	Breeding 2022	4	06/05/2022	1028	1	15	5	5			Flying	
32	Breeding 2022	4	06/05/2022	1345	2	40	15	5-15			Commuting	together
33	Breeding 2022	4	02/06/2022	1248	1	45	15	10-20		Ad	Flying	Travelling Flight
34	Breeding 2022	4	03/06/2022	948	1	28	10	10-20		Ad	Flying	Descending along river bank.
35	Breeding 2022	4	02/07/2022	1218	1	35	15	10-20		Ad	Flying	
36	Breeding 2022	4	16/07/2022	0815	1	34	50	20-30		Ad	Flying	
37	Breeding 2022	4	22/08/2022	1320	1	20	20	15-20		Ad	Commuting	
38	Non-breeding 2022-23	1	25/01/2023	1353	1	36	60	0-60			Commuting	Flying NE
39	Non-breeding 2022-23	4	30/11/2022	1120	1	12	5					
40	Non-breeding 2022-23	4	30/11/2022	1121	2	50	8					
41	Non-breeding 2022-23	4	30/11/2022	1140	1	30	5	0-12				Missed from earlier
42	Breeding 2023	2	27/06/2023	1108	1	21	15	15-0			Flying	
43	Breeding 2023	3	28/06/2023	1101	1	19	30	30		Ad	Flying	
44	Breeding 2023	3	28/06/2023	1216	1	54	30	30		Ad	Flying	
45	Breeding 2023	3	16/08/2023	1541	1	15	40	40-		Ad	Flying	
46	Breeding 2023	4	16/06/2023	0750	1	10	5	5			Flying	
47	Breeding 2023	4	16/06/2023	0845	1	5	25	25		Ad	Flying	
48	Breeding 2023	4	26/06/2023	1739	1	90	50	50-0			Flying/Landed	
49	Breeding 2023	4	26/06/2023	1927	1	20	3	3			Flying	
50	Breeding 2023	4	27/06/2023	1522	1	54	4	0-4		Ad	Flying	
51	Breeding 2023	4	27/06/2023	1622	1	42	10	30-2		Ad	Flying	Over river
52	Breeding 2023	4	27/06/2023	1650	1	36	5	36-0		Ad	Flying	Over river
53	Breeding 2023	4	27/06/2023	1718	1	40	5	5-		Ad	Flying	
54	Breeding 2023	4	28/06/2023	0738	1	71	5			Ad	Flying	To river
55	Breeding 2023	4	28/06/2023	0854	1	25	5			Ad	Flying	To river
56	Breeding 2023	4	28/06/2023	0955	1	16	5			Ad	Flying	
57	Breeding 2023	4	19/07/2023	1306	1	35	10	5-10		Ad	Flying	
58	Breeding 2023	4	19/07/2023	1451	1	54	20	20-		Ad	Flying	
59	Breeding 2023	4	10/08/2023	0947	1	28	15	15-5		Ad	Flying	
60	Breeding 2023	4	10/08/2023	1320	2	162	2	5-0		Juv	Flying	
61	Breeding 2023	4	28/08/2023	1321	1	6	20	20-		Ad	Flying	
62	Breeding 2023	4	20/09/2023	1620	1	24	10	0-10		Ad	Flying	
63	Breeding 2023	4	20/09/2023	1641	1	29	15	0-15		Juv	Flying	

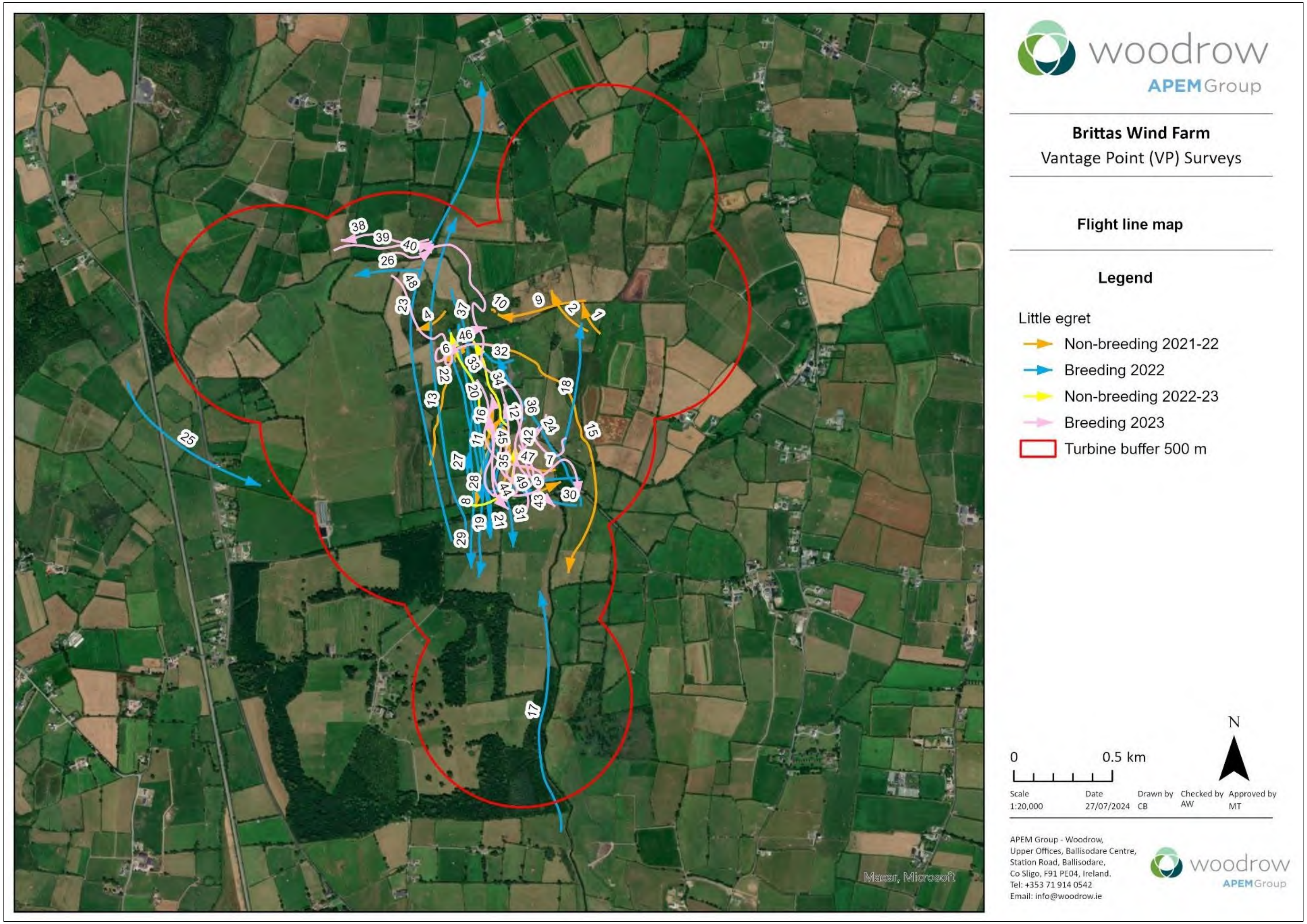

Figure 7E.15: Little egret observations recorded during VP watches

Table 7E.10: Little egret data collected during VP watches

Aggregate seconds = flight/observation time x by the number of birds recorded
Recorded within 500 m turbine buffer
Recorded on boundary of 500 m turbine buffer – flight seconds will be clipped
Recorded beyond 500 m turbine buffer or non-flight observation – time will be excluded from CRM

Map ID	Season	VP No.	Date	Time	No. of birds	Aggregated seconds recorded	Height (m)	Flight range	Sex	Age	Behaviour	Comments
1	Non-breeding 2021-22	2	12/11/2021	1314	1	30	10	10			Commuting	
2	Non-breeding 2021-22	2	18/01/2022	1442	1	60	30	30			Commuting	
3	Non-breeding 2021-22	4	12/11/2021	0807	1	10	5	5			Flying	
4	Non-breeding 2021-22	4	12/11/2021	0819	1	10	5	5			Flying	
5	Non-breeding 2021-22	4	12/11/2021	0931	1	40	5	5		A	Commuting	
6	Non-breeding 2021-22	4	12/11/2021	0936	1	10	3	3			Flying	
7	Non-breeding 2021-22	4	13/11/2021	1203	1	10	15	15-0			Commuting	Landed
8	Non-breeding 2021-22	4	13/11/2021	1220	1	20	10	10			Commuting	Moved on due to shotgun fire.
9	Non-breeding 2021-22	4	02/12/2021	1033	1	30	15	15-0			Flying	
10	Non-breeding 2021-22	4	02/12/2021	1034	1	0	0	0			Landed	Landed on river
11	Non-breeding 2021-22	4	02/12/2021	1045	1	5	3	3-0			Flying	
12	Non-breeding 2021-22	4	02/12/2021	1045	1	0	0	0		Ad	Landed	Landed on river
13	Non-breeding 2021-22	4	24/02/2022	1332	1	30	5	5-0			Flying	
14	Non-breeding 2021-22	4	24/02/2022	1333	1	0	0	0			Feeding	
15	Non-breeding 2021-22	4	24/02/2022	1346	1	60	10	10		Ad	Flying	Took flight down river
16	Non-breeding 2021-22	4	26/02/2022	0927	1	10	5	5		Ad	Flying	
17	Breeding 2022	1	11/04/2022	1219	1	80	15	5-15			Commuting	low across site
18	Breeding 2022	2	13/04/2022	1126	1	60	15	15			Commuting	
19	Breeding 2022	2	13/05/2022	1125	1	90	15	5-15			Commuting	commuting over river
20	Breeding 2022	2	13/05/2022	1216	1	80	15	15			Commuting	commuting over river
21	Breeding 2022	2	13/05/2022	1510	1	150	20	10-20			Commuting	commuting along river
22	Breeding 2022	2	13/05/2022	1516	1	230	40	15-40			Commuting	commuting along river
23	Breeding 2022	2	13/05/2022	1530	2	280	20	20			Commuting	commuting along river
24	Breeding 2022	2	06/07/2022	1608	1	130	10	2-10			Commuting	over river, went behind hedgerow
25	Breeding 2022	3	25/06/2022	1447	1	15	40	30-50			Flying	
26	Breeding 2022	4	12/04/2022	1646	1	90	30	30			Commuting	
27	Breeding 2022	4	12/04/2022	1345	1	40	20	1-20			Flying	
28	Breeding 2022	4	06/05/2022	1120	1	70	20	1-20			Commuting	travelling slowly over river
29	Breeding 2022	4	06/05/2022	1140	1	30	20	25			Commuting	
30	Breeding 2022	4	02/06/2022	1225	1	35	20	20-25		Ad	Flying	Travelling Flight

Map ID	Season	VP No.	Date	Time	No. of birds	Aggregated seconds recorded	Height (m)	Flight range	Sex	Age	Behaviour	Comments
31	Breeding 2022	4	02/06/2022	1318	1	55	20	20-25		Ad	Flying	Travelling Flight
32	Breeding 2022	4	04/07/2022	1306	1	52	20	20-30		Ad	Flying	
33	Non-breeding 2022-23	2	25/01/2023	0949	2	112	30	0-30			Flying	Flying and landing into improved grassland
34	Non-breeding 2022-23	2	25/01/2023	1011	2	94	10	0-10			Flying	Flying and landing into improved grassland
35	Non-breeding 2022-23	4	09/12/2022	0916	1	28	20	20-25		Ad	Flying	Moving N along river
36	Breeding 2023	4	27/06/2023	1507	1	28	5	4-5		Ad	Flying	
37	Breeding 2023	4	19/07/2023	1127	1	131	10	0-10		Ad	Flying	
38	Breeding 2023	4	19/07/2023	1135	5	115	5	0-5-0		Ad	Flying	Startled by tractor
39	Breeding 2023	4	19/07/2023	1344	3	66	1	1-0		Ad	Flying	
40	Breeding 2023	4	19/07/2023	1630	3	51	5	5-0		Ad	Flying	
41	Breeding 2023	4	10/08/2023	0800	2	58	15	15-0		Ad	Flying	
42	Breeding 2023	4	10/08/2023	0834	1	42	10	10-0		Ad	Flying	
43	Breeding 2023	4	10/08/2023	1029	2	54	5	5-0		Ad	Flying	
44	Breeding 2023	4	28/08/2023	1240	1	24	5	5-0		Ad	Flying	
45	Breeding 2023	4	28/08/2023	1307	1	22	5	5-0		Ad	Flying	
46	Breeding 2023	4	20/09/2023	1531	1	37	5	5-0		Ad	Flying	
47	Breeding 2023	4	20/09/2023	1623	1	37	15	0-15		Ad	Flying	
48	Breeding 2023	4	20/09/2023	1741	1	87	50	50-10		Ad	Flying	Behind treeline
49	Breeding 2023	4	29/04/2023	1715	2	14	5	0-5			Flying	

Swans, geese and duck with low incidence rate

Figure 7E.16: Greylag goose observations

Figure 7E.17: Whooper swan observations

Figure 7E.18: Wigeon observations

Table 7E.11: Greylag goose data collected during VP watches

Map ID	Season	VP No	Date	Time	No. of birds	Aggregate seconds recorded	Height (m)	Flight range	Sex	Age	Behaviour	Comments
1	Non-breeding 2021-22	4	13/11/2021	1146	1	10	15	15			Commuting	

Table 7E.12: Whooper swan data collected during VP watches

Map ID	Season	VP No	Date	Time	No. of birds	Aggregate seconds recorded	Height (m)	Flight range	Sex	Age	Behaviour	Comments
1	Non-breeding 2021-22	4	07/03/2022	1130	2	0	0	0		Ad+2Yr	Feeding	On the ground grazing in GA 1 fields with MS (1130-1430)

Table 7E.13: Wigeon data collected during VP watches

Map ID	Season	VP No	Date	Time	No. of birds	Aggregate seconds recorded	Height (m)	Flight range	Sex	Age	Behaviour	Comments
1	Non-breeding 2022-23	4	29/12/2022	1024	22	2,420	40	40-50	M+F		Circling	Wide circling flight, settling back down on flooded area

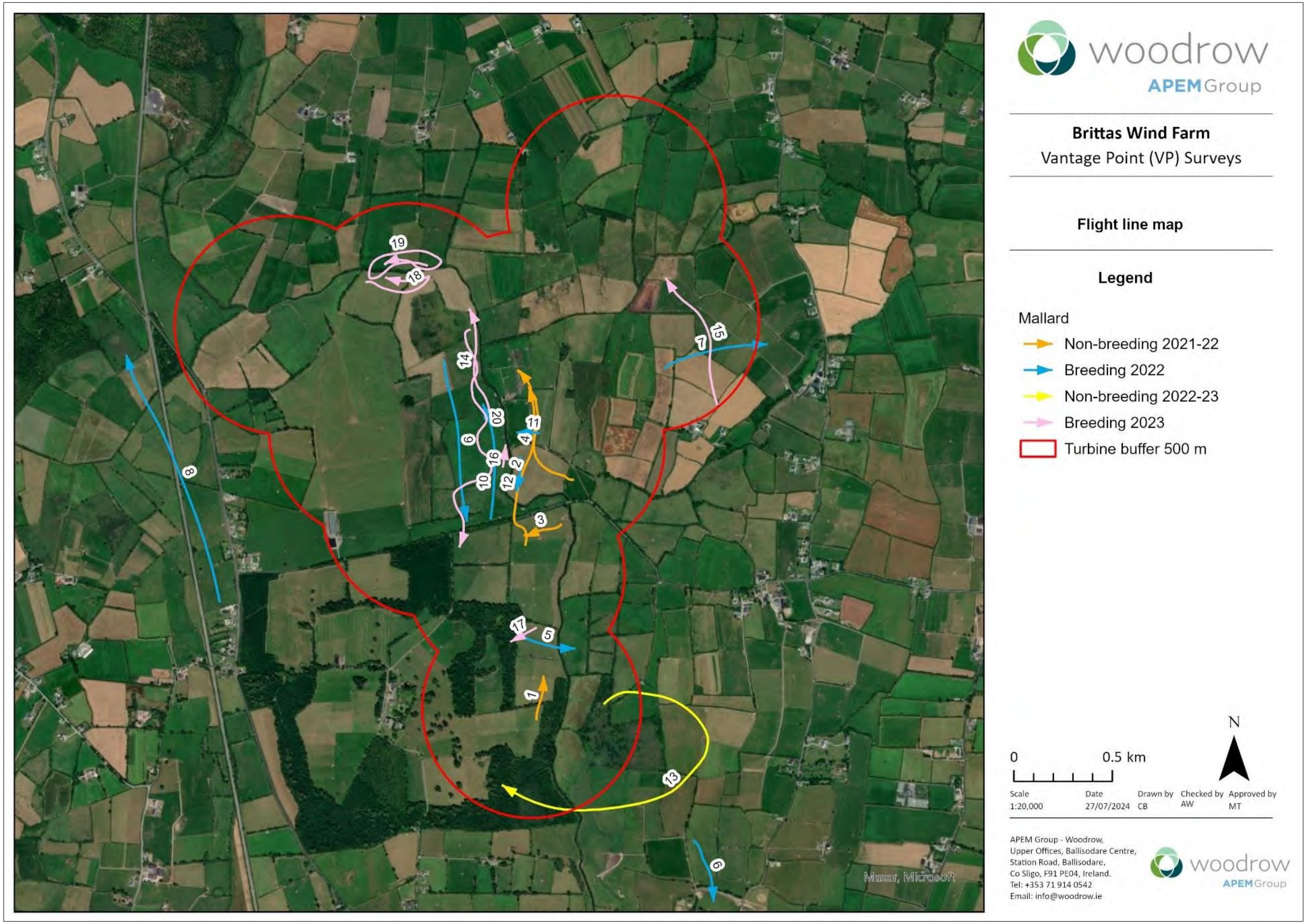

Figure 7E.19: Mallard observations recorded during VP watches

Table 7E.14: Mallard data collected during VP watches

Aggregate seconds = flight/observation time x by the number of birds recorded
Recorded within 500 m turbine buffer
Recorded on boundary of 500 m turbine buffer – flight seconds will be clipped
Recorded beyond 500 m turbine buffer or non-flight observation – time will be excluded from CRM

Map ID	Season	VP No.	Date	Time	No. of birds	Aggregated seconds recorded	Height (m)	Flight range	Sex	Age	Behaviour	Comment
1	Non-breeding 2021-22	1	13/11/2021	0746	2	40	20	20			Commuting	
2	Non-breeding 2021-22	3	19/01/2022	0950	6	360	30	30			Flying	
3	Non-breeding 2021-22	4	25/10/2021	0905	2	30	10	10	F	Ad	Commuting	
4	Non-breeding 2021-22	4	12/11/2021	0918	2	80	15	15	M+F	Ad	Commuting	
5	Breeding 2022	1	11/04/2022	1330	2	30	20	20			Commuting	must have landed out of view
6	Breeding 2022	1	11/04/2022	1512	2	20	5	5			Commuting	away from site
7	Breeding 2022	2	13/05/2022	1610	2	10	5	5			Commuting	
8	Breeding 2022	3	18/04/2022	1235	1	30	10	5-10			landed	in field within 500m
9	Breeding 2022	4	12/04/2022	1655	1	20	20	15-20			Commuting	
10	Breeding 2022	4	12/04/2022	1800	1	20	5	5			Commuting	
11	Breeding 2022	4	06/05/2022	1300	1	5	5	1-5	M	A	Landed	on river/ drainage
12	Breeding 2022	4	06/05/2022	1320	1	5	5	1-5	M	A	Landed	on river
13	Non-breeding 2022-23	1	25/01/2023	1351	4	228	95	0-100			Circling	circling and travelling W
14	Breeding 2023	2	31/07/2023	1023	60	1,680	15	0-15			Flying	vis poor, possibly other species as well
15	Breeding 2023	2	09/08/2023	1109	12	648	20	20			Flying	
16	Breeding 2023	4	16/06/2023	0813	1	30	4	4	F	Ad	Flying	
17	Breeding 2023	4	16/06/2023	0842	1	5	3	3	F	Ad	Flying	
18	Breeding 2023	4	19/07/2023	1238	12	216	5	0-5	F	Ad + Juv	Flying	over flooded area
19	Breeding 2023	4	19/07/2023	1530	16	608	20	0-20		Ad + Juv	Flying	
20	Breeding 2023	4	19/07/2023	1719	3	87	15	0-15		Ad	Flying	

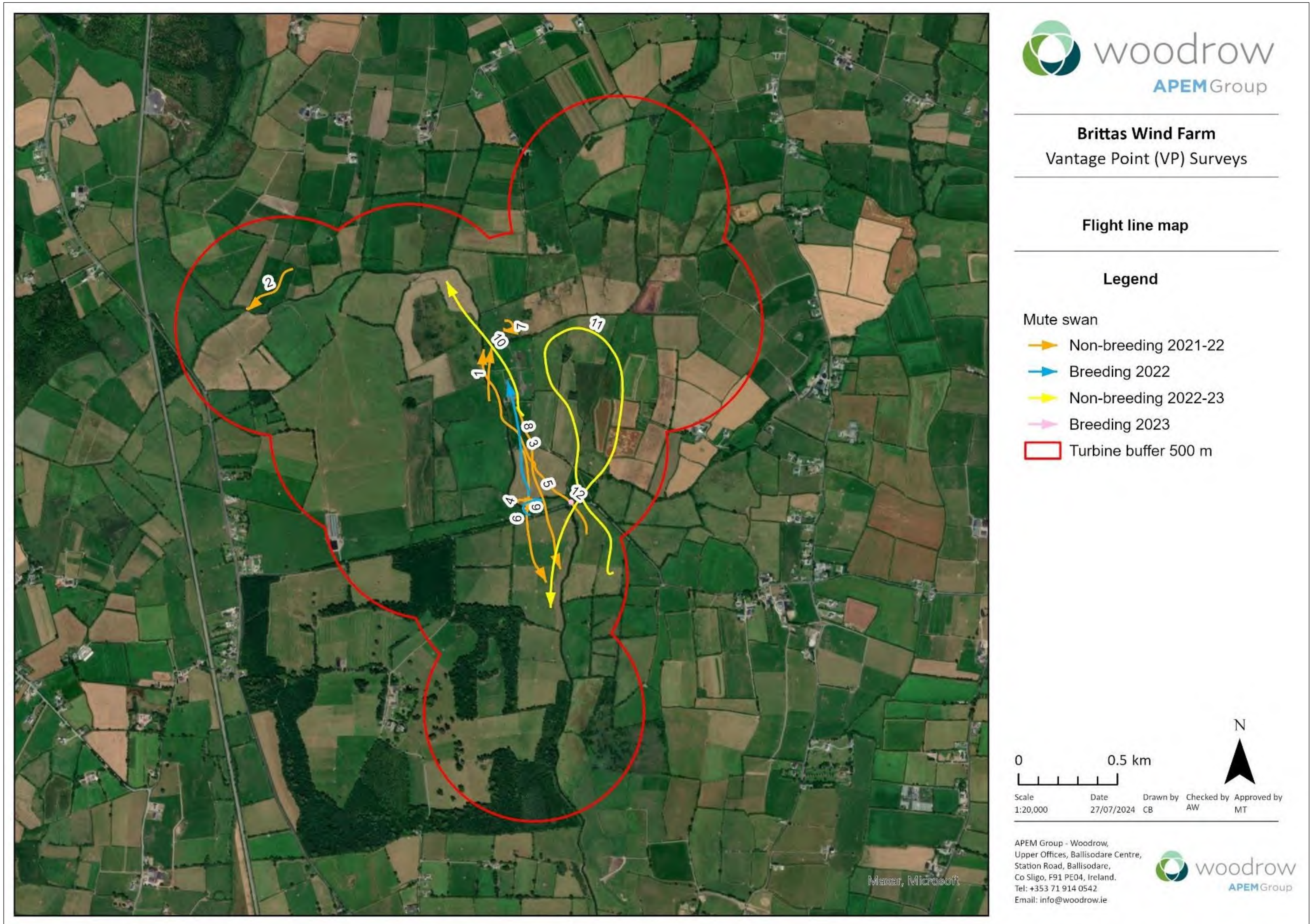

Figure 7E.20: Mute swan observations recorded during VP watches

Table 7E.15: Mute swan data collected during VP watches

Aggregate seconds = flight/observation time x by the number of birds recorded

Recorded within 500 m turbine buffer

Recorded on boundary of 500 m turbine buffer – flight seconds will be clipped

Recorded beyond 500 m turbine buffer or non-flight observation – time will be excluded from CRM

Map ID	Season	VP No.	Date	Time	No. of birds	Aggregated seconds recorded	Height (m)	Flight range	Sex	Age	Behaviour	Comment
1	Non-season 2021-22	2	20/12/2021	0941	1	10	10	10			Commuting	
2	Non-season 2021-22	3	24/02/2022	1601	1	10	10	10		Ad	Flying	
3	Non-season 2021-22	4	25/10/2021	0841	1	60	10	10		Ad	Commuting	
4	Non-season 2021-22	4	17/12/2021	1300	2	0	0	0			Swimming	On river male and female
5	Non-season 2021-22	4	20/12/2021	1401	2	220	10	10	M+F		Flying	Male and female heading down river
6	Non-season 2021-22	4	19/01/2022	1408	2	40	15	15			Commuting	Flying down river
7	Non-season 2021-22	4	07/03/2022	1430	2	0	0	0	M+F	Ad	Feeding	
8	Breeding 2022	2	13/05/2022	1445	2	280	10	10			Commuting	commuting along river
9	Breeding 2022	4	12/04/2022	1750	1	0	0	0			Perched	perched for 600 sec
10	Non-breeding 2022-23	2	25/01/2023	0942	2	116	15	0-20	M+F	Ad	Flying	Flying along river course
11	Non-breeding 2022-23	4	30/11/2022	1007	9	1,080	30	20-40			<Null>	
12	Breeding season 2023	4	16/06/2023	0700	2	0	0	0	M+F	Ad	Swimming	Two birds on river at the bridge

Gull species occurring at low incidence rates

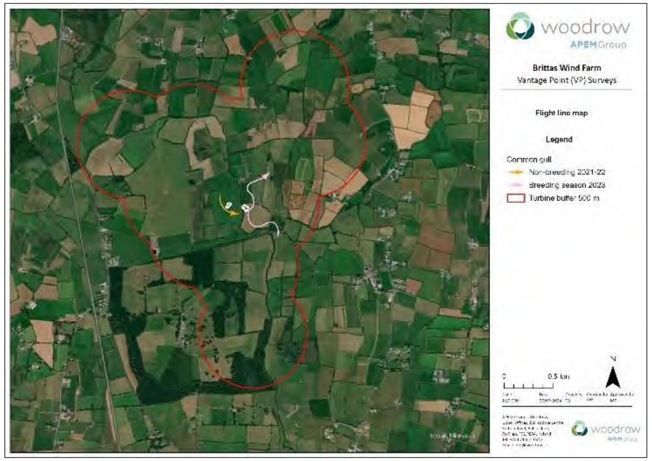

Figure 7E.21: Common gull observations

Figure 7E.22: Great black-backed gull observations

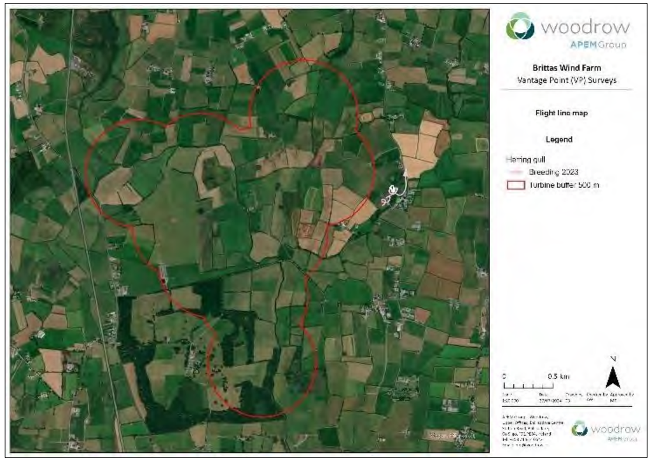

Figure 7E.23: Herring gull observations

Table 7E.16: Common gull data collected during VP watches

Map ID	Season	VP No	Date	Time	No. of birds	Aggregate seconds recorded	Height (m)	Flight range	Sex	Age	Behaviour	Comments
1	Non-breeding 2021-22	3	21/12/2021	1107	2	70	40	40			Commuting	-
2	Breeding 2023	4	19/07/2023	1539	1	43	10	10		1CY JUV	Flying	-

Table 7E.17: Great black-backed gull data collected during VP watches

Map ID	Season	VP No	Date	Time	No. of birds	Aggregate seconds recorded	Height (m)	Flight range	Sex	Age	Behaviour	Comments
1	Breeding 2022	1	11/04/2022	1635	2	120	20	20			Flying	Going away from site

Table 7E.18: Herring gull data collected during VP watches

Map ID	Season	VP No	Date	Time	No. of birds	Aggregate seconds recorded	Height (m)	Flight range	Sex	Age	Behaviour	Comments
1	Breeding 2023	2	09/08/2023	1210	1	204	60	60		2Y JUV	Flying	

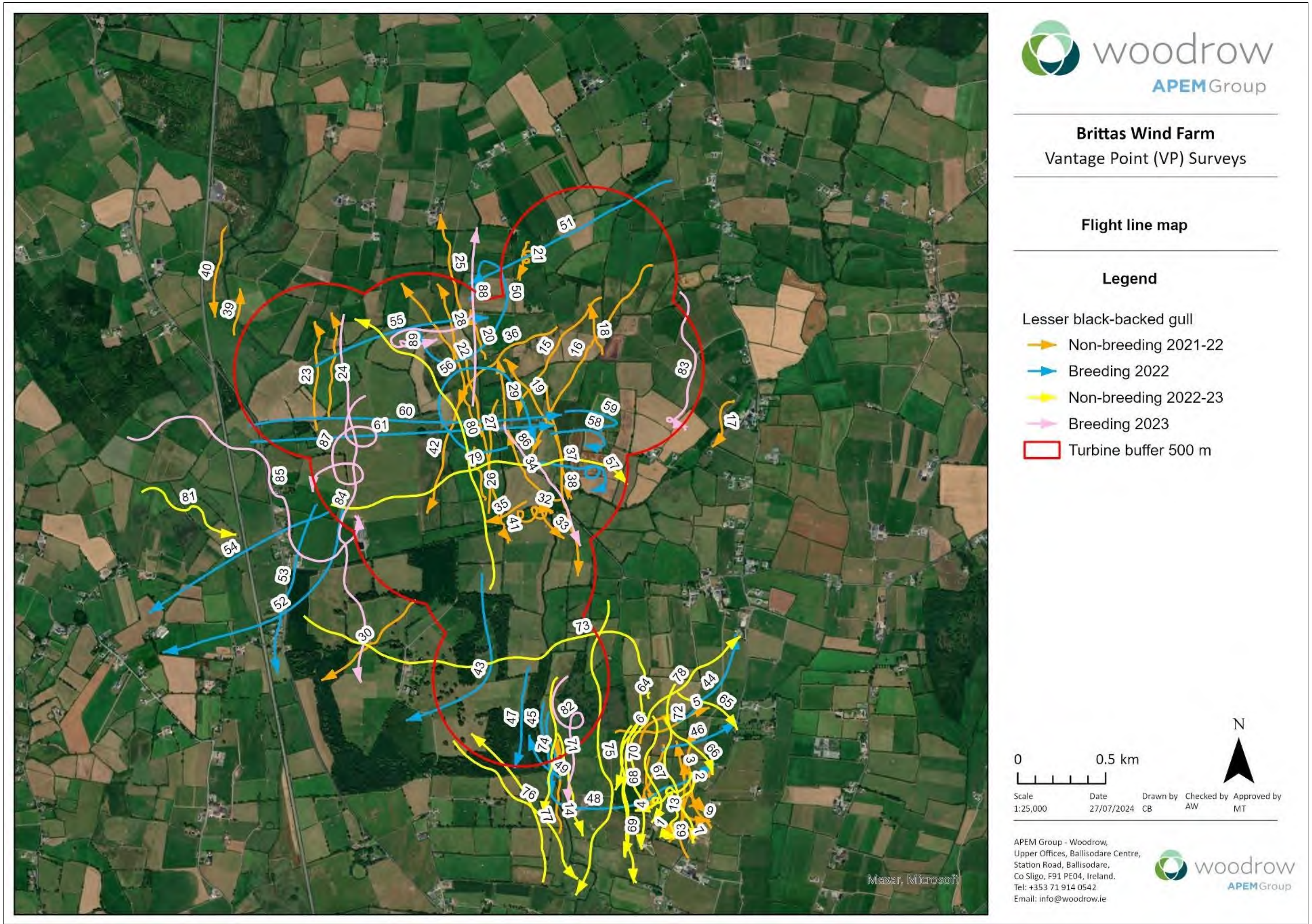

Figure 7E.24: Lesser black-backed gull observations recorded during VP watches

Table 7E.19: Lesser black-backed gull data collected during VP watches

Aggregate seconds = flight/observation time x by the number of birds recorded
Recorded within 500 m turbine buffer
Recorded on boundary of 500 m turbine buffer – flight seconds will be clipped
Recorded beyond 500 m turbine buffer or non-flight observation – time will be excluded from CRM

Map ID	Season	VP No	Date	Time	No. of birds	Aggregate seconds recorded	Height (m)	Flight range	Sex	Age	Behaviour	Comments
1	Non-breeding 2021-22	1	24/10/2021	0858	1	30	15			Ad	Commuting	
2	Non-breeding 2021-22	1	24/10/2021	0903	37	1,480	15				Commuting	
3	Non-breeding 2021-22	1	24/10/2021	0944	4	80	15			Ad	Commuting	
4	Non-breeding 2021-22	1	24/10/2021	0952	1	10	10			Ad	Commuting	
5	Non-breeding 2021-22	1	24/10/2021	1014	1	30	25			1CY	Commuting	
6	Non-breeding 2021-22	1	24/10/2021	1351	1	20	20			Ad	Commuting	
7	Non-breeding 2021-22	1	11/11/2021	1006	4	320	20			Ad	Commuting	
8	Non-breeding 2021-22	1	11/11/2021	1341	6	180	20			Ad	Commuting	
9	Non-breeding 2021-22	1	11/11/2021	1353	2	50	15			Ad	Commuting	
10	Non-breeding 2021-22	1	11/11/2021	1404	2	30	15			Ad	Commuting	
11	Non-breeding 2021-22	1	11/11/2021	1410	3	45	15			Ad	Commuting	
12	Non-breeding 2021-22	1	11/11/2021	1436	24	1,440	15			Ad	Commuting	
13	Non-breeding 2021-22	1	08/02/2022	1017	5	200	10				Commuting	
14	Non-breeding 2021-22	1	24/02/2022	0919	6	240	20			Ad	Commuting	
15	Non-breeding 2021-22	2	23/10/2021	1312	17	1,530	30				Commuting	
16	Non-breeding 2021-22	2	23/10/2021	1720	3	270	35			Ad	Commuting	
17	Non-breeding 2021-22	2	12/11/2021	1210	5	200	15				Commuting	
18	Non-breeding 2021-22	2	12/11/2021	1347	2	60	20				Commuting	
19	Non-breeding 2021-22	2	22/11/2021	1032	4	480	40			Ad	Commuting	
20	Non-breeding 2021-22	2	01/12/2021	1146	2	60	35				Commuting	
21	Non-breeding 2021-22	2	08/02/2022	1432	16	320	25				Circling	
22	Non-breeding 2021-22	2	26/02/2022	1703	14	1,260	20				Commuting	
23	Non-breeding 2021-22	2	13/03/2022	1136	6	360	35			Ad	Commuting	
24	Non-breeding 2021-22	2	13/03/2022	1142	14	840	35			Ad	Commuting	
25	Non-breeding 2021-22	2	13/03/2022	1353	6	240	25			Ad	Commuting	
26	Non-breeding 2021-22	3	26/10/2021	1326	4	80	30				Commuting	
27	Non-breeding 2021-22	3	23/01/2022	1026	6	360	25				Commuting	
28	Non-breeding 2021-22	3	24/02/2022	1525	2	20	10			Ad	Commuting	
29	Non-breeding 2021-22	3	24/02/2022	1617	4	120	15			Ad	Commuting	
30	Non-breeding 2021-22	3	26/02/2022	1235	4	200	15			Ad	Commuting	

Map ID	Season	VP No	Date	Time	No. of birds	Aggregate seconds recorded	Height (m)	Flight range	Sex	Age	Behaviour	Comments
31	Non-breeding 2021-22	4	24/10/2021	1521	1	10	10			Ad	Commuting	
32	Non-breeding 2021-22	4	24/10/2021	1528	1	10	10			Ad	Commuting	
33	Non-breeding 2021-22	4	24/10/2021	1736	6	360	25				Commuting	
34	Non-breeding 2021-22	4	25/10/2021	0810	2	60	15			Ad	Commuting	
35	Non-breeding 2021-22	4	25/10/2021	0915	5	100	20				Commuting	4 Adults 1 1CY
36	Non-breeding 2021-22	4	25/10/2021	0954	10	900	15			Ad	Commuting	
37	Non-breeding 2021-22	4	13/11/2021	1306	2	60	15			Ad	Commuting	
38	Non-breeding 2021-22	4	09/01/2022	1413	4	240	20			Ad	Commuting	
39	Non-breeding 2021-22	4	24/02/2022	1247	1	15	15				Commuting	
40	Non-breeding 2021-22	4	24/02/2022	1318	21	1,260	20				Commuting	
41	Non-breeding 2021-22	4	24/02/2022	1323	9	540	10			Ad	Commuting	
42	Non-breeding 2021-22	4	26/02/2022	0902	16	960	15			Ad	Commuting	
43	Breeding 2022	1	11/04/2022	1209	8	1,120	200	120-200			circling	travelled across site / soaring and circling
44	Breeding 2022	1	11/04/2022	1251	1	200	20	20			Commuting	
45	Breeding 2022	1	11/04/2022	1308	4	520	30	30			Commuting	Commuting slow
46	Breeding 2022	1	11/04/2022	1313	2	180	15	5-15			Commuting	
47	Breeding 2022	1	11/04/2022	1326	1	60	30	30			Commuting	
48	Breeding 2022	1	11/04/2022	1345	2	420	30	5-30			Commuting	travelling away from site
49	Breeding 2022	1	11/04/2022	1604	4	240	30	30			circling	circling, slow flight
50	Breeding 2022	2	13/04/2022	1132	12	2,280	30	10-30			circling	
51	Breeding 2022	2	06/07/2022	1520	2	520	70	50-70			Commuting	flight through site
52	Breeding 2022	3	12/05/2022	1135	10	2,500	30	5-30			Loafing	going away from site
53	Breeding 2022	3	12/05/2022	1526	3	480	20	20			Commuting	
54	Breeding 2022	3	12/05/2022	1650	1	90	30	30			Commuting	
55	Breeding 2022	4	12/04/2022	1725	3	570	60	50-60			circling	
56	Breeding 2022	4	22/08/2022	1838	6	840	30	10-30			Flying	landing to feed
57	Breeding 2022	4	22/08/2022	1320	8	400	50	5-50		Ad	Circling	over field
58	Breeding 2022	4	22/08/2022	1343	3	180	20	20			Landed	on fields
59	Breeding 2022	4	22/08/2022	1350	70	33,600	40	5-40			Circling	landed on fields
60	Breeding 2022	4	31/08/2022	1900	5	1,200	50	50			Commuting	through site, commuting
61	Breeding 2022	4	31/08/2022	1950	3	690	40	35-40			Commuting	commuting through site
62	Non-breeding 2022-23	1	27/10/2022	1023	7	665	40	40-50		Ad	Commuting	Flight through site see map LB1
63	Non-breeding 2022-23	1	27/10/2022	1028	4	440	40	40-50			Commuting	Across site. See map LB2
64	Non-breeding 2022-23	1	27/11/2022	1009	25	0					Feeding	Feeding on pasture
65	Non-breeding 2022-23	1	27/11/2022	1109	3	165	8	5-15		Ad	Flying	Leaving field at #1

Map ID	Season	VP No	Date	Time	No. of birds	Aggregate seconds recorded	Height (m)	Flight range	Sex	Age	Behaviour	Comments
66	Non-breeding 2022-23	1	27/11/2022	1110	2	60	8	8-12			Flying	
67	Non-breeding 2022-23	1	27/11/2022	1110	3	150	12	8-12			Flying	
68	Non-breeding 2022-23	1	27/11/2022	1110	6	360	10	8-12			Flying	
69	Non-breeding 2022-23	1	27/11/2022	1131	2	30	12	10-15			Flying	
70	Non-breeding 2022-23	1	27/11/2022	1133	1	20	10	10-15			Flying	
71	Non-breeding 2022-23	1	27/11/2022	1220	23	690	10	5-20			Flying	
72	Non-breeding 2022-23	1	27/11/2022	1238	4	120	20	15-25		Ad	Flying	
73	Non-breeding 2022-23	1	27/11/2022	1305	20	1,900	10	10-30			Flying	
74	Non-breeding 2022-23	1	27/11/2022	1308	5	125	20	15-25			Flying	
75	Non-breeding 2022-23	1	27/11/2022	1324	9	360	25	20-30			Flying	
76	Non-breeding 2022-23	1	27/11/2022	1323	23	575	40	30-50			Flying	
77	Non-breeding 2022-23	1	27/11/2022	1525	4	120	30	25-35			Flying	
78	Non-breeding 2022-23	1	25/01/2023	1339	2	140	40	0-40			Commuting	Travelling NE
79	Non-breeding 2022-23	2	28/11/2022	1331	1	35	40	30-50			Commuting	Transient bird flying through
80	Non-breeding 2022-23	2	28/11/2022	1408	12	1,440	90	80-100			Commuting	Flying through
81	Non-breeding 2022-23	3	29/10/2022	1027	16	2,080	30	30-40		Ad	Flying	Slow travelling flight see map LB
82	Breeding 2023	1	03/08/2023	1022	2	536	30	80-100		Ad	Soaring	Soaring/circling. Drifting S
83	Breeding 2023	2	31/07/2023	1248	1	63	50	50-0		Ad	Flying	
84	Breeding 2023	3	16/08/2023	1803	2	268	80	80-		Ad	Flying	
85	Breeding 2023	3	27/08/2023	1103	2	214	20	15-20		Ad	Flying	
86	Breeding 2023	4	16/06/2023	0737	1	180	70	70			Flying	
87	Breeding 2023	4	16/06/2023	0920	2	80	80	80			Soaring	
88	Breeding 2023	4	16/06/2023	0924	1	20	20	20			Flying	
89	Breeding 2023	4	19/07/2023	1501	2	368	30	30-0		Ad + 2cy	Flying	

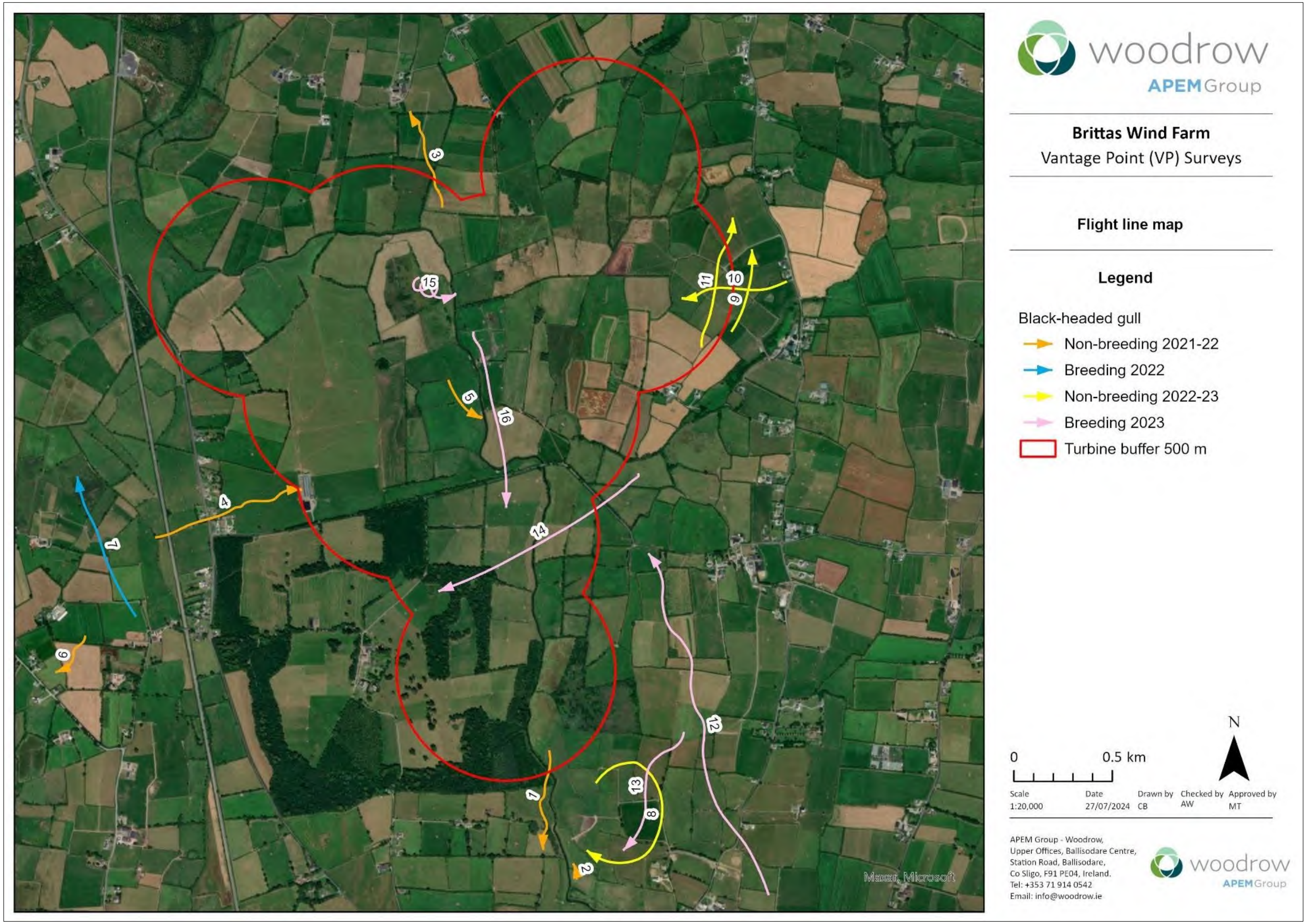

Figure 7E.25: Black-headed gull observations recorded during VP watches

Table 7E.20: Black-headed gull data collected during VP watches

	Aggregate seconds = flight/observation time x by the number of birds recorded
Green	Recorded within 500 m turbine buffer
Yellow	Recorded on boundary of 500 m turbine buffer – flight seconds will be clipped
Red	Recorded beyond 500 m turbine buffer or non-flight observation – time will be excluded from CRM

Map ID	Season	VP No	Date	Time	No. of birds	Aggregate seconds recorded	Height (m)	Flight range	Sex	Age	Behaviour	Comments
1	Non-breeding 2021-22	1	18/01/2022	1117	17	1,190	20	20			Commuting	
2	Non-breeding 2021-22	1	20/01/2022	1345	1	5	5	5		Ad	Flying	
3	Non-breeding 2021-22	2	13/03/2022	1353	3	120	25	25		A	Commuting	
4	Non-breeding 2021-22	3	23/11/2021	1452	2	120	60	60		A	Commuting	
5	Non-breeding 2021-22	3	21/12/2021	1107	6	210	40	40			Commuting	
6	Non-breeding 2021-22	3	23/01/2022	0911	3	0	20	20			Flying	
7	Breeding 2022	3	24/07/2022	1411	1	35	20			Ad	Flying	
8	Non-breeding 2022-23	1	25/01/2023	1433	80	15,360	45	0-50			Circling	Circling and landing into improved grassland/flooded area
9	Non-breeding 2022-23	2	06/02/2023	1122	4	56	40	30-40			Commuting	Commute and calling
10	Non-breeding 2022-23	2	06/02/2023	1405	12	204	30	20-30			Commuting	Commute and calling
11	Non-breeding 2022-23	2	06/02/2023	1527	22	462	40	30-40			Commuting	Commute and calling
12	Breeding 2023	1	12/06/2023	1837	1	45	25	25		Ad	Commuting	
13	Breeding 2023	1	06/07/2023	1242	4	152	30	30-40			Flying	Moving south
14	Breeding 2023	4	16/06/2023	0818	1	30	30	30		Ad		
15	Breeding 2023	4	16/06/2023	0927	1	40	20	20		Ad	Flying	
16	Breeding 2023	4	26/06/2023	1947	2	180	30	30		Ad	Flying	

Raptor species occurring at low incidence rates

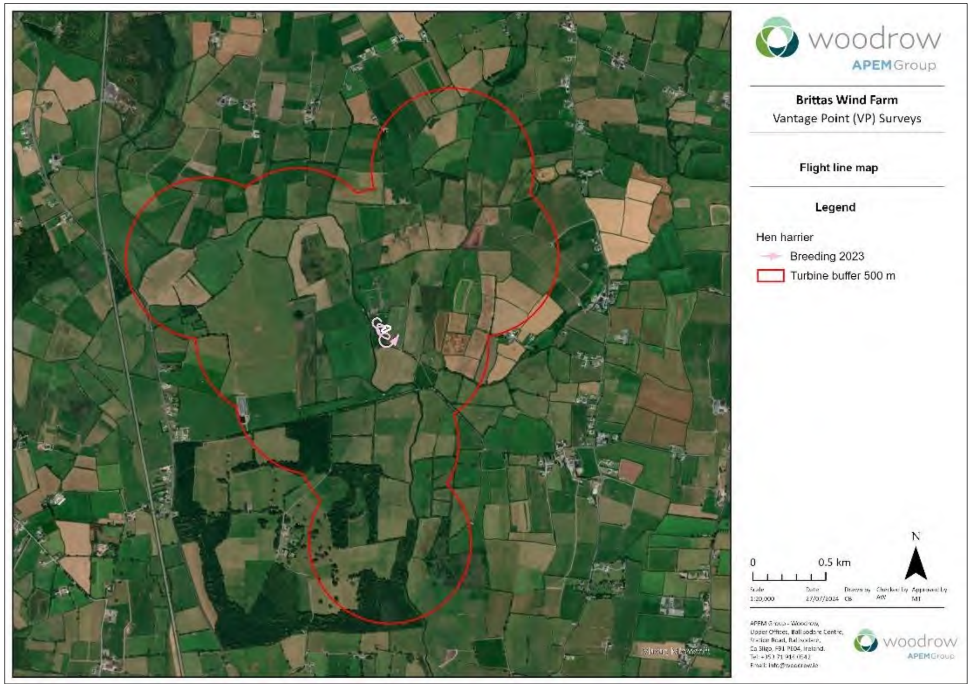

Figure 7E.26: Hen harrier observations recorded during VP watches

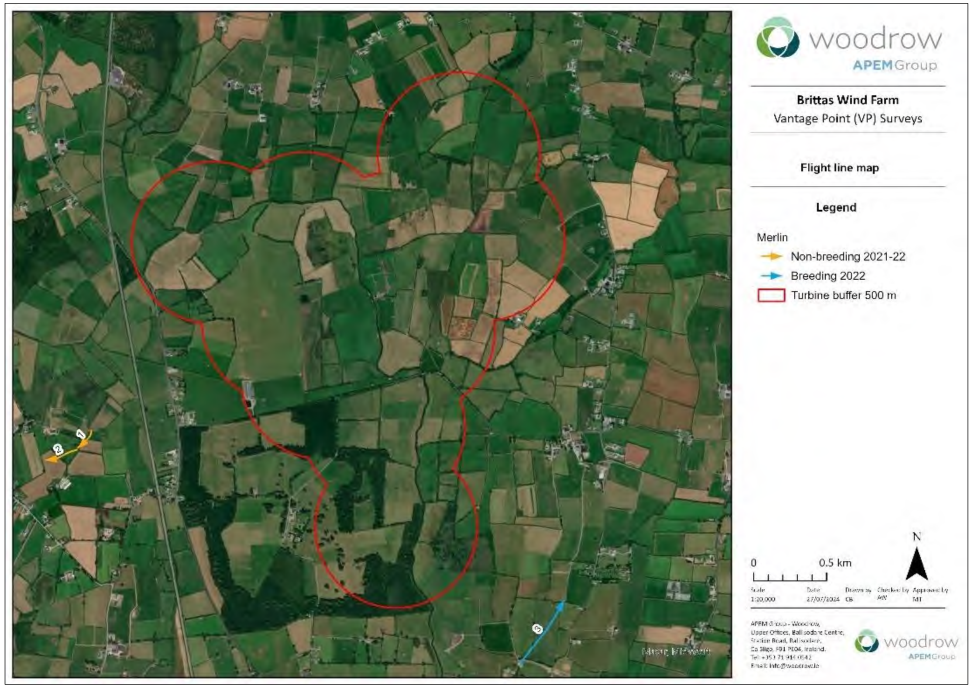

Figure 7E.27: Merlin observations recorded during VP watches

Table 7E.21: Hen harrier data collected during VP watches

Map ID	Season	VP No	Date	Time	No. of birds	Aggregate seconds recorded	Height (m)	Flight range	Sex	Age	Behaviour	Comments
1	Breeding 2023	4	28/08/2023	1258	1	89	4	1-4	M	A	Hunting	Quartering

Table 7E.22: Merlin data collected during VP watches

Map ID	Season	VP No	Date	Time	No. of birds	Aggregate seconds recorded	Height (m)	Flight range	Sex	Age	Behaviour	Comments
1	Non-breeding 2021-22	3	02/12/2021	1304	1	10	10		F	A	Hunting	Hunting then perched in tree.
2	Non-breeding 2021-22	3	02/12/2021	1311	1	10	5		F	A	Hunting	Left perch and flew off
3	Breeding 2022	1	11/04/2022	1320	1	20	15	5-15	F		Commuting	Female, good wintering/hunting habitat. Flying low

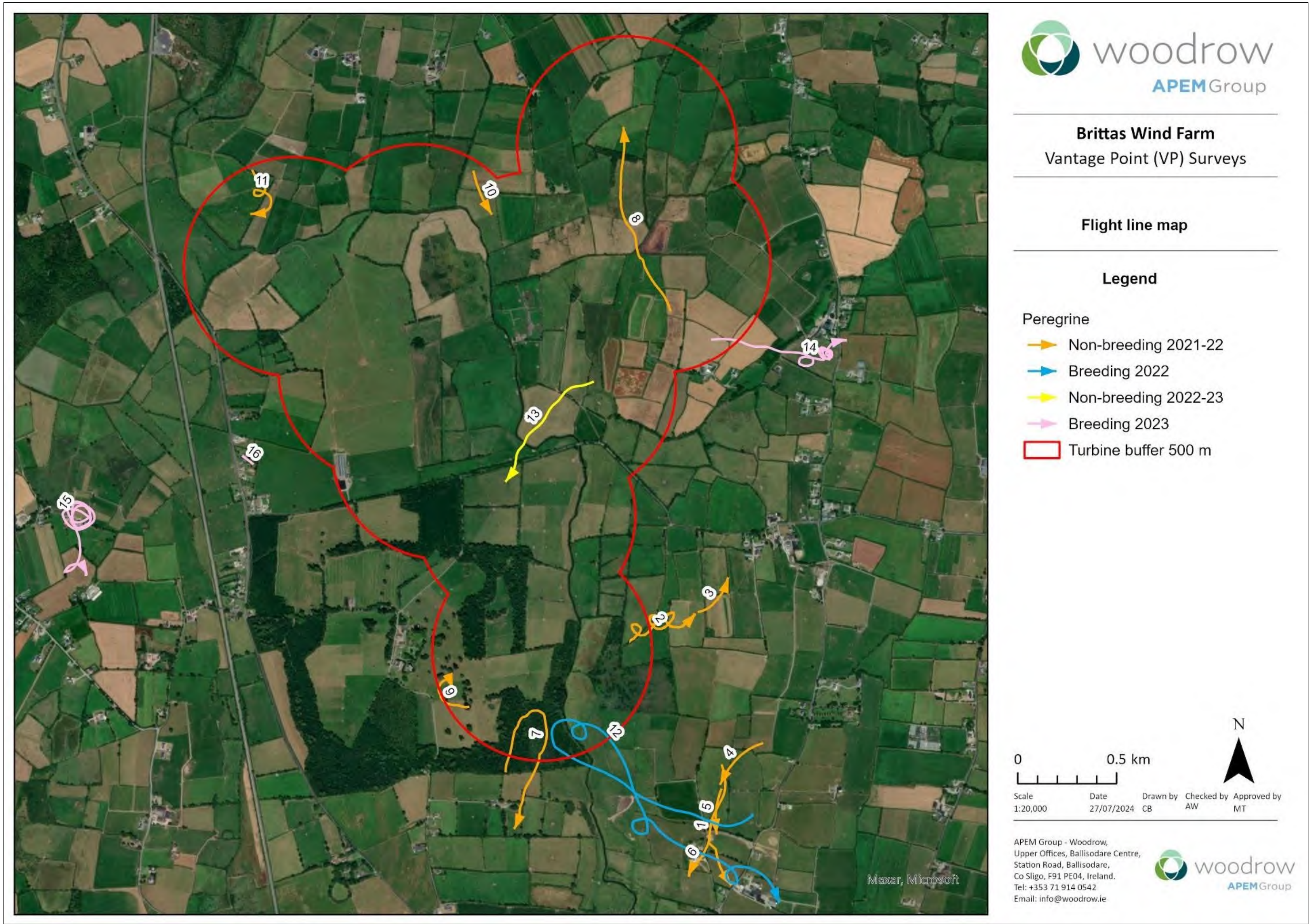

Figure 7E.28: Peregrine observations recorded during VP watches

Table 7E.23: Peregrine data collected during VP watches

Aggregate seconds = flight/observation time x by the number of birds recorded
Recorded within 500 m turbine buffer
Recorded on boundary of 500 m turbine buffer – flight seconds will be clipped
Recorded beyond 500 m turbine buffer or non-flight observation – time will be excluded from CRM

Map ID	Season	VP No	Date	Time	No. of birds	Aggregate seconds recorded	Height (m)	Flight range	Sex	Age	Behaviour	Comments
1	Non-breeding 2021-22	1	24/10/2021	0931	1	40	35		F	Ad	Commuting	
2	Non-breeding 2021-22	1	24/10/2021	1026	1	20	15	15-25		Juv	Hunting	Mobbed by rooks
3	Non-breeding 2021-22	1	24/10/2021	1027	1	20	25				Hunting	
4	Non-breeding 2021-22	1	24/10/2021	1205	1	10	20	20-10	F	A	Hunting	
5	Non-breeding 2021-22	1	24/10/2021	1205	1	10	10	10-20			Hunting	
6	Non-breeding 2021-22	1	24/10/2021	1205	1	10	20				Hunting	
7	Non-breeding 2021-22	1	01/12/2021	1007	1	20	35			Ad	Hunting	
8	Non-breeding 2021-22	2	23/10/2021	1636	1	90	35			Ad	Commuting	
9	Non-breeding 2021-22	3	02/12/2021	1426	1	10	20				Hunting	
10	Non-breeding 2021-22	3	26/02/2022	1115	1	20	15			Ad	Hunting	
11	Non-breeding 2021-22	3	07/03/2022	1522	1	30	20			Ad	Circling	
12	Breeding 2022	1	05/05/2022	1451	1	960	130	5-130			Soaring	
13	Non-breeding 2022-23	4	19/02/2023	1205	1	9	40	30-40			Commuting	Commute flight
14	Breeding 2023	2	09/08/2023	1223	1	12	150	80-150		Ad	Hunting	
15	Breeding season 2023	3	06/03/2023	1110	1	198	60	60-80	M	Ad	Soaring	Drifting S
16	Breeding 2023	3	28/06/2023	1219	1	6	20	20-15		Ad	Alarm call	Alarm calling, appeared to be mobbing. In treeline

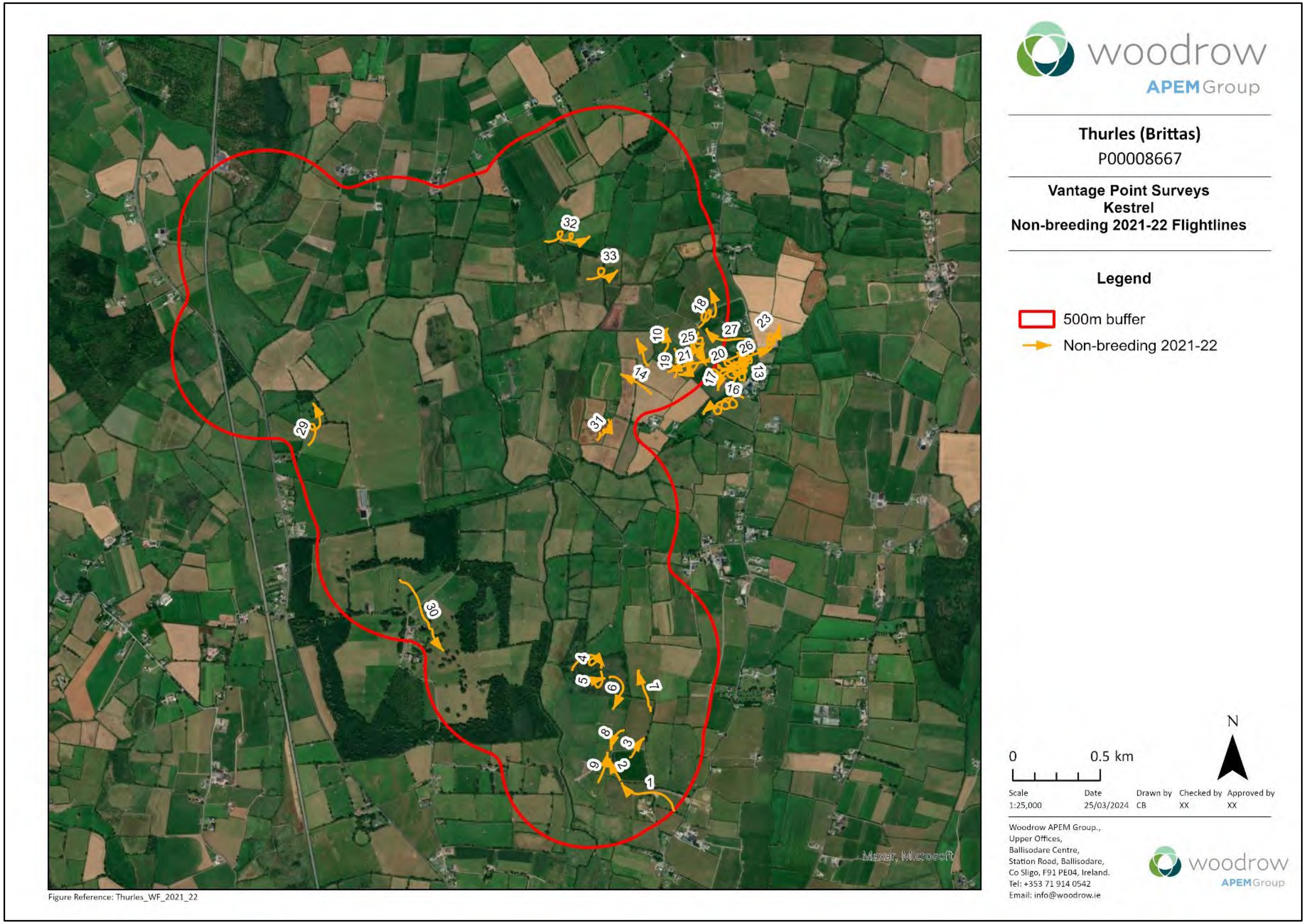

Figure 7E.29: Kestrel observations recorded during VP watches – non-breeding season 2021-22

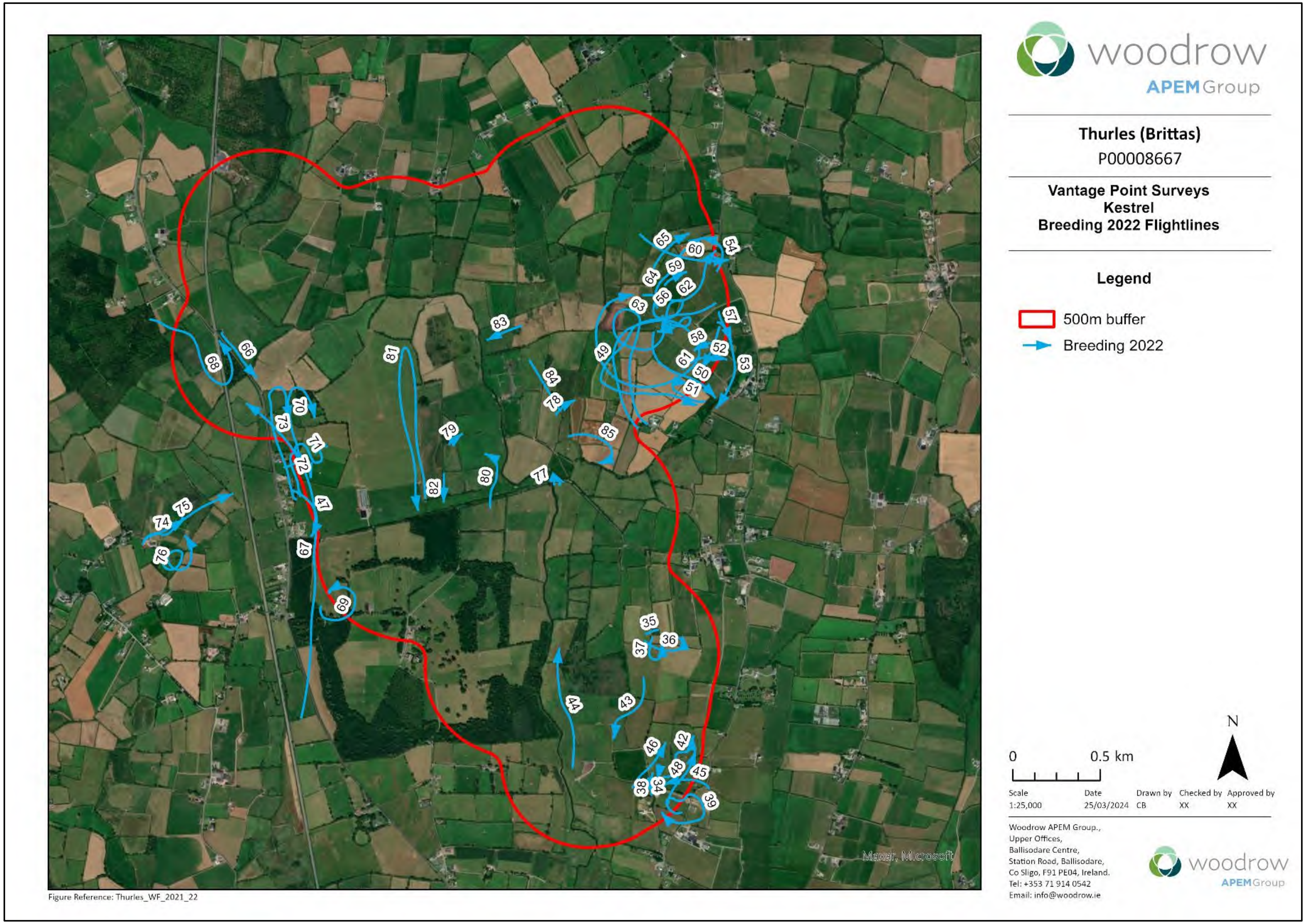

Figure 7E.30: Kestrel observations recorded during VP watches – breeding season2022

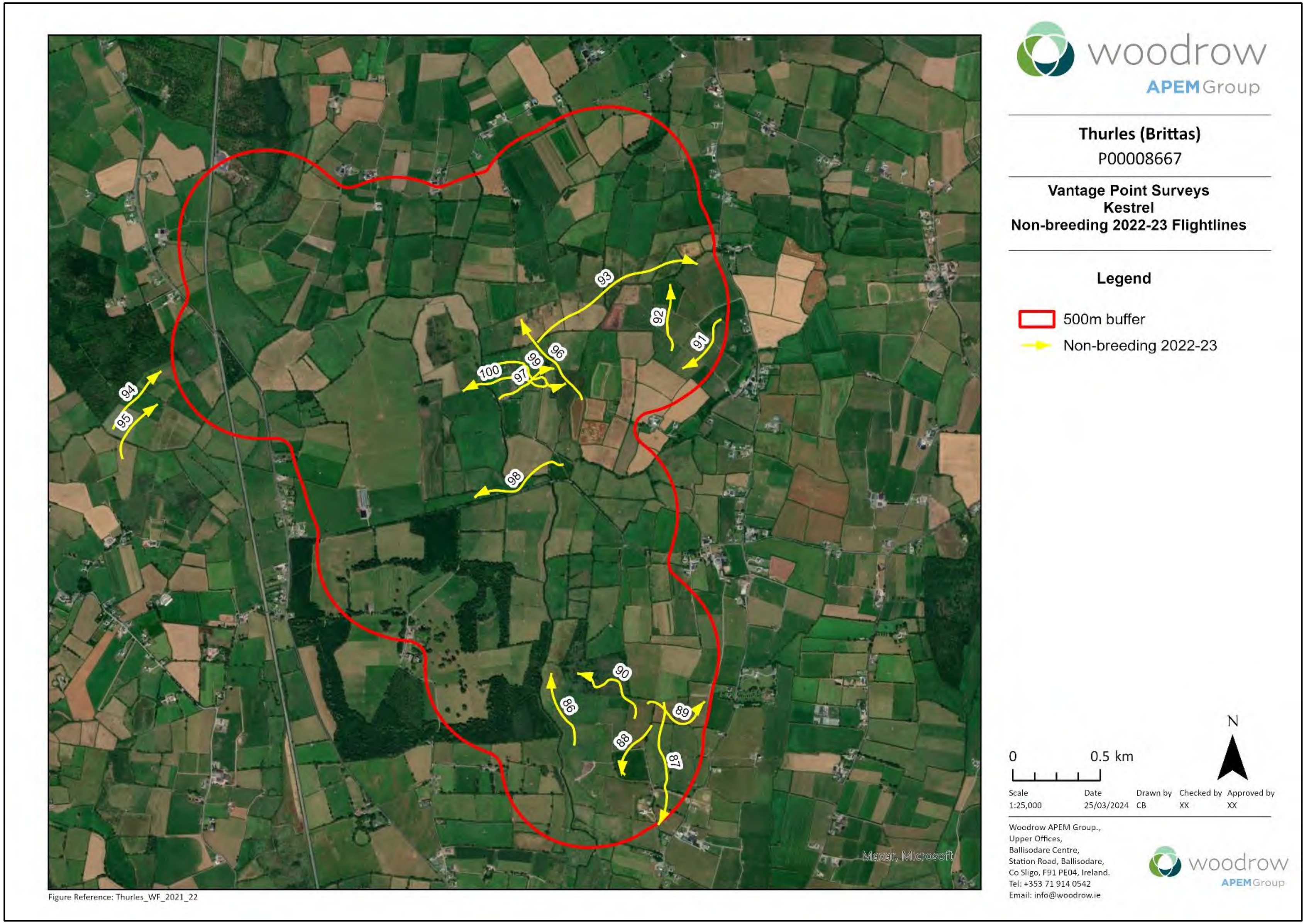

Figure 7E.31: Kestrel observations recorded during VP watches – non-breeding season 2022-23

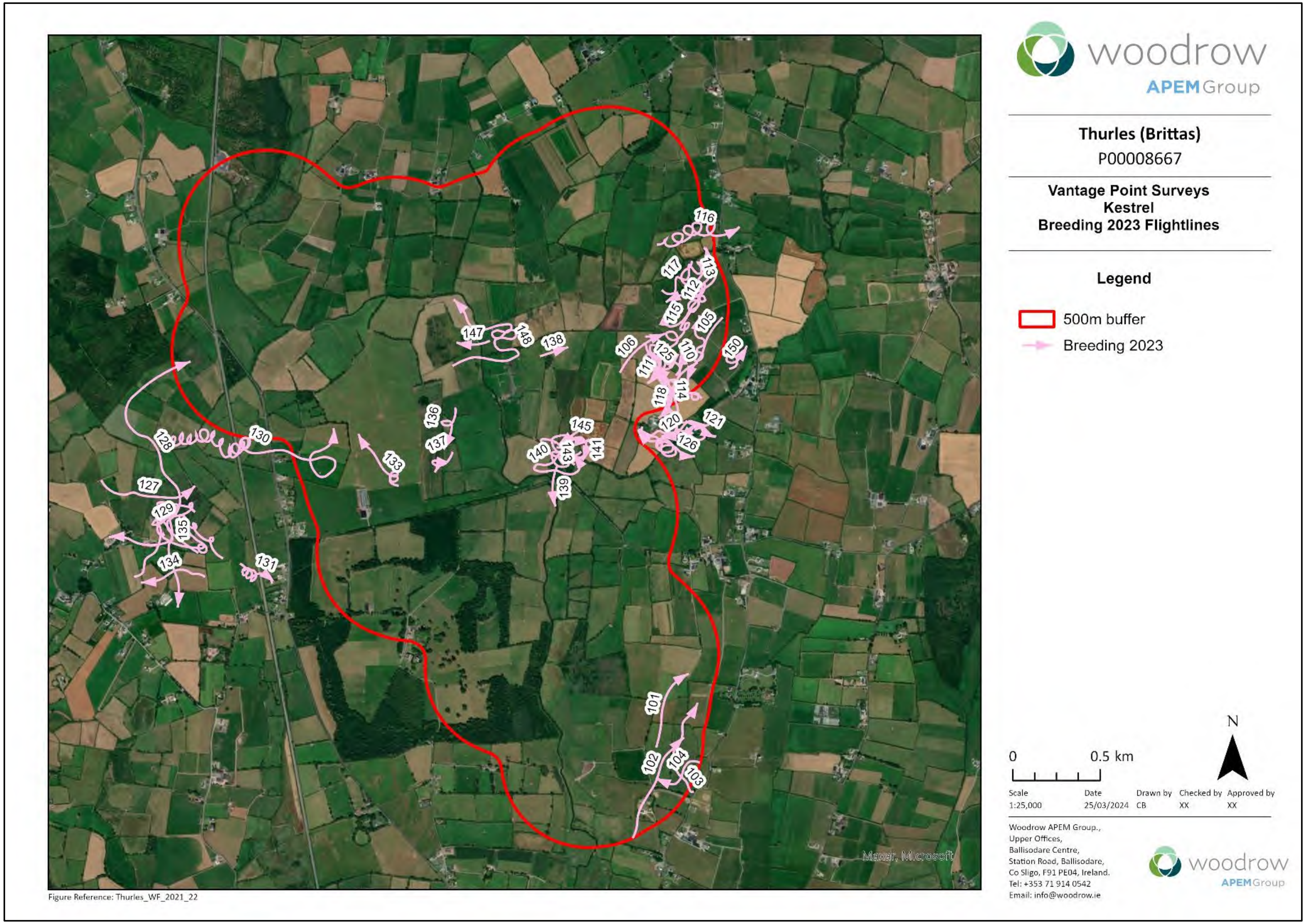

Figure 7E.32: Kestrel observations recorded during VP watches – breeding season 2023

Table 7E.24: Kestrel data collected during VP watches

Aggregate seconds = flight/observation time x by the number of birds recorded
Recorded within 500 m turbine buffer
Recorded on boundary of 500 m turbine buffer – flight seconds will be clipped
Recorded beyond 500 m turbine buffer or non-flight observation – time will be excluded from CRM

Map ID	Season	VP No	Date	Time	No. of birds	Aggregate seconds recorded	Height (m)	Flight range	Sex	Age	Behaviour	Comments
1	Non-breeding 2021-22	1	13/11/2021	0918	1	10	5	5-10	M	Ad	Hunting	Mobbed by HC
2	Non-breeding 2021-22	1	13/11/2021	0919	1	10	10				Hunting	
3	Non-breeding 2021-22	1	01/12/2021	0957	1	5	5		F		Flying	Low over field
4	Non-breeding 2021-22	1	20/01/2022	1439	1	60	25	23-35	M	Ad	Hunting	
5	Non-breeding 2021-22	1	20/01/2022	1440	1	60	35	35-10			Hunting	
6	Non-breeding 2021-22	1	20/01/2022	1441	1	60	10				Hunting	
7	Non-breeding 2021-22	1	20/01/2022	1511	1	30	15		M	Ad	Hunting	
8	Non-breeding 2021-22	1	20/01/2022	1539	1	10	10		M	Ad	Hunting	
9	Non-breeding 2021-22	1	24/02/2022	0810	1	30	20		F	Ad	Flying	
10	Non-breeding 2021-22	2	23/10/2021	1323	1	60	20		F	Ad	Hunting	
11	Non-breeding 2021-22	2	23/10/2021	1728	1	30	15		F	Ad	Hunting	
12	Non-breeding 2021-22	2	12/11/2021	1206	1	30	15		F	Ad	Hunting	
13	Non-breeding 2021-22	2	12/11/2021	1241	1	55	25		M	Ad	Hunting	
14	Non-breeding 2021-22	2	01/12/2021	1226	1	20	15		M	Ad	Hunting	
15	Non-breeding 2021-22	2	01/12/2021	1341	1	10	15		M	Ad	Hunting	
16	Non-breeding 2021-22	2	18/01/2022	1356	1	60	20	20	F	Ad	Hunting	
17	Non-breeding 2021-22	2	18/01/2022	1602	1	120	20	20	F	Ad	Hunting	
18	Non-breeding 2021-22	2	22/01/2022	1406	1	60	15		F	Ad	Hunting	
19	Non-breeding 2021-22	2	22/01/2022	1536	1	30	20		F	Ad	Hunting	
20	Non-breeding 2021-22	2	08/02/2022	1314	1	60	15	15	M	Ad	Hunting	
21	Non-breeding 2021-22	2	08/02/2022	1327	1	20	10		M	Ad	Flying	
22	Non-breeding 2021-22	2	26/02/2022	1431	1	30	15	15	M	Ad	Flying	
23	Non-breeding 2021-22	2	26/02/2022	1607	1	60	10	10	F	Ad	Hunting	
24	Non-breeding 2021-22	2	26/02/2022	1611	1	10	15	15	M	Ad	Flying	
25	Non-breeding 2021-22	2	26/02/2022	1645	1	30	15	15		Ad	Hunting	
26	Non-breeding 2021-22	2	13/03/2022	1207	1	30	15	15	F	Ad	Flying	
27	Non-breeding 2021-22	2	13/03/2022	1226	1	50	20		F	Ad	Hunting	
28	Non-breeding 2021-22	2	13/03/2022	1356	1	60	20		F	Ad	Hunting	
29	Non-breeding 2021-22	3	16/12/2021	1306	1	60	20				Hunting	
30	Non-breeding 2021-22	3	19/01/2022	1031	1	30	35				Commuting	

Map ID	Season	VP No	Date	Time	No. of birds	Aggregate seconds recorded	Height (m)	Flight range	Sex	Age	Behaviour	Comments
31	Non-breeding 2021-22	4	24/10/2021	1612	1	60	30		F	Ad	Soaring	Soaring under buzzard
32	Non-breeding 2021-22	4	19/01/2022	1350	1	20	40				Soaring	
33	Non-breeding 2021-22	4	19/01/2022	1350	1	30	20				Hunting	
34	Breeding 2022	1	11/04/2022	1218	1	5	2	2	M		Flying	Low flight
35	Breeding 2022	1	11/04/2022	1236	1	5	5	5-15			Hunting	Brief view
36	Breeding 2022	1	11/04/2022	1240	1	160	5	5-15			Hunting	
37	Breeding 2022	1	11/04/2022	1246	1	120	10	10			Hunting	
38	Breeding 2022	1	11/04/2022	1510	1	5	2	2	M		Flying	Low flight
39	Breeding 2022	1	05/05/2022	1530	1	660	15	5-15	M+F	Ad	Alarm calling	mobbing BZ, active breeding nearby, possibly at old farm cottage or nearby trees at 52.697245, -7.794175.
40	Breeding 2022	1	05/05/2022	1635	1	10	5	5	F	Ad	Soaring	Female flight, likely responding to farming disturbance
41	Breeding 2022	1	05/05/2022	1707	1	10	5	10			Fly-land	
42	Breeding 2022	1	03/06/2022	1224	1	240	15	15-20	F	Ad	Flying	Moving north
43	Breeding 2022	1	03/06/2022	1306	1	240	15	15-20	F	Ad	Flying	Moving north
44	Breeding 2022	1	03/06/2022	1452	1	180	20	20-25		Ad	Flying	Drifting south
45	Breeding 2022	1	05/08/2022	1237	1	32	20	20-30	F	Ad	Flying	
46	Breeding 2022	1	05/08/2022	1306	1	175	15	15-20		Ad	Hovering	
47	Breeding 2022	1	25/08/2022	1138	1	30	60	50-70				
48	Breeding 2022	1	30/08/2022	1307	1	240	80	80		Ad	Soaring	
49	Breeding 2022	2	13/04/2022	1458	1	450	30	5-30			Hunting	
50	Breeding 2022	2	13/04/2022	1530	1	200	30	5-30			Hunting	
51	Breeding 2022	2	13/04/2022	1700	1	180	20	20			Hunting	
52	Breeding 2022	2	13/04/2022	1110	1	30	20	15-20			Present	
53	Breeding 2022	2	13/05/2022	1403	1	390	30	1-30			Hunting	
54	Breeding 2022	2	13/05/2022	1605	1	120	20	2-20	M	Ad	Hunting	hunting site edge
55	Breeding 2022	2	20/06/2022	1017	1	28	15	15-20	M	Ad	Flying	Travelling Flight
56	Breeding 2022	2	20/06/2022	1107	1	35	20	20-25	M	Ad	Flying	Perching on old ruin for 2mins approx
57	Breeding 2022	2	24/06/2022	1327	1	16	10	10-15	M	Ad	Flying	Perched on old ruin for up to 10mins approx
58	Breeding 2022	2	24/06/2022	1340	1	25	10	10-15	M	Ad	Flying	Flying off from perch.
59	Breeding 2022	2	28/08/2022	1433	1	30	5	3-8		Juv	Calling	
60	Breeding 2022	2	28/08/2022	1500	1	10	15	180-250			Flying	
61	Breeding 2022	2	28/08/2022	1525	1	120	50	15			Flying	
62	Breeding 2022	2	28/08/2022	1528	1	10	25	50-80			Flying	
63	Breeding 2022	2	28/08/2022	1525	1	120	60	20-30			Flying	
64	Breeding 2022	2	28/08/2022	1528	1	15	30	20-30			Flying	

Map ID	Season	VP No	Date	Time	No. of birds	Aggregate seconds recorded	Height (m)	Flight range	Sex	Age	Behaviour	Comments
65	Breeding 2022	2	28/08/2022	1528	1	5	10	15			Flying	
66	Breeding 2022	3	18/04/2022	1547	1	270	15	10-15			Hunting	
67	Breeding 2022	3	18/04/2022	1612	1	190	30	1-30			Hunting	
68	Breeding 2022	3	18/04/2022	1631	1	250	50	20-50			Hunting	
69	Breeding 2022	3	12/05/2022	1136	1	30	20	15-20			Circling	beside BZ
70	Breeding 2022	3	12/05/2022	1155	1	190	15	10-15			Hunting	
71	Breeding 2022	3	12/05/2022	1340	1	170	10	10			Hunting	
72	Breeding 2022	3	12/05/2022	1435	1	120	20	10-20	F	Ad	Hunting	
73	Breeding 2022	3	12/05/2022	1505	1	90	15	15	M	Ad	Hunting	
74	Breeding 2022	3	20/06/2022	1423	1	180	20	20-30		Ad	Flying	Moving East
75	Breeding 2022	3	25/06/2022	1631	1	25	20	1-30			Flushed	
76	Breeding 2022	3	08/08/2022	1307	1	240	80	80-100		Ad	Circling	
77	Breeding 2022	4	12/04/2022	1345	1	0					Displaying	over large area – not tracked
78	Breeding 2022	4	12/04/2022	1450	1	30	10	5-10			Hunting	
79	Breeding 2022	4	12/04/2022	1451	1	10	10	5-10			Hunting	
81	Breeding 2022	4	22/08/2022	1410	1	50	10	10	F	Ad	Hunting	flew back, disturbed by tractors
80	Breeding 2022	4	04/07/2022	1218	1	180	15	15-25	M	Ad	Hovering	
82	Breeding 2022	4	31/08/2022	1909	1	15	10	5-10			Hunting	into trees
83	Breeding 2022	4	31/08/2022	1940	1	180	15	10-15			Hunting	
84	Breeding 2022	4	31/08/2022	2005	1	90	15	15			Hunting	
85	Breeding 2022	4	31/08/2022	2020	1	240	10	10-15			Hunting	
86	Non-breeding 2022-23	1	21/01/2023	1005	1	20	40	30-40			Hunting	Hunting
87	Non-breeding 2022-23	1	05/02/2023	1049	1	8	30	20-30			Commuting	Commuting flight over agri land
88	Non-breeding 2022-23	1	04/03/2023	0941	1	15	35	30-40			Commuting	Commuting flight
89	Non-breeding 2022-23	1	04/03/2023	1316	1	70	30	10-40			Hunting	Hunting
90	Non-breeding 2022-23	1	04/03/2023	1420	1	36	30	20-40			Hunting	Hunting
91	Non-breeding 2022-23	2	29/10/2022	1422	1	22	10	10-15	M	Ad	Flying	Travelling flight, see map K1
92	Non-breeding 2022-23	2	15/01/2023	1140	1	23	50	40-50			Commuting	Commuting flight
93	Non-breeding 2022-23	2	06/03/2023	1009	1	55	30	30-35	F	Ad	Mobbed	Chased by RO
94	Non-breeding 2022-23	3	29/01/2023	1230	1	12	80	15-40			Hunting	Hunting
95	Non-breeding 2022-23	3	05/03/2023	1147	1	6	45	40-50			Commuting	
96	Non-breeding 2022-23	4	22/01/2023	1223	1	14	50	30-50			Commuting	Commuting flight
97	Non-breeding 2022-23	4	19/02/2023	1117	1	13	50	40-50				
98	Non-breeding 2022-23	4	06/03/2023	1248	1	153	12	12-15	M	Ad	Flying	Moving West
99	Non-breeding 2022-23	4	24/03/2023	1821	1	12	60	50-60			Commuting	

Map ID	Season	VP No	Date	Time	No. of birds	Aggregate seconds recorded	Height (m)	Flight range	Sex	Age	Behaviour	Comments
100	Non-breeding 2022-23	4	26/03/2023	1752	1	26	40	20-40			Hunting	
101	Breeding 2023	1	25/03/2023	1015	1	14	50				Commuting	Commuting flight
102	Breeding 2023	1	09/06/2023	1958	1	45	25	25	F	Ad	Commuting	
103	Breeding 2023	1	03/08/2023	1109	1	34	10	10-20	M	Ad	Flying	Low gliding flight. Moving N
104	Breeding 2023	1	19/09/2023	1050	1	116	15	15-20		Ad	Hunting	Hovering, hunting, moving E
105	Breeding 2023	2	01/06/2023	1022	1	32	10	10-15		Ad	Flying	Flying S
106	Breeding 2023	2	01/06/2023	1046	1	35	15	15-20	M	Ad	Flying	Hovering
107	Breeding 2023	2	27/06/2023	0753	1	41	40	15-40			Hunting	Hovering, flew west
108	Breeding 2023	2	27/06/2023	0848	1	2	15	0-15			Flying	Into large ash tree
109	Breeding 2023	2	27/06/2023	0931	1	3	10	0-10	F	Ad	Flying	Behind hedgerow
110	Breeding 2023	2	27/06/2023	0940	1	288	30	1-30	F	Ad	Hunting	
111	Breeding 2023	2	27/06/2023	1004	1	232	30	20-30	M	Ad	Hunting	Below treeline
112	Breeding 2023	2	27/06/2023	1120	1	44	30	20-30	M	Ad	Hunting	
113	Breeding 2023	2	27/06/2023	1123	1	73	30	20-30	F	Ad	Hunting	Hedgerow 20m from VP
114	Breeding 2023	2	27/06/2023	1146	1	49	20	15-20	F	Ad	Hunting	Mobbed BZ, flew west
115	Breeding 2023	2	27/06/2023	1201	1	354	30	0-30	F	Ad	Hunting	Dropped to the ground over hedgerow possibly
116	Breeding 2023	2	27/06/2023	1218	1	267	50	40-50			Hunting	
117	Breeding 2023	2	27/06/2023	1230	1	54	40	20-40			Mobbing	Mobbing BZ for 30sec
118	Breeding 2023	2	27/06/2023	1328	1	192	20	5-20	M	Ad	Hunting	Hovering, flew west, swooped at female K on hawthorn, female dropped to perch on fencepost
119	Breeding 2023	2	27/06/2023	1328	1	48	5	0-5	F	Ad	Hunting	Female dropped to perch on fencepost, then perched in hedgerow, birds then flew over hedgerow into garden of house
120	Breeding 2023	2	31/07/2023	1307	1	204	30	20-30	F	Ad	Hunting	Hovering, dropped behind treeline
121	Breeding 2023	2	31/07/2023	1312	1	118	50	20-50	F	Ad	Hunting	Hovering, dropped behind treeline
122	Breeding 2023	2	31/07/2023	1323	1	15	25	20-25	M	Ad	Hunting	Hovering, dropped behind treeline
123	Breeding 2023	2	31/07/2023	1323	1	33	25	20-25	F	Ad	Hunting	Landed and perched
124	Breeding 2023	2	09/08/2023	1400	1	266	30	0-30	M	Ad	Hunting	
125	Breeding 2023	2	09/08/2023	1446	1	581	30	1-30	M	Ad	Hunting	
126	Breeding 2023	2	28/08/2023	1611	1	584	30	20-30	M	Ad	Hunting	
150	Breeding 2023	2	29/04/2023	1135	1	45	40	40-50			Hunting	
151	Breeding 2023	2	29/04/2023	1154	1	240	60				Hunting	
127	Breeding 2023	3	19/06/2023	1146	1	28	25	25-30		Ad	Flying	Gliding flight
128	Breeding 2023	3	28/06/2023	1455	1	198	30	15-30	M	Ad	Hunting	
129	Breeding 2023	3	28/06/2023	1557	1	263	70	20-70	F	Ad	Hunting	
130	Breeding 2023	3	28/06/2023	1656	1	992	100	2-100	M	Ad	Hunting	

Map ID	Season	VP No	Date	Time	No. of birds	Aggregate seconds recorded	Height (m)	Flight range	Sex	Age	Behaviour	Comments
131	Breeding 2023	3	18/07/2023	1417	1	233	100	30-100	F	Ad	Soaring	Same thermal as above
133	Breeding 2023	3	18/07/2023	1831	1	106	30	30			Hunting	
134	Breeding 2023	3	18/07/2023	1848	1	22	15	15-	F	Ad	Flying	To telephone pole
135	Breeding 2023	3	16/08/2023	1458	1	658	50	0-15	F	Ad	Hunting	
136	Breeding 2023	4	26/06/2023	1846	1	120	20	3-20	M	Ad	Hunting	
137	Breeding 2023	4	26/06/2023	1848	1	10	3	3			Flying	
138	Breeding 2023	4	26/06/2023	1915	1	60	25	25	M	Ad	Hunting	
139	Breeding 2023	4	27/06/2023	1522	1	22	20	20-	M	Ad	Flying	
140	Breeding 2023	4	27/06/2023	1608	1	185	30	5-30	F	Ad	Hunting	Behind hedgerow
141	Breeding 2023	4	27/06/2023	1612	1	140	30	0-30			Hunting	Dived behind hedgerow
142	Breeding 2023	4	19/07/2023	1130	1	97	50	5-50			Hunting	Dropped below hedgerow
143	Breeding 2023	4	19/07/2023	1142	1	245	30	1-30			Hunting	behind/below hedgerow
144	Breeding 2023	4	19/07/2023	1156	1	48	20	10-20			Hunting	behind/below hedgerow
145	Breeding 2023	4	19/07/2023	1212	1	317	30	0-30			Hunting	behind/below hedgerow
146	Breeding 2023	4	28/08/2023	1314	1	0	-	-	F	Ad	Perched	On telephone wire
147	Breeding 2023	4	20/09/2023	1501	1	84	25	25-			Hunting	Behind treeline
148	Breeding 2023	4	20/09/2023	1558	1	202	30	20-30	F	Ad	Hunting	

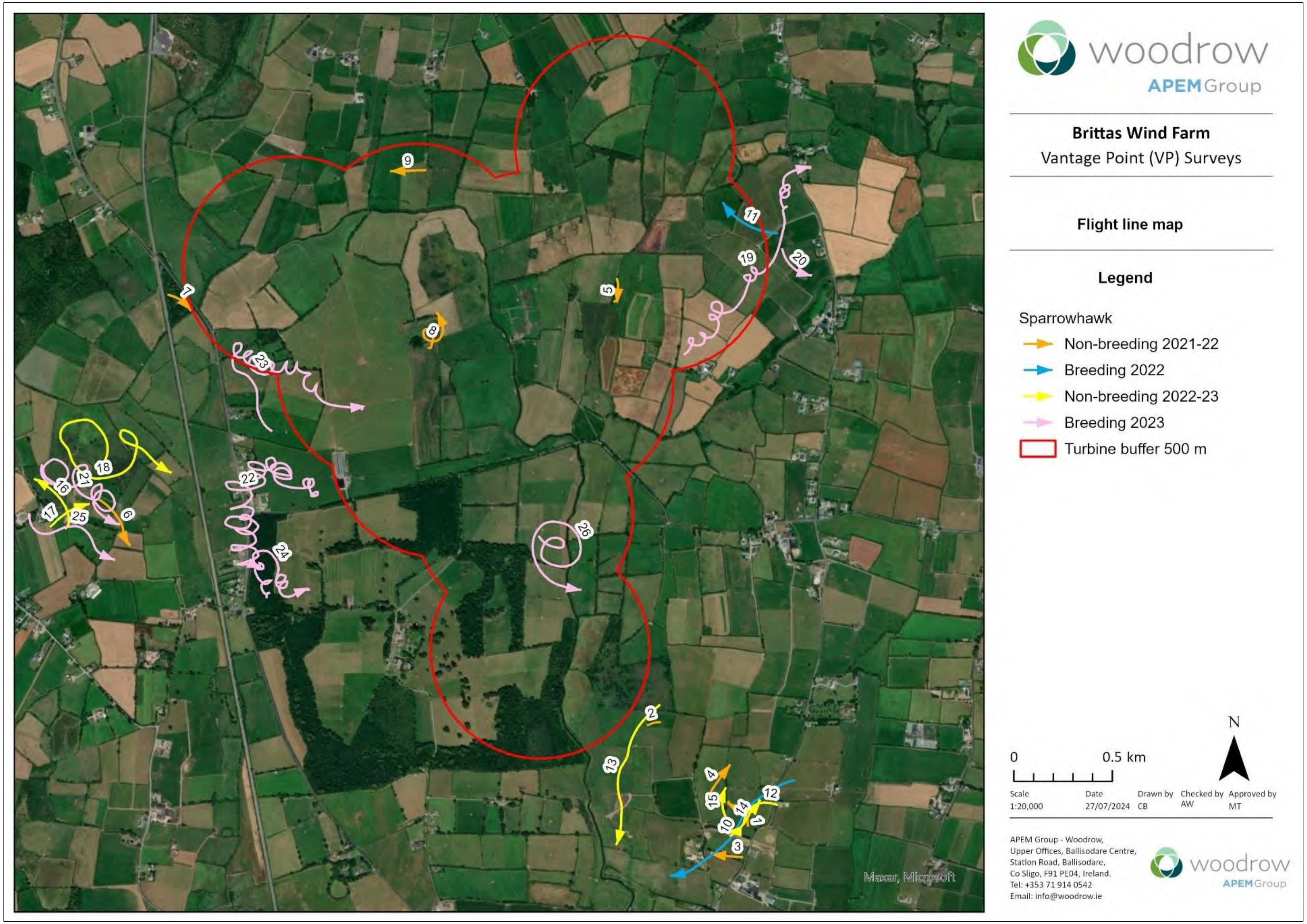

Figure 7E.33: Sparrowhawk observations recorded during VP watches

Table 7E.25: Sparrowhawk data collected during VP watches

Aggregate seconds = flight/observation time x by the number of birds recorded
Recorded within 500 m turbine buffer
Recorded on boundary of 500 m turbine buffer – flight seconds will be clipped
Recorded beyond 500 m turbine buffer or non-flight observation – time will be excluded from CRM

Map ID	Season	VP No.	Date	Time	No. of birds	Aggregate seconds recorded	Height (m)	Flight range	Sex	Age	Behaviour	Comments
1	Non-breeding 2021-22	1	24/10/2021	0854	1	20	4	4	M	Ad	Hunting	Low over hedge and field in front of VP
2	Non-breeding 2021-22	1	16/12/2021	1106	1	5	5	5	F	Ad	Hunting	
3	Non-breeding 2021-22	1	18/01/2022	1136	1	8	5	5	F	Ad	Hunting	
4	Non-breeding 2021-22	1	18/01/2022	1219	1	15	10	10	F	Ad	Hunting	
5	Non-breeding 2021-22	2	22/11/2021	1224	1	10	20	20			Hunting	
6	Non-breeding 2021-22	3	23/01/2022	1108	1	10	10	10	F	Ad	Hunting	
7	Non-breeding 2021-22	3	24/02/2022	1619	1	20	15	15	F	Ad	Hunting	
8	Non-breeding 2021-22	3	26/02/2022	1309	1	40	20	20	F	Ad	Soaring	
9	Non-breeding 2021-22	4	07/03/2022	1225	1	10	5	5	F	Ad	Hunting	
10	Breeding 2022	1	25/08/2022	1121	1	10	12	10-15	M			
11	Breeding 2022	2	13/04/2022	1345	1	30	60	20-60	M		Displaying	Prospecting flight
12	Non-breeding 2022-23	1	24/10/2022	1706	1	8	15	14-16			Commuting	
13	Non-breeding 2022-23	2	24/10/2022	1711	1	21	55	50-60		Ad	Commuting	
14	Non-breeding 2022-23	1	12/12/2022	1105	1	7	5	5-10	F	Ad	Hunting	Flushing RE-FF
15	Non-breeding 2022-23	1	04/03/2023	1013	1	4	3	1-5			Hunting	Hunting flight
16	Non-breeding 2022-23	1	29/10/2022	1116	1	16	20	20-30	F	Ad	Flying	Being mobbed by HC
17	Non-breeding 2022-23	1	31/10/2022	1435	1	8	6	6-10	F	Ad	Hunting	Quick hunting flight
18	Non-breeding 2022-23	3	01/03/2023	1306	1	146	50	50-60	F	Ad	Circling	Drifting east
19	Breeding 2023	3	27/06/2023	1259	1	322	200	50-20			Hunting	
20	Breeding 2023	3	28/08/2023	1838	1	11	25	0-25	F	Ad	Hunting	
21	Breeding 2023	2	06/03/2023	1109	1	263	60	60-80	F	Ad	Soaring	Moving SE
22	Breeding 2023	2	28/06/2023	1645	1	466	120	70-120			Hunting	
23	Breeding 2023	3	18/07/2023	1743	1	194	150	20-150			Hunting	
24	Breeding 2023	3	16/08/2023	1436	1	90	80	50-80			Soaring	
25	Breeding 2023	3	16/08/2023	1931	1	28	20	20-	F	Ad	Hunting	
26	Breeding 2023	3	29/04/2023	1650	1	240	70	4-110			Circling	Circling up – rising slowly over flood plain

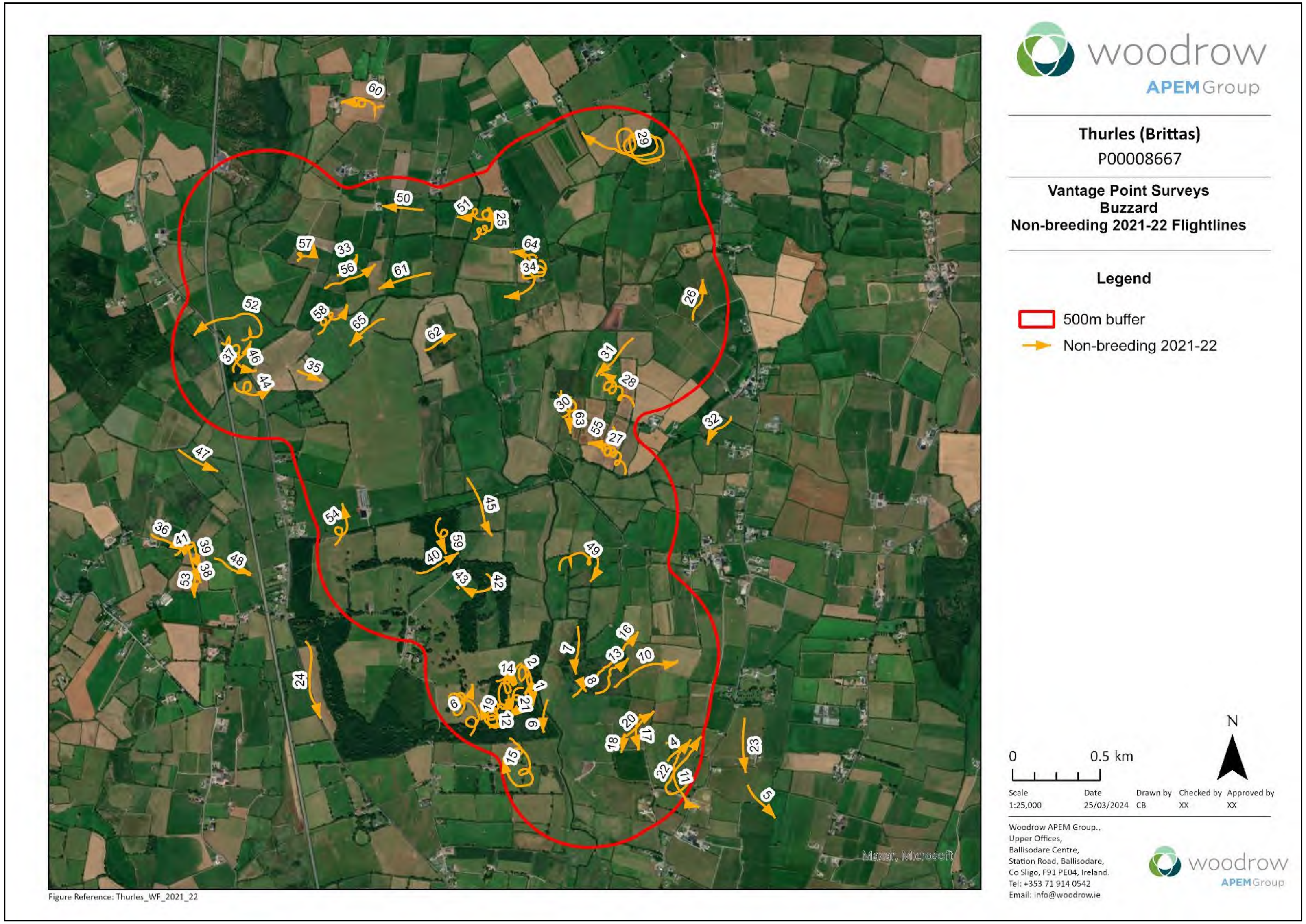

Figure 7E.34: Buzzard observations recorded during VP watches - non-breeding season 2021-22

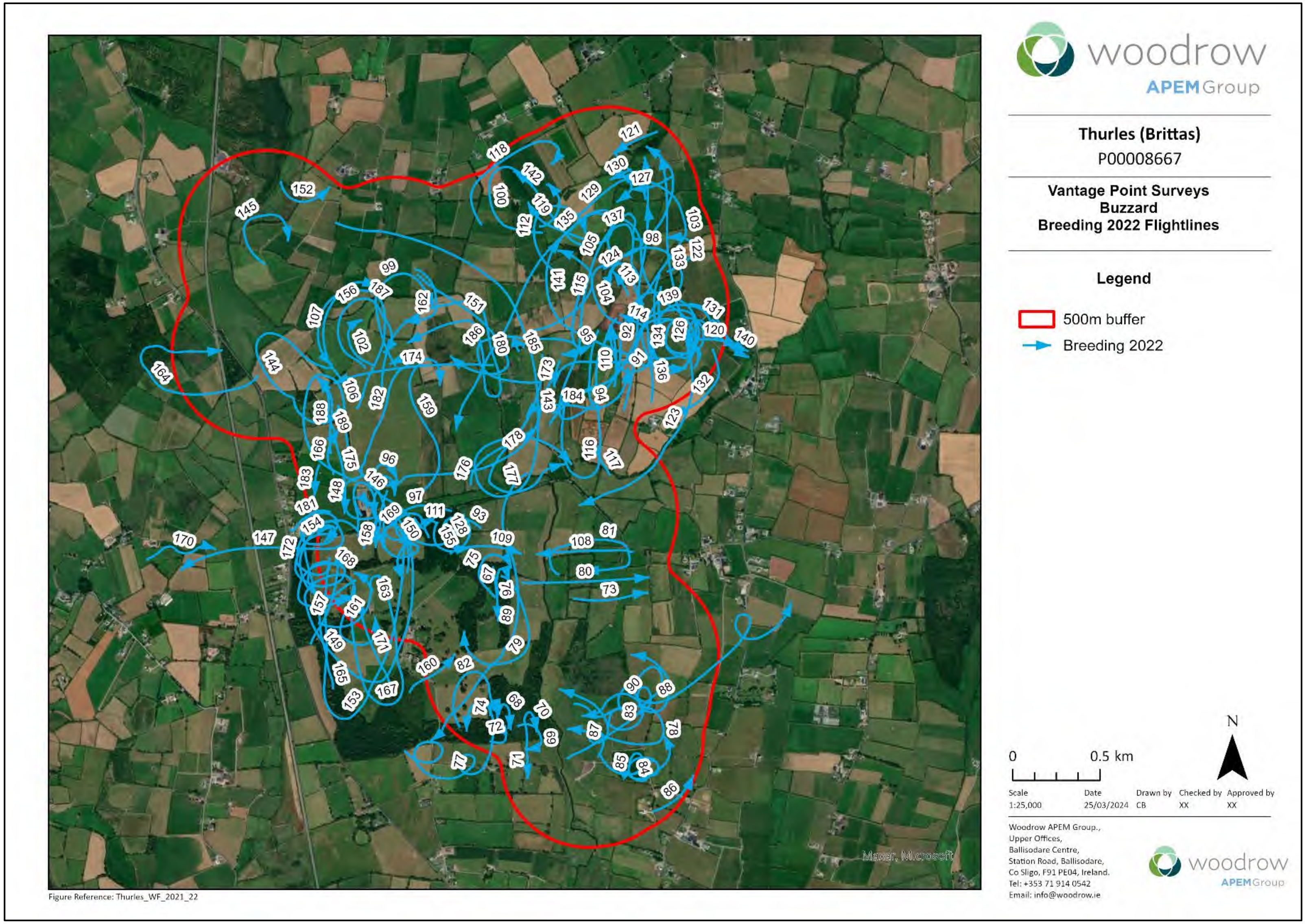

Figure 7E.35: Buzzard observations recorded during VP watches – breeding season 2022

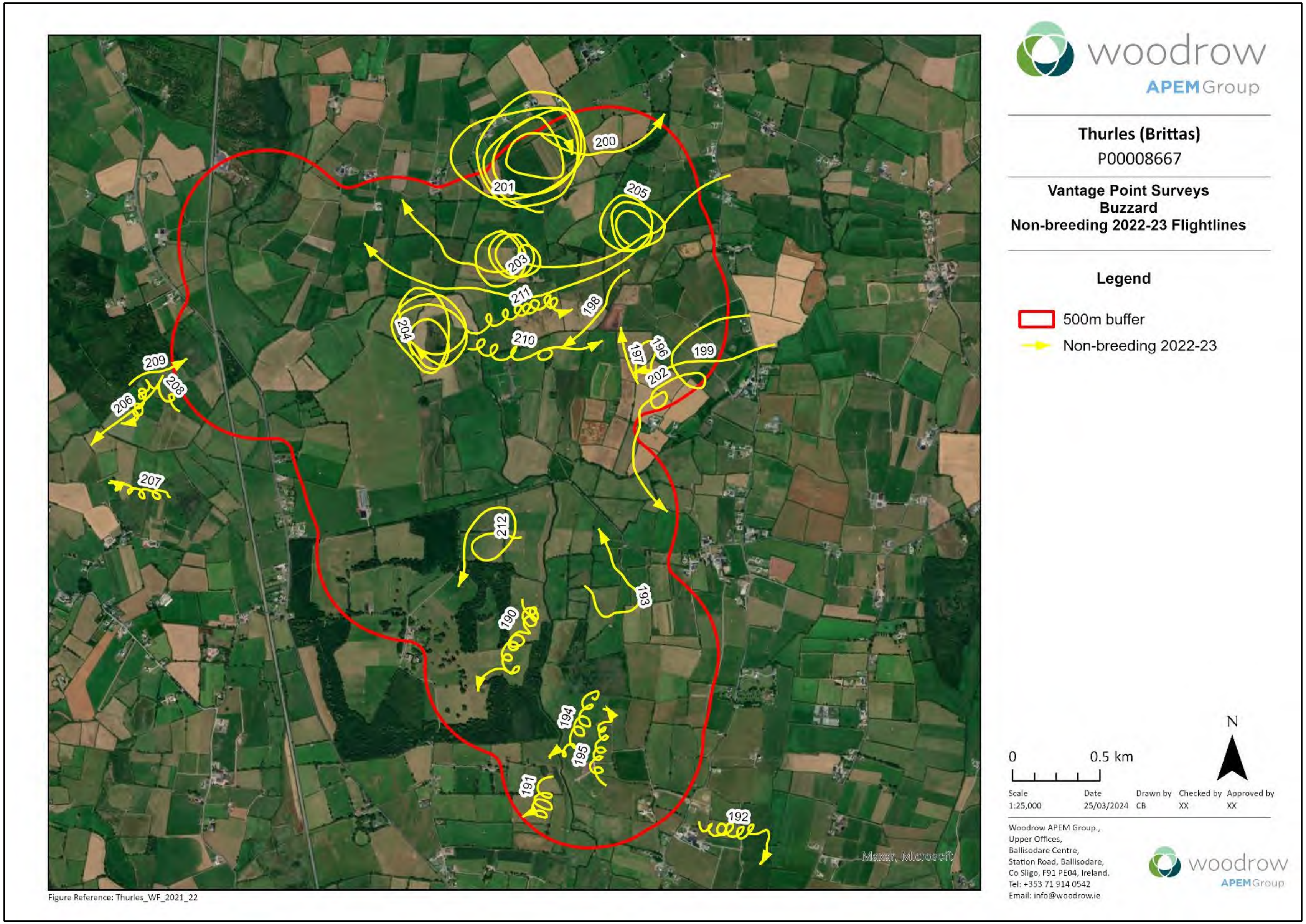

Figure 7E.36: Buzzard observations recorded during VP watches - non-breeding season 2022-23

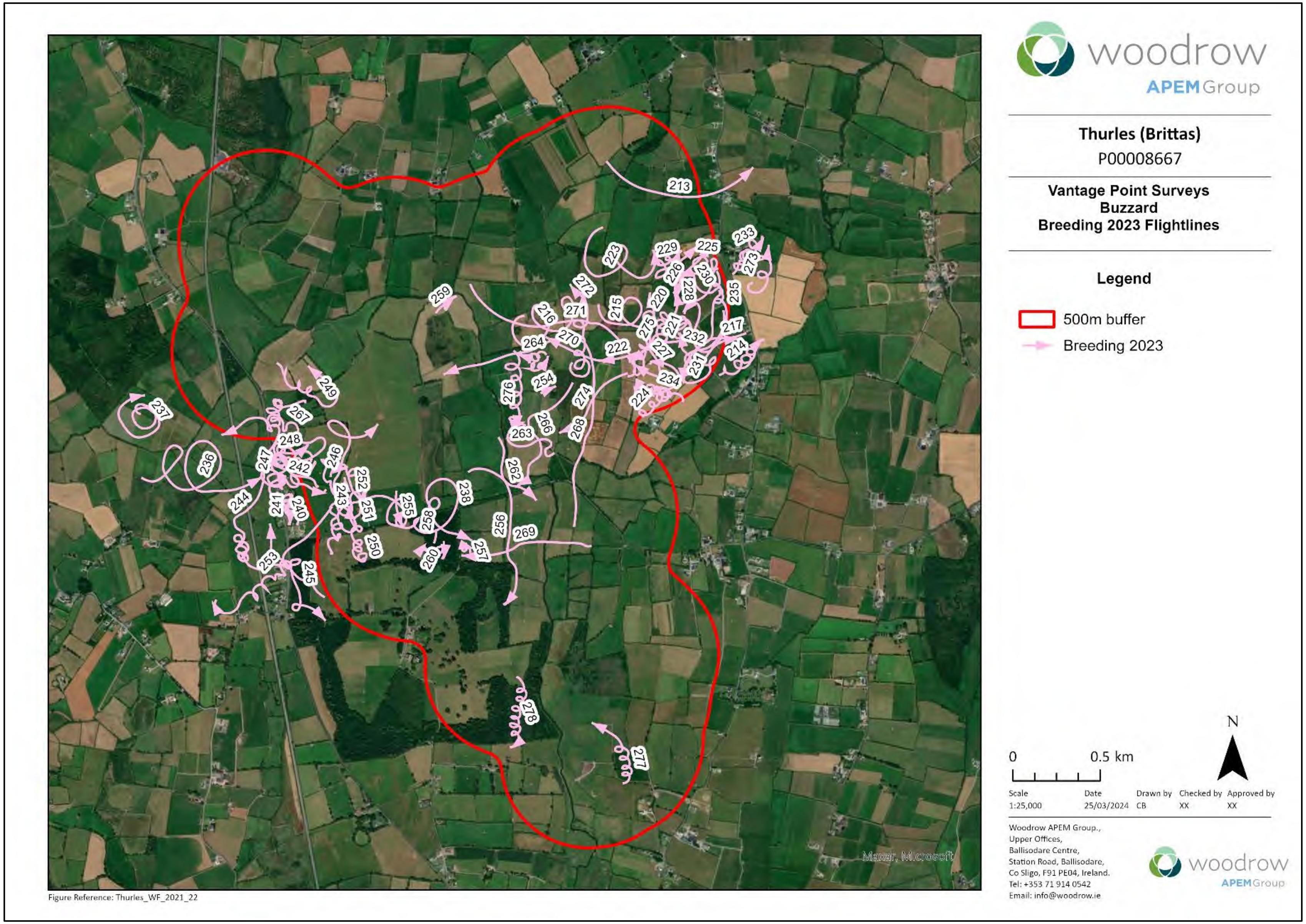

Figure 7E.37: Buzzard observations recorded during VP watches – breeding season 2023

Table 7E.26: Buzzard data collected during VP watches

Aggregate seconds = flight/observation time x by the number of birds recorded
Recorded within 500 m turbine buffer
Recorded on boundary of 500 m turbine buffer – flight seconds will be clipped
Recorded beyond 500 m turbine buffer or non-flight observation – time will be excluded from CRM

Map ID	Season	VP No	Date	Time	No. of birds	Aggregate seconds recorded	Height (m)	Flight range	Sex	Age	Behaviour	Comments
1	Non-breeding 2021-22	1	24/10/2021	1021	1	10	20	20			Commuting	
2	Non-breeding 2021-22	1	24/10/2021	1130	1	48	25	25-15			Soaring	Mobbed by HC
3	Non-breeding 2021-22	1	24/10/2021	1131	1	12	15	15			Soaring	
4	Non-breeding 2021-22	1	24/10/2021	1135	1	10	5	5		Juv	Commuting	Chased by 2 HC
5	Non-breeding 2021-22	1	24/10/2021	1148	1	15	10	10		Juv	Commuting	Same bird as flightline3
6	Non-breeding 2021-22	1	24/10/2021	1245	1	60	25	25		Ad	Hunting	
7	Non-breeding 2021-22	1	24/10/2021	1344	1	30	15	15-5		Ad	Hunting	
8	Non-breeding 2021-22	1	24/10/2021	1345	1	10	5	5			Hunting	
9	Non-breeding 2021-22	1	11/11/2021	1031	1	10	15	15		Ad	Commuting	
10	Non-breeding 2021-22	1	11/11/2021	1142	1	30	30	31			Hunting	
11	Non-breeding 2021-22	1	11/11/2021	1417	1	140	15	15		Ad	Hunting	
12	Non-breeding 2021-22	1	11/11/2021	1458	2	60	30	30			Circling	
13	Non-breeding 2021-22	1	11/11/2021	1503	1	40	7	7			Hunting	
14	Non-breeding 2021-22	1	11/11/2021	1508	1	5	15	15			Circling	
15	Non-breeding 2021-22	1	11/11/2021	1515	1	120	40	40			Circling	
16	Non-breeding 2021-22	1	11/11/2021	1527	1	60	35	35			Commuting	
17	Non-breeding 2021-22	1	11/11/2021	1530	2	60	10	10			Hunting	Two birds together
18	Non-breeding 2021-22	1	13/11/2021	0836	1	10	5	5			Hunting	
19	Non-breeding 2021-22	1	18/01/2022	1022	1	30	15	15			Soaring	
20	Non-breeding 2021-22	1	18/01/2022	1106	1	15	10	10			Flying	
21	Non-breeding 2021-22	1	18/01/2022	1148	1	15	15	15			Soaring	
22	Non-breeding 2021-22	1	20/01/2022	1301	2	120	10	10		Ad	Hunting	
23	Non-breeding 2021-22	1	08/02/2022	0928	1	20	10	10			Flying	
24	Non-breeding 2021-22	1	24/02/2022	1002	1	50	40	40			Flying	Mobbed by 6 RO
25	Non-breeding 2021-22	2	23/10/2021	1544	4	160	40	40			Soaring	4 birds together
26	Non-breeding 2021-22	2	23/10/2021	1746	1	20	10	10		Ad	Commuting	Low over field
27	Non-breeding 2021-22	2	12/11/2021	1220	2	240	20	20			Soaring	
28	Non-breeding 2021-22	2	22/11/2021	1011	2	240	40	40			Soaring	
29	Non-breeding 2021-22	2	22/11/2021	1328	1	180	60	60			Soaring	
30	Non-breeding 2021-22	2	20/12/2021	1025	1	10	15	15			Flying	Up and back down

Map ID	Season	VP No	Date	Time	No. of birds	Aggregate seconds recorded	Height (m)	Flight range	Sex	Age	Behaviour	Comments
31	Non-breeding 2021-22	2	18/01/2022	1403	1	30	25	25			Commuting	
32	Non-breeding 2021-22	2	22/01/2022	1606	1	20	15	15			Commuting	
33	Non-breeding 2021-22	2	26/02/2022	1520	1	20	25	25			Soaring	
34	Non-breeding 2021-22	2	13/03/2022	1311	2	120	30	30			Soaring	
35	Non-breeding 2021-22	3	26/10/2021	1243	1	10	20	20			Commuting	
36	Non-breeding 2021-22	3	23/11/2021	1315	1	30	10	10			Hunting	
37	Non-breeding 2021-22	3	23/11/2021	1322	1	20	15	15			Commuting	
38	Non-breeding 2021-22	3	23/11/2021	1402	1	20	10	10			Hunting	
39	Non-breeding 2021-22	3	24/11/2021	1033	1	10	10	10			Hunting	
40	Non-breeding 2021-22	3	16/12/2021	1428	1	10	10	10			Commuting	
41	Non-breeding 2021-22	3	21/12/2021	1017	1	5	10	10			Hunting	
42	Non-breeding 2021-22	3	19/01/2022	0943	1	10	25	25		Ad	Flying	
43	Non-breeding 2021-22	3	19/01/2022	0943	1	0	25	25-0			Landed	No flight seconds attributed as bird landing
44	Non-breeding 2021-22	3	19/01/2022	1034	2	60	25	25			Soaring	
45	Non-breeding 2021-22	3	19/01/2022	1038	1	5	15	15			Commuting	
46	Non-breeding 2021-22	3	19/01/2022	1052	2	120	25	25			Soaring	Same birds as flightline 10
47	Non-breeding 2021-22	3	23/01/2022	1047	1	20	10	10			Flying	
48	Non-breeding 2021-22	3	23/01/2022	1058	1	20	15	15			Flying	
49	Non-breeding 2021-22	3	24/02/2022	1430	2	120	30	30		Ad	Soaring	Two birds together
50	Non-breeding 2021-22	3	24/02/2022	1431	1	30	20	20			Hunting	
51	Non-breeding 2021-22	3	24/02/2022	1431	1	20	25	25			Soaring	
52	Non-breeding 2021-22	3	07/03/2022	1557	2	60	35	35			Soaring	
53	Non-breeding 2021-22	3	07/03/2022	1617	1	20	15	15			Commuting	
54	Non-breeding 2021-22	3	07/03/2022	1639	1	50	20	20			Hunting	
55	Non-breeding 2021-22	4	24/10/2021	1612	1	60	35	35		Ad	Soaring	
56	Non-breeding 2021-22	4	09/01/2022	1455	1	15	10	10			Flying	
57	Non-breeding 2021-22	4	19/01/2022	1247	1	30	30	30			Hunting	
58	Non-breeding 2021-22	4	24/02/2022	1213	1	30	20	20			Soaring	Over woodland
59	Non-breeding 2021-22	4	24/02/2022	1312	1	20	20	20			Soaring	
60	Non-breeding 2021-22	4	24/02/2022	1325	1	60	40	40			Soaring	
61	Non-breeding 2021-22	4	24/02/2022	1338	1	20	10	10		Ad	Hunting	Mobbed by 2 HC
62	Non-breeding 2021-22	4	26/02/2022	0923	1	20	15	15			Hunting	
63	Non-breeding 2021-22	4	26/02/2022	0952	1	5	10	10			Flying	
64	Non-breeding 2021-22	4	07/03/2022	1253	2	40	15	15			Soaring	Over treetops
65	Non-breeding 2021-22	4	07/03/2022	1304	1	10	5	5		Ad	Flying	

Map ID	Season	VP No	Date	Time	No. of birds	Aggregate seconds recorded	Height (m)	Flight range	Sex	Age	Behaviour	Comments
66	Breeding 2022	1	11/04/2022	1150	1	10	10	10			Present	suitable breeding habitat/dropped into wood area
67	Breeding 2022	1	11/04/2022	1205	2	300	15	10-15			Displaying	interacting, talon grasp - breeding pair
68	Breeding 2022	1	11/04/2022	1218	1	60	15	15			Circling	landed into woodland area
69	Breeding 2022	1	11/04/2022	1305	1	100	25	15-25			Flying	just above trees/ slow glide
70	Breeding 2022	1	11/04/2022	1500	2	720	35	35			Displaying	
71	Breeding 2022	1	11/04/2022	1531	1	250	80	15-80			Circling	slow circling, gliding over trees
72	Breeding 2022	1	11/04/2022	1600	1	240	50	30-50			Displaying	
73	Breeding 2022	1	11/04/2022	1610	1	80	50	30-50			Circling	
74	Breeding 2022	1	11/04/2022	1709	1	140	30	30			Flying	over trees
75	Breeding 2022	1	05/05/2022	1243	1	540	30	20-30			Gliding	went into wooded area
76	Breeding 2022	1	05/05/2022	1451	1	30	30	30			Gliding	lost view to follow PE flight
77	Breeding 2022	1	05/05/2022	1510	2	1,200	140	30-140			Displaying	over suitable nesting habitat
78	Breeding 2022	1	05/05/2022	1617	1	270	40	20-40			Displaying	
79	Breeding 2022	1	05/05/2022	1618	1	250	70	20-70			Displaying	
80	Breeding 2022	1	05/05/2022	1625	1	90	140	140			Circling	
81	Breeding 2022	1	05/05/2022	1650	1	200	80	40-80			Displaying	
82	Breeding 2022	1	05/05/2022	1700	1	280	50	30-50			Displaying	went into trees
83	Breeding 2022	1	04/07/2022	1026	1	180	40	40-50	M	Ad	Gliding	
84	Breeding 2022	1	04/07/2022	1107	1	300	40	40-50	M	Ad	Gliding	
85	Breeding 2022	1	16/07/2022	1125	1	840	100	100-150			Soaring	
86	Breeding 2022	1	16/07/2022	1244	1	420	80	80-100	M	Ad	Soaring	
87	Breeding 2022	1	05/08/2022	1427	1	130	80	80-100		Ad	Soaring	
88	Breeding 2022	1	25/08/2022	1357	1	65	150	120-160				
89	Breeding 2022	1	25/08/2022	1437	1	30	80	60-90				
90	Breeding 2022	1	30/08/2022	1219	3	1,260	100	100		Ad	Soaring	
91	Breeding 2022	2	13/04/2022	1458	1	500	120	20-120			Displaying	
92	Breeding 2022	2	13/04/2022	1515	1	90	20	5-20			Gliding	descended into wood area.
93	Breeding 2022	2	13/04/2022	1535	2	1,400	70	30-70			Displaying	
94	Breeding 2022	2	13/04/2022	1537	1	500	150	10-150			Displaying	
95	Breeding 2022	2	13/04/2022	1635	1	480	200	50-200			Displaying	
96	Breeding 2022	2	13/04/2022	1645	2	800	100	30-100			Displaying	Over woodland, suitable for breeding.
97	Breeding 2022	2	13/04/2022	1702	3	1,350	100	80-100			Displaying	
98	Breeding 2022	2	13/04/2022	1120	2	460	240	10-240			Displaying	descended to woodland/displaying high
99	Breeding 2022	2	13/04/2022	1127	4	1,200	200	100-200			Displaying	
100	Breeding 2022	2	13/04/2022	1135	1	135	100	80-100			Displaying	

Map ID	Season	VP No	Date	Time	No. of birds	Aggregate seconds recorded	Height (m)	Flight range	Sex	Age	Behaviour	Comments
101	Breeding 2022	2	13/04/2022	1230	1	240	120	50-120			Displaying	
102	Breeding 2022	2	13/04/2022	1231	3	900	150	80-150			Displaying	
103	Breeding 2022	2	13/04/2022	1240	2	1,200	80	5-80			Displaying	descended into trees
104	Breeding 2022	2	13/04/2022	1253	2	360	60	5-60			Displaying	talon grasp, sharp descent -breeding pair
105	Breeding 2022	2	13/04/2022	1300	2	2,520	220	10-220			Displaying	likely nesting area marked 14X
106	Breeding 2022	2	13/04/2022	1331	2	1,200	150	20-150			Displaying	likely nesting area marked 15X
107	Breeding 2022	2	13/04/2022	1333	3	1,200	200	30-200			Displaying	separate third pair
108	Breeding 2022	2	13/05/2022	1020	1	45	30	30			Circling	
109	Breeding 2022	2	13/05/2022	1023	2	60	40	30-40			Circling	
110	Breeding 2022	2	13/05/2022	1026	1	50	15	15			Flying	
111	Breeding 2022	2	13/05/2022	1040	1	120	25	25			Circling	
112	Breeding 2022	2	13/05/2022	1150	1	540	40	15-40			Circling	
113	Breeding 2022	2	13/05/2022	1200	1	230	20	5-20			Circling	
114	Breeding 2022	2	13/05/2022	1245	1	40	10	2-10			Gliding	over scrub
115	Breeding 2022	2	13/05/2022	1427	1	180	20	3-20			Circling	
116	Breeding 2022	2	13/05/2022	1533	1	630	50	5-50			Circling	
117	Breeding 2022	2	13/05/2022	1540	1	10	5	5			Flying	over lapwing breeding area
118	Breeding 2022	2	13/05/2022	1545	1	60	40	40			Circling	site edge
119	Breeding 2022	2	13/05/2022	1557	1	30	10	10			Flying	low behind hedges
120	Breeding 2022	2	20/06/2022	1035	1	420	100	100-150	M	Ad	Soaring	Drifting West
121	Breeding 2022	2	06/07/2022	1515	1	25	30	20-30			Flying	glide over wooded area
122	Breeding 2022	2	06/07/2022	1535	1	240	60	30-60			Soaring	soaring/hunting and circling
123	Breeding 2022	2	06/07/2022	1548	1	400	90	10-90			Soaring	soaring/hunting
124	Breeding 2022	2	06/07/2022	1703	1	150	60	5-60			Circling	
125	Breeding 2022	2	06/07/2022	1732	1	60	30	5-30			Flying	landed
126	Breeding 2022	2	06/07/2022	1737	1	90	20	10-15			Hunting	hovering briefly
127	Breeding 2022	2	06/07/2022	1137	1	150	40	10-40			Hunting	glided low out of view
128	Breeding 2022	2	06/07/2022	1220	2	180	30	20-30			Circling	over woodland
129	Breeding 2022	2	06/07/2022	1235	1	80	80	15-80			soaring	low glide, ascended, descended
130	Breeding 2022	2	06/07/2022	1300	1	70	30	20-30			gliding	gliding low
131	Breeding 2022	2	06/07/2022	1305	1	10	10	10			Flying	out of view behind hedgerow
132	Breeding 2022	2	06/07/2022	1345	1	80	5	2-5			Flying	gliding low
133	Breeding 2022	2	06/07/2022	1358	1	240	50	5-50			Carrying food	to likely nest area marked 7
134	Breeding 2022	2	28/08/2022	1445	1	120	40	20-60			Calling	
135	Breeding 2022	2	28/08/2022	1447	1	780	80	80-300			Flying	

Map ID	Season	VP No	Date	Time	No. of birds	Aggregate seconds recorded	Height (m)	Flight range	Sex	Age	Behaviour	Comments
136	Breeding 2022	2	28/08/2022	1446	1	90	60	50-80			Flying	
137	Breeding 2022	2	28/08/2022	1447	1	66	80	70-100			Flying	
138	Breeding 2022	2	28/08/2022	1448	1	10	150	10-150			Flying	
139	Breeding 2022	2	28/08/2022	1447	1	180	80	70-100			Flying	
140	Breeding 2022	2	28/08/2022	1450	1	30	40	70-100			Flying	
141	Breeding 2022	2	28/08/2022	1447	1	90	100	10-50			Flying	
142	Breeding 2022	2	28/08/2022	1448	1	660	200	90-120			Flying	
143	Breeding 2022	2	28/08/2022	1549	1	90	80	60-150			Flying	
144	Breeding 2022	3	18/04/2022	1135	1	480	90	10-90			Displaying	over scrub/ woodland
145	Breeding 2022	3	18/04/2022	1200	3	135	120	90-120			Displaying	together
146	Breeding 2022	3	18/04/2022	1205	1	120	70	30-70			Displaying	likely nesting area marked X
147	Breeding 2022	3	18/04/2022	1206	2	400	40	10-40			Flight call	both birds flying together
148	Breeding 2022	3	18/04/2022	1214	1	60	50	10-50			Flying	circling farmyard
149	Breeding 2022	3	18/04/2022	1215	2	1,560	100	10-100			displaying	landed at wooded area
150	Breeding 2022	3	18/04/2022	1301	2	60	30	30			Circling	over woodland
151	Breeding 2022	3	18/04/2022	1330	2	300	50	20-50			Circling	
152	Breeding 2022	3	18/04/2022	1520	1	150	120	30-120			displaying	at edge of 500m buffer
153	Breeding 2022	3	18/04/2022	1610	3	660	40	20-40			Circling	
154	Breeding 2022	3	18/04/2022	1620	2	500	25	10-25			Circling	over woodland
155	Breeding 2022	3	18/04/2022	1630	1	200	50	50			Circling	display
156	Breeding 2022	3	18/04/2022	1645	1	100	110	40-110			Circling	going high
157	Breeding 2022	3	12/05/2022	1135	1	45	40	15-40			Circling	out of view to sun
158	Breeding 2022	3	12/05/2022	1150	1	100	30	15-30			Circling	landed into trees
159	Breeding 2022	3	12/05/2022	1150	2	640	50	20-50			Displaying	together
160	Breeding 2022	3	12/05/2022	1210	1	40	15	15			Gliding	went behind cover
161	Breeding 2022	3	12/05/2022	1220	1	120	20	10-20			Gliding	above trees
162	Breeding 2022	3	12/05/2022	1325	1	330	40	10-40			Displaying	low into scrub
163	Breeding 2022	3	12/05/2022	1330	3	330	20	5-20			Displaying	low into trees
164	Breeding 2022	3	12/05/2022	1520	1	200	20	10-20			circling	
165	Breeding 2022	3	12/05/2022	1541	1	430	70	15-70			landed	in trees
166	Breeding 2022	3	12/05/2022	1604	1	40	10	10			landed	
167	Breeding 2022	3	12/05/2022	1630	1	600	25	10-25			Circling	returning to likely nest area
168	Breeding 2022	3	20/06/2022	1220	2	1,560	200	200-300	1M1F	Ad	Soaring	Descending over woodland out of sight.
169	Breeding 2022	3	20/06/2022	1242	1	420	200	200-300		Ad	Soaring	Drifting South
170	Breeding 2022	3	20/06/2022	1338	1	55	30	30-40	M	Ad	Flying	Moving East

Map ID	Season	VP No	Date	Time	No. of birds	Aggregate seconds recorded	Height (m)	Flight range	Sex	Age	Behaviour	Comments
171	Breeding 2022	3	25/06/2022	1722	1	15	20	10-30			Flying	
172	Breeding 2022	3	08/08/2022	1219	3	1,260	100	100-150		Ad	Soaring	
173	Breeding 2022	4	12/04/2022	1626	1	45	10	10			Present	low glide
174	Breeding 2022	4	12/04/2022	1630	1	60	10	10			Present	
175	Breeding 2022	4	12/04/2022	1634	1	25	15	15			Present	
176	Breeding 2022	4	12/04/2022	1328	1	30	10	5-10			Present	
177	Breeding 2022	4	12/04/2022	1345	1	250	120	20-120			Flying	landed on callow
178	Breeding 2022	4	12/04/2022	1405	2	920	200	40-200			Displaying	
179	Breeding 2022	4	12/04/2022	1412	1	120	100	60-100			Displaying	
180	Breeding 2022	4	12/04/2022	1428	3	3,600	200	100-200			Displaying	
181	Breeding 2022	4	12/04/2022	1440	3	2,160	180	30-180			Displaying	
182	Breeding 2022	4	12/04/2022	1440	4	2,800	180	30-180			Displaying	
183	Breeding 2022	4	12/04/2022	1500	2	780	50	40-50			Displaying	
184	Breeding 2022	4	12/04/2022	1501	1	390	70	60-70			Displaying	
185	Breeding 2022	4	06/05/2022	1020	1	0	-	-			Perched	for 45 minutes at c. 5m
186	Breeding 2022	4	22/08/2022	1620	4	2,120	60	20-60			Displaying	Likely 2 pairs
187	Breeding 2022	4	22/08/2022	1622	2	900	60	20-60			Displaying	
188	Breeding 2022	4	22/08/2022	1305	1	20	20	10-20			Flying	Glide
189	Breeding 2022	4	22/08/2022	1340	1	60	60	40-60			Displaying	
190	Non-breeding 2022-23	1	21/01/2023	1021	1	45	100	80-100			Circling	Circling
191	Non-breeding 2022-23	1	21/01/2023	1242	1	12	50	40-50			Circling	Circling
192	Non-breeding 2022-23	1	21/01/2023	1311	1	30	70	60-70			Circling	Circling
193	Non-breeding 2022-23	1	25/01/2023	1421	2	168	75	0-80			Soaring	Circling, soaring and travelling N
194	Non-breeding 2022-23	1	04/03/2023	1132	1	186	65	60-70			Circling	Circling
195	Non-breeding 2022-23	1	04/03/2023	1447	1	125	85	80-90			Circling	Circling
196	Non-breeding 2022-23	2	28/11/2022	1432	1	12	5	3-10			Hunting	Sortie from perch to wet pasture and returned, likely hunting worms
197	Non-breeding 2022-23	2	28/11/2022	1441	1	2	12	10-20			Flying	Different individual to #20
198	Non-breeding 2022-23	2	15/01/2023	1024	1	20	100	80-100			Commuting	Commute Flight
199	Non-breeding 2022-23	2	06/02/2023	1547	2	56	50	40-50			Mobbed	Commute, mobbed by rooks
200	Non-breeding 2022-23	2	06/03/2023	1019	1	50	75	60-80		Ad	Mobbed	Chased by HC
201	Non-breeding 2022-23	2	06/03/2023	1027	4	6,640	400	200-600	Pairs	Ad	Soaring	In pairs
202	Non-breeding 2022-23	2	06/03/2023	1053	1	85	150	140-160		Ad	Hunting	
203	Non-breeding 2022-23	2	06/03/2023	1107	2	490	150	100-200		Ad	Hunting	
204	Non-breeding 2022-23	2	06/03/2023	1139	2	1,440	500	400-600		Ad	Soaring	Courtship/displaying
205	Non-breeding 2022-23	2	06/03/2023	1223	2	1,200	200	150-250		Ad	Hunting	

Map ID	Season	VP No	Date	Time	No. of birds	Aggregate seconds recorded	Height (m)	Flight range	Sex	Age	Behaviour	Comments
206	Non-breeding 2022-23	3	18/02/2023	1145	1	nr	50	40-50			Commuting	Commuting flight time not recorded = nr
207	Non-breeding 2022-23	3	05/03/2023	1316	1	45	85	80-90			Commuting	
208	Non-breeding 2022-23	3	05/03/2023	1439	1	37	70	60-80			Circling	
209	Non-breeding 2022-23	3	05/03/2023	1510	1	22	65	60-70			Commuting	
210	Non-breeding 2022-23	4	22/01/2023	1428	1	47	80	70-80			Circling	Circling
211	Non-breeding 2022-23	4	19/02/2023	1450	1	120	70	60-70			Commuting	Commute flight & hunting
212	Non-breeding 2022-23	4	06/03/2023	1317	1	215	30	30-40		Ad	Soaring	Drifting S.
213	Breeding 2023	2	06/03/2023	1433	1	60	75	50-100		Ad	Mobbed	Chased by RO.
214	Breeding 2023	2	25/03/2023	1347	1	30	80	70-80			Circling	
215	Breeding 2023	2	25/03/2023	1415	1	120	90	80-90			Circling	
216	Breeding 2023	2	25/03/2023	1457	1	360	120	100-120			Circling	
217	Breeding 2023	2	25/03/2023	1502	2	40	70	60-70			Commuting	2 BZ fly in over VP mobbed by rooks, one flies off while other perches in tree, perched bird flies off in different direction after a short time
218	Breeding 2023	2	25/03/2023	1502	1	13	50	40-50			Commuting	
219	Breeding 2023	2	25/03/2023	1502	1	14	40	50-60			Commuting	
220	Breeding 2023	2	25/03/2023	1542	1	40	90	80-90			Circling	
221	Breeding 2023	2	25/03/2023	1556	2	360	100	80-100			Circling	
222	Breeding 2023	2	25/03/2023	1556	2	44	130	120-130				
223	Breeding 2023	2	01/06/2023	1248	2	1,044	100	100-150	M+F	Ad	Soaring	Drift N
224	Breeding 2023	2	27/06/2023	0936	1	61	20	20-0	F	Ad	Circling	Circling over treeline
225	Breeding 2023	2	27/06/2023	1105	1	196	40	40-20			Hunting	Below treeline
226	Breeding 2023	2	27/06/2023	1116	1	71	30	30-20		Ad	Hunting	Hedgerow 20m from VP
227	Breeding 2023	2	27/06/2023	1145	1	108	20	20-0		Ad	Hunting	Mobbed by K, calling
228	Breeding 2023	2	27/06/2023	1229	1	114	40	40-20			Mobbed	Mobbed by K
229	Breeding 2023	2	27/06/2023	1317	1	210	80	80-25		Ad	Soaring	Above woodland dived quickly after arrival of BZ
230	Breeding 2023	2	27/06/2023	1318	1	73	30	30-25		Ad	Provisioning	Possibly provisioning
231	Breeding 2023	2	31/07/2023	1411	1	367	30	30-15		Ad	Hunting	
232	Breeding 2023	2	31/07/2023	1412	1	142	30	30-15		Ad	Hunting	
233	Breeding 2023	2	09/08/2023	1048	1	394	80	80			Soaring	Hunting towards NE
234	Breeding 2023	2	09/08/2023	1418	1	411	150	20-150		Ad	Soaring	Dived to treeline
235	Breeding 2023	2	09/08/2023	1541	1	179	80	80-15		Ad	Calling	Continuous calling heard call from second adult in large sycamore
236	Breeding 2023	3	06/03/2023	1036	2	1,508	80	80-100	M+F	Ad	Soaring	Drifting E.
237	Breeding 2023	3	01/06/2023	0853	1	92	30	30-40		Ad	Circling	
238	Breeding 2023	3	19/06/2023	1220	2	1,120	100	100-150	M+F	Ad	Soaring	Circling, drifting E

Map ID	Season	VP No	Date	Time	No. of birds	Aggregate seconds recorded	Height (m)	Flight range	Sex	Age	Behaviour	Comments
239	Breeding 2023	3	28/06/2023	1219	1	5	20	20-15		Ad	Flying	Alarm calling, appeared to be mobbing? In treeline
240	Breeding 2023	3	28/06/2023	1256	1	10	25	25		Ad	Flying	Perched in tree
241	Breeding 2023	3	28/06/2023	1431	1	14	20	30-15			Flying	Perched, probably non-breeding
242	Breeding 2023	3	28/06/2023	1445	1	264	30	30			Hunting	
243	Breeding 2023	3	18/07/2023	1352	1	288	100	100-15		Ad	Hunting	
244	Breeding 2023	3	18/07/2023	1413	1	293	100	100-15		Ad	Soaring	Behind treeline
245	Breeding 2023	3	18/07/2023	1419	1	179	100	100-20		Ad	Calling	Behind treeline
246	Breeding 2023	3	18/07/2023	1557	1	108	40	40-20			Hunting	Behind treeline
247	Breeding 2023	3	18/07/2023	1559	1	349	80	80-15	F	Ad	Soaring	Joined by #8 into treeline
248	Breeding 2023	3	18/07/2023	1601	1	121	100	100-15	M	Ad	Soaring	joined #7 into treeline
249	Breeding 2023	3	18/07/2023	1656	1	466	150	150-20			Hunting	Behind treeline
250	Breeding 2023	3	18/07/2023	1719	1	158	60	60-20			Hunting	Behind treeline
251	Breeding 2023	3	18/07/2023	1722	1	547	60	60-20			Hunting	Behind treeline
252	Breeding 2023	3	18/07/2023	1741	1	73	30	30-20			Hunting	To telephone pole
253	Breeding 2023	3	18/07/2023	1747	1	165	50	50-20			Hunting	Behind treeline
254	Breeding 2023	4	16/06/2023	0733	1	10	20	20			Flying	
255	Breeding 2023	4	16/06/2023	0854	1	5	15	15			Flying	
256	Breeding 2023	4	16/06/2023	0919	1	60	30	30			Hunting	
257	Breeding 2023	4	26/06/2023	1753	2	320	50	50			Soaring	
258	Breeding 2023	4	26/06/2023	1802	1	20	25	25			Flying	
259	Breeding 2023	4	26/06/2023	1811	2	120	25	25			Hunting	
260	Breeding 2023	4	26/06/2023	1826	2	60	20	20			Flying	Calling over woodland good breeding habitat
261	Breeding 2023	4	26/06/2023	1909	1	20	20	20			Flying	over woodland calling
262	Breeding 2023	4	10/08/2023	0852	1	2	5	5		Juv	Hunting	Behind hedgerow (fledged)
263	Breeding 2023	4	10/08/2023	0949	1	28	15	15-5		Juv	Mobbed	Mobbed by 6HC (fledged)
264	Breeding 2023	4	10/08/2023	1205	1	104	50	30-15			Soaring	Hunting
265	Breeding 2023	4	10/08/2023	1205	1	58	30	30-15			Soaring	
266	Breeding 2023	4	10/08/2023	1247	1	59	40	5-0		Juv	Flying	
267	Breeding 2023	4	20/09/2023	1701	1	548	200	150-200			Hunting	
268	Breeding 2023	4	29/04/2023	1642	1	72	40				Flying	
269	Breeding 2023	4	29/04/2023	1709	1	67	80				Flying	
270	Breeding 2023	4	30/04/2023	0947	1	27	60	60			Flying	
271	Breeding 2023	4	30/04/2023	1016	1	28	40	0-40			Flying	
272	Breeding 2023	2	29/04/2023	1106	1	720	10	10-10			Circling	
273	Breeding 2023	2	29/04/2023	1233	2	80	40				Circling	

Map ID	Season	VP No	Date	Time	No. of birds	Aggregate seconds recorded	Height (m)	Flight range	Sex	Age	Behaviour	Comments
274	Breeding 2023	2	29/04/2023	1256	1	32	65	60-70			Hunting	
275	Breeding 2023	2	29/04/2023	1310	1	40	60	60			Circling	
276	Breeding 2023	2	29/04/2023	1531	2	840	95	80-110			Circling	
277	Breeding 2023	1	23/04/2023	0724	1	124	90	80-100			Circling	
278	Breeding 2023	1	23/04/2023	1152	1	35	110	100-120			Circling	

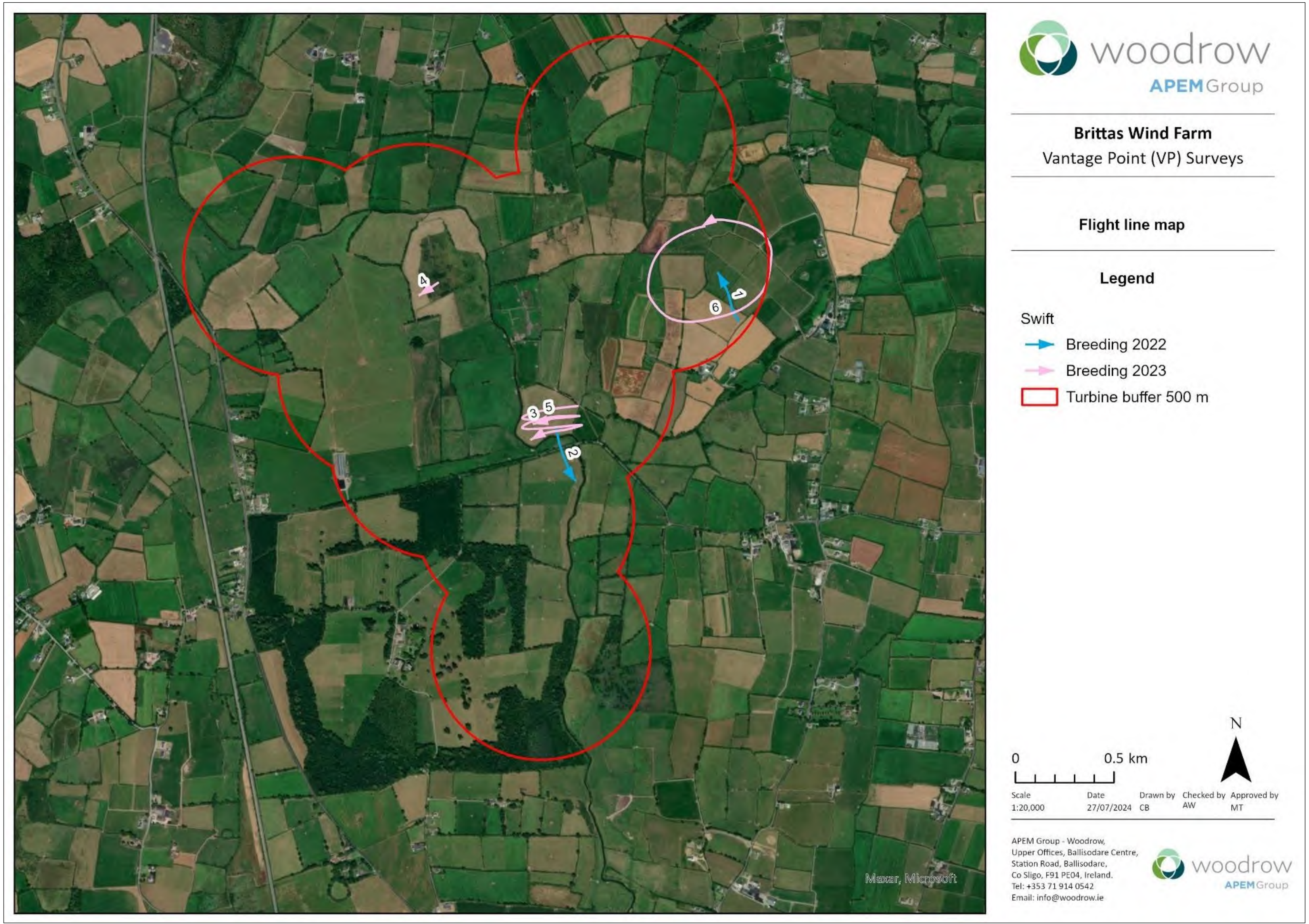

Figure 7E.38: Swift observations recorded during VP watches

Table 7E.27: Swift data collected during VP watches

Aggregate seconds = flight/observation time x by the number of birds recorded
Recorded within 500 m turbine buffer
Recorded on boundary of 500 m turbine buffer – flight seconds will be clipped
Recorded beyond 500 m turbine buffer or non-flight observation – time will be excluded from CRM

Map ID	Season	VP No	Date	Time	No. of birds	Aggregate seconds recorded	Height (m)	Flight range	Sex	Age	Behaviour	Comments
1	Breeding 2022	2	13/05/2022	1041	2	90	40	40			Foraging	
2	Breeding 2022	4	03/06/2022	1108	4	1,440	30	30-40		A	Flying	Moving north
3	Breeding 2023	4	16/06/2023	0733	3	45	25	25			Feeding	
4	Breeding 2023	4	16/06/2023	0738	2	40	10	10			Feeding	
5	Breeding 2023	4	16/06/2023	0900	25	180,000	25	5-25			Feeding	Small flock of swift feeding in front of VP for 1 hour then away
6	Breeding 2023	4	26/06/2023	1730	20	144,000	25	4-25			Feeding	

Appendix 7F

BREEDING BIRD SURVEYS

Appendix 7F: Breeding bird survey results

List of Tables

List of Figures

Table 7F.1: Bird counts from walkover surveys - breeding season 2022

P indicates that a species was recorded as present but was not counted

Species	BTO code	No. individuals			
		Visit 1 28-Arp-22 29-Apr-22	Visit 2 11-May-22 12-May-22	Visit 3 26-Jun-22 27-Jun-22	Visit 4 26-Jul-22
BoCCI (2020-2026) Red listed species					
Grey wagtail	GL	1	-	1	-
Kestrel	K	4	-	2	-
Lapwing	L	18	-	-	-
Meadow pipit	MP	40	-	25	-
Snipe	SN	5	-	6	-
Stock dove	SD	1	-	-	-
Swift	SI	-	-	2	-
Yellowhammer	Y	4	-	1	-
BoCCI (2020-2026) Amber listed species					
Cormorant	CA	2	-	-	-
Goldcrest	GC	21	-	8	-
House martin	HM	-	-	4	-
House sparrow	HS	15	-	-	-
Kingfisher	KF	1	-	-	-
Linnet	LI	25	-	39	-
Mallard	MA	7	4	-	-
Mute swan	MS	2	1	-	-
Sand martin	SM	8	-	-	-
Skylark	S	10	-	7	-
Spotted flycatcher	SF	-	-	-	8
Starling	SG	12	-	-	-
Swallow	SL	15	-	49	-
Willow warbler	WW	33	1	17	-
BoCCI (2020-2026) Green listed species					
Blackbird	B	25	P	-	-
Blackcap	BC	26	1	17	-
Blue tit	BT	7	-	-	-
Bullfinch	BF	2	-	15	-
Buzzard	BZ	14	1	3	
Chaffinch	CH	25	P	16	-
Chiffchaff	CC	10	1	2	-
Coal tit	CT	3	P	-	-
Dunnock	D	13	P	3	-
Feral pigeon	FP	-	-	1	-
Goldfinch	GO	13	2	26	-
Grasshopper warbler	GH	1	-	-	-
Great tit	GT	5	3	-	-
Great spotted woodpecker	GS	-	-	1	-
Grey heron	H	7	2	4	-
Jackdaw	JD	12	P	-	-
Lesser redpoll	LR	5	-	5	-
Little egret	ET	2	-	1	-
Long-tailed tit	LT	5	-	2	-
Magpie	MG	2	P		-
Mistle thrush	M	9	-	19	-
Peregrine	PE	-	-	2	-
Reed bunting	RB	11	2	15	-
Robin	R	21	P	-	-
Rook	RO	245	P	-	-
Sedge warbler	SW	14	4	10	-
Song thrush	ST	13	P	18	-

Species	BTO code	No. individuals			
		Visit 1 28-Arp-22 29-Apr-22	**Visit 2** 11-May-22 12-May-22	**Visit 3** 26-Jun-22 27-Jun-22	**Visit 4** 26-Jul-22
Sparrowhawk	SH	-	P	1	-
Stonechat	SC	15	4	11	-
Treecreeper	TC	1	-	1	-
Whitethroat	WH	1	-		-
Wren	WR	37	P	32	-

Table 7F.2: Bird counts from walkover surveys - breeding season 2023

Species	BTO code	No. individuals					
		Visit 1 13-Apr-23	**Visit 2** 26-Apr-23	**Visit 3** 09-may-23	**Visit 5** 18-May-23 22-May-23	**Visit 5** 28-Jun-23 29-Jun-23	**Visit 6** 24-Jul-23 25-Jul-23
BoCCI (2020-2026) Red listed species							
Grey wagtail	GL	1	-	-	4	-	-
Kestrel	K	1	-	1	1	-	-
Lapwing	L	6	2	14	4	1	2
Meadow pipit	MP	4	2	30	36	1	5
Snipe	SN	6	-	-	-	-	-
Swift	SI	-	-	-	1	2	-
Yellowhammer	Y	-	-	-	5	-	6
BoCCI (2020-2026) Amber listed species							
Black-headed gull	BH	-	-	-	-	-	6
Cormorant	CA	3	3	-	-	-	-
Goldcrest	GC	-	-	-	2	1	2
House martin	HM	31	-	-	22	16	7
House sparrow	HS	-	-	-	-	3	7
Kingfisher	KF	-	-	2	1	-	-
Linnet	LI	-	1	7	8	-	5
Mallard	MA	7	2	1	2	2	3
Mute swan	MS	-	-	-	7	2	2
Sand martin	SM	8	-	-	-	6	-
Skylark	S	3	-	-	-	1	-
Starling	SG	-	-	-	7	2	33
Swallow	SL	10	5	31	52	36	70
Willow warbler	WW	9	5	11	20	13	8
BoCCI (2020-2026) Green listed species							
Blackbird	B	11	4	17	30	12	13
Blackcap	BC	1	-	-	-	1	1
Blue tit	BT	4	2	6	13	20	17
Bullfinch	BF	-	2	4	4	-	5
Buzzard	BZ	2	5	5	2	3	11
Chaffinch	CH	9	5	16	41	18	25
Chiffchaff	CC	5	1	-	-	2	-
Coal tit	CT	-	-	1	-	-	-
Collared dove	CD	-	-	-	-	1	2
Dunnock	D	-	-	-	8	1	5
Goldfinch	GO	3	5	3	5	8	17
Great spotted woodpecker	GS	-		1	1	-	-
Great tit	GT	2	3	15	8	4	1
Grey heron	H	-	1	1	2	2	2
Hooded crow	HC	11	3	2	7	11	10
Jackdaw	JD	3	-	13	-	19	2
Jay	J	-	-	-	2	1	-
Lesser redpoll	LR	-	-	-	2	3	-
Little egret	ET	8		1	2	1	2

Species	BTO code	No. individuals					
		Visit 1 13-Apr-23	Visit 2 26-Apr-23	Visit 3 09-may-23	Visit 5 18-May-23 22-May-23	Visit 5 28-Jun-23 29-Jun-23	Visit 6 24-Jul-23 25-Jul-23
Long-eared owl	LE	-	-	2	-	-	-
Long-tailed tit	LT	-	-	3	-	-	2
Magpie	MG	-	-	4	3	5	9
Mistle thrush	M	-	1	-	3	-	2
Pheasant	PH	-	1	1	-	-	-
Pied wagtail	PW	1	1	-	4	2	12
Raven	RN	-	-	-	-	-	2
Reed bunting	RB	1	3	8	15	4	-
Robin	R	4	3	-	11	5	8
Rook	RO	43	-	72	114	69	278
Sedge warbler	SW	-	-	9	5	2	1
Song thrush	ST	5	3	2	11	5	3
Sparrowhawk	SH	-	-	-	-	-	1
Stonechat	SC	-	-	2	5	-	5
Whitethroat	WH	-	-	-	-	1	-
Woodpigeon	WP	3	5	35	43	23	41
Wren	WR	18	13	7	11	14	15

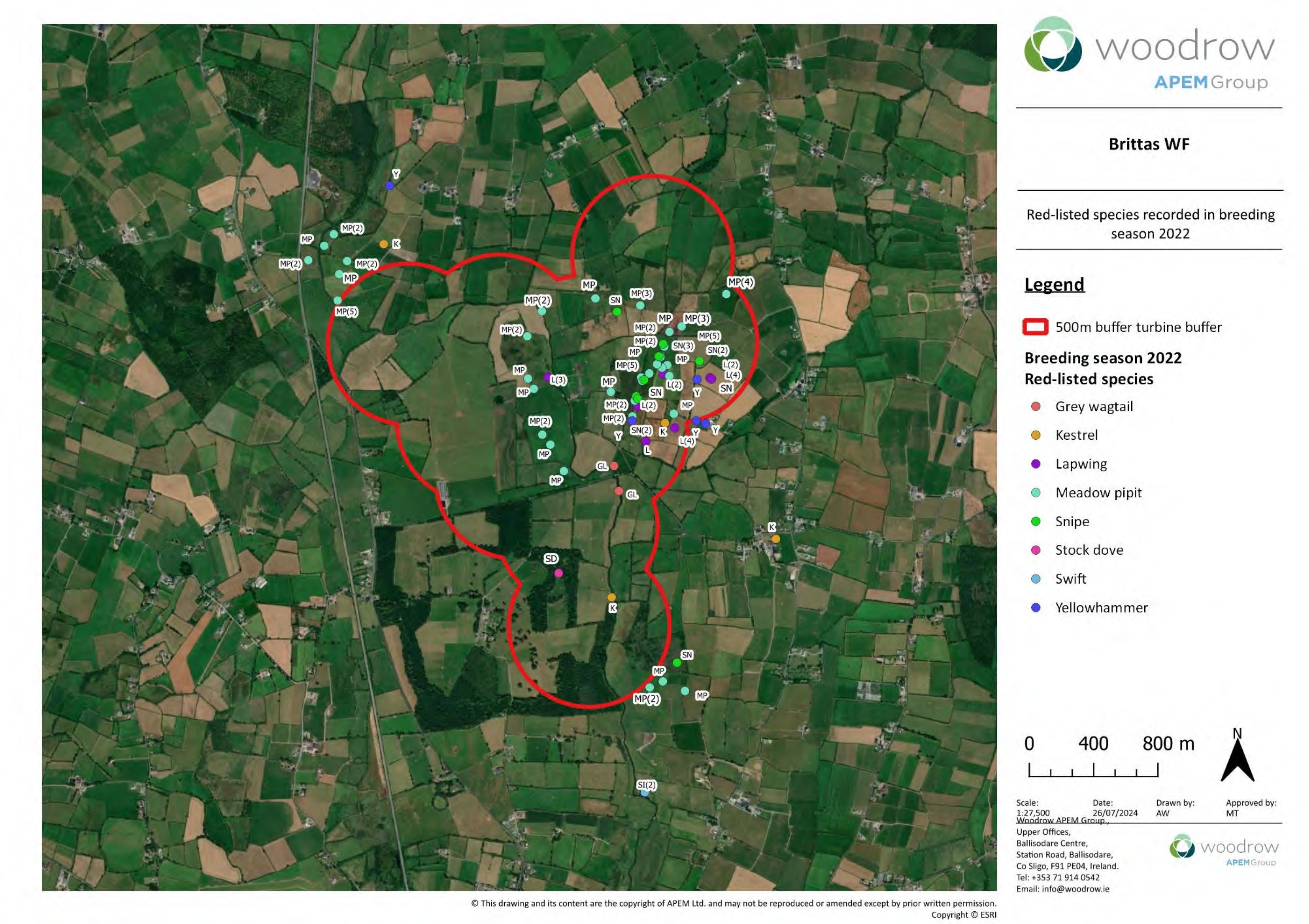

Figure 7F.1: Red listed species recorded during breeding season walkover surveys 2022

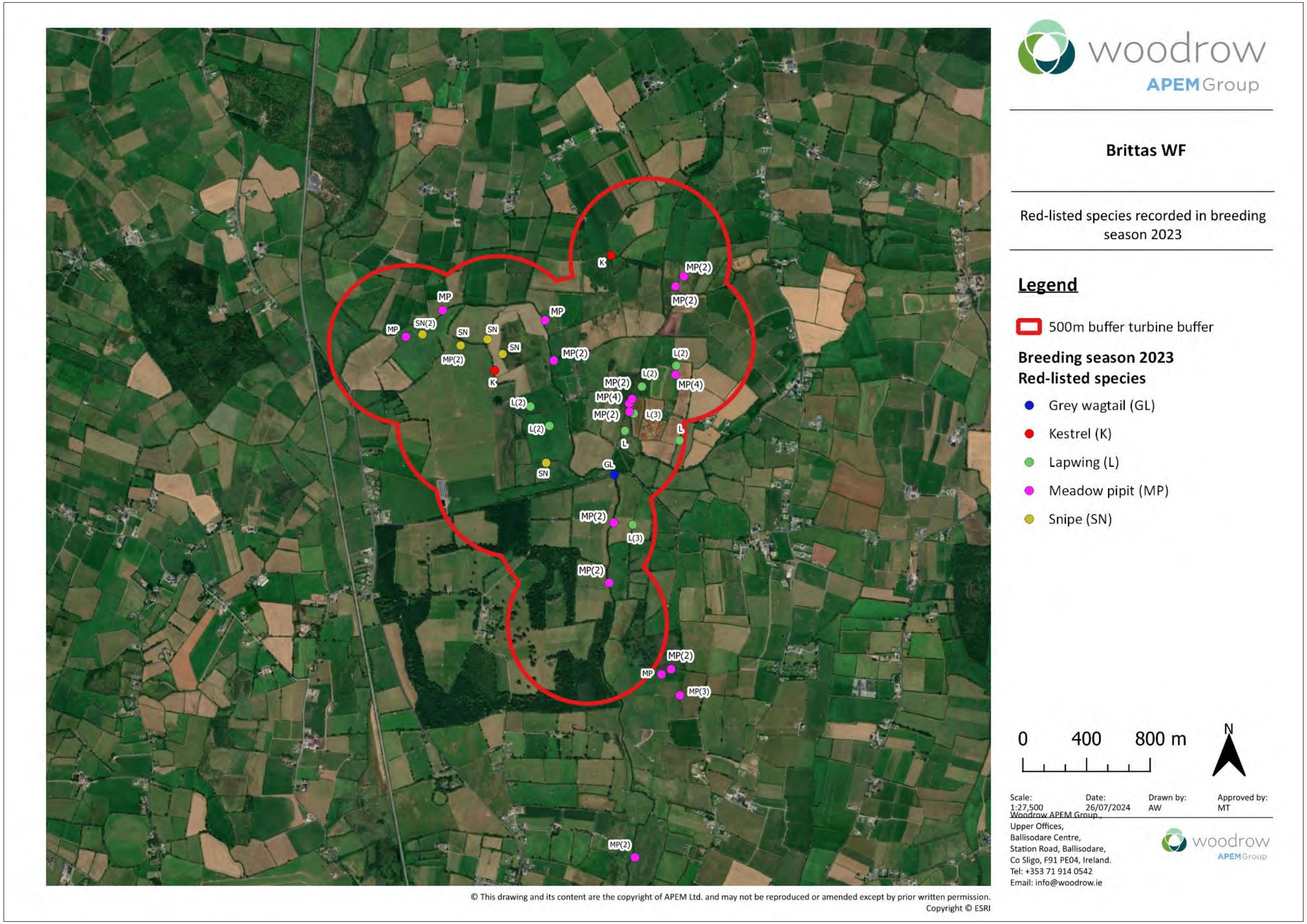

Figure 7F.2: Red listed species recorded during breeding season walkover surveys 2023

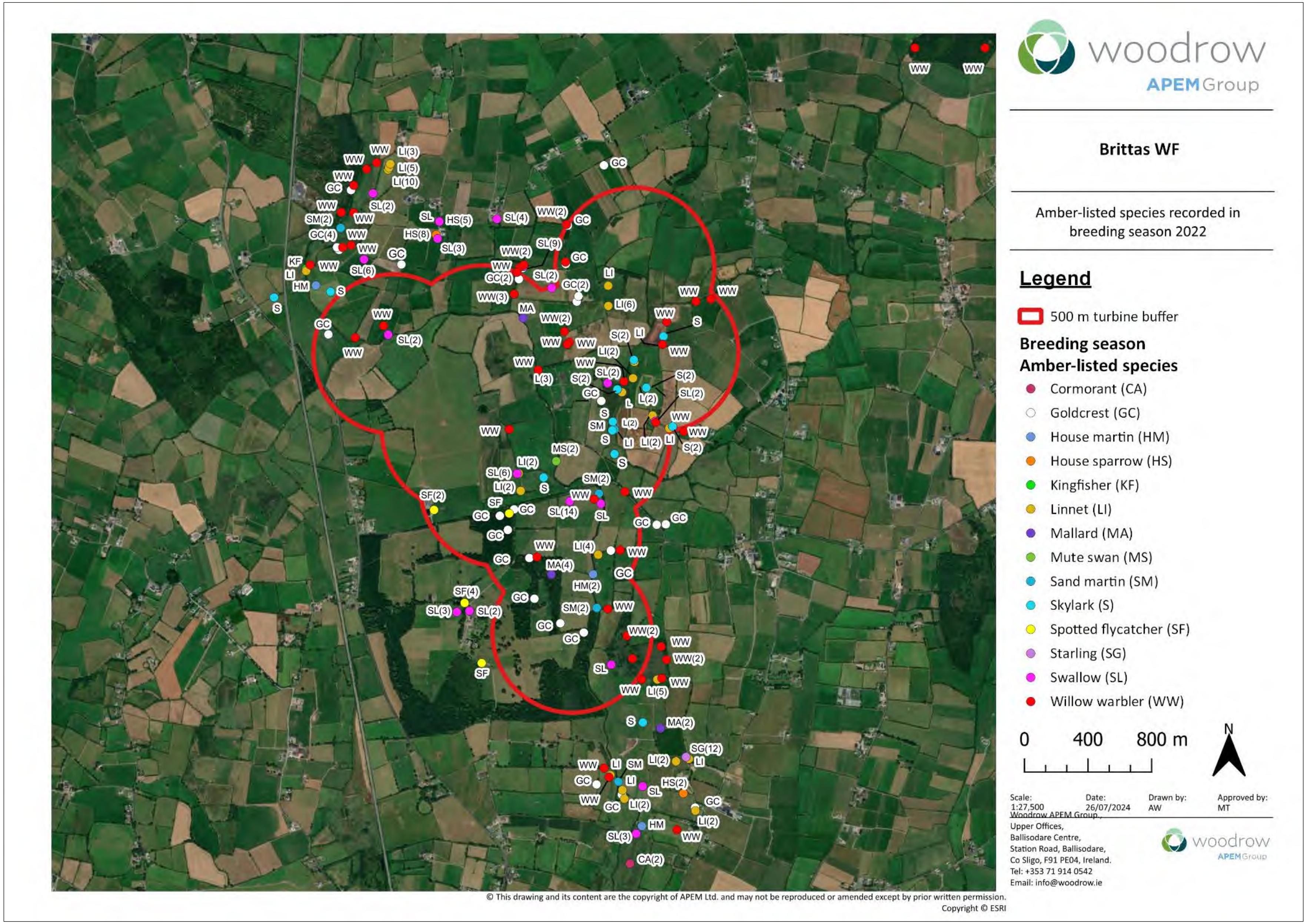

Figure 7F.3: Amber listed species recorded during breeding season walkover surveys 2022

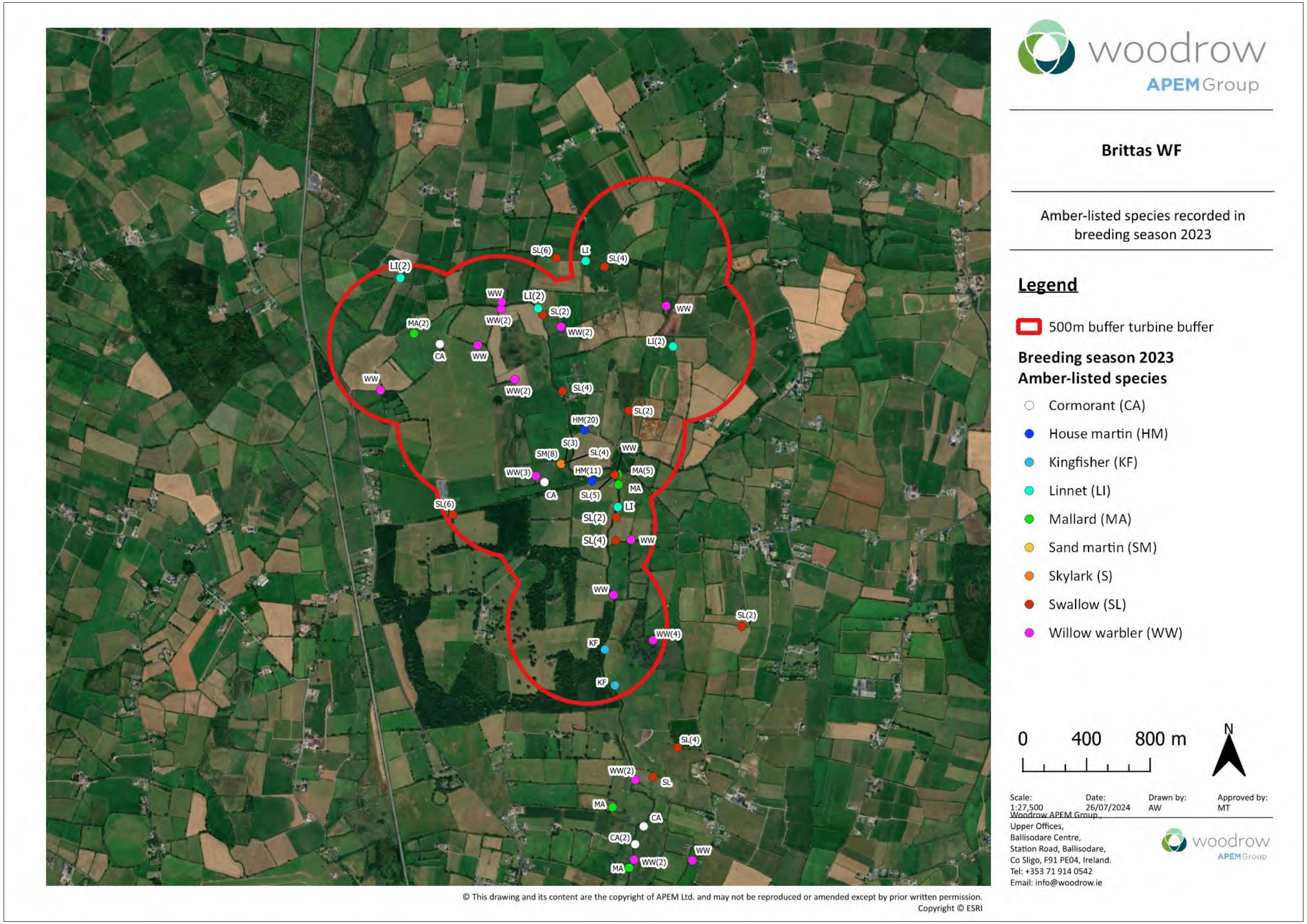

Figure 7F.4: Amber listed species recorded during breeding season walkover surveys 2023

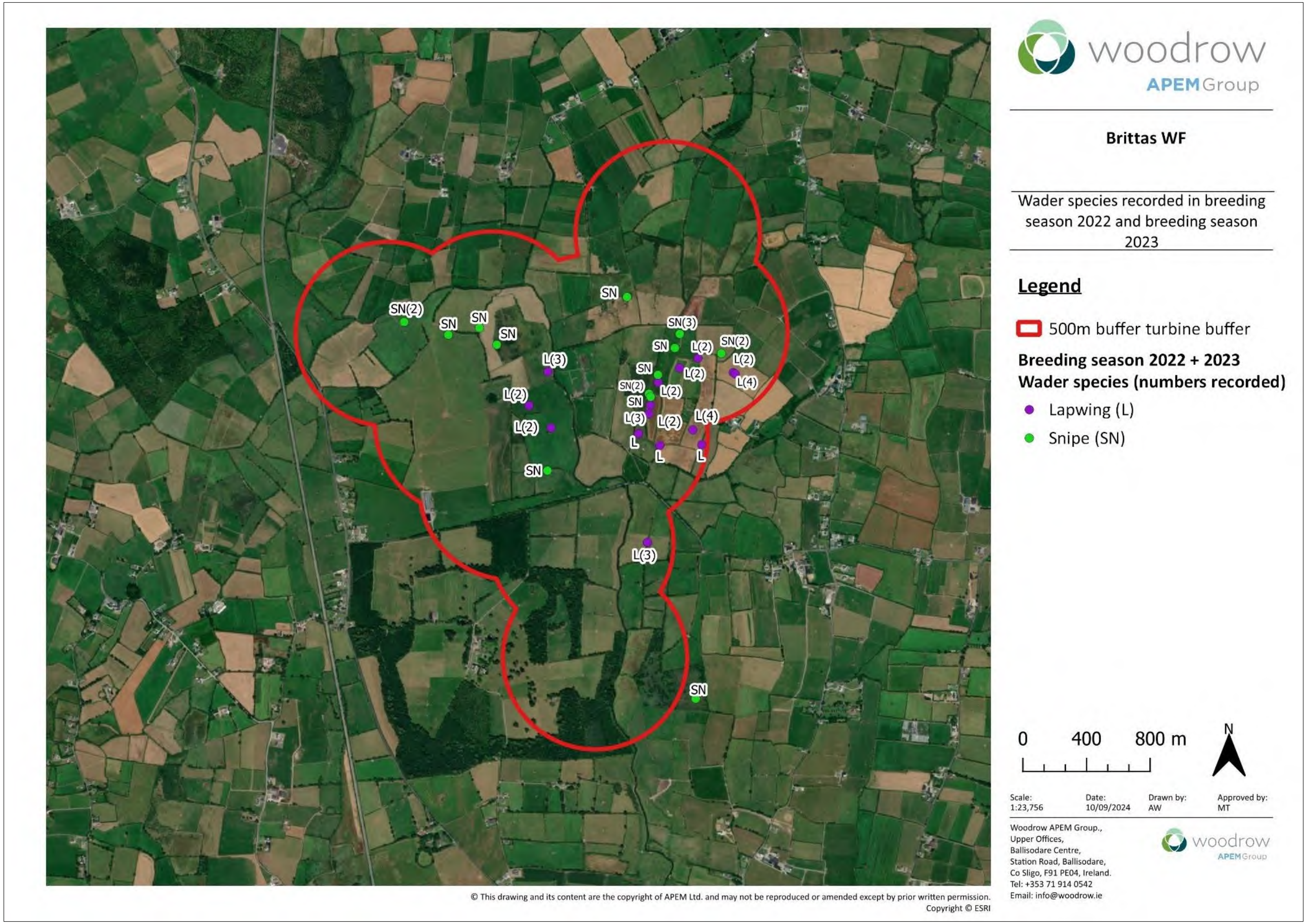

Figure 7F.5: Wader distribution recorded during breeding season walkover surveys 2022 & 2023 combined

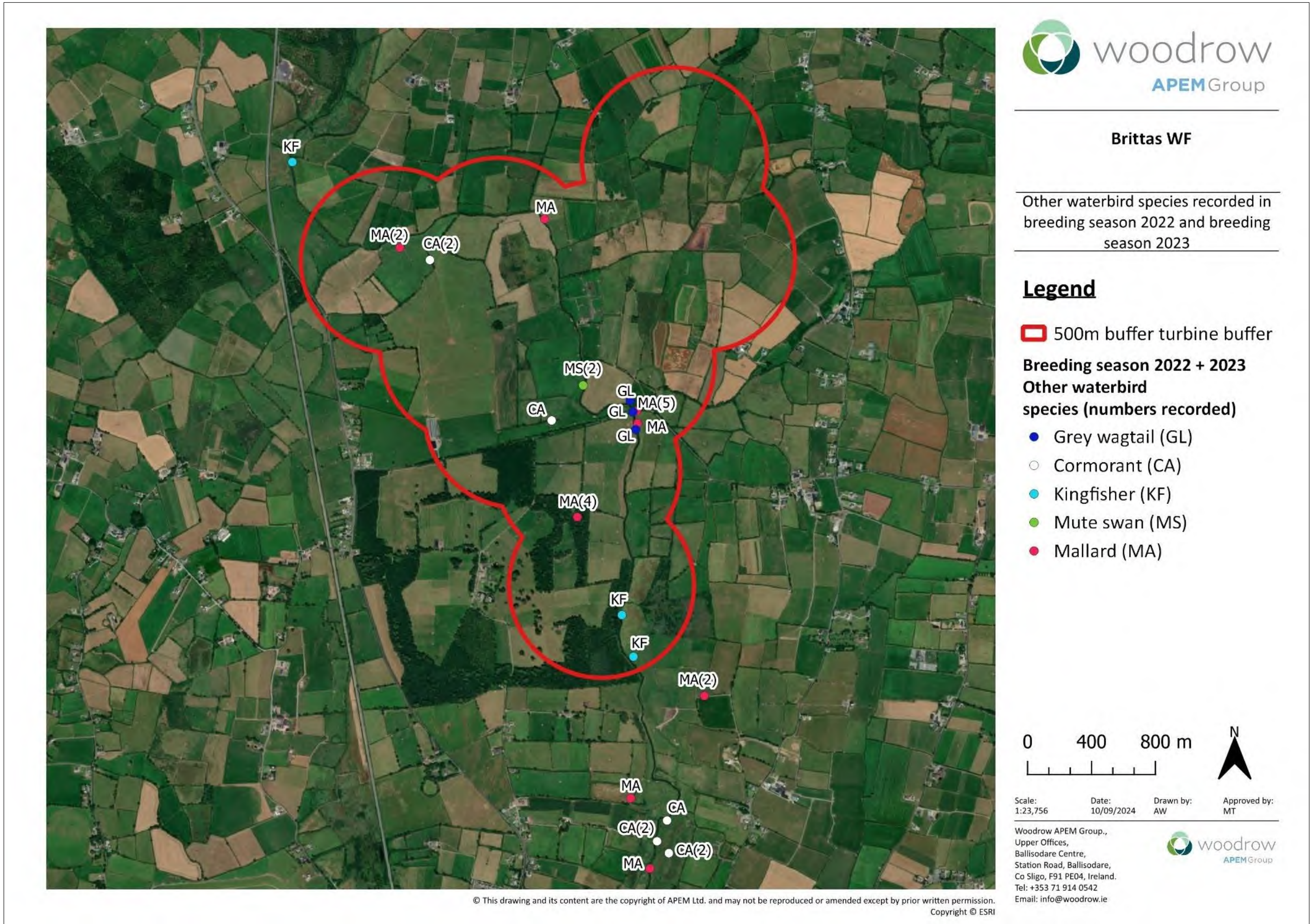

Figure 7F.6: Wetland bird distribution recorded during breeding season walkover surveys 2022 & 2023 combined

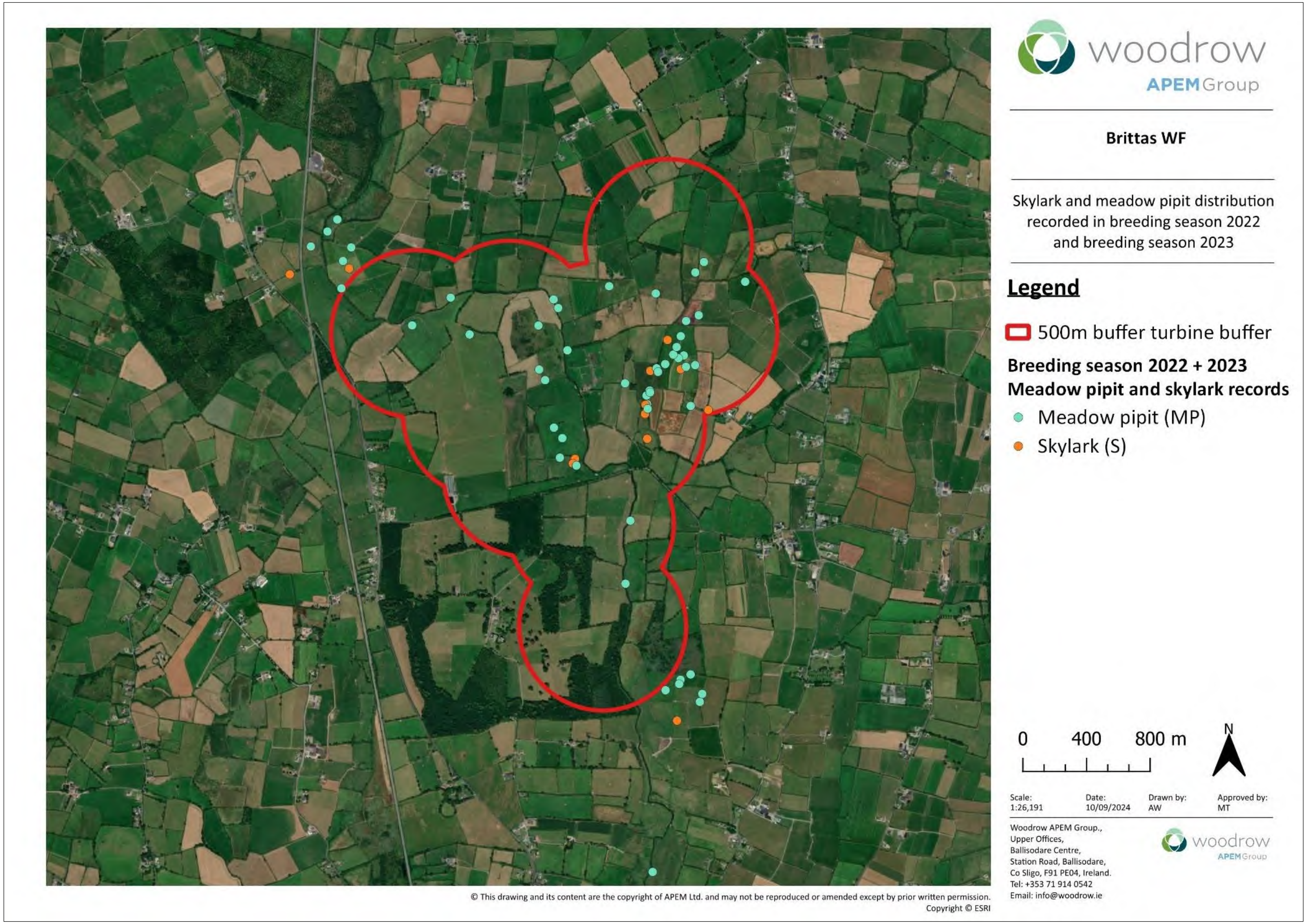

Figure 7F.7: Meadow pipit & skylark distribution recorded during breeding season walkover surveys 2022 & 2023 combined

Table 7F.3: Bird counts from walkover surveys - non-breeding season 2021/22 and 2022/23

*Incidental records: Observations during period of flooding – all these records were beyond 500 m turbine buffer

Season	Non-breeding season 2021-22							Non-breeding season 2022-23				
								Incidental records*				
Date	18-Dec-21	19-Dec-21	21-Jan-22	22-Jan-22	30-Jan-22	27-Feb-22	28-Feb-22	28-Nov-22	30-Nov-22	23-Jan-23	24-Jan-23	16-Mar-23
Species												
BoCCI (2020-2026) Red listed												
Curlew							1					
Golden plover		7										18
Grey wagtail		1		1	1	3	2			1		
Kestrel			2	1	2		2			1		
Lapwing				120			5		240*	102	120	14
Meadow pipit	13	50		16	19		45			15	19	4
Redwing	442	241	680	189	195	83	218			104	81	27
Shoveler												4
Snipe	17	19	5	23	9	1	25			6	1	6
Woodcock	2		3				1					
BoCCI (2020-2026) Amber listed												
Black-headed gull												83
Brambling	1											
Cormorant	3		1	2		1	12				1	
Goldcrest	1	3	5			4	4			1		
House sparrow		60		35	20		62				6	
Kingfisher							1					
Linnet		3	26								3	6
Mallard			14			5	3					2
Mute swan	10	2	1	2			2			2	2	2
Short-eared owl		1										
Skylark				3		1	7					4
Starling	371	99	434	45	207	12	835			5	381	340
Teal			33				1	120*			1	
Wigeon								80*				
BoCCI (2020-2026) Green listed												
Blackbird	78	63	70	20	26	14	26			9	12	9
Blackcap							1					
Blue tit	8	3	7	7			18			3	3	9
Bullfinch	14	10	14	5	1		4			1		1
Buzzard	2	1	2	1	1	1	1			1	3	7
Chaffinch	24	124	92	162	22	13	107			6	4	24

Season	Non-breeding season 2021-22							Non-breeding season 2022-23				
								Incidental records*				
Date	18-Dec-21	19-Dec-21	21-Jan-22	22-Jan-22	30-Jan-22	27-Feb-22	28-Feb-22	28-Nov-22	30-Nov-22	23-Jan-23	24-Jan-23	16-Mar-23
Chiffchaff		1					1					1
Coal tit		2	5	1		1	5					
Collared dove		8	4		2		2				3	
Dunnock	18	16	11	4	10	3	15			3	3	10
Fieldfare	351	246	40	92	150		34			51	62	185
Goldfinch	5		11		3		3			4		3
Great spotted woodpecker			3			1						
Great tit	8	8	5	11	3	3	11			1	5	6
Grey heron	7	2	4	2			1			2		1
Hooded (grey) crow	42	12	21	30	10	8	34			10	10	13
Jack snipe				1								
Jackdaw	119	24	255	16	17	3	34			13	25	40
Jay	11	2	8				3					
Lesser redpoll	19	2	10	3	7	11	3				1	
Little egret	1		1				2			11		2
Long-tailed tit										5	4	2
Magpie	20	6	1	5	4	2	3			1	2	3
Marsh tit												1
Mistle thrush	7	4	2	4			6			2	1	
Moorhen	1		10	1		3						
Peregrine			1	1								
Pheasant			1									
Pied wagtail	1	7	9	6	7		6				1	3
Raven	7	3		10	1	3	2					
Reed bunting	1	3	1	6			15			2	4	10
Robin	21	13	24	17	11	12	28			7	12	21
Rook	398	40	101	45	93	22	30			10	45	32
Siskin	18		3				1					
Song thrush	9	17	13	9	8	7	9			1	4	4
Sparrowhawk		1		2			1					1
Stonechat		1	2	2			2					
Treecreeper				1			1					
Water rail	1		2									
Woodpigeon	519	28	455	22	24	142	82			11	16	13
Wren	42	27	32	16	9	11	26			7	4	13

Appendix 7G

INDICATIVE BREEDING TERRITORY MAPPING

Appendix 7G: Indicative breeding territory mapping for target species

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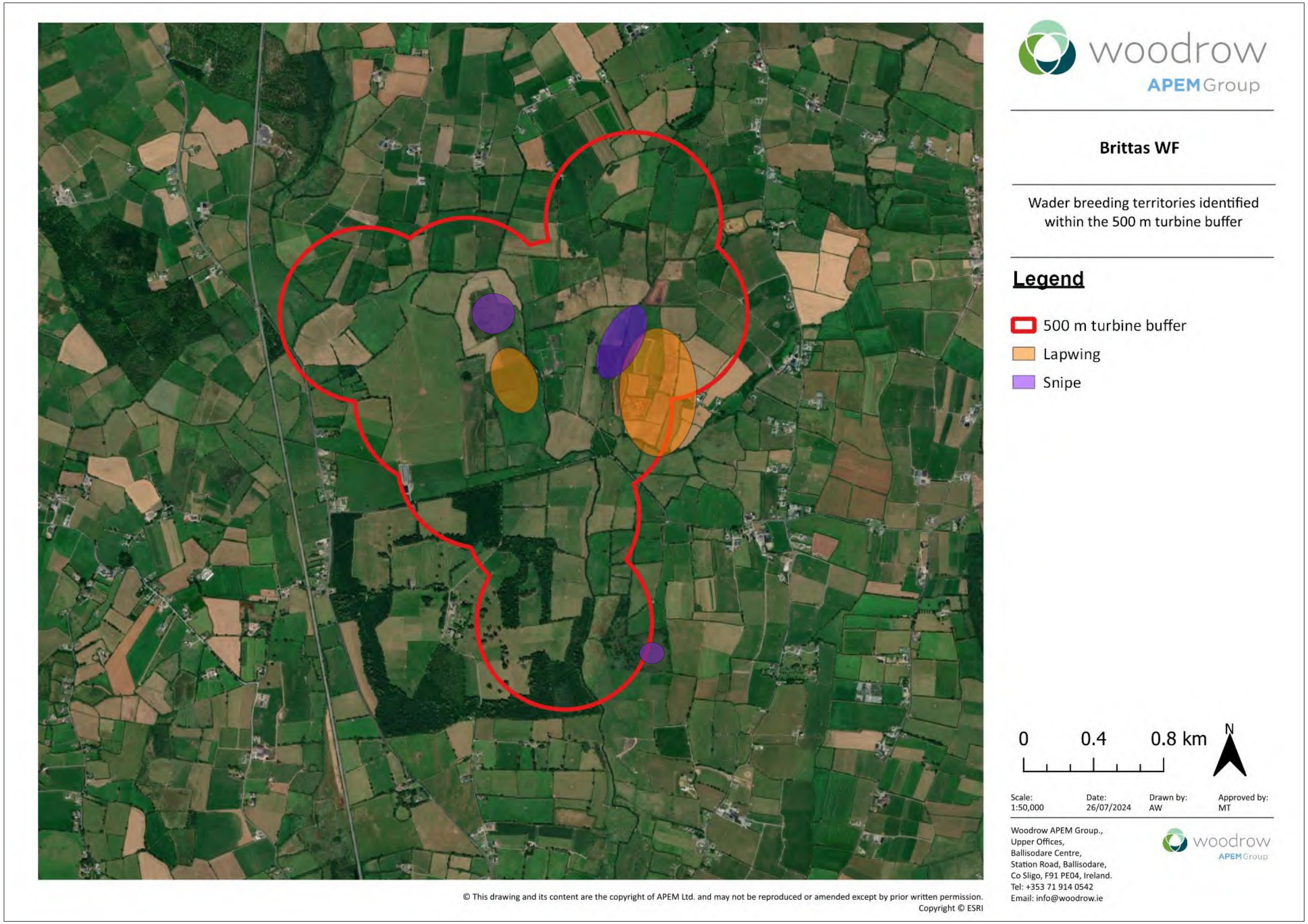

Figure 7G.1: Indicative territories for breeding waders

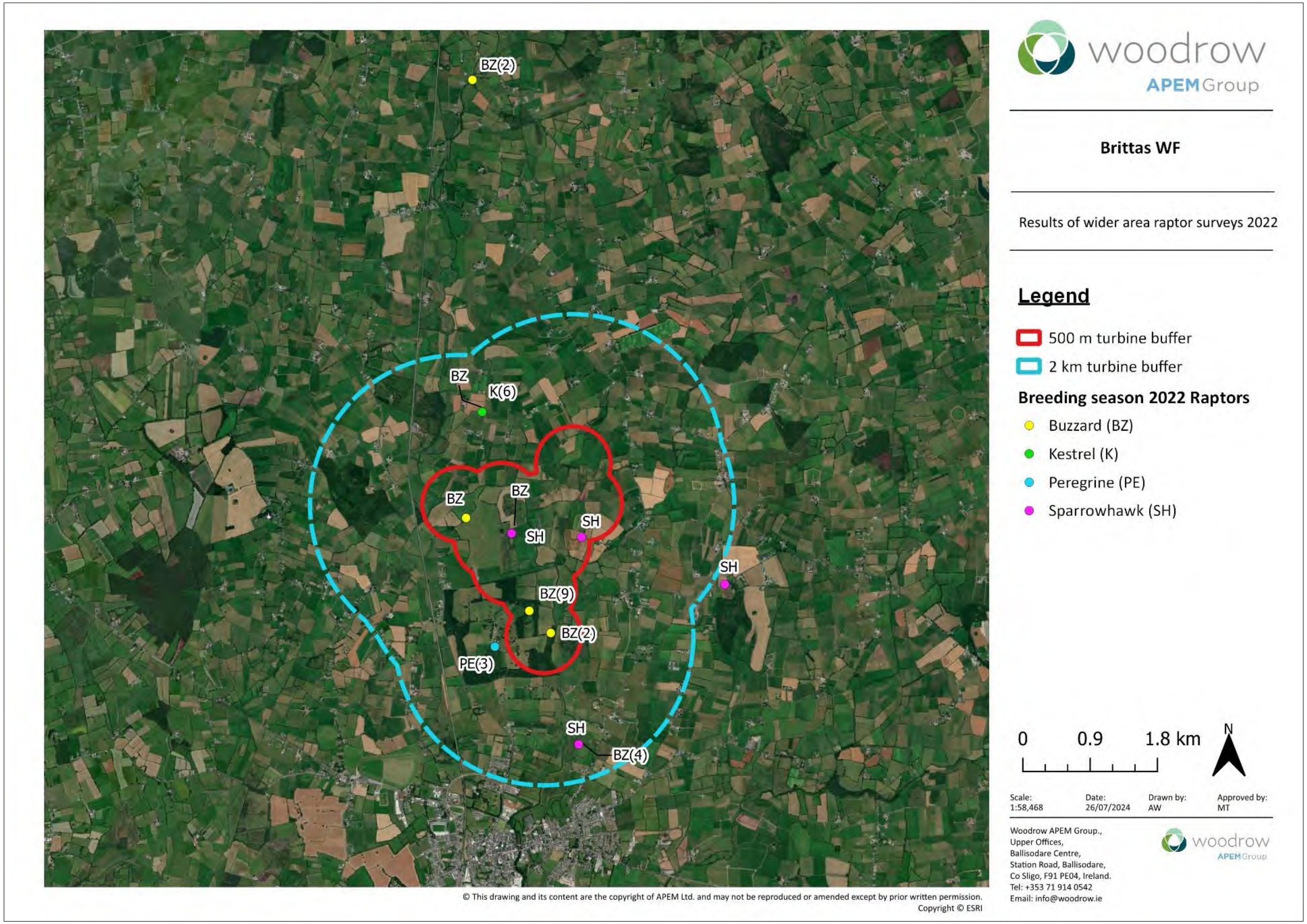

Figure 7G.2: Raptor survey records for breeding season 2022

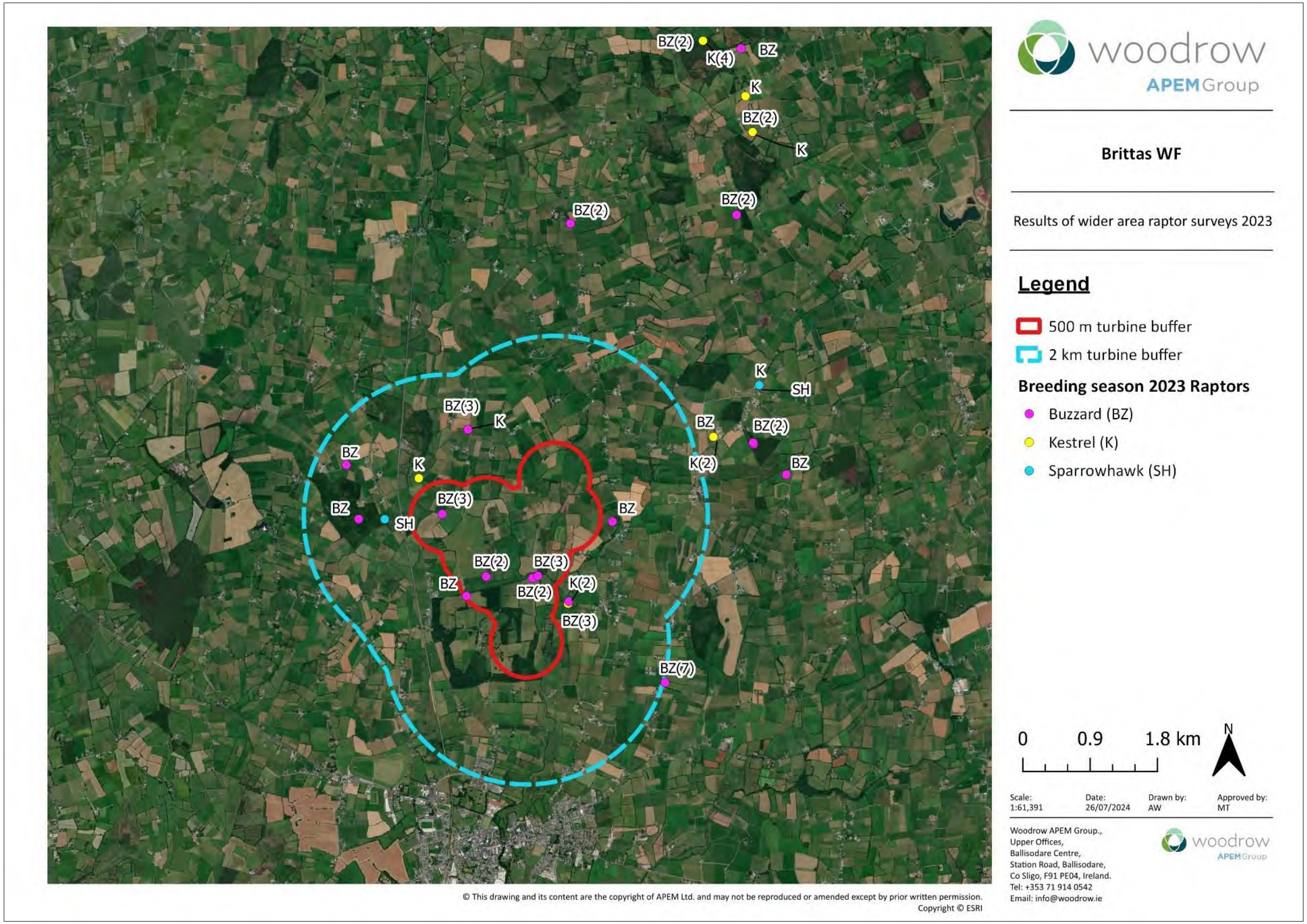

Figure 7G.3: Raptor survey records for breeding season 2023

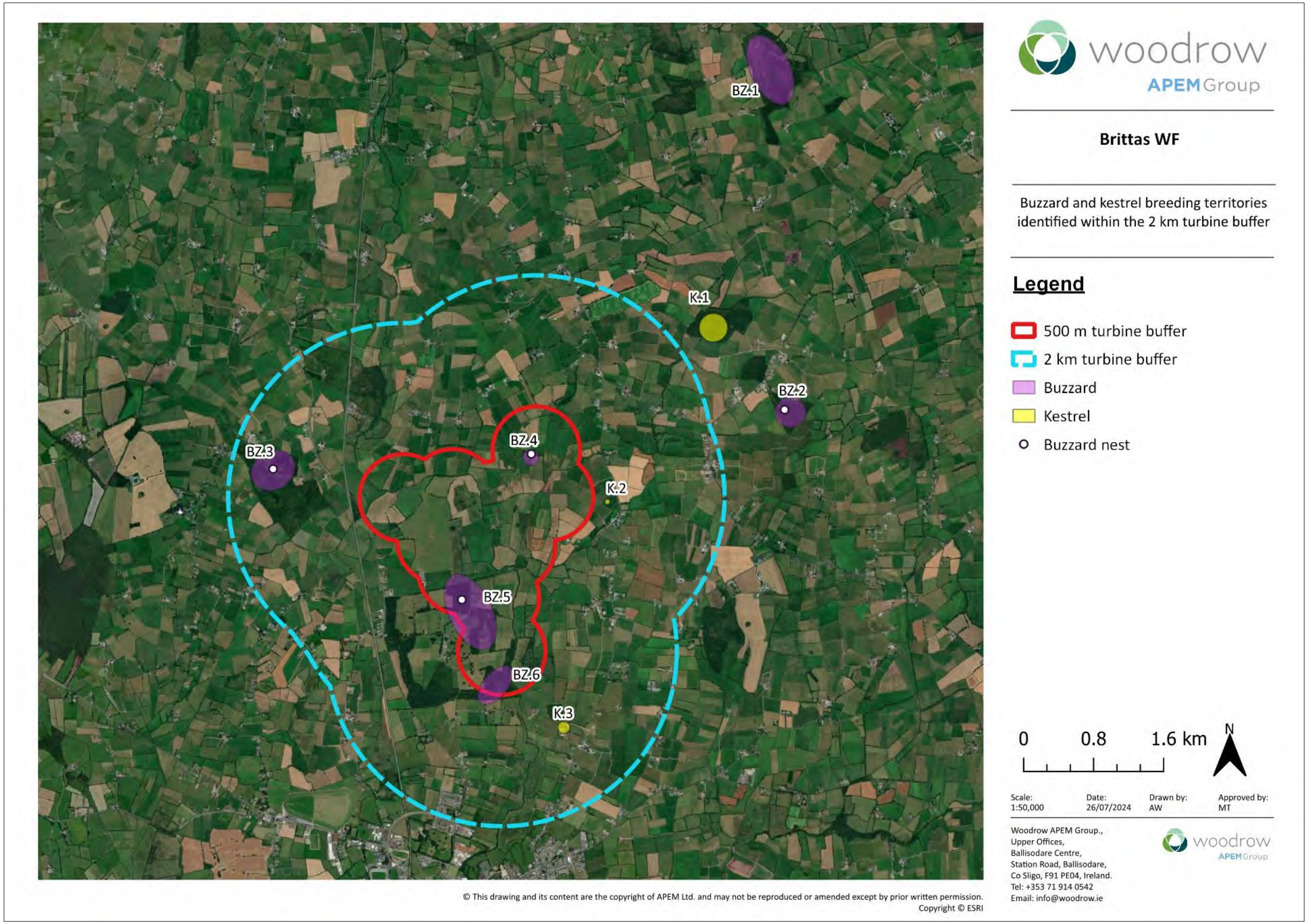

Figure 7G.4: Indicative breeding territories for buzzard and kestrel within the 2 km turbine buffer

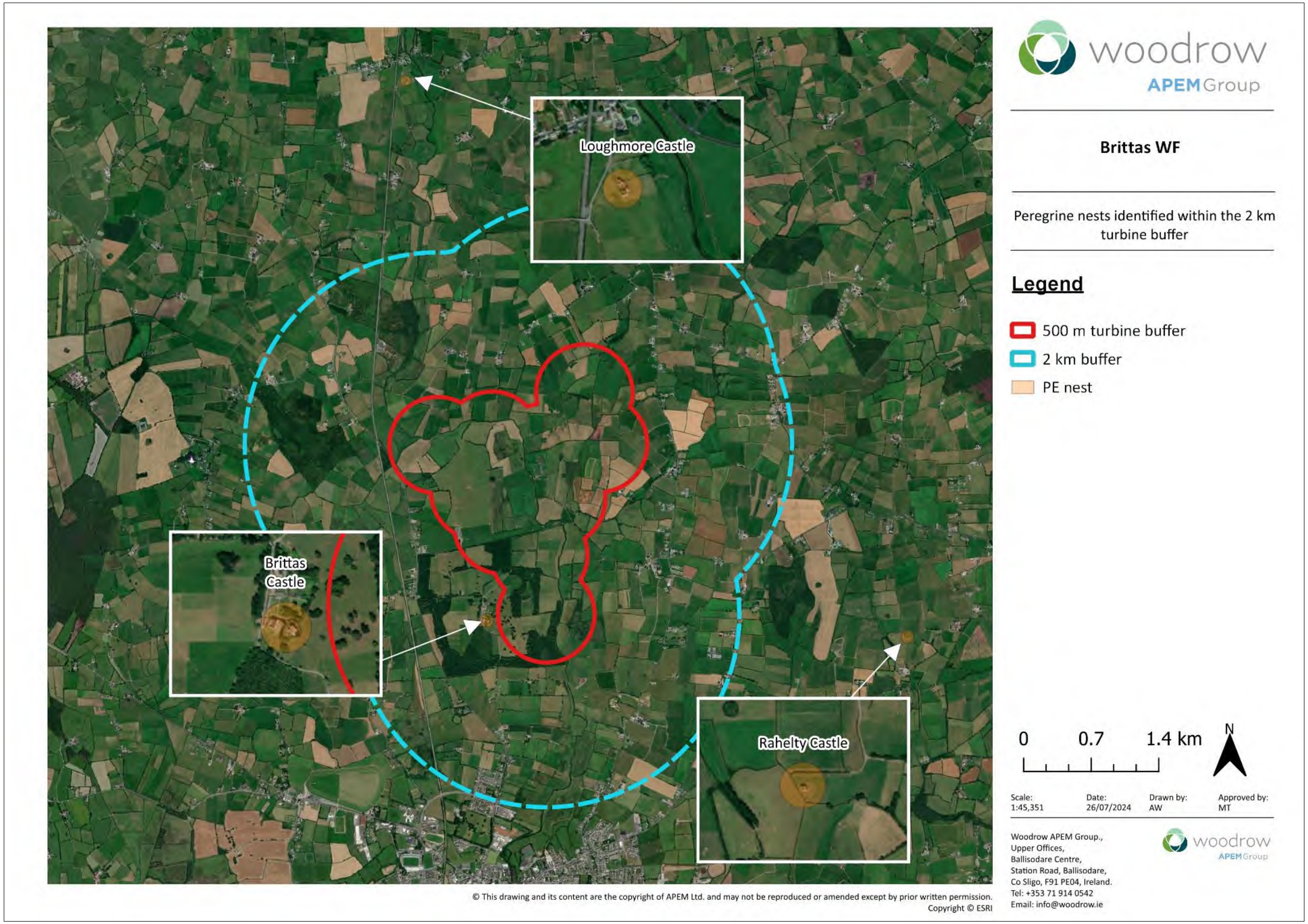

Figure 7G.5: Peregrine nests identified within the 2 km turbine buffer

Appendix 7H

AVIAN COLLISION RISK MODELING

Appendix 7H: Avian Collision Risk Modelling report

Brittas Wind Farm, Co. Tipperary

Avian Collision Risk Modelling Report

Report prepared by APEM Group Woodrow on behalf of Ørsted Onshore Ireland Midco Limited

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October 2024

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7H.1 OVERVIEW

APEM Group Woodrow was commissioned by Brittas Wind Farm Limited, a subsidiary of Ørsted Onshore Ireland Midco Limited, to undertake Collision Risk Modelling (CRM) for a proposed wind farm development known as Brittas Wind Farm in Co. Tipperary, using baseline flight activity data, which included two years of data collected from October 2021 to September 2023. The proposed wind farm is for a 10-turbine site located within the townlands of Brittas, Brownstown, Clonbanna and Rossestown, approximately 3 km north of Thurles town centre.

The intention of this report is to display modelled data, based on observed bird usage of the area, to provide an indices of predicted collision risk imposed by the proposed wind farm on potentially sensitive avian populations.

The CRM employed is known as a 'Basic' Band Model (Band *et al.*, 2007), which for the target species and resultant flight behaviour recorded assumes a uniform distribution of birds across the study area. The proportion of birds at risk height is derived from vantage point (VP) watches conducted by appropriately experienced ornithological surveyors. Flight line data for selected target species was collected from four VPs. The survey period covered two breeding bird seasons and two non-breeding seasons (October 2021 to September 2023) and the minimum requirement of 36 hours of VP watches per VP per season was achieved, which over the two-year study amounted to a total of 589 hours of VP watch data. Note: A third year of VP watches conducted between October 2020 and August 2021 (see Appendix 7I) was not used in the modelling, as survey effort differed in terms of the number of VPs utilised.

The four VPs selected provide comprehensive coverage of the proposed Wind Farm Site and the VP locations are shown on Figure 7H.1, with the 2 km viewshed of each VP location shown in Figure 7H.2. It should be noted that the viewshed for VP4 overlaps significantly with viewsheds for VP2 and VP3. The CRM controls for this duplication in survey effort. Furthermore, the conducting of VP watches simultaneously by two or more surveyors was avoided to prevent surveyors from covering overlapping viewsheds at the same time and potentially recording flight activity in duplicate records. This approach also maximises the number of days when the site was visited over the study period. To limit observer fatigue, surveyors did not undertake VP watches of more than 3 hours without a break unless inclement periods of weather meant watches were paused for short durations until conditions improved.

The flight risk volume applied in this analysis is based on a buffer extending 500 m from the proposed turbine locations, which equates to an area of 490.53 ha. Three different turbine specifications were assessed, classified as Turbine - Type A, Turbine - Type B and Turbine - Type C, with specifications detailed in Table 7H.1. The flight heights within the collision risk zone (CRZ) were defined as those occurring between 25 m and 180 m above ground level, which is based on the minimum and maximum rotor swept heights of all turbine models, as derived from blade length and hub height, including:

- Turbine Type A - rotor swept dimensions: 30 m to 180 m (rotor diameter 150 m)
- Turbine Type B - rotor swept dimensions: 25 m to 180 m (rotor diameter 155 m)
- Turbine Type C - rotor swept dimensions: 31 m to 180 m (rotor diameter 149 m)

Although the extents and positions of rotor swept area relative to the ground varies between the three turbine types assessed, it was decided that initially all flight time recorded between 25 m and 180 m would be applied within the CRMs run for selected target species. This approach is precautionary for Turbine Type A and Type C, and was adopted as the minimum rotor swept height only varies by 1 to 6 m across the turbine types assessed, ranging from 25 to 31 m. In addition to not adjusting the flight times for the smaller CRZ, the initial CRMs also maintained consistent operational parameters, including pitch (6°) and rotational period (6.85 seconds). This approach identifies target species where collision risk presents the potential for likely significant effects, which as a guideline has been taken as a predicted collision risk of one or more collisions over 35 years. The approach also determines, independently of flight time and operational parameters, which turbine specifications present the greatest risk.

For target species where the initial CRMs identify predicted collision risk of more than one bird over 35 years, further analysis is undertaken including running CRMs using flight times for the slightly smaller CRZ (30 to 180 m), examining the effects of different operational parameters, in particular rational period of the turbines, investigating seasonal variation in collision risk, and reviewing the appropriateness of applying default avoidance rates.

Flight time applied in the CRMs used aggregated flight seconds recorded for target species, i.e. number birds x flight seconds for each observation, occurring at collision risk height (25-180 m) and within 500 m proposed turbine buffer. Collision risk modelling was undertaken for those target species with > 200 aggregated flight seconds occurring within the CRZ over the two years. For some target species only marginally exceeding this threshold it was decided not run CRMs, as the number of flight observations generating the flight time within the CRZ was notably low with only one or two observations recorded over the two year study period. Based on the observed aggregate flight times within the CRZ, collision risk models were run for 12 species, including:

Black-headed gull	1,035	flight seconds in CRZ
Buzzard	41,192	flight seconds in CRZ
Cormorant	989	flight seconds in CRZ
Golden plover	719,967	flight seconds in CRZ
Grey heron	1,306	flight seconds in CRZ
Kestrel	5,225	flight seconds in CRZ
Lapwing	531,730	flight seconds in CRZ
Lesser black-backed gull	52,161	flight seconds in CRZ
Little egret	721	flight seconds in CRZ
Peregrine	1,107	flight seconds in CRZ
Snipe	480	flight seconds in CRZ
Sparrowhawk	785	flight seconds in CRZ

Although recorded within the 500 m turbine buffer, CRMs were not run for the following target species: common gull, dunlin, green sandpiper, hen harrier, mallard, mute swan, swift, whimbrel, whooper swan and wigeon; as flight times and/or the number flight observations recorded within the CRZ for these species were too low to draw any significant conclusions in relation to predicted collision risk. Based on low recorded activity within the CRZ over the two-year study, there is not considered to be potential for significant effects due to collision mortality on these species, with the exception of swift. In spite of generating high flight times within the 500 m turbine buffer (325,615 secs), no CRM was run for swift as flights were not recorded systematically by surveyors over the two year study period.

Based on deteriorating conservation status swift were moved from the amber to red list in the most recently published BoCCI (Gilbert *et al.*, 2021). This species is emerging as being prone to turbine mediated mortality. Therefore, swifts were included as target species during VP surveys and flight line data was collected. However, as this was not implemented ubiquitously across the seasons by all surveyors, the flight times recorded are only indicative and do not represent a full breeding season. As such, a CRM was not run for swift and potential collision risk for this species is considered within the species account – see Appendix 7A, Section 7A.2.2.7.1.

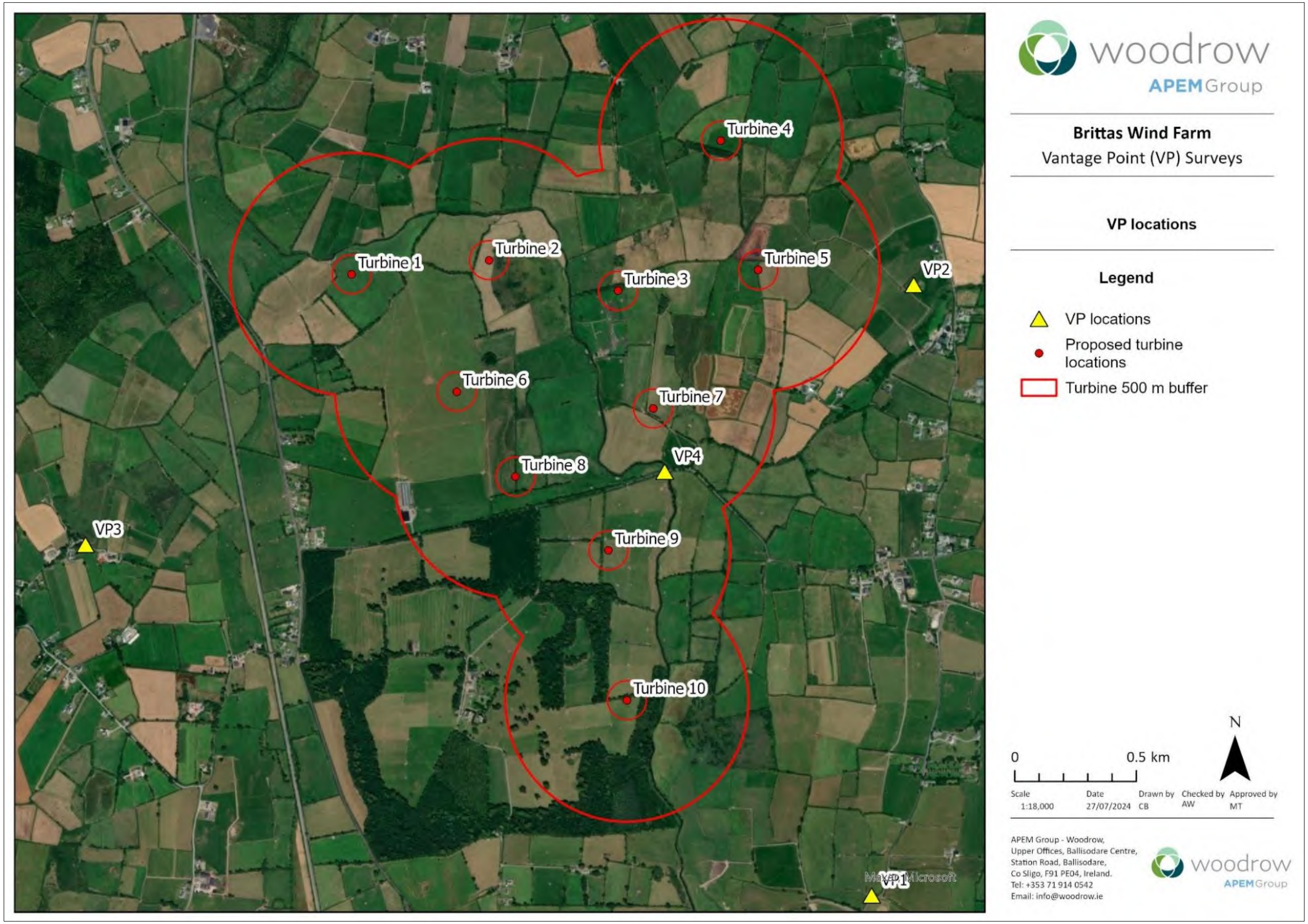

Figure 7H.1: VP locations in relation proposed turbines and 500 m turbine buffer

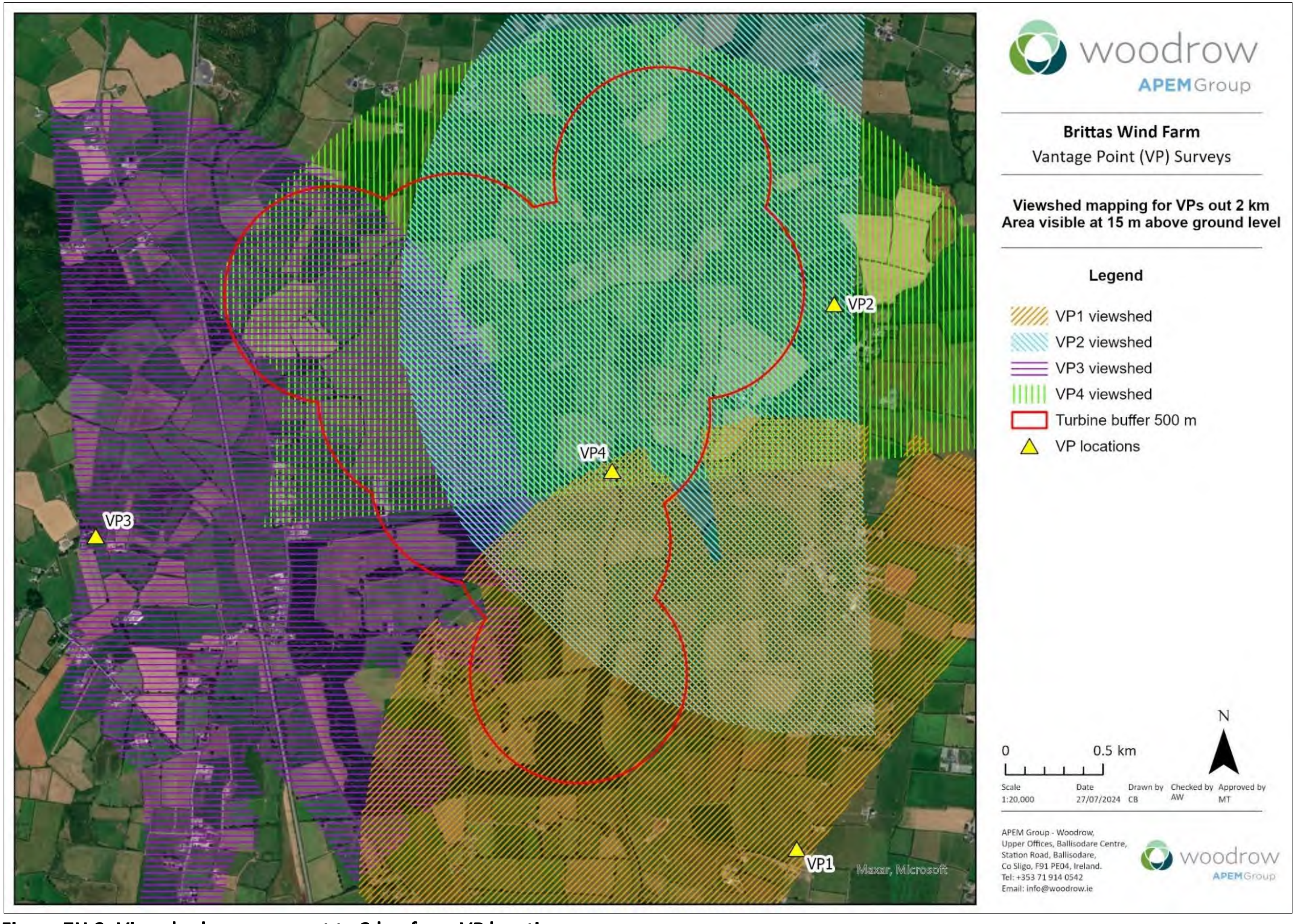

Figure 7H.2: Viewshed coverage out to 2 km from VP locations

7H.2 METHODOLOGY AND MODEL INPUTS

The collision risk modelling was undertaken using the Scottish Natural Heritage (SNH) model and guidelines, based on Band *et al*. (2007). The SNH or Band model uses two approaches for different situations (SNH, 2000). The first approach is for birds that take regular flights through a wind farm area and the second is for birds that may occupy an area, such as a wind farm, as a regular territory. The model approach used in this case is the second approach, relating to birds occupying a given area. The required stages, and tasks within them, are detailed the following sections.

7H.2.1 Stage 1 - Number of birds flying through rotors

This stage involved several sequential steps:

1. Identify a flight risk volume V_w which is the area of the windfarm multiplied by the rotor diameter, as shown in Equation 1.

$$V_w = Area_{windfarm} * rotor\ diameter \quad \text{(Equation 1)}$$

2. Calculate the combined volume swept out by the windfarm rotors using Equation 2:

$$V_r = X\pi R^2(d + l) \quad \text{(Equation 2)}$$

   where X is the number of wind turbines, d is the depth of the rotor back to front, and l is the length of the bird.

3. Estimate the bird occupancy n within the flight risk volume. This is the number of birds present, multiplied by the time spent flying in the flight risk volume, within the period (usually one or two years) for which the collision estimate is being made.
4. The bird occupancy, in bird-seconds, of the volume swept by the rotors b is then calculated using Equation 3.

$$b = n\left(\frac{V_r}{V_w}\right) \quad \text{(Equation 3)}$$

5. Calculate the time taken for a bird to make a transit through the rotor and completely clear the rotor t, see Equation 4:

$$t = \frac{d + l}{v} \quad \text{(Equation 4)}$$

   where v m/sec is the speed of the bird through the rotor.

6. To calculate the number of bird transits through the rotors N, divide the total occupancy of the volume swept by the rotors in bird-secs by the transit time t, as shown in Equation 5:

$$N = \frac{n\left(\frac{V_r}{V_w}\right)}{t} \quad \text{(Equation 5)}$$

Note in this calculation that the factor $(d + l)$ cancels itself out, so only assumed values need be used - it is used above to help visualise the calculation.

Within this stage, a weighting system can be applied to the value for bird occupancy n, which is intended to take account of the fact that the observations arise from different VPs, that different VPs cover varying area extents, and that the combination of the areas seen from all VPs may not always equate to the entire site being assessed and notably acknowledging overlap between VP coverage. The weighting factor for each VP is worked out by the percentage cover of the viewshed of each VP (see viewshed maps in Figure 7H.2), as well as the combined percentage cover of all the VPs. This report includes calculations for both unweighted and weighted occupancy values.

7H.2.2 Stage 2 - Probability of bird being hit when flying through the rotors

This stage uses data relating to bird and rotor characteristics to compute the likelihood of a bird being hit when flying through the rotor. The turbine and operational model inputs have already been shown in Table 7H.1, and Table 7H.2 provides the model input for dimensions/attributes of target species. This, together with the output from Stage 1, allows for a model output of the predicted number of collisions per year. Data relating to the likelihood of a bird being hit when flying through the rotor is derived from a spreadsheet available from NatureScot (formerly Scottish Natural Heritage)[20]. The outputs from this spreadsheet are provided for each target species in Table 7H.3.

Following the above steps, the number of bird transits per year through the rotors can be combined with the probability of a bird being hit when flying through the rotor to give a value for predicted collision risk per year assuming no avoidance. This stage also considers the proportion of time that turbines are likely to be operational.

To attain the predicted collisions per annum with avoidance, avoidance rates are applied, as given in SNH (2018a) and Furness (2019). For species where specific avoidance rate are not available the SNH (2018a) guidelines suggest applying the default rate, which is 98% avoidance. However, for many species including gulls, wintering golden plover and lapwing the default avoidance rate is generally considered too low, and based on recent studies at operational wind farms, e.g. Goole Wind Farm - see Percival *et al*. (2018a, 2018b)[21], the application of higher avoidance rates (0.998) can be justified to generate modelled outputs more representative of actual avoidance rates likely to be exhibited by certain species. Applying higher avoidance rates for wintering waders would be in line with avoidance rates applied for wintering geese (SNH, 2013). Collision risk for wader species, including golden plovers are generally considered to be low due to manoeuvrability in flight (Mc Guinness *et al*., 2015).

As the application is for a 35-year consent period, the predicted collision risk over the 35-year life span of the proposed wind farm is provided for further assessed in terms of potential population level effects.

[20] Available at: https://www.nature.scot/doc/wind-farm-impacts-birds-calculating-probability-collision (Accessed: November 2023)

[21] These post-construction monitoring reports compiled by Ecology Consulting can be accessed via index (ecologyconsult.co.uk)

Table 7H.1: Turbine specifications and operational inputs

Turbine Dimensions	Unit	Turbine – Type A	Turbine – Type B	Turbine – Type C
Number of blades		3	3	3
Hub height	m	105.0	102.5	105.0
Rotor diameter	m	150	155	149
Minimum swept height	m	30	25	31
Maximum swept height	m	180	180	180
Maximum rotor chord (*d*)	m	4.2	4.5	4.2
Blade pitch*	°	6	6	6
Speed – dynamic operating range	rpm	4.9 to 12.0	5.3 to 11.7	4.9 to 12.6
Rotational period applied**	s	6.85	6.85	6.85
Turbine operation time***	%	0.85	0.85	0.85

Notes on turbine specifications and operational parameters
*Pitch varies between -5° and 90° depending on windspeed. This CRM employs a conservative value of 6°, which is considered representative of typical operating conditions for large onshore turbines located at lower altitudes in the midlands of Ireland. This value can be difficult to obtain and is often derived from Band (2012), which states a mean pitch of 25° to 30° for large offshore turbines and this is not considered representative of onshore operating conditions.
**To control for the effects of variable operational parameters (rotational period and pitch), within the CRMs and on the three difference turbine specifications being assessed (rotor diameter and max chord), the values used for rotational period (6.85 sec) and pitch (6°) were kept consistent in the initial model. For target species where flight activity generated one or more collisions over 35 years, CRMs were re-run and additional higher (5.5 sec) and lower (8.0 sec) rotational periods were tested.
***An operational period of 85% is referenced from a report by the British Wind Energy Association (2007), which identifies the standard operational period of wind turbines in the UK to be 70-85% and therefore 85% is used on a precautionary basis.

Table 7H.2: Avian biometrics, flight speeds and avoidance rates used in the CRMs

Sources: Bird biometrics from Snow & Perrins (1998)
Flight speeds from Alerstam *et al*. (2007), Bruderer & Bolt (2001) and Provan & Whitfield (2006)
Avoidance rates form SNH (2018a), update rates for gulls based on Furness (2019)

Bird species	Length		Wingspan		Flight speed (m/s)	Avoidance rate
	Range (cm)	Average (m)	Range (cm)	Average (m)		
Black-headed gull	34-37	0.36	100–110	1.05	11.90	0.992
Buzzard*	51-57	0.54	113-128	1.21	11.60	0.98*
Cormorant*	80-100	0.90	130-160	1.45	16.94	0.98*
Golden plover*	26-29	0.28	67-76	0.72	17.90	0.98*
Grey heron*	90-98	0.94	175-195	1.85	12.50	0.98*
Kestrel	32-35	0.34	71-78	0.76	10.10	0.950
Lapwing*	28-31	0.30	82-87	0.84	12.80	0.98*
Lesser black-backed gull	52-64	0.58	135-150	1.43	13.40	0.995
Little egret*	55-65	0.60	88-106	0.97	25.00	0.98*
Peregrine*	36-48	0.42	95-110	1.03	12.01	0.98*
Snipe*	25-27	0.26	44-47	0.46	17.10	0.98*
Sparrowhawk*	28-38	0.33	55-70	0.62	10.00	0.98*

*Species for which there is no species specific avoidance rate available and default avoidance at 98% has been applied, as suggested by SNH (2018a). Higher avoidance rates are likely to be more appropriate for most species.

Table 7H.3: Averaged collision probability of bird passing through rotor swept area

Collision probability (%):	Turbine Type A			Turbine Type B			Turbine Type C		
Rotational period (sec)	8.00	6.85	5.50	8.00	6.85	5.50	8.00	6.85	5.50
Bird species									
Black-headed gull	4.85%	**4.98%**	5.24%	4.95%	**5.08%**	5.35%	4.88%	**5.01%**	5.27%
Buzzard	5.40%	**5.64%**	6.09%	5.50%	**5.75%**	6.20%	5.42%	**5.67%**	6.11%
Cormorant	5.73%	**6.00%**	6.50%	5.82%	**6.10%**	6.61%	5.75%	**6.03%**	6.52%
Golden plover	4.27%	**4.32%**	4.43%	4.38%	**4.43%**	4.54%	4.30%	**4.34%**	4.46%
Grey heron	6.59%	**7.00%**	6.59%	6.69%	**7.10%**	7.82%	6.62%	**7.03%**	7.75%
Kestrel	4.78%	**4.96%**	7.72%	4.89%	**5.08%**	5.41%	4.80%	**4.99%**	5.32%
Lapwing	4.53%	**4.63%**	4.83%	4.63%	**4.74%**	4.94%	4.56%	**4.66%**	4.85%
Lesser black-backed gull	5.44%	**5.64%**	6.02%	5.53%	**5.73%**	6.12%	5.47%	**5.66%**	6.04%
Little egret	4.65%	**4.74%**	4.92%	4.74%	**4.84%**	5.03%	4.67%	**4.76%**	4.95%
Peregrine	4.95%	**5.12%**	5.44%	5.06%	**5.23%**	5.55%	4.98%	**5.15%**	5.47%
Snipe	4.06%	**4.13%**	4.27%	4.17%	**4.25%**	4.39%	4.08%	**4.14%**	4.29%
Sparrowhawk	4.70%	**4.89%**	5.22%	4.81%	**5.00%**	5.34%	4.72%	**4.91%**	5.24%

Of the three turbine types assessed, Turbine Type B was found to present the highest level of collision probability for the target species assessed, with Turbine Type A presenting marginally lower levels of collision probability when compared with Turbine Type B and Type C.

7H.2.3 Viewshed spatial coverage

The locations of the VPs and respective viewsheds are shown in Figure 7H.2. The VP locations used were consistent throughout the two-year survey period (October 2021 to September 2023). The spatial coverage of viewsheds for each VP were calculated using ArcGIS Pro. The viewshed analysis was performed using a surface offset of 25 m to map the airspace visible to surveyors (height 1.75 m) above 25 m. Spatial coverage of the 500 m turbine buffer from these VPs, is given in Table 7H.4.

Table 7H.4: Spatial and temporal coverage of 500 m turbine buffer

Vantage Point	Area of CRZ visible within 500m turbine buffer (ha)	% Coverage	VP survey effort Breeding season (hours)	VP survey effort Non- breeding season (hours)	VP survey effort Total (hours)
VP1	122.0	24.87	72.0	72.5	144.5
VP2	339.5	69.20	75.0	72.0	147.0
VP3	165.9	33.83	75.0	75.0	150.0
VP4	361.3	73.66	75.0	72.5	147.5
Total for buffer	**490.5**	**100.00**	**297.0**	**292.0**	**589.0**

7H.2.4 Recorded flight activity

For the target species included in the CRMs, Table 7H.5 provides the total number of flight observations and aggregated flight seconds recorded at collision risk heights (25-180 m) within the 500 m turbine buffer over the two-year study period, along with aggregated flight seconds recorded at risk height for each VP. For observations where more than 1 bird was recorded, flight seconds are multiplied by the number of individuals recorded, i.e. aggregated flight seconds. Values in parenthesis in Table 7H.5 give total number of flight observations and aggregated flight seconds recorded within a slightly reduced and heightened rotor swept area of 30-180 m, and is representative of the time target species occurred within the CRZ for Turbine – Type A and Type C.

Table 7H.5: Aggregated flight seconds in 25-180 m CRZ for target species recorded from each VP

Note: Values in parenthesis give number of flights and total aggregated flight seconds for 30-180 m CRZ (Turbine – Type A & C)

Species	No. of flights	Analysis period	Aggregated flight seconds				
			VP1	VP2	VP3	VP4	Total
Black-headed gull	5 (4)	Year-round	-	585	450	-	**1,035** (915)
Buzzard	136 (128)	Year-round	3,141 (3,110)	20,346 (20,176)	5,162 (5,056)	12,544 (12,544)	**41,192** (40,885)
Cormorant	13 (10)	Year-round	38 (38)	326 (86)	35 (-)	590 (546)	**989** (670)
Golden plover	38 (34)	Wintering + passage	6,558 (6,558)	388,962 (388,362)	126,790 (125,974)	197,657 (197,657)	**719,967** (718,551)
Grey heron	12 (10)	Year-round	39 (39)	263 (233)	187 (187)	817 (786)	**1,306** (1,245)
Kestrel	42 (36)	Year-round	231 (84)	3,065 (3,024)	621 (621)	1,308 (1,054)	**5,225** (4,783)
Lapwing	98 (79)	Year-round	305 (305)	41,196 (27,307)	255,538 (238,442)	234,690 (217,100)	**531,730** (483,154)
Lesser black-backed gull	34 (28)	Year-round	2,829 (2,701)	8,339 (7,779)	2,964 (2,604)	38,028 (37,668)	**52,161** (50,752)
Little egret	10 (6)	Year-round	- (-)	394 (394)	- (-)	327 (194)	**721** (588)
Peregrine	6 (5)	Year-round	982	115	-	9	**1,107** (1,103)
Snipe	8 (7)	Wintering + passage (25% for night flights)	-	70	-	410	**480** (310)
Sparrowhawk	4 (4)	Year-round	-	351	194	240	**785** (758)

7H.3 COLLISION RISK ASSESSMENT

As detailed above, the collision risk assessment is undertaken in two stages, with Stage 1 being to ascertain the number of bird flights through the rotors and Stage 2 being to ascertain the probability of a bird being hit by the rotors as it passes through.

7H.3.1 Stage 1 - Number of birds flying through rotors

The first part of Stage 1 is defining the flight risk volume V_w and is calculated using Equation 1. Therefore, V_w is derived from the area of the 500 m turbine buffer (4,905,326 m^2) multiplied by the rotor diameter, which gives a flight risk volume V_w for each of the turbine model being assessed (Table 7H.6).

The rotor swept volume V_r is then worked out based on the rotor-swept area multiplied by the number of turbines, the depth of the rotor and the length of the bird. This is shown for the specified turbine types (A, B, C) in Table 7H.7 and calculated using Equation 2.

Table 7H.6: Flight Risk Volume V_w for each turbine model

Parameters	Turbine A	Turbine B	Turbine C
500 m turbine buffer area (m^2)	4,905,326	4,905,326	4,905,326
Rotor diameter (m)	150	155	149
V_w (m^3)	735,798,900	760,325,530	730,893,574

Table 7H.7: Risk Volume V_r and rotor transit time t for the turbine types (A, B, C)

	Vr (m^3)			t (s)		
Species name	**Turbine A**	**Turbine B**	**Turbine C**	**Turbine A**	**Turbine B**	**Turbine C**
Black-headed gull	805,819	917,043	795,110	0.38	0.41	0.38
Buzzard	837,627	951,007	826,496	0.41	0.43	0.41
Cormorant	901,244	1,018,936	889,268	0.30	0.32	0.30
Golden plover	791,681	901,947	781,161	0.25	0.27	0.25
Grey heron	908,313	1,026,484	896,243	0.41	0.44	0.41
Kestrel	802,284	913,269	791,623	0.45	0.48	0.45
Lapwing	795,216	905,721	784,648	0.35	0.38	0.35
Lesser black-backed gull	844,696	958,555	833,471	0.36	0.38	0.36
Little egret	848,230	962,329	836,958	0.19	0.20	0.19
Peregrine	816,421	928,364	805,572	0.38	0.41	0.38
Snipe	788,147	898,173	777,673	0.26	0.28	0.26
Sparrowhawk	800,517	911,382	789,879	0.45	0.48	0.45

The next stage of the calculations is to determine the bird occupancy n within the flight risk volume. This is worked out individually for each VP and then averaged to find the mean occupancy across the site. The observation effort (see Equation 6) of each VP (in hectare hours) is first calculated by multiplying the area viewed from the VP by the number of VP hours undertaken. Occupancy n is then calculated, using Equation 7, by dividing the flight time at risk height (in hours) by the observation effort and then multiplying that value by the area of the 500 m turbine buffer and the total hours the target species are active across the site (see Table 7H.8).

The time the birds are active is defined as the product of the number of days in the season/year and the mean day length. This is assumed to be an average of 12 hours of daylight for 365 days in the year for species that were present throughout the year (i.e. 4,380 hours). For wintering species, 1,704 hours was used and for species that were only present during the breeding season, 2,400 hours was applied. For golden plover 2,127 hours was applied, which considers the wintering season and passage season (April). Note: For lapwing, while modelled outputs presented in the following tables are for year-round activity, to investigate seasonal variation in predicted collision risk for lapwing the model was also run inputting lapwing occupancy for the breeding and non-breeding season separately – these results are present in the discussion.

The figures calculated for occupancy, in bird-seconds, are shown in Table 7H.8.

$$Observation\ effort = Area_{viewshed} * Survey\ effort \qquad \text{(Equation 6)}$$

$$n = \frac{Flight\ time\ at\ risk\ height\ (hrs)}{Observation\ effort} * Area_{500m\ turbine\ buffer} * Daylight\ hours \qquad \text{(Equation 7)}$$

Table 7H.8: Occupancy n (bird-secs) values calculated for each VP applying CRZ 25-180 m

Species name	Analysis period (hours)		Occupancy n (bird secs)			
			VP1	VP2	VP3	VP4
Black-headed gull	Year-round	4,380	-	6.99	10.79	-
Buzzard	Year-round	4,380	106.32	243.35	123.76	140.47
Cormorant	Year-round	4,380	1.29	3.90	0.84	6.61
Golden plover	Wintering + April	2,127	198.45	4,427.95	2,839.05	2,186.77
Grey heron	Year-round	4,380	1.32	3.15	4.48	9.14
Kestrel	Year-round	4,380	7.80	36.66	14.88	14.65
Lapwing	Year-round	4,380	10.34	492.73	6,127.07	2,628.08
Lesser black-backed gull	Year-round	4,380	95.76	99.74	71.07	425.84
Little egret	Year-round	4,380	-	4.72	-	3.66
Peregrine	Year-round	4,380	33.25	1.38	-	0.10
Snipe	Wintering + April	2,127	-	0.80	-	4.54
Sparrowhawk	Year-round	4,380	-	4.20	4.65	2.69

As previously described, a weighting factor was used to account for the varying extents of coverage from each VP, as well as the combined cover of each VP not accounting for the entire site (see Equation 8). Weighted values for n were calculated using the values for the percentage cover described in Table 7H.4. In this case, the combined VPs do provide 100% coverage of the entire 500 m turbine and there is significant overlap in the viewsheds. The following weighting was therefore applied:

$$n_{weighted} = \frac{(n_{vp1} * (0.249) + n_{vp2} * (0.692) + n_{vp3} * (0.338) + n_{vp4} * (0.737))}{1} \qquad \text{(Equation 8)}$$

Once a value for n and $n_{weighted}$ has been calculated for each VP, this is then used to generate the mean activity for the site as a percentage of time (i.e. a percentage occupancy) within the risk zone, n_{avg}. This is calculated by adding the values for n calculated for each VP then dividing by the number of VPs. In this case, both weighted and unweighted values for n_{avg} were obtained, as shown in Table 7H.9. These values are same for all three turbine types being assessed, as the aggregate flight seconds inputted for each target species was the same, which was precautionary for Turbine Type A and Turbine Type B.

Table 7H.9: Values obtained for $\mathbf{n_{avg}}$ and $\mathbf{n_{weightedavg}}$ (bird-secs)

Species name	Turbine Type A, B & C CRZ 25-180 m		Turbine Type A & C CRZ 30-180 m (selected species)	
	n_{avg}	$n_{weightedavg}$	n_{avg}	$n_{weightedavg}$
Black-headed gull	4.45	2.12	na	na
Buzzard	153.47	85.04	152.07	84.41
Cormorant	3.16	2.04	2.11	1.38
Golden plover	2,413.05	1,421.19	2,406.78	1,418.46
Grey heron	4.52	2.69	4.35	2.56
Kestrel	18.50	10.78	16.42	9.87
Lapwing	2,314.55	1,088.03	2,121.30	988.35
Lesser black-backed gull	94.85	58.98	167.18	104.74
Little egret	2.09	1.49	1.72	1.22
Peregrine	8.68	2.32	na	na
Snipe	1.33	0.97	na	na
Sparrowhawk	2.88	1.62	na	na

The bird occupancy of the rotor-swept volume b is then worked out using Equation 3 by multiplying n_{avg} by $\frac{V_r}{V_w}$.

The bird occupancy of the swept volume b is used to ascertain the number of bird transits through the rotors N by dividing b by the rotor transit time t, see Equation 4 and Equation 5. The number of transits through the rotors N is then adjusted by a factor of 0.85[22] to obtain Tn, which considers likely wind turbine downtime. Calculations for the number of transits through the rotors are shown in Table 7H.10.

[22] This operational period of 85% is referenced from a report by the British Wind Energy Association (2007) which identifies the standard operational period of the wind turbines in the UK to be roughly 85%.

Table 7H.10: Values obtained for the number of transits through the rotors T_n

		Unweighted			Weighted		
	Species name	b	N	Tn	b	N	Tn
Turbine A CRZ 25-180 m	Black-headed gull	17.53	45.74	38.88	8.37	21.84	18.56
	Buzzard	628.96	1,539.22	1,308.34	348.53	852.94	725.00
	Cormorant	13.93	46.28	39.34	9.01	29.92	25.43
	Golden plover	9,346.75	37,345.27	31,743.48	5,504.84	21,994.79	18,695.57
	Grey heron	20.11	48.90	41.57	11.96	29.07	24.71
	Kestrel	72.61	161.54	137.31	42.33	94.17	80.05
	Lapwing	9,005.24	25,614.91	21,772.68	4,233.21	12,041.12	10,234.95
	Lesser black-backed gull	715.40	2,005.52	1,704.69	444.86	1,247.09	1,060.03
	Little egret	8.69	45.27	38.48	6.18	32.21	27.38
	Peregrine	34.68	90.83	77.20	9.29	24.32	20.67
	Snipe	5.14	19.71	16.75	3.75	14.39	12.23
	Sparrowhawk	11.30	24.94	21.20	6.33	13.96	11.87
Turbine A CRZ 30-180 m	**For selected species**	**b**	**N**	**Tn**	**b**	**N**	**Tn**
	Buzzard	623.21	1,525.15	1,296.37	345.94	846.61	719.62
	Cormorant	9.30	30.88	26.25	6.10	20.27	17.23
	Golden plover	9,322.44	37,248.14	31,660.92	5,494.28	21,952.58	18,659.70
	Grey heron	19.33	47.00	39.95	11.40	27.71	23.56
	Kestrel	64.47	143.41	121.90	38.73	86.15	73.23
	Lapwing	8,253.34	23,476.17	19,954.75	3,845.37	10,937.95	9,297.26
	Lesser black-backed gull	690.91	1,936.87	1,646.34	432.87	1,213.47	1,031.45
	Little egret	7.15	37.23	31.64	5.05	26.28	22.34
Turbine B CRZ 25-180 m	Black-headed gull	19.30	47.27	40.18	9.22	22.57	19.18
	Buzzard	691.06	1,590.53	1,351.95	382.94	881.37	749.17
	Cormorant	15.24	47.82	40.65	9.86	30.92	26.28
	Golden plover	10,305.07	38,590.11	32,801.60	6,069.25	22,727.95	19,318.76
	Grey heron	21.99	50.53	42.95	13.08	30.04	25.54
	Kestrel	79.99	166.93	141.89	46.63	97.31	82.72
	Lapwing	9,925.78	26,468.74	22,498.43	4,665.93	12,442.49	10,576.12
	Lesser black-backed gull	785.64	2,072.37	1,761.52	488.54	1,288.66	1,095.36
	Little egret	9.54	46.78	39.77	6.79	33.29	28.29
	Peregrine	38.16	93.85	79.78	10.22	25.13	21.36
	Snipe	5.67	20.37	17.31	4.14	14.87	12.64
	Sparrowhawk	12.45	25.77	21.91	6.97	14.43	12.26
Turbine C CRZ 25-180 m	Black-headed gull	17.41	45.44	38.62	8.31	21.69	18.44
	Buzzard	624.77	1,528.96	1,299.62	346.21	847.26	720.17
	Cormorant	13.84	45.97	39.07	8.95	29.72	25.26
	Golden plover	9,284.44	37,096.30	31,531.86	5,468.14	21,848.16	18,570.93
	Grey heron	19.97	48.58	41.29	11.88	28.88	24.55
	Kestrel	72.13	160.46	136.39	42.05	93.55	79.51
	Lapwing	8,945.21	25,444.15	21,627.53	4,204.98	11,960.85	10,166.72
	Lesser black-backed gull	710.63	1,992.15	1,693.33	441.89	1,238.78	1,052.96
	Little egret	8.63	44.97	38.23	6.14	32.00	27.20
	Peregrine	34.45	90.22	76.69	9.23	24.16	20.54
	Snipe	5.11	19.58	16.64	3.73	14.29	12.15
	Sparrowhawk	11.22	24.78	21.06	6.28	13.87	11.79
Turbine C CRZ 30-180 m	**For selected species**	**b**	**N**	**Tn**	**b**	**N**	**Tn**
	Buzzard	619.05	1,514.98	1,287.73	343.64	840.97	714.82
	Cormorant	9.23	30.67	26.07	6.06	20.14	17.12
	Golden plover	9,260.29	36,999.82	31,449.85	5,457.65	21,806.23	18,535.30
	Grey heron	19.20	46.68	39.68	11.32	27.53	23.40
	Kestrel	64.04	142.46	121.09	38.47	85.58	72.74
	Lapwing	8,198.32	23,319.66	19,821.72	3,819.74	10,865.04	9,235.28
	Lesser black-backed gull	686.31	1,923.95	1,635.36	429.98	1,205.38	1,024.58
	Little egret	7.10	36.98	31.43	5.01	26.11	22.19

7H.3.2 Stage 2 - Probability of bird being hit when flying through the rotors

Table 7H.3 provides the collision probability of the selected target species passing through the rotors, as calculated using the spreadsheet provided by NatureScot[23]. The average collision probability is applied within the CRM and is based the collision probability of birds travelling both upwind and downwind. All collision probability calculations were undertaken using the setting for birds flapping, as opposed to the setting for gliding birds. This is appropriate for birds, like golden plover and snipe that predominately employ a flapping mode of flight. The flapping setting generates higher values for collision probability in species that incorporate gliding in their flight behaviour, in particular larger raptors, like buzzards. The higher (flapping) value has been retained for these species and will generate a more precautionary estimate for collision risk.

[23] Available at: https://www.nature.scot/wind-farm-impacts-birds-calculating-probability-collision (Accessed: November 2023)

Table 7H.11: Collision risk model results

Outputs from initial CRMs applying uniform flight times for CRZ 25-180 m and operational parameters (rotational period: 6.85 sec and pitch 6°)
The turbine models and specifications with the highest and lowest predicted collision risk are highlighted in red and green, respectively

	Species	Unweighted					Weighted				
		Collisions/year		Predicted risk stats			Collisions/year		Predicted risk stats		
		No avoid	Avoid	Per decade	Per 35 years	1 bird every x years	No avoid	Avoid	Per decade	Per 35 years	1 bird every x years
Turbine A	Black-headed gull	1.94	0.015	0.15	0.5	64.6	0.92	0.007	0.07	0.3	135.2
	Buzzard	73.79	1.476	14.76	51.7	0.7	40.89	0.818	8.18	**28.6**	1.2
	Cormorant	2.36	0.047	0.47	1.7	21.2	1.53	0.031	0.31	**1.1**	32.8
	Golden plover	1,371.32	27.426	274.26	959.9	0.04	807.65	16.153	161.53	**565.4**	0.1
	Grey heron	2.91	0.058	0.58	2.0	17.2	1.73	0.035	0.35	**1.2**	28.9
	Kestrel	6.81	0.341	3.41	11.9	2.9	3.97	0.199	1.99	**6.9**	5.0
	Lapwing	1,008.07	20.161	201.61	705.7	0.05	473.88	9.478	94.78	**331.7**	0.1
	Lesser black-backed gull	96.15	0.481	4.81	16.8	2.1	59.79	0.299	2.99	**10.5**	3.3
	Little egret	1.82	0.036	0.36	1.3	27.4	1.30	0.026	0.26	0.9	38.5
	Peregrine	3.95	0.079	0.79	2.8	12.6	1.06	0.021	0.21	0.7	47.2
	Snipe	0.69	0.014	0.14	0.5	72.3	0.51	0.010	0.10	0.4	99.0
	Sparrowhawk	1.04	0.021	0.21	0.7	48.2	0.58	0.012	0.12	0.4	86.1
Turbine B	Black-headed gull	2.04	0.016	0.16	0.6	61.2	0.98	0.008	0.08	0.3	128.2
	Buzzard	77.71	1.554	15.54	54.4	0.6	43.06	0.861	8.61	**30.1**	1.2
	Cormorant	2.48	0.050	0.50	1.7	20.2	1.60	0.032	0.32	**1.1**	31.2
	Golden plover	1,452.07	29.041	290.41	1,016.5	0.03	855.21	17.104	171.04	**598.6**	0.1
	Grey heron	3.05	0.061	0.61	2.1	16.4	1.81	0.036	0.36	**1.3**	27.6
	Kestrel	7.20	0.360	3.60	12.6	2.8	4.20	0.210	2.10	**7.3**	4.8
	Lapwing	1,066.02	21.320	213.20	746.2	0.05	501.12	10.022	100.22	**350.8**	0.1
	Lesser black-backed gull	101.02	0.505	5.05	17.7	2.0	62.81	0.314	3.14	**11.0**	3.2
	Little egret	1.92	0.038	0.38	1.3	26.0	1.37	0.027	0.27	**1.0**	36.5
	Peregrine	4.17	0.083	0.83	2.9	12.0	1.18	0.022	0.22	0.8	44.8
	Snipe	0.74	0.015	0.15	0.5	68.0	0.54	0.011	0.11	0.4	93.2
	Sparrowhawk	1.10	0.022	0.22	0.8	45.6	0.61	0.012	0.12	0.4	81.5
Turbine C	Black-headed gull	1.93	0.015	0.15	0.5	64.6	0.92	0.007	0.07	0.3	135.3
	Buzzard	73.69	1.474	14.74	51.6	0.7	40.83	0.817	8.17	**28.6**	1.2
	Cormorant	2.36	0.047	0.47	1.6	21.2	1.52	0.030	0.30	**1.1**	32.8
	Golden plover	1,368.48	27.370	273.70	957.9	0.0	805.98	16.120	161.20	**564.2**	0.1
	Grey heron	2.90	0.058	0.58	2.0	17.2	1.73	0.035	0.35	**1.2**	29.0
	Kestrel	6.81	0.340	3.40	11.9	2.9	3.97	0.198	1.98	**6.9**	5.0
	Lapwing	1,007.84	20.157	201.57	705.5	0.0	473.77	9.475	94.75	**331.6**	0.1
	Lesser black-backed gull	95.84	0.479	4.79	16.8	2.1	59.60	0.298	2.98	**10.4**	3.4
	Little egret	1.82	0.036	0.36	1.3	27.5	1.29	0.026	0.26	0.9	38.6
	Peregrine	3.95	0.079	0.79	2.8	12.7	1.06	0.021	0.21	0.7	47.3
	Snipe	0.69	0.014	0.14	0.5	72.6	0.50	0.010	0.10	0.4	99.4
	Sparrowhawk	1.03	0.021	0.21	0.7	48.4	0.58	0.012	0.12	0.4	86.4

7H.4 RESULTS

The output figures from stage 1 (bird transits through the rotors per year) and stage 2 (probability of a bird being hit while passing through the rotors) are multiplied to get an estimated collision/mortality rate per year in the absence of any avoidance. An avoidance rate is then applied to this value – see Table 7H.3. Unweighted and weighted results are detailed in Table 7H.11 for the three turbine models assessed (A, B, C). For clarity, Table 7H.12 shows the weighted results for CRM only (with avoidance).

For the dimensions and operational specifications inputted into the initial CRMs, the outputs for predicted collision risk are comparable for the three turbines assessed, with marginally higher values generated by Turbine Type B. The initial outputs from the CRMs predicated collisions risk of one or more collision over 35 years for eight species, and as listed in Table 7H.12 this included buzzard, cormorant, golden plover, grey heron, kestrel, lapwing, lesser black-backed gull and little egret (outputs shown for worst-case scenario - Turbine Type B).

- Buzzard 1 collision every 1.2 years (weighted, 98.0% avoidance)
- Cormorant 1 collision every 31.2 years (weighted, 98.0% avoidance)
- Golden plover 1 collision every 0.1 years (weighted, 98.0% avoidance)
- Grey heron 1 collision every 27.6 years (weighted, 98.0% avoidance)
- Kestrel 1 collision every 4.8 years (weighted, 95.0% avoidance)
- Lapwing 1 collision every 0.1 years (weighted, 98.0% avoidance)
- Lesser black-backed gull 1 collision every 3.2 years (weighted, 99.5% avoidance)
- Little egret 1 collision every 36.5 years (weighted, 98.0% avoidance)

For cormorant, grey heron and little egret modelled outputs predicted one or close to one collision over the 35 years, and this relatively low level of predicted collision risk is considered unlikely to have any significant population level effects. For the other five species, while these outputs are representative of high levels of flight activity within the CRZ, it is important to acknowledge that the application of a default avoidance rate (0.98), as suggested by SNH (2018a), is notably low for some species and leads to inflated estimates, in particular for wintering golden plover and lapwing. Application of higher avoidance rate, if it can be justified in certain cases, provides more realistic outputs for predicted collision risk. For these species further analysis is undertaken in the next section including investigating potential for population level effects to arise as a result of predicted collision risk and re-running CRMs to examine:

- the effect of using flight times for the slightly smaller CRZ (30 to 180 m);
- the effects of different operational parameters, in particular rational period of the turbines;
- seasonal variation in collision risk; and,
- the appropriateness of applying default avoidance rates.

For the target species listed in Table 7H.12, the CRMs generated notably low levels of theoretical collision risk for four of the target species analysed and outputs for the worst-case scenarios (Turbine B) predicted significantly less than one collision over the 35-year life span of the project for:

- Black-headed gull 1 collision every 128.2 years (weighted, 99.2% avoidance)
- Peregrine 1 collision every 44.8 years (weighted, 98.0% avoidance)
- Snipe 1 collision every 93.2 years (weighted, 98.0% avoidance)
- Sparrowhawk 1 collision every 81.5 years (weighted, 98.0% avoidance)

Table 7H.12: CRM weighted results (with avoidance) for three turbine types

CRM outputs inputting flight seconds recorded between 25 m and 180 m, a 6.85 second rotational period and pitch of 6 degrees
The turbine models/specifications with the highest and lowest predicted collision risk are highlighted in red and green, respectively
Species in listed **bold** exhibit predicted collision risk values of one or more collisions over the 35 years life span of the proposed Wind Farm site

	Collisions/year			Collisions per decade			Collisions per 35 years (WF life span)			Equivalent to 1 bird every x years		
	Turbine Type			Turbine Type			Turbine Type			Turbine Type		
Species	**A**	**B**	**C**	**A**	**B**	**C**	**A**	**B**	**C**	**A**	**B**	**C**
Black-headed gull	0.007	0.008	0.007	0.07	0.08	0.07	0.3	0.3	0.3	135.20	128.20	135.30
Buzzard	0.818	0.861	0.817	8.18	8.61	8.17	28.6	**30.1**	28.6	1.2	1.2	1.2
Cormorant	0.031	0.032	0.030	0.31	0.32	0.30	1.1	**1.1**	1.1	32.8	31.2	32.8
Golden plover	16.153	17.104	16.120	161.53	171.04	161.20	565.4	**598.6**	564.2	0.1	0.1	0.1
Grey heron	0.035	0.036	0.035	0.35	0.36	0.35	1.2	**1.3**	1.2	28.9	27.6	29.0
Kestrel	0.199	0.21	0.198	1.99	2.1	1.98	6.9	**7.3**	6.9	5.0	4.8	5.0
Lapwing	9.478	10.022	9.475	94.78	100.22	94.75	331.7	**350.8**	331.6	0.1	0.1	0.1
Lesser black-backed gull	0.299	0.314	0.298	2.99	3.14	2.98	10.5	**11.0**	10.4	3.3	3.2	3.4
Little egret	0.026	0.027	0.026	0.26	0.27	0.26	0.9	**1.0**	0.9	38.5	36.5	38.6
Peregrine	0.021	0.022	0.021	0.21	0.22	0.21	0.7	0.8	0.7	47.2	44.8	47.3
Snipe	0.010	0.011	0.010	0.10	0.11	0.10	0.4	0.4	0.4	99.0	93.2	99.4
Sparrowhawk	0.012	0.012	0.012	0.12	0.12	0.12	0.4	0.4	0.4	86.1	81.5	86.4

7H.5 DISCUSSION

The CRM outputs present in Table 7H.12 are considered to represent theoretical collision risk at an elevated level for the target species recorded, as the parameters entered in the model are precautionary, including:

- Turbine dimensions, especially the maximum chord for the blades;
- Relatively high rotational period;
- Selecting flapping flight behaviour for each species; and,
- Application of the default avoidance (98%), which for some species is considered too low and higher levels of avoidance are more appropriate.

The following sections identify the species where the values for predicted collision risk indicate the potential for likely significant effects, which are identified as species with modelled outputs of one or more collisions over 35 years. For these species the robustness of the CRMs are tested by re-running the models to provides greater confidence in the outputs for predicted collisions risk. The potential for population level effects to arise as a result of turbine mediate mortality is then assessed.

7H.5.1 Predicted collision risk – potential for likely significant effects

For the target species listed in Table 7H.12, the CRMs generated low levels of theoretical collision risk (< 1 collision over 35 years) for four of the 12 target species analysed, including:

- Black-headed gull
- Peregrine
- Snipe
- Sparrowhawk

For these four species the levels of collision risk predicted is negligible and will not affect these species at the population level, i.e. collision-mediated mortality would not add significantly (>1%) to background levels of mortality. Nevertheless, it is important to stress that, as is always the case with a modelled approach, the CRM outputs are only considered to be indicative of the risk level for turbine mediate mortality. For instance, it is acknowledged that the application of CRMs to smaller, evasive species like sparrowhawk and snipe may not provide an accurate estimate of predicted collision risk, as these species can be difficult to detect over the full extent of the viewsheds for VPs, due to diminutive size, cryptic nature and/or flight behaviour. Furthermore, the modelled outputs do not consider the potential displacement of birds from the proposed Wind Farm site, which for species breeding within or directly adjacent to the site, like sparrowhawk or snipe has the potential for higher magnitude of effects than collision risk. This is examined further and taken into account when addressing potential for significant effects within the EIAR Chapter 7: Ornithology.

Likewise, for peregrine, while observed flight activity recorded within the CRZ was low over the two-year study, it is noted that there is a nest site within approximately 600 m of the closest turbine. Given the low level of flight activity observed through the 500 m turbine buffer and the separation distances between turbines and the nest, collision risk to adult peregrines is assessed as negligible. The EIAR Chapter 7: Ornithology addresses the potential effects that may be faced by recently fledged birds due to collision risk; as they are inexperienced at flying and likely to be naive to the hazard, which under certain weather conditions may pose a higher risk, e.g. under higher wind speeds if turbines were obscured by low cloud or fog.

For the proposed Wind Farm site the CRMs for buzzard, cormorant, golden plover, grey heron, kestrel, lapwing, lesser black-backed gull and little egret predicted one or more collisions per 35 years, which was reflective of higher levels of aggregate flight time in the collision risk zone recorded for these species and, with the exception of kestrel and both species of gull, these results are strongly influenced by application of a lower default avoidance rate. Based on predicted collision risk, as shown in Table 7H.12, potential for likely significant effects due to turbine mediated mortality were identified for these eight species, and further analysis is undertaken in the following sections to test the robustness of the modelled outputs.

The CRMs were re-run to investigate:

- the effects of different operational parameters, in particular rational period of the turbines;
- the effect of inputting lower flight times as occurring within the slightly smaller CRZ (30 to 180 m);
- the appropriateness of applying default avoidance rates; and
- seasonal variation in collision risk.

Following this analysis, which provides greater confidence in the outputs for predicted collisions risk, the potential for population level effects to arise as a result of turbine mediate mortality is then assessed.

Based on the initial CRM outputs, as summarised in Table 7H.12, it can be seen for three target species that only one or close to one collision is predicted over 35 years, including: cormorant, grey heron and little egret.

7H.5.2 Effects of operational period

Table 7H.3, shows the effect of slower (8.0 sec) and faster (5.5 sec) rotational periods on averaged collision probabilities for the three turbine types assessed. Turbine Type B has the highest averaged collision probabilities for target species passing the through the rotor swept area, which is to be expected given that Turbine Type B presents the highest flight risk volume (V_w), due having the the longest rotor diameter (155 m) and widest max chord (4.5 m). However, as shown by the final outputs in Table 7H.12, the differences for predicted collision risk across the three turbine types assessed was only marginal. For the operational specifications and flight times inputted into the CRM, Turbine Type B generated the outputs with slightly higher predicted collision risk than the other two turbine types. Turbine Type C, with the smallest flight risk volume (V_w), generated the lowest predicted collision risk, but this was only very marginal when compared to Turbine Type A.

In order to test the effect of rotational period, the CRMs were re-run for all three turbine types inputting rational periods of 5.50 seconds and 8.00 seconds. This was only undertaken for species were the CRM outputs predicted one or more collision over the 35 year life span of the proposed Wind Farm. The results for these modelled outputs are shown in Table 7H.14, along with the results from the initial CRMs applying a rational period of 6.85 seconds for comparison.

The effect of applying different rotational periods only has a minimal effect on the modelled outputs, especially for the smaller (shorter) and/or faster flying species like golden plover and lapwing, and predicted collision risk does not vary significantly over the range tested (5.5 to 8.0 seconds). Therefore, the outputs can be considered representative of a range operational conditions that may be encountered by birds flying through the proposed Wind Farm site.

7H.5.3 Effects of variation in the collision risk zone 25-180 m vs 30-180 m

In relation to target species occupancy within the collision risk zone, the same values for aggregated flight seconds were used initially to assess the three turbine types and captured all flights within the height range of 25 to 180 m. This was considered precautionary for Turbine Type A and Turbine Type C, as the lowest rotor swept heights for these two turbine types were 5-6 m higher than for Turbine Type B. As shown by the values in parenthesis in Table 7H.5, aggregated flight seconds recorded within the height range of 30 to 180 m are lower in some instances. In order to test the effect of lower flight time in the

CRZ, the CRMs were re-run for Turbine Type A and Type C, inputting aggregate flight seconds within the height range of 30-180 m and Table 7H.13 show occupancy (n) calculated for each VP. This was only undertaken for species were the CRM outputs predicted one or more collision over the 35 year life span of the proposed Wind Farm. The results for these modelled outputs are shown in Table 7H.15.

The effect of inputting lower flight time within the CRZ, representative of the 30 to 180 m height range, had minimal effects on most of the modelled outputs. Therefore, the outputs can be considered representative of typical levels of flight activity and behaviour for target species within the rotor swept area, especially within the lower height bands between 25 m and 30 m.

Table 7H.13: Occupancy n (bird-secs) values calculated for each VP applying CRZ 30-180 m

Species name	Analysis period (hours)		Occupancy n (bird secs)			
			VP1	VP2	VP3	VP4
Buzzard	Year-round	4,380	105.27	241.31	121.22	140.47
Cormorant	Year-round	4,380	1.29	1.03	-	6.11
Golden plover	Wintering + April	2,127	198.45	4421.12	2820.77	2186.77
Grey heron	Year-round	4,380	1.32	2.79	4.48	8.80
Kestrel	Year-round	4,380	2.84	36.17	14.88	11.80
Lapwing	Year-round	4,380	10.34	326.60	5717.15	2431.10
Lesser black-backed gull	Year-round	4,380	91.43	93.04	62.44	421.81
Little egret	Year-round	4,380	-	4.72	-	2.17

7H.5.4 Default avoidance rates

Based on SNH (2018a) guidelines, as there are no species specific avoidance rates officially recognised by NatureScot for buzzard, cormorant, golden plover, grey heron, lapwing and little egret, with the default avoidance rate (0.98) being applied in CRMs for these species. For buzzard, the while the default avoidance rate is considered too low it is not contested. Due to the favourable conservation status of buzzards, little research effort has been invested into investigating collision risk in buzzard and evidence to show that that the application of higher avoidance rates is appropriate for this species is limited. In addition, buzzards in similarity with kestrels may be somewhat prone to colliding with turbines. For cormorant, grey heron and little egret modelled outputs predicted one or close to one collision over the 35 years, which is very low and does warrant further investigation with regards to avoidance rates. Needless to say, application of higher avoidance rates would reduce predicted collision further for these species.

Several post-construction ornithological studies monitoring turbine mediated mortality have shown that avoidance rates for golden plover and lapwing are likely to be significantly higher than the default setting, especially for wintering populations (see review by Gittings, 2022). The relevance of studies are discussed further below and in view the findings, golden plover and lapwing CRMs were re-run, applying avoidance ranging from 98.5% to 99.9% for comparison against the default avoidance (98.0%), as applied in the initial CRMs. The specifications for Turbine Type B, as the marginally worst-case scenario, were inputted into the CRMs along with the operational parameters applied in the initial models (rotational period of 6.85 and pitch of 6°) and flight times for the maximum rotor swept area (25-180 m). The results for golden plover and lapwing are presented in Table 7H.16 and Table 7H.17, respectively.

The outputs for golden plover and lapwing show that avoidance rate strongly influences the levels of collision risk predicted and outputs range from:

- Golden plover 599 collisions over 35 years at **98.0%** avoidance
  30 collisions over 35 years at **99.9%** avoidance
- Lapwing 351 collisions over 35 years at **98.0%** avoidance

18 collisions over 35 years at **99.9%** avoidance

7H.5.5 Applying higher avoidance rate for golden plover and lapwing

Collision risk for wader species, including golden plovers and lapwing are generally considered to be low due to manoeuvrability in flight (Mc Guinness *et al*., 2015). A review by Gittings (2022) of post-construction monitoring studies at three wind farm sites in the UK that support wintering golden plover, found that there is empirical evidence that higher avoidance rates should be applied for non-breeding golden plovers; and avoidance ranging from 99.6% to 99.8% would generate more realistic modelled outputs, which are in line with avoidances rates applied for wintering geese (SNH, 2013). Although not specifically reviewed by Gittings (2022), two of these wind farm sites also supported lapwing and based on these studies it is clear that both golden plover and lapwing exhibited very high degrees of turbine avoidance behaviour, well in excess of 99% – see post-construction monitoring reports for Blood Hill Wind Farm (Percival *et al*., 2008) and Goole Fields Wind Farm (Percival *et al*., 2018a, 2018b)[24]. Taking account of the findings from these studies, it is recommended that the impact assessment for golden plover and lapwing assess the effects of predicted collision risk by the applying higher, empirically derived avoidance rates suggested by these studies. Testing population level effects at 99.5% (precautionary) and 99.8% avoidance is considered appropriate, with reference to the default 98% avoidance included to remain in line with SNH (2018a) guidance on the application of default avoidance rates.

7H.5.6 Annual and seasonal variation in collision risk

Figure 7H.3, Figure 7H.4, Figure 7H.5, Figure 7H.6 and Figure 7H.7 illustrate how the flight times (aggregate seconds within the 500 m turbine buffer) recorded for buzzard, golden plover, kestrel, lapwing and lesser black-backed gull, respectively, were distributed over the two year study period. For lapwing and golden plover, the charts highlight the relatively sporadic nature of flights within the 500 m turbine buffer over the winter, and for lapwing the low level of time over the breeding season associated with attempts to breeding within the 500 m buffer.

In order to test for both annual and seasonal variation in collision risk for lapwing the CRM was re-run applying specifications for Turbine Type B, as the marginally worst-case scenario, along with the operational parameters applied in the initial model (rotational period of 6.85 and pitch of 6°) and flight times for the maximum rotor swept area (25-180 m), with adjustments made to the flight period and flight times based on the season being analysed (see Table 7H.18).

Table 7H.19 shows outputs for CRMs run to account for differences in lapwing flight time recorded in breeding seasons 2022 & 2023 combined and separately, and non-breeding seasons 2021/22 & 2022/23 combined and separately. In addition, outputs are shown for a range of avoidance rates and as outlined in the previous section, the default avoidance rate (0.98) is considered too low and will generate unrealistic outputs. Therefore testing population level effects for lapwing at 99.5% (precautionary) and 99.8% avoidance is considered appropriate.

The seasonal CRMs run for lapwing clearly show that predicted collision risk for lapwing is driven by the significantly higher levels of aggregate flight time recorded for wintering birds. Likewise, higher recorded aggregate flight times resulted in predicated collision risk being higher in the second non-breeding season (2022/23), with estimated collisions over 35 years for both non-breeding seasons ranging from:

- 116 to 425 collisions over 35 years with avoidance at 98.0%

[24] These post-construction monitoring reports compiled by Ecology Consulting can be accessed via index (ecologyconsult.co.uk)

- 29 to 106 collisions over 35 years with avoidance at 99.5%
- 12 to 43 collisions over 35 years with avoidance at 99.8%

The outputs from the breeding season models run for lapwing (see Table 7H.19) show that collision risk becomes negligible for breeding birds once avoidance is set to 99.5%. Higher recorded aggregate flight times resulted in predicated collision risk being higher in the second breeding season (2023), with estimated collisions over 35 years for both breeding seasons ranging from:

- 0.7 to 4.3 collisions over 35 years with avoidance at 98.0%
- 0.2 to 1.1 collisions over 35 years with avoidance at 99.5%
- 0.1 to 0.4 collisions over 35 years with avoidance at 99.8%

In both breeding seasons (2022 & 2023), while a small number of pairs attempted to breed within the proposed Wind Farm site; these attempts failed entirely in 2022 and in 2023 only a single pair persisted, which contributed to low flight activity. In addition to the potential effects of collision risk, displacement effects of turbines on breeding lapwing, should be assessed further in the EIAR Chapter 7 Ornithology.

Examining the distribution of flight time for lesser black-back gull in Figure 7H.7, it can be seen that flight activity for lesser black-backed gull was almost entirely recorded within the first year. Re-running the CRM for lesser black-backed gull for year one only (Oct-2021 to Sept-2022), finds that predicted collision risk doubles from one collision every 3.2 years to one collision every 1.6 years. Adopting the high estimate is considered appropriate, rather than taking the average between a higher activity year and a lower activity year. This precautionary approach is supported by similar levels of activity being recorded over the preliminary study year, Oct-2020 to Aug-2021 (FTC, 2022).

Table 7H.14: Predicted collision risk for selected target species at different rotational periods

Turbine	Type A			Type B			Type C		
Rotational period (sec)	5.50	6.85	8.00	5.50	6.85	8.00	5.50	6.85	8.00
Predicted collisions per annum									
Buzzard	0.882	0.818	0.783	0.928	0.861	0.824	0.880	0.817	0.781
Cormorant	0.033	0.031	0.029	0.035	0.032	0.031	0.033	0.030	0.029
Golden plover	16.562	16.153	15.984	17.534	17.104	16.910	16.565	16.120	15.979
Grey heron	0.038	0.035	0.033	0.040	0.036	0.034	0.038	0.035	0.033
Kestrel	0.212	0.199	0.191	0.224	0.210	0.202	0.212	0.198	0.191
Lapwing	9.883	9.478	9.274	10.447	10.022	9.803	9.862	9.475	9.266
Lesser black-backed gull	0.319	0.299	0.288	0.335	0.314	0.303	0.318	0.298	0.288
Little egret	0.027	0.026	0.025	0.028	0.027	0.027	0.027	0.026	0.025
Predicted collisions per 35 years	**5.50**	**6.85**	**8.00**	**5.50**	**6.85**	**8.00**	**5.50**	**6.85**	**8.00**
Buzzard	30.9	28.6	27.4	32.5	30.1	28.8	30.8	28.6	27.34
Cormorant	1.2	1.1	1.0	1.2	1.1	1.1	1.2	1.1	1.02
Golden plover	579.7	565.4	559.4	613.7	598.6	591.8	579.8	564.2	559.25
Grey heron	1.3	1.2	1.1	1.4	1.3	1.2	1.3	1.2	1.14
Kestrel	7.4	6.9	6.7	7.8	7.3	7.1	7.4	6.9	6.68
Lapwing	345.9	331.7	324.6	365.6	350.8	343.1	345.2	331.6	324.32
Lesser black-backed gull	11.2	10.5	10.1	11.7	11.0	10.6	11.1	10.4	10.07
Little egret	0.9	0.9	0.9	1.0	1.0	0.9	0.9	0.9	0.89
Predicted number of years per collision	**5.50**	**6.85**	**8.00**	**5.50**	**6.85**	**8.00**	**5.50**	**6.85**	**8.00**
Buzzard	1.1	1.2	1.3	1.1	1.2	1.2	1.1	1.2	1.3
Cormorant	30.3	32.8	34.3	28.8	31.2	32.7	30.4	32.8	34.4
Golden plover	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Grey heron	26.2	28.9	30.7	25.0	27.6	29.3	26.3	29.0	30.8
Kestrel	4.7	5	5.2	4.5	4.8	4.9	4.7	5.0	5.2
Lapwing	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Lesser black-backed gull	3.1	3.3	3.5	3.0	3.2	3.3	3.1	3.4	3.5
Little egret	37.1	38.5	39.3	35.1	36.5	37.3	37.1	38.6	39.3

Table 7H.15: Predicted collision comparing flight times for CRZ 30-180 m and CRZ 25-180 m

Turbine	Type A		Type B	Type C	
Height band for CRZ	30-180	25-180	25-180	25-180	30-180
Predicted collisions per annum					
Buzzard	0.812	0.818	0.861	0.817	0.811
Cormorant	0.021	0.031	0.032	0.030	0.021
Golden plover	16.122	16.153	17.104	16.120	16.089
Grey heron	0.033	0.035	0.036	0.035	0.033
Kestrel	0.182	0.199	0.210	0.198	0.181
Lapwing	8.609	9.478	10.022	9.475	8.607
Lesser black-backed gull	0.291	0.299	0.314	0.298	0.290
Little egret	0.021	0.026	0.027	0.026	0.021
Predicted collisions per 35 years					
Buzzard	28.4	28.6	30.1	28.6	28.4
Cormorant	0.7	1.1	1.1	1.1	0.7
Golden plover	564.3	565.4	598.6	564.2	563.1
Grey heron	1.2	1.2	1.3	1.2	1.2
Kestrel	6.4	6.9	7.3	6.9	6.4
Lapwing	301.3	331.7	350.8	331.6	301.3
Lesser black-backed gull	10.2	10.5	11	10.4	10.1
Little egret	0.7	0.9	1.0	0.9	0.7
Predicted number of years per collision					
Buzzard	1.2	1.2	1.2	1.2	1.2
Cormorant	48.4	32.8	31.2	32.8	48.4
Golden plover	0.1	0.1	0.1	0.1	0.1
Grey heron	30.3	28.9	27.6	29	30.4
Kestrel	5.5	5.0	4.8	5	5.5
Lapwing	0.1	0.1	0.1	0.1	0.1
Lesser black-backed gull	3.4	3.3	3.2	3.4	3.4
Little egret	47.2	38.5	36.5	38.6	47.3

Table 7H.16: Predicted collision risk for golden plover applying different avoidance rates

CRM run for Turbine Type B (rotational period 6.85, pitch 6°) and flight time in CRZ 25-180m

Avoidance rate	Collisions			1 collision every x years
	Per year	Per decade	Per 35 years	
0.980	17.10	171.0	598.6	0.06
0.990	8.55	85.5	299.3	0.12
0.992	6.84	68.4	239.5	0.15
0.995	4.28	42.8	149.7	0.23
0.998	1.71	17.1	59.9	0.58
0.999	0.86	8.6	29.9	1.17

Table 7H.17: Predicted collision risk for lapwing applying different avoidance rates

CRM run for Turbine Type B (rotational period 6.85, pitch 6°) and flight time in CRZ 25-180m for two years

Avoidance rate	Collisions			1 collision every x years
	Per year	Per decade	Per 35 years	
0.980	10.02	100.2	350.8	0.10
0.990	5.01	50.1	175.4	0.20
0.992	4.01	40.1	140.3	0.25
0.995	2.51	25.1	87.7	0.40
0.998	1.00	10.0	35.1	1.00
0.999	0.50	5.0	17.5	2.00

Table 7H.18: Seasonal variation in flight times recorded for lapwing

Values used in the CRMs were aggregate flight time within the 500m buffer recorded at rotor swept heights 25-180m, with values in parenthesis showing aggregate flight time at and below the rotor swept heights within the 500m buffer

Season	Aggregate flight time (seconds)				
	VP1	VP2	VP3	VP4	Seasonal totals
Breeding 2022		0 (174)		480 (5,912)	**480** (6,086)
Breeding 2023		2,466 (2,466)		631 (646)	**3,097** (3,112)
Breeding season 2022 & 2023 combined		**2,466**		**1,111**	**3,577**
Non-breeding 2021-22	0 (810)	21,530 (21,76)5	64,953 (97,632)	23,275 (32,193)	**109,758** (152,401)
Non-breeding 2022-23	305 (305)	17,200 (17,200)	190,585 (190,585)	210,304 (212,299)	**418,394** (420,390)
Non-breeding season 2021-22 & 2022-23 combined	**305**	**38,730**	**255,538**	**233,579**	**528,153**
Overall total	**305**	**41,197**	**255,538**	**234690**	**531,730**

Table 7H.19: Seasonal CRM outputs for lapwing applying a range of avoidance rates

CRM run for Turbine Type B (rotational period 6.85, pitch 6°) and flight time in CRZ 25-180m – see Table 7H.11

Season(s) included in analysis	Avoidance rate	Collisions (weighted)			1 collision every x years
		Per year	Per decade	Per 35 years	
Breeding seasons combined 2022 & 2023	**0.980**	0.073	0.73	2.6	13.7
	0.990	0.037	0.37	1.3	27.3
	0.992	0.029	0.29	1.0	34.1
	0.995	0.018	0.18	0.6	54.6
	0.998	0.007	0.07	0.3	136.6
Breeding season 2022 only	**0.980**	0.020	0.20	0.7	48.9
	0.990	0.010	0.10	0.4	97.7
	0.992	0.008	0.08	0.3	122.1
	0.995	0.005	0.05	0.2	195.4
	0.998	0.002	0.02	0.1	488.5
Breeding season 2023 only	**0.980**	0.122	1.22	4.3	8.2
	0.990	0.061	0.61	2.1	16.4
	0.992	0.049	0.49	1.7	20.5
	0.995	0.030	0.30	1.1	32.8
	0.998	0.012	0.12	0.4	82.0
Non-breeding seasons combined 2021-22 & 2022-23	**0.980**	7.817	78.17	273.6	0.1
	0.990	3.908	39.08	136.8	0.3
	0.992	3.127	31.27	109.4	0.3
	0.995	1.954	19.54	68.4	0.5
	0.998	0.782	7.82	27.4	1.3
Non-breeding season 2021-22 ONLY	**0.980**	3.323	33.23	116.3	0.3
	0.990	1.662	16.62	58.2	0.6
	0.992	1.329	13.29	46.5	0.8
	0.995	0.831	8.31	29.1	1.2
	0.998	0.33	3.32	11.6	3.0
Non-breeding season 2022-23 ONLY	**0.980**	12.137	121.37	424.8	0.1
	0.990	6.069	60.69	212.4	0.2
	0.992	4.855	48.55	169.9	0.2
	0.995	3.034	30.34	106.2	0.3
	0.998	1.214	12.14	42.5	0.8

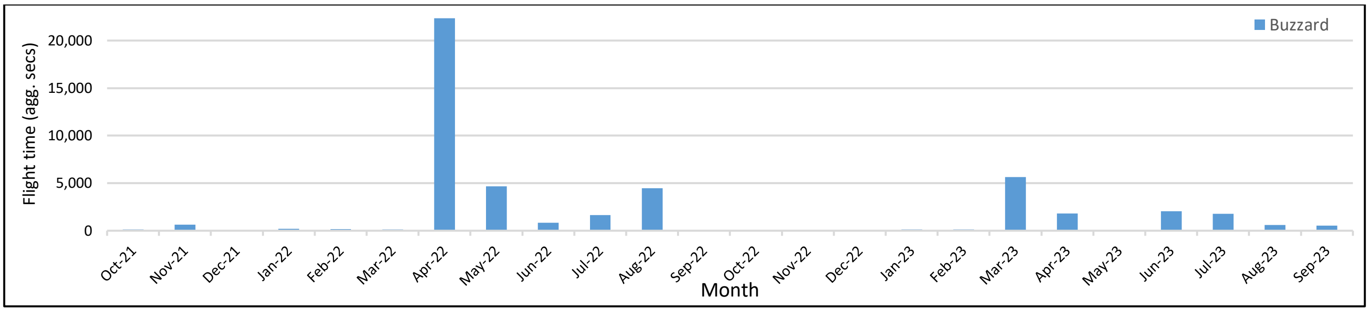

Figure 7H.3: Distribution of flight time recorded for buzzard

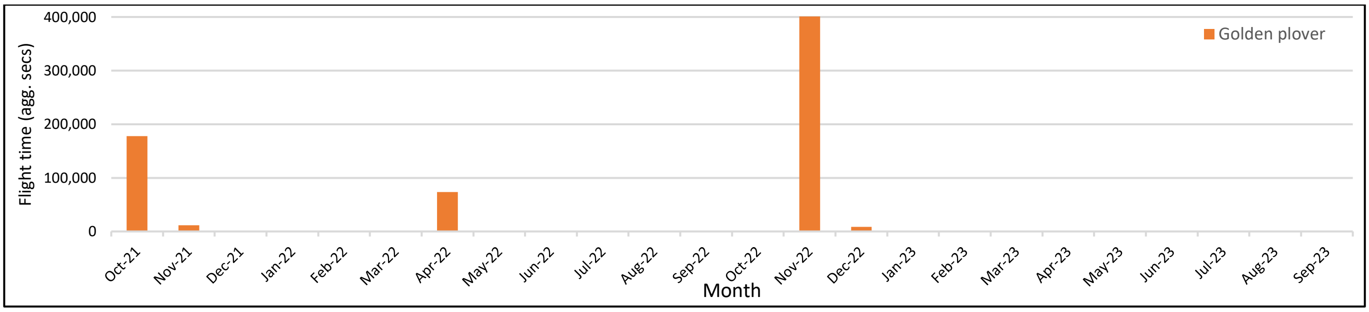

Figure 7H.4: Distribution of flight time recorded for golden plover

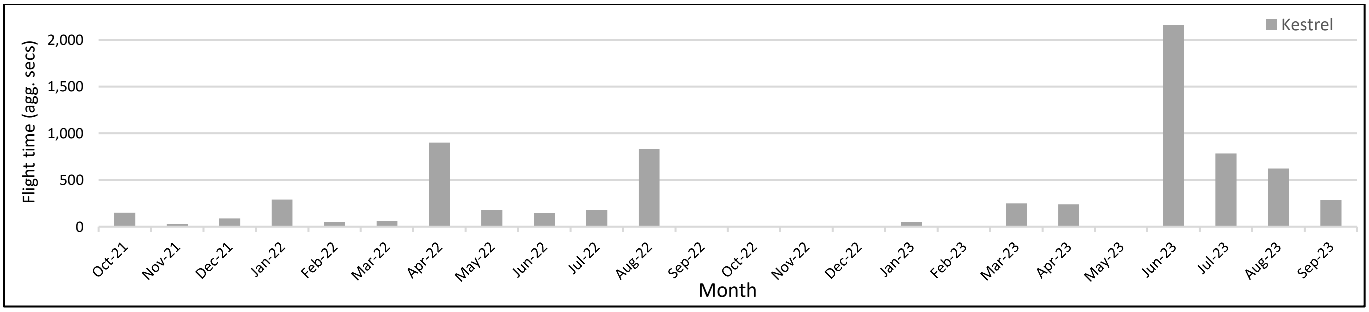

Figure 7H.5: Distribution of flight times recorded for kestrel

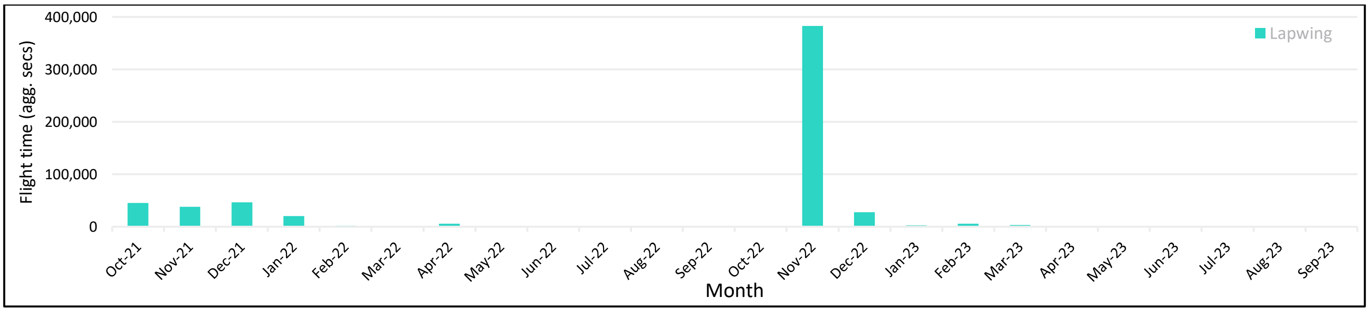

Figure 7H.6: Distribution of flight time recorded for lapwing

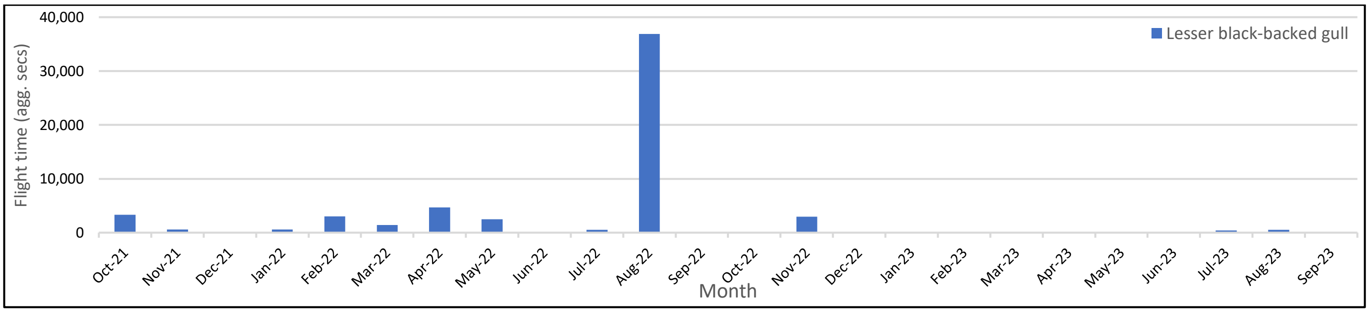

Figure 7H.7: Distribution of flight time recorded for lesser black-backed gull

7H.6 CONCLUSIONS

Collision risk models were run for 12 of the 22 target species recorded during VP watch and three turbine specification were tested.

For the target species listed in Table 7H.12, further investigation is warranted as part of the ornithological impact assessment where the predicted collision risk is more than one collision over 35 years and the ornithological impact assessment should attempt to describe any potential for significant effects at a population level, as well as any potential for significant effects on populations linked to SPAs. The factors that can influence collision risk for specific species, such as the displacement effects of wind turbines or even habituation over time, should be discussed in relation to modelled outputs to provide context to the predicted values for avian collision risk.

The CRMs identified eight species where observed flight activity generated predicted collision risk of one or more collision over 35 years, including buzzard, cormorant, golden plover, grey heron, kestrel, lapwing lesser black-backed gull and little egret. Predicted collision risk outputs for these species were analysed further, including investigating the effects of different operational parameters, the appropriateness of applying default avoidance rates and seasonality in collision risk.

The modelled values for predicted collision risk are provided for consideration within the ornithological impact assessment for the proposed Wind Farm, and this section concludes with an assessment of the population level effects that could be expected based on predicted collision risk – see Table 7H.20 (lapwing), Table 7H.21 (breeding lapwing), Table 7H.22 (golden plover), Table 7H.23 (lesser black-backed gull), Table 7H.24 (buzzard) and Table 7H.25 (kestrel). For cormorant, grey heron and little egret modelled outputs predicted one or close to one collision over the 35 years, and this relatively low level of predicted collision risk is considered unlikely to have any significant population level effects.

For the ornithological receptors identified the modelled outputs are applicable to the proposed turbine layout, proposed number of turbines and for turbine types within the dimensions specified. With the additional analysis conducted, including inputting of higher avoidance rates for golden plover and lapwing, it is considered that the modelled outputs for predicted collision risk while representative of typical operating conditions likely to be encountered by birds utilising the site, are still higher than anticipated for most target species, especially golden plover and lapwing where further assessment is required to account for high levels behavioural avoidance of turbines.

Table 7H.20: Lapwing collision risk – assessment of population level effects – all year

Lapwing	**All-Ireland pop.**			**County pop. est.**			**Local pop. est.**		
Population	84,690			2,000			260		
Annual survival rate (BTO BirdFacts)	0.71			0.71			0.71		
Annual background mortality	24,560			580			75		
Avoidance (%)	98.0%	99.5%	99.8%	98.0%	99.5%	99.8%	98.0%	99.5%	99.8%
Predicted annual collision mortality weighted, 98% | 99.5% | 99.8% avoidance	10.02	2.51	1.00	10.02	2.51	1.00	10.02	2.51	1.00
Increased annual mortality rate due to predicted collision risk (%)	0.04	0.01	0.00	1.73	0.43	0.17	13.29	3.33	1.33
No. of collisions per annum required for 1% increase in annual mortality	246			6			0.75		

Table 7H.21: Lapwing collision risk – assessment of population level effects – breeding population

Lapwing	**All-Ireland pop.**						**Local pop. est.**		
	Low			**High**					
Population (pairs converted to no. of birds)	952			1,240			12		
Annual survival rate (BTO BirdFacts)	0.71			0.71			0.71		
Annual background mortality	276			360			3		
Avoidance (%)	98.0%	99.5%	99.8%	98.0%	99.5%	99.8%	98.0%	99.5%	99.8%
Predicted annual collision mortality weighted, 98% | 99.5% | 99.8% avoidance	0.122	0.03	0.012	0.12	0.03	0.012	0.12	0.03	0.012
Increased annual mortality rate due to predicted collision risk (%)	0.04	0.01	0.00	0.03	0.01	0.00	3.51	0.86	0.34
No. of collisions per annum required for 1% increase in annual mortality	3			4			0.03		

Table 7H.22: Golden plover collision risk – assessment of population level effects

Golden plover	**All-Ireland pop.**			**County pop. est.** Low | High						**Local pop. est.** Low | High					
Population	92,060			3,000 | 5,000						200 | 700					
Annual survival rate (BTO BirdFacts)	0.73			0.73						0.73					
Annual background mortality	24,856			810 | 1,350						54 | 189					
Avoidance (%)	98.0%	99.5%	99.8%	98.0%		99.5%		99.8%		98.0%		99.5%		99.8%	
Predicted annual collision mortality weighted, 98% | 99.5% | 99.8% avoidance	17.10	4.28	1.71	17.10		4.28		1.71		17.10		4.28		1.71	
Increased annual mortality rate due to predicted collision risk (%)	0.07	0.02	0.01	2.1	1.3	0.5	0.3	0.2	0.1	31.7	9.1	7.9	2.3	3.2	0.9
No. of collisions per annum required for 1% increase in annual mortality	249			8 | 14						0.5 | 1.9					

Table 7H.23: Lesser black-backed gull collision risk – assessment of population level effects

Lesser black-backed gull	**All-Ireland pop.**				**County pop. est.**		**Local pop. est.**	
	Winter		**Breeding**					
Population	11,842		14,224		500		100	
Annual survival rate (BTO BirdFacts)	0.913				0.913		0.913	
Annual background mortality	1,030		1,237		44		9	
Predicted annual collision mortality weighted, 99.5% avoidance (low | high)	0.31	0.64	0.31	0.64	0.31	0.64	0.31	0.64
Increased annual mortality rate due to predicted collision risk (%)	0.03	0.06	0.03	0.05	0.71	1.47	3.56	7.36
No. of collisions per annum required for 1% increase in annual mortality	10		12		0.4		0.09	

Table 7H.24: Buzzard collision risk – assessment of population level effects

Buzzard	**Irish pop. est.**	**County pop. est.**	**Local - adult pop.**	**Local - juv. pop.** (up to 3 years)
Population	4,000	90	6	6
Annual survival rate (BTO BirdFacts)	0.90	0.90	0.90	0.63
Annual background mortality	350	9	1	2
Predicted annual collision mortality weighted, 98% avoidance	0.861	0.861	0.861	0.861
Increased annual mortality rate due to predicted collision risk (%)	0.2	9.6	143.5	38.8
No. of collisions per annum required for 1% increase in annual mortality	4	0.1	0.006	0.022

Table 7H.25: Kestrel collision risk – assessment of population level effects

Kestrel	**Irish pop. est.**		**Local - adult pop.**	**Local - juv. pop.** (up to 3 years)
	Low	**High**		
Population	9,918	17,393	6	4
Annual survival rate (BTO BirdFacts)	0.69	0.69	0.69	0.32
Annual background mortality	3,075	5,392	2	3
Predicted annual collision mortality weighted, 95% avoidance	0.21	0.21	0.21	0.21
Increased annual mortality rate due to predicted collision risk (%)	0.01	0.004	11.3	7.7
No. of collisions per annum required for 1% increase in annual mortality	31	54	0.02	0.03

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Appendix 7I

ORNITHOLOGICAL MONITORING – FT REPORT

Appendix 7I: Ornithological monitoring - results report: October 2020 to August 2021

CONSULTANTS IN ENGINEERING, ENVIRONMENTAL SCIENCE & PLANNING

BRITTAS WIND FARM
BIRD SURVEYS

BASELINE ORNITHOLOGICAL SURVEYS - BRITTAS WIND FARM WINTER 2020/2021 AND SUMMER 2021

Prepared for: Enerco (Lissarda) Ltd.

Date: March 2022

NOTE: THIS REPORT CONTAINS SENSITIVE INFORMATION ON LOCATIONS OF BREEDING ANNEX I BIRDS. FIGURES OR COORDINATES OF THESE FEATURES SHOULD NOT BE INCLUDED IN THE EIAR (UPLOADED TO THE PLANNING WEBSITE). THEY SHOULD ONLY BE MADE AVAILABLE WITHIN A CONFIDENTIAL APPENDIX IF REQUIRED.

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BASELINE ORNITHOLOGICAL SURVEYS - BRITTAS WIND FARM WINTER 2020/2021 AND SUMMER 2021

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 Issue	DD/MG	BOD	JK	08.03.2022

Client: Enerco (Lissarda)

Keywords: Baseline, Ornithological Surveys, Wind Farm, Brittas

Abstract: This document comprises of baseline ornithological surveys at the proposed wind farm site at Brittas, Co. Tipperary. This ornithology report is required to assess the impacts of the proposed development on bird species within and surrounding the site. This development is to consist of 11 no. wind turbines across the townlands of Brittas, Brownstown, Clonbanna and Rossestown.

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EXECUTIVE SUMMARY

Ornithological surveys for the proposed Brittas Wind Farm searched for and recorded all bird species, focusing primarily on the wind farm site but also taking in the surrounding region. Surveys extended throughout the year, covering both the breeding and non-breeding seasons. Fehily Timoney carried out ornithological surveys for the proposed Brittas Wind Farm between October 2020 to August 2021, inclusive, comprising one complete year of surveys.

The methodology for the 2020/2021 ornithological survey at Brittas Wind Farm adhered to Scottish Natural Heritage guidance (SNH, 2017) for assessing the impact of proposed Wind Farm developments on the breeding and wintering bird populations. Two timed vantage point (VP) watches of three hours duration were carried out from each VP every month from October 2020 to August 2021, with two rounds of VP surveys completed in August 2021, totalling 72 hours (36 hours per season) of observation time at each VP over the survey period. Breeding & winter bird transect surveys, hinterland surveys, breeding wader and barn owl surveys were also undertaken during this interval.

Year One Summary (winter 2019/20 and summer 2020)

During year one surveys (winter 2020/21 and summer 2021), 53 species of bird in total were recorded during VP surveys. Of these species, nine are red listed under the 4th Birds of Conservation Concern in Ireland (BoCCI) assessment (Gilbert et al. 2021): kestrel, meadow pipit, yellowhammer, redwing, golden plover, lapwing, dunlin, curlew and snipe. A total of 16 species are amber listed – cormorant, hen harrier, merlin, skylark, starling, house sparrow, tree sparrow, linnet, mute swan, whooper swan, mallard, teal, wigeon, black headed gull, lesser-black backed gull and herring gull, and the remaining 28 are green listed. Six species are also protected under Annex I of the EU Birds Directive: golden plover, hen harrier, peregrine, merlin, little egret and whooper swan.

Across the summer and winter seasons, the most frequently observed target species was buzzard. For the six Annex I target species, golden plovers were observed frequently and mostly in medium and large sized flocks in winter, ranging from observations of single individuals to flocks of 700 birds. Whooper swans were observed in small sized flocks in winter, from 2 to 12 individuals. The other four Annex I target species observations were of one to two birds made on single occasions.

During year one hinterland surveys surrounding the proposed Wind Farm site, five red listed species were identified as being present: curlew, golden plover, lapwing, shoveler, and snipe. 14 amber listed bird species were identified, and seven green listed target bird species were identified as being present during hinterland surveys.

No hen harriers were observed nesting/roosting in or near the proposed Wind Farm site.

Bird species recorded during breeding bird transects within the wind farm site itself included five red listed species (grey wagtail, kestrel, meadow pipit, snipe and swift), 12 amber listed species and 33 green listed species.

Peregrine were observed nesting in Brittas Castle (ITM 612558 661504) and a heronry was observed along the woodland edge within the southern areas of the site (Approx. ITM 613090 661048). Snipe were recorded breeding onsite in the north and north-eastern areas (ITM 613413 663065 and 612728 663358). Buzzard were recorded nesting to the west of the site, c. 1km offsite (ITM 610834 662539). Kestrel bred near the site, with three juvenile kestrels observed to have fledged from a nest east of VP2 (ITM 614514 663157).

Seven juvenile mute swans were observed during the breeding bird transects on 14th May 2021 (>100m from transect/flying over). During the breeding wader surveys of hinterland sites on 19th May 2021, two pairs of ringed plover at Lisheen bog, and two pairs at Littleton Bog, exhibited breeding behaviour through distraction displays. Two pairs of curlew also exhibited distraction display at Littleton Bog during this breeding wader survey.

A total of 51 bird species were recorded during the winter bird survey transects, including five red listed species (grey wagtail, lapwing, meadow pipit, redwing and snipe), 13 amber listed species and 33 green listed species.

A barn owl was recorded at a farmhouse in the surrounding hinterland, approximately 1.17 km northwest of the site, during the survey for this species. Barn owl 'snoring' was heard from the building, before a single male emerged from the farmhouse and continued hunting around the buildings at dusk. This observation was recorded on 28th May 2021, within the breeding season.

1. INTRODUCTION

Fehily Timoney & Company (FT) was appointed by Enerco (Lissarda) to undertake ornithological surveys at the proposed Brittas Wind Farm in Co. Tipperary between 2020 to 2021 comprising one full year (winter 2020/21 to summer 2021) of surveys. This report presents the results of the ornithological surveys and summarises the activity of specific target bird species during each survey period.

This avian assessment for surveys completed over the survey period includes the assessment of target bird species potentially occurring within the proposed site boundary, and within the lands surrounding the proposed Wind Farm. Surveys adhered to Scottish Natural Heritage guidance (SNH, 2017). The following surveys were carried out:

- Vantage Point survey (breeding and non-breeding season);
- Hinterland survey;
- Breeding wader survey;
- Breeding & winter bird transect survey;
- Barn Owl survey.

This report outlines the results of the above surveys to inform about avian usage of the proposed Wind Farm site and surrounding areas.

1.1 Study Area

The proposed Brittas wind farm site is located near Brittas, Co. Tipperary, north of Thurles. The Brittas site encompasses parts of the townlands of Brittas, Brownstown, Clonbanna and Rossestown.

Figure 2-1 displays the site location.

The predominant habitat on site is improved agricultural grassland. Hedgerows and treelines are present throughout the site but are absent from large areas of agricultural lands to the north of the site. There are sections of scrub, mixed broadleaved woodland, and commercial forestry within the site. The surrounding landscape is of similar character to that found within the site. The River Suir (WFD Code IE_SE_16S020600) is within the development site and flows in a southerly direction within the site.

Protected European sites within 15 km of the site boundary include two SACs:

- Lower River Suir SAC (002137; 6.55km southwest)
- Kilduff, Devilsbit Mountain SAC (000934; 12.08km northwest)

Protected national sites within 10 km of the site boundary include three pNHAs:

- Cabragh Wetlands pNHA (site code 000582; 0.25 km south)
- Templemore Wood pNHA (site code 000942; 7.99 km north)
- Killough Hill pNHA (site code 000959; 9.18 km south)

Lower River Suir SAC (site code 002137) is located approximately 6.55 km southwest of the Brittas site. This site is designated for habitats, invertebrates, fish and mammal species. While it is not designated for birds, parts of the site have been identified as of ornithological importance for a number of Annex I (E.U. Birds Directive) bird species, including Greenland white fronted goose, golden plover, whooper swan and kingfisher. Wintering populations of migratory birds use the SAC.

No SPAs occur within 15km of the Brittas site.

Kilduff, Devilsbit Mountain SAC (site code 000959) is located approximately 12.08 km northwest of the Brittas site. While it is designated for habitats and not birds, Annex I-listed peregrine breed within the site.

Cabragh Wetlands pNHA overlaps with Lower River Suir SAC. Wigeon, teal and mallard are numerous within these marshes.

Blackcaps, garden warblers, sparrowhawks and mallards have been recorded within Templemore Wood pNHA. It is noted that regenerating limestone grasslands and woodlands of Killough Hill pNHA supports a large bird population.

No NHAs occur within 10km of the Brittas site.

2. SURVEY METHODOLOGY

The avian surveys carried out at the proposed wind farm adhered to Scottish Natural Heritage guidance (SNH, 2017) methodologies of the following survey types:

- Vantage Point survey (breeding and non-breeding season);
- Hinterland survey (hen harrier winter roost; I-WeBS and geese/swan census; and breeding target species);
- Breeding wader survey; and
- Breeding & winter bird transect surveys;

2.1 Vantage Point Surveys

VP surveys were carried out at the proposed Brittas Wind Farm site from October 2020 to August 2021 (with two rounds of VP surveys completed in August 2021), during the non-breeding and breeding seasons, in accordance with the Scottish Natural Heritage methodology for impact assessment of onshore wind farms (SNH, 2017). These surveys were divided into winter (October 2020 to March 2021) and summer (April to August 2021) seasons. Three fixed VP locations overlooking the study area were used during the VP surveys. VPs were chosen to cover a specific viewshed of the proposed development site. Each was chosen specifically to encompass the view of a 500 m circular buffer drawn around each of the proposed turbines (known as the 'flight activity survey area'), per SNH (2017) guidance.

The main purposes of VP survey watches are to collect data on *target species* that will enable estimates to be made of:

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

The specific vantage points and turbines within their viewsheds can be seen in Table 2-1 and Figure 2-1:

Table 2-1: Vantage point viewshed and turbines encompassed

Vantage Point	Turbine number(s) covered in viewshed
VP 1	5, 10 and 11
VP 2	2, 3, 6, 7, 8, 9, 10 and 11
VP 3	1,2, 3 and 4

Vantage point 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 flight activity survey area.

In line with recommended best practice (SNH, 2017 and Band *et al*. 2007), viewshed analysis was undertaken using ARCMAP 10.3, 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 20-30 m above ground level). Predicting visibility at this level is a simple task using GIS. 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."*

The method of observing was via constant search effort, mostly through quality binoculars, or a telescope and a tripod used to scan the horizon back and forth in search of target species combined with short spells of eyeballing the foreground. In this way, smaller target species such as kestrel can be found and tracked up to the 2 km limit of each viewshed in most weather conditions. Dictaphones were utilised to dictate bird heights whilst tracking flight events.

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 were 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 on a casual basis 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 was noted. Details of each flight-path observation are provided in Section 3.

When a flock of the same species were located, one individual within the flock was identified and tracked to record the times within each height band.

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 birds do not fly close enough to a surveyor for a rangefinder to be used, resulting in most flights heights being estimated in any case. An experienced surveyor was used, resulting in a more robust dataset.

As previously mentioned, VP surveys were carried out at the site from October 2020 to August 2021, inclusive, and involved carrying out 2 x 3-hour surveys at each VP location every month.

As per SNH guidance (2017), at least thirty-six hours of VP effort was carried out at each vantage point during each breeding and non-breeding survey period.

The proportion of survey time that activity was recorded inside and outside the 500m turbine buffer was used as part of the overall analysis and assessment of target species usage of the study area. VP locations can be found in Table 2-2 below. All surveys were conducted during suitable weather conditions.

Table 2-2: Grid References for VP locations at Brittas Wind Farm

Vantage Point	Easting, Northing (ITM)
VP1	614141, 660736
VP2	614367, 663290
VP3	610955, 662209

2.2 Hinterland Surveys (IWeBS, hen harrier winter roost and breeding target species)

Two types of hinterland surveys were undertaken: an IWeBS-style census for wintering waders and waterbirds (Lewis et al. 2019), and a summer survey for breeding target species.

Winter season hinterland surveys were carried out between November 2020 and March 2021, and summer season hinterland surveys were carried out in June and July 2021.

The surveys were conducted in suitable agricultural, peatland and wetland habitats in the area surrounding the proposed wind farm site. These sites were chosen as they had suitable habitat for the following target groups: raptors, waders and waterfowl.

For the winter IWeBS-style census surveys, seven sites within 10 km of the proposed wind farm site were surveyed. These sites included Ballydavid, Littleton, Liathmore, Loughmoe Castle, Clonamuckoge Beg, Lisheen Bog, The Tank, Thurles, and Cabragh Wetlands (see Figure 2-2). Winter hinterland IWeBS-style surveys were carried out following a 'look-see' methodology as outlined in BirdWatch Ireland/NPWS's counter manual[1].

In the summer months, an additional site was added, bringing the total of hinterland survey sites to eight. Summer hinterland survey techniques used to survey for raptors followed those outlined in Hardey *et al*. (2013).

Some hinterland sites visited in the winter were not visited in the summer, depending on suitability for breeding target species.

[1] https://birdwatchireland.ie/app/uploads/2019/03/IWeBS-Counter-Manual.pdf. Accessed 26/01/2021.

Details of hinterland survey locations and dates are shown below in Table 2-3 and Figure 2-2.

Table 2-3: Hinterland Survey Locations

Hinterland VP (hVP) number	Location	Easting, Northing (ITM)	Dates visited	Distance from proposed site (km)
1	Ballydavid, Littleton	618520, 655169	12/11/20, 26/11/20, 08/12/20, 16/01/2021, 06/02/2021, 07/03/2021, 26/06/2021, 27/07/2021	7.5
2	Liathmore	622428, 657304	12/11/20, , 26/11/20, 08/12/20, 16/01/2021, 05/02/21, 07/03/2021	9.2
3	Loughmoe Castle	611709, 667115	12/11/20, , 26/11/20, 08/12/20, 16/01/2021, 06/02/2021,	3.4
4	Clonamuckoge Beg	611488, 663537	12/11/20, 26/11/20, 08/12/20, 16/01/2021, 06/02/2021, 07/03/2021	0.3
5	Lisheen Bog	622448, 661640 623808, 664948	26/11/20, 08/12/20, 16/01/2021, 06/02/2021, 07/03/2021, 26/06/2021, 27/07/2021	8.3
6	The Tank, Thurles	611810, 660386	12/11/2020, , 26/11/20, 08/12/20, 06/02/2021, 07/03/2021	0.6
7	Cabragh Wetlands	610792, 655289	12/11/20, 26/11/20, 08/12/20, 16/01/2021, 06/02/2021, 07/03/2021, 26/06/2021,	6
8	Littleton Bog	621016, 654779 623663, 653048	27/07/2021	7.5

2.3 Breeding Waders Surveys

Surveys to assess the presence of breeding wader populations were completed during May 2021. Two areas of bog/ wet grassland suitable for breeding waders, notably snipe, is present at the proposed site (ITM 613412, 663058 and ITM 612724, 663345). Three locations were outside the development boundary, see Table 2-6. These breeding wader sites outside the proposed site overlapped a number of hinterland survey sites, see Figure 2-2. However, a greater search area was covered at each location and increased survey effort was expended during breeding wader surveys.

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 2 categories; those for breeding Lapwing *Vanellus* and those for other species such as Curlew *Numenius arquata*, Common Snipe *Gallinago*, Redshank *Tringa totanus*, Woodcock *Scolopax rusticola*, 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: 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
Woodcock	Woodland, bog woodland
Ringed Plover	Cutover bog, milled peat with exposed gravel

Survey methods for Lapwing followed those in Bibby *et al*. 2000 wherein 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 essentially the same and utilised transects walked through suitable habitat within 3 hours of dawn or dusk. Count units (see Table 2-5) were predefined for each target species and included in the method statement provided to surveyors.

All suitable habitats for waders were visited during May 2020. Observations were annotated onto maps (locations of territories or breeding attempts). Breeding wader summary sheets were also compiled at the end of the breeding season, indicating in each case the minimum number of breeding pairs/occupied territories known to occur.

Table 2-5: Count Units for each Wading Species

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

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 below, details the survey dates and weather conditions.

Table 2-6: Breeding Waders Survey Details

Date	Site	Cloud (Okta)	Precipitation	Wind
19/05/2021	Lisheen Bog	4/8	Dry	F1 N
19/05/2021	Littleton Bog	4/8	Dry	F1 N
19/05/2021	Ballydavid, Littleton	4/8	Dry	F1N
28/05/2021	Brittas Wind Farm	3/8	Dry	F1 N

2.4 Breeding Bird Surveys

For breeding bird surveys, the method utilised was based on the existing British Trust for Ornithology (BTO) Breeding Bird Survey (BBS or CBS; Bibby *et al*, 2000). The study area for this survey comprised a total of four no. c. 1 km transects which were selected and centred on different habitats present within the subject site (see Figure 2-3 for the location of transects). Birds were counted over two visits, each timed to coincide with the early part of the breeding season (late-March to mid-May) and later part of the season (mid-May to late June), with visits at least four weeks apart (transect order and direction were reversed between surveys to avoid confounding transect order and direction with time of day). Surveyors recorded all birds seen or heard as they walked methodically along the transect routes.

Birds were recorded in four 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).

The breeding bird transect schedule is available in Table 2-7. The results are presented in Section 3.

Table 2-7: Breeding Bird Transect Survey Details

Date	Transect	Time	Weather Conditions
14/05/2021	T1, T2, T3 and T4	07:15 – 11:30	dry; wind F1 W; cloud 5/8 oktas
28/06/2021	T1, T2, T3 and T4	08:00 – 14:40	dry; wind F1 NE

2.5 Wintering Bird Survey

For the general wintering bird survey, the method utilised was the same as for the breeding bird transects, except it was undertaken in the winter season. Three visits for all transects were undertaken over the winter season. See Figure 2-3 for the location of transects.

The wintering bird transect schedule is available in Table 2-8. The results are presented in Section 3.

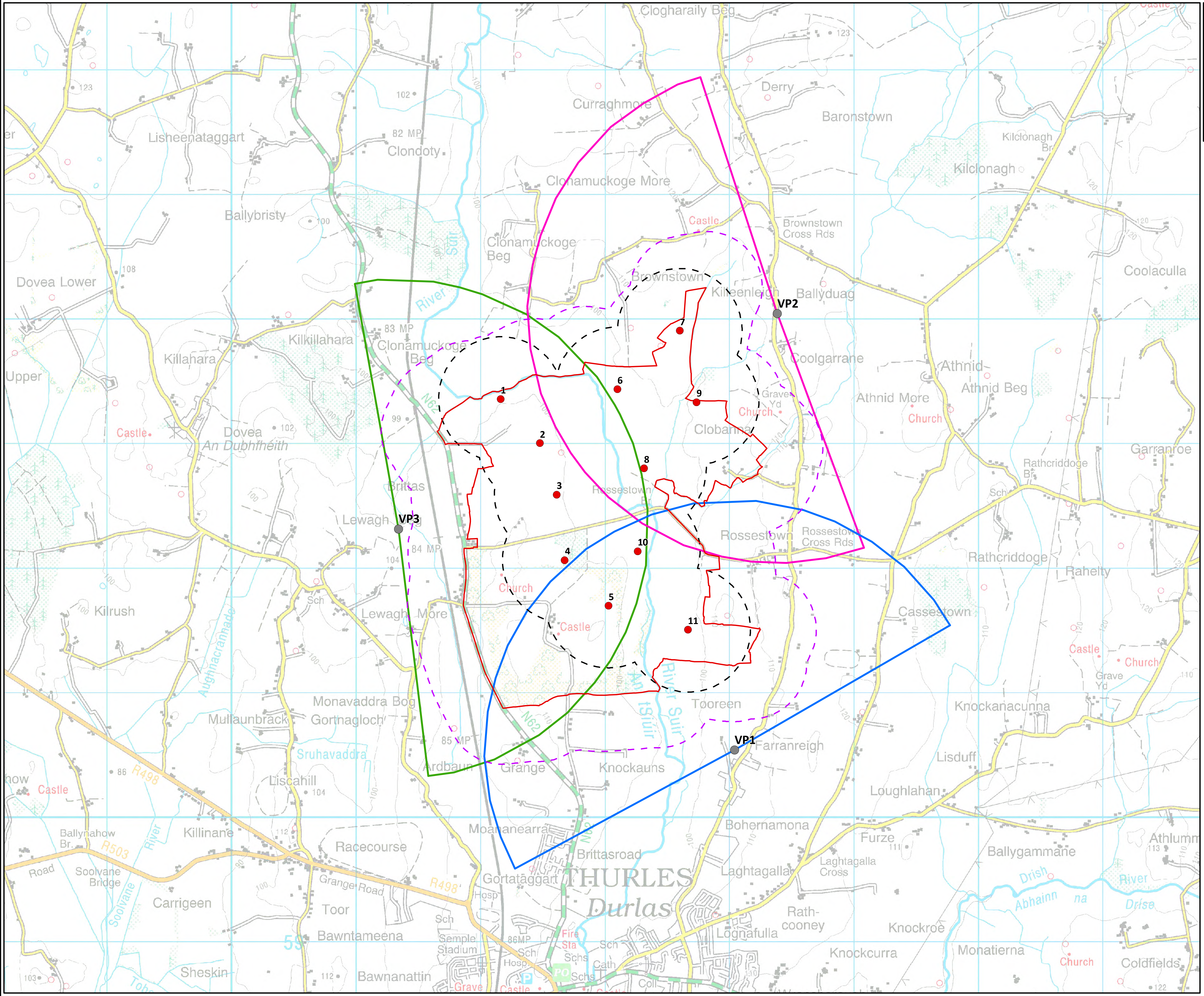
Table 2-8: Wintering Bird Transect Survey Details

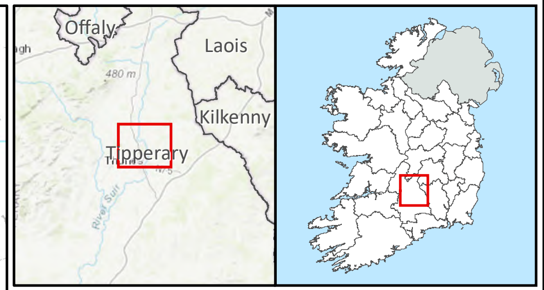
Date	Transect	Time	Weather Conditions
23/01/2021	T1, T2, T3 and T4	10:00 – 14:50	Visibility good; dry; wind F1 W; cloud 1/8 oktas
21/02/2021	T1, T2, T3 and T4	09:00 – 15:00	dry; wind F1 S; cloud 4/8 oktas
27/03/2021	T1, T2, T3 and T4	08:20 - 13:10	dry; wind F2 W; cloud 2/8 oktas

2.6 Barn Owl Surveys

A pre-sunset barn owl walkover survey within the site was carried out on 28th May 2021. A targeted barn owl survey was completed at a farmhouse building was carried out on 28th May 2021 from sunset, 21:45 to 23:00. The barn owl survey focused on visiting an old farmhouse building identified as having potential for Barn Owl The surveyor also remained vigilant for Barn Owl activity when travelling to/from and between survey sites. The barn owl survey was carried out on 28th May 2021 and included watches for activity and searches for signs of barn owl.

The TII guidance document 'Survey and Mitigation Standards for Barn Owls to inform the Planning, Instruction and Operation of National Road Projects' (TII, 2021) was considered in determining Barn Owl survey Methodology; however, the methodology selected aligned with Shawyer (2012) 'Barn Owl *Tyto alba* Survey Methodology and Techniques for use in Ecological Assessment'.





- Vantage Points
- Turbine Layout
- Site Boundary
- 450m Buffer of Site Boundary
- 500m Buffer of Turbine Layout
- VP1 Viewshed
- VP2 Viewshed
- VP3 Viewshed

2km viewsheds based on a target height of 30m and an observation height of 1.5m

ID	Easting	Northing
VP1	614228	660786
VP2	614327	663822
VP3	611356	662042

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PROJECT: Brittas Wind Farm, Co. Tipperary	
FIGURE NO: -	
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DATE: 28/10/2020	**PAGE SIZE:** A3

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Sources: Esri, HERE, Garmin, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), (c) OpenStreetMap contributors, and the GIS User Community
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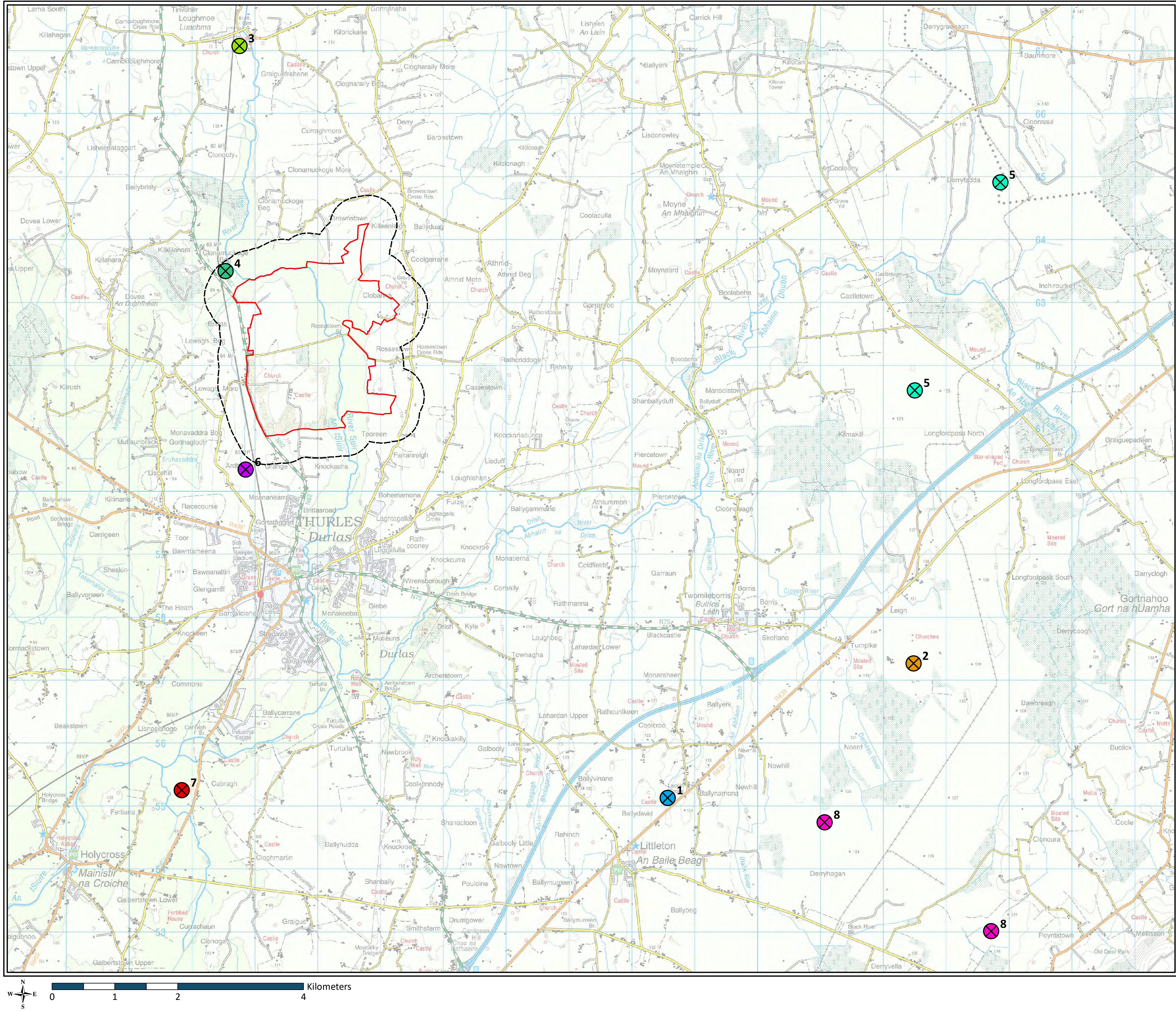

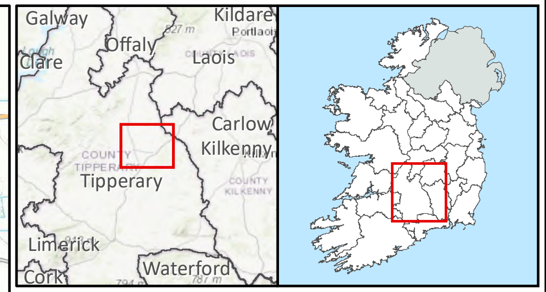

Legend

- Site Boundary
- SNH Buffer

Hinterland Survey Sites

ID and Location:

- 1: Ballydavid, Litleton
- 2: Liathmore
- 3: Loughmoe Castle
- 4: Clonamuckoge Beg
- 5: Lisheen Bog
- 6: The Tank, Thurles
- 7: Cabragh Wetlands
- 8: Littleton Bog

TITLE:	Hinterland Survey Area
PROJECT:	Corbally, Co. Kilkenny
FIGURE NO:	2.2
CLIENT:	Enerco
SCALE: 1:58000	**REVISION:** 0
DATE: 22/11/2021	**PAGE SIZE:** A3

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Sources: Esri, HERE, Garmin, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), (c) OpenStreetMap contributors, and the GIS User Community
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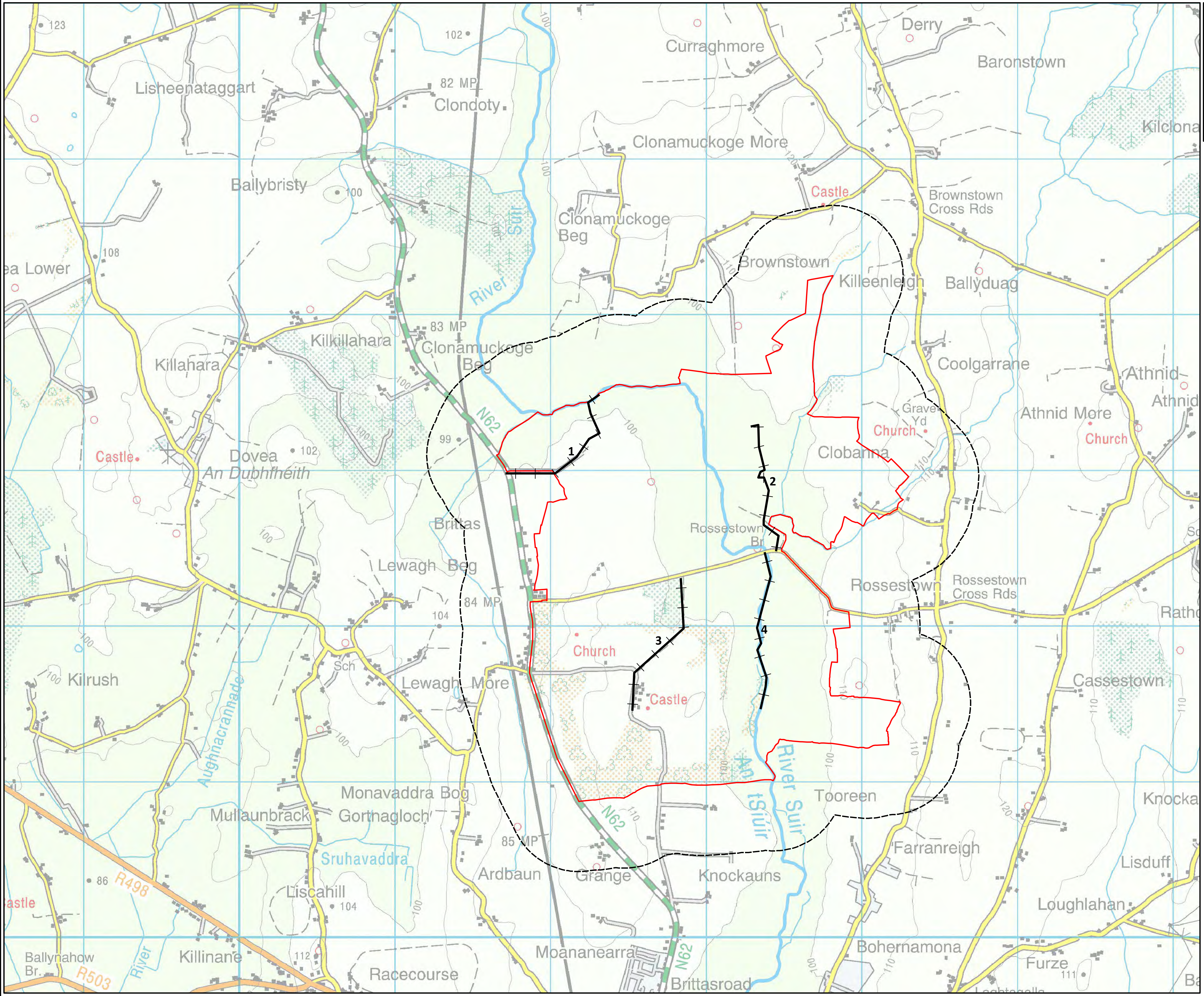

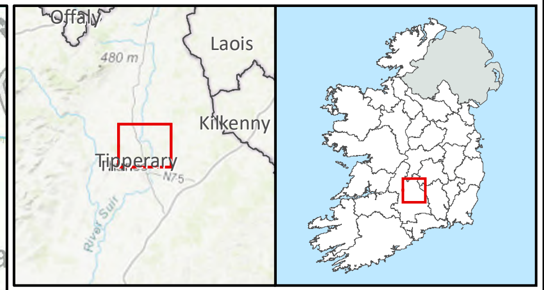

Legend

- Site Boundary
- SNH Buffer
- Survey Transects

TITLE:	Breeding and Wintering Bird Survey Transects
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FIGURE NO:	2.3
CLIENT:	Enerco
SCALE:	1:24000
REVISION:	0
DATE:	22/11/2021
PAGE SIZE:	A3

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3. RESULTS

3.1 Avian usage of the Study Area – Vantage Point surveys

Year One (winter 2020/2021 and summer 2021)

Two timed watches of three hours duration each were carried out at each of the three vantage points every month from November 2020 to August 2021, inclusive. This survey effort totals to 72 hours of observation time at each VP over the survey period in year one, with a double count in December to make up for the October period (see Appendix 1 and Appendix 2). Bird activity was recorded from the VPs during each survey. In total there were 888 individual flight lines of 16 target species observed during the year one survey period.

In total 53 species of bird were recorded. Of these, nine are red listed under the BoCCI: curlew, dunlin, golden plover, kestrel, lapwing, meadow pipit, redwing, snipe, and yellowhammer. 16 species are amber listed and the remaining 28 are green listed. Six species are protected under Annex I of the EU Birds Directive: golden plover, hen harrier, little egret, merlin, peregrine, and whooper swan. Table 3-1 lists all 53 species and indicates their conservation/protection status.

Flight lines for each target species are shown in Appendix 4.

3.1.1 Summary Results Winter (October 2020 to March 2021)

Annex I species

A total of six Annex I species were recorded between October 2020 and March 2021, namely golden plover, hen harrier, little egret, merlin, peregrine and whooper swan. Golden plover were recorded each month at all three VP locations. A single observation of a hen harrier was recorded from VP2 on December 24th. Little egret were recorded each month, present at VP2 and VP3. An observation of merlin from VP2 was recorded 11th November 2020 and observations from VP3 were recorded on November 11th, December 26th, 2021, and February 16th 2021, with all observations of single individuals. A single observation of a peregrine was recorded on October 19th 2021 from VP3 and twice at the same VP on March 16th. These birds were soaring and displaying. Observations of whooper swans were recorded from VP1 on November 15th, December 20th and December 29th, 2020, and February 05th 2021. These observations were both in and outside the flight activity survey area. Three whooper swan juveniles were recorded in the November observation. Whooper swan observations were recorded at VP3 on December 30th, 2020, and January 3rd, 2021.

Other species

Black-headed gull was recorded 14 times, buzzards were observed on 50 occasions, cormorants 16 times, grey heron on seven occasions, kestrel 41 times, lapwing 67 times, lesser black-backed gull on eight occasions, sparrowhawk eleven times and snipe seven times during winter vantage point surveys in 2020/21.

3.1.2 Summary Results Summer 2021 (April to September)

Annex I species

Two Annex I species were recorded between April and September 2021: little egret and peregrine. Little egret were recorded each month, at least once at all the VP locations. Observations where most frequent at VP2.

At VP1, two observations of peregrine were recorded on April 24th, 2021 (no.=1 each), one single individual was observed on May 30th, five observations were recorded on August 26th and one single individual observation was recorded on September 2nd. Of the five observations from VP1 in August, two of these sightings recorded two individuals, and the other observations were of single individuals. A single observation was recorded from VP3 on August 24th, outside the flight activity survey area.

Other species

During the summer 2021 season, levels of avian activity were generally lower than during winter 2020/21. Black-headed gull was recorded 15 times, buzzards were observed on 70 occasions, cormorants three times, curlew once, grey heron on 26 occasions, herring gull once, kestrel 98 times, lapwing 15 times, lesser black-backed gull on eleven occasions, sparrowhawk 16 times and snipe twice during summer vantage point surveys in 2020/21.

Table 3-1: Status of species observed in year one (winter 2020/21 and summer 2021)[2]

Common name	Scientific name	*BoCCI status	**Annex I status
Blackbird	*Turdus merula*	Green	No
Blackcap	*Sylvia atricapilla*	Green	No
Black-headed gull	*Chroicocephalus ridibundus*	Amber	No
Blue tit	*Cyanistes caeruleus*	Green	No
Bullfinch	*Pyrrhula pyrrhula*	Green	No
Buzzard	*Buteo buteo*	Green	No
Chaffinch	*Fringilla coelebs*	Green	No
Collard Dove	*Streptopelia decaocto*	Green	No
Cormorant	*Periparus ater*	Amber	No
Curlew	*Numenius arquata*	Red	No
Dunlin	*Prunella modularis*	Red	No
Fieldfare	*Turdus pilaris*	Green	No
Golden plover	***Pluvialis apricaria***	**Red**	**Yes**
Goldfinch	*Carduelis carduelis*	Green	No
Grey heron	*Ardea cinerea*	Green	No
Hen harrier	***Circus cyanaeus***	**Amber**	**Yes**
Herring gull	*Larus argentatus*	Amber	No
Hooded crow	*Corvus cornix*	Green	No
House sparrow	*Passer domesticus*	Amber	No
Jackdaw	*Coloeus monedula*	Green	No
Kestrel	*Falco tinnunculus*	Red	No

[2] Species listed under Annex I of the EU Birds Directive shown in bold

Common name	Scientific name	*BoCCI status	**Annex I status
Lapwing	*Vanellus vanellus*	Red	No
Lesser black-backed gull	*Larus fuscus*	Amber	No
Lesser redpoll	*Carduelis flammea cabaret*	Green	No
Linnet	*Linaria cannabina*	Amber	No
Little egret	***Egretta garzetta***	**Green**	**Yes**
Long-tailed tit	*Aegithalos caudatus*	Green	No
Magpie	*Pica pica*	Green	No
Mallard	*Anas platyrhynchos*	Amber	No
Meadow pipit	*Anthus pratensis*	Red	No
Merlin	***Falco columbarius***	**Amber**	**Yes**
Mistle thrush	*Turdus viscivorus*	Green	No
Mute swan	*Cygnus olor*	Amber	No
Pheasant	*Phasianus colchicus*	Green	No
Peregrine	***Falco peregrinus***	**Green**	**Yes**
Pied wagtail	*Motacilla alba*	Green	No
Raven	*Corvus corax*	Green	No
Redwing	*Turdus iliacus*	Red	No
Reed bunting	*Emberiza schoeniclus*	Green	No
Robin	*Erithacus rubecula*	Green	No
Rook	*Corvus frugilegus*	Green	No
Siskin	*Spinus spinus*	Green	No
Skylark	*Alauda arvensis*	Amber	No
Snipe	*Gallinago gallinago*	Red	No
Song thrush	*Turdus philomelos*	Green	No
Sparrowhawk	*Accipiter nisus*	Green	No
Starling	*Sturnus vulgaris*	Amber	No
Teal	*Anas crecca*	Amber	No
Tree sparrow	*Passer montanus*	Amber	No
Whooper swan	***Cygnus cygnus***	**Amber**	**Yes**
Wigeon	*Anas penelope*	Amber	No
Woodpigeon	*Columba palumbus*	Green	No
Yellowhammer	*Emberiza citrinella*	Red	No

* refers to the conservation status of the species according to Birds of Conservation Concern in Ireland.

**refers to species listed on Annex I of the EU Birds Directive; shown in bold.

3.2 Target Species observations

3.2.1 Black-headed gull

Winter

A total of 29 observations of this Amber-listed species were recorded during winter vantage point surveys between November 2020 and March 2021. The largest flock of black-headed gulls recorded was on 29th December 2020, where 200 individuals were observed within the flight activity survey area. These birds were observed flying in the 0-20m, 20-50m and the 50-100m height bands. Two birds were observed flying for 70 seconds within the 50-100m on 20th December 2020, the longest observation time for this species in this flight band. Black-headed gulls were not recorded flying above 100m during the winter season 2020/21.

Summer

A total of 12 observations of this species were recorded during summer vantage point surveys across all months (April-August 2021). All birds were recorded within the 20-50m height bands, excluding one individual which flew for 32 seconds in the 0-20m band on 15th June 2021. The largest flock of black-headed gulls recorded was on 30th May 2021, where eight individuals were observed outside of the flight activity survey area (500m turbine buffer).

3.2.2 Buzzard

Winter

A total of 98 observations of this Green-listed species were made at the Brittas site during the winter period VP surveys 2020/21. Buzzard were recorded at all VP locations in each month (October- March 2021). Most observations were of one or two birds, with one observation of three individuals, and another of four. Four individuals were recorded on 8th March 2021, flying outside the flight activity survey area for 189 seconds in the 100-200m height band. A buzzard was observed soaring in the 100-200m height band for 517 seconds on 16th March 2021, the longest observation in this height band. Buzzard were not recorded flying above 200m during the winter season 2020/21.

Summer

A total of 152 observations of this species were recorded during summer vantage point surveys across all months (April-August 2021) and all VP locations. One individual was recorded flying above 200m for 170 seconds outside the site buffer. All other buzzards were recorded between 0-200m. All observations involved between one and three individuals, with the exception of a group of four birds recorded on 31st May 2021 flying outside the flight activity survey area at 0-20m. A nest was confirmed north of VP3, c. 1km outside the site boundary (ITM 610834 662539).

3.2.3 Cormorant

Winter

39 observations of this Amber-listed species were recorded during winter vantage point surveys. The majority of sightings were recorded with the 20-50m height band. On individual was recorded on 28th November 2020 flying for 71 seconds with in the 100-200m height band. All other birds were observed below 100m.

The largest group of birds were recorded on 30th December 2020, with eleven individuals flying within the flight activity survey area for 120 seconds at 50-100m. A cormorant roost was noted to the east of the site, near Turbine 11 and along the River Suir (ITM 613253 661373).

Summer

Cormorant was observed once on 8th April 2021, inside/outside the 500m turbine buffer. There were no other observations of cormorant during the summer period.

3.2.4 Golden plover

Winter

This Red-listed Annex I species was recorded 80 times during winter surveys in 2020/21 at Brittas. This species was regularly seen in large flocks, with observations of 700 individuals recorded in November, December 2020, and January 2021. Golden plover were recorded across all height bands, and were regularly recorded above 200m. The longest observation within this height band involved 350 birds flying above 200m for 867 seconds. Golden plover were recorded at all VP locations, but VP2 and VP 3 had far higher numbers of observations than VP1.

Summer

No golden plover observations were recorded during the summer of 2020.

3.2.5 Grey heron

Winter

Grey heron, a Green-listed species was observed on 17 occasions at Brittas during the winter period 2020/21. The majority of sightings were of one or two individuals that were low flying or on the ground. The highest-flying heron was recorded for 167 seconds within the 50-100m height band on 17th January 2021.

Summer

This species was recorded 22times over the summer 2021 survey period. Similar to the winter period, the majority of sightings were low flying birds or individuals on the ground. The highest-flying heron was recorded for 100 seconds within the 50-100m height band on 30th May 2021. A heronry was observed in the woodland edge to the south of the site (ITM 613090 661048).

3.2.6 Hen harrier

Winter

There was a single observation of this Amber listed Annex 1 species on 24th December 2020. One male was observed flying outside the flight activity survey area at 100-200m for 137 seconds.

Summer

There were no observations of this species during the summer season VP surveys.

3.2.7 Herring gull

Winter

There were no observations of this species during winter VP surveys.

Summer

A single sighting of this Amber listed species was recorded on 15th April 2021. The herring gull was observed flying for 39 seconds inside the flight activity survey area in the 20-50m height band.

3.2.8 Kestrel

Winter

This Red-listed species was recorded 91 times in winter, with several sightings in each month. Most sightings were within the 20-50m height band, and all observations were of single individuals. The longest observation was of a male hunting in the 20-50m height band for 294 seconds on 19th December 2020.

Summer

There were 94observations of kestrel within the summer 2021 survey season. Most sightings were within the 0-20m and the 20-50m height bands, with only two observations of individuals within the 50-100m band. Three juvenile kestrels were observed flying for 57 seconds at 0-20m on 30th June 2021. These had fledged from a successful nest east of VP2, c 280m outside the site boundary.

3.2.9 Lapwing

Winter

There were 82 observations of this Red listed species during winter 2020/21. Flock sizes observed were generally large with 100 to 500 individuals. Three observations of flocks flying at heights greater than 200m were recorded. The longest of these sightings involved 400 individuals flying in this height band for 221 seconds.

Summer

There were 14 observations of lapwing within the summer season, ranging from single individuals up to flock sizes of eight. The longest observation was of six birds for 140 seconds at 20-50m on 30th June 2021.

3.2.10 Lesser black-backed Gull

Winter

There were 10 observations of this Amber listed species during the winter 2020/21 survey season. Observations included individual birds and flocks of up to 21 birds. The largest flock, 21 birds, was observed on 22nd February 2021 flying at 100-200m both inside and out of the flight activity survey area.

Summer

This species was observed on nine occasions during the 2021 summer season. Numbers of birds per sighting ranged from individuals to groups of up to six. The highest-flying flock was recorded on 2nd September 2021, flying for 336 seconds at 100-200m.

3.2.11 Little egret

Winter

There were 16 observations of the Green listed Annex 1 species during the winter 2020/21 survey season. Observations were largely of individual birds, with several sightings of two to three birds, and one observation of four birds. The group of four birds was recorded within the 0-20m height band for 44 seconds on 22nd March 2021. All birds were low flying, being recorded in either the 0-20m or 20-50m height bands. Little egret were recorded on the flooded field within the site adjacent to the River Suir near Turbine 11.

Summer

This species was observed on 11 occasions during the summer season. Observations were largely of two birds, with fewer sightings of one, four or five birds. The longest observation of this species was of two birds flying in the 20-50m height band for 325 seconds on 26th May 2021. The highest height band that little egret were recorded in was 50-100m.

3.2.12 Merlin

Winter

There were seven sightings of this Amber listed Annex 1 species during the winter 2020/21 VP surveys. All sightings were of individual birds. These were low flying sightings, all within the 0-20m to 20-50m height bands. On 11th December 2020 a single bird was recorded being mobbed by hooded crow while flying both in and out of the flight activity survey area. A male was recorded for 14 seconds in the 0-20m height band on 24th December. The sex of all other individuals was not identified.

Summer

There were no observations of this species during summer VP surveys.

3.2.13 Peregrine

Winter

Five records of Green-listed Annex 1 peregrine were made during winter VP surveys. One sighting on 14th January 2021 was of two individuals; all other sightings were of single individuals. These two birds were observed to be calling within the flight activity survey area. An individual was recorded on 16th March 2021 soaring for 69 seconds in the 20-50m height band. It then began displaying for 279 seconds in the 50-100m height band.

Summer

Seven records of peregrine were made during summer VP surveys. One sighting on 14th January 2021 was of two individuals, all other sightings were of single individuals. These two birds were observed to be calling within the flight activity survey area. An individual was recorded on 16th March 2021 soaring for 69 seconds in the 20-50m height band. It then began displaying for 279 seconds in the 50-100m height band.

3.2.14 Snipe

Winter

Seven records of Red-listed snipe were made in the winter VP season. One observation was on 19th December 2020, involving an individual recorded for 6 seconds at 0-20m. The remaining observations were in March 2021. All observations in winter were outside the flight activity survey area and in the 0-20m height band.

Summer

There were two records of snipe in summer 2021, both occurring on 2nd September 2021.The first record was of two birds at 0-20m for 116 seconds. The second record, an hour and eight minutes later, was of two birds for 42 seconds at 0-20m. One record was both inside and outside the flight activity survey area, while the other was outside the flight activity survey area.

3.2.15 Sparrowhawk

Winter

Sparrowhawk, a Green listed species in Ireland, was recorded 28 times in winter 2020/21. Most birds were recorded flying low in the 0-20m or 20-50m height bands. There were three observations in the 50-100m height band. One individual was recorded hunting for 48 seconds inside the flight activity survey area on 15th December 2021. Other hunting observations were made of individuals on 28th November and 04th December, both outside the buffer. Male and female sparrowhawk were recorded in winter.

Summer

A total of 16 observations of sparrowhawk were recorded during summer VP surveys. Most birds were low flying within the 0-20m height band. One observation was within the 20-50m height band and four were within the 50-100m band. All, excluding one, observations were of individual birds. Two birds were recorded on 21st April 2021 for 138 seconds flying within the 50-100m height band.

3.2.16 Whooper swan

Winter

Seven flightlines of whooper swan were recorded during the winter 2020/21 VP surveys. Static observations were also recorded. The largest static flock was 12 birds observed grazing on the site’s flooded fields on 29th December 2020. Two adults and two juveniles were recorded on 15th December 2020, within the flight activity survey area for 10 seconds in the 0-20m height band. All birds were low flying, occurring either in the 0-20 or the 20-50m height bands.

Summer

There were no observations of this species during summer surveys.

3.3 Hinterland Survey (IWeBS and breeding target species)

Hinterland surveys to establish occupancy and quantity of target species that could potentially cross the site whilst moving to and from roosting and feeding grounds within a 10 km radius of the site were carried out in November 2020 - March 2021, and in June/July 2021. These surveys were for wintering (IWeBS survey) and breeding target species.

During the winter season, 25 species were recorded. Of these, five species are Red listed (curlew, golden plover, lapwing, shoveler and snipe), 14 species are Amber listed (black-headed gull, coot, gadwall, garganey, greylag goose, lesser black-backed gull, mallard, mute swan, pintail, ringed plover, shelduck, teal, whooper swan, wigeon) and the remainder are Green listed (buzzard, grey heron, little egret, little grebe, moorhen and peregrine). Golden plover, little egret, peregrine and whooper swan are also listed under Annex I of the EU Birds Directive.

During the summer season, 14 species were recorded. Of these, three species were red listed (curlew, snipe, and lapwing), seven species were amber listed (black-headed gull, coot, lesser black-backed gull, mallard, ringed plover, teal and snipe) and the remainder green listed (little egret, grey heron, moorhen and little grebe). Little egret is listed under Annex I of the EU Birds Directive.

Species of conservation concern that were recorded are discussed in more detail in this section. Species have been selected for detailed discussion on the basis of conservation status, vulnerability to wind farm developments and species sightings recorded on or near the proposed Wind Farm site, which will indicate potential links between species recorded at the proposed site and the surrounding environment. Target species recorded are shown below in Table 3-2. For site-specific hinterland survey results see Appendix 5 of this report.

3.3.1 Black-headed Gull

This Amber-listed Gull species was seen on six occasions during Hinterland surveys. Observations were made at Cabragh Wetlands (c. 6km from the proposed windfarm) of 30 gulls on 26th November 2020, 55 gulls on 16th January 2021, 105 gulls on 06th February and 68 gulls on 7th March 2021. A total of 45 birds were recorded at Ballydavid, Littleton (c. 7.5km from the proposed windfarm) on 07th March 2021 and one individual at Lisheen Bog (c. 8.3km from the proposed windfarm) on 27th July 2021.

3.3.2 Curlew

This Red-listed wader species was seen on three occasions during Hinterland surveys. Two of these were at Cabragh Wetlands; one involved four birds on 26th November 2020 and the other recorded 65 birds on 16th January 2021. The third observation was of 2 birds at Lisheen Bog on 27th July 2021.

3.3.3 Golden Plover

This Red-listed Annex 1 species was noted on six occasions during Hinterland surveys. Observations were made at Clonamuckoge Beg (c. 300m from the proposed windfarm) of 200 birds on 26th November 2020, 200 birds on 08th December 2020, 700 birds on 16th January 2021 and 150 birds on 6th February 2021. Five birds were recorded at Liathmore (c. 9.2km from the proposed windfarm) and 300 birds were recorded at Cabragh Wetlands, both on 6th February 2021.

3.3.4 Grey Heron

Green-listed Heron was noted on 17 occasions during Hinterland surveys. The sites with most heron sightings were Cabragh Wetlands (c. 6km from proposed windfarm) and The Tank (600 m from proposed Wind Farm). Heron were observed at Cabragh Wetlands and The Tank five times at each location in November and December 2020, January and March 2021. Numbers ranged from one individual to five birds. Grey heron were also observed four times at the Lisheen Bog, where two birds were recorded on 26th November 2020, a single heron was seen on 18th December 2020, a single Heron was seen on 26th June 2021 and three birds were recorded on 27th July 2021.

3.3.5 Greylag Goose

This Amber listed species was observed once during hinterland surveys; 12 birds were recorded at Cabragh Wetlands on 16th January 2021.

3.3.6 Lapwing

Red-listed lapwing was noted on 16 occasions during Hinterland surveys. Lapwing were seen seven times at Cabragh Wetlands, in November and December 2020, and January, February, March and June 2021, with 350, 300, 25, 400, 150, 28 and two birds recorded each visit respectively. The two birds recorded in on 26th June 2021 were considered a pair. Lapwing were recorded four times at Clonamuckoge Beg, with 180 birds recorded on 26th November 2020, 300 birds on 18th December 2020, 300 birds observed on 16th January 2021 and 26 birds on 06th February 2021. At Ballydavid, Littleton, 40 birds were recorded on 26th November 2020, 45 on 08th December 2020, and 75 birds were recorded on 16th January 2021. one pair of birds recorded at Lisheen Bog on 26th June 2021, and one individual at Littleton Bog on 27th July 2021.

3.3.7 Lesser Black-backed Gull

Amber-listed Lesser Black-backed Gull was noted on four occasions during Hinterland surveys, all observations being from Ballydavid, Littleton. The first observation was on 16th November 2020, the second on 6th February 2021, the third observation was on 7th of March 2021, and the final observation was on 26th June 2021. All observations were of single gulls, except the November observation which was of 8 birds.

3.3.8 Little Egret

Little Egret, an Annex 1 species, was noted on six occasions during Hinterland surveys. This species was observed at Lisheen Bog and Cabragh Wetlands.

It was observed at Lisheen Bog on 18th December 2020 with two birds recorded, and single birds were recorded there on 16th January, 06th February and 27th July 2021. It was observed at Cabragh Wetlands on 16th January and 27th July 2021, both records were of single birds.

3.3.9 Mute Swan

This Amber-listed swan species was noted on five occasions at four different sites during Hinterland surveys. Eight mute swan were seen at Cabragh Wetlands on 26th December 2021. It was seen once at The Tank where two mute swan were seen on 12th November 2020. Two mute swan were seen at Ballydavid, Littleton on 16th January 2021. Mute swans were seen at Clonamuckoge Beg twice, with six birds recorded on 06th February and four on 07th March 2021.

3.3.10 Peregrine

This Green-listed Annex I raptor species was seen three times during Hinterland surveys, twice at Loughmoe Castle (c. 3.4km from the proposed windfarm). Both observations were of single birds, made on 12th November 2020 and 6th February 2021. One peregrine was recorded at Lisheen Bog on 18th December 2020.

3.3.11 Ringed Plover

A single observation of this Amber-listed species was noted at Lisheen Bog on 26th June 2021. Two pairs were recorded performing distraction displays (breeding behaviour).

3.3.12 Snipe

Red-listed snipe was noted 15 times during Hinterland surveys. It was recorded at The Tank on 12th November, 26th November, 08th December 2020, 16th January, 06th February and 07th March 2021, with four, 15, 12, five, seven and five birds recorded per respective visit. Snipe was also recorded at Lisheen Bog on 16th January, 06th February, 07th March and 27th July, with two, three, one, and three birds recorded per respective visit.

Snipe were also recorded in Cabragh Wetlands, with 15 birds on 26th November, 8 on 8th December 2020, and four pairs observed on 26th June 2021. Snipe were also recorded at Ballydavid, Littleton, with five birds on 8th December 2020

3.3.13 Whooper swan

Annex 1 species Whooper Swan was seen on eight occasions during Hinterland surveys, all of which were throughout the winter season 2020/2021. Of these, five observations were at Liathmore, where the largest flock of 95 Whooper Swans was observed on the 08th December 2021. Further flocks of 26, 37, 22 and 60 swans were observed at this site on the 12th of November, 16th January, 6th February and 7th March 2020 respectively. At Clonamuckoge Beg, three swans were recorded on 26th November, five on 8th December 2020, and five swans were recorded on 16th January 2021.

Table 3-2: Target Bird Species Recorded During Year One Hinterland Surveys (IWeBS and Breeding Target Species)

Common Name	Scientific Name	Conservation Status	
		BoCCI*	Annex I**
Black-headed gull	*Chroicocephalus ridibundus*	Amber	No
Buzzard	*Buteo buteo*	Green	No
Coot	*Fulica atra*	Amber	No
Curlew	*Numenius arquata*	Red	No
Gadwall	*Anas querquedula*	Amber	No
Garganey	*Anas strepera*	Amber	No
Golden plover	***Pluvialis apricaria***	**Red**	**Yes**
Grey heron	*Ardea cinerea*	Green	No
Greylag goose	*Anser anser*	Amber	No
Lapwing	*Vanellus vanellus*	Red	No
Lesser black-backed gull	*Larus fuscus*	Amber	No
Little egret	***Egretta garzetta***	**No**	**Yes**
Little grebe	*Tachybaptus ruficollis*	Green	No
Mallard	*Anas platyrhynchos*	Amber	No
Moorhen	*Gallinula chloropus*	Green	No
Mute swan	*Cygnus olor*	Amber	No
Peregrine	***Falco peregrinus***	**Green**	**Yes**
Pintail	*Anas acuta*	Red	No
Ringed plover	*Charadrius hiaticula*	Amber	No
Shelduck	*Tadorna tadorna*	Amber	No
Shoveler	*Anas clypeata*	Red	No
Snipe	*Gallinago gallinago*	Red	No
Teal	*Aythya fuligula*	Amber	No

Common Name	Scientific Name	Conservation Status	
		BoCCI*	Annex I**
Water Rail	*Rallus aquaticus*	Green	No
Whooper swan	***Cygnus cygnus***	**Amber**	**Yes**
Wigeon	*Anas penelope*	Amber	No

* refers to the conservation status of the species according to Birds of Conservation Concern in Ireland.

**refers to species listed on Annex I of the EU Birds Directive; shown in bold.

3.4 Breeding Waders Survey

During the breeding wader surveys at hinterland sites on 19th May 2021, two pairs of ringed plover at Lisheen bog (c. 8.3km from the proposed windfarm), and two pairs at Littleton Bog (c. 7.5km from the proposed windfarm) exhibited breeding behaviour through distraction displays. Two pairs of curlew also exhibited distraction display at Littleton Bog during this breeding wader survey. Redshank and lapwing were recorded breeding at Lisheen bog, within an area that had been re-wetted.

During the breeding wader surveys within the proposed Wind Farm site on 28th May 2021, six pairs of snipe were recorded drumming, a breeding behaviour, onsite. Two pairs of snipe were recorded in the north east section of the site (ITM 613413 663065), c. 240m from turbine 8. Four pairs of snipe were recorded in the north of the site (ITM 612728 663358), c. 347m from turbine 6.

3.5 Breeding Bird Survey

The results of the breeding bird transect surveys in summer 2021 at Brittas are shown in Table 3-3.

A total of 49 species were recorded along the transects. Five red listed species was recorded during surveys: grey wagtail, kestrel, meadow pipit, snipe and swift. Grey wagtails were recorded during the breeding bird transect surveys. This is a riparian species, recorded on along streams near transects. One individual kestrel was recorded during the breeding bird transect surveys.

This species is widespread in Ireland, found in open habitats. 21 meadow pipit individuals were recorded during the surveys. Meadow pipit were confirmed breeding onsite. Four snipe were recorded during the breeding season, with this species known to breed in grassy tussocks associated with wet/boggy conditions. Three swift were recorded during the breeding transects. Swift breed throughout Ireland, typically in buildings.

A total of 12 Amber listed species were recorded: goldcrest, house martin, lesser black-backed gull, linnet, mallard, mute swan, sand martin, skylark, spotted flycatcher, starling, swallow, and willow warbler. Goldcrest are likely to breed in conifer plantations onsite. Starlings could use suitable deciduous trees and farm buildings for breeding, with the latter also suitable for house martins and swallows. Suitable buildings for breeding starlings, swallows and house martins are located onsite. Linnet are found in rough grassland and scrubby habitats.

Mallard and mute swan occur in almost all available wetland habitats. Sand martin are likely to breed in similar bank habitats to kingfisher, as well as in quarries. Skylarks are likely to breed in similar habitats to meadow pipits. Spotted flycatcher breeds in deciduous woodland, hedgerows and gardens. Willow warbler are commonly found in scrubby habitats along the edges of bogs and marshes, as well as in hedgerows and woodland.

The remaining 33 species are Green listed.

Two species listed under Annex I of the EU Birds Directive were recorded during breeding transect surveys: little egret and peregrine. Peregrine were recorded nesting at Brittas Castle onsite during transect surveys on 28th June 2021. One adult and one juvenile were recorded at the nest.

Table 3-3: Results of breeding bird transects surveys during summer 2021[3]

Common Name	Scientific Name	May			June			May			June			May			June			May			June		
		T1						T2						T3						T4					
		0-25m	25-100m	>100/FO	0-25m	25-100m	>100/FO	0-25m	25-100m	>100/FO	0-25m	25-100m	>100/FO	0-25m	25-100m	>100/FO	0-25m	25-100m	>100/FO	0-25m	25-100m	>100/FO	0-25m	25-100m	>100/FO
Blackbird	*Turdus merula*		1	1	4			2			3			9	7		1	1		2	4	1	3	1	
Blackcap	*Sylvia atricapilla*				5	2		2			1	1		4			2	2						2	
Blue tit	*Cyanistes caeruleus*	2			1									1											
Bullfinch	*Pyrrhula pyrrhula*	2						2															2		
Buzzard	*Buteo buteo*		2																1		1				1
Chaffinch	*Fringilla coelebs*	8	1		7	2		5		1	4			1	2		2	2					3		
Chiffchaff	*Phylloscopus collybita*				1									2			1	1							
Dunnock	*Prunella modularis*		1		1	1		1	1		1			3			2								
Goldcrest	*Regulus regulus*				1						2						1								
Goldfinch	*Carduelis carduelis*				3									3			1	2							
Great tit	*Parus major*							1	1					1											
Grey heron	*Ardea cinerea*			1	2			1	1	1											1		1		1
Grey wagtail	*Motacilla cinerea*									1	2												3		
Hooded crow	*Corvus cornix*						8							1	3				1		1				
House martin	*Delichon urbicum*																			4					
Jackdaw	*Corvus monedula*													9											
Jay	*Garrulus glandarius*	3																	2						

[3] Zero values are not shown to increase readability.

Common Name	Scientific Name	T1						T2						T3						T4					
		May			June			May			June			May			June			May			June		
		0-25m	25-100m	>100/FO	0-25m	25-100m	>100/FO	0-25m	25-100m	>100/FO	0-25m	25-100m	>100/FO	0-25m	25-100m	>100/FO	0-25m	25-100m	>100/FO	0-25m	25-100m	>100/FO	0-25m	25-100m	>100/FO
Kestrel	*Falco tinnunculus*												1												
Lesser black-backed gull	*Larus fuscus*																								1
Lesser redpoll	*Carduelis cabaret*	2			2	3					1														
Linnet	*Linaria cannabina*							2			1														
Little egret	***Egretta garzetta***																							1	
Magpie	*Pica pica*				2								1												
Mallard	*Anas platyrhynchos*		3																						
Meadow pipit	*Anthus pratensis*				2	2		1	2	1	9	2	2								1				
Mistle thrush	*Turdus viscivorus*															1				1				1	
Mute swan	*Cygnus olor*			9						1															
Peregrine	***Falco peregrinus***																2								
Pheasant	*Phasianus colchicus*																		1						
Pied/white wagtail	*Motacilla alba*							1			2						3			3					
Reed bunting	*Emberiza schoeniclus*								2	1	5									3			1		
Reed warbler	*Acrocephalus scirpaceus*														1										
Robin	*Erithacus rubecula*	8			4						1			11	4		5	2			1		1		
Rook	*Corvus frugilegus*				1						1		3	4	3						3	12			
Sand Martin	*Carduelis spinus*							3				1		4						4			5		

Common Name	Scientific Name	May			June			May			June			May			June			May			June		
		T1						T2						T3						T4					
		0-25m	25-100m	>100/FO	0-25m	25-100m	>100/FO	0-25m	25-100m	>100/FO	0-25m	25-100m	>100/FO	0-25m	25-100m	>100/FO	0-25m	25-100m	>100/FO	0-25m	25-100m	>100/FO	0-25m	25-100m	>100/FO
Sedge Warbler	*Acrocephalus schoenobaenus*				2				2											5			9		
Skylark	*Alauda arvensis*								1		1	1	1												
Snipe	*Gallinago gallinago*			1				1			2														
Song thrush	*Turdus philomelos*				2	2	1	1		1	1	1		1	1		1	4		1		1			
Sparrowhawk	*Accipiter nisus*																	1							
Spotted flycatcher	*Musciapa striata*													3			2								
Starling	*Sturnus vulgaris*										6			8											
Stonechat	*Saxicola torquata*										2								2	2					
Swallow	*Hirundo rustica*	6	2		10	1		2			2	2		13			4	25	2				4		
Swift	*Apus apus*				1								1										1		
Treecreeper	*Certhia familiaris*																1								
Willow warbler	*Phylloscopus trochilus*	3			3	2	1		3		2	1						1				3		1	1
Woodpigeon	*Columba palumbus*	8	1	4	2	8	1	4		1			1	13		1		1	3	5				2	2
Wren	*Troglodytes troglodytes*	3			11	1		5			4	2		5	7		14	4		2			4	3	
Total Number of Species	**49**																								

3.6 Wintering Bird Survey

The results of the wintering bird transect survey at Brittas are shown below. Table 3-4 details bird transects 1 to 4 surveyed during winter 2020/2021.

A total of 51 species were recorded along the transects. Five red listed species were recorded during surveys, namely grey wagtail, lapwing, meadow pipit, redwing, and snipe.

Thirteen amber listed species were recorded: black-headed gull, cormorant, goldcrest, greenfinch, house sparrow, kestrel, kingfisher, mallard, mute swan, skylark, starling, teal and whooper swan. The remaining 33 species are green listed. While kingfisher were recorded during the winter transects, and not the breeding transects, kingfisher are likely using the rivers and streams on site for foraging and could be breeding on the banks of these water features. Old nest holes were observed along the banks of the Suir River which borders and also runs through the site.

Four species listed under Annex I of the EU Birds Directive were recorded during winter transect surveys: kingfisher, peregrine, whooper swan and little egret.

Table 3-4: Results of wintering bird transects winter 2020/2021[4]

Common Name	Scientific Name	Jan			Feb			Mar			Jan			Feb			Mar			Jan			Feb			Mar			Jan			Feb			Mar		
		T1									T2									T3									T4								
		0-25m	25-100m	>100/FO	0-25m	25-100m	>100/FO	0-25m	25-100m	>100/FO	0-25m	25-100m	>100/FO	0-25m	25-100m	>100/FO	0-25m	25-100m	>100/FO	0-25m	25-100m	>100/FO	0-25m	25-100m	>100/FO	0-25m	25-100m	>100/FO	0-25m	25-100m	>100/FO	0-25m	25-100m	>100/FO	0-25m	25-100m	>100/FO
Blackbird	*Turdus merula*	6	4	1	4	3		5			5	1			1		1	2		10	4		3	4		2	1		7					1	2		
Black-headed gull	*Chroicocephalus ridibundus*						4																														
Blue tit	*Cyanistes caeruleus*				2			2			1			1						1			2			2			1								
Bullfinch	*Pyrrhula pyrrhula*				2			2			2																										
Buzzard	*Buteo buteo*			1		1		1	1						2	2										2				1				1			
Chaffinch	*Fringilla coelebs*	12	1	2		104		2	2	1	2				2		8	4		2				7		4	2	2		2		2		1			
Coal tit	*Periparus ater*																									1											
Cormorant	*Periparus ater*																																	1	4		
Dunnock	*Prunella modularis*	4			4			2									3						1	3		2			1							1	
Fieldfare	*Turdus pilaris*			16			2								9		13																7				
Garden warbler	*Sylvia borin*																						2									2			3		
Goldcrest	*Regulus regulus*	2			2			1						4						3			4			1											
Goldfinch	*Carduelis carduelis*				1																																
Great tit	*Parus major*	2				1															1		3	1													
Greenfinch	*Carduelis chloris*																			3																	
Grey heron	*Ardea cinerea*							2					1																						1		
Grey wagtail	*Motacilla cinerea*										1																										
Hooded crow	*Corvus cornix*	3		2			7		1				6		1						2				3		4			2							
House sparrow	*Passer domesticus*																							2													
Jackdaw	*Corvus monedula*			2								2			4						11	13	4	12		5	2					2					
Jay	*Garrulus glandarius*																			1	1			2		2	1										
Kestrel	*Falco tinnunculus*												2																								
Kingfisher	***Alcedo atthis***	1						1																											1		
Lapwing	*Vanellus vanellus*						35									60																					
Lesser redpoll	*Egretta garzetta*																						3														
Little egret	***Linaria cannabina***															1																					
Long-tailed tit	*Aegithalos caudatus*				2																		3			1											
Magpie	*Pica pica*			2	1							3							1					2		1											
Mallard	*Anas platyrhynchos*		2		2									2						14						2											
Meadow pipit	*Anthus pratensis*					1						2	18	2		1	1	2												8		1	1		1		
Mistle thrush	*Turdus viscivorus*			1		1											1							2	1	1		2			1						

[4] Zero values are not shown to increase readability.

Common Name	Scientific Name	Jan			Feb			Mar			Jan			Feb			Mar			Jan			Feb			Mar			Jan			Feb			Mar		
		T1									T2									T3									T4								
		0-25m	25-100m	>100/FO	0-25m	25-100m	>100/FO	0-25m	25-100m	>100/FO	0-25m	25-100m	>100/FO	0-25m	25-100m	>100/FO	0-25m	25-100m	>100/FO	0-25m	25-100m	>100/FO	0-25m	25-100m	>100/FO	0-25m	25-100m	>100/FO	0-25m	25-100m	>100/FO	0-25m	25-100m	>100/FO	0-25m	25-100m	>100/FO
Moorhen	*Gallinula chloropus*				1																																
Mute swan	*Cygnus olor*						4			17		6							4		2																
Peregrine	***Falco peregrinus***																										1										
Pheasant	*Phasianus colchicus*	1																				1			1			1							1		
Pied/white wagtail	*Motacilla alba*																				1					1						1					
Raven	*Corvus corax*												1																								
Redwing	*Turdus iliacus*	30	5			2	22					4			20								14									1					
Reed bunting	*Emberiza schoeniclus*																																		1		
Robin	*Erithacus rubecula*	9			8			6			4	1		1			3		1	6	2		7	4		5	5		2							5	
Rook	*Corvus frugilegus*			3			1		2	2			2		9				2			33		4	2	3	13	1			14		25				
Skylark	*Alauda arvensis*																		2													1					
Snipe	*Gallinago gallinago*		1	1							1	4																	2			1					
Song thrush	*Turdus philomelos*	2	2		2	4	1	1	2						1									4	1			1	1			2			1		1
Sparrowhawk	*Accipiter nisus*																													2							
Starling	*Sturnus vulgaris*		5	5		1	7					7	13		60	32				4	2		3			11											
Stonechat	*Saxicola torquata*	1									1	1																	1						2		
Teal	*Anas crecca*	1																																			
Whooper swan	***Cygnus cygnus***			5			7												3																		
Woodpigeon	*Columba palumbus*	1		5		4		5	1	12	2			3			2	2	1	3	5	3	6		4	3	2	2	5		2		6			3	
Wren	*Troglodytes troglodytes*	10			3			4	1		4			1	2		2	3	1	6			5	2		4	1		4			1			6	3	
Total Number of Species	51																																				

3.7 Barn Owl Survey

One location (approx. 1.17 km northwest of the site) was identified as potentially suitable for barn owl occupancy within the search area encompassing the site boundary and a radius of 1.5 km beyond the flight activity survey area buffer. This location, an old farmhouse, was surveyed for evidence of barn owl. Barn owl 'snoring' was heard from the building during the dusk survey, before a single male emerged from the farmhouse and began hunting around the buildings.

4. DISCUSSION

FT carried out a full year of ornithological surveys at the proposed Brittas Wind Farm between October 2020 and August 2021 inclusive, with two rounds of VP surveys completed in August 2021. The following surveys were undertaken: Vantage point surveys, breeding & winter bird transect surveys, hinterland surveys, breeding wader surveys, and barn owl surveys.

In total there were 888 individual flight lines of 19 target species observed during the VP survey period.

Some target species were frequently or regularly sighted across seasons; these include black headed gull, buzzard and kestrel. Resident populations of these species stay in the vicinity of the proposed Brittas Wind Farm year-round and utilise the proposed site for hunting/ foraging. The following species have been observed hunting within the site: buzzard, kestrel and sparrowhawk.

The most sensitive species recorded within the flight activity survey area, flying at rotor swept heights and in considerable numbers is red listed/ Annex I golden plover. This species is a winter visitor in this region and has not been recorded breeding at the Brittas site. Whooper swans were recorded flying over the Brittas site in winter 2020/21 as well as grazing within the site in low numbers (up to 12 birds), notably on fields that flooded in winter. As these observations were recorded during the day, it is considered the site is used as a foraging area by limited numbers of whooper swans. Roosting sites for whooper swans were not identified at or near the site. A cormorant roost was observed onsite, along the River Suir (ITM 613253 661373).

Peregrine were observed nesting in Brittas Castle (ITM 612558 661504) and a heronry was observed along the woodland edge within the southern areas of the site (ITM 613090 661048). Snipe were recorded breeding onsite in the north and north-eastern areas of the site (ITM 613413 663065 and 612728 663358). Buzzard were recorded nesting to the west of the site, c. 1km offsite (ITM 610834 662539). Kestrel bred near the site, with three juvenile kestrels observed to have fledged from a nest east of VP2 (614514 663157).

Kingfisher were not recorded during breeding surveys, however their presence in winter and the availability of suitable nesting habitat along the Suir in this area means they are considered likely to breed within or near the site.

Meadow pipit were also confirmed breeding on site. All passerine species recorded within the 0-25m distance band during the breeding transect surveys are considered to be breeding within the site.

During winter and breeding bird transect surveys identified the riparian/ river habitat along the River Suir as high value bird habitat, with notable species such as grey wagtail and kingfisher recorded. The majority of species recorded during the transects surveys were small passerine species, unlikely to be vulnerable to significant effects from wind farm developments. Peregrine were recorded nesting onsite at Brittas Castle during transects surveys.

Hinterland surveys were conducted to show the general breeding occupancy and bird occupancy throughout the year in a c. 10 km radius around the proposed site. Hinterland sites that were identified as being of high value to bird species of conservation interest were Cabragh Wetlands, Clonamuckoge Beg, Liathmore and Lisheen Bog. Cabragh Wetlands is important for wintering birds with large flocks of curlew (up to 65 birds), lapwing (up to 400 birds) and golden plover (up to 300 birds), as well as breeding birds, with one pair of lapwing and four pairs of snipe observed in the breeding season. Clonamuckoge Beg is important for wintering birds with large flocks of lapwing (up to 300 birds) and golden plover (up to 700 birds). Liathmore is an important site for wintering whooper swan, with flock sizes of up to 95 swans recorded.

Lisheen Bog is important for breeding birds, with one pair of lapwing and two pairs of ringed plover observed in the breeding season. Peregrine were recorded at Loughmoe castle in the non-breeding season.

Species of note that were seen during Hinterland surveys, that were not recorded during the surveys within the proposed development site include: gadwall, garganey, greylag goose, pintail, shelduck and shoveler. These observations were from at Hinterland sites within 10 km of the site boundary, namely Cabragh Wetlands. The absence of these species on site indicates the habitats on the proposed Brittas Wind Farm site are not suitable for these wetland birds.

A barn owl breeding site was identified in a building approx. 1.17 km northwest of the site (ITM 611071 664291). Suitable foraging habitat is present on site in the form of rough grassland, field margins, hedgerows, and potentially in low-growing open scrub.

5. REFERENCES

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FEHILY TIMONEY

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APPENDIX 1

VP Winter 2020/21 –
Survey Details

VP Winter 2020/21 - Survey Details

VP	Date	Observer	Start	End	Cloud (okta)	Visibility	Rain	Wind
1	05/11/2020	KC	12.20	15.20	8/8 (thin, high)	Good	Dry	F1-2 SW
1	28/11/2020	KC	08.15	11.15	8/8 (low)	Fair	Dry	F1 E
2	05/11/2020	KC	8.45	11.45	8/8 (thin, high)	Good	Dry	F1 SW
2	19/11/2020	KC	9.15	12.15	1/8	Good	Dry	F1 NW
3	19/11/2020	KC	12.45	15.45	2/8	V.good	Dry	F1 NW
3	28/11/2020	KC	11.30	14.30	8/8 (low)	Fair	Dry	F1 E
1	04/12/2020	KC	11.15	14.15	1/8	Excellent	Dry	F3 W
1	15/12/2020	KC	09.15	12.15	7/8	Good	Dry	F1 S
2	11/12/2020	KC	09.00	12.00	8/8	Good	Dry	F1 W
2	19/12/2020	KC	09.10	12.10	5/8	Good	Dry	F1 SW
3	11/12/2020	KC	12.30	15.30	8/8	Good	Dry	F3 W
3	15/12/2020	KC	12.30	15.30	3/8	Good	Dry	F2 S
1	20/12/2020	KC	09.50	12.50	2/8	Good	Dry	F1 S
1	29/12/2020	KC	09.10	12.10	3/8	Good	Dry	F3 NW
2	24/12/2020	KC	09.15	12.15	1/8	V.good	Dry	F1 N
2	30/12/2020	KC	12.45	15.45	4/8	Good	Dry	F2 NW
3	29/12/2020	KC	12.45	15.45	8/8	Good	Dry	F2 NW
3	30/12/2020	KC	09.15	12.15	2/8	Good	Dry	F2 NW
1	14/01/2021	KC	09.00	12.00	8/8	Good	Dry	F3 NW
1	26/01/2021	KC	13.00	16.00	8/8	Good	Dry	F1 SW
2	17/01/2021	KC	10.00	13.00	2/8	Good	Dry	F1 NW
2	28/01/2021	KC	11:40	14:40	8/8	Good	Dry	F2 SW
3	14/01/2021	KC	12:30	15:30	8/8	Good	Dry	F2 WNW
3	28/01/2021	KC	08:20	11:20	5/8	Good	Dry	F1 SW
1	05/02/2021	KC	08:10	11:10	7/8	Good	Dry	F1 W
1	22/02/2021	KC	09:00	12:00	0/8	Very good	Dry	F1 S
2	18/02/2021	KC	13:30	16:30	6/8	Good	Dry	F4 WSW
2	27/02/2021	KC	09:30	12:30	7/8	Good	Dry	F1 S
3	04/02/2021	KC	09:45	12:45	8/8	Good	Dry	F1 SW
3	16/02/2021	KC	14:30	17:30	5/8	Good	Dry	F1 SW
1	08/03/2021	KC	11:00	14:00	7/8	Good	Dry	F1 S
1	22/03/2021	KC	13:15	16:15	8/8	Good	Dry	F1 S
2	23/03/2021	KC	09:00	12:00	8/8	Good	Dry	F2 SW
2	30/03/2021	KC	08:30	11:30	1/8	Good	Dry	F1 SW
3	16/03/2021	KC	10:00	13:00	8/8	Good	Dry	F1 S
3	24/03/2021	KC	08:45	11:45	1/8	Good	Dry	F1 SW

FEHILY TIMONEY

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APPENDIX 2

VP Summer 2021 – Survey Details

VP Summer 2021 - Survey Details

VP	Date	Observer	Start	End	Cloud (okta)	Visibility	Rain	Wind
1	08/04/2021	KC	09:45	12:45	5/8	Good	Dry	F2 W
1	24/04/2021	KC	10:45	13:45	1/8	Very good	Dry	F2 E
2	15/04/2021	KC	11:45	14:45	1/8	Very good	Dry	F1 W
2	21/04/2021	KC	11:20	14:20	2/8	Very good	Dry	F1 E
3	14/04/2021	KC	11:45	14:45	5/8	Good	Dry	F2 W
3	28/04/2021	KC	15:00	18:00	7/8	Good	Dry	F2 N
1	25/05/2021	KC	15:30	18:30	7/8	Good	Dry	F1 NW
1	30/05/2021	KC	14:00	17:00	5/8	Good	Dry	F1 S
2	26/05/2021	KC	17:00	20:00	3/8	Good	Dry/ light drizzle	F1 S
2	30/05/2021	KC	17:15	20:15	5/8	Good	Dry	F1 S
3	11/05/2021	KC	09:00	12:00	3/8	Good	Dry	F2 S
3	31/05/2021	KC	14:00	17:00	1/8	Good	Dry	F3 SE
1	19/06/2021	KC	08.15	11.15	6/8.	Good	No data	F1 S
1	30/06/2021	KC	17.00	20.00	1/8.	v Good	No data	F1 NW
2	17/06/2021	KC	13.15	16.15	7/8.	V. Good	None	F1 S
2	30/06/2021	KC	08.15	11.15	0/8.	v Good	No data	Calm
3	15/06/2021	KC	11:00	14:00	7/8.	V. good	None	F3 S
3	25/06/2021	KC	09:00	12:00	8/8.	Good	No data	F3 N
1	15/07/2021	KC	14.30.	16.30.	5/8.	Good	No data	F1 NW
1	24/07/2021	KC	08.40	11.40	1/8.	good	No data	F1 NE
2	15/07/2021	KC	11.00	14.00	4/8.	Good	No data	F1-2 NW
2	21/07/2021	KC	09.12	12.12	2/8.	v. Good	No data	F1 SE
3	19/07/2021	KC	10.00	13.00	0/8	v.good	No data	calm
3	24/07/2021	KC	12.00	15.00	6/8.	good	No data	F1 NE
1	29/07/2021	KC	12.00	15.00	4/8.	good	No data	F1 NW
2	26/07/2021	KC	08.15	11.15	8/8.	fair	No data	F1 NW
3	26/07/2021	KC	11.30	14.30	6/8.	good	No data	F1 NW
1	24/08/2021	KC	13.00	16.00	3/8.	good	No data	F1 NW
1	26/08/2021	KC	09.30	12.30	0/8	v. Good	No data	calm
2	10/08/2021	KC	09.00	12:00	6/8.	good	No data	F1 S
2	24/08/2021	KC	9.30	12.30	2/8.	good	No data	F1 NW
3	10/08/2021	KC	12.30	15.30	7/8.	good	No data	F1 S
3	24/08/2021	KC	16.30	19.30	2/8.	good	No data	F1 NW
1	26/08/2021	KC	12.40	15.40	0/8.	v good	No data	F1 SE
2	02/09/2021	KC	09.30	12.30	8/8.	good	No data	F1 E
3	02/09/2021	KC	13.00	16.00	8/8.	good	No data	F1 E

FEHILY TIMONEY

CONSULTANTS IN ENGINEERING, ENVIRONMENTAL SCIENCE & PLANNING

APPENDIX 3

Winter VP Surveys 2020/21
and Summer VP Surveys 2021
raw flight line data

Winter Survey 2020/21 Bird Flightline Data

VP no.	Date	Common Name	Scientific Name	Species Quantity	Sex	Time of Observation	Inside / Outside Buffer	Total Duration (s)	0-20 m (s)	20-50 m (s)	50-100 m (s)	100-200 m (s)	>200 m (s)	Notes
1	04/12/2020	Black-headed Gull	*Chroicocephalus ridibundus*	3		11.31	Out	57		57				
1	04/12/2020	Black-headed Gull	*Chroicocephalus ridibundus*	60		12.27	Out	141	70	71				
1	20/12/2020	Black-headed Gull	*Chroicocephalus ridibundus*	20		9.56	In	26		26				
1	20/12/2020	Black-headed Gull	*Chroicocephalus ridibundus*				Out	40		40				
1	20/12/2020	Black-headed Gull	*Chroicocephalus ridibundus*	2		11.41	Out	70			70			
1	29/12/2020	Black-headed Gull	*Chroicocephalus ridibundus*	45		9.19	In	7		7				
1	29/12/2020	Black-headed Gull	*Chroicocephalus ridibundus*				Out	8		8				
1	29/12/2020	Black-headed Gull	*Chroicocephalus ridibundus*	55		9.40	In	64		64				
1	29/12/2020	Black-headed Gull	*Chroicocephalus ridibundus*	120		10.12	In	120		90	30			
1	29/12/2020	Black-headed Gull	*Chroicocephalus ridibundus*	120		10.22	In	77		17	60			
1	29/12/2020	Black-headed Gull	*Chroicocephalus ridibundus*	28		11.54	In	64			64			
1	29/12/2020	Black-headed Gull	*Chroicocephalus ridibundus*	120		12.05	In	66			66			
2	19/12/2020	Black-headed Gull	*Chroicocephalus ridibundus*	4		10.00	In	42						

VP no.	Date	Common Name	Scientific Name	Species Quantity	Sex	Time of Observation	Inside / Outside Buffer	Total Duration (s)	0-20 m (s)	20-50 m (s)	50-100 m (s)	100-200 m (s)	>200 m (s)	Notes
2	19/12/2020	Black-headed Gull	*Chroicocephalus ridibundus*	9		10.30	In	91		91				
3	29/12/2020	Black-headed Gull	*Chroicocephalus ridibundus*	11		12.47	In	51		51				
3	29/12/2020	Black-headed Gull	*Chroicocephalus ridibundus*	40		12.52	In	22		22				
3	29/12/2020	Black-headed Gull	*Chroicocephalus ridibundus*	16		13.06	In	79		79				
3	29/12/2020	Black-headed Gull	*Chroicocephalus ridibundus*	200		13.52	In	46	10	36				
3	29/12/2020	Black-headed Gull	*Chroicocephalus ridibundus*	40		13.55	In	42	10	32				
3	29/12/2020	Black-headed Gull	*Chroicocephalus ridibundus*	35		15.06	In	13			13			
3	30/12/2020	Black-headed Gull	*Chroicocephalus ridibundus*	1		11.16	In	45		45				
1	14/01/2021	Black-headed Gull	*Chroicocephalus ridibundus*	16		9.12	Out	121		121				
1	14/01/2021	Black-headed Gull	*Chroicocephalus ridibundus*	4		9.21	Out	34		34				
1	14/01/2021	Black-headed Gull	*Chroicocephalus ridibundus*	13		10.07	Out	19		19				
1	14/01/2021	Black-headed Gull	*Chroicocephalus ridibundus*	10		11.51	Out	107		107				
1	26/01/2021	Black-headed Gull	*Chroicocephalus ridibundus*	1		14.24	Out	25			25			
1	26/01/2021	Black-headed Gull	*Chroicocephalus ridibundus*	2		15.15	Out	27		27				

VP no.	Date	Common Name	Scientific Name	Species Quantity	Sex	Time of Observation	Inside / Outside Buffer	Total Duration (s)	0-20 m (s)	20-50 m (s)	50-100 m (s)	100-200 m (s)	>200 m (s)	Notes
2	28/01/2021	Black-headed Gull	*Chroicocephalus ridibundus*	6		14:14	In	21		21				
1	05/02/2021	Black-headed Gull	*Chroicocephalus ridibundus*	25		09:21	In	12		12				
1	05/02/2021	Black-headed Gull	*Chroicocephalus ridibundus*	25		09:21	Out	10		10				
1	22/03/2021	Black-headed Gull	*Chroicocephalus ridibundus*	3		13:22	Out	43		43				
1	22/03/2021	Black-headed Gull	*Chroicocephalus ridibundus*	35		13:25	Out	66		66				
1	05/11/2020	Buzzard	*Buteo buteo*	1		13.08	Out	12	12					
1	28/11/2020	Buzzard	*Buteo buteo*	1		10.39	In	24		24				
2	05/11/2020	Buzzard	*Buteo buteo*	1		8.48	Out	10		10				
2	05/11/2020	Buzzard	*Buteo buteo*	1		8.51	Out	58	45	13				
2	05/11/2020	Buzzard	*Buteo buteo*	1		8.57	In	19	19					
2	05/11/2020	Buzzard	*Buteo buteo*	1		11.14	In	29	7	22				
2	19/11/2020	Buzzard	*Buteo buteo*	1		9.51	In	24	24					Hunting/perching
2	19/11/2020	Buzzard	*Buteo buteo*	1		9.56	In	26	26					
3	19/11/2020	Buzzard	*Buteo buteo*	1		13.19	Out	58		58				
3	19/11/2020	Buzzard	*Buteo buteo*	1		13.31	Out	11	11					
1	04/12/2020	Buzzard	*Buteo buteo*	2		12.10	In	62	10	52				
1	04/12/2020	Buzzard	*Buteo buteo*	1		12.12	In	65			65			
1	04/12/2020	Buzzard	*Buteo buteo*	2		13.30	In	92		52	40			
1	04/12/2020	Buzzard	*Buteo buteo*	1		13.35	In	37		37				
1	04/12/2020	Buzzard	*Buteo buteo*	2		13.37	In	31		31				

VP no.	Date	Common Name	Scientific Name	Species Quantity	Sex	Time of Observation	Inside / Outside Buffer	Total Duration (s)	0-20 m (s)	20-50 m (s)	50-100 m (s)	100-200 m (s)	>200 m (s)	Notes
1	15/12/2020	Buzzard	*Buteo buteo*	2		11.19	In	362		20	30	312		
1	20/12/2020	Buzzard	*Buteo buteo*	1		12.15	Out	10		10				
1	29/12/2020	Buzzard	*Buteo buteo*	1		9.45	Out	19		19				
2	11/12/2020	Buzzard	*Buteo buteo*	1		9.14	In	16		16				
2	11/12/2020	Buzzard	*Buteo buteo*	1		11.21	In	69			69			
2	11/12/2020	Buzzard	*Buteo buteo*	1		11.38	In	22		22				
2	19/12/2020	Buzzard	*Buteo buteo*	1		10.58	In	64		64				
2	30/12/2020	Buzzard	*Buteo buteo*	1		14.08	In	49		49				
3	11/12/2020	Buzzard	*Buteo buteo*	2		12.35	Out	56		56				
3	11/12/2020	Buzzard	*Buteo buteo*	1		14.14	Out	14	14					
3	15/12/2020	Buzzard	*Buteo buteo*	1		12.59	Out	31		31				
3	15/12/2020	Buzzard	*Buteo buteo*	1		13.04	Out	32		32				
3	15/12/2020	Buzzard	*Buteo buteo*	1		13.51	Out	16		16				
3	29/12/2020	Buzzard	*Buteo buteo*	1		13.39	Out	40		40				
3	29/12/2020	Buzzard	*Buteo buteo*	1		15.14	Out	78		78				
3	30/12/2020	Buzzard	*Buteo buteo*	1		9.44	Out	29		29				
1	14/01/2021	Buzzard	*Buteo buteo*	1		10.47	Out	40		40				
1	14/01/2021	Buzzard	*Buteo buteo*				In	52		52				
1	14/01/2021	Buzzard	*Buteo buteo*	1		10.50	Out	63		63				
1	14/01/2021	Buzzard	*Buteo buteo*				In	60		60				
1	14/01/2021	Buzzard	*Buteo buteo*	1		11.39	Out	25		25				
1	26/01/2021	Buzzard	*Buteo buteo*	1		13.52	In	22			22			
1	26/01/2021	Buzzard	*Buteo buteo*	1		15.06	Out	41			41			

VP no.	Date	Common Name	Scientific Name	Species Quantity	Sex	Time of Observation	Inside / Outside Buffer	Total Duration (s)	0-20 m (s)	20-50 m (s)	50-100 m (s)	100-200 m (s)	>200 m (s)	Notes
1	26/01/2021	Buzzard	*Buteo buteo*	1		15.18	In	14	14					
1	26/01/2021	Buzzard	*Buteo buteo*	2		15.40	Out	15		15				
2	17/01/2021	Buzzard	*Buteo buteo*	1		10.13	Out	41		41				
2	17/01/2021	Buzzard	*Buteo buteo*	1		12:55	In	18		18				
2	28/01/2021	Buzzard	*Buteo buteo*	1		12:49	In	22	22					
3	14/01/2021	Buzzard	*Buteo buteo*	1		12:58	Out	55		55				
3	14/01/2021	Buzzard	*Buteo buteo*	1		12:59	Out	44		44				
3	14/01/2021	Buzzard	*Buteo buteo*	1		13:23	Out	19	19					
3	14/01/2021	Buzzard	*Buteo buteo*	1		13:29	Out	49			49			
3	14/01/2021	Buzzard	*Buteo buteo*	1		13:32	Out	90			90			
3	14/01/2021	Buzzard	*Buteo buteo*	1		13:40	Out	75		75				
3	14/01/2021	Buzzard	*Buteo buteo*	1		13:53	Out	43		43				
3	14/01/2021	Buzzard	*Buteo buteo*	1		14:02	Out	23	23					
1	05/02/2021	Buzzard	*Buteo buteo*	1		09:35	Out	20	20					
1	05/02/2021	Buzzard	*Buteo buteo*	1		09:35	In	40	40					
1	05/02/2021	Buzzard	*Buteo buteo*	1		10:42	In	36			36			
1	22/02/2021	Buzzard	*Buteo buteo*	2		10:30	Out	80			80			
1	22/02/2021	Buzzard	*Buteo buteo*	2		10:30	In	89			89			
2	18/02/2021	Buzzard	*Buteo buteo*	2		13:53	Out	97		40	57			
2	18/02/2021	Buzzard	*Buteo buteo*	1		16:07	In	12	12					
2	18/02/2021	Buzzard	*Buteo buteo*	1		16:19	In	17		17				
2	27/02/2021	Buzzard	*Buteo buteo*	1		09:31	Out	15		15				
2	27/02/2021	Buzzard	*Buteo buteo*	1		11:12	Out	33	33					

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2	27/02/2021	Buzzard	*Buteo buteo*	1		11:37	In	121				121		Soaring
2	27/02/2021	Buzzard	*Buteo buteo*	1		11:56	In	99				99		Soaring
2	27/02/2021	Buzzard	*Buteo buteo*	3		12:14	Out	23		23				
3	04/02/2021	Buzzard	*Buteo buteo*	1		09:51	Out	27	27					Some flooding in places along the river
3	04/02/2021	Buzzard	*Buteo buteo*	1		12:12	In	302			302			
3	16/02/2021	Buzzard	*Buteo buteo*	1		15:25	In	19		19				
3	16/02/2021	Buzzard	*Buteo buteo*	1		15:49	Out	72			72			
3	16/02/2021	Buzzard	*Buteo buteo*	1		16:06	In	30		30				
1	08/03/2021	Buzzard	*Buteo buteo*	1		11:20	In	244				244		
1	08/03/2021	Buzzard	*Buteo buteo*	1		11:32	In	218				218		
1	08/03/2021	Buzzard	*Buteo buteo*	4		11:46	Out	189				189		
1	08/03/2021	Buzzard	*Buteo buteo*	1		12:57	In	78			78			
1	08/03/2021	Buzzard	*Buteo buteo*	1		13:26	Out	28		28				
1	22/03/2021	Buzzard	*Buteo buteo*	2		13:45	Out	173			173			
1	22/03/2021	Buzzard	*Buteo buteo*	2		15:35	In	106			106			
2	23/03/2021	Buzzard	*Buteo buteo*	1		09:36	In	39		39				
2	23/03/2021	Buzzard	*Buteo buteo*	1		09:39	In	120			120			
2	23/03/2021	Buzzard	*Buteo buteo*	2		10:10	In	63			63			
2	23/03/2021	Buzzard	*Buteo buteo*	2		11:11	In	138				138		
2	23/03/2021	Buzzard	*Buteo buteo*	1		11:31	Out	31		31				
2	30/03/2021	Buzzard	*Buteo buteo*	1		09:10	In	243			243			
2	30/03/2021	Buzzard	*Buteo buteo*	2		09:30	Out	85			85			
2	30/03/2021	Buzzard	*Buteo buteo*	1		09:48	In	171		171				

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2	30/03/2021	Buzzard	*Buteo buteo*	1		09:54	Out	56		56				
2	30/03/2021	Buzzard	*Buteo buteo*	1		09:56	In	199			199			
2	30/03/2021	Buzzard	*Buteo buteo*	1		11:41	Out	67			67			
2	30/03/2021	Buzzard	*Buteo buteo*	1		12:04	In	36		36				
3	16/03/2021	Buzzard	*Buteo buteo*	1		10:44	Out	82			82			
3	16/03/2021	Buzzard	*Buteo buteo*	2		11:21	In	43				43		Soaring
3	16/03/2021	Buzzard	*Buteo buteo*	1		11:32	Out	101			101			
3	16/03/2021	Buzzard	*Buteo buteo*	2		11:43	Out	67		67				
3	16/03/2021	Buzzard	*Buteo buteo*	1		11:46	Out	83						
3	16/03/2021	Buzzard	*Buteo buteo*	1		11:49	In	517				517		Soaring
3	16/03/2021	Buzzard	*Buteo buteo*	2		12:03	In	23				23		Soaring
3	16/03/2021	Buzzard	*Buteo buteo*	2		12:28	In	216				216		Soaring
3	16/03/2021	Buzzard	*Buteo buteo*	2		12:42	In	41				41		Soaring
3	24/03/2021	Buzzard	*Buteo buteo*	2		09:22	Out	95			95			
3	24/03/2021	Buzzard	*Buteo buteo*	2		10:15	Out	194		194				
3	24/03/2021	Buzzard	*Buteo buteo*	1		10:34	In	71				71		
3	24/03/2021	Buzzard	*Buteo buteo*	1		11:06	In	98				98		
3	24/03/2021	Buzzard	*Buteo buteo*	2		11:25	In	178				178		
3	24/03/2021	Buzzard	*Buteo buteo*	1		11:40	In	38			38			
2	05/11/2020	Cormorant	*Phalacrocorax carbo*	1		12.40	Out	16	16					
2	28/11/2020	Cormorant	*Phalacrocorax carbo*	2		8.45	Out	16		16				
2	28/11/2020	Cormorant	*Phalacrocorax carbo*	2		9.10	Out	8		8				
2	28/11/2020	Cormorant	*Phalacrocorax carbo*	1		10.08	In	35		35				

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2	28/11/2020	Cormorant	*Phalacrocorax carbo*				Out	30		30				
2	28/11/2020	Cormorant	*Phalacrocorax carbo*	4		10.25	In	25	5	20				
2	28/11/2020	Cormorant	*Phalacrocorax carbo*				Out	21		21				
2	28/11/2020	Cormorant	*Phalacrocorax carbo*	1		12.06	Out	71				71		
2	20/12/2020	Cormorant	*Phalacrocorax carbo*	1		11.27	Out	49	49					
2	29/12/2020	Cormorant	*Phalacrocorax carbo*	1		9.20	In	10	4	6				
2	29/12/2020	Cormorant	*Phalacrocorax carbo*	1		11.17	In	10		10				
2	29/12/2020	Cormorant	*Phalacrocorax carbo*	6		N/A								On flooded fields on site.
2	19/12/2020	Cormorant	*Phalacrocorax carbo*	1		11.51	In	65	10	55				
2	30/12/2020	Cormorant	*Phalacrocorax carbo*	1		15.03	In	152		152				
2	29/12/2020	Cormorant	*Phalacrocorax carbo*	1		13.20	In	91		91				
2	30/12/2020	Cormorant	*Phalacrocorax carbo*	11		9.40	In	120			120			
2	14/01/2021	Cormorant	*Phalacrocorax carbo*	6		9.07	Out	22		22				
2	14/01/2021	Cormorant	*Phalacrocorax carbo*	2		10.02	Out	17		17				
2	14/01/2021	Cormorant	*Phalacrocorax carbo*	1		11.26	Out	24		24				
2	14/01/2021	Cormorant	*Phalacrocorax carbo*	2		11.31	In	49		49				
2	14/01/2021	Cormorant	*Phalacrocorax carbo*	1		11.44	In	41		41				5 in roost
2	26/01/2021	Cormorant	*Phalacrocorax carbo*	2		15.35	In	14		14				
2	17/01/2021	Cormorant	*Phalacrocorax carbo*	1		10.14	In	140			140			
2	17/01/2021	Cormorant	*Phalacrocorax carbo*				Out	30			30			
2	28/01/2021	Cormorant	*Phalacrocorax carbo*	1		12:48	In	16		16				
2	05/02/2021	Cormorant	*Phalacrocorax carbo*	5		08:27	In	25		25				
2	05/02/2021	Cormorant	*Phalacrocorax carbo*	7		08:55	Out	15		15				

VP no.	Date	Common Name	Scientific Name	Species Quantity	Sex	Time of Observation	Inside / Outside Buffer	Total Duration (s)	0-20 m (s)	20-50 m (s)	50-100 m (s)	100-200 m (s)	>200 m (s)	Notes
2	22/02/2021	Cormorant	*Phalacrocorax carbo*	4		09:15	In	20		20				
2	22/02/2021	Cormorant	*Phalacrocorax carbo*	4		09:34	In	16		16				
2	22/02/2021	Cormorant	*Phalacrocorax carbo*	4		09:34	Out	20		20				
2	18/02/2021	Cormorant	*Phalacrocorax carbo*	2		13:51	In	78		78				
2	18/02/2021	Cormorant	*Phalacrocorax carbo*	1		15:51	In	51		51				
2	18/02/2021	Cormorant	*Phalacrocorax carbo*	1		15:51	Out	20		20				
2	27/02/2021	Cormorant	*Phalacrocorax carbo*	1		09:45	In	27		27				
2	27/02/2021	Cormorant	*Phalacrocorax carbo*	2		10:12	In	90		90				
2	27/02/2021	Cormorant	*Phalacrocorax carbo*	2		10:12	Out	12		12				
2	27/02/2021	Cormorant	*Phalacrocorax carbo*	2		12:04	In	79			79			
2	16/02/2021	Cormorant	*Phalacrocorax carbo*	2		17:24	In	27		27				
2	08/03/2021	Cormorant	*Phalacrocorax carbo*	1		11:10	Out	8		8				
2	22/03/2021	Cormorant	*Phalacrocorax carbo*	1		14:12	In	33		33				
2	22/03/2021	Cormorant	*Phalacrocorax carbo*	3		15:50	In	26		26				
2	23/03/2021	Cormorant	*Phalacrocorax carbo*	2		09:23	In	35		35				
2	05/11/2020	Golden Plover	*Pluvialis apricaria*	200		11.03	Out	77				45	32	
3	19/11/2020	Golden Plover	*Pluvialis apricaria*	20		13.16	Out	74				74		
3	19/11/2020	Golden Plover	*Pluvialis apricaria*	220		14.49	In	86			86			
3	19/11/2020	Golden Plover	*Pluvialis apricaria*	200		15.08	In	220					220	
3	28/11/2020	Golden Plover	*Pluvialis apricaria*	500		11.43	Out	216		20	10	10	176	
3	28/11/2020	Golden Plover	*Pluvialis apricaria*	600		12.34	In	206				206		
3	28/11/2020	Golden Plover	*Pluvialis apricaria*				Out	420				420		
3	28/11/2020	Golden Plover	*Pluvialis apricaria*	600		12.55	Out	75			75			

VP no.	Date	Common Name	Scientific Name	Species Quantity	Sex	Time of Observation	Inside / Outside Buffer	Total Duration (s)	0-20 m (s)	20-50 m (s)	50-100 m (s)	100-200 m (s)	>200 m (s)	Notes
3	28/11/2020	Golden Plover	*Pluvialis apricaria*	600		13.01	In	250				250		
3	28/11/2020	Golden Plover	*Pluvialis apricaria*				Out	53			53			
1	15/12/2020	Golden Plover	*Pluvialis apricaria*	25		11.06	In	38			38			
1	15/12/2020	Golden Plover	*Pluvialis apricaria*				Out	30				30		
2	11/12/2020	Golden Plover	*Pluvialis apricaria*	1		9.19	In	57		57				
2	11/12/2020	Golden Plover	*Pluvialis apricaria*				Out	20		20				
2	11/12/2020	Golden Plover	*Pluvialis apricaria*	700		10.00	Out	440	10	30	60	140	200	Estimate
2	11/12/2020	Golden Plover	*Pluvialis apricaria*	700		10.08	Out	236	10	30	60	136		Estimate
2	11/12/2020	Golden Plover	*Pluvialis apricaria*	700		10.20	Out	344	10	30	60	244		Train passed
2	11/12/2020	Golden Plover	*Pluvialis apricaria*	700		10.42	Out							Train passed
2	11/12/2020	Golden Plover	*Pluvialis apricaria*	700		10.57	Out	385	10	30	145	200		
2	11/12/2020	Golden Plover	*Pluvialis apricaria*	700		11.07	Out	369	10	20	339			
2	11/12/2020	Golden Plover	*Pluvialis apricaria*	350		11.14	Out	51	10	20	21			
2	11/12/2020	Golden Plover	*Pluvialis apricaria*	700		11.24	Out	397	10	30	60	297		
2	11/12/2020	Golden Plover	*Pluvialis apricaria*	700		11.46	Out	106	10	20	76			
2	19/12/2020	Golden Plover	*Pluvialis apricaria*	700		10.02	Out	180	10	20	60	90		
2	24/12/2020	Golden Plover	*Pluvialis apricaria*	250		9.21	Out	202	10	20	60	112		
2	24/12/2020	Golden Plover	*Pluvialis apricaria*	300		9.35	Out	245	10	20	60	155		
2	24/12/2020	Golden Plover	*Pluvialis apricaria*	13		10.24	In	95			95			
2	24/12/2020	Golden Plover	*Pluvialis apricaria*				Out	20	10	10				
2	24/12/2020	Golden Plover	*Pluvialis apricaria*	500		11.52	Out	87	10	20	57			
2	24/12/2020	Golden Plover	*Pluvialis apricaria*	700		12.05	Out	95	10	20	65			
2	30/12/2020	Golden Plover	*Pluvialis apricaria*	450		13.50	Out	265	10	20	60	75	100	

VP no.	Date	Common Name	Scientific Name	Species Quantity	Sex	Time of Observation	Inside / Outside Buffer	Total Duration (s)	0-20 m (s)	20-50 m (s)	50-100 m (s)	100-200 m (s)	>200 m (s)	Notes
2	30/12/2020	Golden Plover	*Pluvialis apricaria*	450		14.50	Out	76	10	20	46			
2	30/12/2020	Golden Plover	*Pluvialis apricaria*	650		15.32	Out	237	10	20	60	60	87	
3	11/12/2020	Golden Plover	*Pluvialis apricaria*	700		12.37	Out	376	10	30	60	276		
3	11/12/2020	Golden Plover	*Pluvialis apricaria*	350		12.47	Out	100	10	20	70			
3	11/12/2020	Golden Plover	*Pluvialis apricaria*	700		12.49	In	120				120		
3	11/12/2020	Golden Plover	*Pluvialis apricaria*				Out	320	10	30	60	220		
3	11/12/2020	Golden Plover	*Pluvialis apricaria*	700		13.02	Out	555	10	30	60	455		
3	11/12/2020	Golden Plover	*Pluvialis apricaria*	400		13.27	Out	391	10	30	60	291		Train
3	11/12/2020	Golden Plover	*Pluvialis apricaria*	700		13.29	Out	287	10	30	60	187		Train
3	11/12/2020	Golden Plover	*Pluvialis apricaria*	700		13.34	In	214			60	154		
3	11/12/2020	Golden Plover	*Pluvialis apricaria*				Out	40	10	30				
3	11/12/2020	Golden Plover	*Pluvialis apricaria*	20		14.24	In	12				12		
3	15/12/2020	Golden Plover	*Pluvialis apricaria*	22		13.15	Out	18		18				
3	15/12/2020	Golden Plover	*Pluvialis apricaria*	200		14.16	Out	67				67		
3	15/12/2020	Golden Plover	*Pluvialis apricaria*	350		14.56	Out	867					867	
3	29/12/2020	Golden Plover	*Pluvialis apricaria*	60		12.20	In	155				155		
3	29/12/2020	Golden Plover	*Pluvialis apricaria*				Out	30				30		
3	30/12/2020	Golden Plover	*Pluvialis apricaria*	200		9.18	In	60				60		
3	30/12/2020	Golden Plover	*Pluvialis apricaria*				Out	114				114		
3	30/12/2020	Golden Plover	*Pluvialis apricaria*	200		9.24	In	213					213	
3	30/12/2020	Golden Plover	*Pluvialis apricaria*				Out	20		20				
3	30/12/2020	Golden Plover	*Pluvialis apricaria*	35		9.53	In	127			127			
3	30/12/2020	Golden Plover	*Pluvialis apricaria*				Out	219			219			

VP no.	Date	Common Name	Scientific Name	Species Quantity	Sex	Time of Observation	Inside / Outside Buffer	Total Duration (s)	0-20 m (s)	20-50 m (s)	50-100 m (s)	100-200 m (s)	>200 m (s)	Notes
3	30/12/2020	Golden Plover	*Pluvialis apricaria*	450		10.10	Out	75	10	20	45			Train
3	30/12/2020	Golden Plover	*Pluvialis apricaria*	450		10.19	Out	40	5	10	25			
3	30/12/2020	Golden Plover	*Pluvialis apricaria*	450		11.23	Out	169		30	139			
3	30/12/2020	Golden Plover	*Pluvialis apricaria*	15		11.54	In	28	10	18				
3	30/12/2020	Golden Plover	*Pluvialis apricaria*	450		11.58	Out	265	10	30	60	165		
2	17/01/2021	Golden Plover	*Pluvialis apricaria*	500		10.42	Out	175	10	20	145			
2	17/01/2021	Golden Plover	*Pluvialis apricaria*	700		11.11	Out	183	10	20	153			
2	17/01/2021	Golden Plover	*Pluvialis apricaria*	350		11:24	Out	44	10	20	14			
2	28/01/2021	Golden Plover	*Pluvialis apricaria*	300		12:31	Out	470		70	400			
2	28/01/2021	Golden Plover	*Pluvialis apricaria*	50		12:35	Out	26				26		
3	14/01/2021	Golden Plover	*Pluvialis apricaria*	700		12:36	Out	129			129			
3	14/01/2021	Golden Plover	*Pluvialis apricaria*	700		12:36	In	112			112			
3	14/01/2021	Golden Plover	*Pluvialis apricaria*	700		12:40	Out	149		149				
3	14/01/2021	Golden Plover	*Pluvialis apricaria*	700		12:40	In	77		77				
3	14/01/2021	Golden Plover	*Pluvialis apricaria*	700		12:44	Out	13		13				
3	14/01/2021	Golden Plover	*Pluvialis apricaria*	700		12:44	In	10		10				
3	14/01/2021	Golden Plover	*Pluvialis apricaria*	700		13:00	In	80		20	60			
3	14/01/2021	Golden Plover	*Pluvialis apricaria*	700		13:00	Out	20	10	10				
3	14/01/2021	Golden Plover	*Pluvialis apricaria*	400		13:15	In	37		37				
3	14/01/2021	Golden Plover	*Pluvialis apricaria*	400		13:15	Out	10	10					
3	14/01/2021	Golden Plover	*Pluvialis apricaria*	300		13:20	In	61	10	20	31			
3	14/01/2021	Golden Plover	*Pluvialis apricaria*	500		13:55	In	43	10	33				
3	14/01/2021	Golden Plover	*Pluvialis apricaria*	700		13:56	In	301			301			

VP no.	Date	Common Name	Scientific Name	Species Quantity	Sex	Time of Observation	Inside / Outside Buffer	Total Duration (s)	0-20 m (s)	20-50 m (s)	50-100 m (s)	100-200 m (s)	>200 m (s)	Notes
3	14/01/2021	Golden Plover	*Pluvialis apricaria*	700		13:56	Out	55	10	45				
3	14/01/2021	Golden Plover	*Pluvialis apricaria*	2		15:16	In	95	30	65				
3	14/01/2021	Golden Plover	*Pluvialis apricaria*	700		15:24	In	189			189			
3	14/01/2021	Golden Plover	*Pluvialis apricaria*	700		15:24	Out	64		20	44			
3	28/05/2021	Golden Plover	*Pluvialis apricaria*	130		09:26	Out	104			104			
3	28/06/2021	Golden Plover	*Pluvialis apricaria*	130		09:26	In	100			100			
3	28/10/2021	Golden Plover	*Pluvialis apricaria*	400		09:57	Out	228				228		
3	28/11/2021	Golden Plover	*Pluvialis apricaria*	400		09:57	In	111				111		
3	28/01/2022	Golden Plover	*Pluvialis apricaria*	250		10:04	Out	228					228	
3	28/02/2022	Golden Plover	*Pluvialis apricaria*	250		10:04	In	240					240	
3	28/03/2022	Golden Plover	*Pluvialis apricaria*	120		10:17	Out	342				342		
3	28/04/2022	Golden Plover	*Pluvialis apricaria*	400		10:27	Out	351				351		
3	28/05/2022	Golden Plover	*Pluvialis apricaria*	400		10:27	In	175				175		
3	28/06/2022	Golden Plover	*Pluvialis apricaria*	400		10:38	Out	125				126		
3	28/07/2022	Golden Plover	*Pluvialis apricaria*	400		10:40	Out	104			104			
3	28/08/2022	Golden Plover	*Pluvialis apricaria*	600		10:43	Out	210				210		
3	28/12/2022	Golden Plover	*Pluvialis apricaria*	70		11:04	In	96			96			
1	05/02/2021	Golden Plover	*Pluvialis apricaria*	30		09:31	Out	94				94		
1	22/02/2021	Golden Plover	*Pluvialis apricaria*	14		11:32	In	15		15				
1	22/02/2021	Golden Plover	*Pluvialis apricaria*	14		11:32	Out	20		20				
1	22/02/2021	Golden Plover	*Pluvialis apricaria*	1		11:51	In	17	17					
3	04/02/2021	Golden Plover	*Pluvialis apricaria*	300		10:27	In	381		81	100	200		
3	04/02/2021	Golden Plover	*Pluvialis apricaria*	300		11:09	Out	166			166			

VP no.	Date	Common Name	Scientific Name	Species Quantity	Sex	Time of Observation	Inside / Outside Buffer	Total Duration (s)	0-20 m (s)	20-50 m (s)	50-100 m (s)	100-200 m (s)	>200 m (s)	Notes
3	16/02/2021	Golden Plover	*Pluvialis apricaria*	350		14:48	In	300				300		
3	16/02/2021	Golden Plover	*Pluvialis apricaria*	350		14:48	Out	73				73		
3	16/02/2021	Golden Plover	*Pluvialis apricaria*	120		15:06	Out	290			50	240		
3	16/02/2021	Golden Plover	*Pluvialis apricaria*	120		15:06	In	27		27				
3	16/02/2021	Golden Plover	*Pluvialis apricaria*	80		15:15	Out	100				100		
3	16/02/2021	Golden Plover	*Pluvialis apricaria*	80		15:15	In	72				72		
2	30/03/2021	Golden Plover	*Pluvialis apricaria*	5		10:59	Out	44			44			
1	05/11/2020	Grey Heron	*Ardea cinerea*	1		13.02	In	27	27					
3	19/11/2020	Grey Heron	*Ardea cinerea*	1		12.53	Out	83		83				
3	19/11/2020	Grey Heron	*Ardea cinerea*	1		14.16	In	19	19					
1	15/12/2020	Grey Heron	*Ardea cinerea*	2		10.47	In	17		17				
1	15/12/2020	Grey Heron	*Ardea cinerea*				Out	10		10				
1	20/12/2020	Grey Heron	*Ardea cinerea*	1		11.14	In	52	52					
1	29/12/2020	Grey Heron	*Ardea cinerea*	5		N/A								On flooded fields on site.
2	19/12/2020	Grey Heron	*Ardea cinerea*	1		9.25	In	26		26				
2	19/12/2020	Grey Heron	*Ardea cinerea*	1		11.43	Out	76		76				
1	14/01/2021	Grey Heron	*Ardea cinerea*	1		9.31	In	15	7	8				
2	17/01/2021	Grey Heron	*Ardea cinerea*	1		10.12	Out	46		46				
2	17/01/2021	Grey Heron	*Ardea cinerea*	5		10.27	In	167			167			
2	17/01/2021	Grey Heron	*Ardea cinerea*	1		11:39	In	134		134				
3	14/01/2021	Grey Heron	*Ardea cinerea*	1		12:34	Out	22	22					
1	22/02/2021	Grey Heron	*Ardea cinerea*	6		10:26	Out	123		123				
2	27/02/2021	Grey Heron	*Ardea cinerea*	2		09:54	In	18		18				

VP no.	Date	Common Name	Scientific Name	Species Quantity	Sex	Time of Observation	Inside / Outside Buffer	Total Duration (s)	0-20 m (s)	20-50 m (s)	50-100 m (s)	100-200 m (s)	>200 m (s)	Notes
1	08/03/2021	Grey Heron	*Ardea cinerea*	2		11:17	In	71		71				
2	30/03/2021	Grey Heron	*Ardea cinerea*	1		09:05	In	27		27				
3	24/03/2021	Grey Heron	*Ardea cinerea*	1		09:42	Out	148		148				
2	24/12/2020	Hen Harrier	*Circus cyaneus*	1	M	11.18	Out	137				137		
2	05/11/2020	Kestrel	*Falco tinnunculus*	1		9.06	Out	55		55				
2	19/11/2020	Kestrel	*Falco tinnunculus*	1	F	10.36	In	201		201				Hunting
2	19/11/2020	Kestrel	*Falco tinnunculus*	1	M	10.51	In	8	8					
3	19/11/2020	Kestrel	*Falco tinnunculus*	1		14.12	In	58	58					
3	19/11/2020	Kestrel	*Falco tinnunculus*	1		14.17	In	17	17					
3	28/11/2020	Kestrel	*Falco tinnunculus*	1		11.42	Out	5	5					
1	04/12/2020	Kestrel	*Falco tinnunculus*	1		12.12	In	65			65			Mobbing BZ (Obs. 3 above)
1	04/12/2020	Kestrel	*Falco tinnunculus*	1	F	13.06	Out	246		246				Hunting
1	15/12/2020	Kestrel	*Falco tinnunculus*	1		9.34	Out	25		25				
1	15/12/2020	Kestrel	*Falco tinnunculus*	1	F	9.38	Out	11	11					
1	15/12/2020	Kestrel	*Falco tinnunculus*	1	F	9.39	Out	11	11					
1	15/12/2020	Kestrel	*Falco tinnunculus*	1	F	10.19	Out	25	25					
1	15/12/2020	Kestrel	*Falco tinnunculus*	1		10.44	In	42	42					
1	15/12/2020	Kestrel	*Falco tinnunculus*	1		11.33	Out	10	10					
1	20/12/2020	Kestrel	*Falco tinnunculus*	1	F	10.45	In	33	33					
1	29/12/2020	Kestrel	*Falco tinnunculus*	1		10.10	Out	17		17				
2	11/12/2020	Kestrel	*Falco tinnunculus*	1		9.26	In	25	25					
2	11/12/2020	Kestrel	*Falco tinnunculus*	1	M	11.40	In	76		76				
2	19/12/2020	Kestrel	*Falco tinnunculus*	1	M	9.10	In	294		294				Hunting

VP no.	Date	Common Name	Scientific Name	Species Quantity	Sex	Time of Observation	Inside / Outside Buffer	Total Duration (s)	0-20 m (s)	20-50 m (s)	50-100 m (s)	100-200 m (s)	>200 m (s)	Notes
2	19/12/2020	Kestrel	*Falco tinnunculus*	1	M	9.29	In	53		53				
2	19/12/2020	Kestrel	*Falco tinnunculus*	1	M	9.31	In	178		178				
2	19/12/2020	Kestrel	*Falco tinnunculus*	1		9.45	In	13	13					
2	19/12/2020	Kestrel	*Falco tinnunculus*	1		10.59	In	129		129				
2	24/12/2020	Kestrel	*Falco tinnunculus*	1	M	11.35	In	45	45					
2	24/12/2020	Kestrel	*Falco tinnunculus*	2	M	11.45	Out	23	23					
2	30/12/2020	Kestrel	*Falco tinnunculus*	1		14.53	In	84		84				
2	30/12/2020	Kestrel	*Falco tinnunculus*	1		14.56	In	91		91				
2	30/12/2020	Kestrel	*Falco tinnunculus*	1		15.28	In	66	10	56				
3	11/12/2020	Kestrel	*Falco tinnunculus*	1	M	13.39	Out	41	41					
3	11/12/2020	Kestrel	*Falco tinnunculus*	1	M	13.59	Out	25	25					
3	15/12/2020	Kestrel	*Falco tinnunculus*	1		12.58	Out	59		59				
3	15/12/2020	Kestrel	*Falco tinnunculus*	1		13.01	In	75	20	55				
3	15/12/2020	Kestrel	*Falco tinnunculus*	1		13.23	Out	20		20				
3	15/12/2020	Kestrel	*Falco tinnunculus*	1		13.46	Out	28		28				
3	15/12/2020	Kestrel	*Falco tinnunculus*	1	M	14.15	Out	272		272				
3	15/12/2020	Kestrel	*Falco tinnunculus*	1	M	14.21	Out	37		37				
3	30/12/2020	Kestrel	*Falco tinnunculus*	1		9.31	Out	6		6				
3	30/12/2020	Kestrel	*Falco tinnunculus*	1		10.44	In	51		51				
3	30/12/2020	Kestrel	*Falco tinnunculus*	1		11.43	In	30		30				
3	30/12/2020	Kestrel	*Falco tinnunculus*	1		12.10	In	27		27				
1	14/01/2021	Kestrel	*Falco tinnunculus*	1		9.00	Out	40		40				
1	14/01/2021	Kestrel	*Falco tinnunculus*	1	M	9.56	In	182		182				

VP no.	Date	Common Name	Scientific Name	Species Quantity	Sex	Time of Observation	Inside / Outside Buffer	Total Duration (s)	0-20 m (s)	20-50 m (s)	50-100 m (s)	100-200 m (s)	>200 m (s)	Notes
1	14/01/2021	Kestrel	*Falco tinnunculus*	1		10.31	In	33		33				
1	14/01/2021	Kestrel	*Falco tinnunculus*	1		10.36	In	38		38				
1	14/01/2021	Kestrel	*Falco tinnunculus*	1		11.17	Out	10	10					
1	14/01/2021	Kestrel	*Falco tinnunculus*	1		11.41	Out	16		16				
1	26/01/2021	Kestrel	*Falco tinnunculus*	1	F	13.36	In	17		17				
1	26/01/2021	Kestrel	*Falco tinnunculus*	1	F	13.40	Out	44		44				
1	26/01/2021	Kestrel	*Falco tinnunculus*	1	F	13.42	Out	23		23				
1	26/01/2021	Kestrel	*Falco tinnunculus*	1	F	13.46	In	110		110				
1	26/01/2021	Kestrel	*Falco tinnunculus*				Out	23		23				
1	26/01/2021	Kestrel	*Falco tinnunculus*	1	F	14.30	In	58		58				
1	26/01/2021	Kestrel	*Falco tinnunculus*	1	F	15.01	In	41		41				
1	26/01/2021	Kestrel	*Falco tinnunculus*	1	F	15.05	Out	20		20				
2	17/01/2021	Kestrel	*Falco tinnunculus*	1		10.24	In	37		37				
2	17/01/2021	Kestrel	*Falco tinnunculus*	1	M	10.56	In	38		38				
2	17/01/2021	Kestrel	*Falco tinnunculus*	1		11:31	In	136		30	106			
2	17/01/2021	Kestrel	*Falco tinnunculus*	1	M	12:26	In	29		29				
2	17/01/2021	Kestrel	*Falco tinnunculus*	1	M	12:29	In	80		80				
2	28/01/2021	Kestrel	*Falco tinnunculus*	1	M	11:54	In	42		42				
2	28/01/2021	Kestrel	*Falco tinnunculus*	1	F	11:59	In	57		57				
2	28/01/2021	Kestrel	*Falco tinnunculus*	1	M	14:09	In	27		27				
2	28/01/2021	Kestrel	*Falco tinnunculus*	1	M	14:10	In	15		15				
3	14/01/2021	Kestrel	*Falco tinnunculus*	1		13:28	Out	47		47				
3	14/01/2021	Kestrel	*Falco tinnunculus*	1	M	14:44	Out	20	20					

VP no.	Date	Common Name	Scientific Name	Species Quantity	Sex	Time of Observation	Inside / Outside Buffer	Total Duration (s)	0-20 m (s)	20-50 m (s)	50-100 m (s)	100-200 m (s)	>200 m (s)	Notes
3	14/01/2021	Kestrel	*Falco tinnunculus*	1	F	14:50	In	233		30	203			
3	14/01/2021	Kestrel	*Falco tinnunculus*	1	F	15:03	Out	33		33				
3	14/01/2021	Kestrel	*Falco tinnunculus*	1	F	15:19	In	70		70				
3	28/03/2021	Kestrel	*Falco tinnunculus*	1		09:04	Out	21		21				
1	05/02/2021	Kestrel	*Falco tinnunculus*	1		09:58	In	18		18				
1	05/02/2021	Kestrel	*Falco tinnunculus*	1		11:05	Out	17		17				
1	22/02/2021	Kestrel	*Falco tinnunculus*	1		11:15	In	188	188					
2	18/02/2021	Kestrel	*Falco tinnunculus*	1		15:38	In	156		156				
2	18/02/2021	Kestrel	*Falco tinnunculus*	1		15:45	In	49		49				
3	16/02/2021	Kestrel	*Falco tinnunculus*	1		15:57	Out	86			86			
3	16/02/2021	Kestrel	*Falco tinnunculus*	1		17:11	In	17	17					
1	08/03/2021	Kestrel	*Falco tinnunculus*	1		12:20	Out	72		72				
1	08/03/2021	Kestrel	*Falco tinnunculus*	1		12:22	Out	42		42				
1	08/03/2021	Kestrel	*Falco tinnunculus*	1		12:32	Out	21		21				
1	08/03/2021	Kestrel	*Falco tinnunculus*	1		12:32	In	30		30				
1	22/03/2021	Kestrel	*Falco tinnunculus*	1		14:03	Out	92		92				
1	22/03/2021	Kestrel	*Falco tinnunculus*	1		14:21	In	22		22				
1	22/03/2021	Kestrel	*Falco tinnunculus*	1		16:12	In	34		34				
2	23/03/2021	Kestrel	*Falco tinnunculus*	1		10:47	Out	44		44				
2	23/03/2021	Kestrel	*Falco tinnunculus*	1		11:49	Out	21		21				
2	30/03/2021	Kestrel	*Falco tinnunculus*	1		09:01	In	28		28				
2	30/03/2021	Kestrel	*Falco tinnunculus*	1		09:04	Out	14		14				
2	30/03/2021	Kestrel	*Falco tinnunculus*	1		10:16	In	35		35				

VP no.	Date	Common Name	Scientific Name	Species Quantity	Sex	Time of Observation	Inside / Outside Buffer	Total Duration (s)	0-20 m (s)	20-50 m (s)	50-100 m (s)	100-200 m (s)	>200 m (s)	Notes
2	30/03/2021	Kestrel	*Falco tinnunculus*	1		11:18	In	186		186				
2	30/03/2021	Kestrel	*Falco tinnunculus*	1		12:21	Out	15		15				
3	16/03/2021	Kestrel	*Falco tinnunculus*	1		10:31	In	28		28				
3	16/03/2021	Kestrel	*Falco tinnunculus*	1		11:02	In	29		29				
3	24/03/2021	Kestrel	*Falco tinnunculus*	1		08:55	Out	14		14				
3	24/03/2021	Kestrel	*Falco tinnunculus*	1		10:24	In	134		134				
3	24/03/2021	Kestrel	*Falco tinnunculus*	1		10:31	Out	15	15					
3	24/03/2021	Kestrel	*Falco tinnunculus*	1		11:15	In	28		28				
2	19/11/2020	Lapwing	*Vanellus vanellus*	200		9.36	In	45			45			
2	19/11/2020	Lapwing	*Vanellus vanellus*				Out	90				90		
3	19/11/2020	Lapwing	*Vanellus vanellus*	50		14.23	In	54		54				
3	19/11/2020	Lapwing	*Vanellus vanellus*	400		15.08	Out	245	40	205				
3	28/11/2020	Lapwing	*Vanellus vanellus*	400		11.50	Out	241		10	10		221	
3	28/11/2020	Lapwing	*Vanellus vanellus*	28		11.58	In	45			45			
3	28/11/2020	Lapwing	*Vanellus vanellus*				Out	209				209		
3	28/11/2020	Lapwing	*Vanellus vanellus*	10		12.04	In	99			40	59		
3	28/11/2020	Lapwing	*Vanellus vanellus*	30		12.56	Out	125		30	95			
3	28/11/2020	Lapwing	*Vanellus vanellus*	200		14.19	Out	168		40	128			
1	15/12/2020	Lapwing	*Vanellus vanellus*	12		11.13	In	27	27					
1	15/12/2020	Lapwing	*Vanellus vanellus*	8		11.17	In	26		26				
1	20/12/2020	Lapwing	*Vanellus vanellus*	1		10.10	In	42	5	37				
1	20/12/2020	Lapwing	*Vanellus vanellus*	5		10.24	In	20		20				
1	20/12/2020	Lapwing	*Vanellus vanellus*				Out	22		22				

VP no.	Date	Common Name	Scientific Name	Species Quantity	Sex	Time of Observation	Inside / Outside Buffer	Total Duration (s)	0-20 m (s)	20-50 m (s)	50-100 m (s)	100-200 m (s)	>200 m (s)	Notes
1	29/12/2020	Lapwing	*Vanellus vanellus*	2		10.16	In	92			92			
1	29/12/2020	Lapwing	*Vanellus vanellus*	90		11.33	Out	114		44	70			
1	29/12/2020	Lapwing	*Vanellus vanellus*	40		11.39	In	22			22			
1	29/12/2020	Lapwing	*Vanellus vanellus*				Out	55			55			
1	29/12/2020	Lapwing	*Vanellus vanellus*	30		11.50	In	90	10	80				
1	29/12/2020	Lapwing	*Vanellus vanellus*	45		N/A								On flooded fields on site.
2	11/12/2020	Lapwing	*Vanellus vanellus*	300		10.20	Out	80	25	55				
2	11/12/2020	Lapwing	*Vanellus vanellus*	300		10.57	Out	360	10	20	330			
2	19/12/2020	Lapwing	*Vanellus vanellus*	250		10.15	Out	179	10	10	159			
2	19/12/2020	Lapwing	*Vanellus vanellus*	300		11.19	Out	112	10	20	82			
2	19/12/2020	Lapwing	*Vanellus vanellus*	150		11.27	In	158				158		
2	19/12/2020	Lapwing	*Vanellus vanellus*				Out	260				260		
2	19/12/2020	Lapwing	*Vanellus vanellus*	150		11.35	Out	422	10	20	60	332		
2	19/12/2020	Lapwing	*Vanellus vanellus*	150		11.46	Out	71	10	61				
2	19/12/2020	Lapwing	*Vanellus vanellus*	150		12.03	Out	109	10	20	79			
2	24/12/2020	Lapwing	*Vanellus vanellus*	300		9.21	Out	120	10	20	90			
2	24/12/2020	Lapwing	*Vanellus vanellus*	250		9.35	Out	245	10	20	215			
2	24/12/2020	Lapwing	*Vanellus vanellus*	300		9.40	Out	104	10	20	74			
2	24/12/2020	Lapwing	*Vanellus vanellus*	300		9.43	Out	206	10	20	176			
2	24/12/2020	Lapwing	*Vanellus vanellus*	300		9.52	Out	72	10	62				
2	24/12/2020	Lapwing	*Vanellus vanellus*	30		10.34	In	32		32				
2	24/12/2020	Lapwing	*Vanellus vanellus*				Out	10	10					
2	24/12/2020	Lapwing	*Vanellus vanellus*	300		10.42	Out	93	10	83				

VP no.	Date	Common Name	Scientific Name	Species Quantity	Sex	Time of Observation	Inside / Outside Buffer	Total Duration (s)	0-20 m (s)	20-50 m (s)	50-100 m (s)	100-200 m (s)	>200 m (s)	Notes
2	24/12/2020	Lapwing	*Vanellus vanellus*	300		11.44	Out	128	10	20	98			
2	24/12/2020	Lapwing	*Vanellus vanellus*	300		11.50	Out	46	10	36				
2	30/12/2020	Lapwing	*Vanellus vanellus*	400		13.12	Out	101	10	20	71			
2	30/12/2020	Lapwing	*Vanellus vanellus*	400		13.50	Out	265	10	20	60	175		
2	30/12/2020	Lapwing	*Vanellus vanellus*	18		14.14	Out	91	5	10	76			
2	30/12/2020	Lapwing	*Vanellus vanellus*	400		14.31	Out	42	5	37				
2	30/12/2020	Lapwing	*Vanellus vanellus*	400		14.46	Out	75	5	70				
3	11/12/2020	Lapwing	*Vanellus vanellus*	350		14.07	Out	47	10	37				
3	11/12/2020	Lapwing	*Vanellus vanellus*	350		14.17	Out	351	10	30	60	251		
3	11/12/2020	Lapwing	*Vanellus vanellus*	400		12.25	Out	131	10	30	60	31		
3	11/12/2020	Lapwing	*Vanellus vanellus*	12		14.43	In	39		39				
3	11/12/2020	Lapwing	*Vanellus vanellus*				Out	40		40				
3	15/12/2020	Lapwing	*Vanellus vanellus*	300		13.17	Out	84	10	20	54			
3	15/12/2020	Lapwing	*Vanellus vanellus*	12		14.04	In	16		16				
3	15/12/2020	Lapwing	*Vanellus vanellus*				Out	10	10					
3	29/12/2020	Lapwing	*Vanellus vanellus*	400		13.29	In	110		50	60			
3	29/12/2020	Lapwing	*Vanellus vanellus*				Out	101	10	50	41			
3	29/12/2020	Lapwing	*Vanellus vanellus*	500		14.20	In	598			85	513		
3	29/12/2020	Lapwing	*Vanellus vanellus*				Out	231			46	185		
3	29/12/2020	Lapwing	*Vanellus vanellus*	500		14.36	In	528			38	380	110	
3	29/12/2020	Lapwing	*Vanellus vanellus*				Out	305				163	142	
3	29/12/2020	Lapwing	*Vanellus vanellus*	500		15.21	Out	525				325	200	
3	29/12/2020	Lapwing	*Vanellus vanellus*	150		15.35	In	71		21	50			

VP no.	Date	Common Name	Scientific Name	Species Quantity	Sex	Time of Observation	Inside / Outside Buffer	Total Duration (s)	0-20 m (s)	20-50 m (s)	50-100 m (s)	100-200 m (s)	>200 m (s)	Notes
3	30/12/2020	Lapwing	*Vanellus vanellus*	24		10.04	Out	136	10	20	106			
3	30/12/2020	Lapwing	*Vanellus vanellus*	1		10.40	In	84			84			
3	30/12/2020	Lapwing	*Vanellus vanellus*	40		11.26	Out	48		48				
3	30/12/2020	Lapwing	*Vanellus vanellus*	1		11.35	In	42	5	37				
3	30/12/2020	Lapwing	*Vanellus vanellus*	400		11.58	Out	275	10	30	235			
1	14/01/2021	Lapwing	*Vanellus vanellus*	5		10.42	In	21			21			
2	17/01/2021	Lapwing	*Vanellus vanellus*	120		10.37	Out	26	10	16				
2	17/01/2021	Lapwing	*Vanellus vanellus*	250		11.22	Out	84	10	20	153			
2	28/01/2021	Lapwing	*Vanellus vanellus*	70		12:43	Out	132		132				
2	28/01/2021	Lapwing	*Vanellus vanellus*	120		13:27	Out	63			63			
3	14/01/2021	Lapwing	*Vanellus vanellus*	70		12:54	Out	20	10	10				
3	14/01/2021	Lapwing	*Vanellus vanellus*	70		12:54	In	18		18				
3	28/07/2021	Lapwing	*Vanellus vanellus*	200		09:26	Out	34			34			
3	28/08/2021	Lapwing	*Vanellus vanellus*	200		09:26	In	90			90			
3	28/09/2021	Lapwing	*Vanellus vanellus*	125		09:31	Out	791	10	20	761			
3	28/09/2022	Lapwing	*Vanellus vanellus*	200		10:43	Out	138				138		
3	28/10/2022	Lapwing	*Vanellus vanellus*	200		10:43	In	112				112		
3	28/11/2022	Lapwing	*Vanellus vanellus*	200		10:48	In	279				279		
3	28/01/2023	Lapwing	*Vanellus vanellus*	200		11:16	In	45			45			
3	28/02/2023	Lapwing	*Vanellus vanellus*	200		11:16	Out	70			70			
1	05/02/2021	Lapwing	*Vanellus vanellus*	100		08:51	In	330			330			
1	05/02/2021	Lapwing	*Vanellus vanellus*	100		08:51	Out	20			20			
1	05/02/2021	Lapwing	*Vanellus vanellus*	100		08:57	In	57			57			

VP no.	Date	Common Name	Scientific Name	Species Quantity	Sex	Time of Observation	Inside / Outside Buffer	Total Duration (s)	0-20 m (s)	20-50 m (s)	50-100 m (s)	100-200 m (s)	>200 m (s)	Notes
1	05/02/2021	Lapwing	*Vanellus vanellus*	100		08:57	Out	39			39			
1	05/02/2021	Lapwing	*Vanellus vanellus*	100		09:00	Out	13			13			
1	05/02/2021	Lapwing	*Vanellus vanellus*	100		09:00	In	110		10	100			
1	05/02/2021	Lapwing	*Vanellus vanellus*	100		09:06	In	48		48				On flooded field beside the Suir - 10 WS, 3 MS, 1 ET
1	05/02/2021	Lapwing	*Vanellus vanellus*	100		09:59	Out	10		10				
1	05/02/2021	Lapwing	*Vanellus vanellus*	100		09:59	In	101		101				
1	22/02/2021	Lapwing	*Vanellus vanellus*	5		09:48	In	22		22				
1	22/02/2021	Lapwing	*Vanellus vanellus*	5		11:26	In	10		10				
1	22/02/2021	Lapwing	*Vanellus vanellus*	5		11:26	Out	14		14				
2	18/02/2021	Lapwing	*Vanellus vanellus*	80		14:00	Out	289		50	239			
3	04/02/2021	Lapwing	*Vanellus vanellus*	120		09:57	Out	120			120			
3	04/02/2021	Lapwing	*Vanellus vanellus*	120		09:57	In	43		43				
3	04/02/2021	Lapwing	*Vanellus vanellus*	120		10:10	In	234		34	50	150		
3	04/02/2021	Lapwing	*Vanellus vanellus*	300		10:37	In	51				51		
3	04/02/2021	Lapwing	*Vanellus vanellus*	300		10:37	Out	130				130		
3	04/02/2021	Lapwing	*Vanellus vanellus*	350		10:47	Out	213			213			
3	04/02/2021	Lapwing	*Vanellus vanellus*	40		11:07	Out	90			90			
3	04/02/2021	Lapwing	*Vanellus vanellus*	40		11:07	In	208			208			
3	04/02/2021	Lapwing	*Vanellus vanellus*	300		11:35	Out	620		120	500			
3	04/02/2021	Lapwing	*Vanellus vanellus*	350		11:50	Out	354				354		
3	04/02/2021	Lapwing	*Vanellus vanellus*	350		11:56	Out	135			135			
3	04/02/2021	Lapwing	*Vanellus vanellus*	350		12:02	Out	55		55				

VP no.	Date	Common Name	Scientific Name	Species Quantity	Sex	Time of Observation	Inside / Outside Buffer	Total Duration (s)	0-20 m (s)	20-50 m (s)	50-100 m (s)	100-200 m (s)	>200 m (s)	Notes
3	04/02/2021	Lapwing	*Vanellus vanellus*	18		12:05	In	107	27	80				
1	05/11/2020	Lesser Black-backed Gull	*Larus fuscus*	5		12.42	In	24		24				Flying NE
1	05/11/2020	Lesser Black-backed Gull	*Larus fuscus*				Out	45		45				
1	05/11/2020	Lesser Black-backed Gull	*Larus fuscus*	4		12.52	Out	17	17					Flying NE
1	05/11/2020	Lesser Black-backed Gull	*Larus fuscus*	1		13.12	Out	22			22			Flying NE
1	05/11/2020	Lesser Black-backed Gull	*Larus fuscus*	1		15.02	Out	39			39			Flying SW
1	05/11/2020	Lesser Black-backed Gull	*Larus fuscus*	5		15.08	In	34	14	20				
3	15/12/2020	Lesser Black-backed Gull	*Larus fuscus*	1		14.53	In	117				117		
1	22/02/2021	Lesser Black-backed Gull	*Larus fuscus*	21		09:08	In	50				50		
1	22/02/2021	Lesser Black-backed Gull	*Larus fuscus*	21		09:08	Out	31				31		
2	18/02/2021	Lesser Black-backed Gull	*Larus fuscus*	2		14:14	Out	22		22				
2	18/02/2021	Lesser Black-backed Gull	*Larus fuscus*	2		14:14	In	40		40				
2	27/02/2021	Lesser Black-backed Gull	*Larus fuscus*	18		10:19	Out	146			146			
3	16/02/2021	Lesser Black-backed Gull	*Larus fuscus*	1		16:51	Out	61			61			
1	05/11/2020	Little Egret	*Egretta garzetta*	1		13.17	In	19	19					

VP no.	Date	Common Name	Scientific Name	Species Quantity	Sex	Time of Observation	Inside / Outside Buffer	Total Duration (s)	0-20 m (s)	20-50 m (s)	50-100 m (s)	100-200 m (s)	>200 m (s)	Notes
2	05/11/2020	Little Egret	*Egretta garzetta*	2		10.33	In	19	19					
2	19/11/2020	Little Egret	*Egretta garzetta*	1		9.28	In	17	17					
1	29/12/2020	Little Egret	*Egretta garzetta*	1		N/A								On flooded fields on site.
2	11/12/2020	Little Egret	*Egretta garzetta*	2		10.38	In	27	27					
2	30/12/2020	Little Egret	*Egretta garzetta*	1		13.57	In	52		52				
2	30/12/2020	Little Egret	*Egretta garzetta*	1		14.18	In	46		46				
1	14/01/2021	Little Egret	*Egretta garzetta*	1		9.53	In	20		20				
1	26/01/2021	Little Egret	*Egretta garzetta*	1		13.17	Out	17	17					
1	26/01/2021	Little Egret	*Egretta garzetta*	1		15.21	Out	16	16					
1	05/02/2021	Little Egret	*Egretta garzetta*	1		10:28	In	12	12					
1	22/02/2021	Little Egret	*Egretta garzetta*	2		11:14	In	13	13					
2	18/02/2021	Little Egret	*Egretta garzetta*	1		14:52	In	11	11					
2	18/02/2021	Little Egret	*Egretta garzetta*	1		16:00	In	22	22					
1	22/03/2021	Little Egret	*Egretta garzetta*	3		13:27	Out	10	10					
1	22/03/2021	Little Egret	*Egretta garzetta*	3		13:27	In	19		19				
1	22/03/2021	Little Egret	*Egretta garzetta*	1		13:53	Out	10		10				
1	22/03/2021	Little Egret	*Egretta garzetta*	4		14:16	In	44	44					
2	11/12/2020	Merlin	*Falco columbarius*	1		10.55	In	10		10				Chased by HC
2	11/12/2020	Merlin	*Falco columbarius*				Out	17		17				
2	24/12/2020	Merlin	*Falco columbarius*	1	M	9.45	In	14	14					
3	11/12/2020	Merlin	*Falco columbarius*	1		14.00	Out	18	18					
3	11/12/2020	Merlin	*Falco columbarius*	1		14.09	Out	9	9					
3	28/12/2021	Merlin	*Falco columbarius*	1		10:01	Out	15	15					

VP no.	Date	Common Name	Scientific Name	Species Quantity	Sex	Time of Observation	Inside / Outside Buffer	Total Duration (s)	0-20 m (s)	20-50 m (s)	50-100 m (s)	100-200 m (s)	>200 m (s)	Notes
3	16/02/2021	Merlin	*Falco columbarius*	1		14:54	Out	22	22					
1	28/11/2020	Mute Swan	*Cygnus olor*	1		8.56	In	14		14				
2	05/11/2020	Mute Swan	*Cygnus olor*	6		11.22	In	24	24					2 adults
3	19/11/2020	Mute Swan	*Cygnus olor*	1		13.41	Out	71	20	51				
3	28/11/2020	Mute Swan	*Cygnus olor*	1		13.11	Out	131			131			
1	20/12/2020	Mute Swan	*Cygnus olor*	6		12.14	In	40		40				
1	20/12/2020	Mute Swan	*Cygnus olor*				Out	19		19				
1	29/12/2020	Mute Swan	*Cygnus olor*	3		N/A								On flooded fields on site.
2	19/12/2020	Mute Swan	*Cygnus olor*	7		9.30	In	54	54					
2	19/12/2020	Mute Swan	*Cygnus olor*	4		9.37	In	52	52					
2	24/12/2020	Mute Swan	*Cygnus olor*	2		9.28	In	20	20					
2	30/12/2020	Mute Swan	*Cygnus olor*	3		15.25	Out	23		23				
3	30/12/2020	Mute Swan	*Cygnus olor*	3		11.41	Out	58	10	48				
3	28/01/2021	Mute Swan	*Cygnus olor*	2		08:42	Out	30		30				
3	28/02/2021	Mute Swan	*Cygnus olor*	2		08:42	In	34		34				
2	27/02/2021	Mute Swan	*Cygnus olor*	2		09:56	In	71		71				
2	27/02/2021	Mute Swan	*Cygnus olor*	2		09:56	Out	30		30				
2	27/02/2021	Mute Swan	*Cygnus olor*	2		10:18	In	85			85			
2	27/02/2021	Mute Swan	*Cygnus olor*	2		10:18	Out	10			10			
3	19/11/2020	Peregrine	*Falco peregrinus*	1		14.08	Out	18		18				
2	30/12/2020	Peregrine	*Falco peregrinus*	1		13.32	In	129		129				
1	14/01/2021	Peregrine	*Falco peregrinus*	2		11.58	In	45	5	40				Calling
3	16/03/2021	Peregrine	*Falco peregrinus*	1		12:19	Out	69		69				Soaring

VP no.	Date	Common Name	Scientific Name	Species Quantity	Sex	Time of Observation	Inside / Outside Buffer	Total Duration (s)	0-20 m (s)	20-50 m (s)	50-100 m (s)	100-200 m (s)	>200 m (s)	Notes
3	16/03/2021	Peregrine	*Falco peregrinus*	1		12:21	Out	279			279			Displaying
1	28/11/2020	Snipe	*Gallinago gallinago*	1		10.51	Out	3	3					
1	04/12/2020	Snipe	*Gallinago gallinago*	1		13.00	Out	6	6					
2	11/12/2020	Snipe	*Gallinago gallinago*	3		9.04	Out	17	17					
2	19/12/2020	Snipe	*Gallinago gallinago*	1		9.28	Out	6	6					
1	22/03/2021	Snipe	*Gallinago gallinago*	2		14:45	Out	5	5					
2	30/03/2021	Snipe	*Gallinago gallinago*	2		08:44	Out	6	6					
2	30/03/2021	Snipe	*Gallinago gallinago*	1		09:18	Out	18	18					
3	28/11/2020	Sparrowhawk	*Accipiter nisus*	1		11.33	Out	39	39					Hunting
3	28/11/2020	Sparrowhawk	*Accipiter nisus*	1		12.21	Out	12	12					
1	04/12/2020	Sparrowhawk	*Accipiter nisus*	1		14.05	Out	17	17					Hunting
1	15/12/2020	Sparrowhawk	*Accipiter nisus*	3		11.37	In	72		72				2 x F, 1 x M
1	15/12/2020	Sparrowhawk	*Accipiter nisus*	3		11.41	In	71		48				
1	15/12/2020	Sparrowhawk	*Accipiter nisus*	1		11.46	In	48		48				Hunting
2	19/12/2020	Sparrowhawk	*Accipiter nisus*	1		10.28	In	138		138				Mobbed by magpies
2	24/12/2020	Sparrowhawk	*Accipiter nisus*	1	M	10.59	In	46	46					
2	24/12/2020	Sparrowhawk	*Accipiter nisus*	1		11.33	In	26	26					
2	30/12/2020	Sparrowhawk	*Accipiter nisus*	1		12.58	In	17	17					
3	30/12/2020	Sparrowhawk	*Accipiter nisus*	1	F	9.37	In	47		47				
3	30/12/2020	Sparrowhawk	*Accipiter nisus*	1	F	11.29	Out	117		117				
3	30/12/2020	Sparrowhawk	*Accipiter nisus*	1	F	11.31	Out	24		24				
3	30/12/2020	Sparrowhawk	*Accipiter nisus*	1	F	11.34	Out	26		26				
1	26/01/2021	Sparrowhawk	*Accipiter nisus*	1		14.41	In	21			21			
1	26/01/2021	Sparrowhawk	*Accipiter nisus*	1		14.44	In	24		24				

VP no.	Date	Common Name	Scientific Name	Species Quantity	Sex	Time of Observation	Inside / Outside Buffer	Total Duration (s)	0-20 m (s)	20-50 m (s)	50-100 m (s)	100-200 m (s)	>200 m (s)	Notes
2	17/01/2021	Sparrowhawk	*Accipiter nisus*	2		10.53	In	36		36				
2	17/01/2021	Sparrowhawk	*Accipiter nisus*	1	M	11:44	In	25	25					
2	28/01/2021	Sparrowhawk	*Accipiter nisus*	1		13:48	In	17	17					
3	14/01/2021	Sparrowhawk	*Accipiter nisus*	1	M	13:17	Out	15	15					
3	14/01/2021	Sparrowhawk	*Accipiter nisus*	1	M	13:18	Out	11	11					
2	18/02/2021	Sparrowhawk	*Accipiter nisus*	1		15:10	In	7	7					
2	27/02/2021	Sparrowhawk	*Accipiter nisus*	1		10:55	Out	26			26			
2	27/02/2021	Sparrowhawk	*Accipiter nisus*	1		11:46	In	28			28			
3	04/02/2021	Sparrowhawk	*Accipiter nisus*	1		12:29	In	7	7					
1	08/03/2021	Sparrowhawk	*Accipiter nisus*	1		13:39	Out	12	12					
2	23/03/2021	Sparrowhawk	*Accipiter nisus*	1		10:!9	In	14	14					
2	30/03/2021	Sparrowhawk	*Accipiter nisus*	1		10:03	In	15	15					Hunting
1	15/12/2020	Whooper Swan	*Cygnus cygnus*	2		9.50	In	9	9					2 Adults
1	15/12/2020	Whooper Swan	*Cygnus cygnus*				Out	10	10					
1	15/12/2020	Whooper Swan	*Cygnus cygnus*	5		10.35	In	10	10					2 adults and 3 Juveniles
1	15/12/2020	Whooper Swan	*Cygnus cygnus*				Out	11	11					
1	20/12/2020	Whooper Swan	*Cygnus cygnus*	5		9.58	In	10	10					
1	20/12/2020	Whooper Swan	*Cygnus cygnus*				Out	22		22				
1	29/12/2020	Whooper Swan	*Cygnus cygnus*	4		9.59	In	19	10	9				
1	29/12/2020	Whooper Swan	*Cygnus cygnus*	12		N/A								On flooded fields on site.
3	30/12/2020	Whooper Swan	*Cygnus cygnus*	2		10.06	In	22	10	12				
3	28/04/2021	Whooper Swan	*Cygnus cygnus*	5		09:16	In	36	10	26				
1	05/02/2021	Whooper Swan	*Cygnus cygnus*	2		09:44	In	35		35				
1	29/12/2020	Wigeon	*Anas penelope*	7		N/A								On flooded fields on site.

Summer Survey 2021 Bird Flightline Data

VP no.	Date	Common Name	Latin Name	Species Quantity	Sex	Time of Observation	Inside / Outside Buffer	Total Duration (s)	0-20 m (s)	20-50 m (s)	50-100 m (s)	100-200 m (s)	>200 m (s)	Notes
1	24/04/2021	Black-headed Gull	*Chroicocephalus ridibundus*	4		11:14	Out	20		20				
1	24/04/2021	Black-headed Gull	*Chroicocephalus ridibundus*	4		11:14	In	108		108				
1	24/04/2021	Black-headed Gull	*Chroicocephalus ridibundus*	6		11:22	Out	92		92				
1	25/05/2021	Black-headed Gull	*Chroicocephalus ridibundus*	4		17:03	Out	71		71				
1	25/05/2021	Black-headed Gull	*Chroicocephalus ridibundus*	2		17:41	Out	68		68				
1	30/05/2021	Black-headed Gull	*Chroicocephalus ridibundus*	8		14:20	Out	24		24				
3	31/05/2021	Black-headed Gull	*Chroicocephalus ridibundus*	1		15:18	Out	10		10				
3	31/05/2021	Black-headed Gull	*Chroicocephalus ridibundus*	1		15:18	In	35		35				
3	15/06/2021	Black-headed Gull	*Chroicocephalus ridibundus*	1		15.41	out	173		173				
3	15/06/2021	Black-headed Gull	*Chroicocephalus ridibundus*	1		16.38	out	32	32					
1	08/04/2021	Buzzard	*Buteo buteo*	1		10:25	In	32			32			
1	08/04/2021	Buzzard	*Buteo buteo*	2		10:34	In	349				349		
1	08/04/2021	Buzzard	*Buteo buteo*	3		10:43	In	109			109			

VP no.	Date	Common Name	Latin Name	Species Quantity	Sex	Time of Observation	Inside / Outside Buffer	Total Duration (s)	0-20 m (s)	20-50 m (s)	50-100 m (s)	100-200 m (s)	>200 m (s)	Notes
1	08/04/2021	Buzzard	*Buteo buteo*	1		12:05	Out	37			37			
1	08/04/2021	Buzzard	*Buteo buteo*	1		12:26	In	77				77		
1	24/04/2021	Buzzard	*Buteo buteo*	1		10:57	Out	35		35				
1	24/04/2021	Buzzard	*Buteo buteo*	1		11:33	In	151			151			
1	24/04/2021	Buzzard	*Buteo buteo*	1		12:00	Out	270				100	170	
1	24/04/2021	Buzzard	*Buteo buteo*	1		13:21	Out	49			49			
2	15/04/2021	Buzzard	*Buteo buteo*	2		12:01	In	194				194		
2	15/04/2021	Buzzard	*Buteo buteo*	2		12:30	In	21				21		
2	15/04/2021	Buzzard	*Buteo buteo*	1		12:45	In	103				103		
2	15/04/2021	Buzzard	*Buteo buteo*	1		14:07	In	144			144			
2	15/04/2021	Buzzard	*Buteo buteo*	1		14:37	In	54			54			
2	21/04/2021	Buzzard	*Buteo buteo*	2		11:55	In	94				94		
2	21/04/2021	Buzzard	*Buteo buteo*	3		12:15	In	120			120			
2	21/04/2021	Buzzard	*Buteo buteo*	1		12:22	In	90				90		
2	21/04/2021	Buzzard	*Buteo buteo*	1		12:28	In	85			85			
2	21/04/2021	Buzzard	*Buteo buteo*	2		13:11	In	24			24			
2	21/04/2021	Buzzard	*Buteo buteo*	2		13:44	Out	61		61				
3	14/04/2021	Buzzard	*Buteo buteo*	1		13:03	Out	34			34			
3	14/04/2021	Buzzard	*Buteo buteo*	1		13:41	In	185				185		
3	14/04/2021	Buzzard	*Buteo buteo*	1		14:10	In	107				107		
3	14/04/2021	Buzzard	*Buteo buteo*	1		14:38	Out	63		63				

VP no.	Date	Common Name	Latin Name	Species Quantity	Sex	Time of Observation	Inside / Outside Buffer	Total Duration (s)	0-20 m (s)	20-50 m (s)	50-100 m (s)	100-200 m (s)	>200 m (s)	Notes
3	28/04/2021	Buzzard	*Buteo buteo*	1		15:45	In	61			61			
3	28/04/2021	Buzzard	*Buteo buteo*	1		15:56	Out	14		14				
3	28/04/2021	Buzzard	*Buteo buteo*	1		16:38	Out	19			19			
3	28/04/2021	Buzzard	*Buteo buteo*	1		16:40	In	37				37		
3	28/04/2021	Buzzard	*Buteo buteo*	1		16:58	Out	104		104				
3	28/04/2021	Buzzard	*Buteo buteo*	1		17:39	In	71			71			
3	28/04/2021	Buzzard	*Buteo buteo*	1		17:43	Out	37		37				
1	25/05/2021	Buzzard	*Buteo buteo*	1		16:35	In	91			91			
1	25/05/2021	Buzzard	*Buteo buteo*	1		17:11	Out	26			26			
1	25/05/2021	Buzzard	*Buteo buteo*	1		17:13	Out	15			15			
1	25/05/2021	Buzzard	*Buteo buteo*	1		18:12	In	112			112			
1	25/05/2021	Buzzard	*Buteo buteo*	1		18:18	Out	46		46				
1	30/05/2021	Buzzard	*Buteo buteo*	1		14:11	In	106			106			
1	30/05/2021	Buzzard	*Buteo buteo*	1		14:22	In	58		58				
1	30/05/2021	Buzzard	*Buteo buteo*	1		14:54	In	180			180			
1	30/05/2021	Buzzard	*Buteo buteo*	1		14:54	Out	59			59			
1	30/05/2021	Buzzard	*Buteo buteo*	1		15:31	In	168			168			
1	30/05/2021	Buzzard	*Buteo buteo*	1		16:28	Out	57	57					
2	26/05/2021	Buzzard	*Buteo buteo*	1		17:59	Out	30		30				
2	26/05/2021	Buzzard	*Buteo buteo*	1		18:10	In	12	12					
2	26/05/2021	Buzzard	*Buteo buteo*	1		19:03	Out	36		36				

VP no.	Date	Common Name	Latin Name	Species Quantity	Sex	Time of Observation	Inside / Outside Buffer	Total Duration (s)	0-20 m (s)	20-50 m (s)	50-100 m (s)	100-200 m (s)	>200 m (s)	Notes
2	26/05/2021	Buzzard	*Buteo buteo*	1		19:!7	In	68	68					
2	26/05/2021	Buzzard	*Buteo buteo*	1		19:56	In	121		121				
2	30/05/2021	Buzzard	*Buteo buteo*	1		17:43	In	46						
2	30/05/2021	Buzzard	*Buteo buteo*	1		18:40	In	149		149				
2	30/05/2021	Buzzard	*Buteo buteo*	1		19:20	Out	27	27					
3	11/05/2021	Buzzard	*Buteo buteo*	1		09:10	Out	60	60					
3	11/05/2021	Buzzard	*Buteo buteo*	3		09:38	Out	264			264			
3	11/05/2021	Buzzard	*Buteo buteo*	1		09:55	In	114			114			
3	11/05/2021	Buzzard	*Buteo buteo*	1		10:26	Out	31		31				
3	11/05/2021	Buzzard	*Buteo buteo*	3		11:36	In	48			48			
3	11/05/2021	Buzzard	*Buteo buteo*	1		11:47	Out	17		17				
3	31/05/2021	Buzzard	*Buteo buteo*	1		14:41	Out	34		34				
3	31/05/2021	Buzzard	*Buteo buteo*	4		14:49	Out	77			77			
3	31/05/2021	Buzzard	*Buteo buteo*	1		14:55	Out	43	43					
3	31/05/2021	Buzzard	*Buteo buteo*	1		15:05	In	32		32				
3	31/05/2021	Buzzard	*Buteo buteo*	1		15:10	In	27		27				
3	31/05/2021	Buzzard	*Buteo buteo*	1		15:21	In	138			138			
3	31/05/2021	Buzzard	*Buteo buteo*	1		15:40	Out	158			158			
3	31/05/2021	Buzzard	*Buteo buteo*	1		16:23	Out	150		150				
3	15/06/2021	Buzzard	*Buteo buteo*	1		15.08	out	51		51				
3	15/06/2021	Buzzard	*Buteo buteo*	1		15.16	in	130	130					

VP no.	Date	Common Name	Latin Name	Species Quantity	Sex	Time of Observation	Inside / Outside Buffer	Total Duration (s)	0-20 m (s)	20-50 m (s)	50-100 m (s)	100-200 m (s)	>200 m (s)	Notes
3	15/06/2021	Buzzard	*Buteo buteo*	1		15.31	out	186		186				
3	15/06/2021	Buzzard	*Buteo buteo*	1		16.15	out	137		137				
3	15/06/2021	Buzzard	*Buteo buteo*	1		16.39	In	203			203			
3	15/06/2021	Buzzard	*Buteo buteo*	3		17.23	in	110		110				
2	17/06/2021	Buzzard	*Buteo buteo*	2		13.44	out	161			161			
2	17/06/2021	Buzzard	*Buteo buteo*	1		14.59	in	54		54				
2	17/06/2021	Buzzard	*Buteo buteo*	1		15.16	in	43		43				
2	17/06/2021	Buzzard	*Buteo buteo*	1		15.55	out	78		78				
1	19/06/2021	Buzzard	*Buteo buteo*	1		8:52	in	10		10				
1	19/06/2021	Buzzard	*Buteo buteo*	1		8:52	out	12		12				
1	19/06/2021	Buzzard	*Buteo buteo*	1		10.16	out	30		30				
1	19/06/2021	Buzzard	*Buteo buteo*	1		10.16	in	44		44				
1	19/06/2021	Buzzard	*Buteo buteo*	1		10.56	in	13		13				
1	19/06/2021	Buzzard	*Buteo buteo*	1		11.09	in	124			124			
3	25/06/2021	Buzzard	*Buteo buteo*	1		10.56	out	42	42					
3	25/06/2021	Buzzard	*Buteo buteo*	1		11.02	in	28		28				
3	25/06/2021	Buzzard	*Buteo buteo*	1		11.05	out	117			117			
3	25/06/2021	Buzzard	*Buteo buteo*	1		11.09	out	67		67				
3	25/06/2021	Buzzard	*Buteo buteo*	1		11.18	out	35	35					
3	25/06/2021	Buzzard	*Buteo buteo*	1		11.21	in	26			26			
3	25/06/2021	Buzzard	*Buteo buteo*	1		11.26	in	215		215				

VP no.	Date	Common Name	Latin Name	Species Quantity	Sex	Time of Observation	Inside / Outside Buffer	Total Duration (s)	0-20 m (s)	20-50 m (s)	50-100 m (s)	100-200 m (s)	>200 m (s)	Notes
3	25/06/2021	Buzzard	*Buteo buteo*	1		11.45	in	24		24				
2	30/06/2021	Buzzard	*Buteo buteo*	1		10.56	in	68			68			
2	30/06/2021	Buzzard	*Buteo buteo*	2		11.12	out	45			45			
1	30/06/2021	Buzzard	*Buteo buteo*	1		19.23	out	15		15				
1	30/06/2021	Buzzard	*Buteo buteo*	1		19.41	out	12		12				
2	15/07/2021	Buzzard	*Buteo buteo*	1		11.51	out	74		74				
2	15/07/2021	Buzzard	*Buteo buteo*	1		12.43	out	42		42				
2	15/07/2021	Buzzard	*Buteo buteo*	1		13.17	in	33		33				
1	15/07/2021	Buzzard	*Buteo buteo*	1		15.05	out	19		19				
1	15/07/2021	Buzzard	*Buteo buteo*	1		16.23	in	77			77			
1	15/07/2021	Buzzard	*Buteo buteo*	1		17.21	out	34			34			
3	19/07/2021	Buzzard	*Buteo buteo*	1		10.24	in	164			164			
3	19/07/2021	Buzzard	*Buteo buteo*	1		10.24	out	49			49			
3	19/07/2021	Buzzard	*Buteo buteo*	1		11.02	in	100		100				
3	19/07/2021	Buzzard	*Buteo buteo*	1		11.51	in	241			241			
3	19/07/2021	Buzzard	*Buteo buteo*	1		11.55	out	476			476			
3	19/07/2021	Buzzard	*Buteo buteo*	1		12.04	out	191		191				
2	21/07/2021	Buzzard	*Buteo buteo*	1		9.32	in	91			91			very warm
2	21/07/2021	Buzzard	*Buteo buteo*	1		10.44	out	122			122			
1	24/07/2021	Buzzard	*Buteo buteo*	1		11.06	in	38		38				
1	24/07/2021	Buzzard	*Buteo buteo*	1		11.28	out	55		55				

VP no.	Date	Common Name	Latin Name	Species Quantity	Sex	Time of Observation	Inside / Outside Buffer	Total Duration (s)	0-20 m (s)	20-50 m (s)	50-100 m (s)	100-200 m (s)	>200 m (s)	Notes
3	24/07/2021	Buzzard	*Buteo buteo*	2		12.48	out	275		275				
3	24/07/2021	Buzzard	*Buteo buteo*	1		13.41	out	23	23					
3	24/07/2021	Buzzard	*Buteo buteo*	1		13.48	in	84		84				
3	24/07/2021	Buzzard	*Buteo buteo*	1		14.08	out	41		41				
3	24/07/2021	Buzzard	*Buteo buteo*	1		14.42	out	134			134			
2	26/07/2021	Buzzard	*Buteo buteo*	1		10.07	in	44		44				
2	26/07/2021	Buzzard	*Buteo buteo*	1		10.28	out	44			44			
3	26/07/2021	Buzzard	*Buteo buteo*	1		12.07	out	39		39				
3	26/07/2021	Buzzard	*Buteo buteo*	1		13.16	in	93			93			
3	26/07/2021	Buzzard	*Buteo buteo*	1		14.07	out	143			143			
1	29/07/2021	Buzzard	*Buteo buteo*	1		12.17	in	141			141			
1	29/07/2021	Buzzard	*Buteo buteo*	1		12.17	out	62			62			
1	29/07/2021	Buzzard	*Buteo buteo*	1		12.47	in	27	27					
1	29/07/2021	Buzzard	*Buteo buteo*	2		13.28	in	27		27				
1	29/07/2021	Buzzard	*Buteo buteo*	1		14.31	out	104		104				
1	29/07/2021	Buzzard	*Buteo buteo*	1		14.51	in	41		41				
2	10/08/2021	Buzzard	*Buteo buteo*	1		9.48	in	12	12					
2	10/08/2021	Buzzard	*Buteo buteo*	1		10.07	in	46		46				
2	10/08/2021	Buzzard	*Buteo buteo*	1		11.11	out	51			51			
3	10/08/2021	Buzzard	*Buteo buteo*	1		13.46	in	180		180				
3	10/08/2021	Buzzard	*Buteo buteo*	1		13.46	out	210		210				

VP no.	Date	Common Name	Latin Name	Species Quantity	Sex	Time of Observation	Inside / Outside Buffer	Total Duration (s)	0-20 m (s)	20-50 m (s)	50-100 m (s)	100-200 m (s)	>200 m (s)	Notes
3	10/08/2021	Buzzard	*Buteo buteo*	1		14.42	out	111		111				
3	10/08/2021	Buzzard	*Buteo buteo*	1		14.49	out	93			93			
3	10/08/2021	Buzzard	*Buteo buteo*	1		15.02	in	64		64				
2	24/08/2021	Buzzard	*Buteo buteo*	1		10.12	out	144			144			
2	24/08/2021	Buzzard	*Buteo buteo*	1		11.04	in	52		52				
2	24/08/2021	Buzzard	*Buteo buteo*	1		12.11	in	48		48				
1	24/08/2021	Buzzard	*Buteo buteo*	1		13.58	in	135			135			
1	24/08/2021	Buzzard	*Buteo buteo*	1		14.52	out	47		47				
1	24/08/2021	Buzzard	*Buteo buteo*	1		15.17	in	83		83				
1	24/08/2021	Buzzard	*Buteo buteo*	1		15.56	out	38		38				
3	24/08/2021	Buzzard	*Buteo buteo*	1		16.37	out	52	52					Dog walker on site near VP
3	24/08/2021	Buzzard	*Buteo buteo*	2		16.55	out	193		193				
3	24/08/2021	Buzzard	*Buteo buteo*	1		17.26	out	290				290		
3	24/08/2021	Buzzard	*Buteo buteo*	1		18.55	in	51		51				
1	26/08/2021	Buzzard	*Buteo buteo*	1		11.25	out	176				176		
1	26/08/2021	Buzzard	*Buteo buteo*	2		12.11	in	73		73				
2	26/08/2021	Buzzard	*Buteo buteo*	1		13.22	out	24	24					
2	26/08/2021	Buzzard	*Buteo buteo*	1		13.33	in	287			287			
2	26/08/2021	Buzzard	*Buteo buteo*	2		13.57	in	16	16					
2	26/08/2021	Buzzard	*Buteo buteo*	1		14.27	out	33		33				
2	26/08/2021	Buzzard	*Buteo buteo*	1		14.39	out	26		26				

VP no.	Date	Common Name	Latin Name	Species Quantity	Sex	Time of Observation	Inside / Outside Buffer	Total Duration (s)	0-20 m (s)	20-50 m (s)	50-100 m (s)	100-200 m (s)	>200 m (s)	Notes
2	26/08/2021	Buzzard	*Buteo buteo*	1		15.11	in	20	20					
1	02/09/2021	Buzzard	*Buteo buteo*	1		9.58	out	18	18					
1	02/09/2021	Buzzard	*Buteo buteo*	1		10.31	out	137			137			
1	02/09/2021	Buzzard	*Buteo buteo*	2		11.11	in	58		58				
1	02/09/2021	Buzzard	*Buteo buteo*	1		12.18	in	46			46			
3	02/09/2021	Buzzard	*Buteo buteo*	1		13.11	out	26		26				
3	02/09/2021	Buzzard	*Buteo buteo*	2		13.36	out	137			137			
3	02/09/2021	Buzzard	*Buteo buteo*	2		14.28	in	188			188			
3	02/09/2021	Buzzard	*Buteo buteo*	1		15.13	in	58		58				
1	08/04/2021	Cormorant	*Phalacrocorax carbo*	1		10:08	Out	7		7				
1	08/04/2021	Cormorant	*Phalacrocorax carbo*	1		10:08	In	30		30				
3	10/08/2021	Curlew	*Numenius arquata*	1		13.53	out	157			157			
1	08/04/2021	Grey Heron	*Ardea cinerea*	1		09:48	In	20		20				
1	08/04/2021	Grey Heron	*Ardea cinerea*	1		09:48	Out	11		11				
1	08/04/2021	Grey Heron	*Ardea cinerea*	1		09:53	Out	39		39				
1	08/04/2021	Grey Heron	*Ardea cinerea*	1		09:53	In	30		30				
1	24/04/2021	Grey Heron	*Ardea cinerea*	1		12:26	In	23		23				
2	15/04/2021	Grey Heron	*Ardea cinerea*	1		12:03	In	22		22				
2	21/04/2021	Grey Heron	*Ardea cinerea*	1		11:43	Out	48		48				
3	14/04/2021	Grey Heron	*Ardea cinerea*	1		12:40	In	227		227				
3	28/04/2021	Grey Heron	*Ardea cinerea*	1		16:22	Out	30		30				

VP no.	Date	Common Name	Latin Name	Species Quantity	Sex	Time of Observation	Inside / Outside Buffer	Total Duration (s)	0-20 m (s)	20-50 m (s)	50-100 m (s)	100-200 m (s)	>200 m (s)	Notes
3	28/04/2021	Grey Heron	*Ardea cinerea*	1		16:22	In	146		146				
1	25/05/2021	Grey Heron	*Ardea cinerea*	1		17:57	In	32		32				
2	26/05/2021	Grey Heron	*Ardea cinerea*	1		19:47	In	51		51				
2	30/05/2021	Grey Heron	*Ardea cinerea*	1		17:50	In	100			100			
3	11/05/2021	Grey Heron	*Ardea cinerea*	1		09:34	In	30		30				
3	11/05/2021	Grey Heron	*Ardea cinerea*	1		09:34	Out	139		139				
3	11/05/2021	Grey Heron	*Ardea cinerea*	1		10:50	In	20		20				
3	31/05/2021	Grey Heron	*Ardea cinerea*	1		16:51	In	17		17				
3	15/06/2021	Grey Heron	*Ardea cinerea*	1		17.11	in	34	34					
2	17/06/2021	Grey Heron	*Ardea cinerea*	1		14.04	out	53	53					
1	30/06/2021	Grey Heron	*Ardea cinerea*	1		18.07	in	15		15				
1	29/07/2021	Grey Heron	*Ardea cinerea*	1		14.02	in	13	13					
2	24/08/2021	Grey Heron	*Ardea cinerea*	2		9.38	in	21	21					
3	24/08/2021	Grey Heron	*Ardea cinerea*	1		18.18	in	26		26				
1	02/09/2021	Grey Heron	*Ardea cinerea*	1		9.38	in	13	13					
3	02/09/2021	Grey Heron	*Ardea cinerea*	1		13.22	in	16		16				
3	02/09/2021	Grey Heron	*Ardea cinerea*	1		15.44	in	29		29				
2	15/04/2021	Herring Gull	*Larus argentatus*	1		13:40	In	39		39				
1	08/04/2021	Kestrel	*Falco tinnunculus*	1	M	11:39	Out	42		42				
1	08/04/2021	Kestrel	*Falco tinnunculus*	1		12:36	In	14	14					
1	24/04/2021	Kestrel	*Falco tinnunculus*	1	M	12:51	Out	34		34				

VP no.	Date	Common Name	Latin Name	Species Quantity	Sex	Time of Observation	Inside / Outside Buffer	Total Duration (s)	0-20 m (s)	20-50 m (s)	50-100 m (s)	100-200 m (s)	>200 m (s)	Notes
2	15/04/2021	Kestrel	*Falco tinnunculus*	2		12:04	In	57		57				
2	15/04/2021	Kestrel	*Falco tinnunculus*	1		12:21	Out	165		165				
2	15/04/2021	Kestrel	*Falco tinnunculus*	1		12:58	In	338		338				
2	21/04/2021	Kestrel	*Falco tinnunculus*	1		11:31	Out	66		66				
2	21/04/2021	Kestrel	*Falco tinnunculus*	1		11:37	Out	76		76				
2	21/04/2021	Kestrel	*Falco tinnunculus*	1		11:41	Out	169		169				
2	21/04/2021	Kestrel	*Falco tinnunculus*	1		13:27	Out	179		179				
2	21/04/2021	Kestrel	*Falco tinnunculus*	1		14:09	In	27		27				
3	14/04/2021	Kestrel	*Falco tinnunculus*	1	M	12:09	Out	16		16				
3	14/04/2021	Kestrel	*Falco tinnunculus*	1	M	13:26	Out	10		10				
3	14/04/2021	Kestrel	*Falco tinnunculus*	1	M	13:34	Out	146		146				
3	28/04/2021	Kestrel	*Falco tinnunculus*	1		15:25	In	93		93				
3	28/04/2021	Kestrel	*Falco tinnunculus*	1		16:21	In	12		12				
3	28/04/2021	Kestrel	*Falco tinnunculus*	1		16:26	In	8		8				
3	28/04/2021	Kestrel	*Falco tinnunculus*	1		17:17	Out	23	23					
3	28/04/2021	Kestrel	*Falco tinnunculus*	1		17:28	Out	12	12					
1	25/05/2021	Kestrel	*Falco tinnunculus*	1	M	15:39	Out	19	19					
1	25/05/2021	Kestrel	*Falco tinnunculus*	1	M	15:40	In	44	44					
1	25/05/2021	Kestrel	*Falco tinnunculus*	1	M	15:40	Out	32	32					
1	25/05/2021	Kestrel	*Falco tinnunculus*	1	M	15:44	In	62	62					
1	25/05/2021	Kestrel	*Falco tinnunculus*	1	M	15:44	Out	30	30					

VP no.	Date	Common Name	Latin Name	Species Quantity	Sex	Time of Observation	Inside / Outside Buffer	Total Duration (s)	0-20 m (s)	20-50 m (s)	50-100 m (s)	100-200 m (s)	>200 m (s)	Notes
1	25/05/2021	Kestrel	*Falco tinnunculus*	1		16:50	Out	44		44				
1	25/05/2021	Kestrel	*Falco tinnunculus*	1	M	17:22	Out	26	26					
1	30/05/2021	Kestrel	*Falco tinnunculus*	1		15:59	In	170		170				
1	30/05/2021	Kestrel	*Falco tinnunculus*	2	M+F	16:17	Out	92		92				
1	30/05/2021	Kestrel	*Falco tinnunculus*	2	M+F	16:17	In	171		171				
1	30/05/2021	Kestrel	*Falco tinnunculus*	1	M	16:39	In	48	48					
1	30/05/2021	Kestrel	*Falco tinnunculus*	1	F	16:54	Out	34	34					
2	30/05/2021	Kestrel	*Falco tinnunculus*	1	M	17:15	Out	173		173				
2	30/05/2021	Kestrel	*Falco tinnunculus*	1	M	17:15	In	40		40				
2	30/05/2021	Kestrel	*Falco tinnunculus*	1	M	17:17	In	145	145					
2	30/05/2021	Kestrel	*Falco tinnunculus*	1	M	18:06	Out	243		243				
2	30/05/2021	Kestrel	*Falco tinnunculus*	1	F	18:33	Out	38						
2	30/05/2021	Kestrel	*Falco tinnunculus*	1	F	18:46	Out	120	120					
3	11/05/2021	Kestrel	*Falco tinnunculus*	1		10:21	Out	77	77					
3	11/05/2021	Kestrel	*Falco tinnunculus*	1		11:!4	Out	16		16				
3	31/05/2021	Kestrel	*Falco tinnunculus*	1		16:02	Out	52		52				
3	31/05/2021	Kestrel	*Falco tinnunculus*	1		16:07	Out	22		22				
2	17/06/2021	Kestrel	*Falco tinnunculus*	1		13.15	out	49	49					
2	17/06/2021	Kestrel	*Falco tinnunculus*	1		13.29	out	50	50					
2	17/06/2021	Kestrel	*Falco tinnunculus*	1		13.3	out	62	62					
2	17/06/2021	Kestrel	*Falco tinnunculus*	1	male	13.42	out	73	50					

VP no.	Date	Common Name	Latin Name	Species Quantity	Sex	Time of Observation	Inside / Outside Buffer	Total Duration (s)	0-20 m (s)	20-50 m (s)	50-100 m (s)	100-200 m (s)	>200 m (s)	Notes
2	17/06/2021	Kestrel	*Falco tinnunculus*	1	male	13.42	in		23					
2	17/06/2021	Kestrel	*Falco tinnunculus*	1	male	13.54	out	425	425					
2	17/06/2021	Kestrel	*Falco tinnunculus*	1		14.08	out	100	100					
2	17/06/2021	Kestrel	*Falco tinnunculus*	1		14.17	out	103	103					
2	17/06/2021	Kestrel	*Falco tinnunculus*	1		15.34	out	67	67					
2	17/06/2021	Kestrel	*Falco tinnunculus*	1		16.11	out	22	22					
1	19/06/2021	Kestrel	*Falco tinnunculus*	1		10.51	in	20	20					
1	19/06/2021	Kestrel	*Falco tinnunculus*	1	male	10.57	out	37	37					
1	19/06/2021	Kestrel	*Falco tinnunculus*	1		11:00	out	88	88					
3	25/06/2021	Kestrel	*Falco tinnunculus*	1		9.51	out	20		20				
3	25/06/2021	Kestrel	*Falco tinnunculus*	1		10.4	in	65		65				
3	25/06/2021	Kestrel	*Falco tinnunculus*	1		10.43	out	13		13				
3	25/06/2021	Kestrel	*Falco tinnunculus*	1		10.44	out	133			133			
3	25/06/2021	Kestrel	*Falco tinnunculus*	1		11.23	in	113		113				
2	30/06/2021	Kestrel	*Falco tinnunculus*	1	female	8.19	out	13	13					
2	30/06/2021	Kestrel	*Falco tinnunculus*	2		8.58	out	66	66					
2	30/06/2021	Kestrel	*Falco tinnunculus*	3		9.54	out	57	57					3 juveniles
2	30/06/2021	Kestrel	*Falco tinnunculus*	1		9.59	out	13	13					
2	30/06/2021	Kestrel	*Falco tinnunculus*	1		10.01	out	40	40					
2	30/06/2021	Kestrel	*Falco tinnunculus*	4		10.04	out	59						
2	30/06/2021	Kestrel	*Falco tinnunculus*	1		10.38	out	12						

VP no.	Date	Common Name	Latin Name	Species Quantity	Sex	Time of Observation	Inside / Outside Buffer	Total Duration (s)	0-20 m (s)	20-50 m (s)	50-100 m (s)	100-200 m (s)	>200 m (s)	Notes
1	30/06/2021	Kestrel	*Falco tinnunculus*	1		17.13	out	13	13					
1	30/06/2021	Kestrel	*Falco tinnunculus*	1		17.14	in	15	15					
1	30/06/2021	Kestrel	*Falco tinnunculus*	1		17.23	in	14	14					
1	30/06/2021	Kestrel	*Falco tinnunculus*	1		18	in	11	11					
1	30/06/2021	Kestrel	*Falco tinnunculus*	1		18.43	out	8	8					
1	30/06/2021	Kestrel	*Falco tinnunculus*	1		18.46	out	15						
1	30/06/2021	Kestrel	*Falco tinnunculus*	1		19.19	out	36		36				
1	30/06/2021	Kestrel	*Falco tinnunculus*	1		19.52	in	23	23					
2	15/07/2021	Kestrel	*Falco tinnunculus*	1	male	11.11	in	66	66					
2	15/07/2021	Kestrel	*Falco tinnunculus*	1	male	11.39	in	23	23					
1	15/07/2021	Kestrel	*Falco tinnunculus*	1	male	15.15	in	158			158			
3	19/07/2021	Kestrel	*Falco tinnunculus*	1		12.48	in	27		27				
2	21/07/2021	Kestrel	*Falco tinnunculus*	1		11.26	in	16	16					
1	24/07/2021	Kestrel	*Falco tinnunculus*	1	male	9.57	in	212	212					
1	24/07/2021	Kestrel	*Falco tinnunculus*	1	male	10.28	in	28	28					
3	24/07/2021	Kestrel	*Falco tinnunculus*	1		12.28	in	39	39					
2	26/07/2021	Kestrel	*Falco tinnunculus*	1		10.07	in	68		68				
2	26/07/2021	Kestrel	*Falco tinnunculus*	1		11.07	in	51	51					
1	29/07/2021	Kestrel	*Falco tinnunculus*	1		13.36	out	29		29				
2	10/08/2021	Kestrel	*Falco tinnunculus*	1		11.16	in	30	30					
2	10/08/2021	Kestrel	*Falco tinnunculus*	1		11.48	in	24	24					

VP no.	Date	Common Name	Latin Name	Species Quantity	Sex	Time of Observation	Inside / Outside Buffer	Total Duration (s)	0-20 m (s)	20-50 m (s)	50-100 m (s)	100-200 m (s)	>200 m (s)	Notes
3	10/08/2021	Kestrel	*Falco tinnunculus*	1	female	15.17	out	28	28					
2	24/08/2021	Kestrel	*Falco tinnunculus*	1		9.48	out	41		41				
2	24/08/2021	Kestrel	*Falco tinnunculus*	1		10.28	in	12	12					
1	24/08/2021	Kestrel	*Falco tinnunculus*	1		13.36	out	14	14					
1	24/08/2021	Kestrel	*Falco tinnunculus*	1		13.39	out	10	10					
2	26/08/2021	Kestrel	*Falco tinnunculus*	1		13.37	out	108	108					
2	26/08/2021	Kestrel	*Falco tinnunculus*	1		13.41	in	42	42					
2	26/08/2021	Kestrel	*Falco tinnunculus*	1		15.27	in	12	12					
1	02/09/2021	Kestrel	*Falco tinnunculus*	1		10.16	out	44		44				
1	02/09/2021	Kestrel	*Falco tinnunculus*	1		12.07	out	18		18				
3	02/09/2021	Kestrel	*Falco tinnunculus*	1		15.26	out	17		17				
2	26/05/2021	Lapwing	*Vanellus vanellus*	1		17:15	Out	47	47					
2	26/05/2021	Lapwing	*Vanellus vanellus*	1		19:25	Out	11	11					
2	30/05/2021	Lapwing	*Vanellus vanellus*	1		17:21	In	15	15					
2	30/05/2021	Lapwing	*Vanellus vanellus*	1		17:44	Out	200		200				
2	30/05/2021	Lapwing	*Vanellus vanellus*	1		17:44	In	16		16				
2	30/05/2021	Lapwing	*Vanellus vanellus*	1		18:26	In	131	131					
2	30/05/2021	Lapwing	*Vanellus vanellus*	1		18:36	In	101	20					
2	30/05/2021	Lapwing	*Vanellus vanellus*	1		18:36	Out	81	81					
2	30/05/2021	Lapwing	*Vanellus vanellus*	1		19:06	In	36	36					
2	17/06/2021	Lapwing	*Vanellus vanellus*	1		14.04	out	50	50					

VP no.	Date	Common Name	Latin Name	Species Quantity	Sex	Time of Observation	Inside / Outside Buffer	Total Duration (s)	0-20 m (s)	20-50 m (s)	50-100 m (s)	100-200 m (s)	>200 m (s)	Notes
2	17/06/2021	Lapwing	*Vanellus vanellus*	1		14.04	in	47	47					
2	17/06/2021	Lapwing	*Vanellus vanellus*	1		15.49	in	31	31					
3	25/06/2021	Lapwing	*Vanellus vanellus*	8		10.13	out	34		34				
2	30/06/2021	Lapwing	*Vanellus vanellus*	6		8.55	out	140		140				
2	30/06/2021	Lapwing	*Vanellus vanellus*	8		9.01	out	77	77					
2	26/05/2021	Lesser Black-backed Gull	*Larus fuscus*	1		17:38	In	63		63				
2	26/05/2021	Lesser Black-backed Gull	*Larus fuscus*	1		17:38	Out	60		60				
2	30/06/2021	Lesser Black-backed Gull	*Larus fuscus*	1		8.33	in	23		23				
2	15/07/2021	Lesser Black-backed Gull	*Larus fuscus*	4		13.12	in	58		58				
3	24/07/2021	Lesser Black-backed Gull	*Larus fuscus*	6		13.05	out	169			169			
2	26/07/2021	Lesser Black-backed Gull	*Larus fuscus*	1		9.55	out	30		30				
2	26/07/2021	Lesser Black-backed Gull	*Larus fuscus*	1		9.55	in	12		12				
2	26/07/2021	Lesser Black-backed Gull	*Larus fuscus*	1		10.02	in	155		155				
3	26/07/2021	Lesser Black-backed Gull	*Larus fuscus*	4		14.19	in	77			77			
2	24/08/2021	Lesser Black-backed Gull	*Larus fuscus*	1		11.41	out	78			78			

VP no.	Date	Common Name	Latin Name	Species Quantity	Sex	Time of Observation	Inside / Outside Buffer	Total Duration (s)	0-20 m (s)	20-50 m (s)	50-100 m (s)	100-200 m (s)	>200 m (s)	Notes
3	02/09/2021	Lesser Black-backed Gull	*Larus fuscus*	4		14.34	out	336				336		farmer collecting round bales
1	08/04/2021	Little Egret	*Egretta garzetta*	4		10:54	In	18	18					
2	15/04/2021	Little Egret	*Egretta garzetta*	5		12:06	In	12	12					
2	15/04/2021	Little Egret	*Egretta garzetta*	5		13:06	In	11	11					
2	21/04/2021	Little Egret	*Egretta garzetta*	2		12:41	In	20	20					
2	26/05/2021	Little Egret	*Egretta garzetta*	2		18:19	Out	325		325				
2	26/05/2021	Little Egret	*Egretta garzetta*	1		18:46	In	13	13					
2	30/05/2021	Little Egret	*Egretta garzetta*	1		17:35	In	81	81					
2	17/06/2021	Little Egret	*Egretta garzetta*	2		14.52	out	60			60			
2	17/06/2021	Little Egret	*Egretta garzetta*	2		14.52	in	63			63			
1	15/07/2021	Little Egret	*Egretta garzetta*	2		17.06	in	26		26				
1	24/08/2021	Little Egret	*Egretta garzetta*	2		14.18	out	16	16					
3	24/08/2021	Little Egret	*Egretta garzetta*	2		19.09	in	28		28				
1	30/05/2021	Mute Swan	*Cygnus olor*	2		14:37	In	31		31				
3	11/05/2021	Mute Swan	*Cygnus olor*	2		10:08	In	26		26				
3	31/05/2021	Mute Swan	*Cygnus olor*	2		15:11	In	68	68					
1	24/04/2021	Peregrine	*Falco peregrinus*	1		11:41	Out	13			13			
1	24/04/2021	Peregrine	*Falco peregrinus*	1		11:41	In	10		10				
1	30/05/2021	Peregrine	*Falco peregrinus*	1		16:10	Out	229			229			
3	24/08/2021	Peregrine	*Falco peregrinus*	1		17.04	out	131			131			
1	26/08/2021	Peregrine	*Falco peregrinus*	1		11.14	in	6	6					

VP no.	Date	Common Name	Latin Name	Species Quantity	Sex	Time of Observation	Inside / Outside Buffer	Total Duration (s)	0-20 m (s)	20-50 m (s)	50-100 m (s)	100-200 m (s)	>200 m (s)	Notes
1	26/08/2021	Peregrine	*Falco peregrinus*	1		11.18	out	9		9				
1	26/08/2021	Peregrine	*Falco peregrinus*	2		11.19	out	230				150		calling
1	26/08/2021	Peregrine	*Falco peregrinus*	2		11.19	in					80		
1	02/09/2021	Peregrine	*Falco peregrinus*	1		10.36	in	12			12			
3	02/09/2021	Snipe	*Gallinago gallinago*	2		13.59	out	116	116					
3	02/09/2021	Snipe	*Gallinago gallinago*	2		14.51	out	42	42					
1	24/04/2021	Sparrowhawk	*Accipiter nisus*	1		13:35	In	12	12					
2	15/04/2021	Sparrowhawk	*Accipiter nisus*	1		13:04	In	119			119			
2	15/04/2021	Sparrowhawk	*Accipiter nisus*	1		14:27	Out	7	7					
2	21/04/2021	Sparrowhawk	*Accipiter nisus*	2		11:33	In	138			138			
2	21/04/2021	Sparrowhawk	*Accipiter nisus*	1		12:00	In	167			167			
3	14/04/2021	Sparrowhawk	*Accipiter nisus*	1		14:02	In	48			48			
1	25/05/2021	Sparrowhawk	*Accipiter nisus*	1		16:11	In	24	10	14				
3	11/05/2021	Sparrowhawk	*Accipiter nisus*	1		11:10	Out	8	8					
3	15/06/2021	Sparrowhawk	*Accipiter nisus*	1		17.46	out	8	8					
2	15/07/2021	Sparrowhawk	*Accipiter nisus*	1		13.52	in	10	10					
3	26/07/2021	Sparrowhawk	*Accipiter nisus*	1		13.36	out	12	12					
3	10/08/2021	Sparrowhawk	*Accipiter nisus*	1		13.44	out	23	23					
3	24/08/2021	Sparrowhawk	*Accipiter nisus*	1		19.23	out	8	8					
1	02/09/2021	Sparrowhawk	*Accipiter nisus*	1		11.33	out	9	9					
3	02/09/2021	Sparrowhawk	*Accipiter nisus*	1		13.01	out	13	13					
3	02/09/2021	Sparrowhawk	*Accipiter nisus*	1		13.47	in	36	36					

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APPENDIX 4

Target Species Flight Line Maps

Path: R:\Map Production\2020\P20-290\Workspace\Flightlines\P20-290_GIS_INFO_Flightlines_Brittas_A3.mxd

Sources: Esri, HERE, Garmin, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), (c) OpenStreetMap contributors, and the GIS User Community
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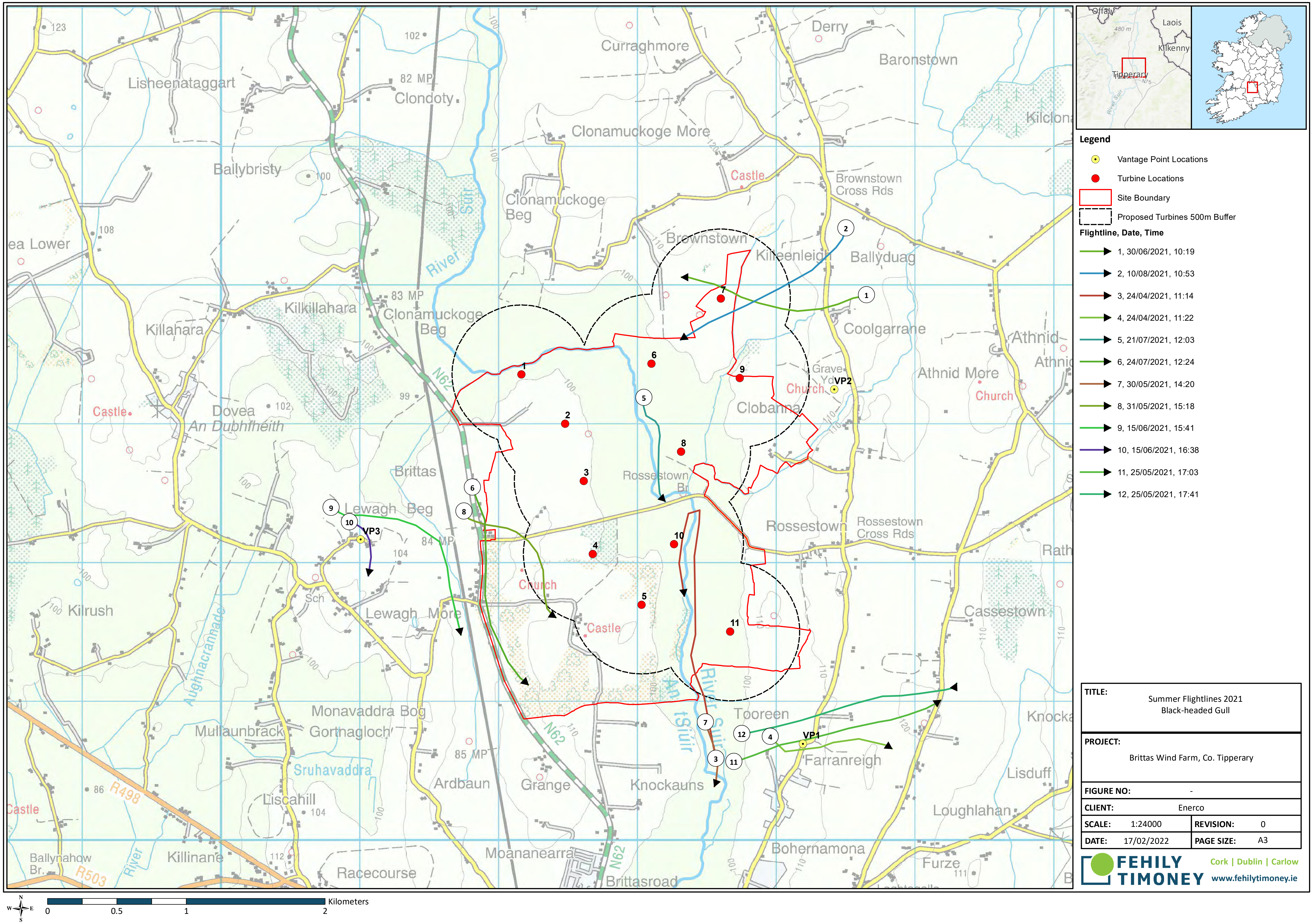

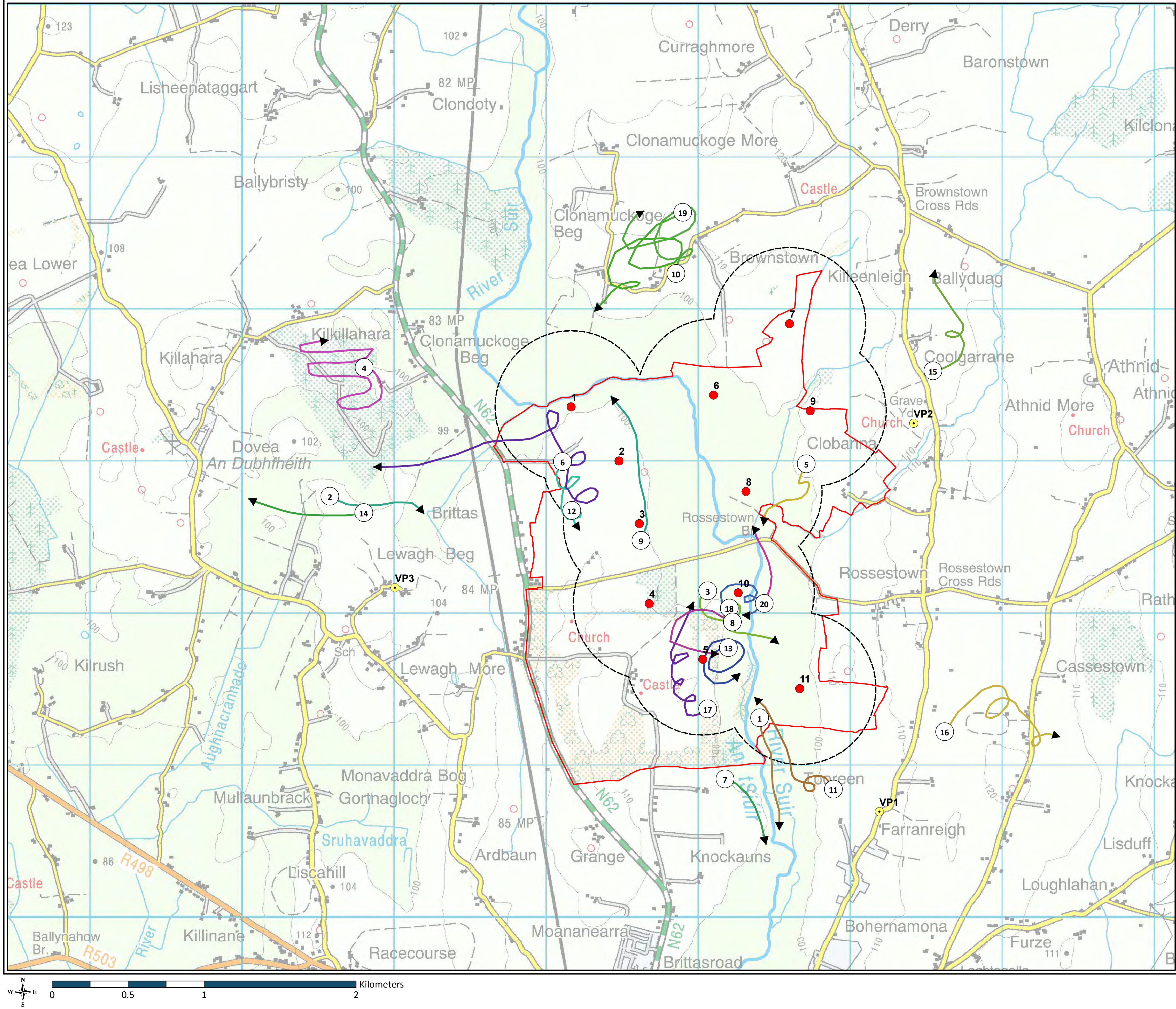

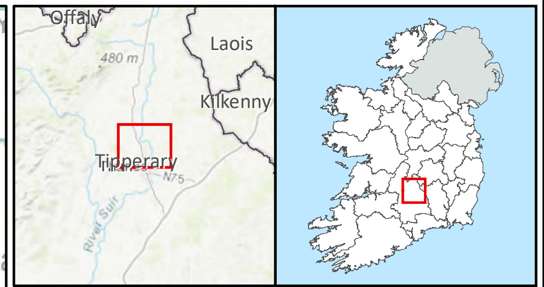

Legend

- Vantage Point Locations
- Turbine Locations
- Site Boundary
- Proposed Turbines 500m Buffer

Flightline, Date, Time

- 1, 19/06/2021, 08:52
- 2, 11/05/2021, 09:10
- 3, 21/07/2021, 09:32
- 4, 11/05/2021, 09:38
- 5, 10/08/2021, 09:48
- 6, 11/05/2021, 09:55
- 7, 02/09/2021, 09:58
- 8, 26/07/2021, 10:07
- 9, 10/08/2021, 10:07
- 10, 24/08/2021, 10:12
- 11, 19/06/2021, 10:16
- 12, 19/07/2021, 10:24
- 13, 08/04/2021, 10:25
- 14, 11/05/2021, 10:26
- 15, 26/07/2021, 10:28
- 16, 02/09/2021, 10:31
- 17, 08/04/2021, 10:34
- 18, 08/04/2021, 10:43
- 19, 21/07/2021, 10:44
- 20, 19/06/2021, 10:56

TITLE:	Summer Flightlines 2021 Buzzard 1		
PROJECT:	Brittas Wind Farm, Co. Tipperary		
FIGURE NO:	-		
CLIENT:	Enerco		
SCALE:	1:24000	**REVISION:**	0
DATE:	17/02/2022	**PAGE SIZE:**	A3

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Path: R:\Map Production\2020\P20-290\Workspace\Flightlines\P20-290_GIS_INFO_Flightlines_Brittas_A3.mxd

Sources: Esri, HERE, Garmin, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), (c) OpenStreetMap contributors, and the GIS User Community
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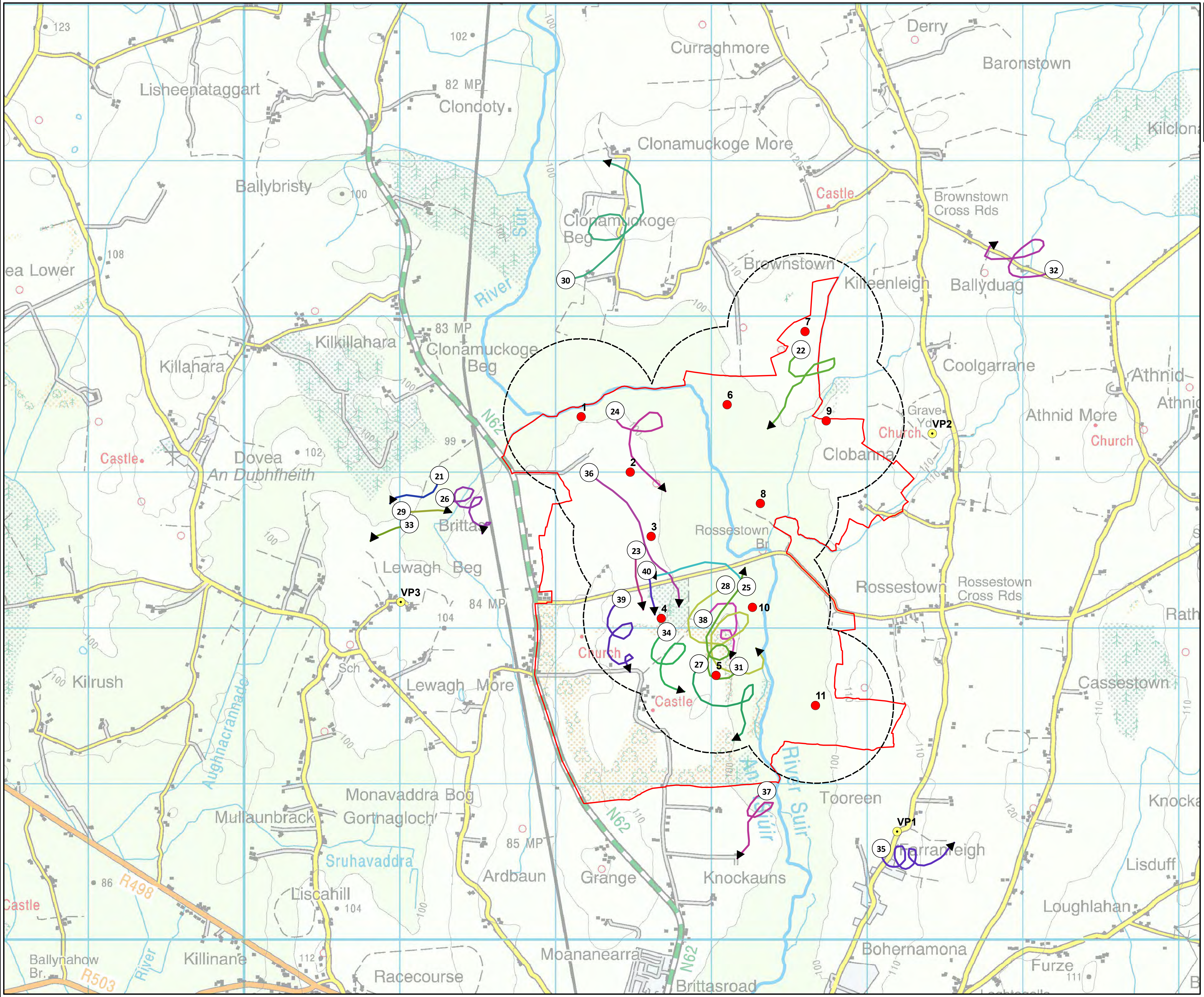
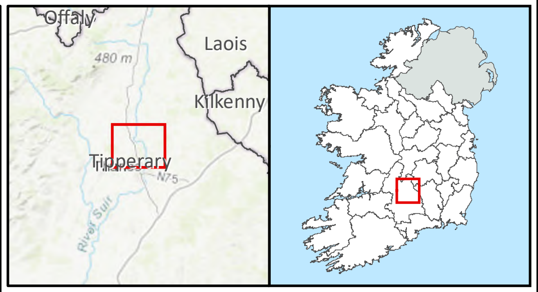


0 0.5 1 2 Kilometers



Legend

- Vantage Point Locations
- Turbine Locations
- Site Boundary
- Proposed Turbines 500m Buffer

Flightline, Date, Time

- 21, 25/06/2021, 10:56
- 22, 30/06/2021, 10:56
- 23, 25/06/2021, 11:02
- 24, 19/07/2021, 11:02
- 25, 24/08/2021, 11:04
- 26, 25/06/2021, 11:05
- 27, 24/07/2021, 11:06
- 28, 19/06/2021, 11:09
- 29, 25/06/2021, 11:09
- 30, 10/08/2021, 11:11
- 31, 02/09/2021, 11:11
- 32, 30/06/2021, 11:12
- 33, 25/06/2021, 11:18
- 34, 25/06/2021, 11:21
- 35, 26/08/2021, 11:25
- 36, 25/06/2021, 11:26
- 37, 24/07/2021, 11:28
- 38, 24/04/2021, 11:33
- 39, 11/05/2021, 11:36
- 40, 25/06/2021, 11:45

TITLE:	Summer Flightlines 2021 Buzzard 2		
PROJECT:	Brittas Wind Farm, Co. Tipperary		
FIGURE NO:	-		
CLIENT:	Enerco		
SCALE:	1:24000	REVISION:	0
DATE:	17/02/2022	PAGE SIZE:	A3

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Path: R:\Map Production\2020\P20-290\Workspace\Flightlines\P20-290_GIS_INFO_Flightlines_Brittas_A3.mxd

Sources: Esri, HERE, Garmin, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), (c) OpenStreetMap contributors, and the GIS User Community
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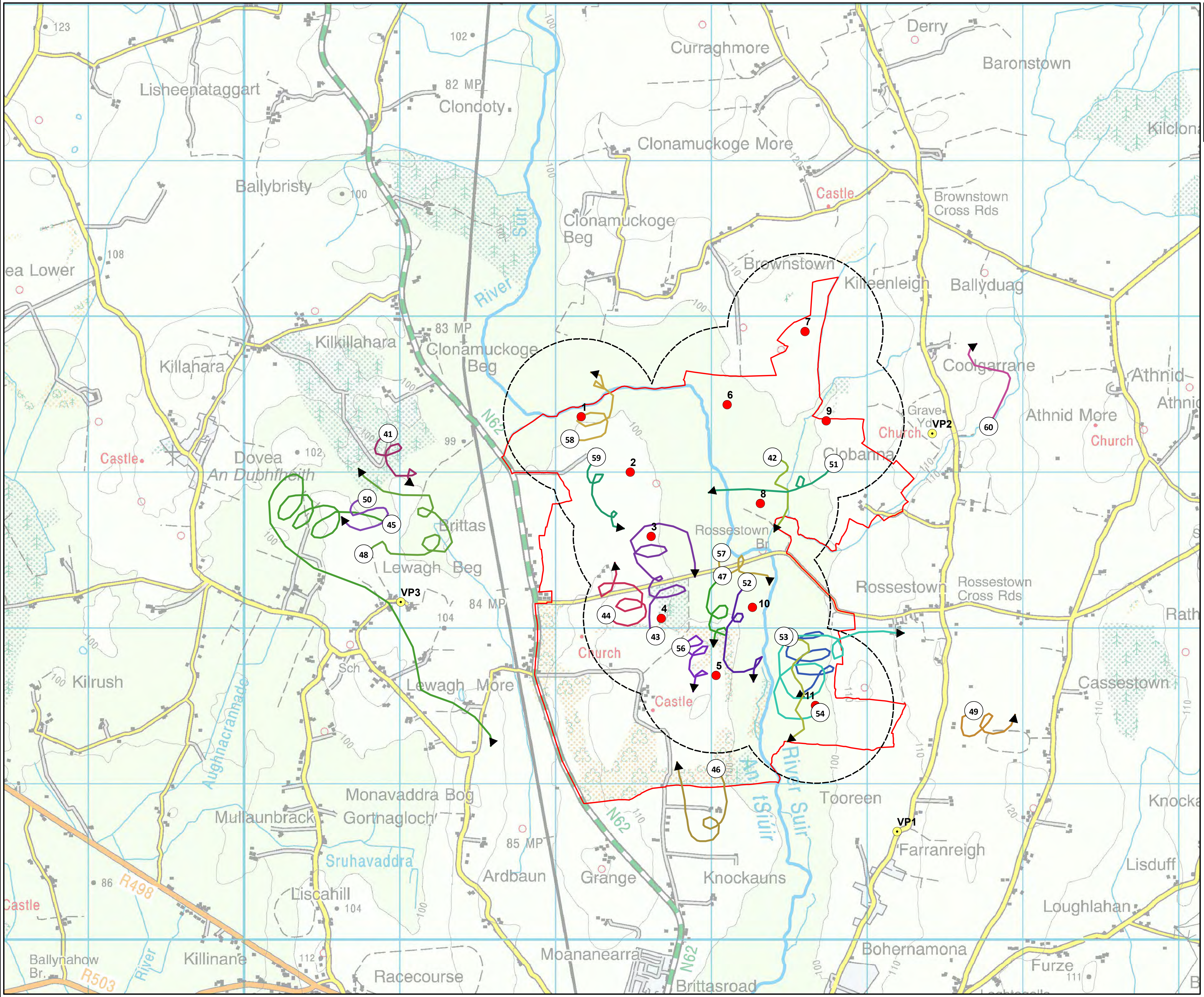

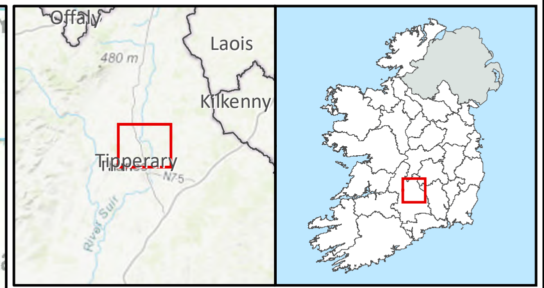

Legend

- Vantage Point Locations
- Turbine Locations
- Site Boundary
- Proposed Turbines 500m Buffer

Flightline, Date, Time

- 41, 11/05/2021, 11:47
- 42, 15/07/2021, 11:51
- 43, 19/07/2021, 11:51
- 44, 21/04/2021, 11:55
- 45, 19/07/2021, 11:55
- 46, 24/04/2021, 12:00
- 47, 15/04/2021, 12:01
- 48, 19/07/2021, 12:04
- 49, 08/04/2021, 12:05
- 50, 26/07/2021, 12:07
- 51, 24/08/2021, 12:11
- 52, 26/08/2021, 12:11
- 53, 21/04/2021, 12:15
- 54, 29/07/2021, 12:17
- 55, 02/09/2021, 12:18
- 56, 21/04/2021, 12:22
- 57, 08/04/2021, 12:26
- 58, 21/04/2021, 12:28
- 59, 15/04/2021, 12:30
- 60, 15/07/2021, 12:43

TITLE: Summer Flightlines 2021 Buzzard 3

PROJECT: Brittas Wind Farm, Co. Tipperary

FIGURE NO:	-		
CLIENT:	Enerco		
SCALE:	1:24000	REVISION:	0
DATE:	17/02/2022	PAGE SIZE:	A3

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0 0.5 1 2 Kilometers

Path: R:\Map Production\2020\P20-290\Workspace\Flightlines\P20-290_GIS_INFO_Flightlines_Brittas_A3.mxd

Sources: Esri, HERE, Garmin, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), (c) OpenStreetMap contributors, and the GIS User Community
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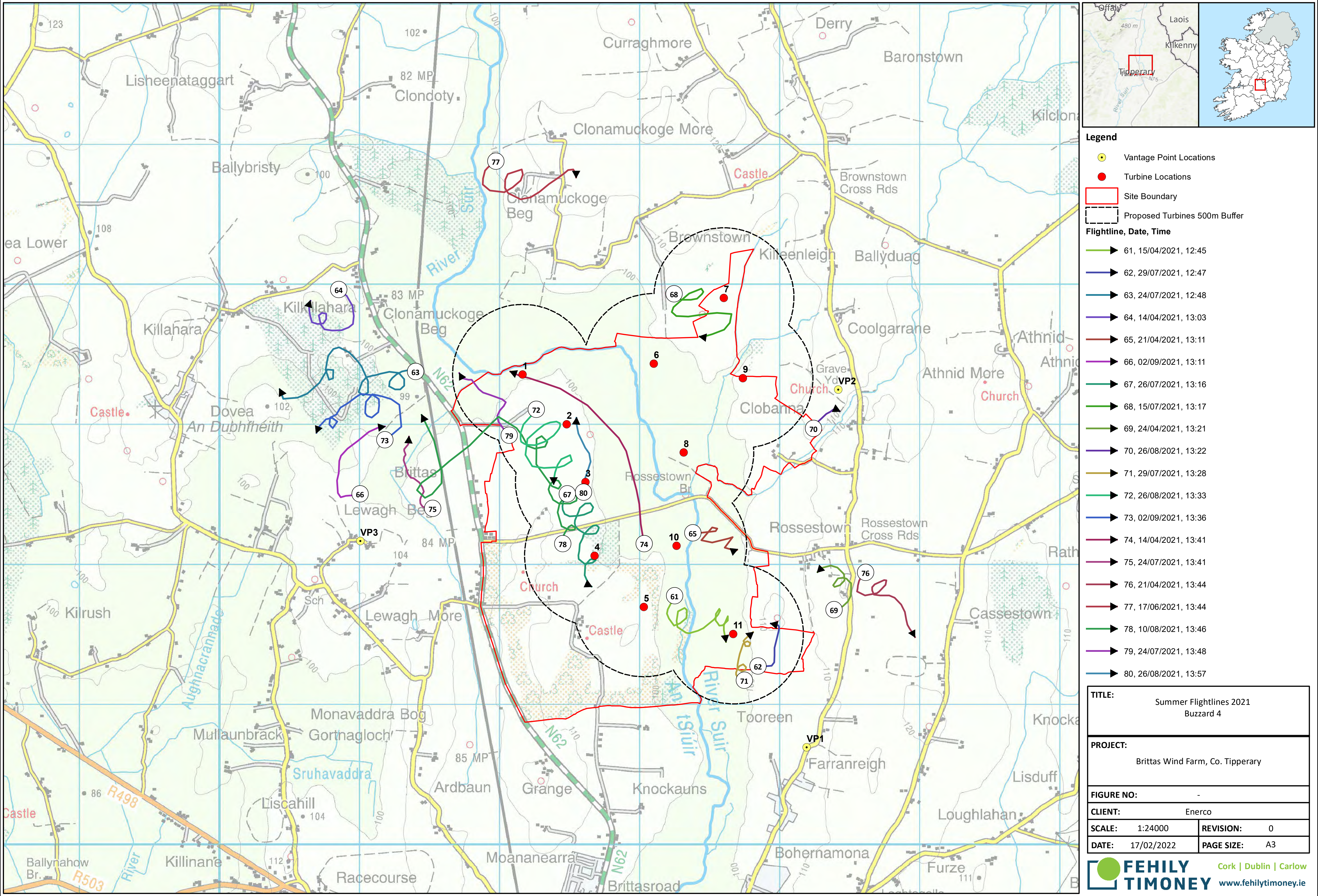

Legend

- Vantage Point Locations
- Turbine Locations
- Site Boundary
- Proposed Turbines 500m Buffer

Flightline, Date, Time

- 61, 15/04/2021, 12:45
- 62, 29/07/2021, 12:47
- 63, 24/07/2021, 12:48
- 64, 14/04/2021, 13:03
- 65, 21/04/2021, 13:11
- 66, 02/09/2021, 13:11
- 67, 26/07/2021, 13:16
- 68, 15/07/2021, 13:17
- 69, 24/04/2021, 13:21
- 70, 26/08/2021, 13:22
- 71, 29/07/2021, 13:28
- 72, 26/08/2021, 13:33
- 73, 02/09/2021, 13:36
- 74, 14/04/2021, 13:41
- 75, 24/07/2021, 13:41
- 76, 21/04/2021, 13:44
- 77, 17/06/2021, 13:44
- 78, 10/08/2021, 13:46
- 79, 24/07/2021, 13:48
- 80, 26/08/2021, 13:57

TITLE: Summer Flightlines 2021
Buzzard 4

PROJECT: Brittas Wind Farm, Co. Tipperary

FIGURE NO:	-		
CLIENT:	Enerco		
SCALE:	1:24000	REVISION:	0
DATE:	17/02/2022	PAGE SIZE:	A3

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0 0.5 1 2
Kilometers

Path: R:\Map Production\2020\P20-290\Workspace\Flightlines\P20-290_GIS_INFO_Flightlines_Brittas_A3.mxd

Sources: Esri, HERE, Garmin, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), (c) OpenStreetMap contributors, and the GIS User Community
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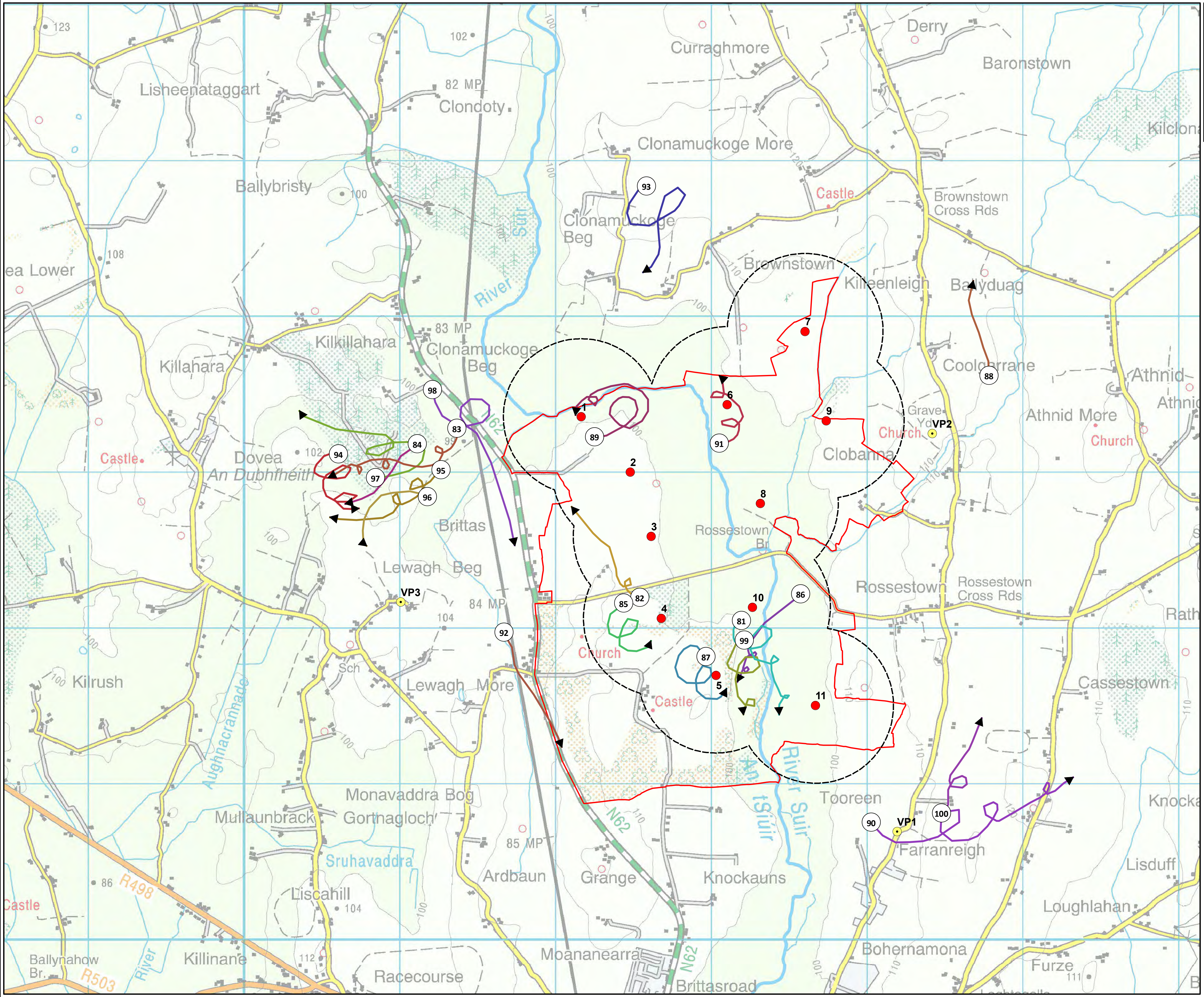

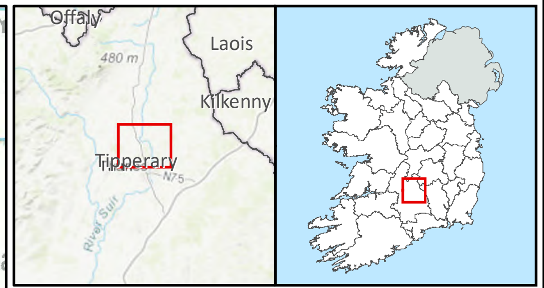

Legend

- Vantage Point Locations
- Turbine Locations
- Site Boundary
- Proposed Turbines 500m Buffer

Flightline, Date, Time

- 81, 24/08/2021, 13:58
- 82, 15/04/2021, 14:07
- 83, 26/07/2021, 14:07
- 84, 24/07/2021, 14:08
- 85, 14/04/2021, 14:10
- 86, 30/05/2021, 14:11
- 87, 30/05/2021, 14:22
- 88, 26/08/2021, 14:27
- 89, 02/09/2021, 14:28
- 90, 29/07/2021, 14:31
- 91, 15/04/2021, 14:37
- 92, 14/04/2021, 14:38
- 93, 26/08/2021, 14:39
- 94, 31/05/2021, 14:41
- 95, 24/07/2021, 14:42
- 96, 10/08/2021, 14:42
- 97, 31/05/2021, 14:49
- 98, 10/08/2021, 14:49
- 99, 29/07/2021, 14:51
- 100, 24/08/2021, 14:52

TITLE:	Summer Flightlines 2021 Buzzard 5
PROJECT:	Brittas Wind Farm, Co. Tipperary
FIGURE NO:	-
CLIENT:	Enerco

SCALE:	1:24000	**REVISION:**	0
DATE:	17/02/2022	**PAGE SIZE:**	A3

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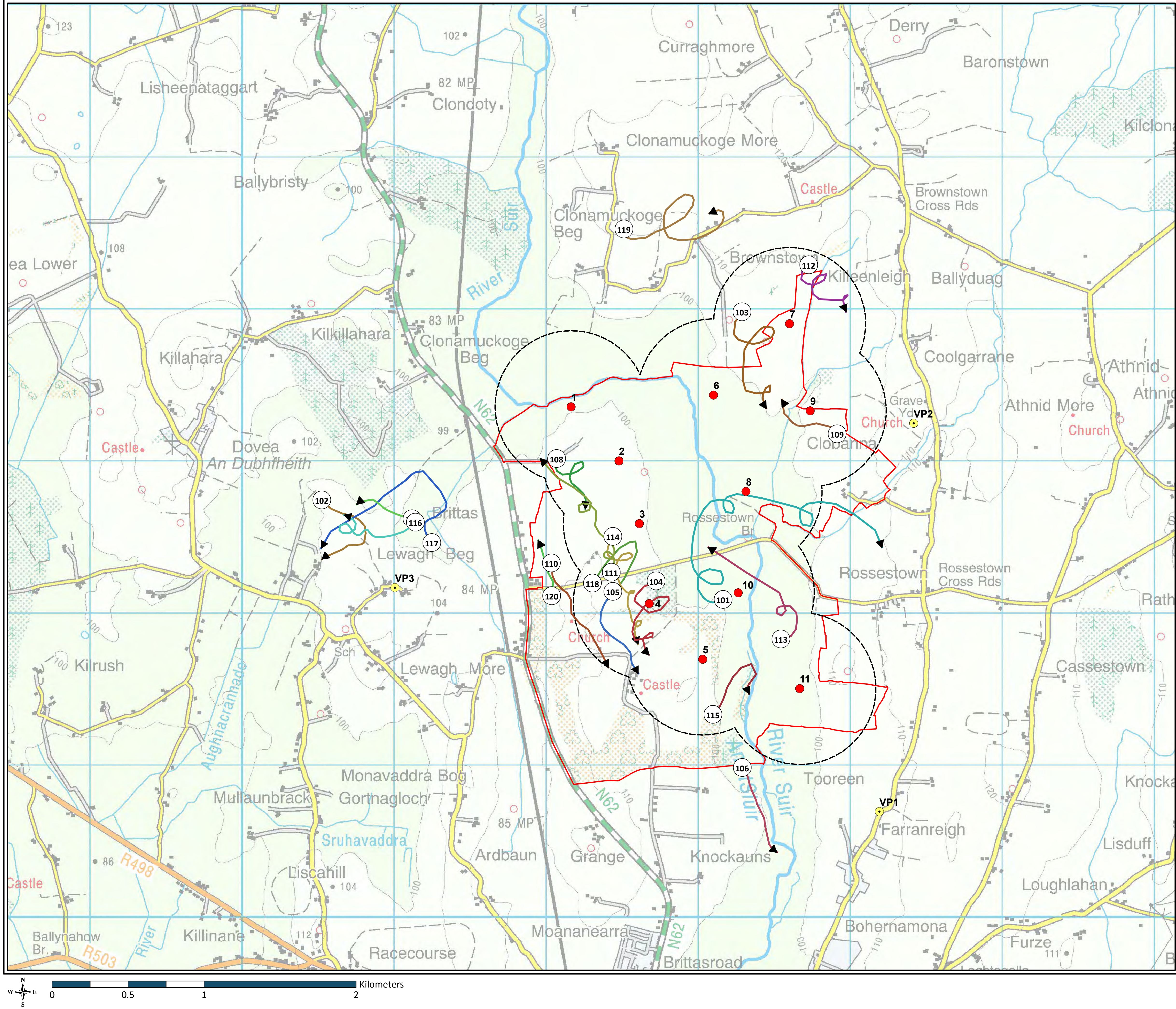

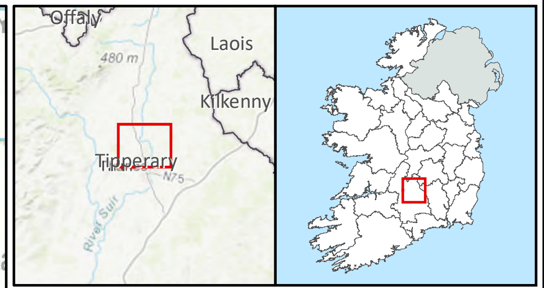

Legend

- Vantage Point Locations
- Turbine Locations
- Site Boundary
- Proposed Turbines 500m Buffer

Flightline, Date, Time

- 101, 30/05/2021, 14:54
- 102, 31/05/2021, 14:55
- 103, 17/06/2021, 14:59
- 104, 10/08/2021, 15:02
- 105, 31/05/2021, 15:05
- 106, 15/07/2021, 15:05
- 107, 15/06/2021, 15:08
- 108, 31/05/2021, 15:10
- 109, 26/08/2021, 15:11
- 110, 02/09/2021, 15:13
- 111, 15/06/2021, 15:16
- 112, 17/06/2021, 15:16
- 113, 24/08/2021, 15:17
- 114, 31/05/2021, 15:21
- 115, 30/05/2021, 15:31
- 116, 15/06/2021, 15:31
- 117, 31/05/2021, 15:40
- 118, 28/04/2021, 15:45
- 119, 17/06/2021, 15:55
- 120, 28/04/2021, 15:56

TITLE:	Summer Flightlines 2021 Buzzard 6		
PROJECT:	Brittas Wind Farm, Co. Tipperary		
FIGURE NO:	-		
CLIENT:	Enerco		
SCALE:	1:24000	REVISION:	0
DATE:	17/02/2022	PAGE SIZE:	A3

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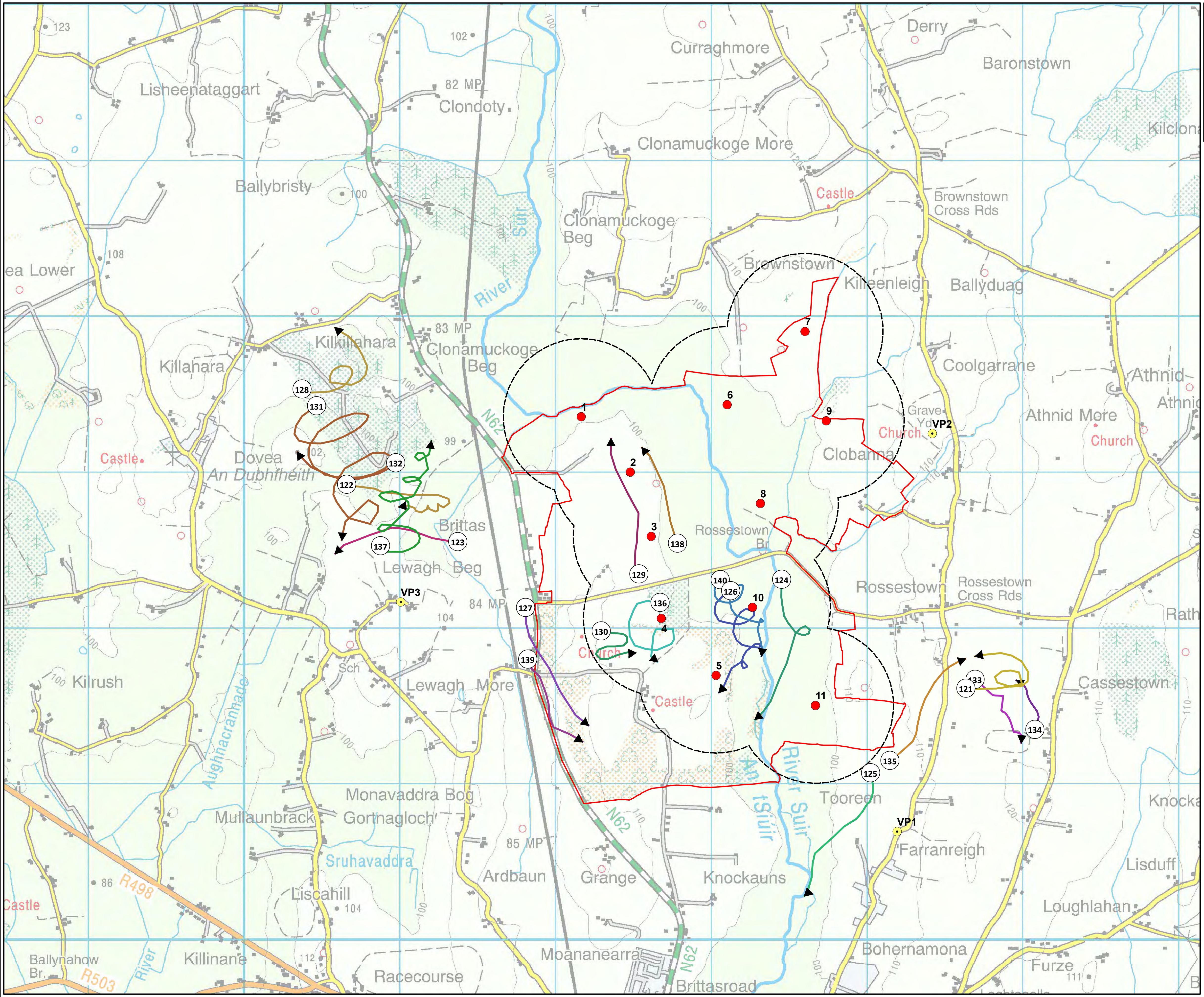

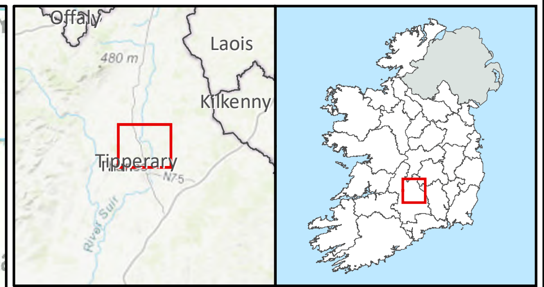

Legend

- Vantage Point Locations
- Turbine Locations
- Site Boundary
- Proposed Turbines 500m Buffer

Flightline, Date, Time

- 121, 24/08/2021, 15:56
- 122, 15/06/2021, 16:15
- 123, 31/05/2021, 16:23
- 124, 15/07/2021, 16:23
- 125, 30/05/2021, 16:28
- 126, 25/05/2021, 16:35
- 127, 24/08/2021, 16:37
- 128, 28/04/2021, 16:38
- 129, 15/06/2021, 16:39
- 130, 28/04/2021, 16:40
- 131, 24/08/2021, 16:55
- 132, 28/04/2021, 16:58
- 133, 25/05/2021, 17:11
- 134, 25/05/2021, 17:13
- 135, 15/07/2021, 17:21
- 136, 15/06/2021, 17:23
- 137, 24/08/2021, 17:26
- 138, 28/04/2021, 17:39
- 139, 28/04/2021, 17:43
- 140, 30/05/2021, 17:43

TITLE:	Summer Flightlines 2021 Buzzard 7
PROJECT:	Brittas Wind Farm, Co. Tipperary
FIGURE NO:	-
CLIENT:	Enerco
SCALE: 1:24000	REVISION: 0
DATE: 17/02/2022	PAGE SIZE: A3

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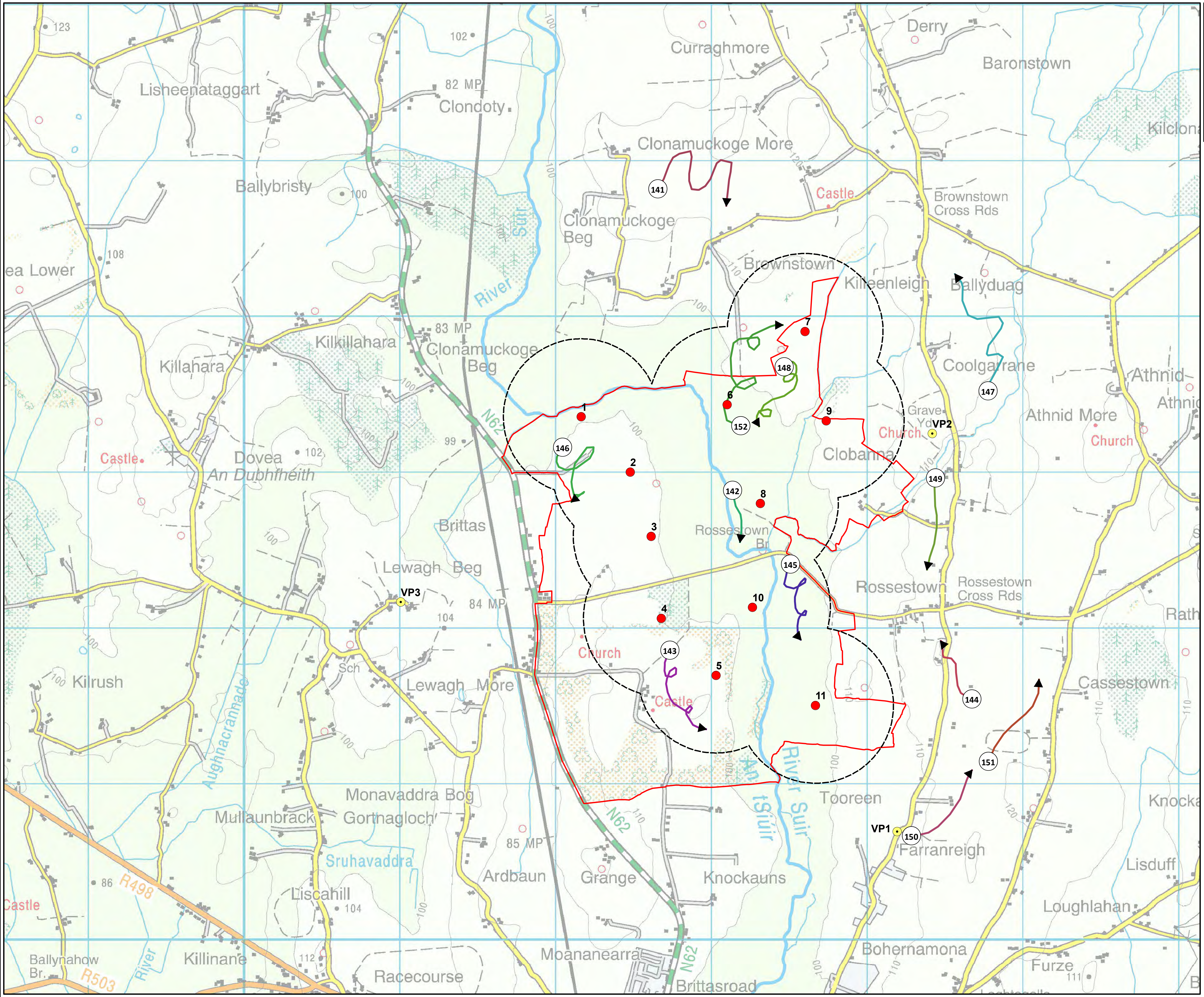
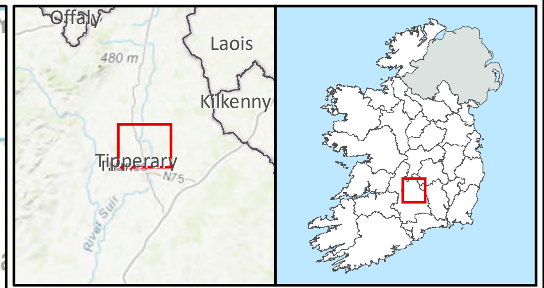
0 0.5 1 2 Kilometers





Legend

- Vantage Point Locations
- Turbine Locations
- Site Boundary
- Proposed Turbines 500m Buffer

Flightline, Date, Time

- 141, 26/05/2021, 17:59
- 142, 26/05/2021, 18:10
- 143, 25/05/2021, 18:12
- 144, 25/05/2021, 18:18
- 145, 30/05/2021, 18:40
- 146, 24/08/2021, 18:55
- 147, 26/05/2021, 19:03
- 148, 26/05/2021, 19:17
- 149, 30/05/2021, 19:20
- 150, 30/06/2021, 19:23
- 151, 30/06/2021, 19:41
- 152, 26/05/2021, 19:56

TITLE:	Summer Flightlines 2021 Buzzard 8
PROJECT:	Brittas Wind Farm, Co. Tipperary
FIGURE NO:	-
CLIENT:	Enerco
SCALE: 1:24000	REVISION: 0
DATE: 17/02/2022	PAGE SIZE: A3

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0 0.5 1 2 Kilometers

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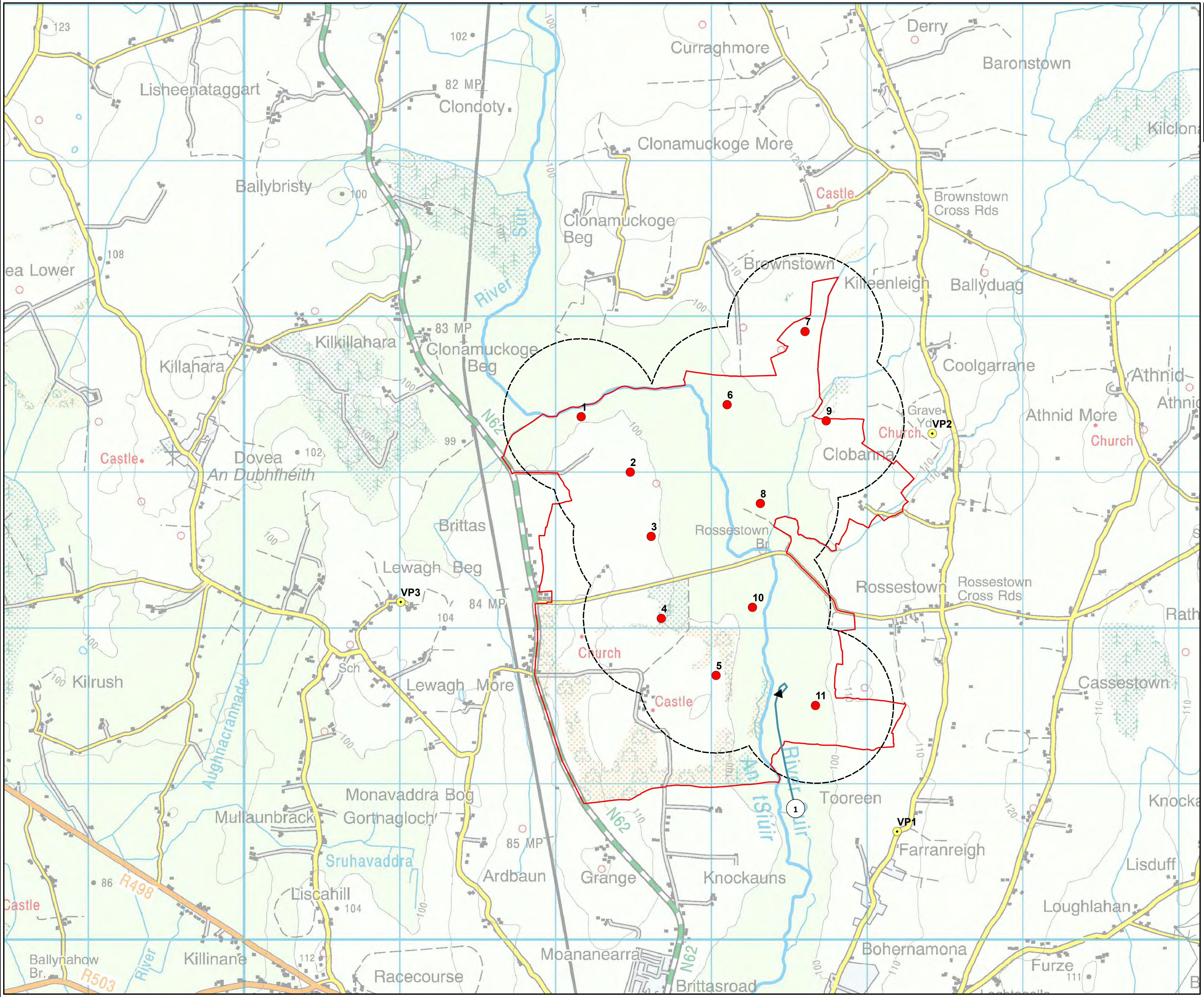

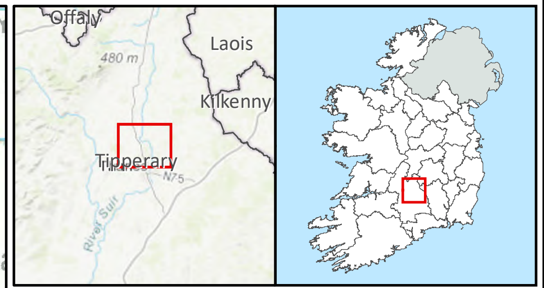

Legend

- Vantage Point Locations
- Turbine Locations
- Site Boundary
- Proposed Turbines 500m Buffer

Flightline, Date, Time

- 1, 08/04/2021, 10:08

TITLE:	Summer Flightlines 2021 Cormorant
PROJECT:	Brittas Wind Farm, Co. Tipperary
FIGURE NO:	-
CLIENT:	Enerco
SCALE: 1:24000	**REVISION:** 0
DATE: 18/02/2022	**PAGE SIZE:** A3

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0 0.5 1 2 Kilometers

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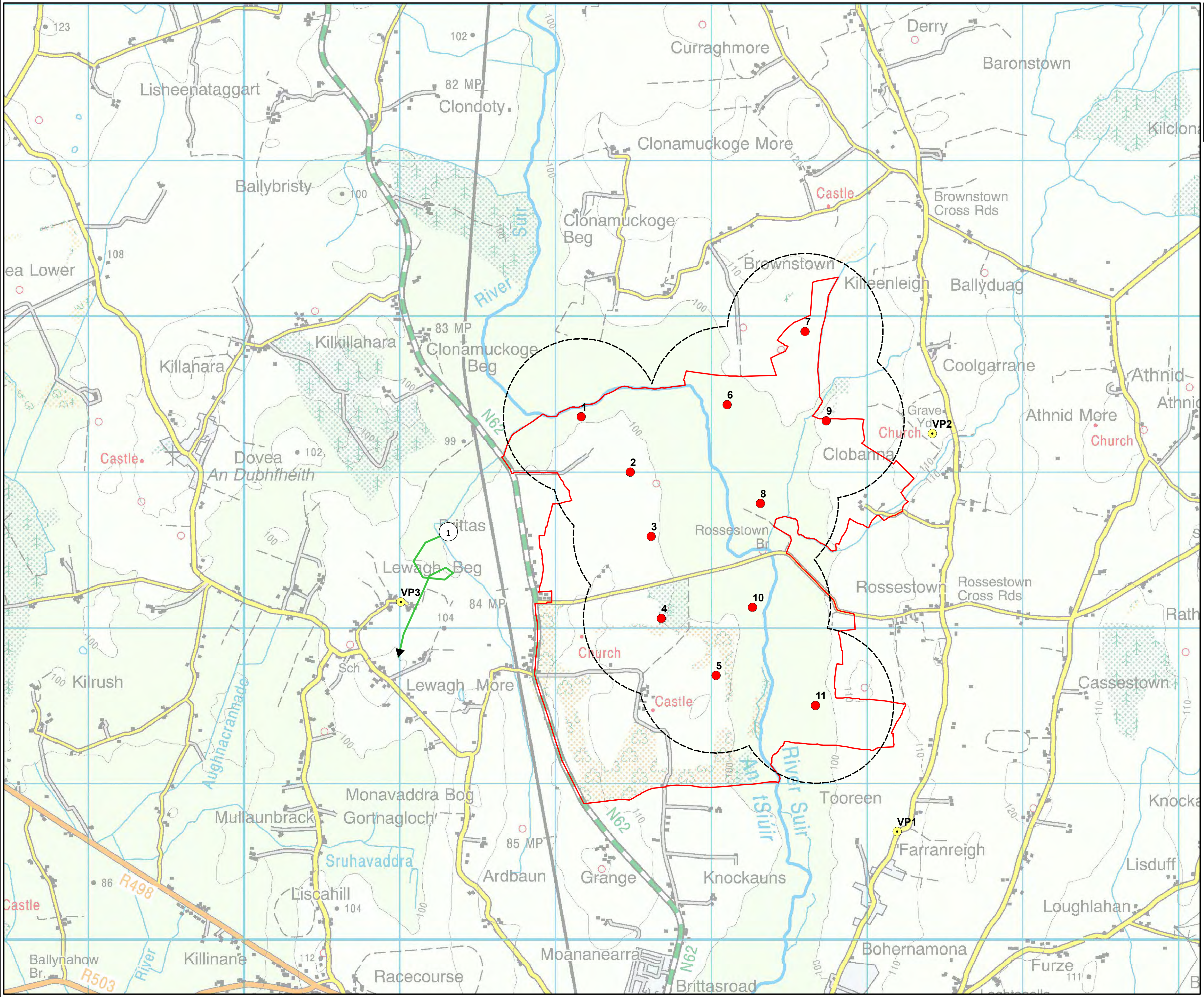

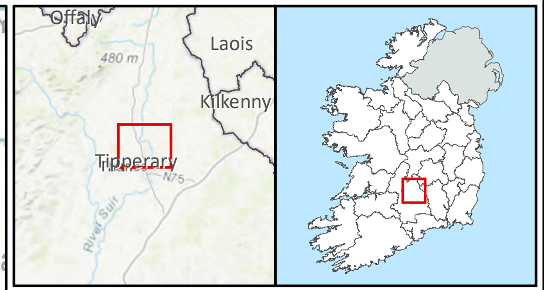

Legend

- Vantage Point Locations
- Turbine Locations
- Site Boundary
- Proposed Turbines 500m Buffer

Flightline, Date, Time

- 1, 10/08/2021, 13:53

TITLE:	Summer Flightlines 2021 Curlew
PROJECT:	Brittas Wind Farm, Co. Tipperary
FIGURE NO:	-
CLIENT:	Enerco
SCALE: 1:24000	**REVISION:** 0
DATE: 18/02/2022	**PAGE SIZE:** A3

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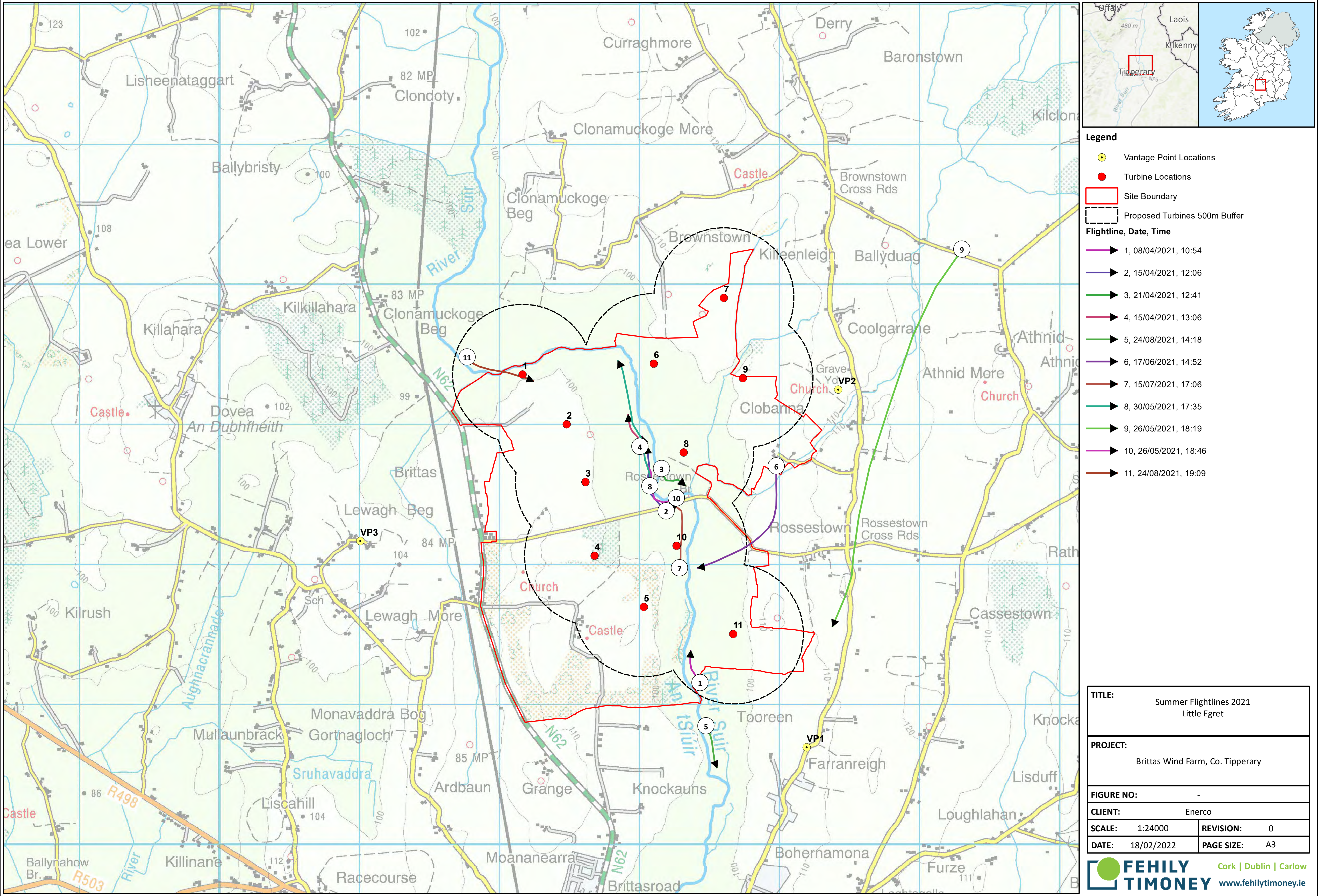
0 0.5 1 2 Kilometers

Path: R:\Map Production\2020\P20-290\Workspace\Flightlines\P20-290_GIS_INFO_Flightlines_Brittas_A3.mxd



Legend

- Vantage Point Locations
- Turbine Locations
- Site Boundary
- Proposed Turbines 500m Buffer

Flightline, Date, Time

- 1, 08/04/2021, 10:54
- 2, 15/04/2021, 12:06
- 3, 21/04/2021, 12:41
- 4, 15/04/2021, 13:06
- 5, 24/08/2021, 14:18
- 6, 17/06/2021, 14:52
- 7, 15/07/2021, 17:06
- 8, 30/05/2021, 17:35
- 9, 26/05/2021, 18:19
- 10, 26/05/2021, 18:46
- 11, 24/08/2021, 19:09

TITLE:	Summer Flightlines 2021 Little Egret
PROJECT:	Brittas Wind Farm, Co. Tipperary
FIGURE NO:	-
CLIENT:	Enerco
SCALE: 1:24000	REVISION: 0
DATE: 18/02/2022	PAGE SIZE: A3

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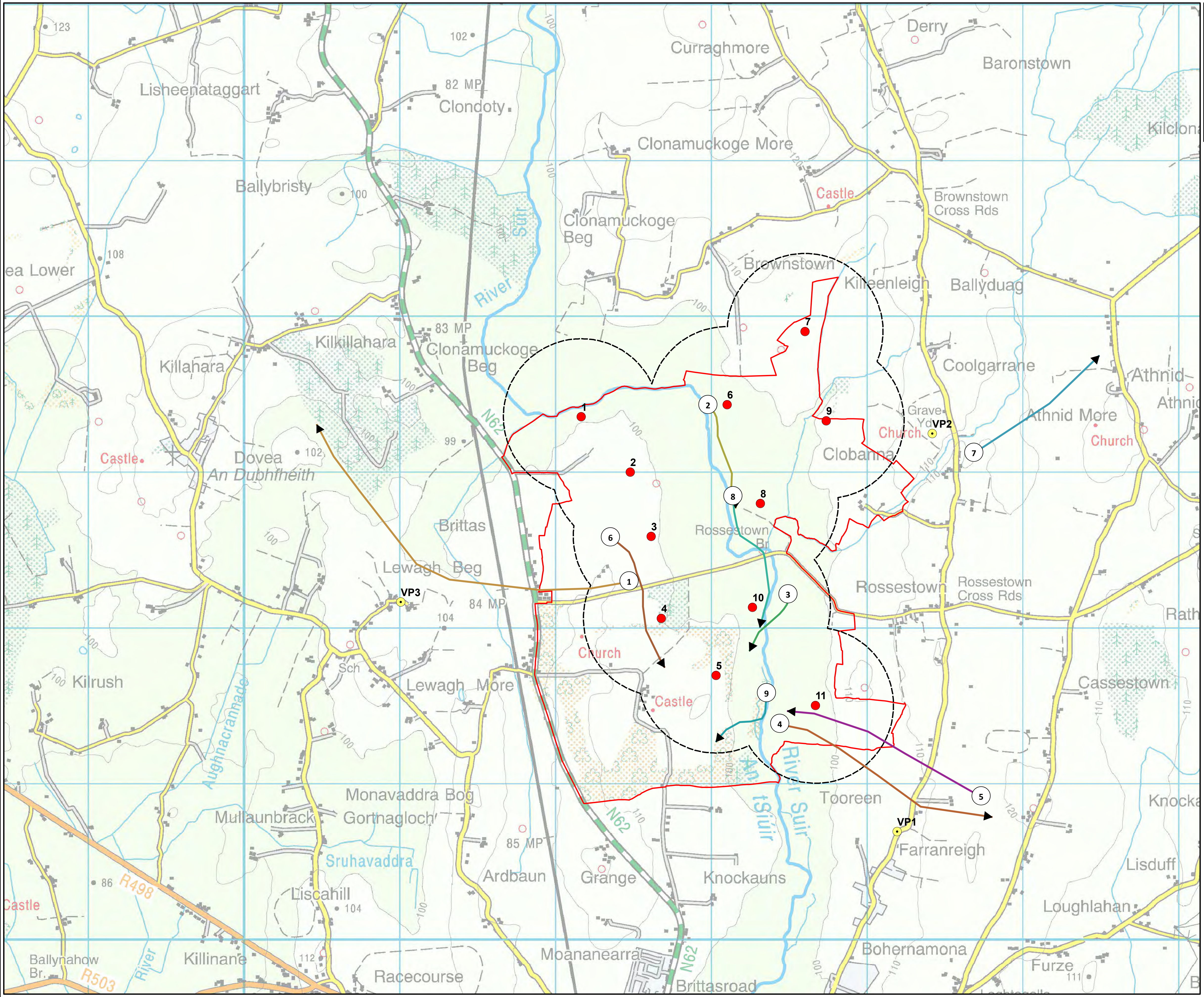

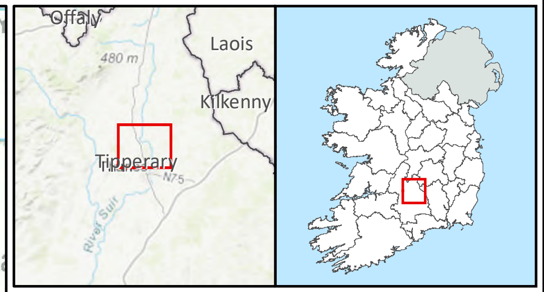

Legend

- Vantage Point Locations
- Turbine Locations
- Site Boundary
- Proposed Turbines 500m Buffer

Flightline, Date, Time

- 1, 11/05/2021, 09:34
- 2, 24/08/2021, 09:38
- 3, 02/09/2021, 09:38
- 4, 08/04/2021, 09:48
- 5, 08/04/2021, 09:53
- 6, 11/05/2021, 10:50
- 7, 21/04/2021, 11:43
- 8, 15/04/2021, 12:03
- 9, 24/04/2021, 12:26

TITLE:	Summer Flightlines 2021 Grey Heron 1		
PROJECT:	Brittas Wind Farm, Co. Tipperary		
FIGURE NO:	-		
CLIENT:	Enerco		
SCALE:	1:24000	REVISION:	0
DATE:	18/02/2022	PAGE SIZE:	A3

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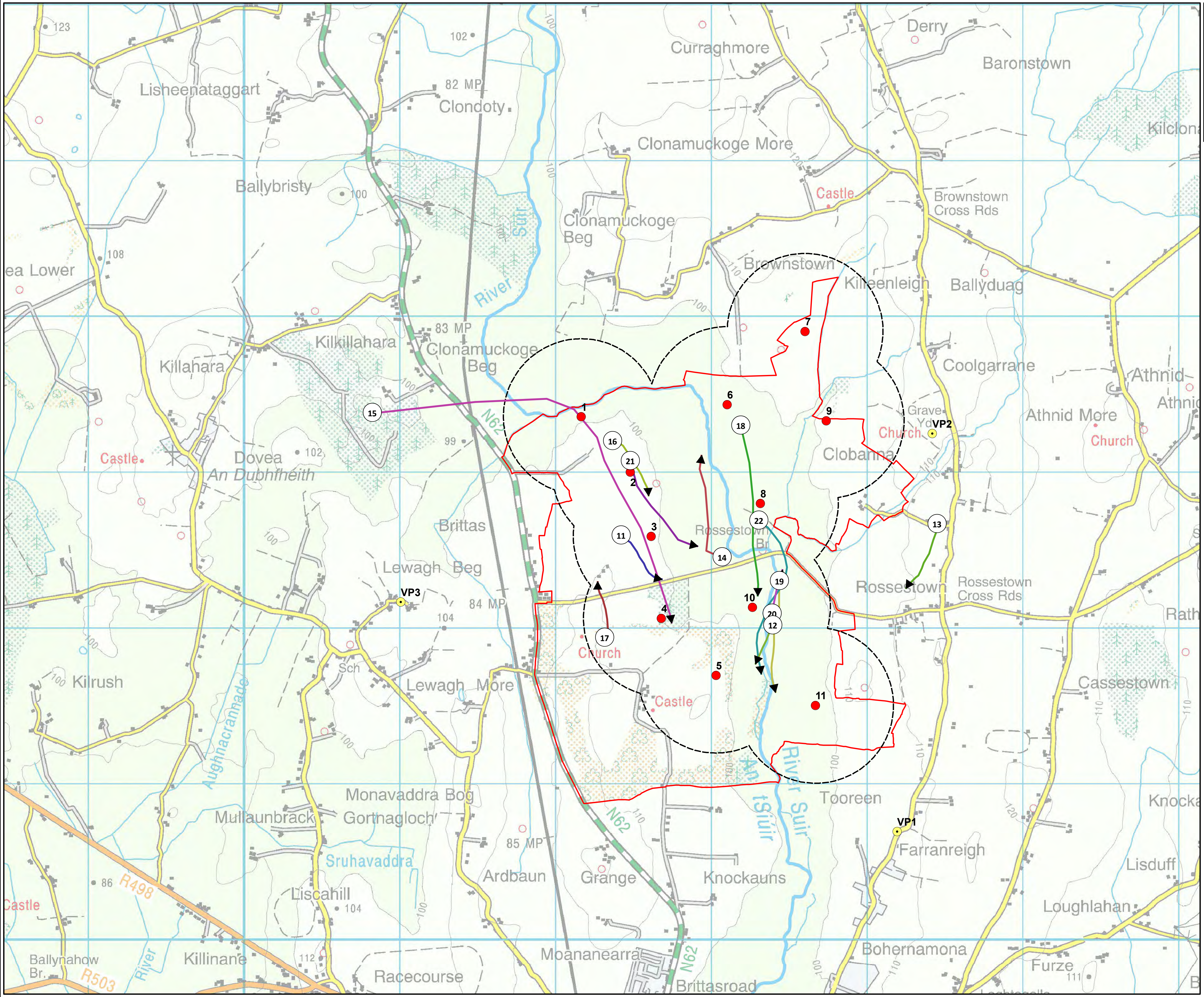

N W E S

0 0.5 1 2 Kilometers

Legend

- Vantage Point Locations
- Turbine Locations
- Site Boundary
- Proposed Turbines 500m Buffer

Flightline, Date, Time

- 11, 02/09/2021, 13:22
- 12, 29/07/2021, 14:02
- 13, 17/06/2021, 14:04
- 14, 02/09/2021, 15:44
- 15, 28/04/2021, 16:22
- 16, 31/05/2021, 16:51
- 17, 15/06/2021, 17:11
- 18, 30/05/2021, 17:50
- 19, 25/05/2021, 17:57
- 20, 30/06/2021, 18:07
- 21, 24/08/2021, 18:18
- 22, 26/05/2021, 19:47

TITLE:	Summer Flightlines 2021 Grey Heron 2		
PROJECT:	Brittas Wind Farm, Co. Tipperary		
FIGURE NO:	-		
CLIENT:	Enerco		
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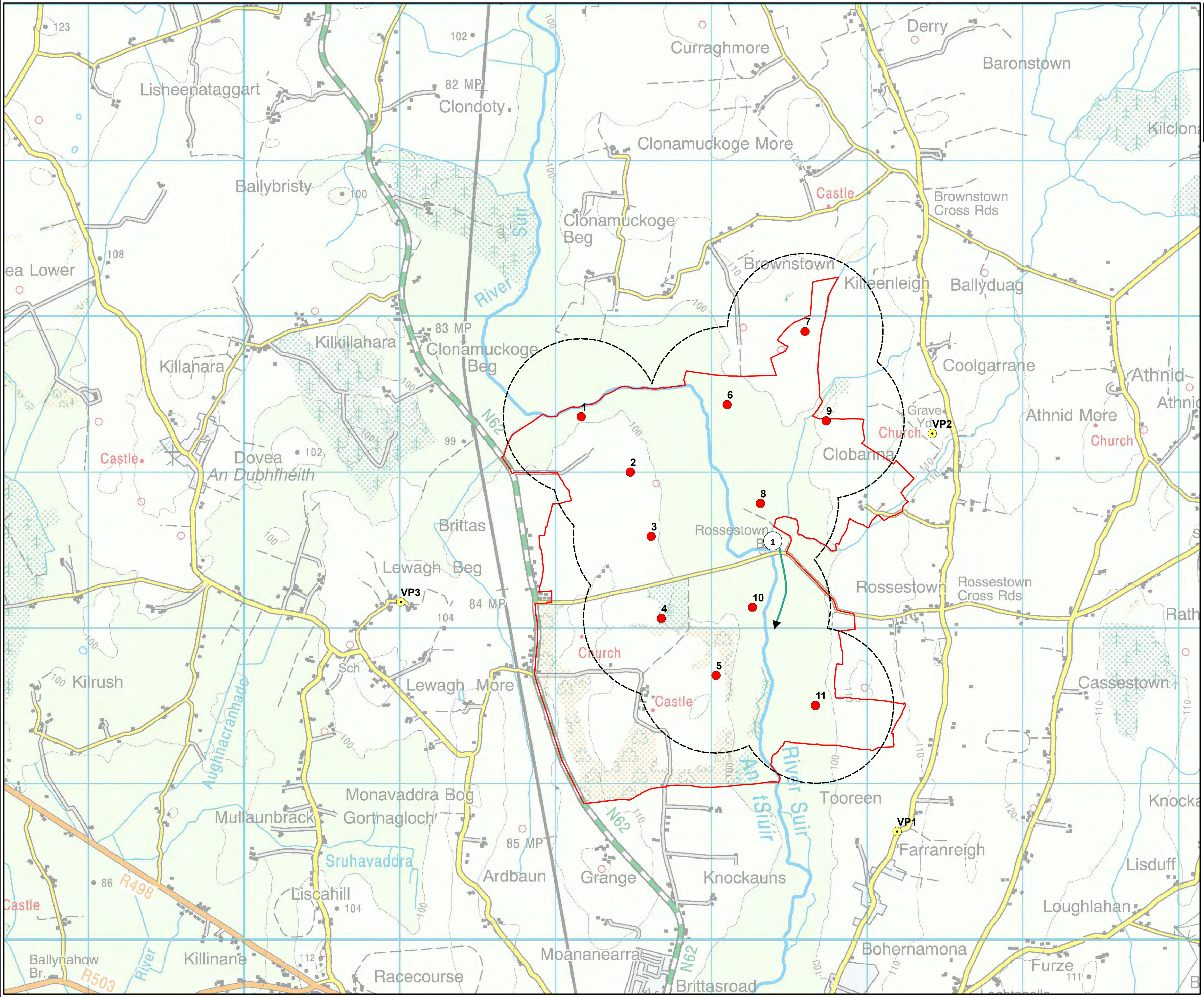

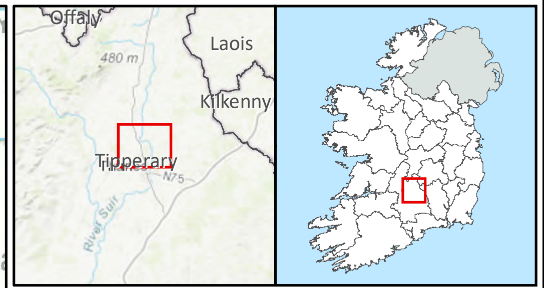

Legend

- Vantage Point Locations
- Turbine Locations
- Site Boundary
- Proposed Turbines 500m Buffer

Flightline, Date, Time

- 1, 15/04/2021, 13:40

TITLE:	Summer Flightlines 2021 Herring Gull
PROJECT:	Brittas Wind Farm, Co. Tipperary
FIGURE NO:	-
CLIENT:	Enerco
SCALE: 1:24000	**REVISION:** 0
DATE: 18/02/2022	**PAGE SIZE:** A3

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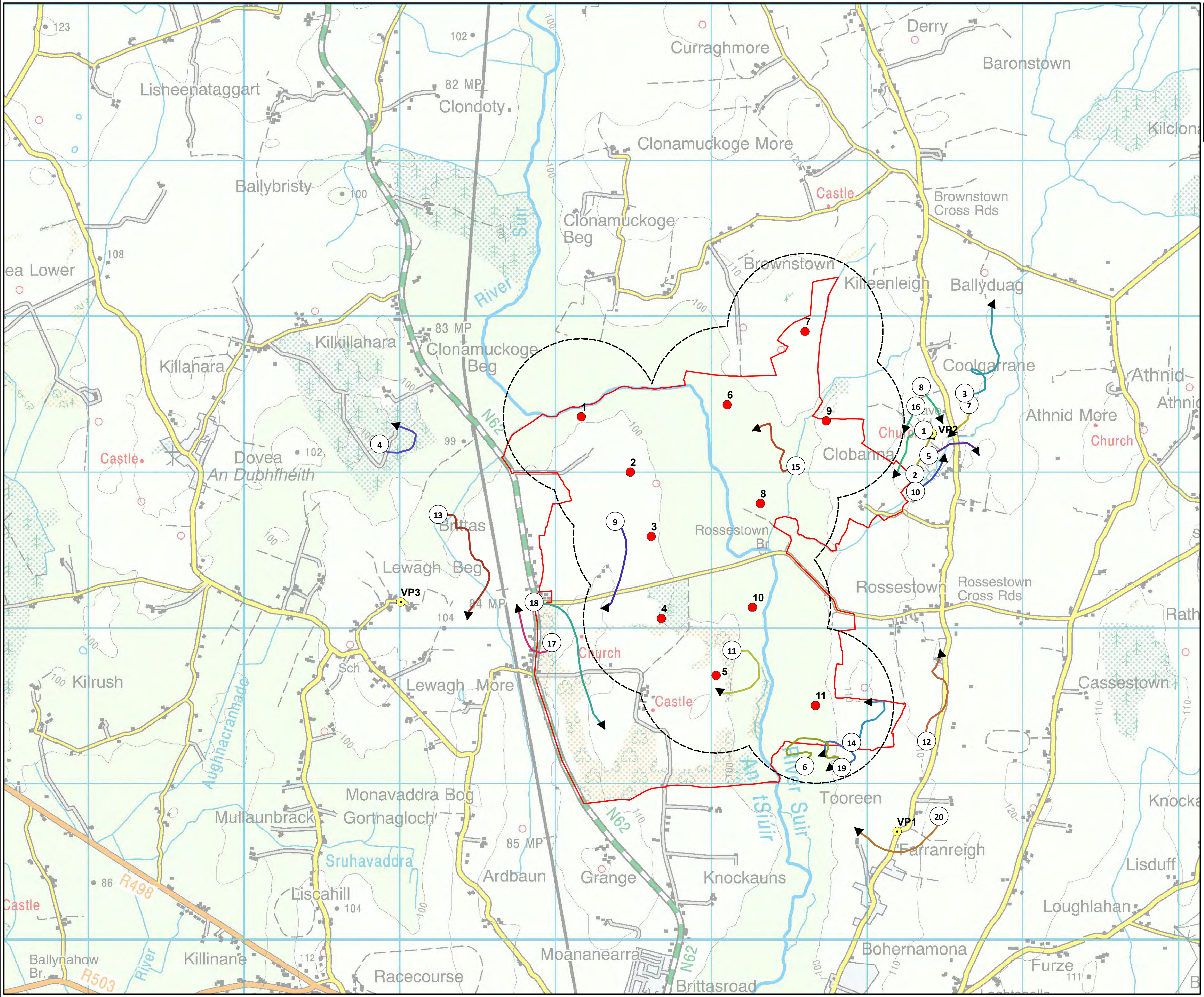

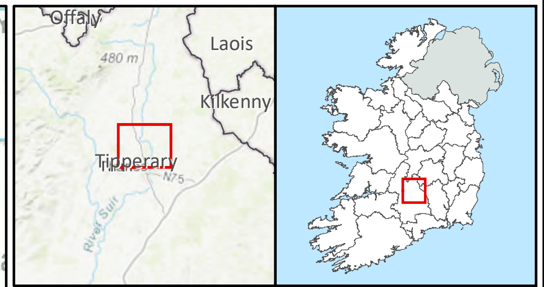

Legend

- Vantage Point Locations
- Turbine Locations
- Site Boundary
- Proposed Turbines 500m Buffer

Flightline, Date, Time

- 1, 30/06/2021, 08:19
- 2, 30/06/2021, 08:58
- 3, 24/08/2021, 09:48
- 4, 25/06/2021, 09:51
- 5, 30/06/2021, 09:54
- 6, 24/07/2021, 09:57
- 7, 30/06/2021, 09:59
- 8, 30/06/2021, 10:01
- 9, 25/06/2021, 10:04
- 10, 30/06/2021, 10:04
- 11, 26/07/2021, 10:07
- 12, 02/09/2021, 10:16
- 13, 11/05/2021, 10:21
- 14, 24/07/2021, 10:28
- 15, 24/08/2021, 10:28
- 16, 30/06/2021, 10:38
- 17, 25/06/2021, 10:43
- 18, 25/06/2021, 10:44
- 19, 19/06/2021, 10:51
- 20, 19/06/2021, 10:57

TITLE: Summer Flightlines 2021
Kestrel 1

PROJECT: Brittas Wind Farm, Co. Tipperary

FIGURE NO:	-		
CLIENT:	Enerco		
SCALE:	1:24000	REVISION:	0
DATE:	18/02/2022	PAGE SIZE:	A3

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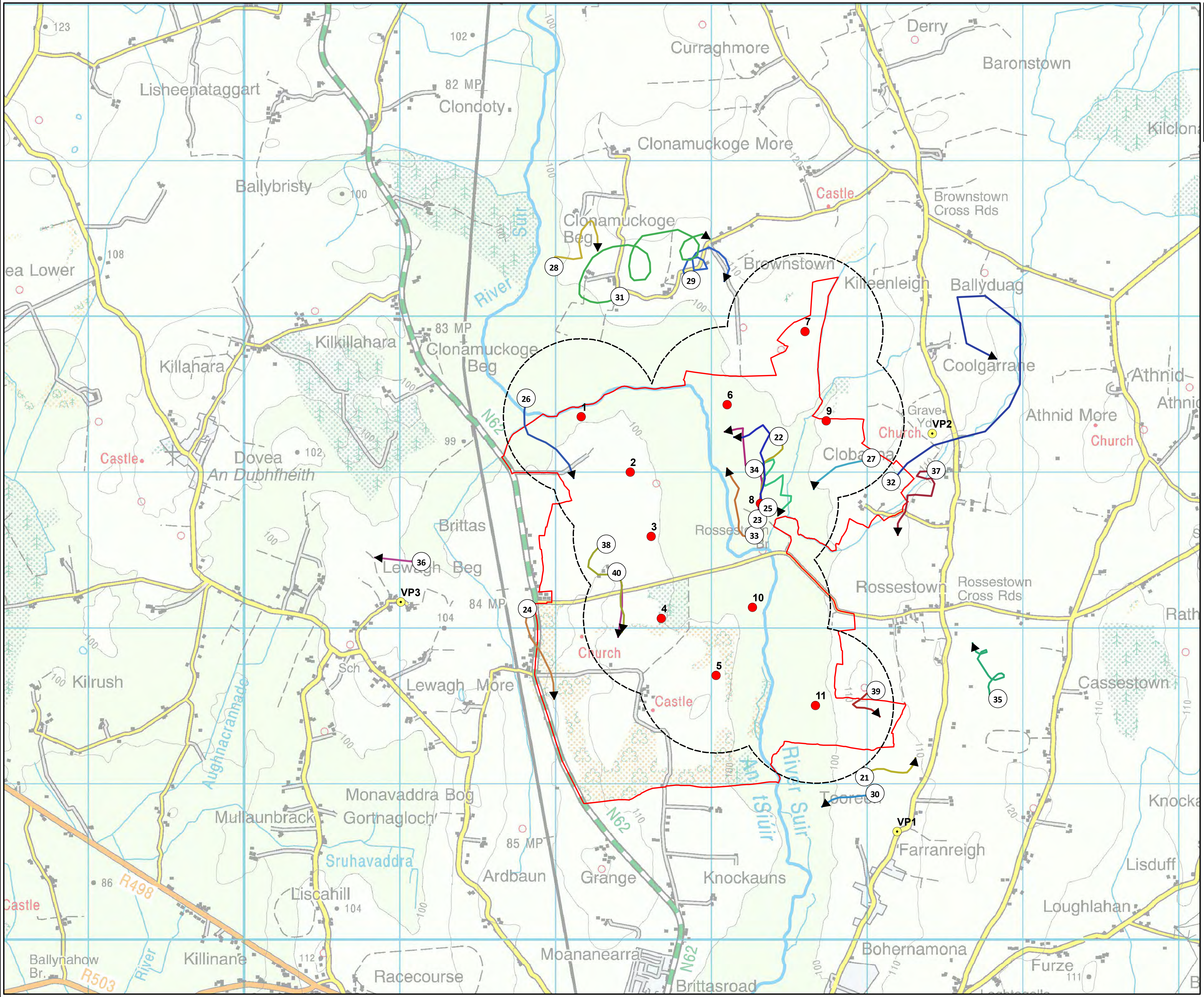

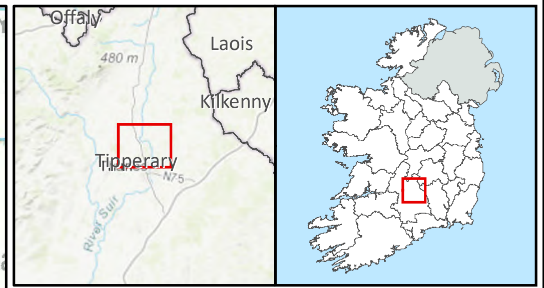

Legend

- Vantage Point Locations
- Turbine Locations
- Site Boundary
- Proposed Turbines 500m Buffer

Flightline, Date, Time

- 21, 19/06/2021, 11:00
- 22, 26/07/2021, 11:07
- 23, 15/07/2021, 11:11
- 24, 11/05/2021, 11:14
- 25, 10/08/2021, 11:16
- 26, 25/06/2021, 11:23
- 27, 21/07/2021, 11:26
- 28, 21/04/2021, 11:31
- 29, 21/04/2021, 11:37
- 30, 08/04/2021, 11:39
- 31, 15/07/2021, 11:39
- 32, 21/04/2021, 11:41
- 33, 10/08/2021, 11:48
- 34, 15/04/2021, 12:04
- 35, 02/09/2021, 12:07
- 36, 14/04/2021, 12:09
- 37, 15/04/2021, 12:21
- 38, 24/07/2021, 12:28
- 39, 08/04/2021, 12:36
- 40, 19/07/2021, 12:48

TITLE:	Summer Flightlines 2021 Kestrel 2
PROJECT:	Brittas Wind Farm, Co. Tipperary
FIGURE NO:	-
CLIENT:	Enerco
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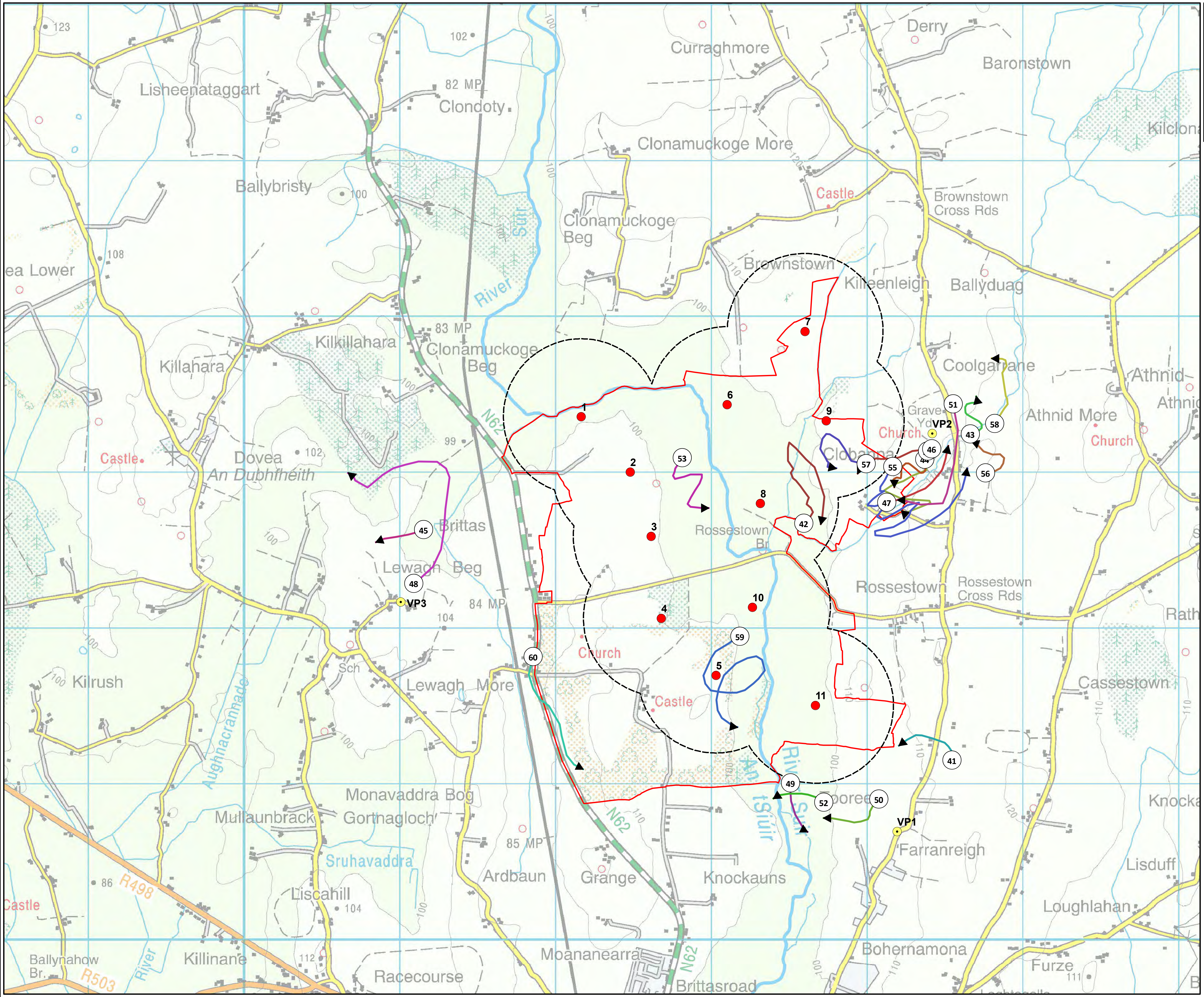

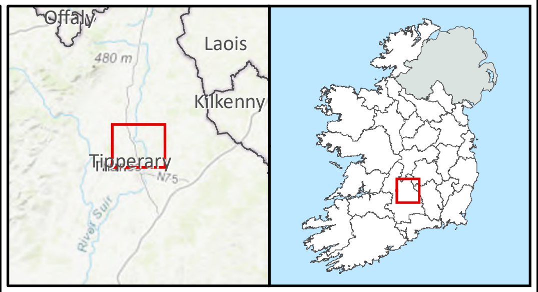

Legend

- Vantage Point Locations
- Turbine Locations
- Site Boundary
- Proposed Turbines 500m Buffer

Flightline, Date, Time

- 41, 24/04/2021, 12:51
- 42, 15/04/2021, 12:58
- 43, 17/06/2021, 13:03
- 44, 17/06/2021, 13:15
- 45, 14/04/2021, 13:26
- 46, 21/04/2021, 13:27
- 47, 17/06/2021, 13:29
- 48, 14/04/2021, 13:34
- 49, 29/07/2021, 13:36
- 50, 24/08/2021, 13:36
- 51, 26/08/2021, 13:37
- 52, 24/08/2021, 13:39
- 53, 26/08/2021, 13:41
- 54, 17/06/2021, 13:42
- 55, 17/06/2021, 13:54
- 56, 17/06/2021, 14:08
- 57, 21/04/2021, 14:09
- 58, 17/06/2021, 14:17
- 59, 15/07/2021, 15:15
- 60, 10/08/2021, 15:17

TITLE:	Summer Flightlines 2021 Kestrel 3
PROJECT:	Brittas Wind Farm, Co. Tipperary
FIGURE NO:	-
CLIENT:	Enerco
SCALE: 1:24000	**REVISION:** 0
DATE: 18/02/2022	**PAGE SIZE:** A3

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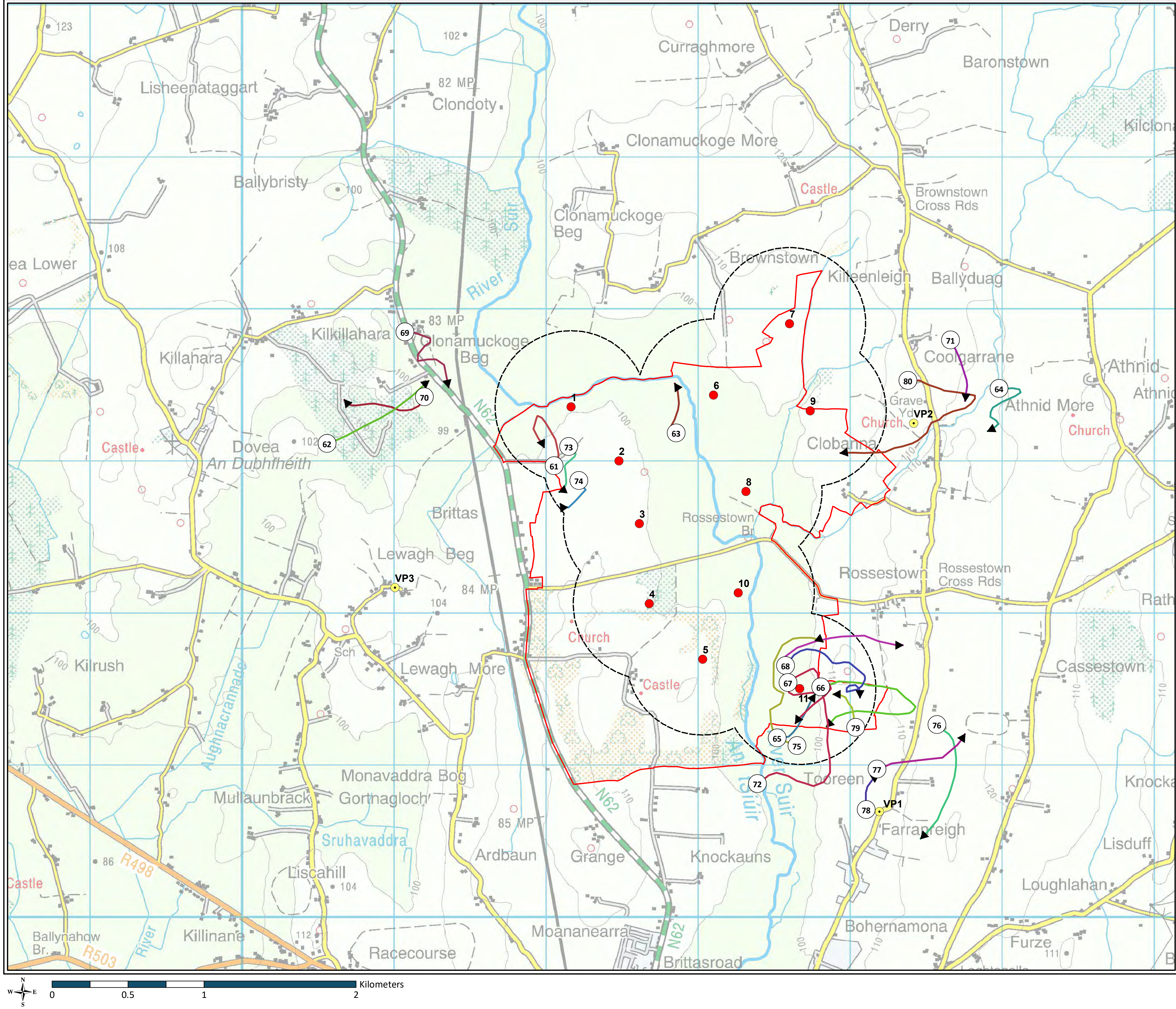

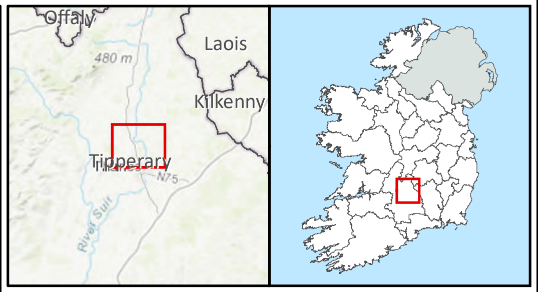

Legend

- Vantage Point Locations
- Turbine Locations
- Site Boundary
- Proposed Turbines 500m Buffer

Flightline, Date, Time

- 61, 28/04/2021, 15:25
- 62, 02/09/2021, 15:26
- 63, 26/08/2021, 15:27
- 64, 17/06/2021, 15:34
- 65, 25/05/2021, 15:39
- 66, 25/05/2021, 15:40
- 67, 25/05/2021, 15:44
- 68, 30/05/2021, 15:59
- 69, 31/05/2021, 16:02
- 70, 31/05/2021, 16:07
- 71, 17/06/2021, 16:11
- 72, 30/05/2021, 16:17
- 73, 28/04/2021, 16:21
- 74, 28/04/2021, 16:26
- 75, 30/05/2021, 16:39
- 76, 25/05/2021, 16:50
- 77, 30/05/2021, 16:54
- 78, 30/06/2021, 17:13
- 79, 30/06/2021, 17:14
- 80, 30/05/2021, 17:15

TITLE:	Summer Flightlines 2021 Kestrel 4		
PROJECT:	Brittas Wind Farm, Co. Tipperary		
FIGURE NO:	-		
CLIENT:	Enerco		
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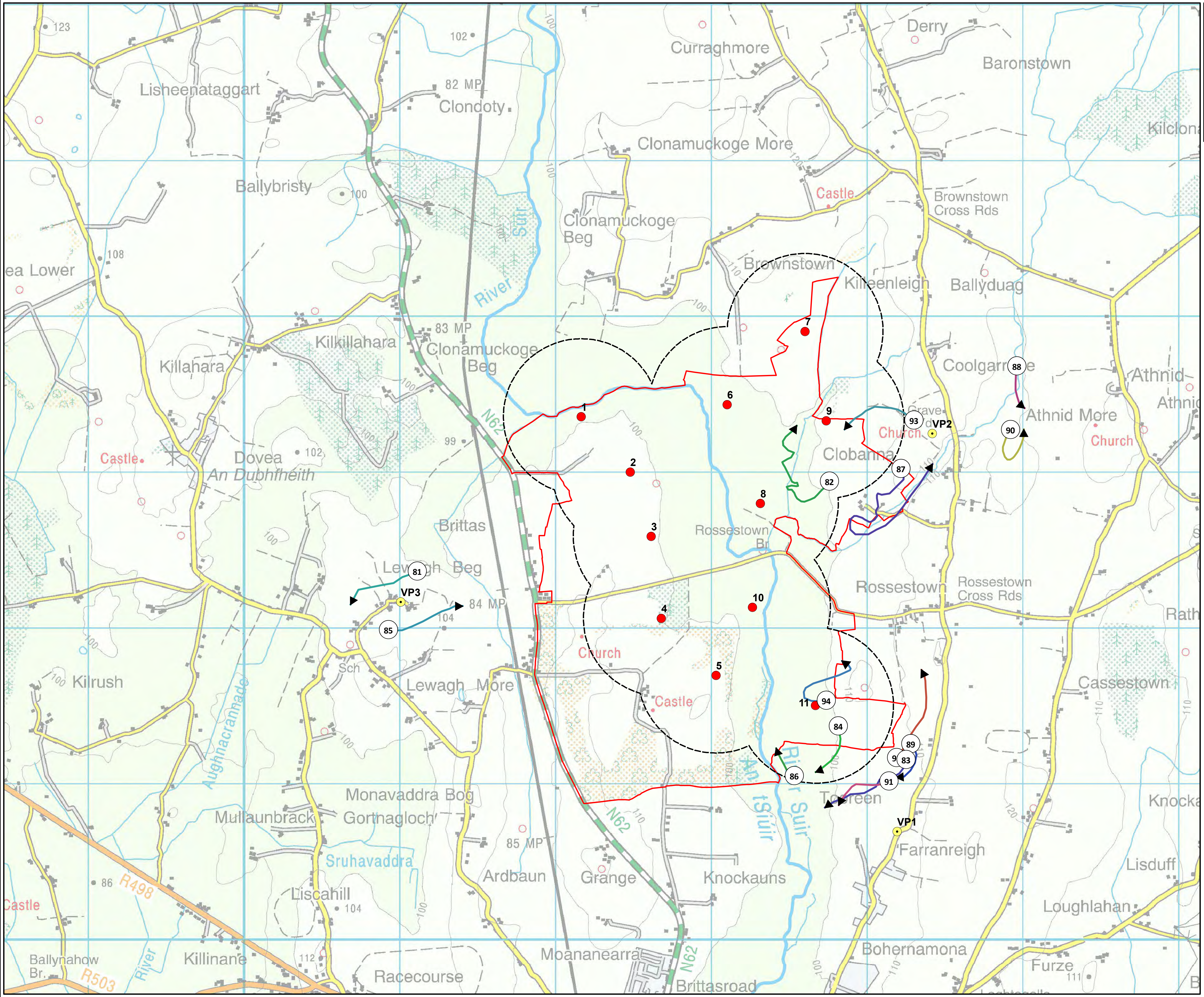

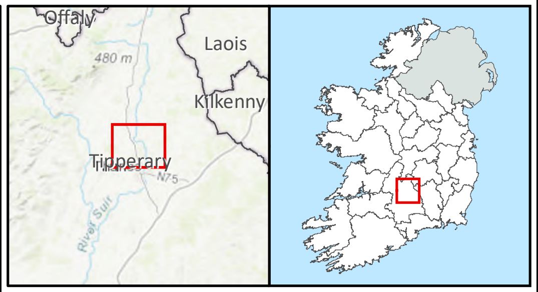

Legend

- Vantage Point Locations
- Turbine Locations
- Site Boundary
- Proposed Turbines 500m Buffer

Flightline, Date, Time

- 81, 28/04/2021, 17:17
- 82, 30/05/2021, 17:17
- 83, 25/05/2021, 17:22
- 84, 30/06/2021, 17:23
- 85, 28/04/2021, 17:28
- 86, 30/06/2021, 18:00
- 87, 30/05/2021, 18:06
- 88, 30/05/2021, 18:33
- 89, 30/06/2021, 18:43
- 90, 30/05/2021, 18:46
- 91, 30/06/2021, 18:46
- 92, 30/06/2021, 19:19
- 93, 31/05/2021, 19:22
- 94, 30/06/2021, 19:52

TITLE:	Summer Flightlines 2021 Kestrel 5		
PROJECT:	Brittas Wind Farm, Co. Tipperary		
FIGURE NO:	-		
CLIENT:	Enerco		
SCALE:	1:24000	**REVISION:**	0
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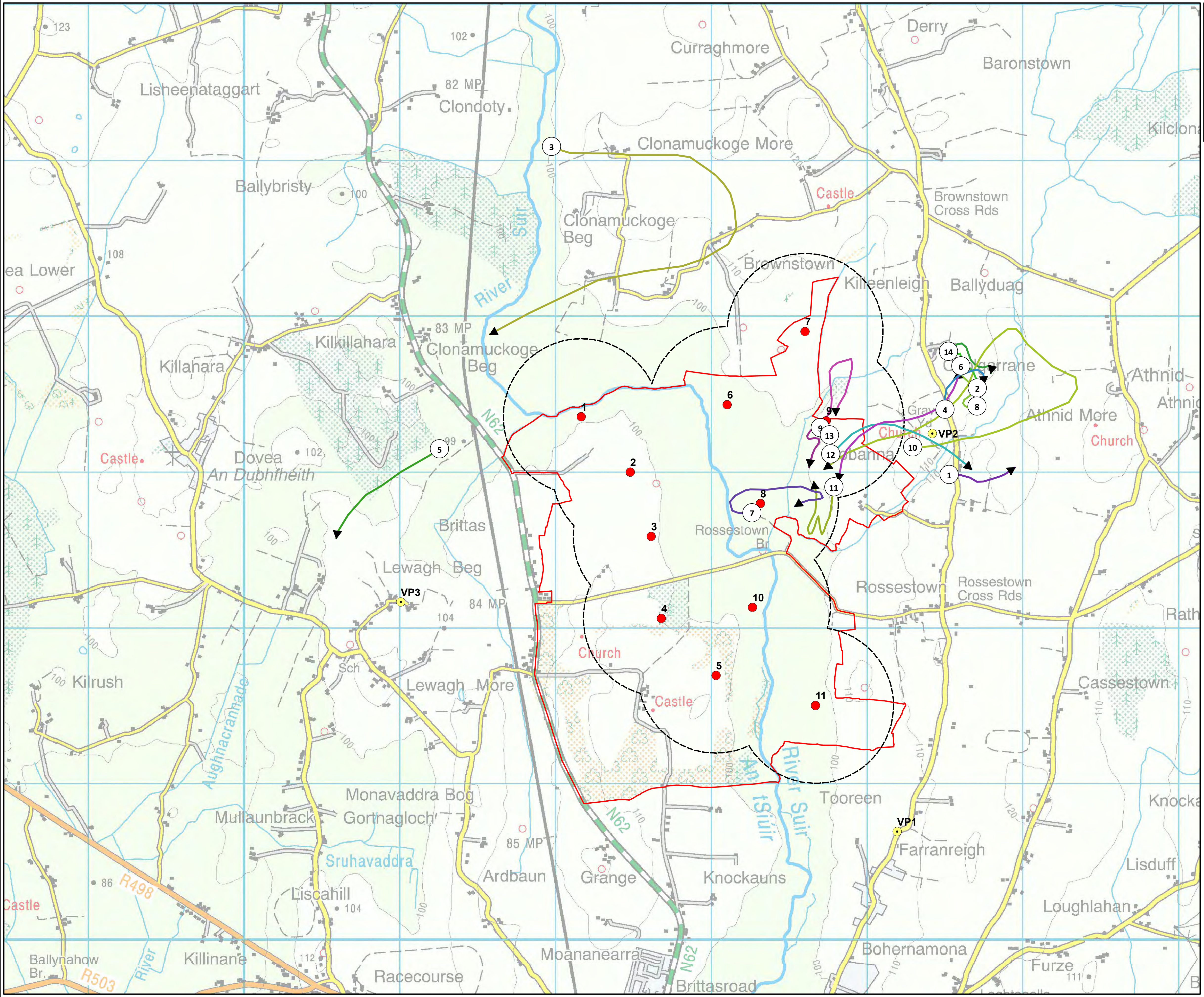

Legend

- Vantage Point Locations
- Turbine Locations
- Site Boundary
- Proposed Turbines 500m Buffer

Flightline, Date, Time

- 1, 01/06/2021, 19:31
- 2, 31/05/2021, 20:05
- 3, 30/06/2021, 08:55
- 4, 30/06/2021, 09:01
- 5, 25/06/2021, 10:13
- 6, 17/06/2021, 14:04
- 7, 17/06/2021, 15:49
- 8, 26/05/2021, 17:15
- 9, 30/05/2021, 17:21
- 10, 30/05/2021, 17:44
- 11, 30/05/2021, 18:26
- 12, 30/05/2021, 18:36
- 13, 30/05/2021, 19:06
- 14, 26/05/2021, 19:25

TITLE:	Summer Flightlines 2021 Lapwing		
PROJECT:	Brittas Wind Farm, Co. Tipperary		
FIGURE NO:	-		
CLIENT:	Enerco		
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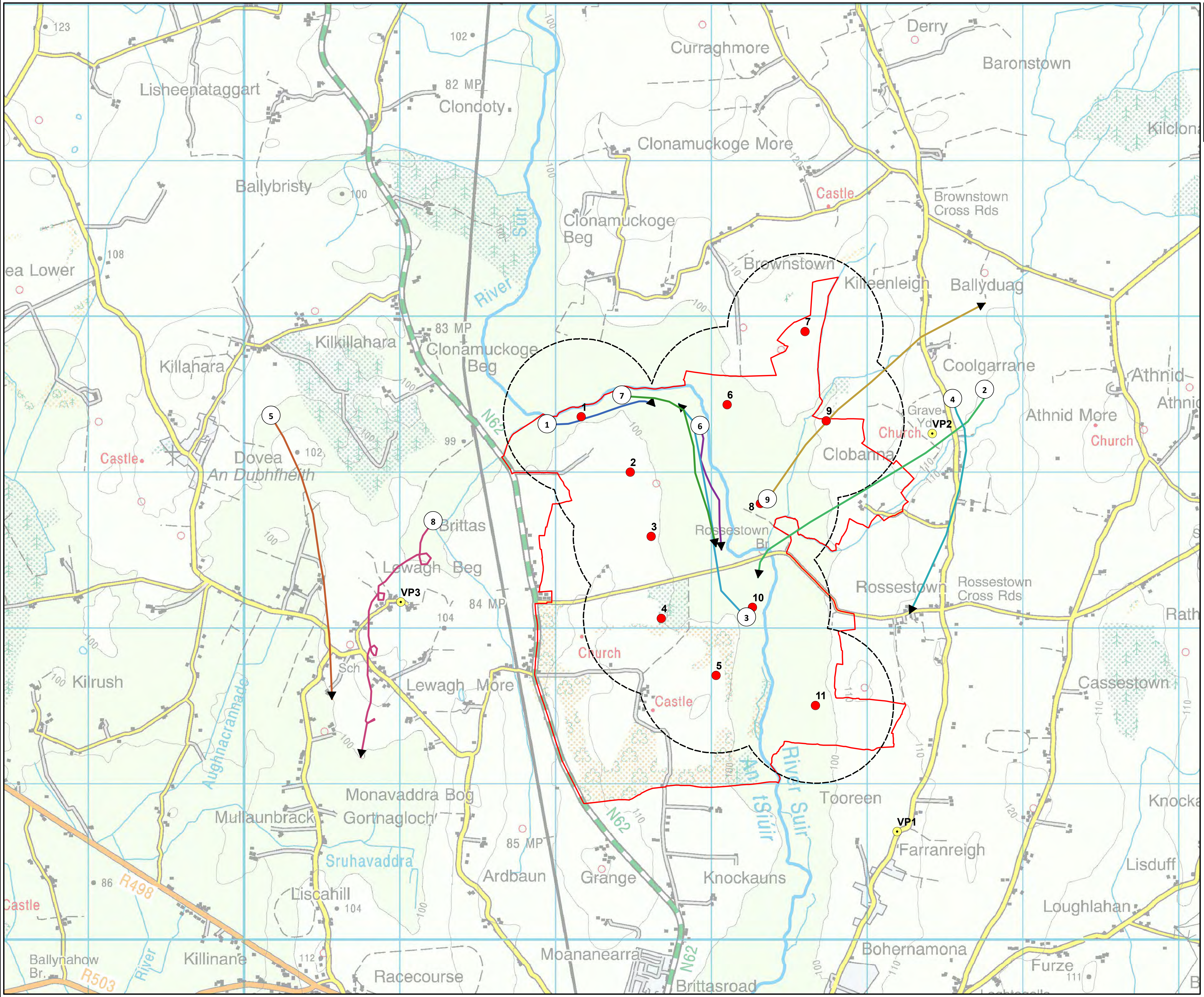

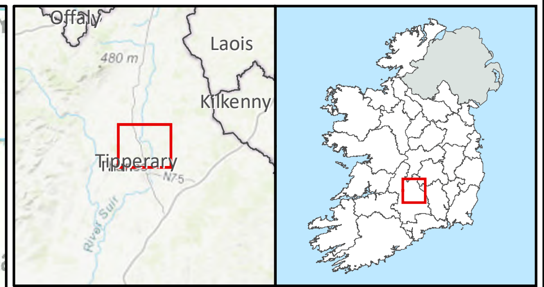

Legend

- Vantage Point Locations
- Turbine Locations
- Site Boundary
- Proposed Turbines 500m Buffer

Flightline, Date, Time

- 1, 30/06/2021, 08:33
- 2, 26/07/2021, 09:55
- 3, 26/07/2021, 10:02
- 4, 24/08/2021, 11:41
- 5, 24/07/2021, 13:05
- 6, 15/07/2021, 13:12
- 7, 26/07/2021, 14:19
- 8, 02/09/2021, 14:34
- 9, 26/05/2021, 17:38

TITLE:	Summer Flightlines 2021 Lesser Black-backed Gull
PROJECT:	Brittas Wind Farm, Co. Tipperary
FIGURE NO:	-
CLIENT:	Enerco
SCALE: 1:24000	REVISION: 0
DATE: 18/02/2022	PAGE SIZE: A3

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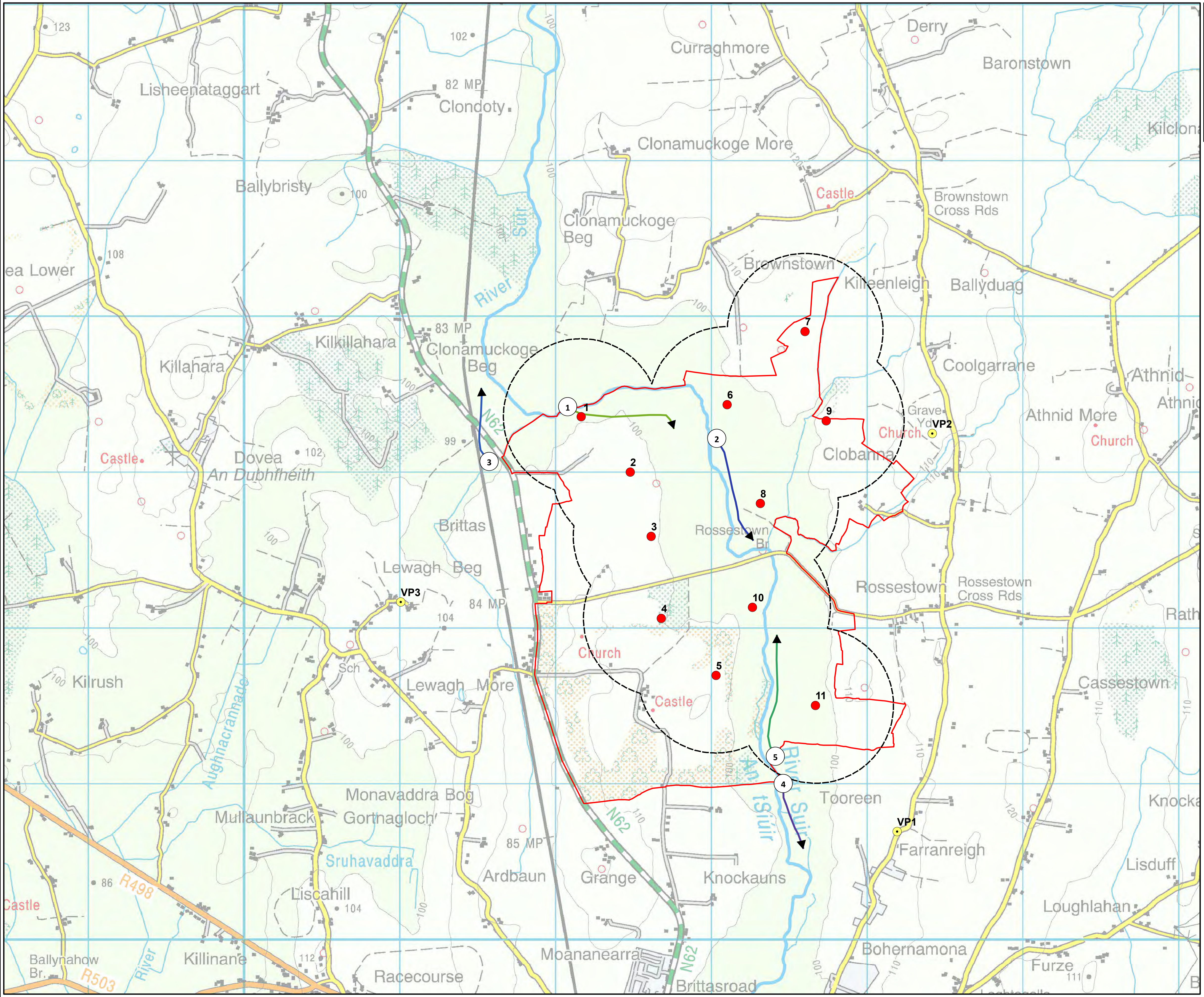

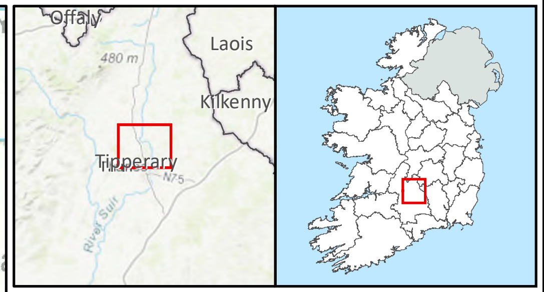

Legend

- Vantage Point Locations
- Turbine Locations
- Site Boundary
- Proposed Turbines 500m Buffer

Flightline, Date, Time

- 1, 25/06/2021, 11:31
- 2, 26/08/2021, 13:43
- 3, 31/05/2021, 14:12
- 4, 25/05/2021, 15:51
- 5, 30/05/2021, 15:54

TITLE:	Summer Flightlines 2021 Mallard
PROJECT:	Brittas Wind Farm, Co. Tipperary
FIGURE NO:	-
CLIENT:	Enerco
SCALE: 1:24000	REVISION: 0
DATE: 18/02/2022	PAGE SIZE: A3

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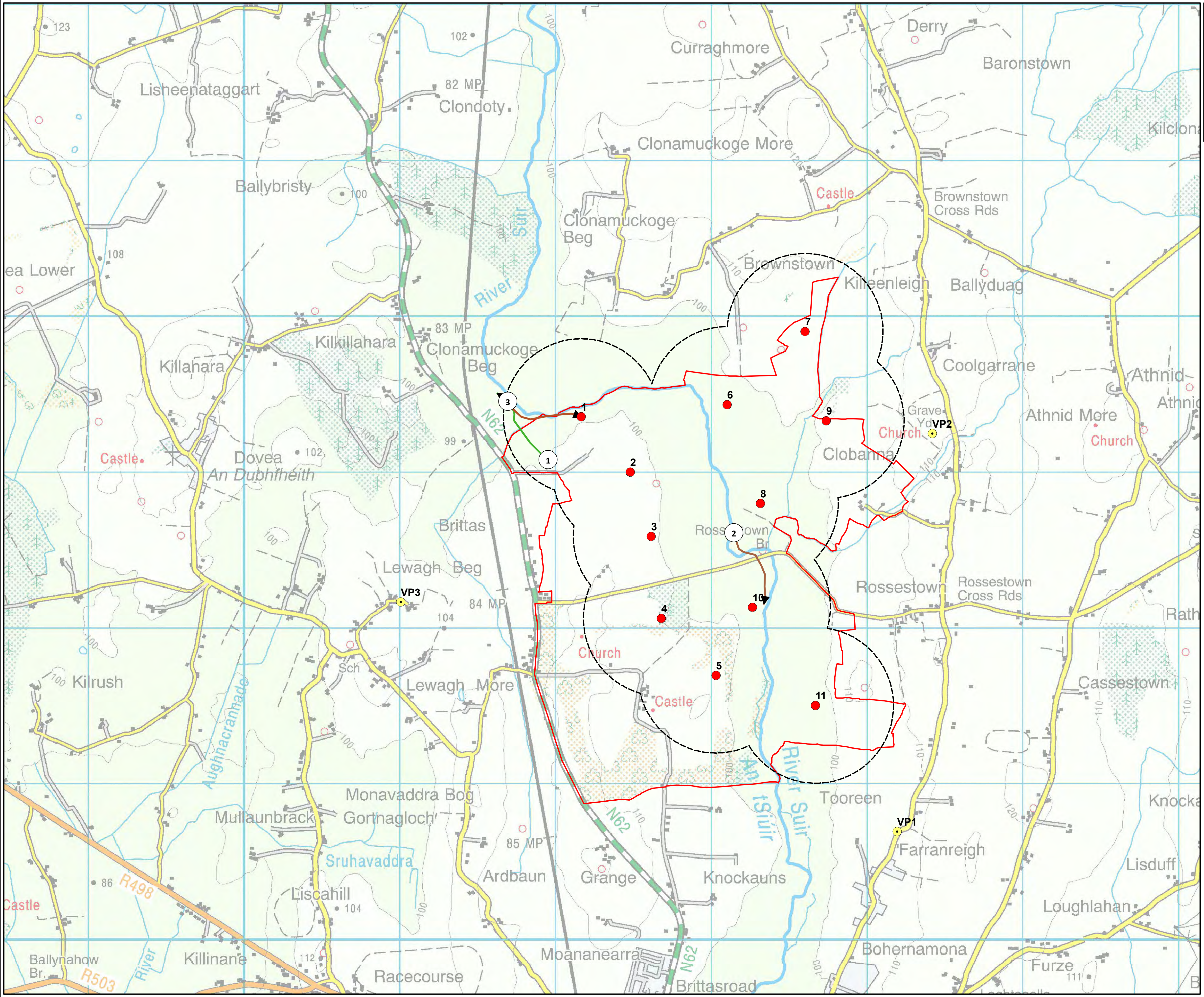

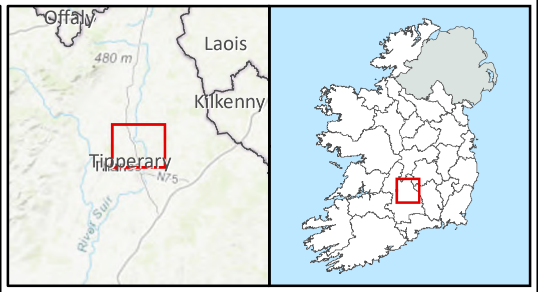

Legend

- Vantage Point Locations
- Turbine Locations
- Site Boundary
- Proposed Turbines 500m Buffer

Flightline, Date, Time

- 1, 11/05/2021, 10:08
- 2, 30/05/2021, 14:37
- 3, 31/05/2021, 15:11

TITLE:	Summer Flightlines 2021 Mute Swan
PROJECT:	Brittas Wind Farm, Co. Tipperary
FIGURE NO:	-
CLIENT:	Enerco
SCALE: 1:24000	**REVISION:** 0
DATE: 18/02/2022	**PAGE SIZE:** A3

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0 0.5 1 2 Kilometers

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Sources: Esri, HERE, Garmin, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), (c) OpenStreetMap contributors, and the GIS User Community
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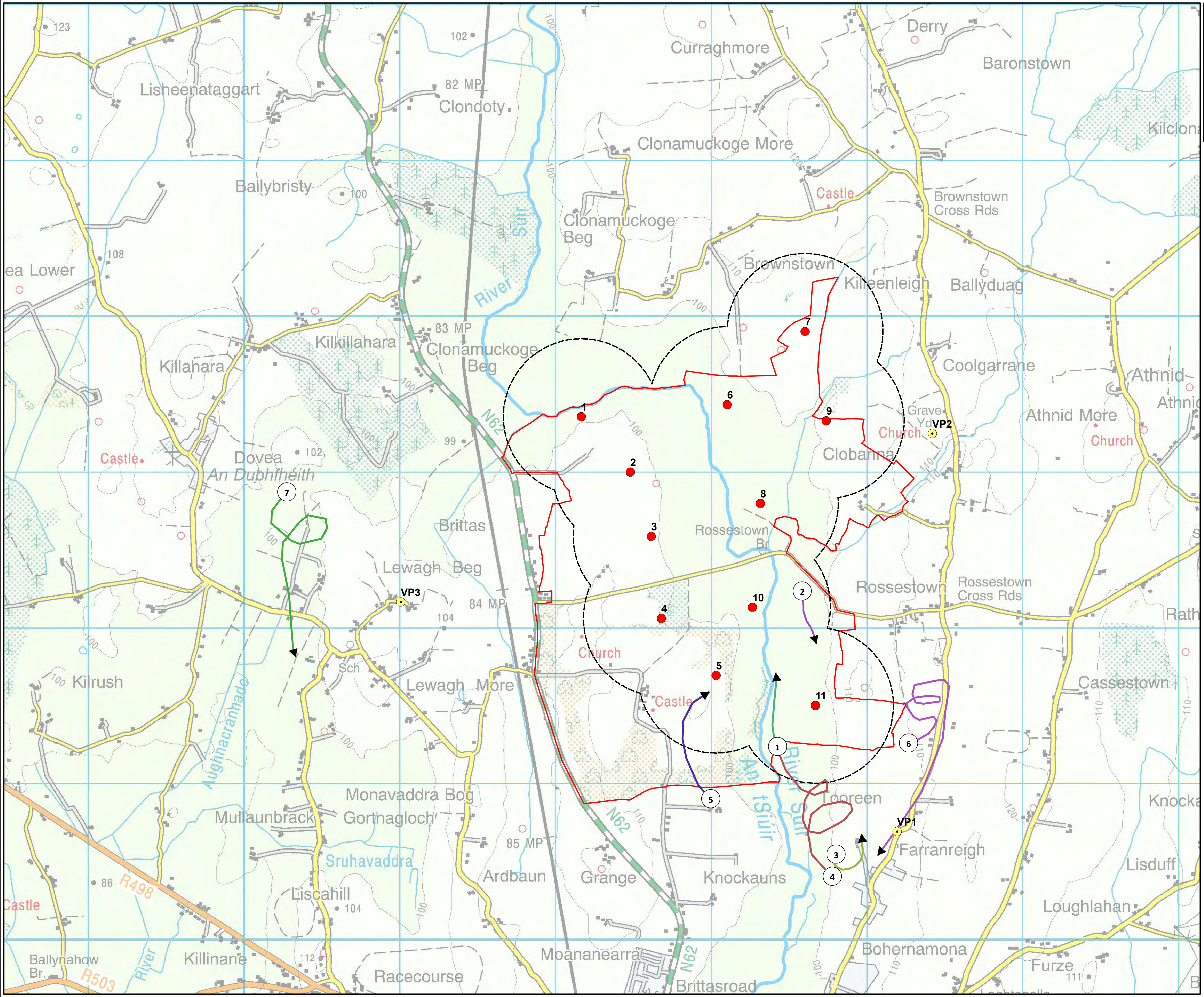

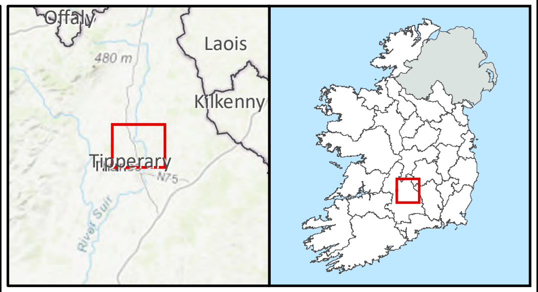

Legend

- Vantage Point Locations
- Turbine Locations
- Site Boundary
- Proposed Turbines 500m Buffer

Flightline, Date, Time

- 1, 02/09/2021, 10:36
- 2, 26/08/2021, 11:14
- 3, 26/08/2021, 11:18
- 4, 26/08/2021, 11:19
- 5, 24/04/2021, 11:41
- 6, 30/05/2021, 16:10
- 7, 24/08/2021, 17:04

TITLE:	Summer Flightlines 2021 Peregrine		
PROJECT:	Brittas Wind Farm, Co. Tipperary		
FIGURE NO:	-		
CLIENT:	Enerco		
SCALE:	1:24000	REVISION:	0
DATE:	18/02/2022	PAGE SIZE:	A3

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Path: R:\Map Production\2020\P20-290\Workspace\Flightlines\P20-290_GIS_INFO_Flightlines_Brittas_A3.mxd

Sources: Esri, HERE, Garmin, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), (c) OpenStreetMap contributors, and the GIS User Community
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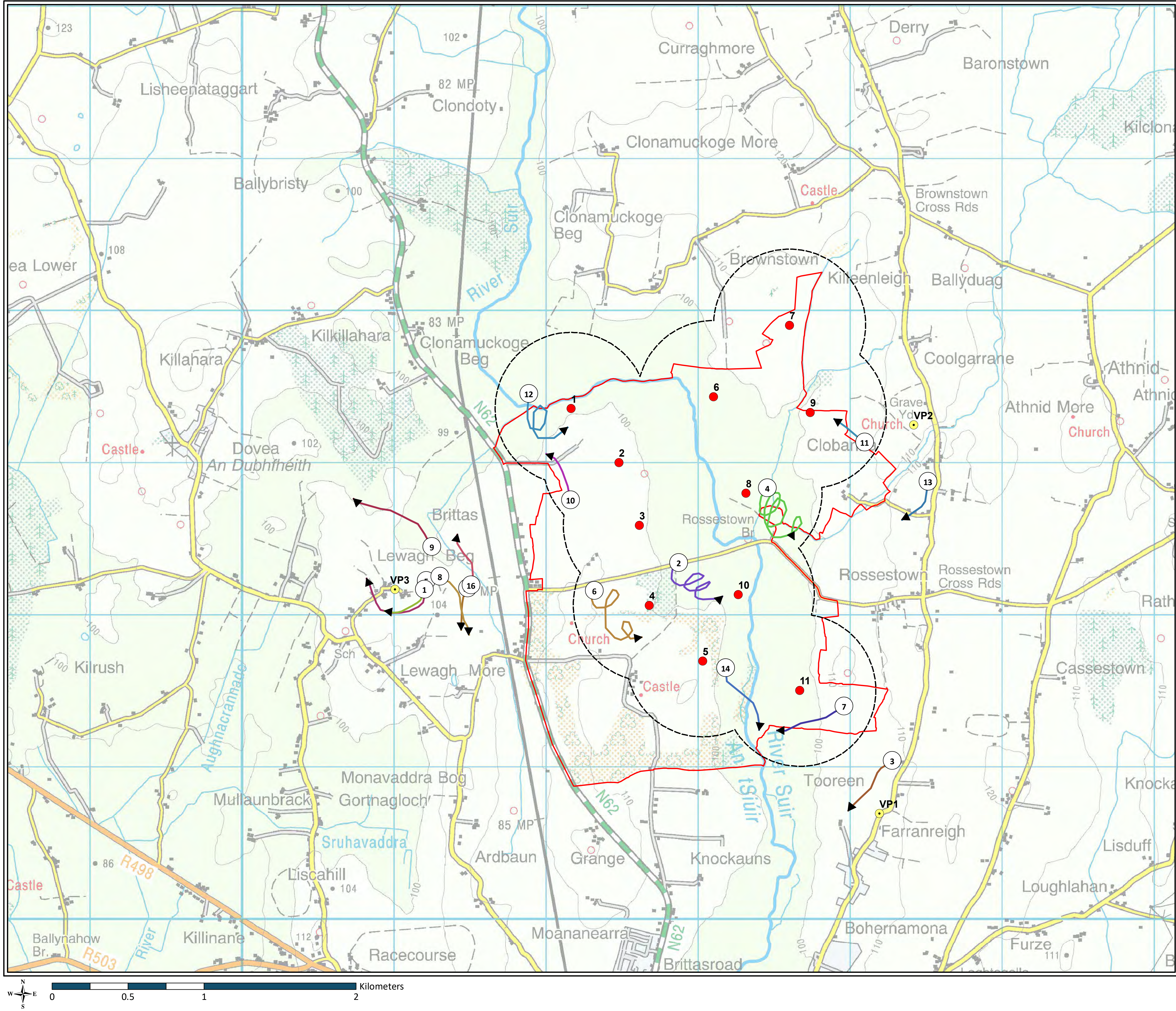

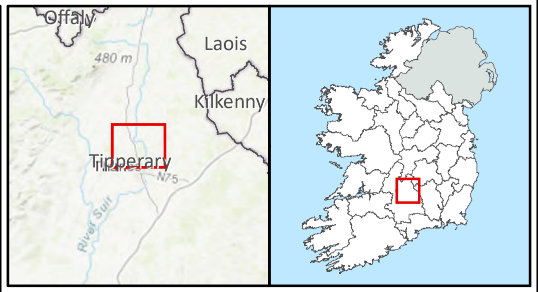

Legend

- Vantage Point Locations
- Turbine Locations
- Site Boundary
- Proposed Turbines 500m Buffer

Flightline, Date, Time

- 1, 11/05/2021, 11:10
- 2, 21/04/2021, 11:33
- 3, 02/09/2021, 11:33
- 4, 21/04/2021, 12:00
- 5, 02/09/2021, 13:01
- 6, 15/04/2021, 13:04
- 7, 24/04/2021, 13:35
- 8, 26/07/2021, 13:36
- 9, 10/08/2021, 13:44
- 10, 02/09/2021, 13:47
- 11, 15/07/2021, 13:52
- 12, 14/04/2021, 14:02
- 13, 15/04/2021, 14:27
- 14, 25/05/2021, 16:11
- 15, 15/06/2021, 17:46
- 16, 24/08/2021, 19:23

TITLE:	Summer Flightlines 2021 Sparrowhawk		
PROJECT:	Brittas Wind Farm, Co. Tipperary		
FIGURE NO:	-		
CLIENT:	Enerco		
SCALE:	1:24000	REVISION:	0
DATE:	18/02/2022	PAGE SIZE:	A3

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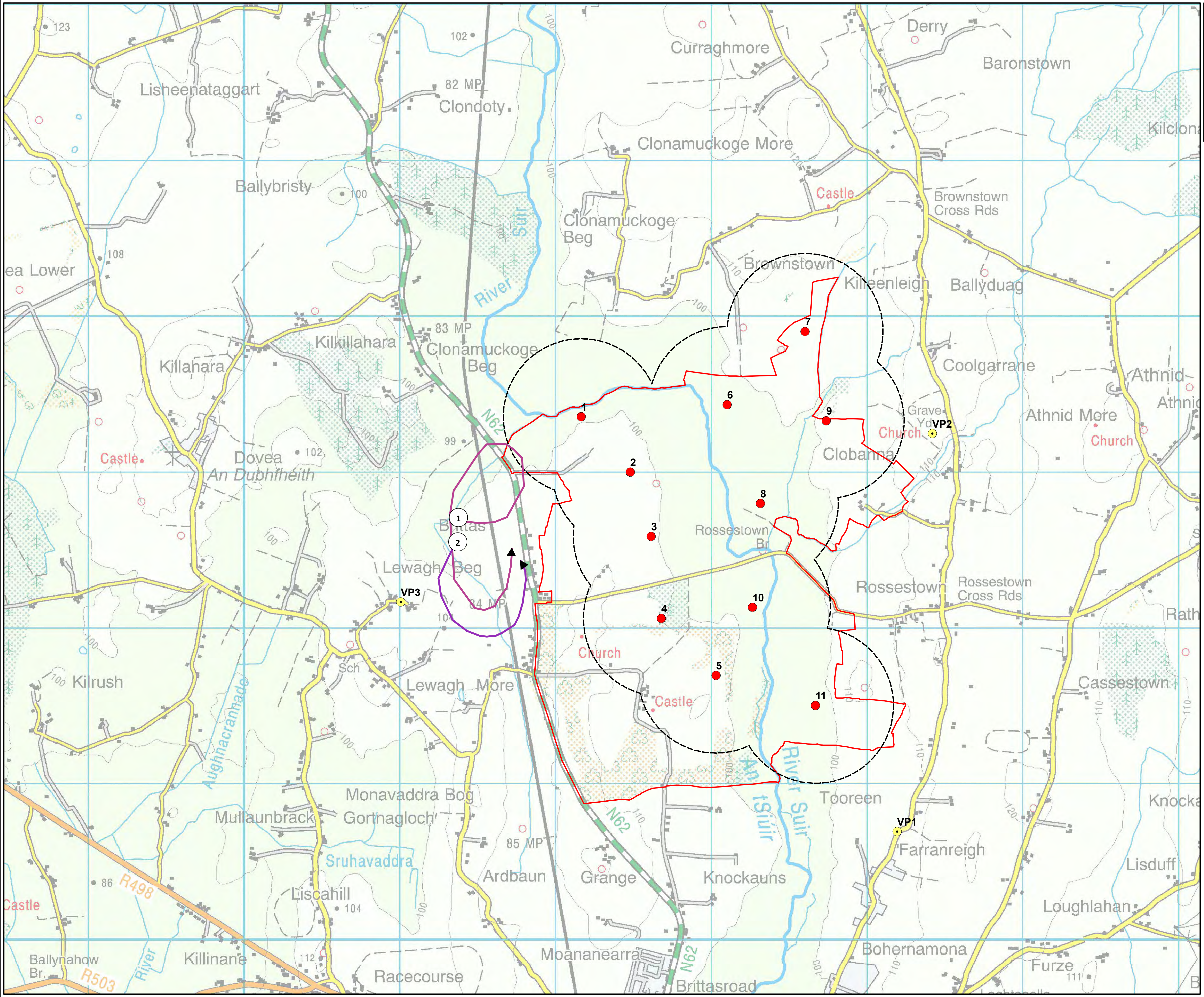

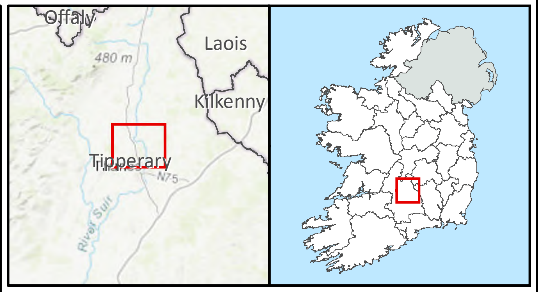

Legend

- Vantage Point Locations
- Turbine Locations
- Site Boundary
- Proposed Turbines 500m Buffer

Flightline, Date, Time

- 1, 02/09/2021, 13:59
- 2, 02/09/2021, 14:51

TITLE:	Summer Flightlines 2021 Snipe
PROJECT:	Brittas Wind Farm, Co. Tipperary
FIGURE NO:	-
CLIENT:	Enerco
SCALE: 1:24000	REVISION: 0
DATE: 18/02/2022	PAGE SIZE: A3

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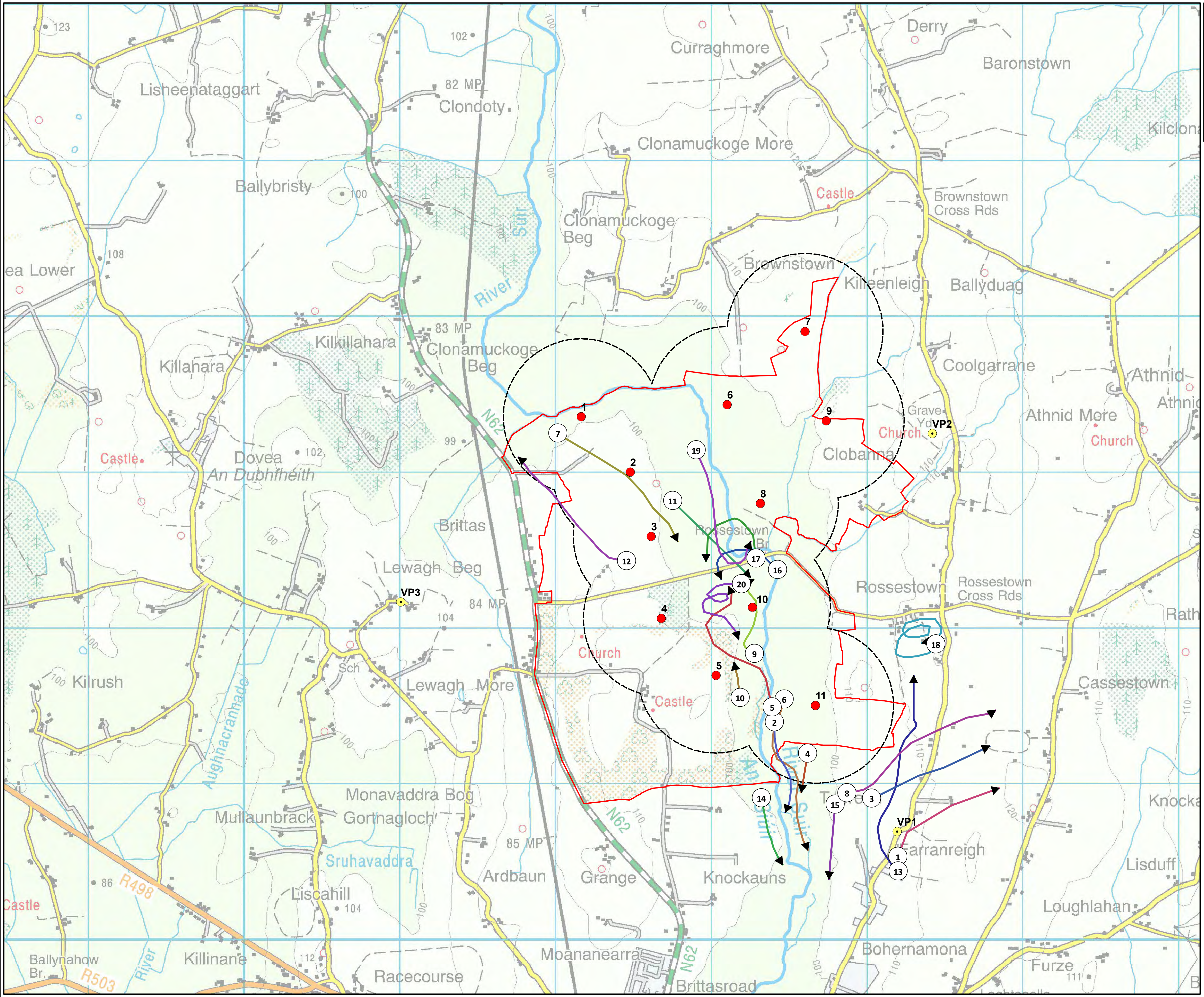

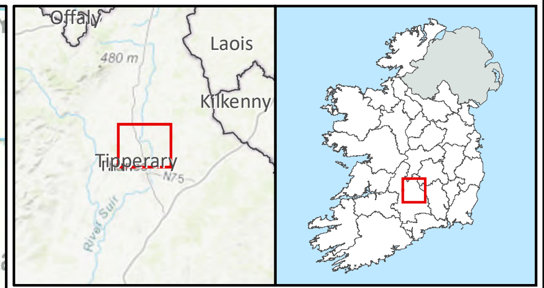

Legend

- Vantage Point Locations
- Turbine Locations
- Site Boundary
- Proposed Turbines 500m Buffer

Flightline, Date, Time

- 1, 14/01/2021, 09:12
- 2, 29/12/2020, 09:19
- 3, 14/01/2021, 09:21
- 4, 05/02/2021, 09:21
- 5, 29/12/2020, 09:40
- 6, 20/12/2020, 09:56
- 7, 19/12/2020, 10:00
- 8, 14/01/2021, 10:07
- 9, 29/12/2020, 10:12
- 10, 29/12/2020, 10:22
- 11, 19/12/2020, 10:30
- 12, 30/12/2020, 11:16
- 13, 04/12/2020, 11:31
- 14, 20/12/2020, 11:41
- 15, 14/01/2021, 11:51
- 16, 29/12/2020, 11:54
- 17, 29/12/2020, 12:05
- 18, 04/12/2020, 12:27
- 19, 29/12/2020, 12:47
- 20, 29/12/2020, 12:52

TITLE:
Winter Flightlines 2020/2021
Black-headed Gull 1

PROJECT:
Brittas Wind Farm, Co. Tipperary

FIGURE NO:	-		
CLIENT:	Enerco		
SCALE:	1:24000	REVISION:	0
DATE:	17/02/2022	PAGE SIZE:	A3

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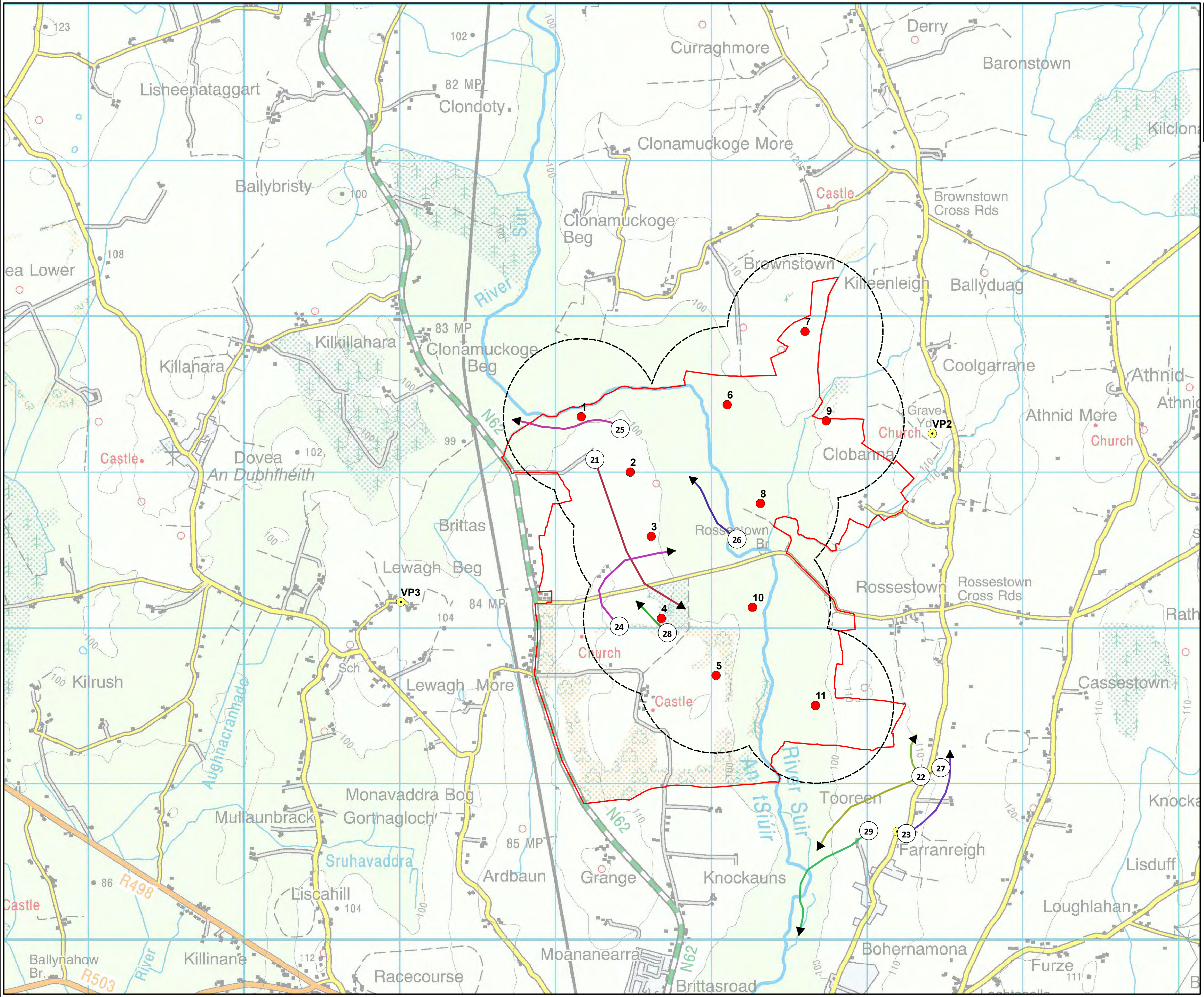

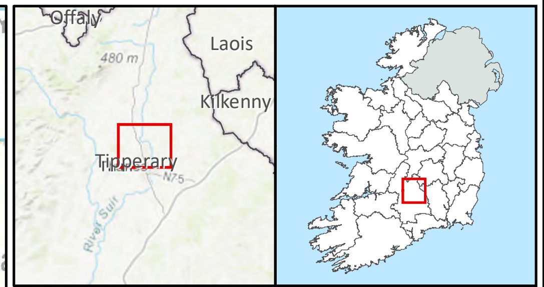

Legend

- Vantage Point Locations
- Turbine Locations
- Site Boundary
- Proposed Turbines 500m Buffer

Flightline, Date, Time

- 21, 29/12/2020, 13:06
- 22, 22/03/2021, 13:22
- 23, 22/03/2021, 13:25
- 24, 29/12/2020, 13:52
- 25, 29/12/2020, 13:55
- 26, 28/01/2021, 14:14
- 27, 26/01/2021, 14:24
- 28, 29/12/2020, 15:06
- 29, 26/01/2021, 15:15

TITLE:	Winter Flightlines 2020/2021 Black-headed Gull 2
PROJECT:	Brittas Wind Farm, Co. Tipperary
FIGURE NO:	-
CLIENT:	Enerco
SCALE: 1:24000	**REVISION:** 0
DATE: 17/02/2022	**PAGE SIZE:** A3

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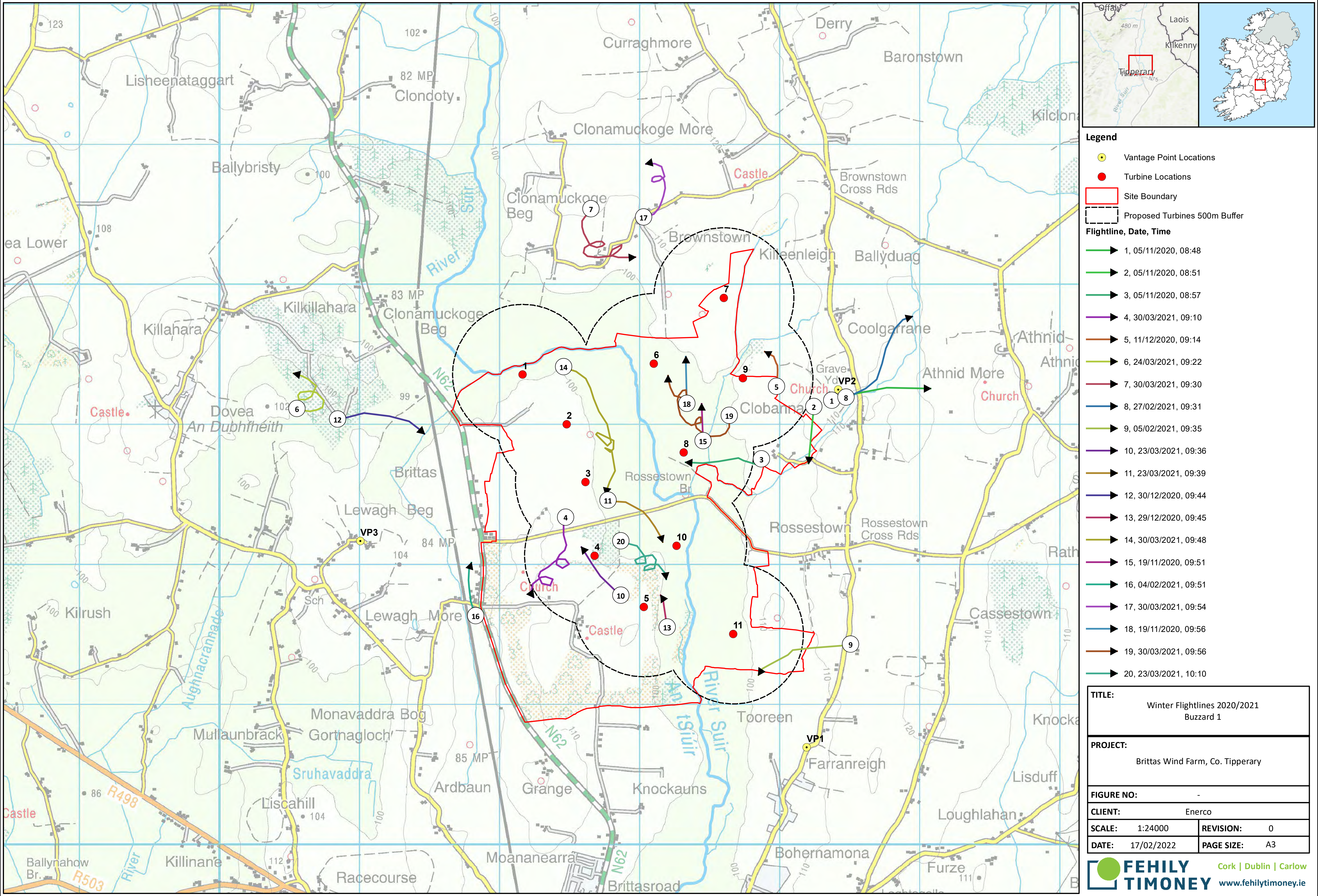

Legend

- Vantage Point Locations
- Turbine Locations
- Site Boundary
- Proposed Turbines 500m Buffer

Flightline, Date, Time

- 1, 05/11/2020, 08:48
- 2, 05/11/2020, 08:51
- 3, 05/11/2020, 08:57
- 4, 30/03/2021, 09:10
- 5, 11/12/2020, 09:14
- 6, 24/03/2021, 09:22
- 7, 30/03/2021, 09:30
- 8, 27/02/2021, 09:31
- 9, 05/02/2021, 09:35
- 10, 23/03/2021, 09:36
- 11, 23/03/2021, 09:39
- 12, 30/12/2020, 09:44
- 13, 29/12/2020, 09:45
- 14, 30/03/2021, 09:48
- 15, 19/11/2020, 09:51
- 16, 04/02/2021, 09:51
- 17, 30/03/2021, 09:54
- 18, 19/11/2020, 09:56
- 19, 30/03/2021, 09:56
- 20, 23/03/2021, 10:10

TITLE: Winter Flightlines 2020/2021 Buzzard 1

PROJECT: Brittas Wind Farm, Co. Tipperary

FIGURE NO:	-		
CLIENT:	Enerco		
SCALE:	1:24000	REVISION:	0
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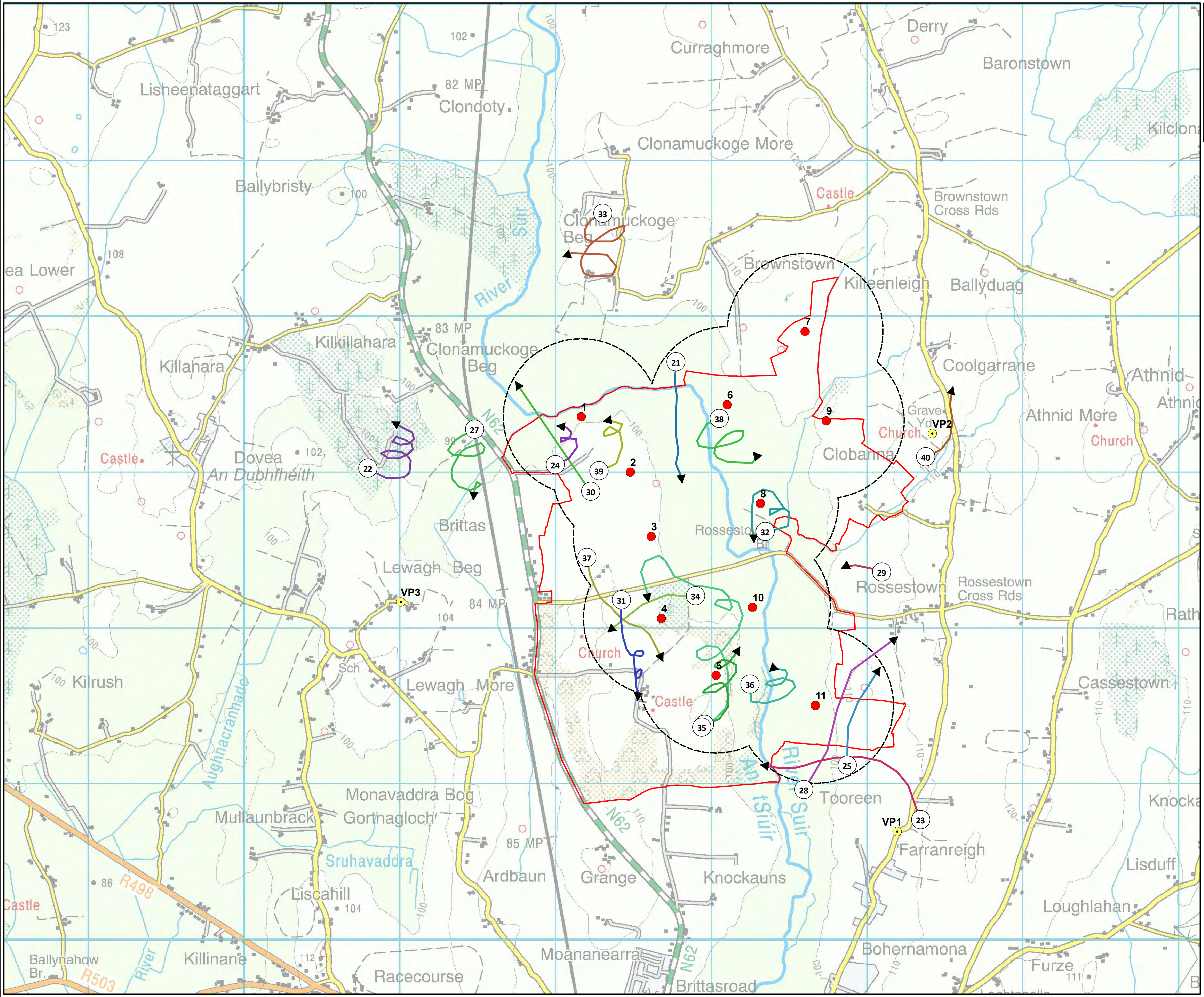

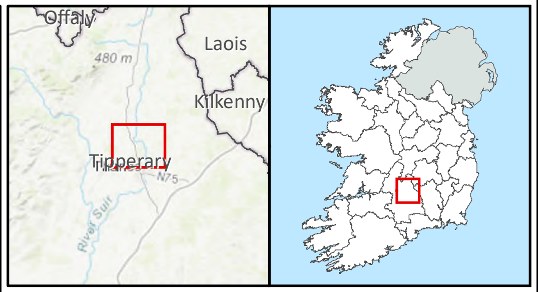

Legend

- Vantage Point Locations
- Turbine Locations
- Site Boundary
- Proposed Turbines 500m Buffer

Flightline, Date, Time

- 21, 17/01/2021, 10:13
- 22, 24/03/2021, 10:15
- 23, 22/02/2021, 10:30
- 24, 24/03/2021, 10:34
- 25, 28/11/2020, 10:39
- 26, 05/02/2021, 10:42
- 27, 16/03/2021, 10:44
- 28, 14/01/2021, 10:47
- 29, 14/01/2021, 10:50
- 30, 19/12/2020, 10:58
- 31, 24/03/2021, 11:06
- 32, 23/03/2021, 11:11
- 33, 27/02/2021, 11:12
- 34, 05/11/2020, 11:14
- 35, 15/12/2020, 11:19
- 36, 08/03/2021, 11:20
- 37, 11/12/2020, 11:21
- 38, 16/03/2021, 11:21
- 39, 24/03/2021, 11:25
- 40, 23/03/2021, 11:31

TITLE: Winter Flightlines 2020/2021
Buzzard 2

PROJECT: Brittas Wind Farm, Co. Tipperary

FIGURE NO:	-		
CLIENT:	Enerco		
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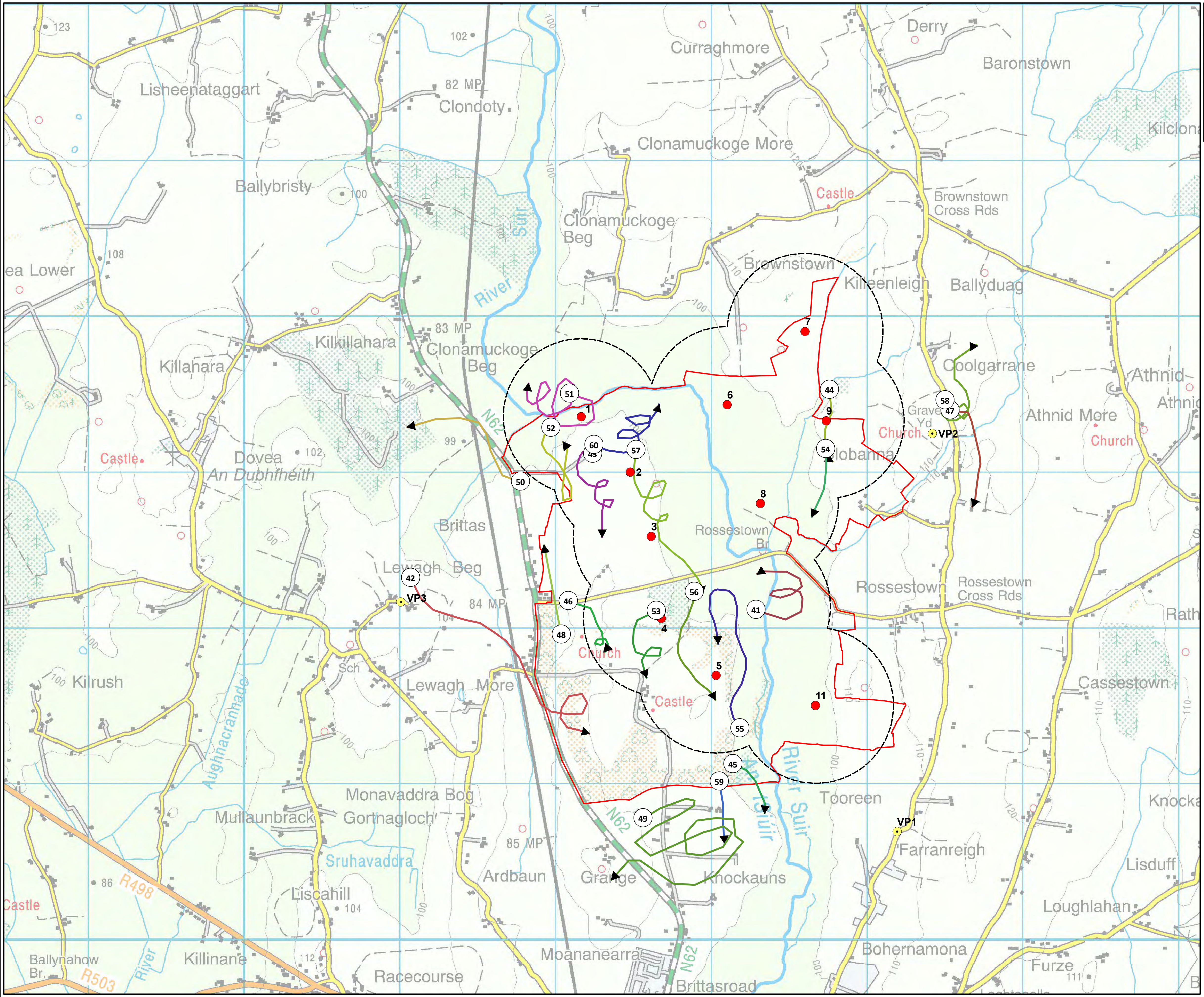

Legend

- Vantage Point Locations
- Turbine Locations
- Site Boundary
- Proposed Turbines 500m Buffer

Flightline, Date, Time

- 41, 08/03/2021, 11:32
- 42, 16/03/2021, 11:32
- 43, 27/02/2021, 11:37
- 44, 11/12/2020, 11:38
- 45, 14/01/2021, 11:39
- 46, 24/03/2021, 11:40
- 47, 30/03/2021, 11:41
- 48, 16/03/2021, 11:43
- 49, 08/03/2021, 11:46
- 50, 16/03/2021, 11:46
- 51, 16/03/2021, 11:49
- 52, 27/02/2021, 11:56
- 53, 16/03/2021, 12:03
- 54, 30/03/2021, 12:04
- 55, 04/12/2020, 12:10
- 56, 04/12/2020, 12:12
- 57, 04/02/2021, 12:12
- 58, 27/02/2021, 12:14
- 59, 20/12/2020, 12:15
- 60, 16/03/2021, 12:28

TITLE:	Winter Flightlines 2020/2021 Buzzard 3
PROJECT:	Brittas Wind Farm, Co. Tipperary
FIGURE NO:	-
CLIENT:	Enerco

SCALE:	1:24000	REVISION:	0
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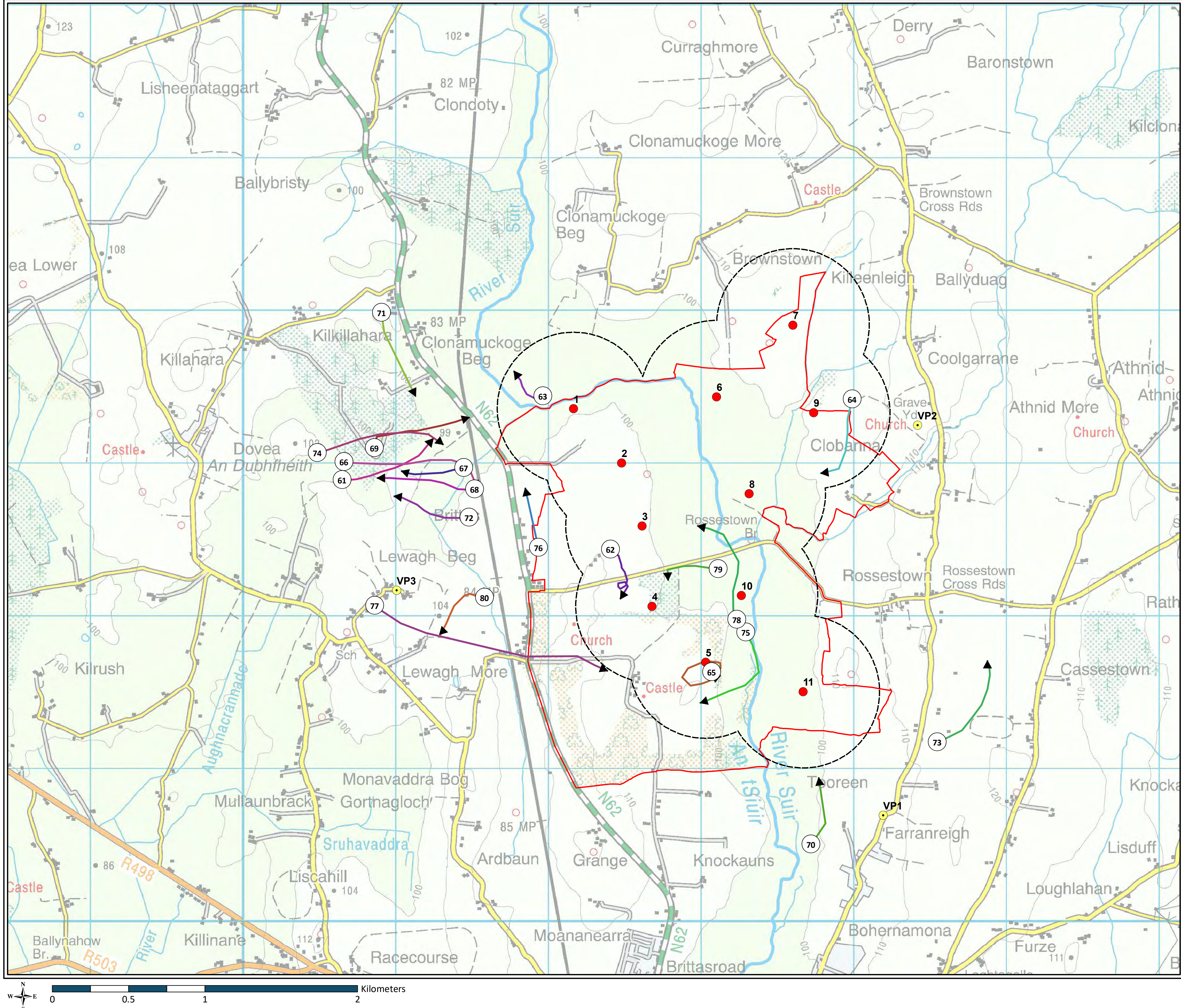

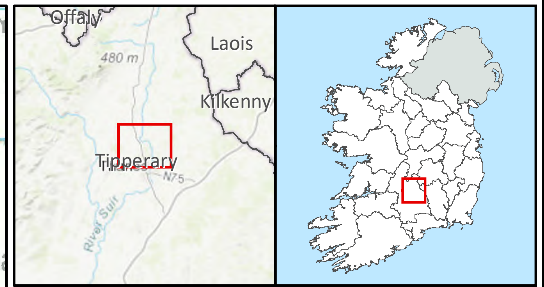

Legend

- Vantage Point Locations
- Turbine Locations
- Site Boundary
- Proposed Turbines 500m Buffer

Flightline, Date, Time

- 61, 11/12/2020, 12:35
- 62, 16/03/2021, 12:42
- 63, 28/01/2021, 12:49
- 64, 17/01/2021, 12:55
- 65, 08/03/2021, 12:57
- 66, 14/01/2021, 12:58
- 67, 15/12/2020, 12:59
- 68, 14/01/2021, 12:59
- 69, 15/12/2020, 13:04
- 70, 05/11/2020, 13:08
- 71, 19/11/2020, 13:19
- 72, 14/01/2021, 13:23
- 73, 08/03/2021, 13:26
- 74, 14/01/2021, 13:29
- 75, 04/12/2020, 13:30
- 76, 19/11/2020, 13:31
- 77, 14/01/2021, 13:32
- 78, 04/12/2020, 13:35
- 79, 04/12/2020, 13:37
- 80, 29/12/2020, 13:39

TITLE: Winter Flightlines 2020/2021
Buzzard 4

PROJECT: Brittas Wind Farm, Co. Tipperary

FIGURE NO:	-		
CLIENT:	Enerco		
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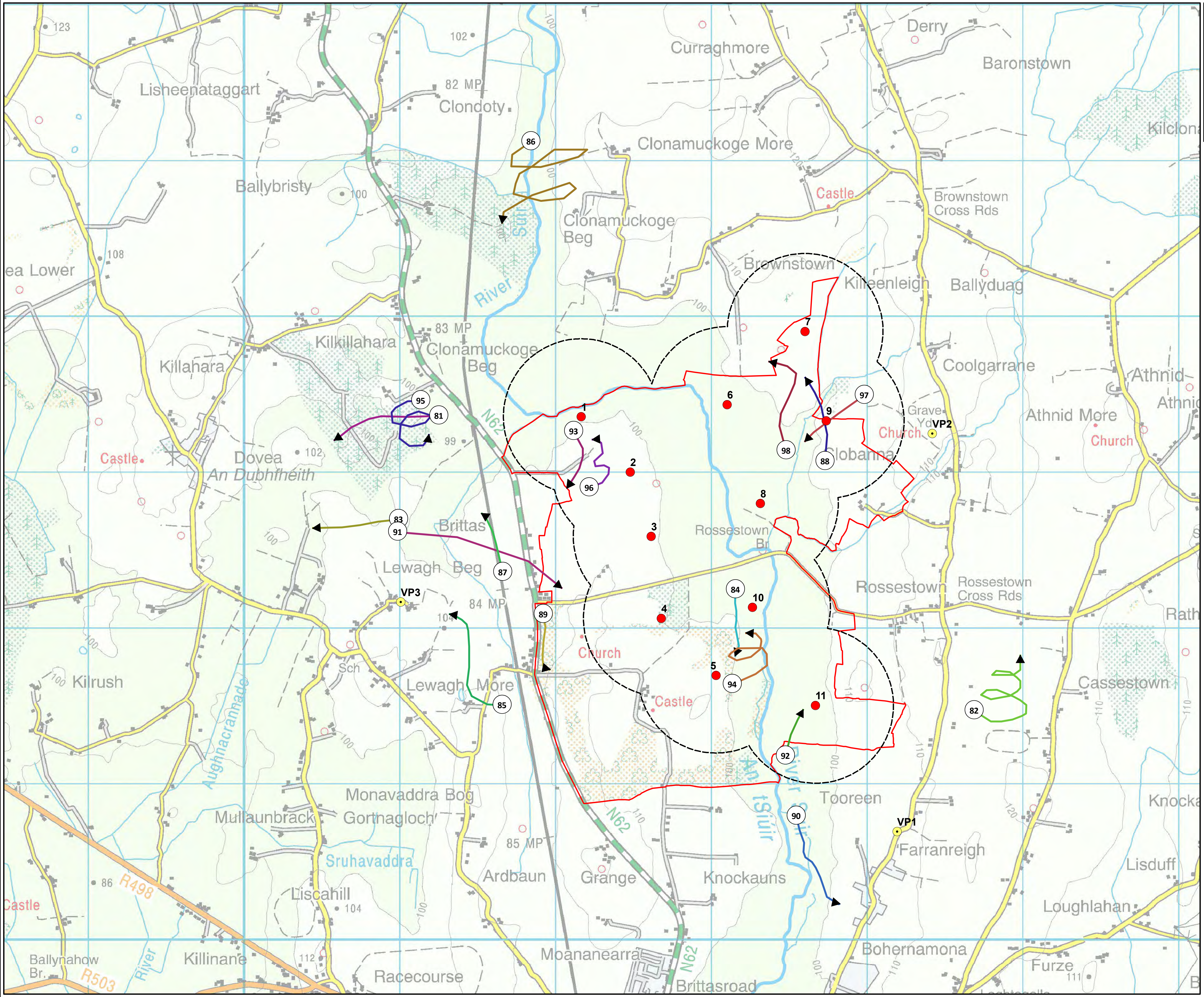

Legend

- Vantage Point Locations
- Turbine Locations
- Site Boundary
- Proposed Turbines 500m Buffer

Flightline, Date, Time

- 81, 14/01/2021, 13:40
- 82, 22/03/2021, 13:45
- 83, 15/12/2020, 13:51
- 84, 26/01/2021, 13:52
- 85, 14/01/2021, 13:53
- 86, 18/02/2021, 13:53
- 87, 14/01/2021, 14:02
- 88, 30/12/2020, 14:08
- 89, 11/12/2020, 14:14
- 90, 26/01/2021, 15:06
- 91, 29/12/2020, 15:14
- 92, 26/01/2021, 15:18
- 93, 16/02/2021, 15:25
- 94, 22/03/2021, 15:35
- 95, 16/02/2021, 15:49
- 96, 16/02/2021, 16:06
- 97, 18/02/2021, 16:07
- 98, 18/02/2021, 16:19

TITLE:	Winter Flightlines 2020/2021 Buzzard 5
PROJECT:	Brittas Wind Farm, Co. Tipperary
FIGURE NO:	-
CLIENT:	Enerco

SCALE:	1:24000	**REVISION:**	0
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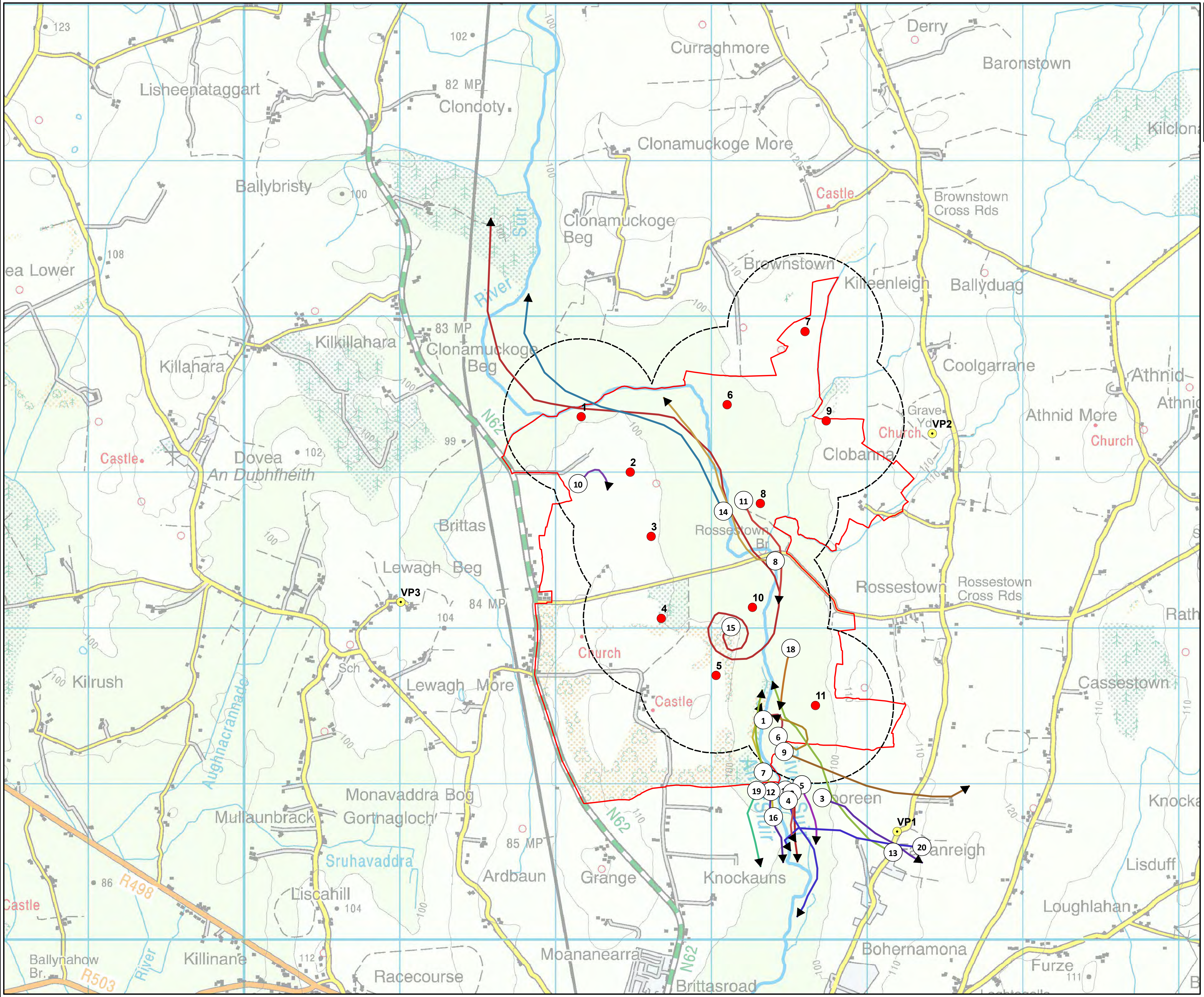

Legend

- Vantage Point Locations
- Turbine Locations
- Site Boundary
- Proposed Turbines 500m Buffer

Flightline, Date, Time

- 1, 05/02/2021, 08:27
- 2, 28/11/2020, 08:45
- 3, 05/02/2021, 08:55
- 4, 14/01/2021, 09:07
- 5, 28/11/2020, 09:10
- 6, 22/02/2021, 09:15
- 7, 29/12/2020, 09:20
- 8, 23/03/2021, 09:23
- 9, 22/02/2021, 09:34
- 10, 30/12/2020, 09:40
- 11, 27/02/2021, 09:45
- 12, 14/01/2021, 10:02
- 13, 28/11/2020, 10:08
- 14, 27/02/2021, 10:12
- 15, 17/01/2021, 10:14
- 16, 28/11/2020, 10:25
- 17, 08/03/2021, 11:10
- 18, 29/12/2020, 11:17
- 19, 14/01/2021, 11:26
- 20, 20/12/2020, 11:27

TITLE:	Winter Flightlines 2020/2021 Cormorant 1		
PROJECT:	Brittas Wind Farm, Co. Tipperary		
FIGURE NO:	-		
CLIENT:	Enerco		
SCALE:	1:24000	REVISION:	0
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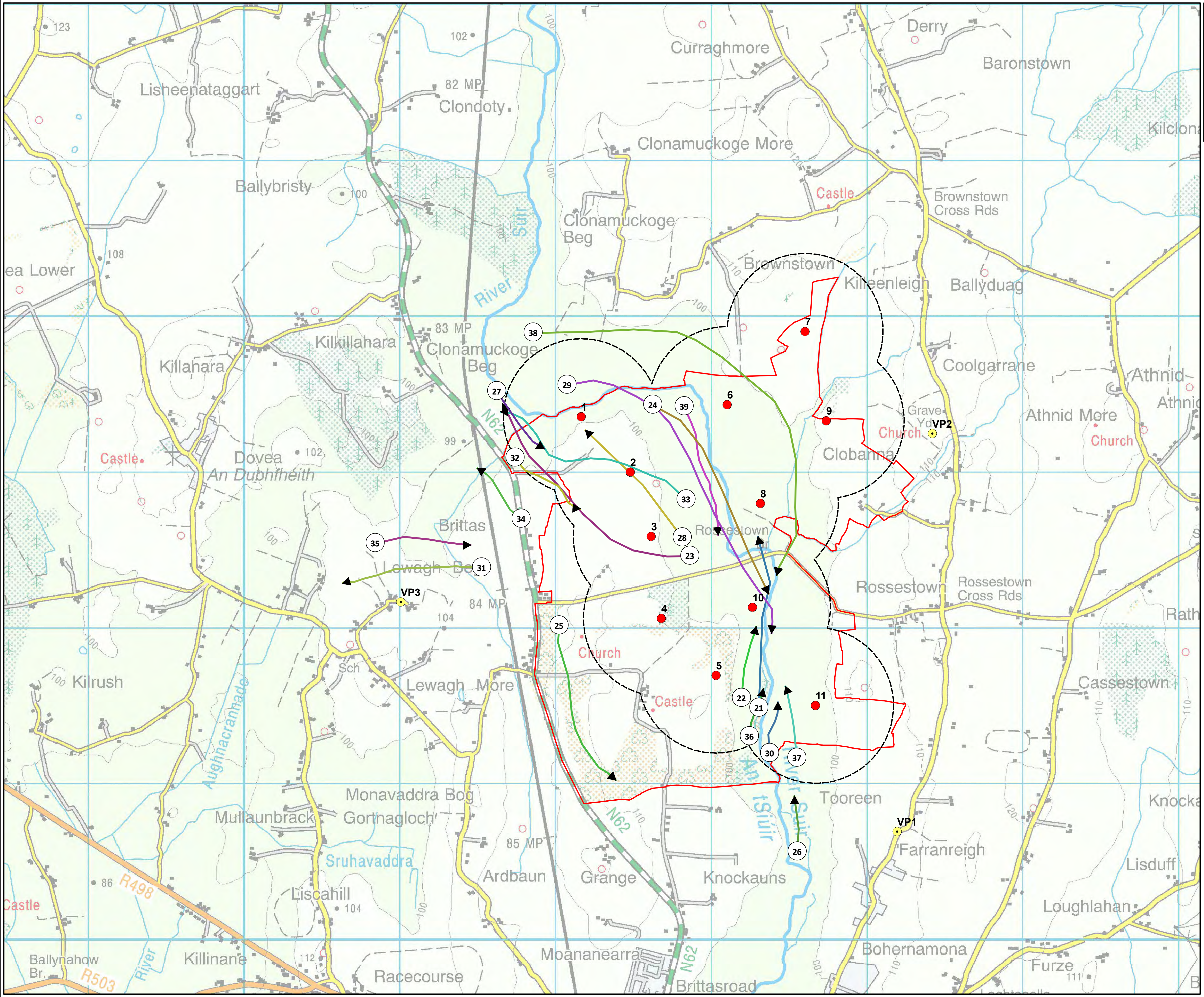

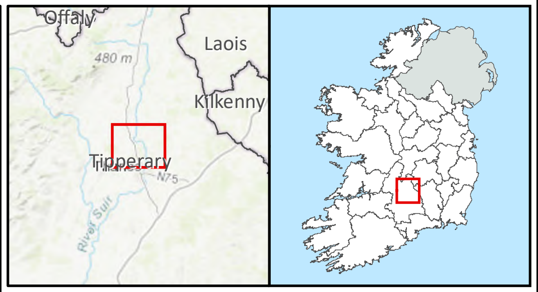

Legend

- Vantage Point Locations
- Turbine Locations
- Site Boundary
- Proposed Turbines 500m Buffer

Flightline, Date, Time

- 21, 14/01/2021, 11:31
- 22, 14/01/2021, 11:44
- 23, 19/12/2020, 11:51
- 24, 27/02/2021, 12:04
- 25, 28/11/2020, 12:06
- 26, 05/11/2020, 12:40
- 27, 28/01/2021, 12:48
- 28, 29/12/2020, 13:20
- 29, 18/02/2021, 13:51
- 30, 22/03/2021, 14:12
- 31, 14/01/2021, 14:44
- 32, 14/01/2021, 14:50
- 33, 30/12/2020, 15:03
- 34, 14/01/2021, 15:03
- 35, 14/01/2021, 15:10
- 36, 26/01/2021, 15:35
- 37, 22/03/2021, 15:50
- 38, 18/02/2021, 15:51
- 39, 16/02/2021, 17:24

TITLE:	Winter Flightlines 2020/2021 Cormorant 2		
PROJECT:	Brittas Wind Farm, Co. Tipperary		
FIGURE NO:	-		
CLIENT:	Enerco		
SCALE:	1:24000	REVISION:	0
DATE:	17/02/2022	PAGE SIZE:	A3

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0 0.5 1 2 Kilometers

Path: R:\Map Production\2020\P20-290\Workspace\Flightlines\P20-290_GIS_INFO_Flightlines_Brittas_A3.mxd

Sources: Esri, HERE, Garmin, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), (c) OpenStreetMap contributors, and the GIS User Community
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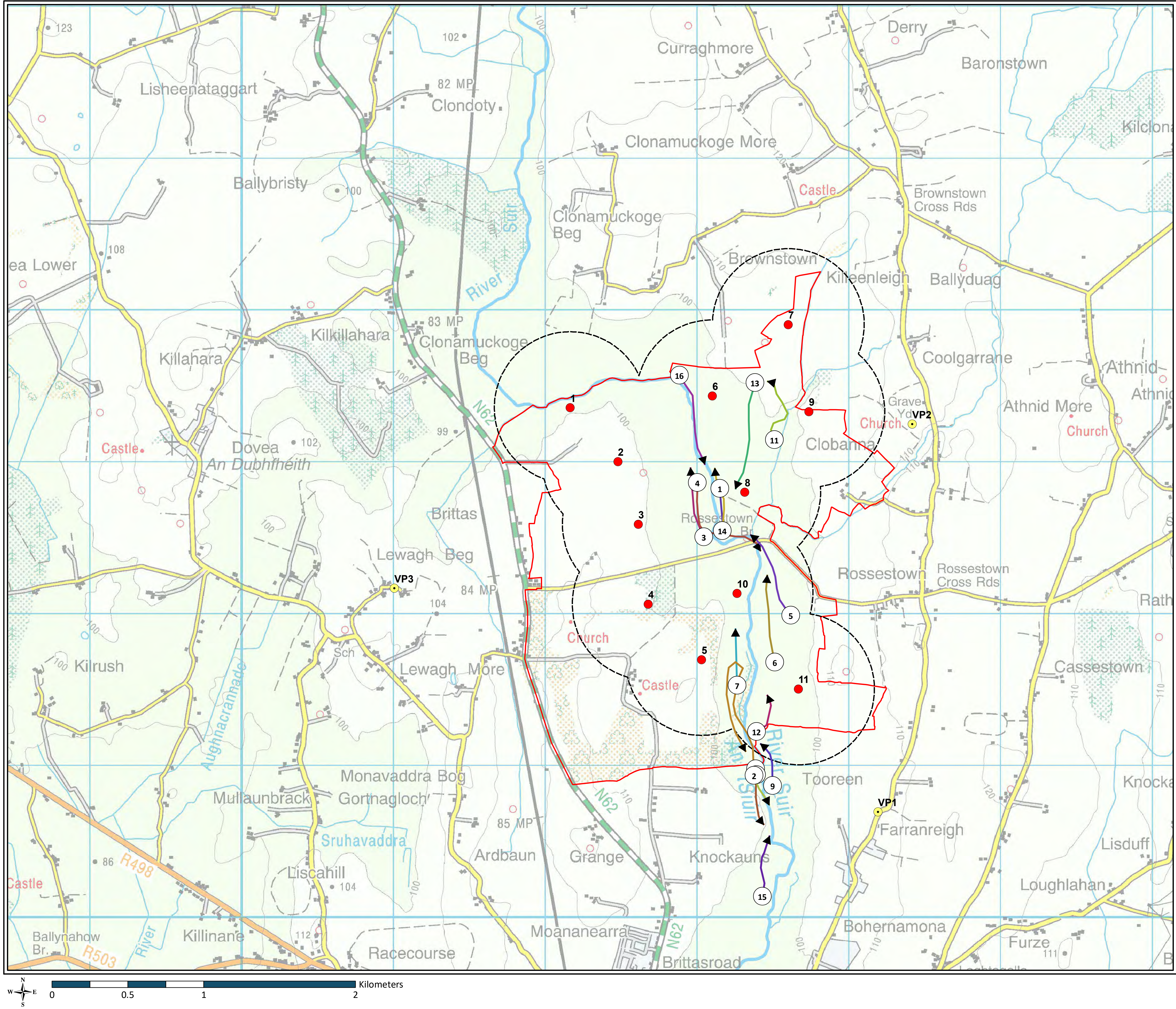

TITLE:	Winter Flightlines 2020/2021 Little Egret
PROJECT:	Brittas Wind Farm, Co. Tipperary
FIGURE NO:	-
CLIENT:	Enerco
SCALE: 1:24000	**REVISION:** 0
DATE: 17/02/2022	**PAGE SIZE:** A3

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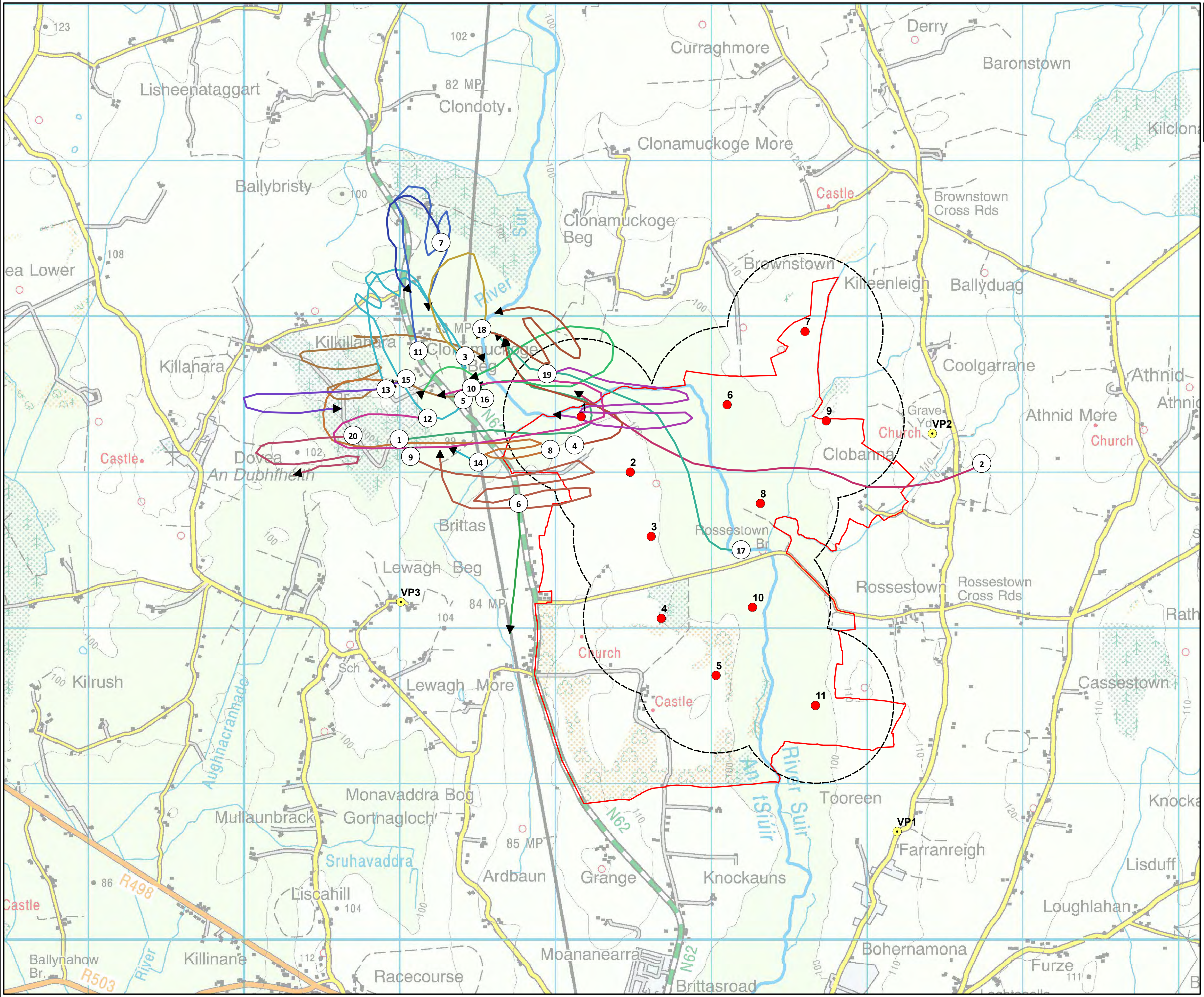

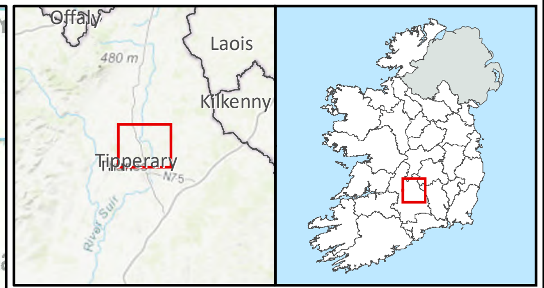

Legend

- Vantage Point Locations
- Turbine Locations
- Site Boundary
- Proposed Turbines 500m Buffer

Flightline, Date, Time

- 1, 30/12/2020, 09:18
- 2, 11/12/2020, 09:19
- 3, 24/12/2020, 09:21
- 4, 30/12/2020, 09:24
- 5, 28/01/2021, 09:26
- 6, 05/02/2021, 09:31
- 7, 24/12/2020, 09:35
- 8, 30/12/2020, 09:53
- 9, 28/01/2021, 09:57
- 10, 11/12/2020, 10:00
- 11, 19/12/2020, 10:02
- 12, 28/01/2021, 10:04
- 13, 11/12/2020, 10:08
- 14, 30/12/2020, 10:10
- 15, 28/01/2021, 10:17
- 16, 30/12/2020, 10:19
- 17, 24/12/2020, 10:24
- 18, 28/01/2021, 10:27
- 19, 04/02/2021, 10:27
- 20, 28/01/2021, 10:38

TITLE:	Winter Flightlines 2020/2021 Golden Plover 1		
PROJECT:	Brittas Wind Farm, Co. Tipperary		
FIGURE NO:	-		
CLIENT:	Enerco		
SCALE:	1:24000	REVISION:	0
DATE:	17/02/2022	PAGE SIZE:	A3

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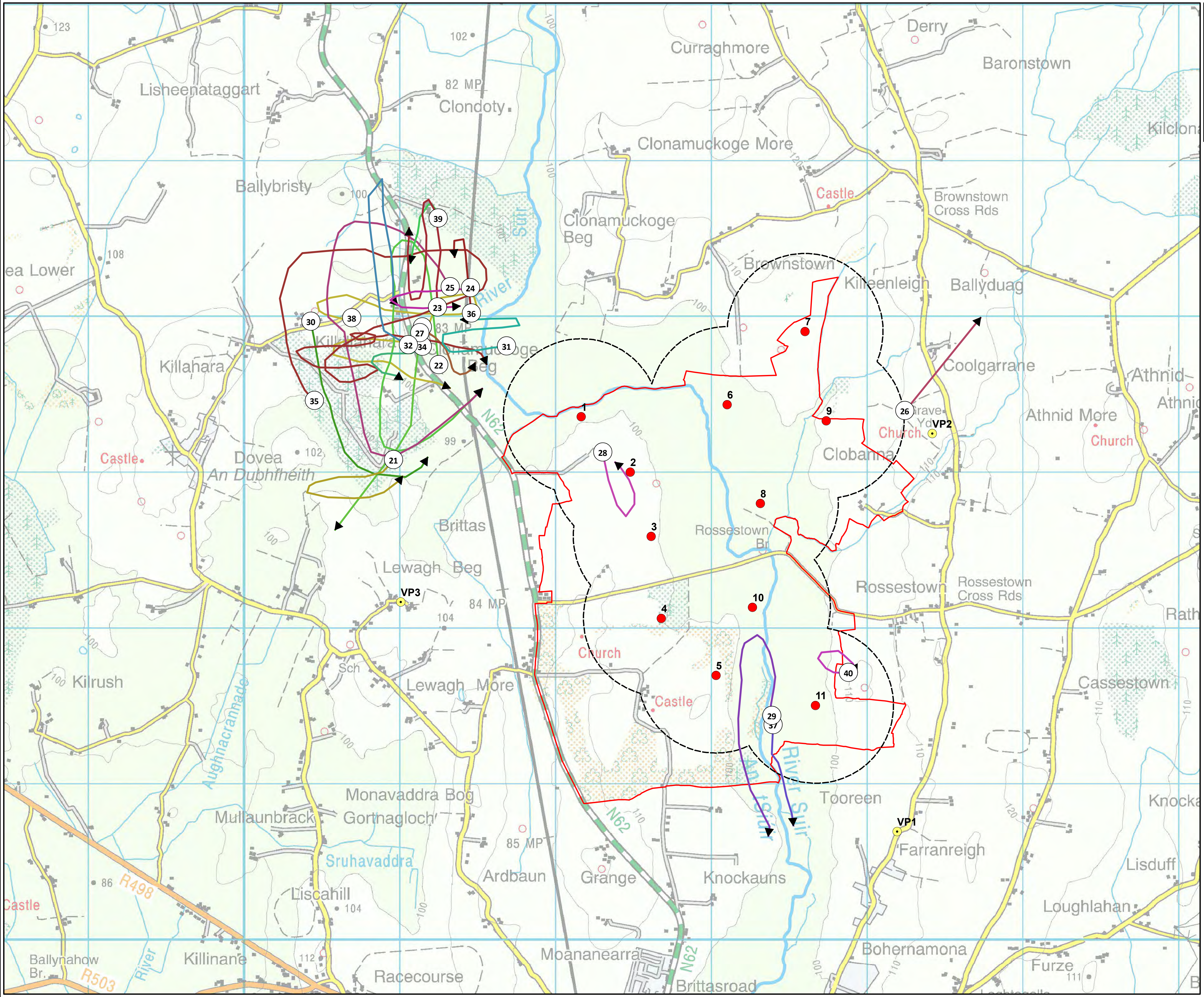
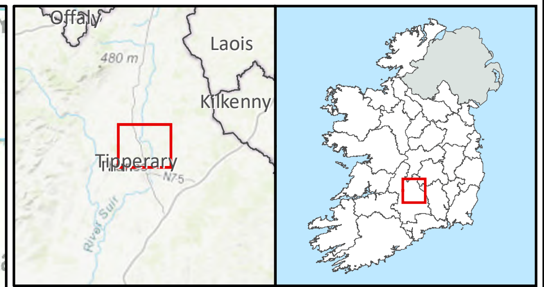
0 0.5 1 2 Kilometers

Path: R:\Map Production\2020\P20-290\Workspace\Flightlines\P20-290_GIS_INFO_Flightlines_Brittas_A3.mxd





Legend

- Vantage Point Locations
- Turbine Locations
- Site Boundary
- Proposed Turbines 500m Buffer

Flightline, Date, Time

- 21, 28/01/2021, 10:40
- 22, 11/12/2020, 10:42
- 23, 17/01/2021, 10:42
- 24, 28/01/2021, 10:43
- 25, 11/12/2020, 10:57
- 26, 30/03/2021, 10:59
- 27, 05/11/2020, 11:03
- 28, 28/01/2021, 11:04
- 29, 15/12/2020, 11:06
- 30, 11/12/2020, 11:07
- 31, 04/02/2021, 11:09
- 32, 17/01/2021, 11:11
- 33, 11/12/2020, 11:14
- 34, 30/12/2020, 11:23
- 35, 11/12/2020, 11:24
- 36, 17/01/2021, 11:24
- 37, 22/02/2021, 11:32
- 38, 28/11/2020, 11:43
- 39, 11/12/2020, 11:46
- 40, 22/02/2021, 11:51

TITLE: Winter Flightlines 2020/2021
Golden Plover 2

PROJECT: Brittas Wind Farm, Co. Tipperary

FIGURE NO:	-		
CLIENT:	Enerco		
SCALE:	1:24000	**REVISION:**	0
DATE:	17/02/2022	**PAGE SIZE:**	A3

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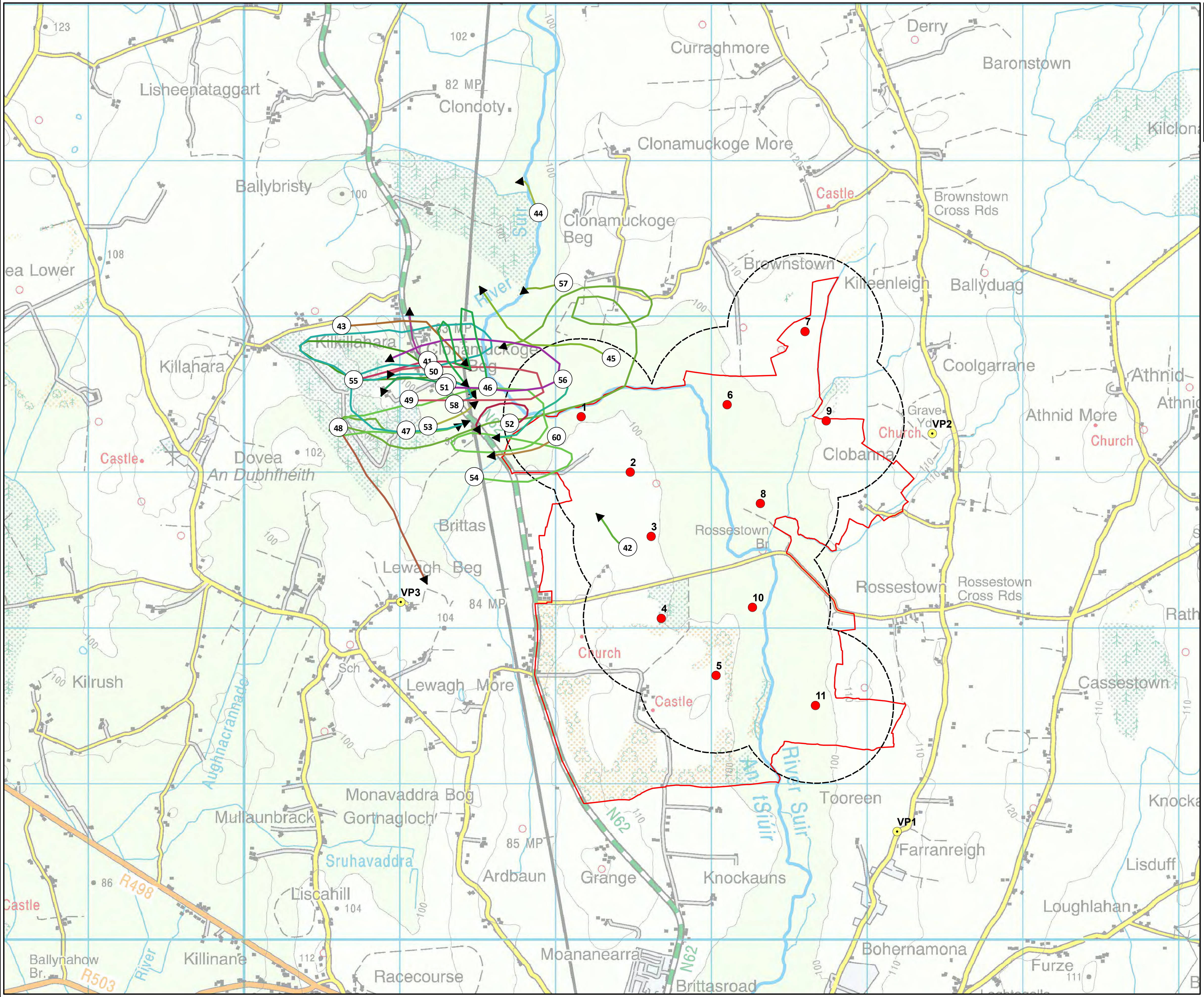

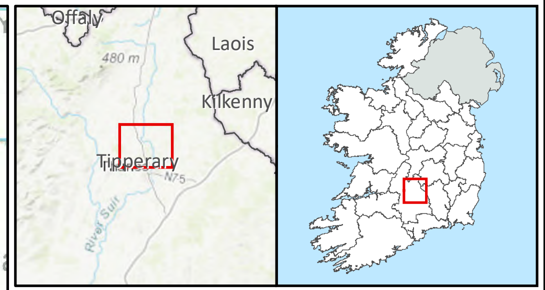

Legend

- Vantage Point Locations
- Turbine Locations
- Site Boundary
- Proposed Turbines 500m Buffer

Flightline, Date, Time

- 41, 24/12/2020, 11:52
- 42, 30/12/2020, 11:54
- 43, 30/12/2020, 11:58
- 44, 24/12/2020, 12:05
- 45, 29/12/2020, 12:20
- 46, 28/01/2021, 12:31
- 47, 28/11/2020, 12:34
- 48, 28/01/2021, 12:35
- 49, 14/01/2021, 12:36
- 50, 11/12/2020, 12:37
- 51, 14/01/2021, 12:40
- 52, 14/01/2021, 12:44
- 53, 11/12/2020, 12:47
- 54, 11/12/2020, 12:49
- 55, 28/11/2020, 12:55
- 56, 14/01/2021, 13:00
- 57, 28/11/2020, 13:01
- 58, 11/12/2020, 13:02
- 59, 15/12/2020, 13:15
- 60, 14/01/2021, 13:15

TITLE:
Winter Flightlines 2020/2021
Golden Plover 3

PROJECT:
Brittas Wind Farm, Co. Tipperary

FIGURE NO:	-		
CLIENT:	Enerco		
SCALE:	1:24000	REVISION:	0
DATE:	17/02/2022	PAGE SIZE:	A3

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Path: R:\Map Production\2020\P20-290\Workspace\Flightlines\P20-290_GIS_INFO_Flightlines_Brittas_A3.mxd

Sources: Esri, HERE, Garmin, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), (c) OpenStreetMap contributors, and the GIS User Community
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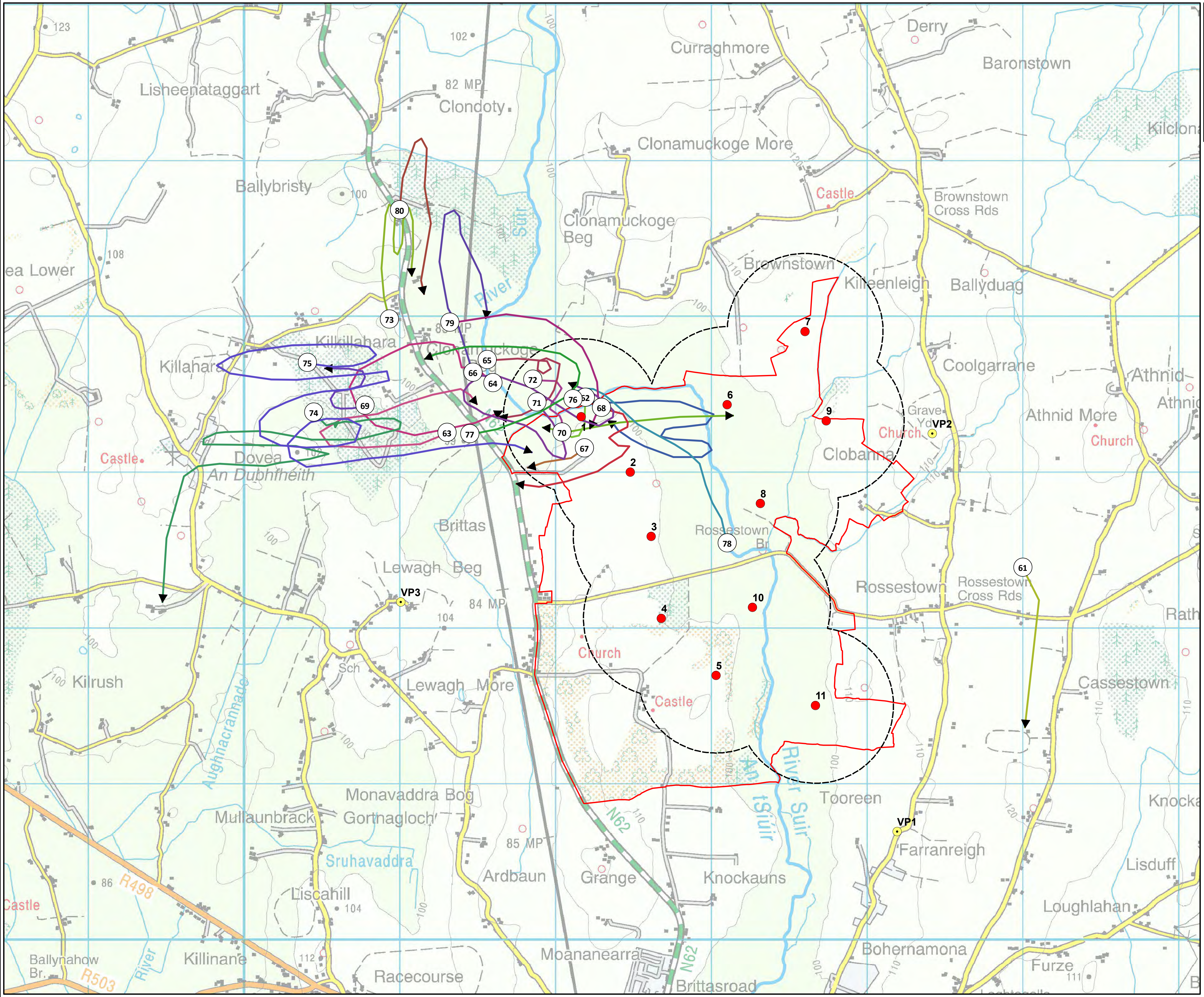

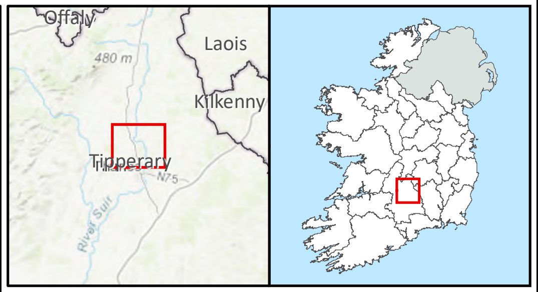

Legend

- Vantage Point Locations
- Turbine Locations
- Site Boundary
- Proposed Turbines 500m Buffer

Flightline, Date, Time

- 61, 19/11/2020, 13:16
- 62, 14/01/2021, 13:20
- 63, 11/12/2020, 13:27
- 64, 11/12/2020, 13:29
- 65, 11/12/2020, 13:34
- 66, 30/12/2020, 13:50
- 67, 14/01/2021, 13:55
- 68, 14/01/2021, 13:56
- 69, 15/12/2020, 14:16
- 70, 11/12/2020, 14:24
- 71, 16/02/2021, 14:48
- 72, 19/11/2020, 14:49
- 73, 30/12/2020, 14:50
- 74, 15/12/2020, 14:56
- 75, 16/02/2021, 15:06
- 76, 19/11/2020, 15:08
- 77, 16/02/2021, 15:15
- 78, 14/01/2021, 15:16
- 79, 14/01/2021, 15:24
- 80, 30/12/2020, 15:32

TITLE:	Winter Flightlines 2020/2021 Golden Plover 4		
PROJECT:	Brittas Wind Farm, Co. Tipperary		
FIGURE NO:	-		
CLIENT:	Enerco		
SCALE:	1:24000	REVISION:	0
DATE:	17/02/2022	PAGE SIZE:	A3

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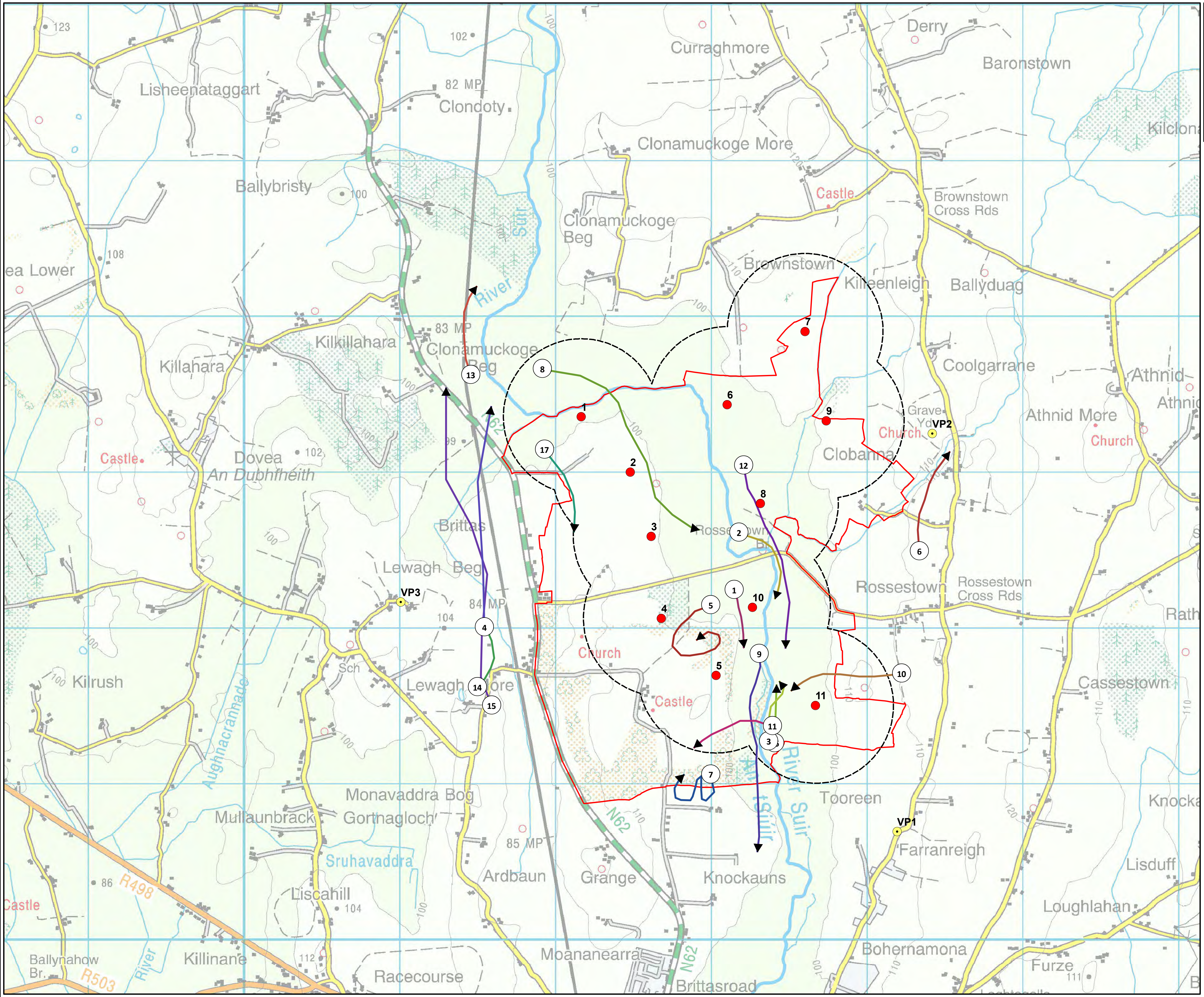

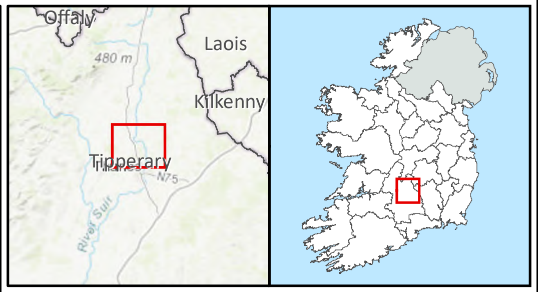

Legend

- Vantage Point Locations
- Turbine Locations
- Site Boundary
- Proposed Turbines 500m Buffer

Flightline, Date, Time

- 1, 30/03/2021, 09:05
- 2, 19/12/2020, 09:25
- 3, 14/01/2021, 09:31
- 4, 24/03/2021, 09:42
- 5, 27/02/2021, 09:54
- 6, 17/01/2021, 10:12
- 7, 22/02/2021, 10:26
- 8, 17/01/2021, 10:27
- 9, 15/12/2020, 10:47
- 10, 20/12/2020, 11:14
- 11, 08/03/2021, 11:17
- 12, 17/01/2021, 11:39
- 13, 19/12/2020, 11:43
- 14, 14/01/2021, 12:34
- 15, 19/11/2020, 12:53
- 16, 05/11/2020, 13:02
- 17, 19/11/2020, 14:16

TITLE:	Winter Flightlines 2020/2021 Grey Heron		
PROJECT:	Brittas Wind Farm, Co. Tipperary		
FIGURE NO:	-		
CLIENT:	Enerco		
SCALE:	1:24000	REVISION:	0
DATE:	17/02/2022	PAGE SIZE:	A3

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Sources: Esri, HERE, Garmin, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), (c) OpenStreetMap contributors, and the GIS User Community
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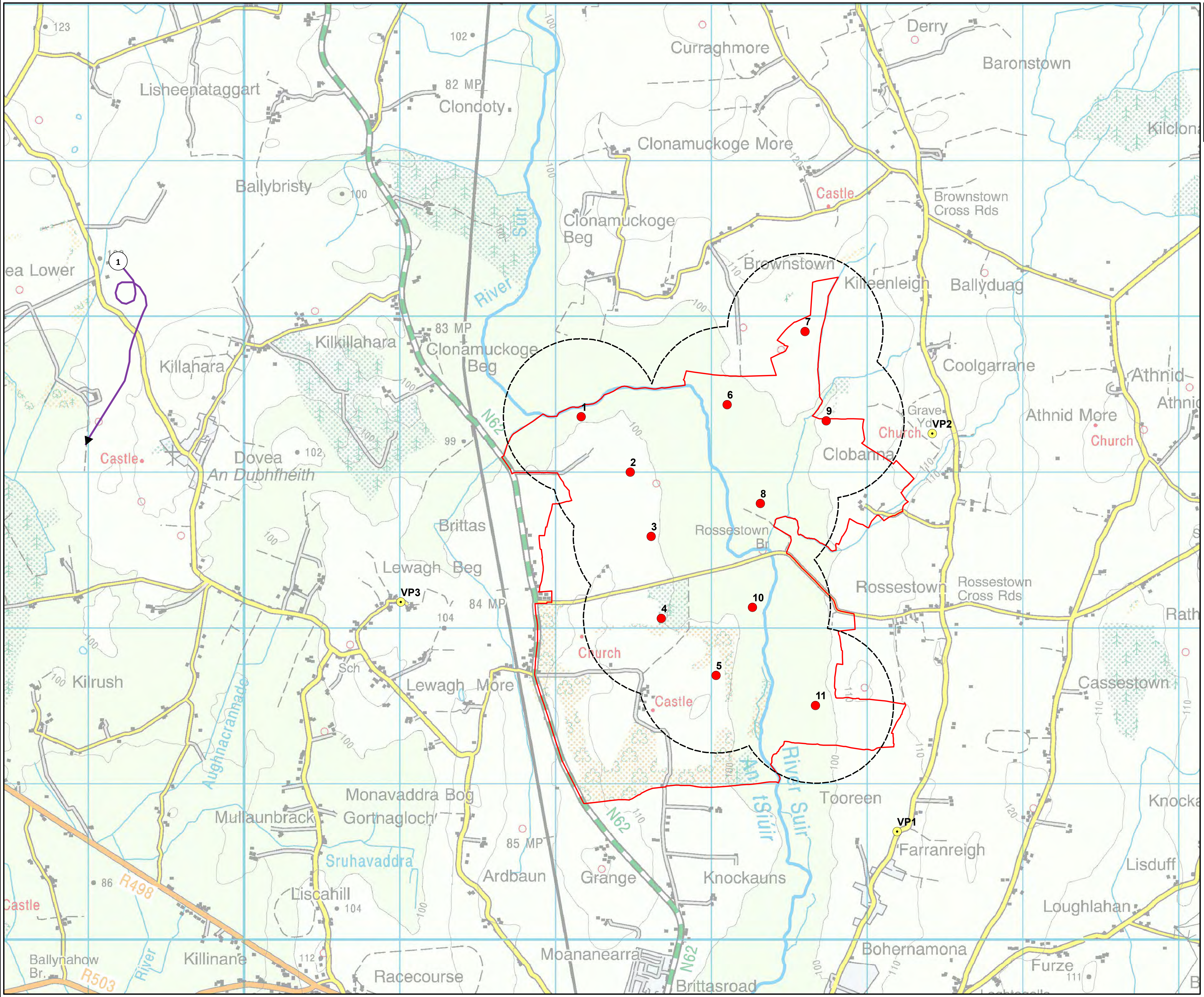

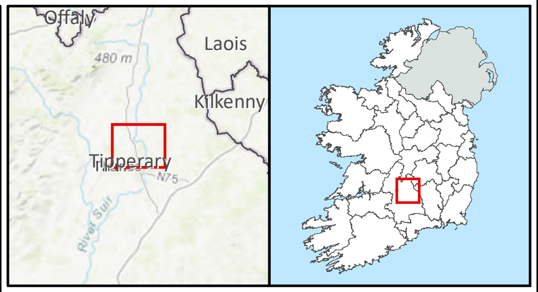

Legend

- Vantage Point Locations
- Turbine Locations
- Site Boundary
- Proposed Turbines 500m Buffer

Flightline, Date, Time

- 1, 24/12/2020, 11:18

TITLE:	Winter Flightlines 2020/2021 Hen Harrier
PROJECT:	Brittas Wind Farm, Co. Tipperary
FIGURE NO:	-
CLIENT:	Enerco
SCALE: 1:24000	**REVISION:** 0
DATE: 17/02/2022	**PAGE SIZE:** A3

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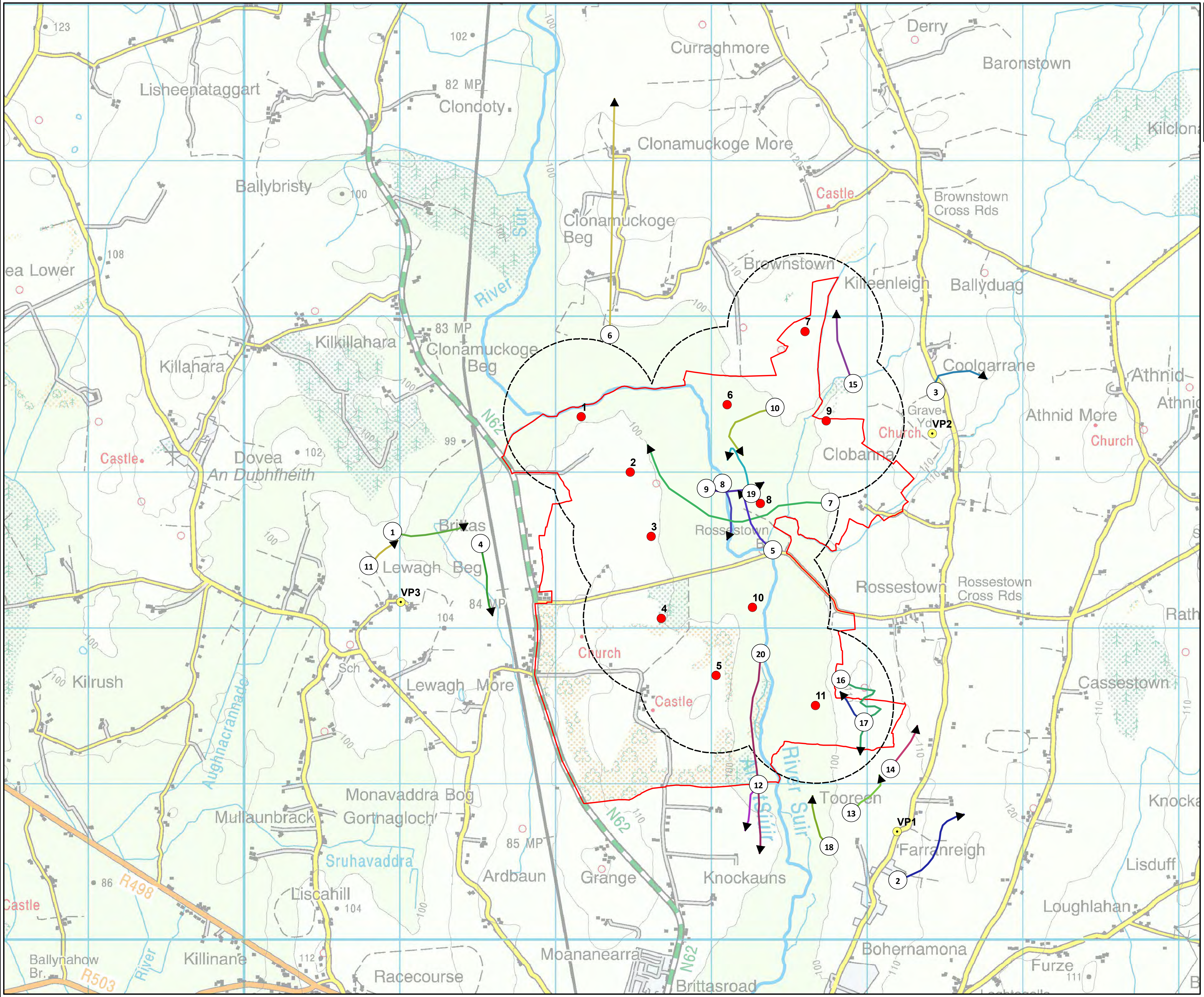

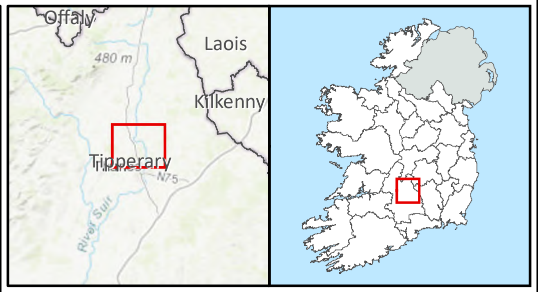

Legend

- Vantage Point Locations
- Turbine Locations
- Site Boundary
- Proposed Turbines 500m Buffer

Flightline, Date, Time

- 1, 24/03/2021, 08:55
- 2, 14/01/2021, 09:00
- 3, 30/03/2021, 09:01
- 4, 28/01/2021, 09:04
- 5, 30/03/2021, 09:04
- 6, 05/11/2020, 09:06
- 7, 19/12/2020, 09:10
- 8, 11/12/2020, 09:26
- 9, 19/12/2020, 09:29
- 10, 19/12/2020, 09:31
- 11, 30/12/2020, 09:31
- 12, 15/12/2020, 09:34
- 13, 15/12/2020, 09:38
- 14, 15/12/2020, 09:39
- 15, 19/12/2020, 09:45
- 16, 14/01/2021, 09:56
- 17, 05/02/2021, 09:58
- 18, 29/12/2020, 10:10
- 19, 30/03/2021, 10:16
- 20, 15/12/2020, 10:19

TITLE:	Winter Flightlines 2020/2021 Kestrel 1
PROJECT:	Brittas Wind Farm, Co. Tipperary
FIGURE NO:	-
CLIENT:	Enerco
SCALE: 1:24000	**REVISION:** 0
DATE: 17/02/2022	**PAGE SIZE:** A3

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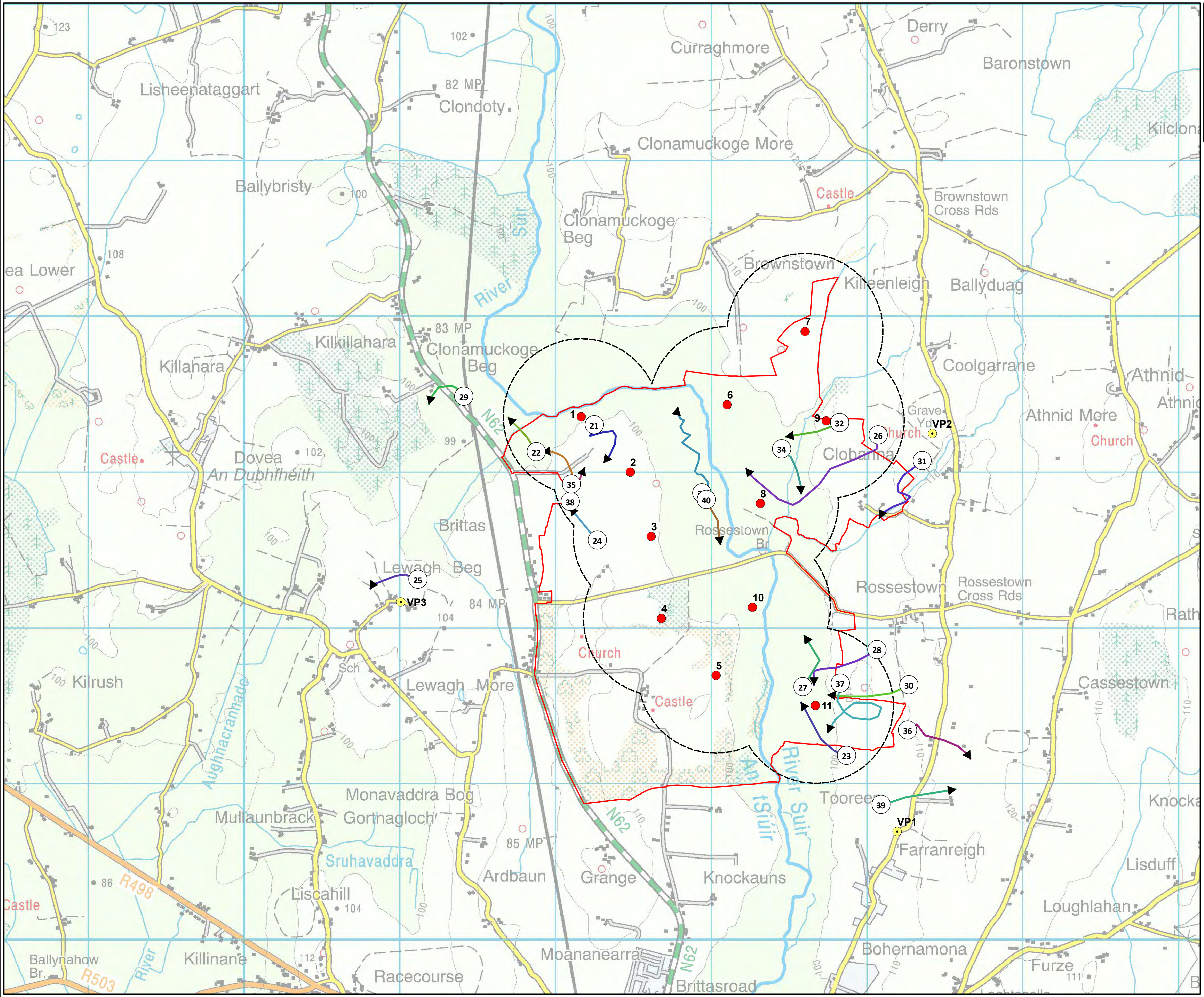

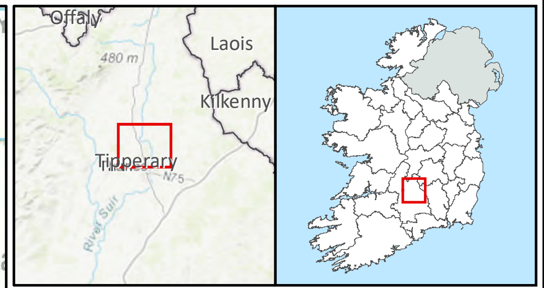

Kilometers

0 0.5 1 2

Legend

- Vantage Point Locations
- Turbine Locations
- Site Boundary
- Proposed Turbines 500m Buffer

Flightline, Date, Time

- 21, 17/01/2021, 10:24
- 22, 24/03/2021, 10:24
- 23, 14/01/2021, 10:31
- 24, 16/03/2021, 10:31
- 25, 24/03/2021, 10:31
- 26, 19/11/2020, 10:36
- 27, 14/01/2021, 10:36
- 28, 15/12/2020, 10:44
- 29, 30/12/2020, 10:44
- 30, 20/12/2020, 10:45
- 31, 23/03/2021, 10:47
- 32, 19/11/2020, 10:51
- 33, 17/01/2021, 10:56
- 34, 19/12/2020, 10:59
- 35, 16/03/2021, 11:02
- 36, 05/02/2021, 11:05
- 37, 22/02/2021, 11:15
- 38, 24/03/2021, 11:15
- 39, 14/01/2021, 11:17
- 40, 30/03/2021, 11:18

TITLE: Winter Flightlines 2020/2021
Kestrel 2

PROJECT: Brittas Wind Farm, Co. Tipperary

FIGURE NO:	-		
CLIENT:	Enerco		
SCALE:	1:24000	REVISION:	0
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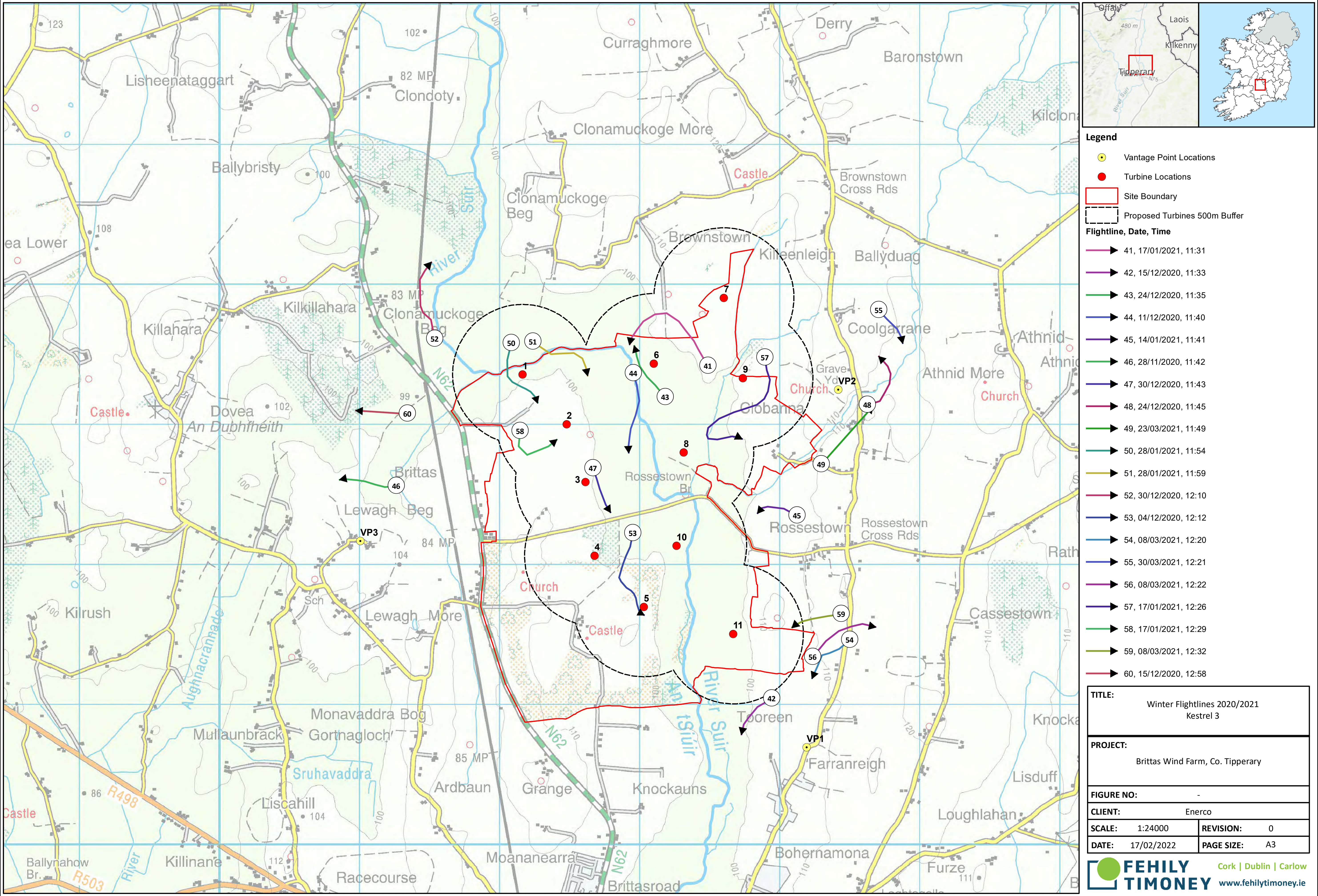

Legend

- Vantage Point Locations
- Turbine Locations
- Site Boundary
- Proposed Turbines 500m Buffer

Flightline, Date, Time

- 41, 17/01/2021, 11:31
- 42, 15/12/2020, 11:33
- 43, 24/12/2020, 11:35
- 44, 11/12/2020, 11:40
- 45, 14/01/2021, 11:41
- 46, 28/11/2020, 11:42
- 47, 30/12/2020, 11:43
- 48, 24/12/2020, 11:45
- 49, 23/03/2021, 11:49
- 50, 28/01/2021, 11:54
- 51, 28/01/2021, 11:59
- 52, 30/12/2020, 12:10
- 53, 04/12/2020, 12:12
- 54, 08/03/2021, 12:20
- 55, 30/03/2021, 12:21
- 56, 08/03/2021, 12:22
- 57, 17/01/2021, 12:26
- 58, 17/01/2021, 12:29
- 59, 08/03/2021, 12:32
- 60, 15/12/2020, 12:58

TITLE:	Winter Flightlines 2020/2021 Kestrel 3		
PROJECT:	Brittas Wind Farm, Co. Tipperary		
FIGURE NO:	-		
CLIENT:	Enerco		
SCALE:	1:24000	REVISION:	0
DATE:	17/02/2022	PAGE SIZE:	A3

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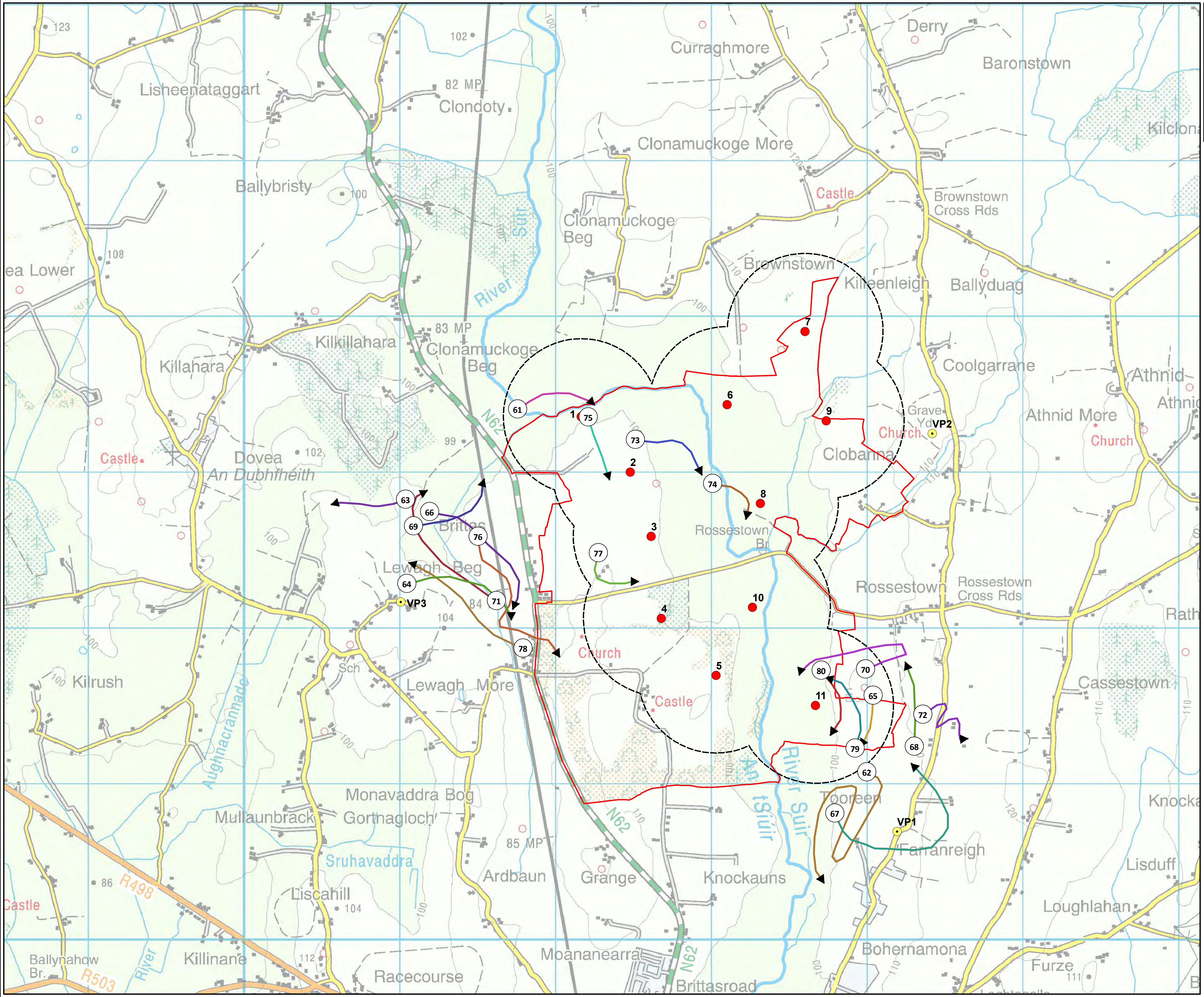

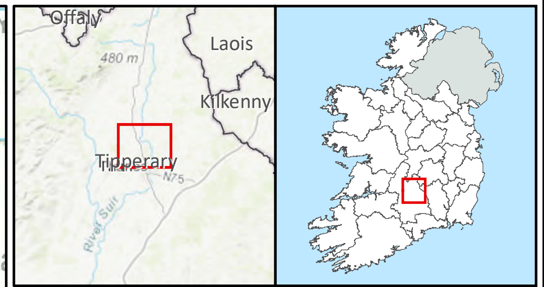

Legend

- Vantage Point Locations
- Turbine Locations
- Site Boundary
- Proposed Turbines 500m Buffer

Flightline, Date, Time

- 61, 15/12/2020, 13:01
- 62, 04/12/2020, 13:06
- 63, 15/12/2020, 13:23
- 64, 14/01/2021, 13:28
- 65, 26/01/2021, 13:36
- 66, 11/12/2020, 13:39
- 67, 26/01/2021, 13:40
- 68, 26/01/2021, 13:42
- 69, 15/12/2020, 13:46
- 70, 26/01/2021, 13:46
- 71, 11/12/2020, 13:59
- 72, 22/03/2021, 14:03
- 73, 28/01/2021, 14:09
- 74, 28/01/2021, 14:10
- 75, 19/11/2020, 14:12
- 76, 15/12/2020, 14:15
- 77, 19/11/2020, 14:17
- 78, 15/12/2020, 14:21
- 79, 22/03/2021, 14:21
- 80, 26/01/2021, 14:30

TITLE: Winter Flightlines 2020/2021 Kestrel 4

PROJECT: Brittas Wind Farm, Co. Tipperary

FIGURE NO:	-		
CLIENT:	Enerco		
SCALE:	1:24000	REVISION:	0
DATE:	17/02/2022	PAGE SIZE:	A3

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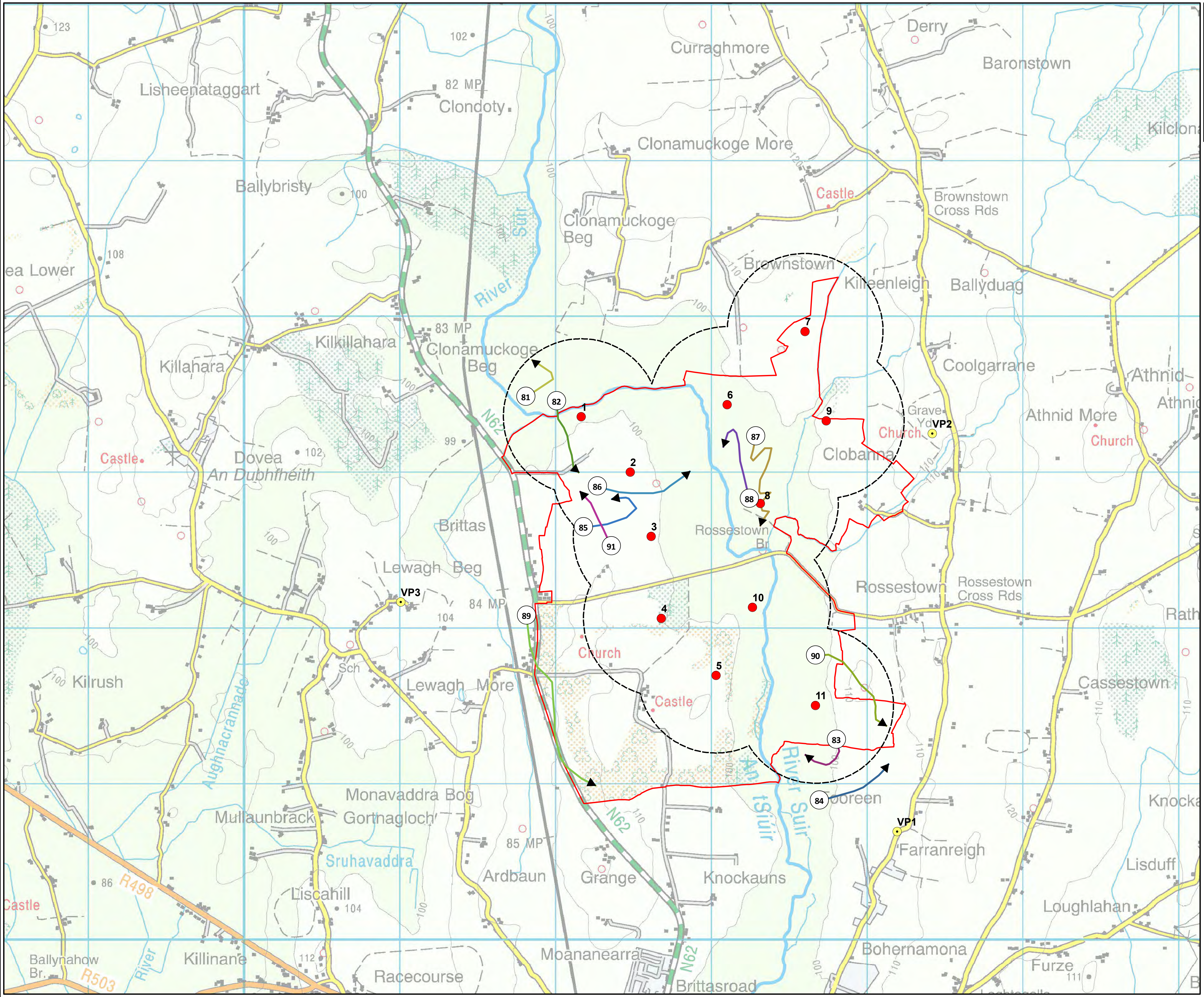

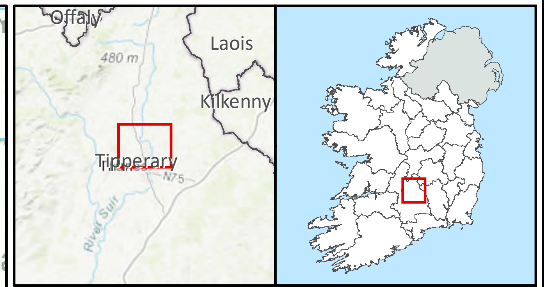

Legend

- Vantage Point Locations
- Turbine Locations
- Site Boundary
- Proposed Turbines 500m Buffer

Flightline, Date, Time

- 81, 30/12/2020, 14:53
- 82, 30/12/2020, 14:56
- 83, 26/01/2021, 15:01
- 84, 26/01/2021, 15:05
- 85, 14/01/2021, 15:19
- 86, 30/12/2020, 15:28
- 87, 18/02/2021, 15:38
- 88, 18/02/2021, 15:45
- 89, 16/02/2021, 15:57
- 90, 22/03/2021, 16:12
- 91, 16/02/2021, 17:11

TITLE:	Winter Flightlines 2020/2021 Kestrel 5
PROJECT:	Brittas Wind Farm, Co. Tipperary
FIGURE NO:	-
CLIENT:	Enerco
SCALE: 1:24000	REVISION: 0
DATE: 17/02/2022	PAGE SIZE: A3

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0 0.5 1 2 Kilometers

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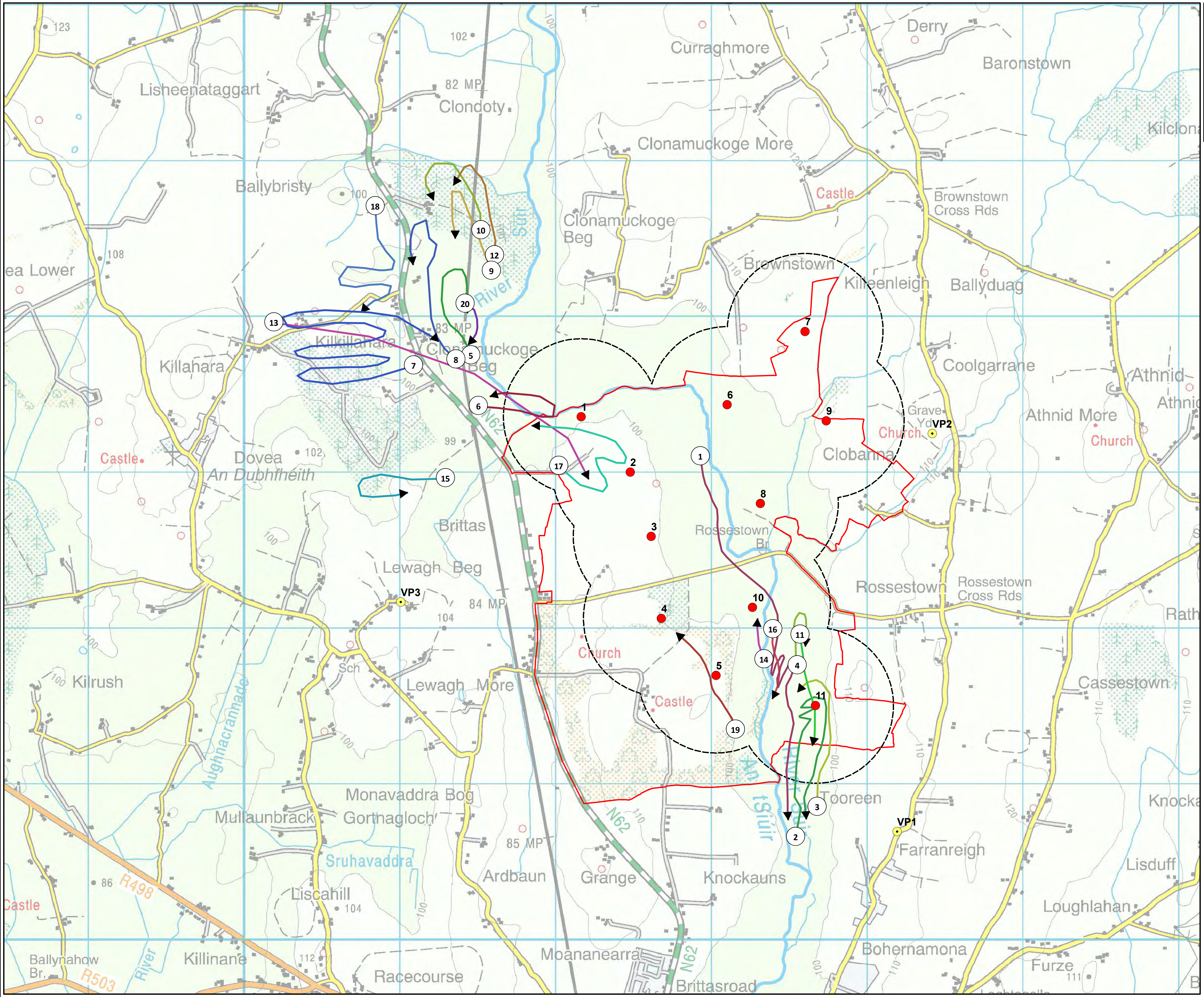

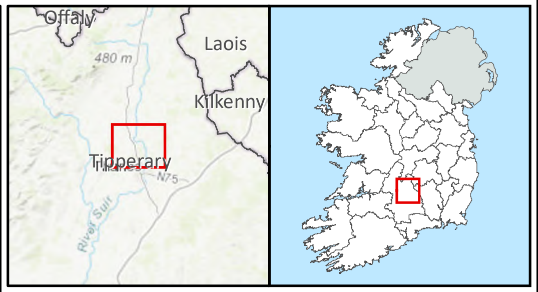

Legend

- Vantage Point Locations
- Turbine Locations
- Site Boundary
- Proposed Turbines 500m Buffer

Flightline, Date, Time

- 1, 05/02/2021, 08:51
- 2, 05/02/2021, 08:57
- 3, 05/02/2021, 09:00
- 4, 05/02/2021, 09:06
- 5, 24/12/2020, 09:21
- 6, 28/01/2021, 09:26
- 7, 28/01/2021, 09:31
- 8, 24/12/2020, 09:35
- 9, 24/12/2020, 09:40
- 10, 24/12/2020, 09:43
- 11, 22/02/2021, 09:48
- 12, 24/12/2020, 09:52
- 13, 04/02/2021, 09:57
- 14, 05/02/2021, 09:59
- 15, 30/12/2020, 10:04
- 16, 20/12/2020, 10:10
- 17, 04/02/2021, 10:10
- 18, 19/12/2020, 10:15
- 19, 29/12/2020, 10:16
- 20, 11/12/2020, 10:20

TITLE:	Winter Flightlines 2020/2021 Lapwing 1
PROJECT:	Brittas Wind Farm, Co. Tipperary
FIGURE NO:	-
CLIENT:	Enerco
SCALE: 1:24000	**REVISION:** 0
DATE: 17/02/2022	**PAGE SIZE:** A3

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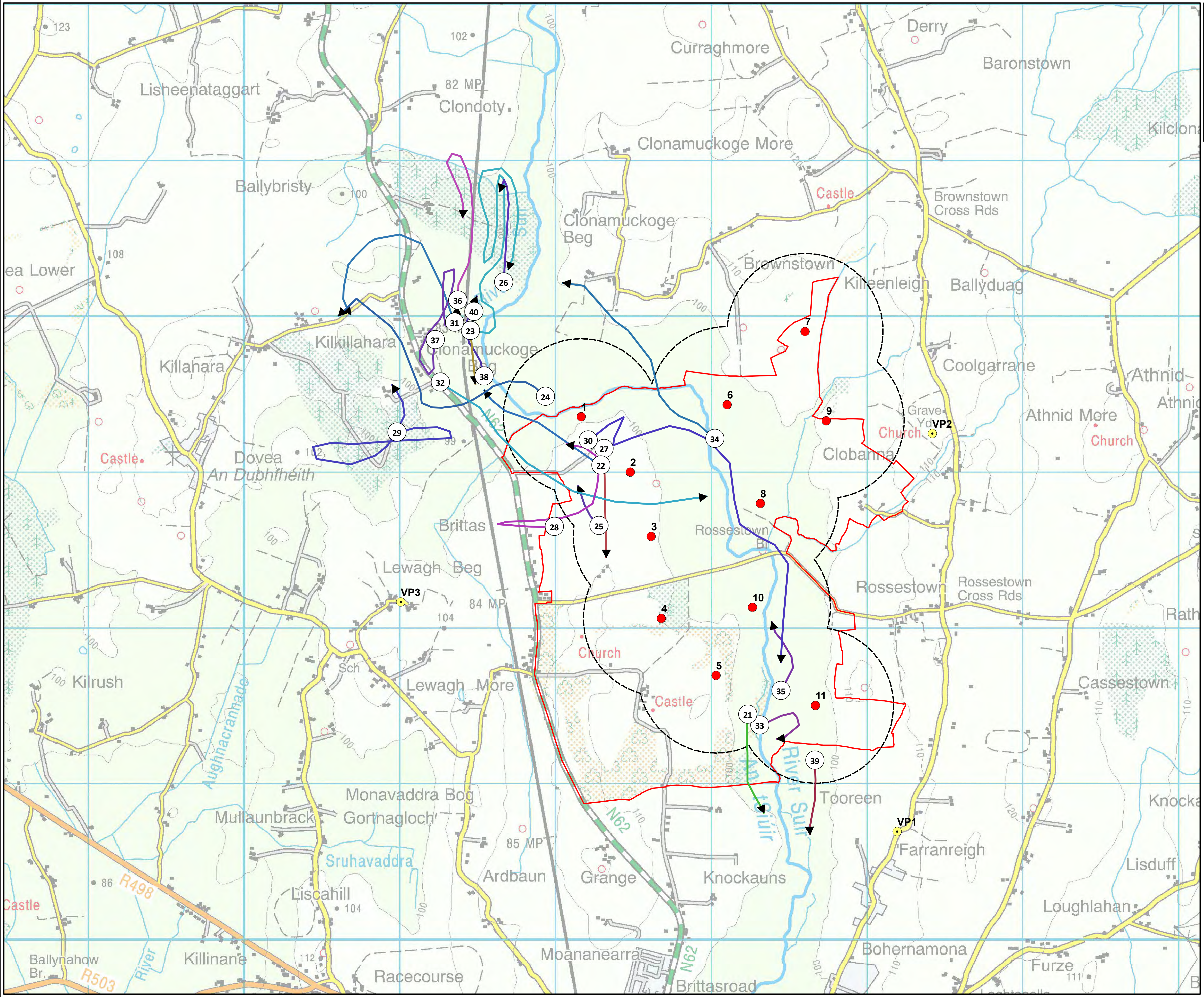

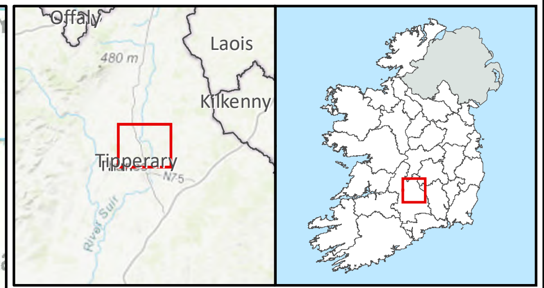

Legend

- Vantage Point Locations
- Turbine Locations
- Site Boundary
- Proposed Turbines 500m Buffer

Flightline, Date, Time

- 21, 20/12/2020, 10:24
- 22, 24/12/2020, 10:34
- 23, 17/01/2021, 10:37
- 24, 04/02/2021, 10:37
- 25, 30/12/2020, 10:40
- 26, 24/12/2020, 10:42
- 27, 14/01/2021, 10:42
- 28, 28/01/2021, 10:43
- 29, 04/02/2021, 10:47
- 30, 28/01/2021, 10:48
- 31, 11/12/2020, 10:57
- 32, 04/02/2021, 11:07
- 33, 15/12/2020, 11:13
- 34, 28/01/2021, 11:16
- 35, 15/12/2020, 11:17
- 36, 19/12/2020, 11:19
- 37, 17/01/2021, 11:22
- 38, 30/12/2020, 11:26
- 39, 22/02/2021, 11:26
- 40, 19/12/2020, 11:27

TITLE:
Winter Flightlines 2020/2021
Lapwing 2

PROJECT:
Brittas Wind Farm, Co. Tipperary

FIGURE NO:	-		
CLIENT:	Enerco		
SCALE:	1:24000	REVISION:	0
DATE:	17/02/2022	PAGE SIZE:	A3

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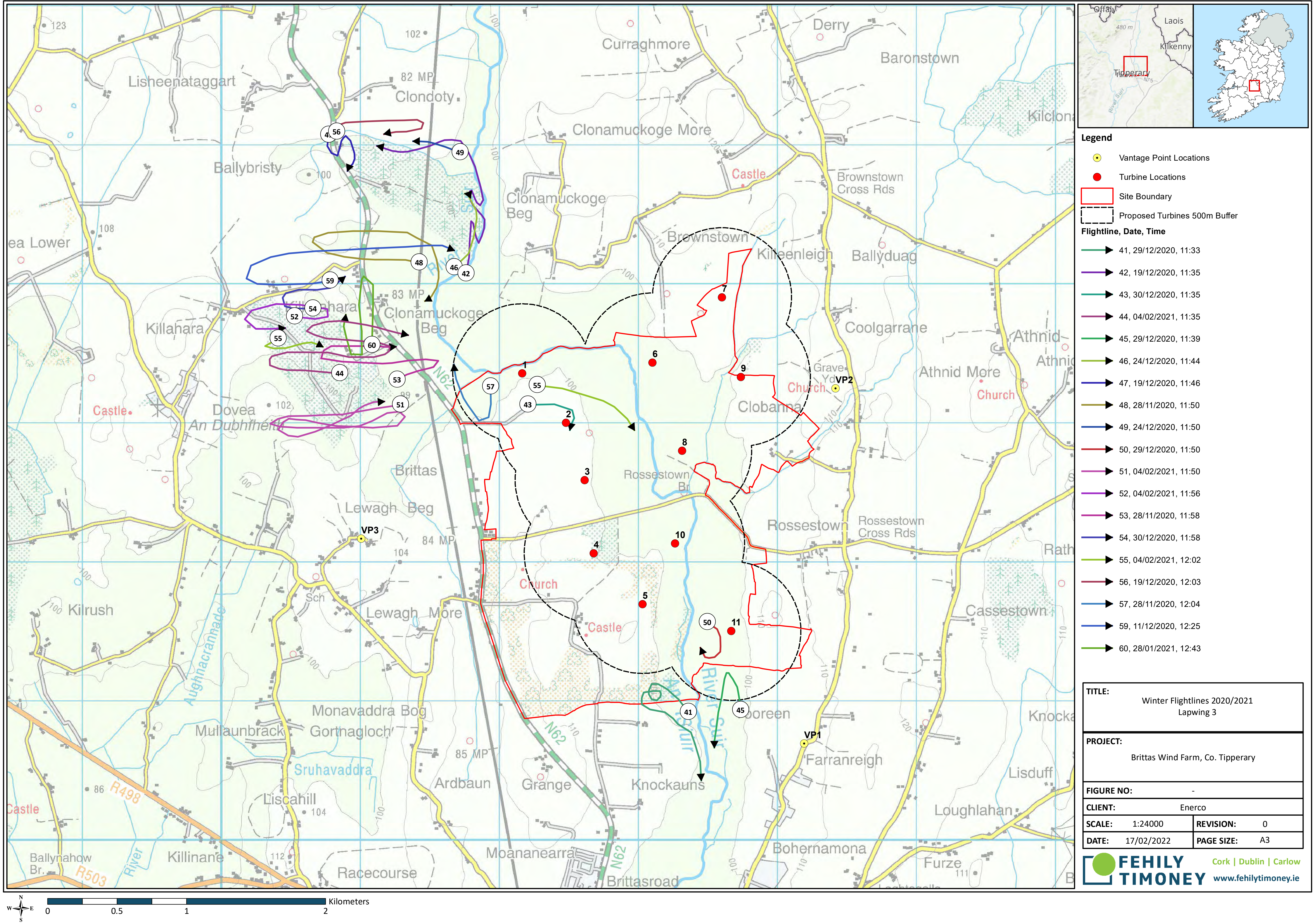

Legend

- Vantage Point Locations
- Turbine Locations
- Site Boundary
- Proposed Turbines 500m Buffer

Flightline, Date, Time

- 41, 29/12/2020, 11:33
- 42, 19/12/2020, 11:35
- 43, 30/12/2020, 11:35
- 44, 04/02/2021, 11:35
- 45, 29/12/2020, 11:39
- 46, 24/12/2020, 11:44
- 47, 19/12/2020, 11:46
- 48, 28/11/2020, 11:50
- 49, 24/12/2020, 11:50
- 50, 29/12/2020, 11:50
- 51, 04/02/2021, 11:50
- 52, 04/02/2021, 11:56
- 53, 28/11/2020, 11:58
- 54, 30/12/2020, 11:58
- 55, 04/02/2021, 12:02
- 56, 19/12/2020, 12:03
- 57, 28/11/2020, 12:04
- 59, 11/12/2020, 12:25
- 60, 28/01/2021, 12:43

TITLE:	Winter Flightlines 2020/2021 Lapwing 3		
PROJECT:	Brittas Wind Farm, Co. Tipperary		
FIGURE NO:	-		
CLIENT:	Enerco		
SCALE:	1:24000	REVISION:	0
DATE:	17/02/2022	PAGE SIZE:	A3

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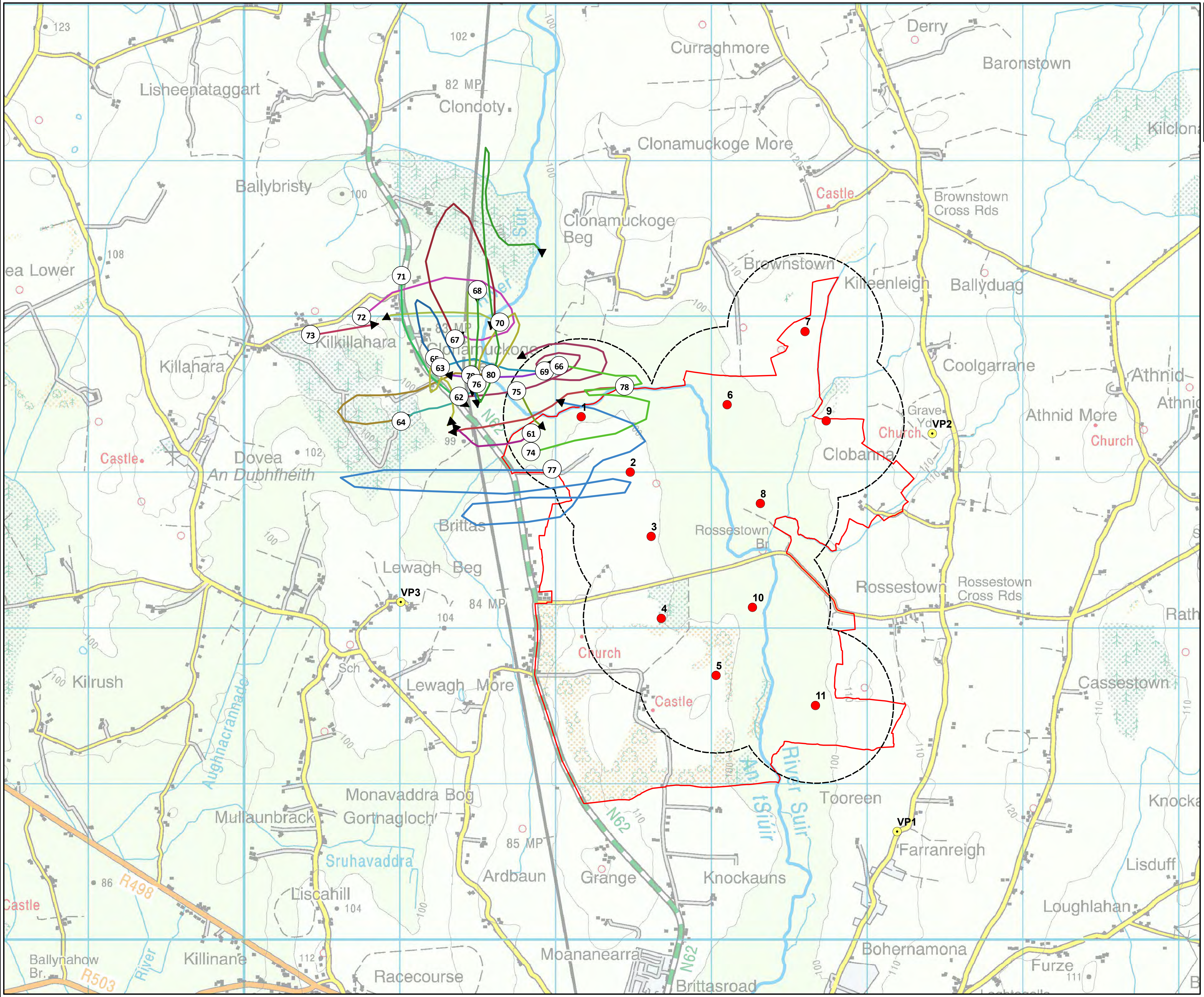

Legend

- Vantage Point Locations
- Turbine Locations
- Site Boundary
- Proposed Turbines 500m Buffer

Flightline, Date, Time

- 61, 14/01/2021, 12:54
- 62, 28/11/2020, 12:56
- 63, 30/12/2020, 13:12
- 64, 15/12/2020, 13:17
- 65, 28/01/2021, 13:27
- 66, 29/12/2020, 13:29
- 67, 30/12/2020, 13:50
- 68, 18/02/2021, 14:00
- 69, 15/12/2020, 14:04
- 70, 11/12/2020, 14:07
- 71, 30/12/2020, 14:14
- 72, 11/12/2020, 14:17
- 73, 28/11/2020, 14:19
- 74, 29/12/2020, 14:20
- 75, 19/11/2020, 14:23
- 76, 30/12/2020, 14:31
- 77, 29/12/2020, 14:36
- 78, 11/12/2020, 14:43
- 79, 30/12/2020, 14:46
- 80, 19/11/2020, 15:08

TITLE:	Winter Flightlines 2020/2021 Lapwing 4
PROJECT:	Brittas Wind Farm, Co. Tipperary
FIGURE NO:	-
CLIENT:	Enerco
SCALE: 1:24000	**REVISION:** 0
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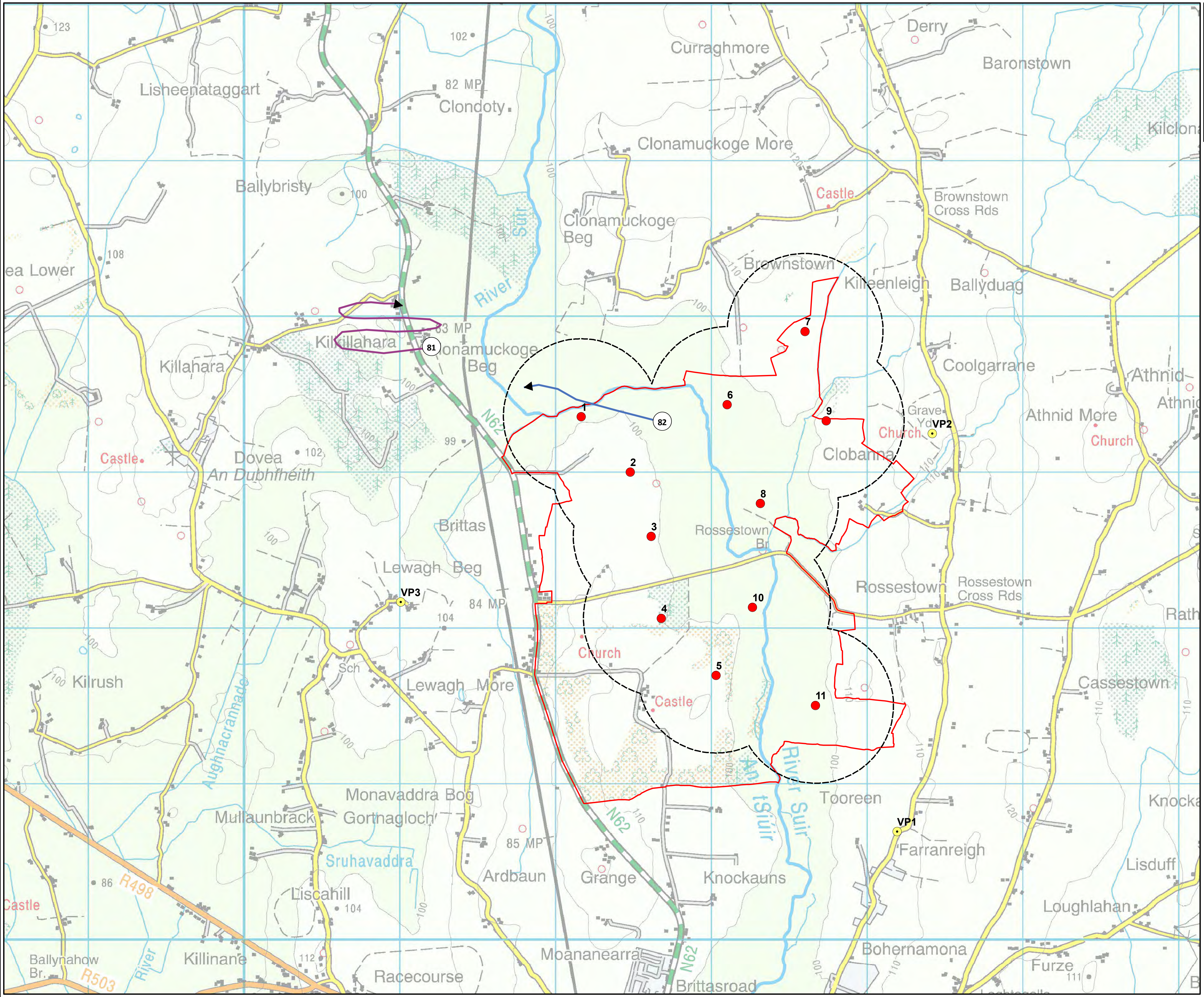

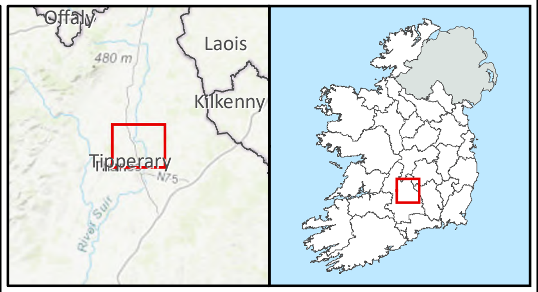

Kilometers
0 0.5 1 2

Legend

- Vantage Point Locations
- Turbine Locations
- Site Boundary
- Proposed Turbines 500m Buffer

Flightline, Date, Time

- 81, 29/12/2020, 15:21
- 82, 29/12/2020, 15:35

TITLE:	Winter Flightlines 2020/2021 Lapwing 5
PROJECT:	Brittas Wind Farm, Co. Tipperary
FIGURE NO:	-
CLIENT:	Enerco
SCALE: 1:24000	**REVISION:** 0
DATE: 17/02/2022	**PAGE SIZE:** A3

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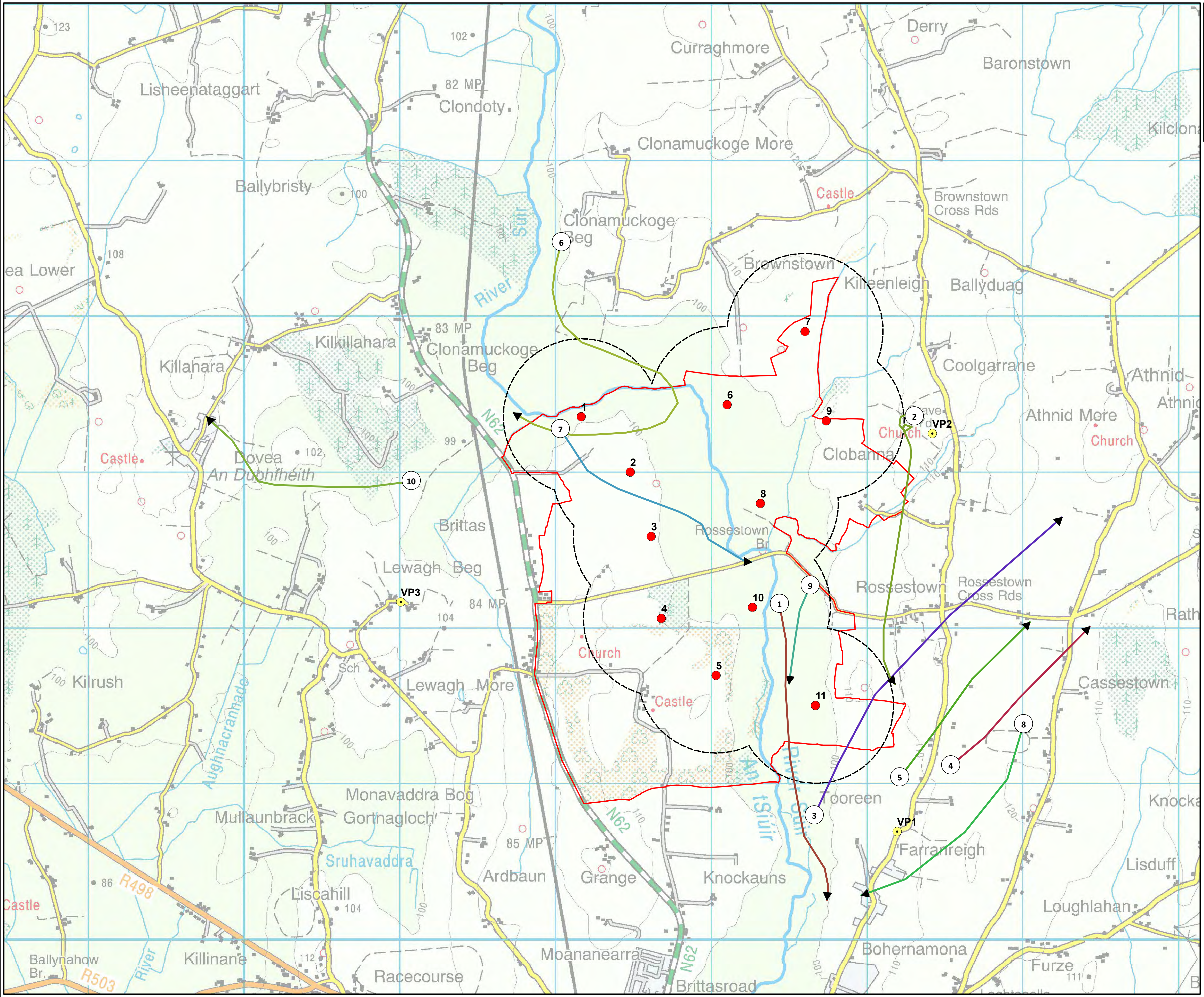

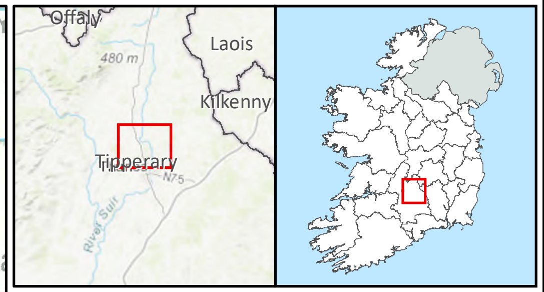

Legend

- Vantage Point Locations
- Turbine Locations
- Site Boundary
- Proposed Turbines 500m Buffer

Flightline, Date, Time

- 1, 22/02/2021, 09:08
- 2, 27/02/2021, 10:19
- 3, 05/11/2020, 12:42
- 4, 05/11/2020, 12:52
- 5, 05/11/2020, 13:12
- 6, 18/02/2021, 14:14
- 7, 15/12/2020, 14:53
- 8, 05/11/2020, 15:02
- 9, 05/11/2020, 15:08
- 10, 16/02/2021, 16:51

TITLE: Winter Flightlines 2020/2021 Lesser Black-backed Gull			
PROJECT: Brittas Wind Farm, Co. Tipperary			
FIGURE NO:	-		
CLIENT:	Enerco		
SCALE:	1:24000	**REVISION:**	0
DATE:	17/02/2022	**PAGE SIZE:**	A3

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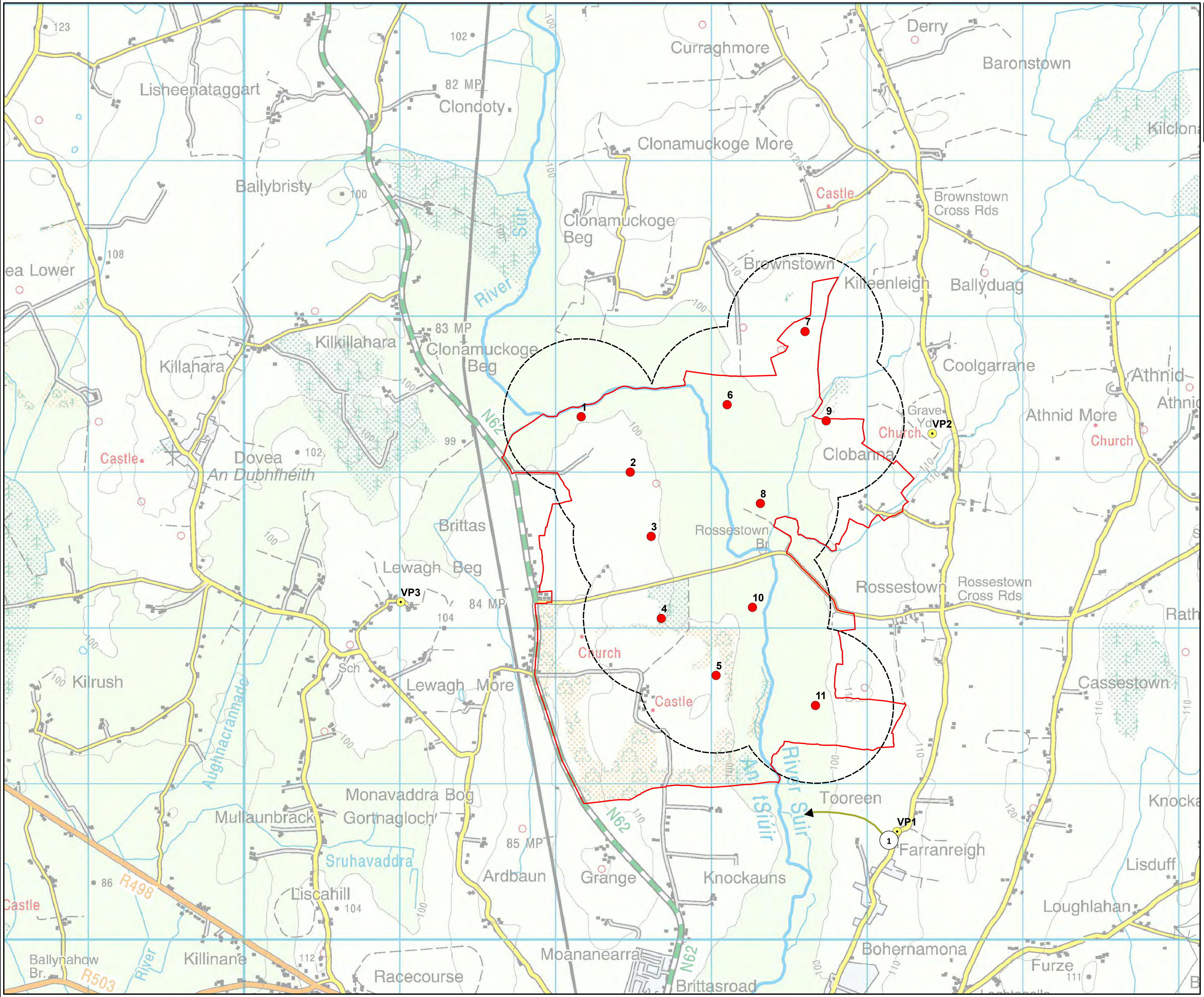

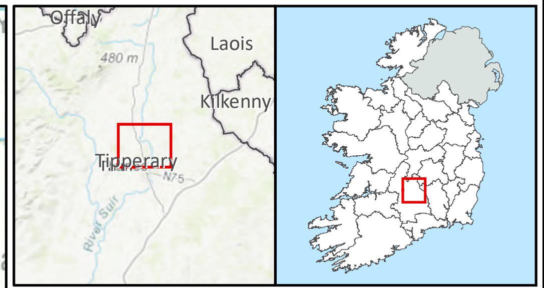

Legend

- Vantage Point Locations
- Turbine Locations
- Site Boundary
- Proposed Turbines 500m Buffer

Flightline, Date, Time

- 1, 22/03/2021, 15:21

TITLE:	Winter Flightlines 2020/2021 Mallard
PROJECT:	Brittas Wind Farm, Co. Tipperary
FIGURE NO:	-
CLIENT:	Enerco
SCALE: 1:24000	**REVISION:** 0
DATE: 17/02/2022	**PAGE SIZE:** A3

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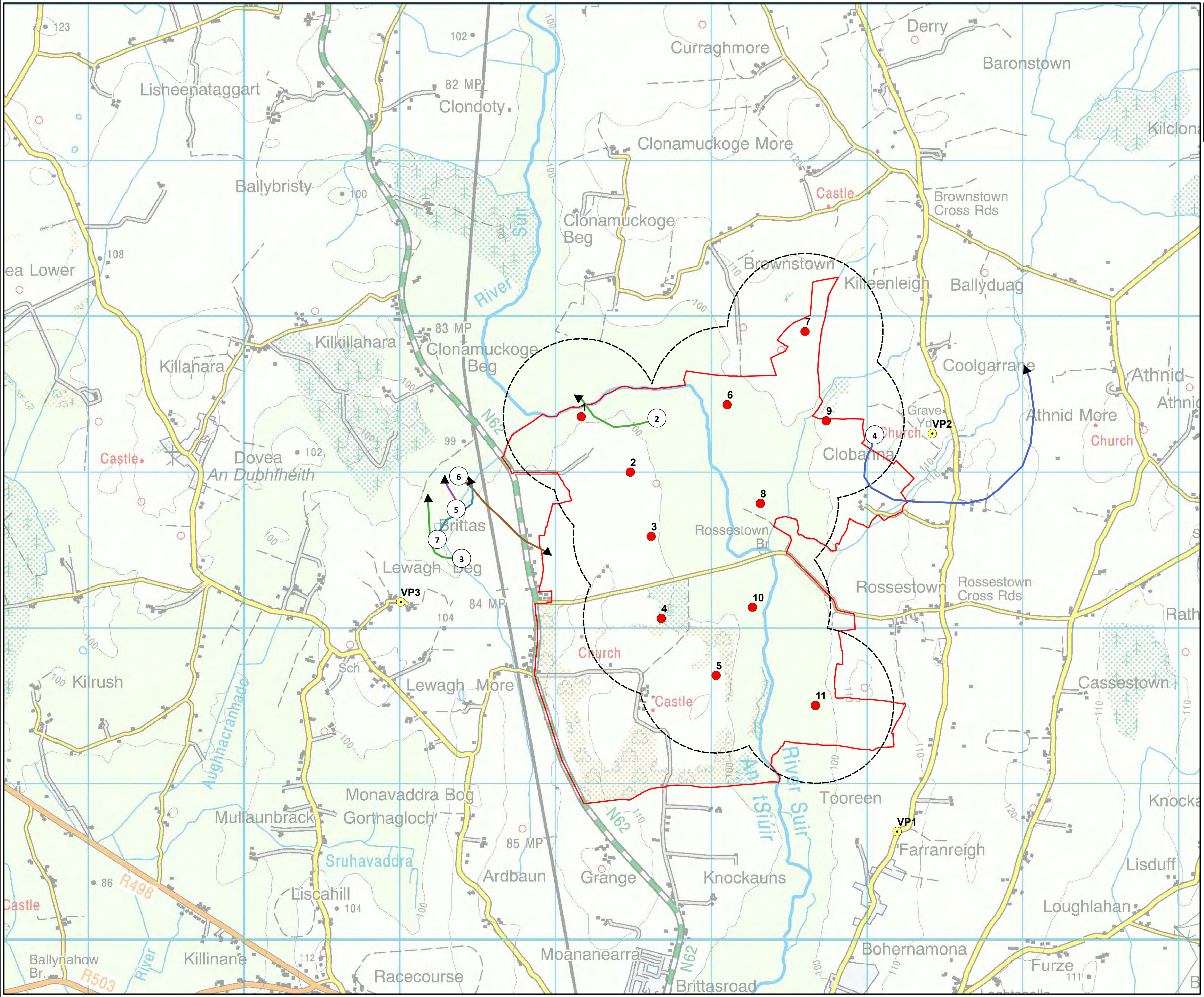

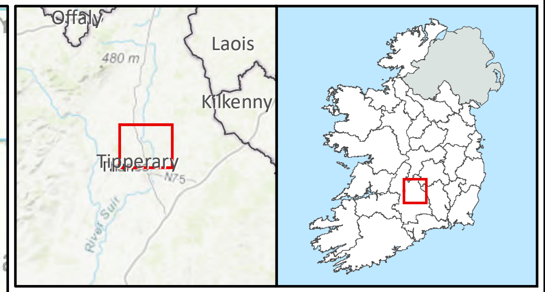

Legend

- Vantage Point Locations
- Turbine Locations
- Site Boundary
- Proposed Turbines 500m Buffer

Flightline, Date, Time

- 2, 24/12/2020, 09:45
- 3, 28/01/2021, 10:01
- 4, 11/12/2020, 10:55
- 5, 11/12/2020, 14:00
- 6, 11/12/2020, 14:09
- 7, 16/02/2021, 14:54

TITLE:	Winter Flightlines 2020/2021 Merlin
PROJECT:	Brittas Wind Farm, Co. Tipperary
FIGURE NO:	-
CLIENT:	Enerco
SCALE: 1:24000	**REVISION:** 0
DATE: 17/02/2022	**PAGE SIZE:** A3

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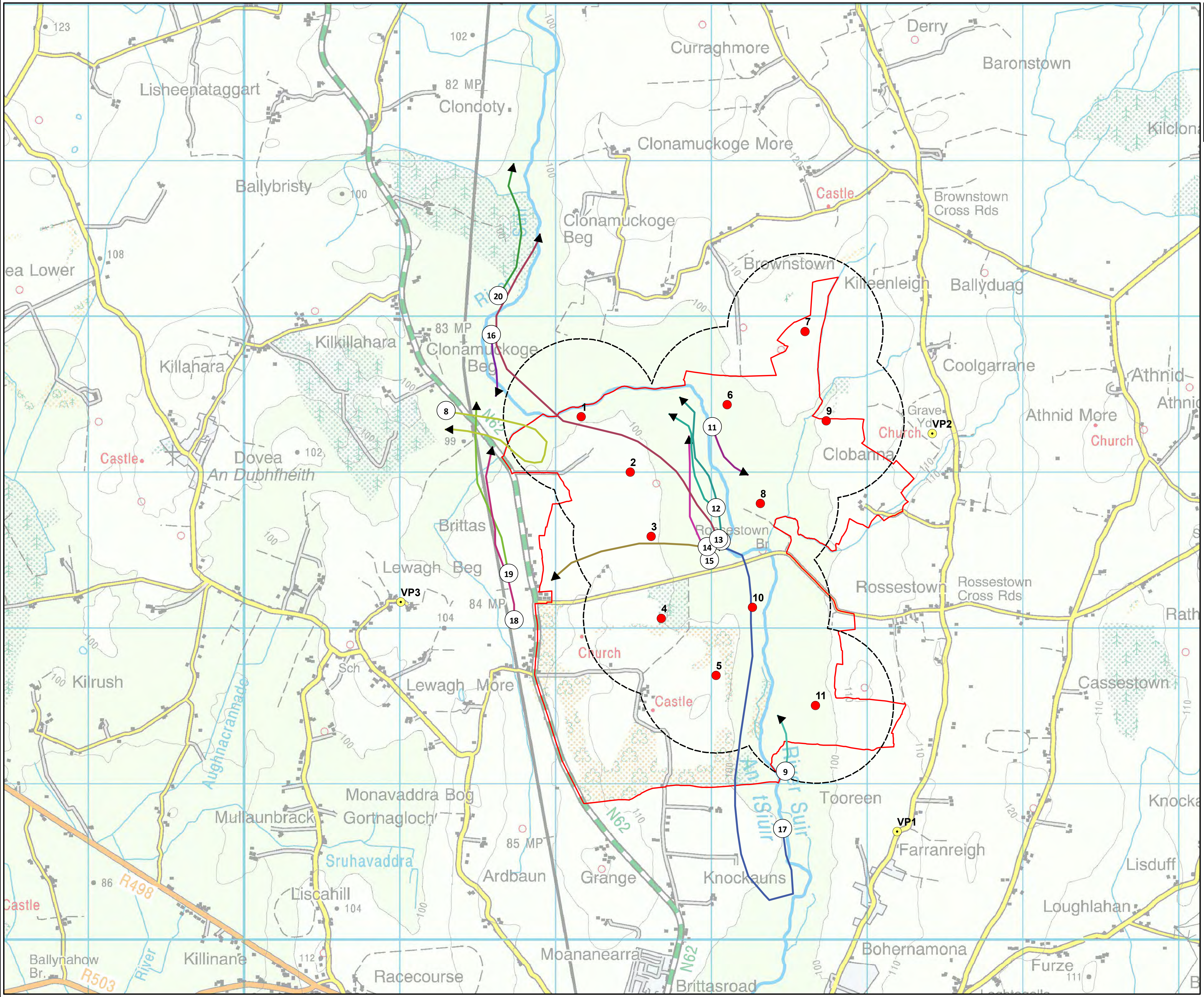

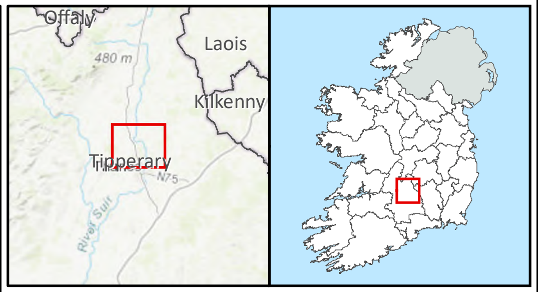

Legend

- Vantage Point Locations
- Turbine Locations
- Site Boundary
- Proposed Turbines 500m Buffer

Flightline, Date, Time

- 8, 28/01/2021, 08:42
- 9, 28/11/2020, 08:56
- 10, 24/12/2020, 09:28
- 11, 19/12/2020, 09:30
- 12, 19/12/2020, 09:37
- 13, 27/02/2021, 09:56
- 14, 27/02/2021, 10:18
- 15, 05/11/2020, 11:22
- 16, 30/12/2020, 11:41
- 17, 20/12/2020, 12:14
- 18, 28/11/2020, 13:11
- 19, 19/11/2020, 13:41
- 20, 30/12/2020, 15:25

TITLE:	Winter Flightlines 2020/2021 Mute Swan
PROJECT:	Brittas Wind Farm, Co. Tipperary
FIGURE NO:	-
CLIENT:	Enerco
SCALE: 1:24000	**REVISION:** 0
DATE: 17/02/2022	**PAGE SIZE:** A3

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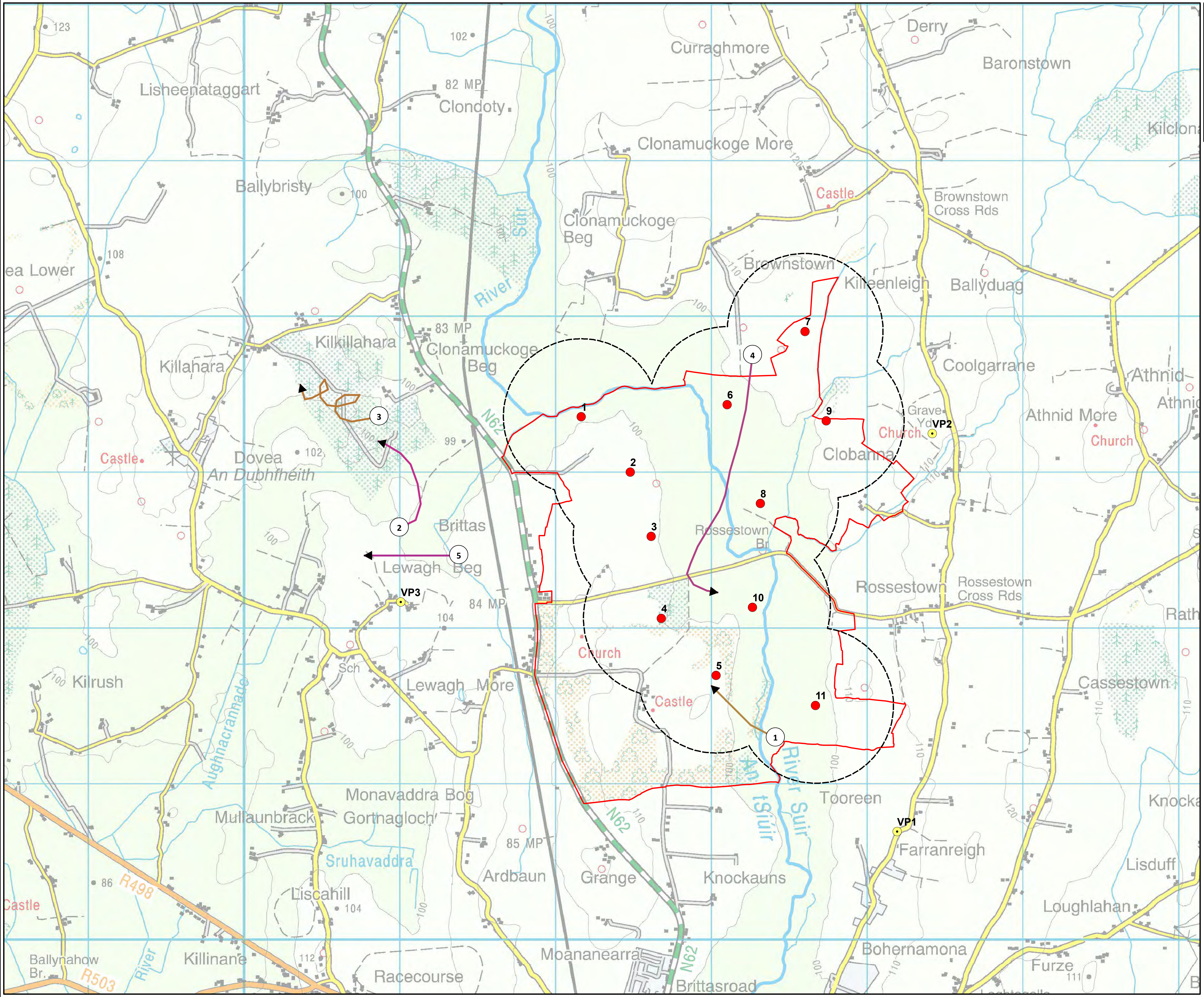

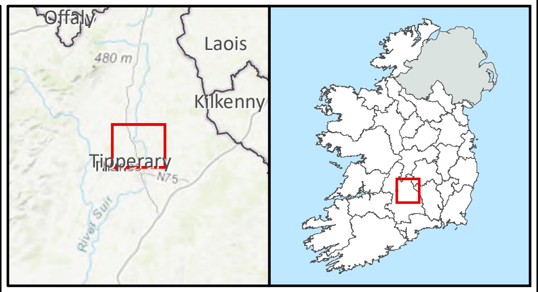

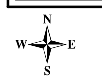

Legend

- Vantage Point Locations
- Turbine Locations
- Site Boundary
- Proposed Turbines 500m Buffer

Flightline, Date, Time

- 1, 14/01/2021, 11:58
- 2, 16/03/2021, 12:19
- 3, 16/03/2021, 12:21
- 4, 30/12/2020, 13:32
- 5, 19/11/2020, 14:08

TITLE:	Winter Flightlines 2020/2021 Peregrine		
PROJECT:	Brittas Wind Farm, Co. Tipperary		
FIGURE NO:	-		
CLIENT:	Enerco		
SCALE:	1:24000	REVISION:	0
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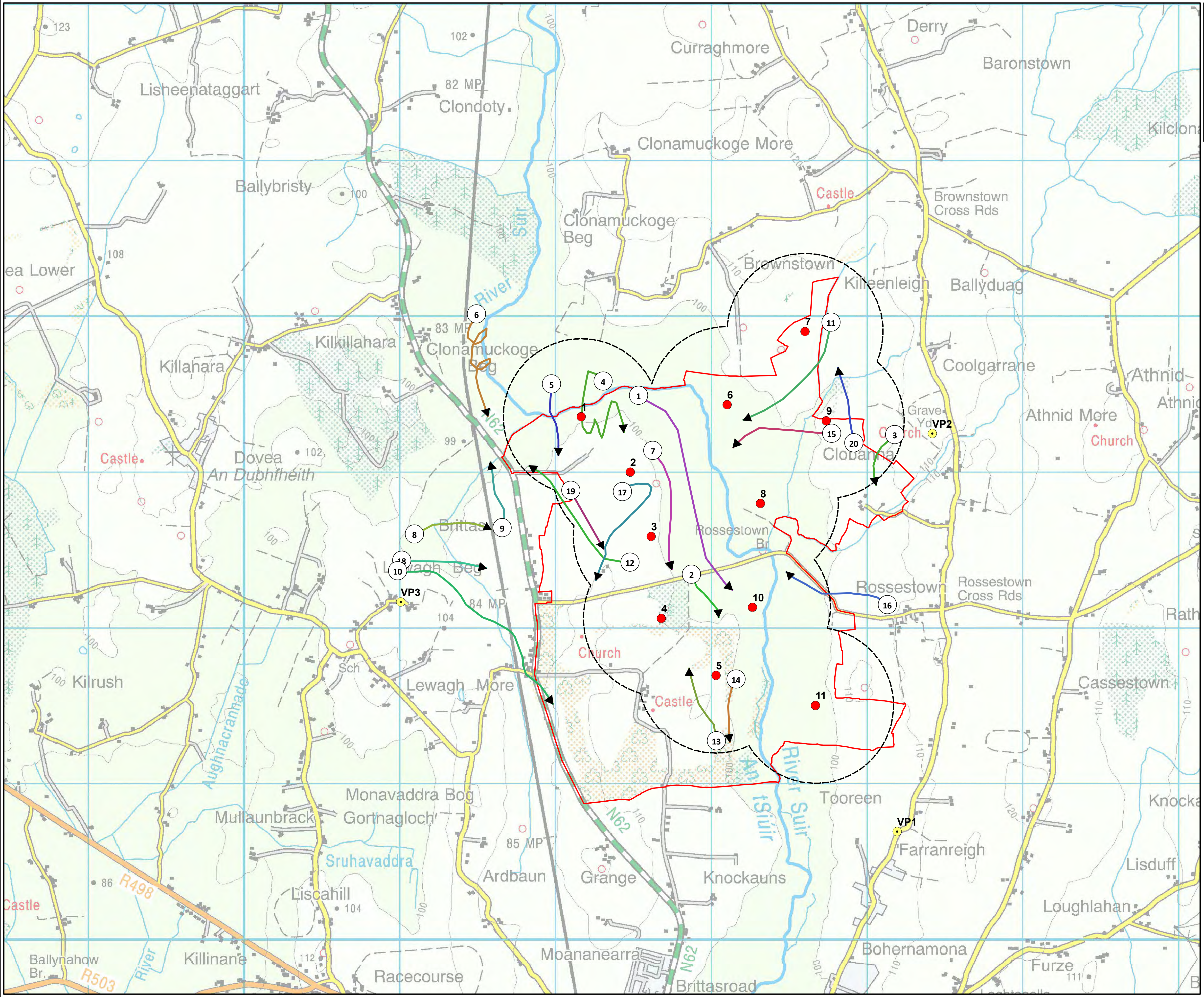

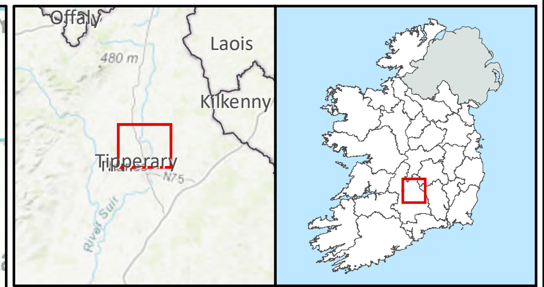

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Legend

- Vantage Point Locations
- Turbine Locations
- Site Boundary
- Proposed Turbines 500m Buffer

Flightline, Date, Time

- 1, 30/12/2020, 09:37
- 2, 30/03/2021, 10:03
- 3, 23/03/2021, 10:19
- 4, 19/12/2020, 10:28
- 5, 17/01/2021, 10:53
- 6, 27/02/2021, 10:55
- 7, 24/12/2020, 10:59
- 8, 30/12/2020, 11:29
- 9, 30/12/2020, 11:31
- 10, 28/11/2020, 11:33
- 11, 24/12/2020, 11:33
- 12, 30/12/2020, 11:34
- 13, 15/12/2020, 11:37
- 14, 15/12/2020, 11:41
- 15, 17/01/2021, 11:44
- 16, 15/12/2020, 11:46
- 17, 27/02/2021, 11:46
- 18, 28/11/2020, 12:21
- 19, 04/02/2021, 12:29
- 20, 30/12/2020, 12:58

TITLE:	Winter Flightlines 2020/2021 Sparrowhawk 1		
PROJECT:	Brittas Wind Farm, Co. Tipperary		
FIGURE NO:	-		
CLIENT:	Enerco		
SCALE:	1:24000	**REVISION:**	0
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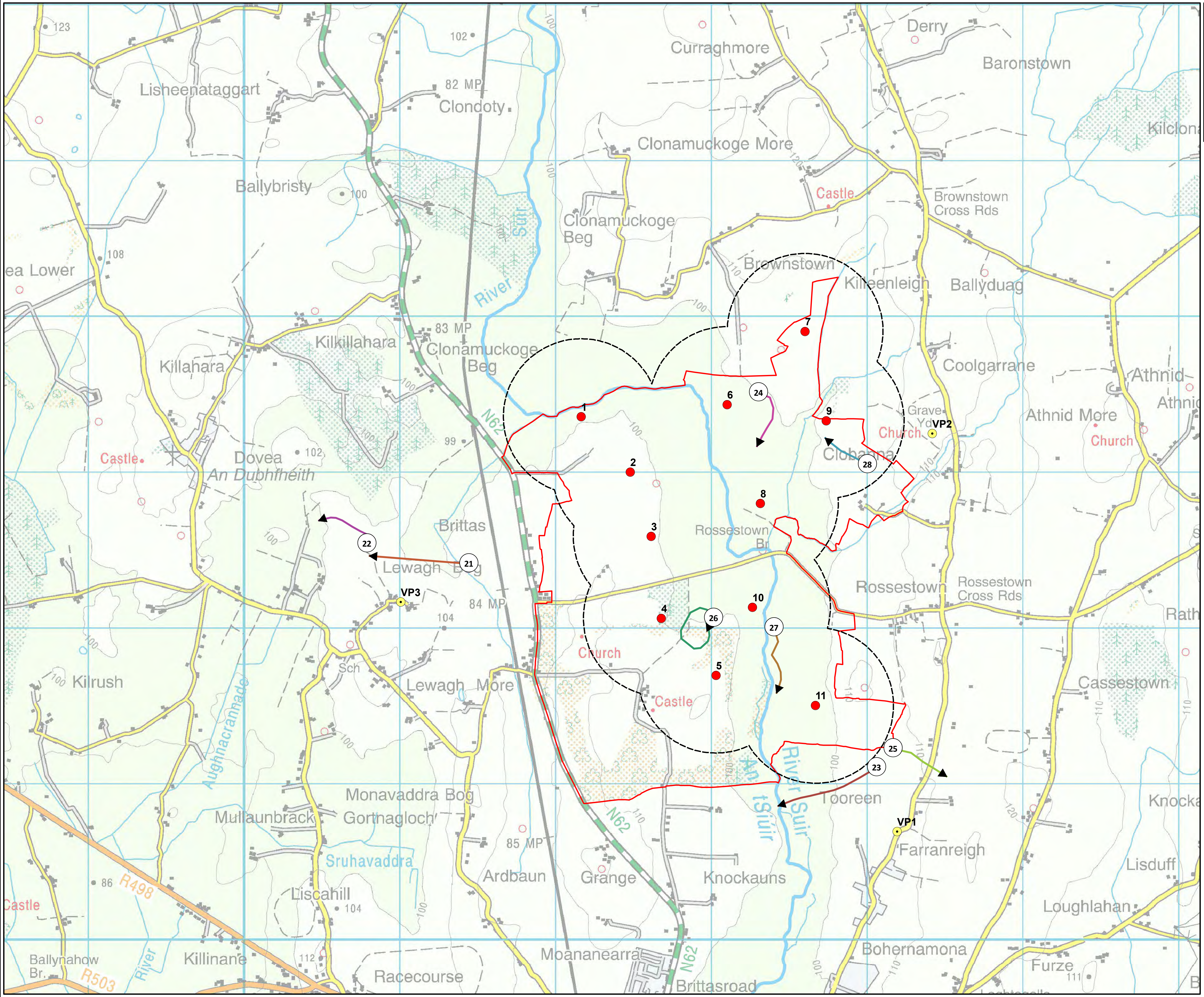

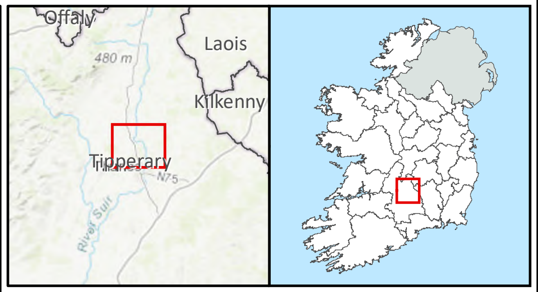

Legend

- Vantage Point Locations
- Turbine Locations
- Site Boundary
- Proposed Turbines 500m Buffer

Flightline, Date, Time

- 21, 14/01/2021, 13:17
- 22, 14/01/2021, 13:18
- 23, 08/03/2021, 13:39
- 24, 28/01/2021, 13:48
- 25, 04/12/2020, 14:05
- 26, 26/01/2021, 14:41
- 27, 26/01/2021, 14:44
- 28, 18/02/2021, 15:10

TITLE: Winter Flightlines 2020/2021 Sparrowhawk 2			
PROJECT: Brittas Wind Farm, Co. Tipperary			
FIGURE NO:	-		
CLIENT:	Enerco		
SCALE:	1:24000	**REVISION:**	0
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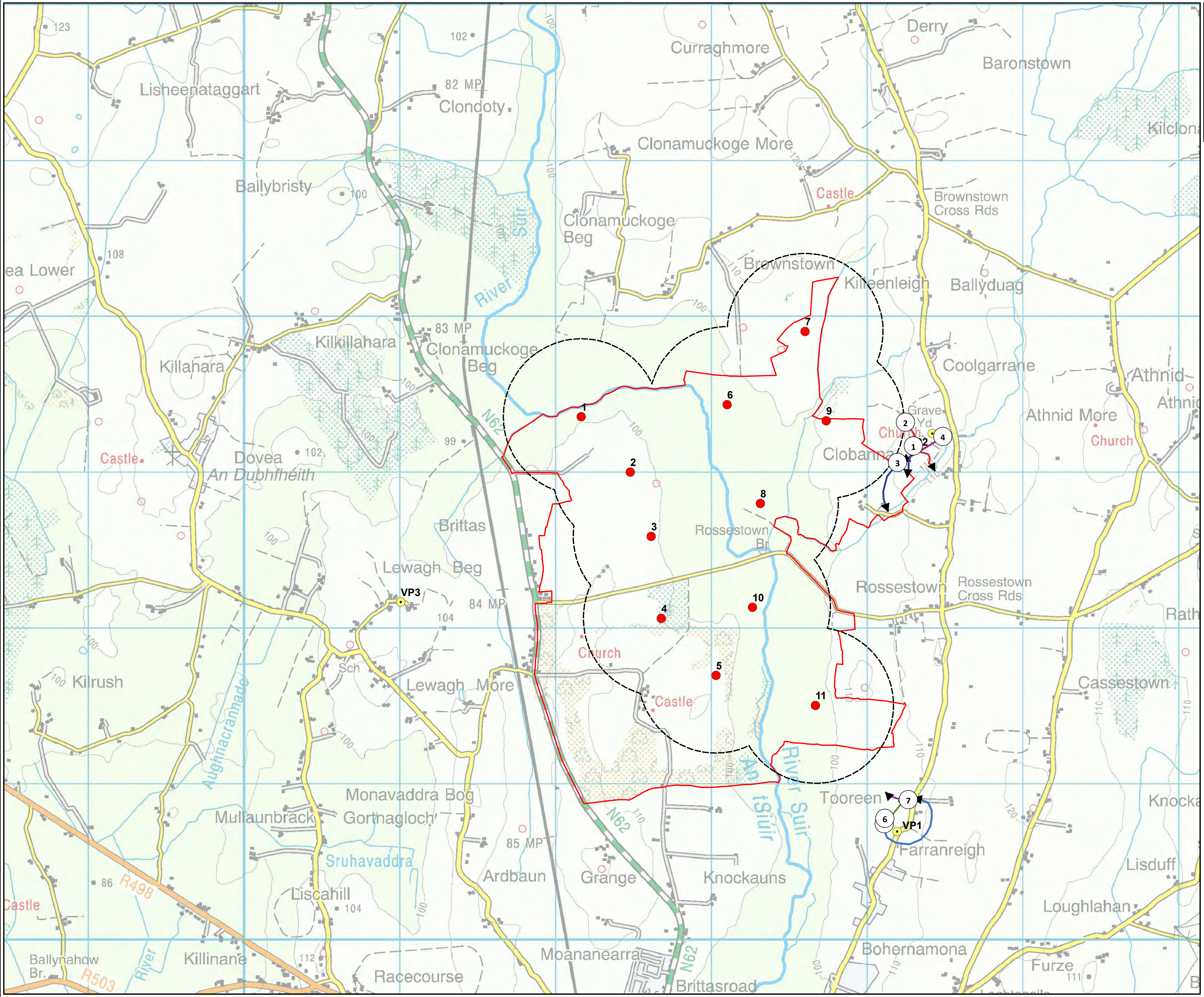

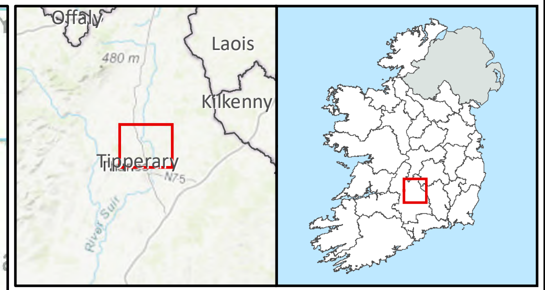

Legend

- Vantage Point Locations
- Turbine Locations
- Site Boundary
- Proposed Turbines 500m Buffer

Flightline, Date, Time

- 1, 30/03/2021, 08:44
- 2, 11/12/2020, 09:04
- 3, 30/03/2021, 09:18
- 4, 19/12/2020, 09:28
- 5, 28/11/2020, 10:51
- 6, 04/12/2020, 13:00
- 7, 22/03/2021, 14:45

TITLE:	Winter Flightlines 2020/2021 Snipe
PROJECT:	Brittas Wind Farm, Co. Tipperary
FIGURE NO:	-
CLIENT:	Enerco
SCALE: 1:24000	REVISION: 0
DATE: 17/02/2022	PAGE SIZE: A3

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Sources: Esri, HERE, Garmin, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), (c) OpenStreetMap contributors, and the GIS User Community
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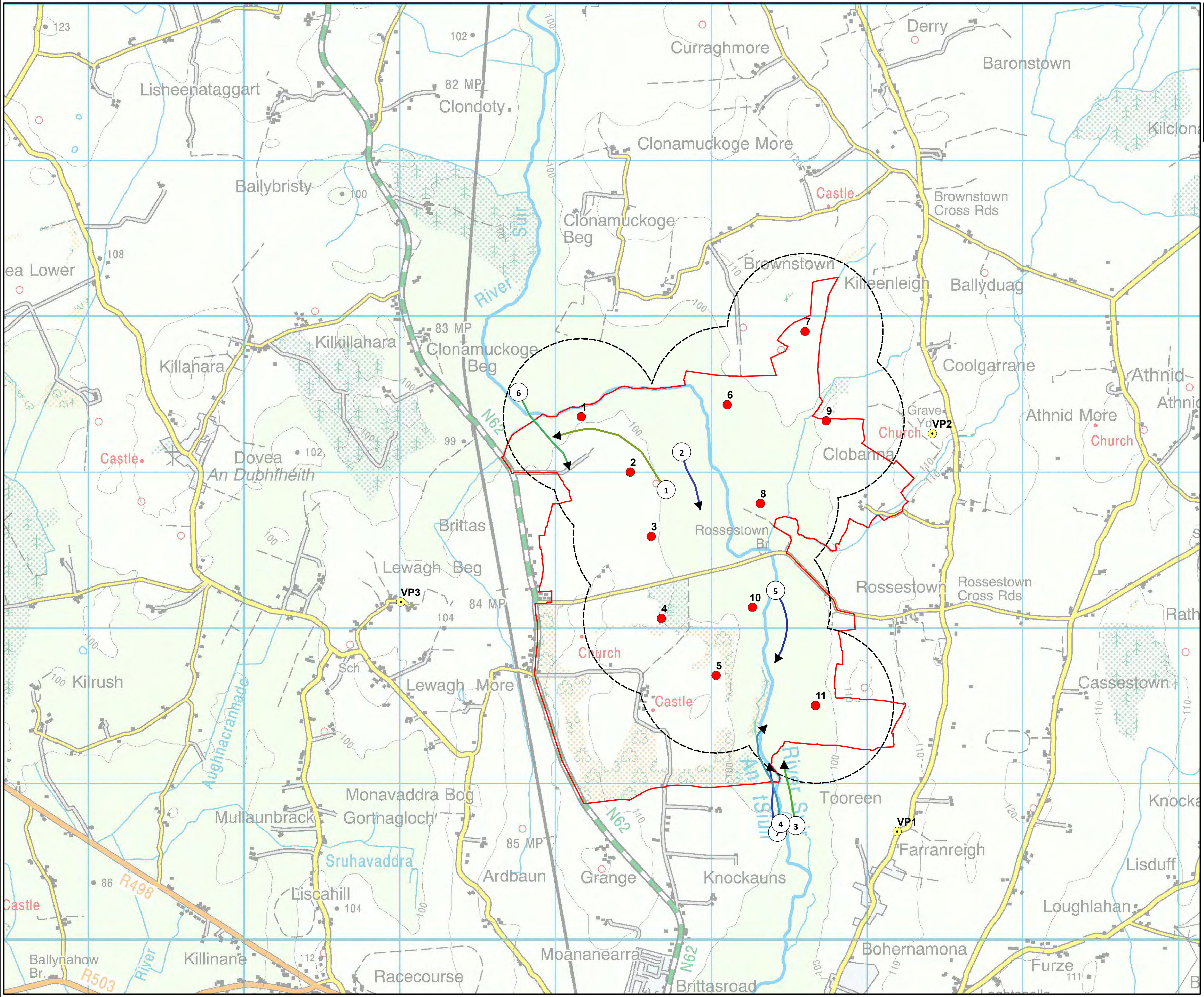

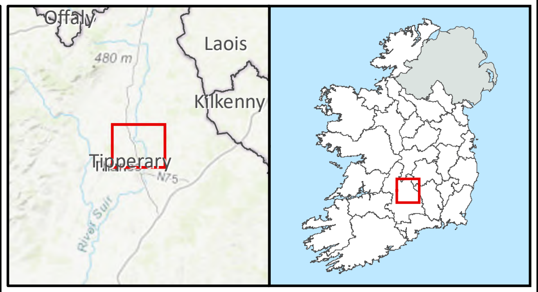

Legend

- Vantage Point Locations
- Turbine Locations
- Site Boundary
- Proposed Turbines 500m Buffer

Flightline, Date, Time

- 1, 28/01/2021, 09:16
- 2, 05/02/2021, 09:44
- 3, 15/12/2020, 09:50
- 4, 20/12/2020, 09:58
- 5, 29/12/2020, 09:59
- 6, 30/12/2020, 10:06
- 7, 15/12/2020, 10:35

TITLE:	Winter Flightlines 2020/2021 Whooper Swan		
PROJECT:	Brittas Wind Farm, Co. Tipperary		
FIGURE NO:	-		
CLIENT:	Enerco		
SCALE:	1:24000	REVISION:	0
DATE:	17/02/2022	PAGE SIZE:	A3

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APPENDIX 5

Hinterland Bird Survey Data

Hinterland Survey Data Winter 2020/21 – Summer 2021

Date	Site	Species	Species Quantity
12/11/20	Liathmore	Whooper swan	26
12/11/20	Loughmoe castle	Peregrine	1
12/11/20	The Tank, Thurles	Snipe	4
12/11/20	The Tank, Thurles	Grey Heron	2
12/11/20	The Tank, Thurles	Mute swan	2
12/11/20	Cabragh Wetlands	Grey Heron	2
12/11/20	Cabragh Wetlands	Coot	1
12/11/20	Cabragh Wetlands	Lapwing	350
12/11/20	Cabragh Wetlands	Garganey	4
12/11/20	Cabragh Wetlands	Shoveler	5
12/11/20	Cabragh Wetlands	Mallard	70
12/11/20	Cabragh Wetlands	Teal	350
12/11/20	Cabragh Wetlands	Wigeon	150
26/11/20	Ballydavid, Littleton	Lesser Black-backed gull	8
26/11/20	Ballydavid, Littleton	Lapwing	40
26/11/20	Ballydavid, Littleton	Teal	12
26/11/20	Lisheen Bog	Grey Heron	2
26/11/20	Lisheen Bog	Mallard	9
26/11/20	Lisheen Bog	Moorhen	1
26/11/20	Lisheen Bog	Teal	1
26/11/20	The Tank	Grey Heron	3
26/11/20	The Tank	Snipe	15
26/11/20	Cabragh Wetlands	Mallard	55
26/11/20	Cabragh Wetlands	Garganey	2
26/11/20	Cabragh Wetlands	Coot	1
26/11/20	Cabragh Wetlands	Mute Swan	8
26/11/20	Cabragh Wetlands	Lapwing	300
26/11/20	Cabragh Wetlands	Grey Heron	3
26/11/20	Cabragh Wetlands	Snipe	15
26/11/20	Cabragh Wetlands	Curlew	4
26/11/20	Cabragh Wetlands	Black-headed Gull	30
26/11/20	Cabragh Wetlands	Shelduck	8
26/11/20	Cabragh Wetlands	Teal	400
26/11/20	Cabragh Wetlands	Wigeon	350

Date	Site	Species	Species Quantity
26/11/20	Cabragh Wetlands	Sparrowhawk	1
26/11/20	Clonamuckoge Beg	Whooper Swan	3
26/11/20	Clonamuckoge Beg	Golden Plover	200
26/11/20	Clonamuckoge Beg	Lapwing	180
08/12/20	Ballydavid, Littleton	Lapwing	45
08/12/20	Ballydavid, Littleton	Snipe	5
08/12/20	Ballydavid, Littleton	Moorhen	1
08/12/20	Ballydavid, Littleton	Teal	25
08/12/20	Liathmore	Whooper Swan	95
08/12/20	Lisheen Bog	Peregrine	1
08/12/20	Lisheen Bog	Little Egret	2
08/12/20	Lisheen Bog	Grey Heron	1
08/12/20	Clonamuckoge Beg	Whooper Swan	5
08/12/20	Clonamuckoge Beg	Lapwing	300
08/12/20	Clonamuckoge Beg	Golden Plover	200
08/12/20	The Tank	Grey Heron	3
08/12/20	The Tank	Snipe	12
08/12/20	Cabragh Wetlands	Sparrowhawk	1
08/12/20	Cabragh Wetlands	Snipe	8
08/12/20	Cabragh Wetlands	Mallard	35
08/12/20	Cabragh Wetlands	Teal	350
08/12/20	Cabragh Wetlands	Wigeon	250
08/12/20	Cabragh Wetlands	Lapwing	25
08/12/20	Cabragh Wetlands	Grey Heron	2
16/01/2021	Ballydavid, Littleton	Mute Swan	2
16/01/2021	Ballydavid, Littleton	Teal	12
16/01/2021	Ballydavid, Littleton	Lapwing	75
16/01/2021	Liathmore	Whooper swan	37
16/01/2021	Loghmoe Castle	No birds	0
16/01/2021	Lisheen Bog	Little Egret	1
16/01/2021	Lisheen Bog	Mallard	7
16/01/2021	Lisheen Bog	Teal	1
16/01/2021	Lisheen Bog	Buzzard	2
16/01/2021	Lisheen Bog	Snipe	2
16/01/2021	Clonamuckoge Beg	Whooper Swan	5

Date	Site	Species	Species Quantity
16/01/2021	Clonamuckoge Beg	Golden Plover	700
16/01/2021	Clonamuckoge Beg	Lapwing	300
16/01/2021	The Tank	Grey Heron	2
16/01/2021	The Tank	Snipe	5
16/01/2021	Cabragh Wetlands	Grey Heron	4
16/01/2021	Cabragh Wetlands	Little Egret	1
16/01/2021	Cabragh Wetlands	Curlew	65
16/01/2021	Cabragh Wetlands	Lapwing	400
16/01/2021	Cabragh Wetlands	Garganey	2
16/01/2021	Cabragh Wetlands	Black-headed Gull	55
16/01/2021	Cabragh Wetlands	Pintail	6
16/01/2021	Cabragh Wetlands	Shoveler	6
16/01/2021	Cabragh Wetlands	Wigeon	350
16/01/2021	Cabragh Wetlands	Teal	300
16/01/2021	Cabragh Wetlands	Greylag Goose	12
16/01/2021	Cabragh Wetlands	Mallard	55
06/02/2021	Ballydavid, Littleton	Coot	1
06/02/2021	Ballydavid, Littleton	Mallard	4
06/02/2021	Ballydavid, Littleton	Moorhen	2
06/02/2021	Ballydavid, Littleton	Lesser Black-backed Gull	1
06/02/2021	Liathmore	Whooper Swan	22
06/02/2021	Liathmore	Golden Plover	5
06/02/2021	Loughmoe Castle	Peregrine	1
06/02/2021	Lisheen Bog	Mallard	5
06/02/2021	Lisheen Bog	Snipe	3
06/02/2021	Lisheen Bog	Grey Heron	1
06/02/2021	Lisheen Bog	Little egret	1
06/02/2021	Clonamuckoge Beg	Mute swan	6
06/02/2021	Clonamuckoge Beg	Lapwing	26
06/02/2021	Clonamuckoge Beg	Golden Plover	150
06/02/2021	Clonamuckoge Beg	Teal	14
06/02/2021	Clonamuckoge Beg	Mallard	2
06/02/2021	Clonamuckoge Beg	Moorhen	2
06/02/2021	The Tank	Grey Heron	3
06/02/2021	The Tank	Mallard	4

Date	Site	Species	Species Quantity
06/02/2021	The Tank	Snipe	7
06/02/2021	Cabragh Wetlands	Gadwall	4
06/02/2021	Cabragh Wetlands	Collard dove	1
06/02/2021	Cabragh Wetlands	Lapwing	150
06/02/2021	Cabragh Wetlands	Golden Plover	300
06/02/2021	Cabragh Wetlands	Grey Heron	4
06/02/2021	Cabragh Wetlands	Chaffinch	31
06/02/2021	Cabragh Wetlands	Black headed gull	110
06/02/2021	Cabragh Wetlands	Mallard	15
06/02/2021	Cabragh Wetlands	Wigeon	75
06/02/2021	Cabragh Wetlands	Teal	150
06/02/2021	Cabragh Wetlands	Shoveler	45
06/02/2021	Cabragh Wetlands	Garganey	1
07/03/2021	Ballydavid, Littleton	Lesser Black-backed Gull	1
07/03/2021	Ballydavid, Littleton	Black-headed Gull	45
07/03/2021	Ballydavid, Littleton	Coot	4
07/03/2021	Ballydavid, Littleton	Moorhen	6
07/03/2021	Ballydavid, Littleton	Teal	4
07/03/2021	Liathmore	Whooper Swan	60
07/03/2021	Lisheen Bog	Mallard	5
07/03/2021	Lisheen Bog	Moorhen	2
07/03/2021	Lisheen Bog	Little Grebe	2
07/03/2021	Lisheen Bog	Snipe	1
07/03/2021	Clonamuckoge Beg	Mute Swan	4
07/03/2021	The Tank, Thurles	Snipe	5
07/03/2021	The Tank, Thurles	Grey Heron	3
07/03/2021	Cabragh Wetlands	Grey Heron	5
07/03/2021	Cabragh Wetlands	Little Egret	3
07/03/2021	Cabragh Wetlands	Black-headed Gull	68
07/03/2021	Cabragh Wetlands	Water Rail	2
07/03/2021	Cabragh Wetlands	Lapwing	28
07/03/2021	Cabragh Wetlands	Teal	30
07/03/2021	Cabragh Wetlands	Gadwall	6
07/03/2021	Cabragh Wetlands	Mallard	12
07/03/2021	Cabragh Wetlands	Wigeon	230

Date	Site	Species	Species Quantity
26/06/2021	Ballydavid, Littleton	Coot	8
26/06/2021	Ballydavid, Littleton	Little Grebe	5
26/06/2021	Ballydavid, Littleton	Lesser Black-backed Gull	1
26/06/2021	Ballydavid, Littleton	Moorhen	2
26/06/2021	Lisheen Bog	Ringed Plover	2 pairs
26/06/2021	Lisheen Bog	Lapwing	1 pair
26/06/2021	Lisheen Bog	Grey Heron	1
26/06/2021	Cabragh Wetlands	Lapwing	1 pair
26/06/2021	Cabragh Wetlands	Snipe	4 pairs
27/07/2021	Ballydavid, Littleton	Coot	6
27/07/2021	Lisheen Bog	Grey Heron	3
27/07/2021	Lisheen Bog	Snipe	3
27/07/2021	Lisheen Bog	Curlew	20
27/07/2021	Lisheen Bog	Black-headed Gull	1
27/07/2021	Lisheen Bog	Little Egret	1
27/07/2021	Littleton Bog	Lapwing	1
27/07/2021	Littleton Bog	Mallard	4
27/07/2021	Littleton Bog	Teal	2
27/07/2021	Littleton Bog	Moorhen	2
27/07/2021	Littleton Bog	Little grebe	2
27/07/2021	Littleton Bog	Snipe	2

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