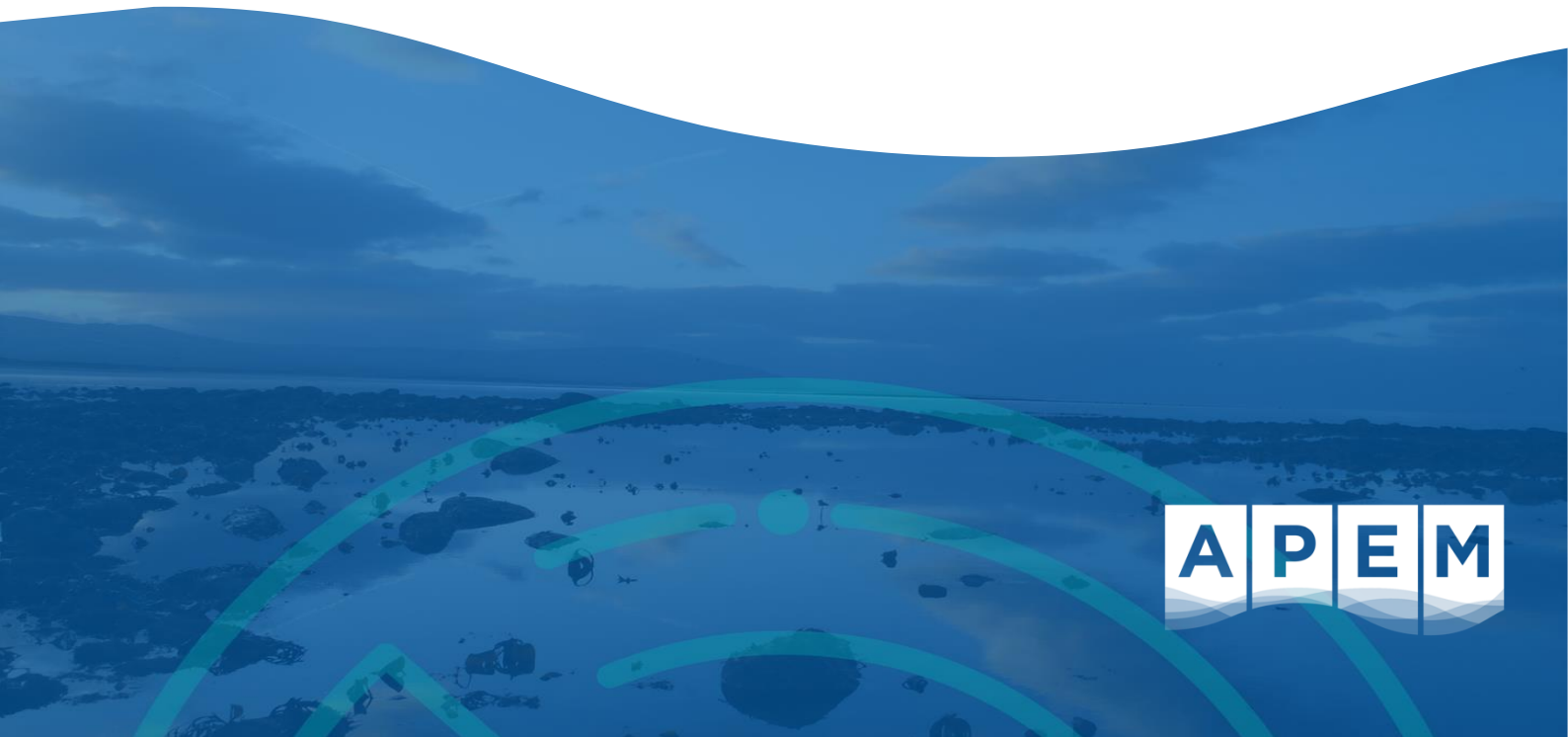
Ørsted

Brittas Wind Farm

Appropriate Assessment Screening and Natura Impact Statement

P00008667

November 2024



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1. Introduction

Woodrow, part of the Apem Group, was commissioned by Ørsted in November 2023 to prepare an Appropriate Assessment (AA) report for the proposed Brittas Wind Farm. The proposed project comprises ten (10) No. Wind Turbine Generator Systems (WTGS) approximately 3km north of Thurles, Co. Tipperary.

1.1. Background

Brittas Wind Farm Ltd. (the Applicant) propose to develop a wind farm (named Brittas Wind Farm) referred to hereafter as the "proposed project", located c. 3km north of Thurles town as shown in Figure 1. The proposed project will be located within the following townlands: Brittas, Rossestown, Clobanna, Brownstown, Killeenleigh and Kilkillahara in County Tipperary. This report has been prepared as part of the planning application.

A ten-year consent is being requested for this development. The applicant requests the grant of permission is on the basis of a 35-year operational period. With permission for the onsite substation sought in permanency, given that the substation will form part of the national electricity network. Therefore, the substation will be retained as a permanent structure and will not be removed.

The main components of the proposed project are ten WTGS with a hub height range from 102.5 to 105.5 m and a blade diameter range from 149 to 155 m, an on-site 110kV electrical substation, a Battery Energy Storage System (BESS) and an underground electrical connection to an existing 110kV substation at Thurles which is connected to the National Grid. This is the preferred technical grid connection approach.

Should it become operational, this wind farm will be capable of providing between 57 and 66 megawatts (MW) of renewable electricity to the National Grid.

The proposed project for which planning permission is sought includes the following elements that are described separately in the sections which follow:

- Core Wind Farm Elements;
- Grid Route Connection (GCR); and
- Turbine Delivery Route (TDR).

1.2. Site Description

The wind farm referred to hereafter as the "the Site", is centred at ITM coordinates 613211, 662889. Figure 1 outlines the extent of the Site. The planning boundary (redline) includes a total land area of approximately 331.83 ha with an additional 0.15 ha in Thurles Town. The proposed GCR and TDR are also assessed in this NIS report.

The Site comprises largely agricultural fields bounded by hedgerows and treelines. An area of broadleaf forestry is located at the southwest of the Site. The River Suir transects the Site from north to south. The N62 is located west of the Site, running north to south, connecting Templemore to Thurles. The N62 provides a link to the M6, M7 and M8 motorways. The L8017 local road traverses the centre of Site from east to west, crossing the River Suir at a bridge point.

The Site principally lies within areas identified as 'Open to Consideration for New Wind Energy Development' in the Tipperary County Development Plan 2022-2028 Renewable Energy Strategy.

1.3. Brief Description of the Project

The development for which planning permission is sought in the planning application (the proposed project) consists of the following (Figure 1):

- 10 No. Wind Turbines with a blade tip height of 180m, hub height range from 102.5 to 105.5m and a rotor diameter range from 149m to 155m;
- 10 No. Wind Turbine foundations and Hardstand areas and associated drainage infrastructure;
- 1 No. Permanent Lidar unit and associated foundation, hardstand area and compound for Meteorological Monitoring;
- 1 No. 110kV Electrical Substation including 2 No. control buildings, electrical plant and equipment, welfare facilities, carparking, water and wastewater holding tanks, security fencing, lightening protection and telecommunications masts, security cameras, external lighting and all associated infrastructure;
- Installation of medium voltage underground electrical and communication cabling connecting the wind turbines to the proposed onsite substation and associated ancillary works;
- Installation of 7km of underground electricity and communication cabling between the proposed onsite substation and the nearby existing Thurles 110kV substation in the townland of Ballygammane, Co. Tipperary. The cabling will be laid primarily within the public road and will connect the proposed wind farm to the national grid;
- 4 No. Site Entrances from the public road and associated fencing and signage;
- Construction of new permanent site access tracks, turning heads and associated drainage infrastructure;
- The upgrading of existing access tracks and associated drainage infrastructure;
- 2 No. Temporary construction site compounds and mobile welfare facilities;
- 1 No. Borrow pit and associated drainage infrastructure to be used as a source of stone material during construction;
- Spoil deposition areas;
- Associated surface water management systems;
- Tree felling and hedgerow removal to accommodate wind farm infrastructure;
- Temporary accommodation works at 2 no. locations adjacent to the public road to facilitate delivery of turbine components to site within the townlands of Brittas and Brittasroad, Co. Tipperary. The works primarily relate to trimming and clearing of vegetation, temporary removal of street furniture and fencing, and installation of temporary stone hard standing; and
- All related site works and ancillary development;

Other elements of the project which are assessed but are not the subject of this planning application are as follows:

- Battery Energy Storage Facility (BESS) located adjacent the proposed substation;
- Rerouting of on-site ESB 38kV overhead powerline (OHL); and
- Accommodation works along the turbine delivery route which includes temporary removal of traffic signs and lights, electricity poles, bollards and lamp posts, fences, and hedge and tree removal/trimming.

1.3.1. Connection to Substation and Grid Connection Route

The proposed Grid Connection Route will consist of approximately 7km of a 110kV underground cable buried in the public road. The Grid Connection Route will connect the proposed on-site 110kV substation at the Wind Farm Site to the nearby existing Thurles 110kV substation located in the townland of Ballygammane (Figure 1).

1.3.2. Turbine Delivery Route

The turbine components are expected to be delivered by sea to the Port of Foynes in County Limerick and transported to site along the national, regional and local road network. A total of 100 deliveries are expected, mostly at night.

It is proposed that the site will be accessed from Junction 25 on the M7 at Knockalton/Nenagh to the site entrance on Rossestown Road L8017. This route will make use of the M7 motorway, the R498, the N62 and finally the Rossestown local road L8017 to the proposed project site. Twenty-two pinch points have been identified along the route where various works will be required. These works include the following:

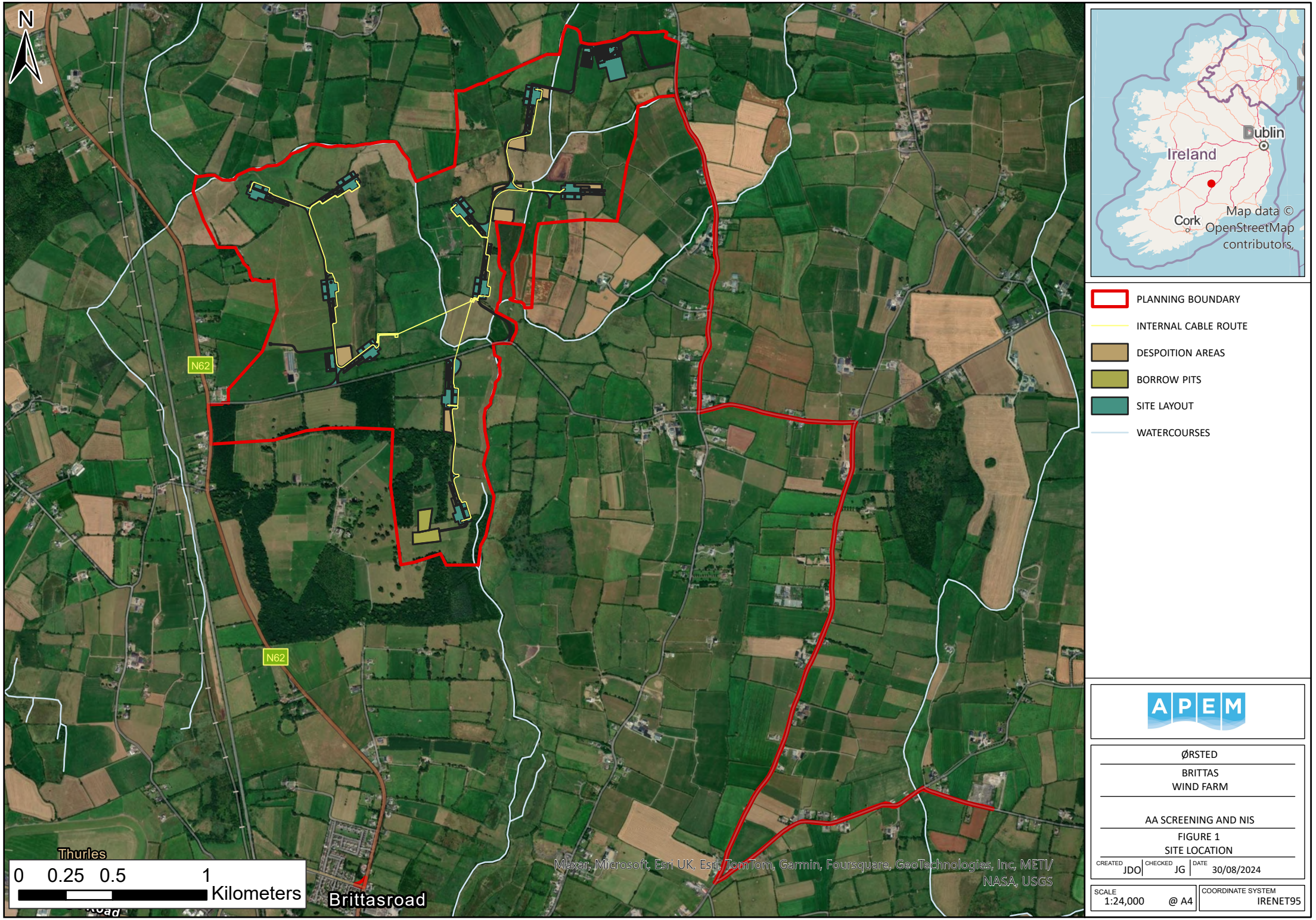
- The temporary removal of traffic signs and lights
- The temporary removal of electricity poles, bollards and lamp posts
- Hedges and tree removal or trimming
- Temporary land access/take
- Lowering of some roadside banks
- Temporary Fence removal
- Road widening.

Two points have been identified where hardstanding areas are required, and these are included in the redline planning boundary for this SID application.

A detailed description of the project is provided in Section 3.

Figure 1. Site Location

THURLES MAPS



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AA SCREENING AND NIS

FIGURE 1
SITE LOCATION

CREATED	CHECKED	DATE
JDO	JG	30/08/2024

SCALE	COORDINATE SYSTEM
1:24,000 @ A4	IRENET95

1.4. Aim of the Report

The aim of this report is to provide supporting information to assist the competent authority, An Bord Pleanála, to carry out an appropriate assessment of the proposed Brittas Wind Farm, County Tipperary.

1.5. Objectives of the Appropriate Assessment Process

The Habitats Directive 92/43/EEC promotes a hierarchy of avoidance, mitigation and compensatory measures to be addressed in the AA process[1] as follows:

- Firstly, a plan / project should aim to avoid any negative impacts on European sites[2] by identifying possible impacts early and designing the project / plan to avoid such impacts;
- Secondly, mitigation measures should be applied if required after Stage 1 of the AA process to the point where no adverse effects on the integrity of the European site(s) remain;
- Thirdly a plan / project may have to undergo an assessment of alternative solutions. Under this stage of the assessment, compensatory measures are required for any remaining adverse effects, but they are permitted only if (a) there are no alternative solutions and (b) the plan / project is required for imperative reasons of overriding public interest (the 'IROPI test').

1.6. Relevant Legislation and Policy

This document has been prepared in compliance with:

- The Habitats Directive 92/43/EEC;
- The Birds Directive 2009/147/EC;
- European Communities (Birds and Natural Habitats) Regulations 2011 – 2021; and,
- Planning and Development Act 2000 (as amended)
- Planning and Development Regulations 2001 (as amended).

The relevant sections of the legislation are summarised in Appendix A of this report.

1.7. Evidence of Technical Competence and Experience

This report was prepared by Consultant Ecologist Elizabeth O'Brien and Senior Terrestrial Ecologist Amy Adwan. Jason Guile and Michael Dobson carried out the technical review of this report.

Elizabeth O'Brien, BSc - Consultant Ecologist has a First Class Hons. BSc in Zoology from National University of Galway Ireland and a First Class Hons. MA in Ecological Design Strategy. She is experienced in a range of research and technical survey skills in terrestrial habitats, aquatic surveys, fisheries science, and small mammal surveys. She has a good knowledge of environmental legislation with reference to Ireland as well as the EU and the Habitats Directive. She has also previously spent

[1]Planning and Development Act 2000 (as amended).
[2] Natura 2000 sites are also referred to as European sites in some guidance documents and legislation such as the Planning and Development Act 2000 (As amended).

time at sea conducting Underwater TV and Deep-Sea Trawling fisheries surveys with the Marine Institute.

As a consultant ecologist for Woodrow Sustainable Solutions Ltd trading as APEM Ireland, part of the APEM Group, she contributes towards many reports including technical reports, Ecological Impact Assessments (EcIA), Appropriate Assessment Reports (AA Screening and Natura Impact Statements) and Biodiversity Action Plans.

Amy Adwan BSc - Senior Terrestrial ecologist with 8 years' experience in the ecological sector in Ireland. She holds a BSc in Environmental Science from the University of Limerick. Amy is a qualified ecologist experienced in a wide range of ecological survey techniques and methodology including bats, mammals, freshwater and habitats. Amy also has a licence to handle bats and is a licensed bat surveyor, with a Certificate in Bat Acoustics Analysis she is also proficient in using analysis software Kaleidoscope and Anabat Insight.

She has an extensive knowledge of environmental laws with reference to Ireland as well as the EU and the Habitats Directive. Her experience has involved regularly undertaking Appropriate Assessment reporting, including Screening for Appropriate Assessment and Natura Impact Statements, as well as legal reviews of same, in relation to relevant CJEU rulings and European Commission Guidance. She also undertakes Ecological Impact Assessments (EcIA), Environmental Impact Assessment (EIAR) and Preliminary Ecological Appraisal (PEA) reporting.

Jason Guile BSc - Principal Ecologist at Woodrow Sustainable Solutions Ltd trading as APEM Ireland, part of the APEM Group. He has over 12 years' relevant industry experience in ecological assessment and has worked in both Ireland and the UK. Jason has a B.Sc. in Marine Biology and Oceanography at University of Wales, Bangor. Jason holds a lead role on numerous projects undertaken by APEM Ireland and provides technical expertise and experience for other significant projects.

Since moving to Ireland Jason's work has involved coordinating, surveying, analysing data, and writing technical reports for several species and numerous projects including renewables, infrastructure, landfill remediation works, urban planning applications and commercial regeneration sites. Jason is currently lead author of the chapters for several Environmental Impact Assessments (EIA) and AA.

Dr Michael Dobson FLS, MCIEEM - Associate Director with Woodrow Sustainable Solutions Ltd trading as APEM Ireland, part of the APEM Group. He holds a BSc (Hons) in Biology from the University of Southampton and a PhD in freshwater ecology from the University of London (Queen Mary College). Mike spent 20 years as a research scientist, specialising in ecology and management of rivers and freshwater wetlands throughout Europe and East Africa, along with developing biotic indices for river quality assessment in Central America. He was Director of the Freshwater Biological Association for six years before joining APEM in 2013, working initially in the limnology and water quality team before starting APEM's invasive species team in 2019 and moving in 2022 to APEM Ireland. Mike has written many peer-reviewed papers in ecology and biogeography, along with two undergraduate textbooks for Oxford University Press (both in their second editions) and seven identification guides to freshwater invertebrates of Britain and Ireland. He has extensive experience of survey design, data analysis and reporting, including publication and verbal reporting for non-technical audiences.

2. Methods

2.1. Guidance and Practice Notes

This report has been compiled in accordance with guidance contained in the following documents:

- DoEHLG (2010) - Appropriate Assessment of Plans and Projects in Ireland - Guidance for Planning Authorities. (Department of Environment, Heritage and Local Government, 2010 revision);
- NPWS AA Circular - Appropriate Assessment under Article 6 of the Habitats Directive: Guidance for Planning Authorities. Circular NPWS 1/10 & PSSP 2/10;
- EC Article 6 Guidance (2021) - Assessment of Plans and Projects in Relation to European sites: Methodological Guidance on Article 6(3) and (4) of the Habitats Directive 92/43/EEC (European Commission, 2021);
- EC Precautionary Principle (2000) - Communication from the Commission on the precautionary principle (European Commission, 2000);
- EC Managing European Sites (2019) - Managing European sites: The Provisions of Article 6 of the Habitats Directive 92/43/EEC (European Commission, 2019); and
- EC Interpretation Manual (2013) - EC (2013) Interpretation Manual of European Union Habitats. Version EUR 28. European Commission.
- OPR Practice Note (2021) - Office of the Planning Regulator (2021). Appropriate Assessment Screening for Development Management. OPR Practice Note PN01.
- NPWS Article 12 and 16 Protection (2021) - Mullen *et al.,* (2021). Strict Protection of Animal Species: Guidance for Public Authorities on the Application of Articles 12 and 16 of the EU Habitats Directive to development / works undertaken on or on behalf of a Public Authority. National Parks and Wildlife Service Guidance Series.
- CIEEM (2018) - CIEEM, (2018). Guidelines for Ecological Impact Assessment in the UK and Ireland: Terrestrial, Freshwater and Coastal. , s.l.: Chartered Institute of Ecology and Environmental Management.

2.2. Zone of Influence

The '*zone of influence*' (ZoI) for a project is the area over which ecological features may be affected by biophysical changes as a result of the proposed project and associated activities. This is likely to extend beyond the project site, for example where there are ecological or hydrological links beyond the site boundaries. The ZoI will vary for different ecological features depending on their sensitivity to an environmental change (CIEEM, 2018).

Irish guidance (DoEHLG, 2010)[3] states, for the ZoI of plans, that "*A distance of 15 km is currently recommended in the case of plans, and derives from UK guidance (Scott Wilson et al, 2006)*". The guidance goes on to state that "*for projects, the distance could be much less than 15 km, and in some cases less than 100 m, but this must be evaluated on a case-by-case basis with reference to the nature,*

[3] *Appropriate Assessment of Plans and Projects in Ireland -Guidance for Planning Authorities*

size and location of the project, the sensitivities of the ecological receptors, and the potential for in-combination effects."

In determining the ZoI, an initial distance of 15 km is considered, but the Source – Pathway – Receptor (S-P-R) model is also applied. OPR Practice Note (2021) describes the S-P-R model for determining the ZoI of a project, identifying all pathways via which a designated site could be affected irrespective of distance. This model also reflects guidance described in CIEEM (2018) above.

The ZoI for this project was identified through reviewing the project details, the type of impacts and effects that could arise as a result, the distance between the project and European sites considering the qualifying interests and features of conservation interest of those European sites.

2.3. Desk Study

A desk study was carried out to collate information available on Natura 2000 sites within the potential ZoI of the project. This comprised a review of the following publications, websites, data sources and datasets:

- Google Maps[4]
- Ordnance Survey of Ireland (OSI)[5]
- Environmental Sensitivity Mapping (ESM)[6]
- Tipperary County Council planning portal[7].
- National Parks and Wildlife Service (NPWS) website[8]
- National Biodiversity Data Centre (NBDC)[9]
- Environmental Protection Agency (EPA) Maps[10]
- Geological Survey of Ireland (GSI)[11]
- National Parks and Wildlife Service – Information on the status of EU protected habitats in Ireland (Article 17 and Article 12 Reports and datasets).
- Inland Fisheries Ireland (IFI)[12]
- An Bord Pleanála Planning[13]
- Department of Housing, Planning, and Local Government – online land use mapping[14]

2.4. Screening Report

The approach taken in preparing the AA screening report is summarised as follows:

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[4] https://www.google.ie/maps (last accessed 27/08/24)
[5] http://www.osi.ie (last accessed 27/08/24)
[6] enviromap.ie (last accessed 27/08/24)
[7] https://eplanning.ie/TipperaryCC/searchexact (last accessed 27/08/24).
[8] https://www.npws.ie/protected-sites (last accessed 27/08/24)
[9] www.biodiversityireland.ie (last accessed 27/08/24)
[10] http://gis.epa.ie/(last accessed 27/08/24)
[11] gsi.ie (last accessed 27/08/24)
[12] fisheriesireland.ie (last accessed 27/08/24)
[13] https://www.pleanala.ie/en-ie/home/ (last accessed 27/08/24)
[14] www.myplan.ie/en/index.html (last accessed 27/08/24)

- Identify Natura 2000 sites within the potential ZoI of the project;
- Identify the qualifying interests of the Natura 2000 sites and review their conservation objectives;
- Review whether there is potential for the qualifying interests to be affected by the project based on information such as the vulnerabilities of the Natura 2000 site, proximity to the Site and the nature and scale of the works associated with the project, measures intended to avoid or reduce the harmful effects of the proposed development on European sites (i.e. 'Mitigation measures') or best practice measures are not taken into account in the screening stage, except for certain standard design features (Case C-712/21 Eco Advocacy v An Bord Pleanála);
- Consider the likelihood of the identified potential impacts, in the absence of mitigation, occurring based on the information collated and professional judgement;
- Consider the likelihood of cumulative effects arising from the project in-combination with other plans and projects; and,
- Identify the likelihood of significant effects on Natura 2000 sites occurring because of the project
- Where it cannot be excluded, on the basis of best scientific information and objective evidence that the project, individually or in combination with any other plan or project will have a significant effect on a European site, a Natura Impact Statement and Appropriate Assessment will be required.

2.5. Natura Impact Statement

The approach to preparing the Natura Impact Statement (NIS) is summarised as follows:

- Describe the elements of the project that are likely to give rise to significant effects on the Natura 2000 sites;
- Carry out a focused and detailed examination, analysis and evaluation of the implications of the project on the integrity of the relevant European sites in view of the site's conservation objectives;
- Set out the conservation objectives of the Natura 2000 sites;
- Identify and describe, in the light of the best scientific knowledge in the field, complete, precise and definitive findings and conclusions in respect of how the project is likely to affect the key species and key habitats of the Natura 2000 sites;
- Identify and describe, in the light of the best scientific knowledge in the field, complete, precise and definitive findings and conclusions in respect of how the integrity of Natura 2000 sites is likely to be affected by the project, by itself and in-combination with any other plan or project;
- Describe what measures are to be introduced to avoid, reduce or remedy the adverse effects on the integrity of the Natura 2000 site; and,
- Consider findings and determine if potential for adverse effects on the integrity of any Natura 2000 sites remains after such measures have been implemented.

The approach taken in preparing both the screening report and NIS complies with standard methods and best practice guidance, as listed in the references section of this report.

2.6. Cumulative Effects

Cumulative effects can result from individually insignificant but collectively significant actions taking place over a period of time or concentrated in a location. Cumulative effects can occur where a

proposed project results in individually insignificant impacts that, when considered in-combination with impacts of other proposed or permitted plans and projects, can result in significant effects (CIEEM, 2018).

Other plans and projects to be considered would include the following types of future development within the same zone of influence:

- Proposals for which consent has been applied which are awaiting determination in any regulatory process (not necessarily limited to planning permission);
- Projects which have been granted consent (not limited to planning permissions) but which have not yet been started or which have been started but are not yet completed (i.e., under construction); and,
- Proposals for which the applicant is aware of but for which consent has not been applied.

3. Detailed Description of the Project

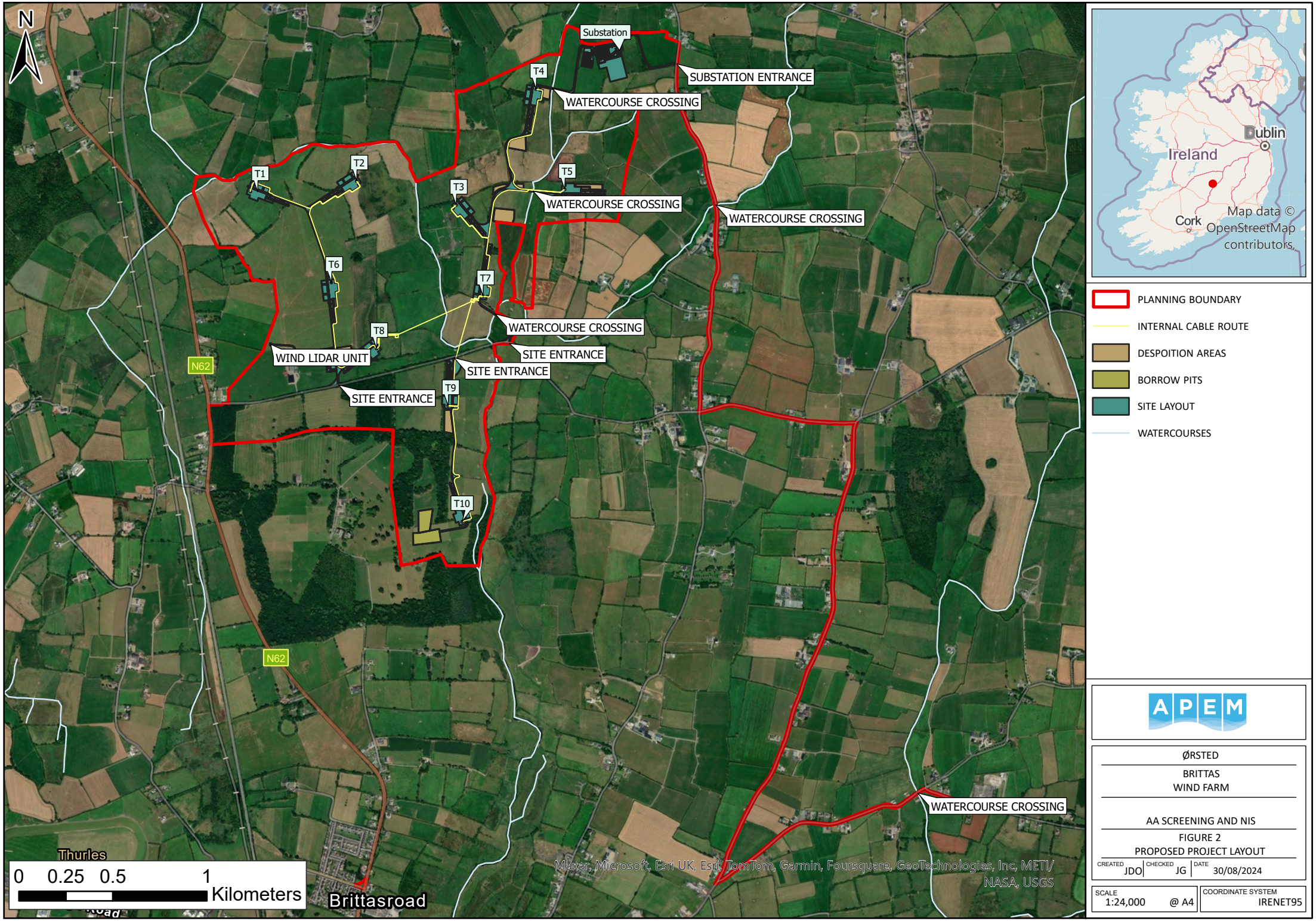
The detailed description of the Proposed project below has been summarised using information provided by Brittas Wind Farm Ltd.

The proposed wind farm, further referred to as 'The Site' (redline boundary) included in the planning application is outlined in Figure 1. The planning boundary is 331.98 hectares. Figure 2 shows the proposed project boundary for which planning permission is being sought, along with project details.

The Site comprises agricultural fields bounded by hedgerows and treelines for the most part. An area of broadleaf forestry is located to the southwest of the Site. The River Suir transects the site from north to south. The N62 is located west of the site, running north to south, connecting Templemore to Thurles. The N62 provides a link to the M6, M7 and M8 motorways. The L8017 local road traverses the centre of site from east to west, crossing the River Suir at a bridge point.

Figure 2. Proposed Project Layout

THURLES MAPS



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AA SCREENING AND NIS

FIGURE 2
PROPOSED PROJECT LAYOUT

CREATED	CHECKED	DATE
JDO	JG	30/08/2024

SCALE	COORDINATE SYSTEM
1:24,000 @ A4	IRENET95

3.1. Construction

3.1.1. Turbines

It is proposed to install ten (10) no. wind turbines each with a tip height of 180 metres (refer to Table 1 for turbine dimension details). The precise turbine model has not yet been determined and the developer has been granted flexibility to consider three different types of turbines with variable designs, blade lengths, and hub height. The characteristics of such are presented in Table 1.

Table 1. Characteristics of the three types of turbines proposed.

Turbine Type	Rotor Diameter	Tip Height	Blade length	Hub Height
A (1)	150m	180m	73.7m	105m
B (2)	155m	180m	76m	102.5m
C (3)	149m	180m	73m	105m

The proposed turbines will be of a modern design, incorporating tubular towers and three blades attached to a nacelle. The tower supports a nacelle and rotor hub. It is proposed that the wind turbine hubs and towers will be made of steel, while the blades will be made of a matrix of glass-fibre reinforced polyester or wood-epoxy or a similar composite material. The turbines will be designed in accordance with the requirements for finish and colour that are detailed in the 2006 Department of Environment, Heritage and Local Government Wind Farm Development Guidelines (DoEHLG 2006 Guidelines) and the 2019 Draft Revised Wind Energy Development Guidelines (DoHPLG, 2019) as follows:

- Turbines shall be finished to a white, off-white, or grey colour to correspond with the colour scheme of existing turbines; and,
- All surfaces will have a matt non-reflective finish.

It is proposed to install lighting on the turbines in a pattern that is acceptable to the Irish Aviation Authority (IAA) for aviation visibility purposes, subject to agreement with the IAA.

3.1.2. Wind Turbine Foundations

Each wind turbine will have a reinforced concrete base pad foundation with a central plinth above the base, which will support the tower. The foundations are anticipated to be circular in shape and 32m in diameter and 4.5m in depth. The turbine foundations shall be constructed using standard reinforced concrete construction techniques.

3.1.3. Hardstands and Lay Down Areas

Turbine hardstands are required to accommodate the delivery of the turbine components prior to their erection, to support the cranes during erection and to provide a safe working area during construction, operation and decommissioning. Each wind turbine will have an associated turbine hardstand area adjacent to the foundation.

The hardstand areas will be excavated and bear onto rock (or other suitable bearing stratum) with a foundation of 0.5-1.5m depending on the local bedrock profile. In the decommissioning phase, the hardstands will be left in situ and covered over by soil and revegetated. Refer to accompanying design drawing 23318-MWP-00-00-DR-C-5404 for hardstanding details.

3.1.4. Permanent Meteorological Lidar Monitor

A permanent meteorological lidar monitor will be erected within the wind farm to monitor the local wind regime while the wind farm is in operation. This is to be located west of T8 and T6 close to the large existing farm shed. The lidar will have a base foundation and hardstanding area as well as its own access track. The meteorological lidar will be surrounded by a galvanised steel palisade fence, 2.4m in height. The meteorological lidar will have an antenna for internal radio communications for the SCADA (Supervisory Control and Data Acquisition) equipment on site. Refer to the accompanying planning drawing 23318-MWP-00-00-DR-C-5405.

3.1.5. Internal Site Access Tracks and Roads

Internal site access tracks are required to connect elements of the site and allow access to all wind turbines and wind farm infrastructure. Existing tracks will be upgraded, and new tracks will be constructed to access each of the turbines, substation compound and meteorological lidar. Overall, a total of 6.83 km of track infrastructure will be constructed within the proposed project site. This is comprised of 6.4 km of new internal access tracks and 353 m of existing internal farm tracks being upgraded and widened. These access tracks will have a standard running width of circa 5.5m with surface water collection drains on either side. These will be constructed using excavated and floating road techniques depending on the ground conditions. Refer to drawing no. 23318-MWP-00-00-DR-C-5406.

3.1.6. Site Access

Primary access to the proposed project site will be provided from the local public Rossestown road (L-8017). There will be four site entrances. Three of these are located along the L-8017 road and will provide site access during the construction, operational and decommissioning phases. The most westerly of these three site entrances provides access to turbines 1, 2, 6 and 8 as well as the Lidar and the main construction site compound to the north of the public road. The middle entrance provides access to Turbines 9 and 10 and the borrow pit to the south of the L-8017. The third eastern entrance on the L-8017 provides access to turbines 3, 4, 5 and 7 as well as another construction compound and the proposed substation. The fourth entrance is to the substation only and will only be used for operations and maintenance access during the operational phase. This entrance is located along the section of the L-4120 road in the townland of Killeenleigh, located at the north-east of the Wind Farm Site. Refer to **Figure** 2.

3.1.7. Turbine Delivery Route

The components for each turbine are expected to be delivered in approximately 100 No. deliveries in total. Due to their abnormal size, blades and towers will be delivered at night to avoid disruption to daytime traffic. The turbine blades will be the longest components to be transported from port to site at approximately 76m in length. The components are expected to be delivered by sea to the Port of Foynes in County Limerick and transported to site along the national, regional and local road network.

The first section of the proposed route to the site will be along the M7 from the Port to Junction 25 (Nenagh Centre). A description of the rest of the turbine delivery route is provided below:

- Exit M7 at Junction 25
- M7/R498/ Roundabout, Exit travelling southeast
- Travelling southeast along R498 to Borrisoleigh
- Travelling southeast along R498 to Thurles
- R498/Jimmy Doyle Rd Roundabout, 1st Exit travelling northeast
- Turn left at Jimmy Doyle Rd/N62 (Brittas Rd) junction
- Travelling north along N62 (Brittas Rd) to Brittas
- Turn right at N62 (Brittas Rd)/L-8017 Rossestown Rd junction
- Travelling east along L-8017 Rossestown Rd
- Turn left at site entrance for wind turbines 1 - 8
- Turn right at site entrance for wind turbines 9 – 10

Twenty-two pinch points have been identified along the route where various works will be required. These include the following:

- The temporary removal of traffic signs and lights
- The temporary removal of electricity poles, bollards and lamp posts
- Hedges and tree removal or trimming
- Temporary land take
- Lowering of some roadside banks
- Temporary Fence removal
- Road widening

3.1.8. Temporary Construction Compounds and Welfare Facilities

Two (2) No. temporary construction compounds will be set up upon commencement of the construction phase. The main construction compound (located to the north of the western site entrance of the wind farm site adjacent T8) will have a footprint of 21 375m² (2.1 ha). The supplementary construction compound will be located north of T7 and will be 13 759m^2 (1.38ha) in size.

The compounds will be used as a secure storage area for construction materials and will also contain temporary site cabins to provide welfare facilities for site personnel. Facilities will include office space, meeting rooms, canteen area and mobile sanitary facilities. The proposed project will include an enclosed wastewater management system at the temporary compounds capable of handling the demand during the construction phase. Two holding tanks are proposed at each compound for wastewater management. The holding tanks will be emptied by a licensed permitted contractor only and wastewater will be removed from Site and treated at a licenced wastewater treatment plant. Upon completion of the project the compound will be decommissioned by backfilling the area with the material arising during excavation and landscaping with topsoil.

3.1.9. Borrow Pits and Material Storage Areas

There is one (1) no. proposed on-site borrow pit location which has been identified to provide fill material for internal roads, passing bays, hardstands, foundations, and temporary compound. It is estimated that this will provide 15.5% of the fill material required for the development. During the construction period, and post-excavation, the borrow pit area and the other deposition areas will act as material storage areas for the management of excess material generated on the site during construction. Post-construction, the borrow pit will be filled with excess material generated on the site during construction and thereafter topped with topsoil recovered from construction areas and stored for later use in landscaping. The borrow pit site will then be revegetated and restored to its current use as pasture.

3.1.10. Water crossings

Seven water crossings will be required at the Wind Farm site for the internal access roads and underground cables. Where an open drain or watercourse is encountered during the installation of the internal site cable trenches; the cable trenches will cross the open drain or watercourse within the road carriageway via new or existing road crossing points to minimise the requirement for in-stream works. The seven water crossings consist of three crossings for internal access roads, two crossings for underground cables and two underground cable crossings along the GCR. Refer to Figure 2 for the location of these watercourse crossings.

3.1.11. Surface Water management

A site surface water management system will be constructed on the site to attenuate run-off, guard against soil erosion and safeguard downstream water quality. The drainage system will be implemented along all work areas including all internal site access roads, storage areas, crane hardstand areas and temporary site construction compound. The following gives an outline of drainage management arrangements along internal services roads:

- The surface water run-off drainage system will be implemented along all internal access routes, to separate and collect ‘dirty water’ run-off from the roadway and to intercept clean over land surface water flows from crossing internal roadways.
- To achieve separation, clean water drains will be positioned on the upslope and dirty water drains positioned on the downslope of roadsides, with road surfaces sloped towards dirty drains.
- Clean water will be piped under both the access roads and downslope collection drains to avoid contamination. Piping the clean water under the service road allows the clean water to follow the course it would have taken before construction thus mimicking the existing surface water over land flow pattern of the site and thus not altering the natural existing hydrological regime on site.

3.1.12. Tree and Hedge Felling

Felling of some hedgerows and portions of existing woodland is required within and around wind farm infrastructure to accommodate the construction of the turbine foundations and associated hardstands, access tracks, and turbine assembly and turbine delivery routes. Trees in a radius of 105m around each turbine will be felled as part of the project. Additional tree line and hedge removal will be needed in some areas for the new access roads and construction areas. Overall forestry felling of

1.4ha and 4086m of hedgerow removal which will be undertaken in accordance with a tree felling licence, using good working practices as outlined by the Department of Agriculture, Food, and the Marine (DAFM) Standards for Felling and Reforestation (2019) and will follow the specifications set out in Forest Service's 'Forestry and Water Quality Guidelines' (2000) and 'Forest Harvesting and Environmental Guidelines' (2000). These standards deal with sensitive areas, buffer zone guidelines for aquatic zones, ground preparation and drainage, chemicals, fuel, and machine oils. All conditions associated with the felling licence will be complied with. A felling licence application will only be submitted once planning permission is received for the proposed development.

3.1.13. Replanting Area

Replacement replanting of forestry in Ireland is subject to license in compliance with the Forestry Act 2014 as amended. The consent for such replanting is covered by the Forestry Regulations 2017 (S.I. No. 191 of 2017). The total amount of forestry felling proposed for the project is 1.4 ha. It should be noted that the clearfelling of forestry in the State requires a felling licence. The associated afforestation of alternative lands equivalent in area to those lands being permanently clear felled is also subject to licensing ('afforestation licensing'). The Forest Service of the Department of Agriculture, Food and the Marine is Ireland's national forest authority and is responsible for all forest licensing. The forestry replanting license application for this wind farm will propose to replant in areas around existing plantations within the project site. The Applicant commits to not commencing the forestry felling activities until both licences are in place. The felling and afforestation licence applications will be submitted closest to the time when these activities are proposed to occur to enable the identification of optional lands and to comply with the relevant standards at that time.

3.1.14. Grid Connection Options and Infrastructure

Following a grid connection route study, one grid connection route and associated connection point for connecting the proposed Project to the National Grid has been identified and assessed. The Grid Connection will connect the proposed on-site substation to the nearby existing Thurles 110kV substation located approximately 4.3km straight line distance south-east of the proposed on-site substation at the wind farm site. Alternative grid route options have been assessed in the alternatives chapter (4) of the EIAR.

This entire route is along local roads. Almost 3km of these local roads from Brittas Substation are narrow one lane roads. Starting from the onsite substation entrance the proposed grid route will follow the L-4120 road south to the L-8017 Rossestown road and turn east. At the next junction it will turn south along the L-4119 road to Thurles town. At the T-junction with the L-8015 road the route will turn east until the fork in the road and will then follow the L-8014 (to the right) to Thurles substation.

The grid connection route is 7km long and there are two watercourse crossings along the route. The first is located on the L-4120 in the townland of Clobanna. The second watercourse crossing is located in proximity to the existing Thurles 110kV substation in the townland of Loughlahan. Horizontal Directional Drilling will be used to route the proposed cable beneath each stream. The grid connection route will include 12 no. joint bays which have been sited at suitable locations along the route. These are pre-cast concrete chambers where individual lengths of cables are joined to form one continuous cable. 11 no. of the proposed joint bays are located within the public road. 1 no. joint bay is located in private lands in proximity to the proposed on-site substation.

3.1.15. Substation

The proposed 110kV substation will comprise an outdoor electrical yard and two single storey buildings (one for the system operator and one for the wind farm operator). The system operator (Eirgrid) compound and the wind farm operator or independent power producer (IPP) substation compound will each be 107.7m^2 in size and composed of compacted layers of suitable site won crushed rock or granular fill. The Eirgrid building will contain a a control room, a storeroom, an office / canteen, a toilet and four parking spaces. The IPP building will contain a storeroom, a communications room, a control room, a staff room, an office, a switchgear room, a toilet and four parking spaces. Both substation buildings will be 6.1m in height, with pitched roofs and an external blockwork and plastered finish.

There will be a very small water requirement for toilet flushing and hand washing for which it is proposed to harvest rain-water from the roofs of the buildings. The discharge from the toilet within each building will go to a holding tank located within the substation compound where the effluent will be temporarily stored and removed at regular intervals by an approved contractor and disposed of in a licenced facility. The four car parking spaces for each building will be located within the compound area. The substation buildings and associated compound will be contained within a 2.6m high galvanised steel palisade fence around the boundary of the substation compound. It is proposed to topsoil and revegetate the cut and fill slopes required for the substation site.

An expansion area has been provided for adjacent to the proposed substation, in line with EirGrid requirements. This expansion area is not proposed as part of this project and will be taken in charge by EirGrid for potential future expansion of the substation. While this is a requirement by EirGrid they have no timeframe or commitment to expand the substation. Such a development would be the subject of a separate EirGrid planning application.

3.1.16. Battery Energy Storage System (BESS)

A battery energy storage system (BESS) will be developed for the proposed wind farm adjacent to the proposed on-site substation.). The Battery Energy Storage System (BESS) is not proposed as part of this planning application and will be subject to a separate planning application to Tipperary County Council. However, the BESS is considered as part of the project and assessed throughout the EIAR.

The Battery Energy Storage System (BESS) consists of 12 no. battery storage units to facilitate on site energy storage and to provide ancillary services to the electricity grid. The purpose of the battery energy storage system (BESS) is to provide greater robustness and security for managing fluctuating loads. During times of high wind, the BESS can store excess energy to be utilised at times where wind is low, allowing for greater use of the natural resource.

The BESS units will be situated next to the onsite substation compound in the north-eastern section of the wind farm site in the townland of Killeenleigh. The storage units will use Lithium-ion battery storage technology, which is a widely available and globally used energy storage option which is utilised to provide storage services to the grid at a local level. The battery storage technology to be used is comparable to the batteries found in domestic electrical appliances such as remote controls, laptops and mobile phones.

The batteries will be located on battery racks and housed within a container where they will be continually monitored and controlled for performance, temperature and other safety factors. Each battery container will comprise high-quality galvanised metal with a separate external Heating, Ventilation and Air Conditioning (HVAC) to provide external climate control. The battery containers

are 27m (L) x 5.5 (W) x 2.9 (H) each and will sit on concrete pad foundations above the finished ground level. Technicians can access the containers with full width steps at one end and an emergency exit with steps at the other.

A control and switch room will be located next to the battery containers. The control room acts as the main point of operations of the BESS and is connected to the grid via the adjacent proposed 110kV substation.

The external colouring of the containers will be of a colour that is amenable to the surrounding landscape and does not create a visual intrusion (e.g. colours that would represent more natural background colours and be best absorbed into the existing landscape such as greens, browns or greys). The colour which will be used on the containers from the above options will be agreed with Tipperary County Council prior to commencement of construction. The exact rating and design of the selected BESS units will be subject to a separate planning application to Tipperary County Council.

3.1.17. Underground Cabling within the Wind Farm Site

A network of underground cabling serving each turbine with electrical power and signal transmission will be installed along internal service roads connecting to the sub-station compound. There will be no additional overhead power lines constructed on the site for the wind farm. The internal underground cabling route will be split into three sections and will involve open trenching in the verge of the proposed internal access tracks. The internal circuit to the north (purple) and the southern circuit (orange) joins at the start of the internal cable circuit to the east (green). All three circuits follow the green route to the substation. The internal circuit to the north (blue) and the southern circuit (cyan) joins the eastern circuit (green) by horizontal direction drilling under the L8017 road and River Suir for 350m.An existing, partially constructed 38kV overhead line that traverses the site will be rerouted through the site to allow for the safe construction and operation of the proposed wind farm.

3.2. Construction Methodology

Construction works will be carried out in a phased manner in order to minimise disruption to the local community, minimise environmental impact and create the safest working conditions possible. The construction of the proposed project will comprise of the following works:

- Felling of 1.4 ha of forestry plantation and 4086m of hedgerows necessary to facilitate construction works;
- Construction of four site entrances and any sections of internal access tracks necessary to facilitate access to the temporary construction compound and proposed on-site borrow pit location;
- Construction of temporary construction compounds including fencing (for security and ecology, water and archaeological exclusion zones), site offices, parking, material laydown and storage areas, etc;
- Establishment of the on-site borrow pit and temporary storage of stockpiled overburden and surplus excavated materials within the material storage areas.
- Earthworks and drainage infrastructure associated with construction of new and upgraded internal access tracks, crane hardstand, turbine foundations and substation compound;
- Construction of upgraded and new watercourse crossings for construction of internal access tracks and underground cables;

- Excavation of turbine bases and permanent met lidar foundations, and associated turbine hardstand areas;
- Installation of sections of underground cabling between turbines;
- Installation of sections of underground cabling to connect to the national grid;
- Construction of the substation compound;
- Turbine delivery, installation, and commissioning; and
- Meteorological lidar delivery, installation, and commissioning.

Table 2 below provides a summary of the types of proposed construction techniques for the various elements of the project.

Table 2. Proposed Construction Techniques.

Element	Construction Technique
Wind turbine foundations and hardstands	Wind turbine locations will be cleared, graded, and foundations will be either excavated or piled by rotary core technique. Blasting and piling may be required at wind turbine locations where bedrock is present near the ground surface, which is not expected at this site. An engineered concrete foundation will be installed in the excavated/piled structure location. Backfill will be provided, and grading will be performed in a manner to allow for immediate drainage away from each tower. Construction activities include tree removal, vegetation clearing, topsoil and/or peat stripping, excavation and or piling, grading, foundation construction, final grading and landscaping of temporary works areas.
Permanent Meteorological Lidar	Construction includes grass removal, topsoil stripping, excavation, grading, foundation construction, final grading, and landscaping of temporary works area.
Site Access	Four site accesses will be needed, including one for the substation during the operational phase. Sightline improvements where required. . Construction activities include vegetation clearing (including some hedgerows), topsoil and/subsoil stripping, aggregate placement and grading, and landscaping of temporary works areas.
Internal Access Tracks	Upgrading, widening and new excavated access tracks**:** Construction activities will include vegetation clearing (including some hedgerows), topsoil stripping, excavation, placement of geogrid/ geotextile layer and aggregate, compaction, grading, berm placement and landscaping. Floating Roads: If required, construction activities will include removal of major protrusions, placement of geogrid/ geotextile layer and aggregate, compaction, grading, berm placement and landscaping. However, it is not expected that floating roads will be required at this site.
Internal Underground Site Electrical Cables	To the extent possible, underground electrical collector cables will be co-located on the verge of the proposed access tracks and roads in order to minimise the area of construction disturbance. Underground cable installation construction activities

Element	Construction Technique
	include some hedgerow removal, topsoil stripping, trenching, installing electrical cables, and revegetation of disturbed areas unless the cables are under the roads.
Substation Compound	Construction includes some hedgerow removal, topsoil stripping, excavation, grading, foundation construction, building construction.
Battery Energy Storage System	Construction includes some hedgerow removal, topsoil stripping, excavation, grading, foundation construction, building construction.
Construction Compounds	Construction includes topsoil stripping, excavation, grading, aggregate placement, compaction, and landscaping.
Borrow Pit	Works include topsoil stripping, excavation and/or blasting. Once the borrow pit is excavated, the area will be backfilled with spoil material and rehabilitated to pasture land.
Water Crossings	Seven water crossing will be required, including five crossings at the Wind Farm site for the internal underground cables and access tracks. The cable river crossings will involve Horizontal Directional Drilling (HDD) under the River Suir. Two additional stream crossings will be needed for the grid connection route. This will involve Horizontal Directional Drilling (HDD) under the river/stream courses.
Grid Connection Route to Thurles Sub-station (7km)	Construction activities include excavation, trenching, backfilling, resurfacing and associated traffic management. Horizontal Directional Drilling (HDD) will be used at two watercourse crossings to route the cable ducts beneath each stream.

3.2.1. Major Temporary Features

Temporary features on site include the construction compound facilities, plant, and equipment along with safety fencing and building materials. Large excavators and turbine erection cranes are also a temporary feature on site during the construction phase. There will be some temporary stockpiling of soils on site. Any surplus material will be placed within the proposed borrow pit and material deposition areas.

3.2.2. List of Plant

Various plant used for construction projects will be required to facilitate the proposed project. The following non-exhaustive list of mechanical machinery and electrical equipment is proposed to be used for the wind farm and heavy civil engineering work:

- 30-50T excavators;

- 15-30T Excavator;
- Rubber Tired 15-20T Excavator;
- 3-10T Mini Diggers;
- Mobile Crane for construction;
- Rebar/shuttering/precast units/conc. pipes/box culverts etc 60t to 120t;
- Cranes (1 main, 1 assist) Erection 120t to 1000t;
- Telescopic Handler;
- Tractors and trailers;
- Road grader;
- Double contained fuel bowsers;
- 12T Rollers;
- Diesel powered generators; and
- Water bowsers.

3.3. Operation and Maintenance

Wind farm commissioning is expected to take two to four months to complete from the erection of the final turbine to exporting of power. It involves commissioning engineers working through an entire schedule of SCADA and electrical testing and control measures to ensure the wind farm will perform and export power to the national electricity grid as designed.

3.3.1. Land Use Requirement

The permanent land take will be limited to the wind turbine hardstands and crane pads, access tracks, lidar area, control building and substation hard-standings and BESS hardstanding which account collectively for about 20.4 ha or 6% of the planning application boundary within the proposed project planning boundary. All land within the planning application boundary but not used for the above-mentioned permanent elements of the proposed wind farm can continue in agricultural use throughout the operational phase of the proposed project.

3.3.2. Maintenance

During the operation of the wind farm, the turbine manufacturer, the Developer or a service company will carry out regular maintenance of the turbines. The likely schedule of visits to the site during the operational phase is as follows. The regional supervisor will visit the site 2 times per month, civils maintenance will occur as needed and will likely take place twice per year, substation maintenance will occur once per year and the Original Equipment Manufacturer (OEM) will inspect the wind turbines twice per year or as needed if specific issues are identified.

During the life of the project, it is envisaged that at least two permanent jobs will be created locally in the form of an operator or maintenance personnel. In addition, operation and monitoring activities may be carried out remotely with the aid of computers connected via a telephone broadband link. However, routine inspection and preventive maintenance visits will be necessary to ensure the smooth and efficient running of the wind farm and require a minimal presence.

3.4. Decommissioning

At the end of the 35-year lifespan of the proposed project, the Developer will make the decision whether to repower or decommission the turbines. Any further proposals for development at the site during or after this time will be subject to a new planning permission application. If planning permission is not sought after the end of life of the turbines, the site will be decommissioned and reinstated with all 10 No. wind turbines and towers removed. Removal of infrastructure will be undertaken in line with landowner and regulatory requirements and best practice applicable at the time. The information below outlines the proposed decommissioning tasks based on current requirements and best practice.

Prior to the decommissioning work, the following will be provided to Tipperary County Council for approval:

- A plan outlining measures to ensure the safety of the public and workforce and the use of best available decommissioning techniques at the time.
- A comprehensive reinstatement proposal, including the implementation of a programme that details the removal of all structures and landscaping.

Cranes of similar size to those used for construction will disassemble each turbine. The towers, blades and all components will then be removed.

Wastes generated during the decommissioning phase will be taken off site and disposed of at an authorised waste facility. Any materials suitable for recycling will be disposed of in an appropriate manner.

At present it is anticipated that internal underground cables connecting the proposed turbines to the proposed on-site substation will be cut back and left underground. The cables will not be removed if an environmental assessment of the decommissioning operation demonstrates that this would do more harm than leaving them *in situ*. The confirmatory assessment will be carried out closer to the time to confirm environmental changes over the project life.

Hardstand and turbine foundation areas will be left in situ and covered with soil to match the existing landscape. Access roads will be left in situ for agricultural use.

The grid cable will be taken in charge by EirGrid on commissioning of the project and remain a permanent part of the national electricity grid and therefore decommissioning is not foreseen. In the event of decommissioning, it will involve removing the cable from the ducting but leaving the ducting and associated supporting structure in place. Similarly, the proposed on-site substation will be taken in charge of by EirGrid on commissioning and will likely remain in place and will form part of the national electricity grid.

3.5. Duration and Timing of Works

3.5.1. Wind Farm Construction

It is envisaged that the proposed project will commence in Quarter 4 of 2028 with an 18-month construction period. The start date is dependent on planning being granted, receipt of a grid connection offer from EirGrid, funding and all permits being in place.

A proposed programme of work is outlined in Table 4 below. It is expected that a number of these phases will however run concurrently as follows.

- As the internal site access tracks are constructed up to each turbine, hardstanding areas for construction purposes and crane stands, turbine foundations and building foundations will be prepared.
- Once the tracks are completed, the trenching and laying of underground cables will begin.
- Construction of the site sub-station and control houses will commence so that they will be ready to export power as turbines are commissioned.

Table 3. Construction Programme.

Phase	Activity	Duration
Phase 1	Clearfelling (to be complete ahead of construction site mobilisation)	2 months (prior to construction)
Phase 2	Prepare site, pre-construction activities, site entrance, temporary compounds	1 month
Phase 3	Access road construction + Drainage plan implementation	3 months
Phase 4	Hard standing construction for turbines	2 months
Phase 5	Turbine Foundation construction	4 months
Phase 6	On site trenching and ducting (underground electrical collection system)	2 months
Phase 7	Substation and BESS construction	4 months
Phase 8	Permanent meteorological lidar compound preparation and unit installation	1 month
Phase 9	Underground grid connection route within the public road	5 months
Phase 10	Turbine delivery	3 months
Phase 11	Turbine erection	4 months
Phase 12	Wind Farm Commissioning	4 months (approx.)

3.5.2. Grid Connection Construction

The proposed grid connection from the proposed on-site substation to the existing Thurles 110kV substation will be constructed in on-site tracks and within the public road. The active construction area is proposed to be only along a 100-200m stretch of any roadway at any one time. The works for

the grid connection route are estimated to take approximately 4-5 months and will overlap with the wind farm works. During the first 2 months the cable trenches will be constructed. The second 2-3 months will involve sequentially opening up all joint bays (these are pre-cast concrete chambers that will be required along the grid connection route over its entire length) and pulling electrical cables, pulled through ducts and then joining each cable together. There is anticipated to be 12 joint bays with 2-3 days' work involved at each. Construction activities along the proposed grid connection route will operate between the hours 7:00 a.m. and 7:00 p.m., Monday to Saturday (if required). Any deviations to these times will be agreed in advance with Tipperary County Council. It is expected that the civil works for the grid connection route will require at least 10 personnel to complete the works. The electrical works will require less heavy machinery but more labour personnel.

3.5.3. Turbine Delivery Route Accommodation Works

Prior to turbine delivery movements, accommodation works will be required along the turbine delivery route to allow for transport of oversized loads. The accommodation works will require temporary hard standing areas at 2 no. locations. Other temporary works will be completed under road opening licence. Temporary accommodation works required to allow the movement of oversized loads include the temporary removal of traffic signs and lights, the temporary removal of electricity poles, bollards and lamp posts, hedges and tree removal or trimming, temporary land take, lowering of some roadside banks, temporary fence removal and road widening. The temporary accommodation works will be completed one month prior to delivery in agreement with the Local Authority.

3.5.4. Operation

The proposed project is expected to have a lifespan of 35 years. The proposed project is designed to operate when wind speeds at the hub height are within the operating range of the wind turbines. Most turbine models have a cut in wind speed of 3m/s with optimum generation at approximately 12.5m/s. The turbines are expected to have a cut out wind speed of 25m/s.

3.5.5. Decommissioning

The decommissioning stage will require similar infrastructure to that of the construction phase, minus the need for concrete pours and cable trenching etc, therefore it is understood that decommissioning will be less intensive and occur over a shorter timescale to that proposed for construction.

4. Appropriate Assessment Screening

This section of the report identifies the ZoI of the proposed project, provides information on the Natura 2000 sites within the identified ZoI and sets out the potential impacts and likelihood of significant effects.

4.1. Identification of Natura 2000 sites

When the ZoI of the project has been determined Natura 2000 sites within this area can be identified and the potential for these sites to be affected by the project can be evaluated by considering:

- Scale and type of the project;
- Proximity to the project;
- Qualifying interests (QI) and Special Conservation Interests (SCI) of Natura 2000 sites; and,
- Ecological[15] and Landscape[16] connectivity.

4.1.1. Zone of Influence

The QIs and SCIs of Natura 2000 sites within a 15km search radius of the planning application boundary and the TDR were examined to initially understand the potential physical or ecological connectivity to the Site and the associated likely project impacts. Additionally, any Natura 2000 sites beyond the initial 15 km buffer with direct hydrological or physical connectivity were also identified for further examination.

Table 4 and Figure 3 details the Natura 2000 sites within the 15km search radius and any other sites identified using the S-P-R model, as described in Section 2.2.

From this preliminary assessment, it was found that there is no Natura 2000 site recorded within the boundary of the Site. The closest Natura 2000 site is the Lower River Suir Special Area of Conservation (SAC) (Site Code 002137) located c. 5.5km terrestrially and c. 7.8km hydrologically via the main channel of the River Suir. Kilduff, Devilsbit Mountain SAC (Site Code 000934) lies c. 11.5km northwest of the Site, with no hydrological or ecological connectivity.

The Kilduff, Devilsbit Mountain SAC is located c. 11.5km northwest of the Site, and c. 9 km north-east of the TDR. There is no downstream hydrological connectivity between the Site (or TDR) and this SAC. The qualifying interests of this SAC include European dry heath habitats, and species-rich *Nardus* grasslands. This SAC is located in the middle of two catchments, the Shannon and the Suir. There are no watercourses within the boundary of the SAC. To the west of the SAC, first order streams rise near the Devilsbit Mountain and flow north-west, and to the east of the SAC, first order streams rise on the

[15] Connectivity is defined as a measure of the functional availability of the habitats needed for a particular species to move through a given area. Examples include the flight lines used by bats to travel between roosts and foraging areas or the corridors of appropriate habitat needed by some slow colonising species if they are to spread (CIEEM, 2018).
[16] Landscape connectivity is a combined product of structural and functional connectivity, i.e. the effect of physical landscape structure and the actual species use of the landscape (Kettunen et al. 2007).

other side of the mountain and flow south-east. Therefore, there is no downstream hydrological connectivity. Similarly, there is no ecological connectivity between this SAC and the Site or TDR. The SAC is, at its closest, c. 9 km from the TDR, which is located along existing road infrastructure, with residential housing, agricultural land, forestry land, watercourses and numerous other barriers to potential impacts. The same can be said for the distance between the SAC and the Site, c. 11.5km. This SAC is therefore not considered to be within the ZoI for impact relating to the Site or TDR.

There is no Special Protection Area (SPA) recorded within the initial 15km search radius. The closest SPA is the Slievefelim to Silvermines Mountains SPA (Site Code 004165), c. 18km west of the Site. This SPA is designated for Hen Harrier *Circus cyaneus*. The ornithological desk study (Appendix xx) determined, based on the separation distance between the SPA and Proposed Project Site that there is no potential for possible or likely significant effects on hen harrier ecological linked the Slievefelim to Silvermines Mountains SPA. Based on SNH (2016), hen harrier has a core breeding season foraging range of 6 km, with a maximum of 10 km. This is slightly lower than, but comparable with maximum breeding season foraging distances reported by Irwin *et al.,* (2012) remote tracking of birds in Ireland, which is give 7.5 km (female) and 11.4 km (male).

The desk study investigating hen harrier distribution found that the 10 km grid square [S16] encompassing the Proposed Project 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 Project Site and are breeding territories are associated with the Slievefelim to Silvermines Mountains SPA, which is located between 18 km and 21 km from the Proposed Project Site. Based on habitat availability the desk study determined that the Proposed Project Site and surrounding hinterland (out to 2 km) is not 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 Project Site.

With the above taken into account, as well as extensive bird surveys undertaken at the Site for both breeding and wintering Hen harrier, the QIs in this SPA are determined to be outside the ZoI for potential significant effects relating to the proposed project. There is also no downstream hydrological connectivity between this SPA and the Site or TDR and thus no potential for impacts to occur via watercourses on bog or heath habitats that this species may utilise as per the conservation objectives document.

There is no ecological, hydrological or hydrogeological connectivity between the Site and any other Natura 2000 site. Therefore, the ZoI for the Site is defined as 6.5km, including the Lower River Suir SAC (Site Code 002137).

4.2. Description of Natura 2000 sites

The Natura 2000 sites identified as being within the ZoI of the proposed project are described below. The description of the sites has been prepared and summarised using the supporting information available on the NPWS website[17].

4.2.1. Lower River Suir SAC 002137

Lower River Suir SAC consists of the freshwater stretches of the River Suir immediately south of Thurles, the tidal stretches as far as the confluence with the Barrow/Nore immediately east of Cheekpoint in Co. Waterford, and many tributaries. The Lower River Suir contains excellent examples of a number of Annex I habitats, including the alluvial forest and Yew woodland. The site supports populations of several important animal species, some listed on Annex II of the Habitats Directive or listed in the Irish Red Data Book.

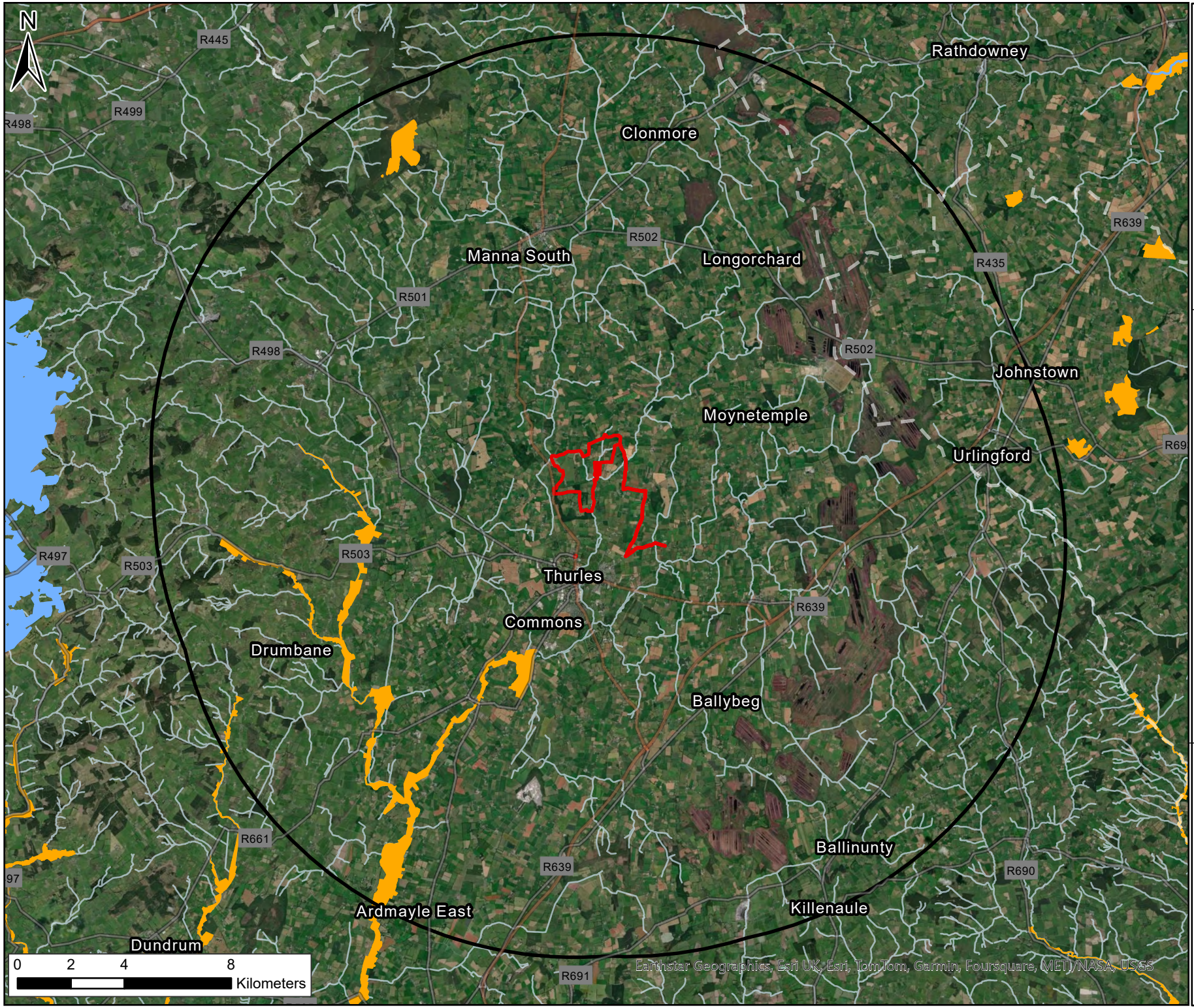
The site is of particular conservation interest for the presence of a number of Annex II animal species, including Freshwater Pearl Mussel (both *Margaritifera margaritifera* and *M. margaritifera subsp. durrovensis* occur), White-clawed Crayfish, Salmon, Twaite Shad (*Alosa fallax fallax*), three species of Lampreys - Sea Lamprey, Brook Lamprey and River Lamprey, and Otter. This is one of only three known spawning grounds in the country for Twaite Shad. The presence of two legally protected plants (Flora (Protection) Order, 2022) and the ornithological importance of the site adds further to the ecological interest and importance (NPWS, 2023).

4.3. Qualifying Interests and Conservation Objectives

The features of interest and conservation objectives for the Natura 2000 site identified within the ZoI of the project are listed within Table 4. This information was obtained from the resources available on the NPWS website.

[17] https://www.npws.ie/protected-sites (Date accessed: 27/08/2024)

Figure 3. Natura 2000 sites within the initial 15km search radius



APEM

ØRSTED

BRITTAS
WIND FARM

AAS AND NIS

FIGURE 3
NATURA 2000 SITES WITHIN 15 KM

CREATED	CHECKED	DATE
JDO	JG	30/08/2024

SCALE	COORDINATE SYSTEM
1:185,000 @ A4	IRENET95

Table 4 Qualifying Interests and Conservation Objectives

Natura 2000 site	Distance from Site[18]	Qualifying Interests	Conservation Objectives
Lower River Suir SAC 002137	c. 5.5km terrestrially and c. 7.8km hydrologically via River Suir	• Atlantic salt meadows (*Glauco-Puccinellietalia maritimae*) [1330] • Water courses of plain to montane levels with the *Ranunculion fluitantis* and *Callitricho-Batrachion* vegetation [3260] • Hydrophilous tall herb fringe communities of plains and of the montane to alpine levels [6430] • Old sessile oak woods with Ilex and Blechnum in the British Isles [91A0] • Alluvial forests with *Alnus glutinosa* and Fraxinus excelsior (*Alno-Padion*, *Alnion incanae*, *Salicion albae*) [91E0] • *Taxus baccata* woods of the British Isles [91J0] • *Margaritifera margaritifera* (Freshwater Pearl Mussel) [1029] • *Austropotamobius pallipes* (White-clawed Crayfish) [1092] • *Petromyzon marinus* (Sea Lamprey) [1095] • *Lampetra planeri* (Brook Lamprey) [1096] • *Lampetra fluviatilis* (River Lamprey) [1099 • *Alosa fallax fallax* (Twaite Shad) [1103] • *Salmo salar* (Salmon) [1106] • *Lutra lutra* (Otter) [1355]	• To maintain or restore the favourable conservation condition of the Annex I habitat(s) and/or the Annex II species for which the SAC has been selected. Full details of the conservation objectives can be found at: conservation_objectives/CO002137.pdf

[18] Measured in a straight line between the Site and closest point of Natura 2000 site boundary

4.4. Identification of Potential Impacts and Effects on Natura 2000 sites

The potential impacts of the proposed project on the habitats and species listed as qualifying interests for the Lower River Suir SAC are discussed in this section.

NPWS (2010) guidance for planning authorities states "*If the effects are deemed to be significant, potentially significant, or uncertain, or if the screening process becomes overly complicated, then the process must proceed to Stage 2 (AA). Screening should be undertaken without the inclusion of mitigation, unless potential impacts clearly can be avoided through the modification or redesign of the plan or project, in which case the screening process is repeated on the altered plan. The greatest level of evidence and justification will be needed in circumstances when the process ends at screening stage on grounds of no impact.*" This approach is adopted in this report to appraising likely significant effects of the proposed project.

A significant effect is defined in paragraph 49 of the Waddenzee Case C-127/02[19] as follows "….. *pursuant to the first sentence of Article 6(3) of the Habitats Directive, where a plan or project not directly connected with or necessary to the management of a site is likely to undermine the site's conservation objectives, it must be considered likely to have a significant effect on that site. The assessment of that risk must be made in the light inter alia of the characteristics and specific environmental conditions of the site concerned by such a plan or project.*"

The likelihood of impacts occurring as a result of the proposed project, alone or in-combination with other plans or projects is established in light of the type and scale of the project, the location of the project with respect to Natura 2000 sites within the ZoI and the qualifying interests and conservation objectives of those Natura 2000 sites.

Table 5 identifies the potential occurrence of QIs/SCIs within the ZoI, as well as potential sources, pathways and the potential for likely significant effects, to determine which site(s) will be brought forward for detailed assessment.

[19] https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A62002CJ0127

Table 5 Summary of the potential occurrence of the relevant QIs of the Natura 2000 sites within the ZoI of potential impacts.

Qualifying Interests	Source	Pathway	Likely Significant Effects	Included further in Screening (Yes / No)
Lower River Suir SAC 002137				
Atlantic salt meadows (*Glauco-Puccinellietalia maritimae*) [1330]	**Construction, Operational and Decommissioning phases:** Emissions to surface water Introduction and / or spread of Invasive Alien Species (IAS)	Hydrological connection to the River Suir	No – Atlantic salt meadows are confined to the most easterly area of the SAC (NPWS, 2017), occurring at significant distances downstream, south of Waterford city which is >140 km via hydrological links. Due to distance and dilution factors, there is no potential for significant effects to arise with regards to surface water. With regards to IAS potentially arising / spreading from the Site, a distance of over >140 km is considered to be too large to convey any significant effect on this habitat within the SAC, whether via hydrological connectivity or terrestrial. Should sources from the proposed works reach this QI it is considered they would dissipate / be diluted to such a level that no likely significant effects are predicted.	No
Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (*Alno-Padion, Alnion incanae,*	**Construction, Operational and Decommissioning phases:** Emissions to surface water	Hydrological connection to the River Suir	No – Alluvial woodlands within the SAC also occur at significant distances downstream, over 100km via hydrological links (NPWS, 2017). Hydrophilous tall herb fringe communities occur in association with alluvial woodland and have not been mapped in detail for this SAC. Therefore, the closest distance is considered to be c. 6.5 km or c. 10 km	No

Qualifying Interests	Source	Pathway	Likely Significant Effects	Included further in Screening (Yes / No)
Salicion albae) [91E0] Hydrophilous tall herb fringe communities of plains and of the montane to alpine levels [6430]	Introduction and / or spread of IAS		hydrologically downstream. No significant effects are expected on these QIs due to distance, dilution and dispersion. Due to barriers present in the landscape at the closest point terrestrially, there is no potential for IAS potentially arising / spreading from the Site to result in a significant impact on these QIs at this distance. There is no potential for significant effects. Should sources from the proposed works reach these QIs it is considered they would dissipate / be diluted to such a level that no likely significant effects are predicted.	
Taxus baccata woods of the British Isles [91J0]	**Construction, Operational and Decommissioning phases:** Emissions to surface water Introduction and / or spread of IAS	Hydrological connection to the River Suir	No – *Taxus baccata* (Yew) wood habitats have not been mapped in detail for the Lower River Suir SAC and thus the total area of the qualifying habitat is unknown. Yew woodland is known to occur at Cahir Park in an area of c. 500m by 50m (NPWS, 2017), further areas may be present within the SAC. Cahir Park is located c. 50km downstream of the Site. Despite this uncertainty, the boundary of this SAC is c. 5.5 km at its closest point and using the precautionary principal, it must be assumed that this habitat could occur at this location. Due to barriers present between the Site and this SAC boundary at c. 5.5km, no significant effects are expected to arise. Should IAS be spread / introduced to the Site, there is no potential for IAS to result in a significant impact on the QI taking into account the	No

Qualifying Interests	Source	Pathway	Likely Significant Effects	Included further in Screening (Yes / No)
			distance and barriers present. Should sources of surface water pollution from the proposed works reach this QI it is considered they would dissipate / diluted to such a level that no likely significant effects are predicted.	
Old sessile oak woods with *Ilex* and *Blechnum* in the British Isles [91A0]	**Construction, Operational and Decommissioning phases:** Emissions to surface water Introduction and / or spread of IAS	Hydrological connection to the River Suir	No – All recorded occurrences of old Sessile oak woods in the SAC are located upstream of the proposed project (NPWS, 2017) ruling out any potential for likely significant effects to reach this QI. There is no occurrence of this QI downstream of the Site, with the River Suir being the only connectivity to this SAC. With regards to IAS, this SAC boundary is c. 5.5km from the Site at its closest point. Due to barriers present between the Site and the location of this QI in the SAC, there is no potential for significant effects with regards to IAS.	No
Water courses of plain to montane levels with the *Ranunculion fluitantis* and *Callitricho-*	**Construction, Operational and Decommissioning phases:** Emissions to surface water	Hydrological connection to the River Suir	Yes – The conservation objectives for this QI concentrate on the high conservation value sub-types, however, little is known of the habitat's distribution, or sub-types present in the Lower River Suir SAC, apart from their distribution being predominantly confined to lowland and tidal rivers in the SAC, as well as faster-flowing tributaries (NPWS, 2017).	**Yes**

Qualifying Interests	Source	Pathway	Likely Significant Effects	Included further in Screening (Yes / No)
Batrachion vegetation [3260]	Introduction and / or spread of IAS		It is therefore assumed that the closest possible distance hydrologically would be the SAC boundary, c. 7.8km hydrologically. Due to this hydrological connection, there is potential for significant effects relating to emissions to surface water and / or the introduction and / or spread of IAS. This cannot be ruled out and in the absence of mitigation there is potential for significant effects on this QI. Therefore, this QI is brought forward for detailed assessment.	
Margaritifera margaritifera (Freshwater Pearl Mussel) [1029]	**Construction, Operational and Decommissioning phases:** Emissions to surface water Introduction and / or spread of IAS	Hydrological connection to the River Suir	No – This QI is present within the Clodiagh [Portlaw] River and Clodiagh subcatchment, upstream of the main channel of the lower reaches of the Suir. There is no downstream hydrological connection between the location of this QI in the Clodiagh subcatchment and the Site. Therefore, no source pathway links exist for emissions to water or for the spread of IAS between the Site and freshwater pearl mussel populations in the Clodiagh subcatchment. Therefore, no likely significant effects on this QI are predicted.	No
Austropotamobius pallipes (White-	**Construction, Operational and Decommissioning phases:**	Hydrological connection to the River Suir	Yes – White-clawed crayfish occur extensively on the River Suir and on many of its tributaries, the species has been recorded on almost the entire length of non-tidal	**Yes**

Qualifying Interests	Source	Pathway	Likely Significant Effects	Included further in Screening (Yes / No)
clawed Crayfish) [1092]	Emissions to surface water Introduction and / or spread of IAS		main channel river Suir, from the most upstream point at Cabragh (c. 7.8 km downstream from the Site within the River Suir), near Thurles, to downstream of Kilsheelan. No crayfish were recovered during the baited crayfish trap surveys undertaken at the Site, and no evidence of crayfish usage was noted, as detailed in Appendix C. The survey also noted that much of the main channel appeared to have unsuitable habitat for crayfish. The absence of crayfish is noted to potentially be due to crayfish plague. Crayfish can be adversely affected by siltation of suitable habitat and deterioration in water quality (e.g. reduction in dissolved oxygen). Disease is identified as a major threat and crayfish plague has occurred in Ireland and can, in some circumstances, be introduced through contaminated equipment and water in the absence of vector species. Crayfish plague is also known to occur in the River Suir downstream of Clonmel. There is the potential for likely significant effects to impact this QI in the absence of mitigation. Therefore, white-clawed crayfish are brought forward for detailed assessment.	

Qualifying Interests	Source	Pathway	Likely Significant Effects	Included further in Screening (Yes / No)
Petromyzon marinus (Sea Lamprey) [1095] *Lampetra planeri* (Brook Lamprey) [1096] *Lampetra fluviatilis* (River Lamprey) [1099] *Salmo salar* (Salmon) [1106] *Alosa fallax fallax* (Twaite Shad) [1103]	**Construction and Decommissioning phases:** Emissions to surface water Introduction and / or spread of IAS	Hydrological connection to the River Suir	Yes – Lamprey and salmon are considered to be mobile aquatic species. Sea Lamprey, River Lamprey and Salmon migration may be blocked by the presence of migration barriers downstream in the catchment, such as the hydro power stations at Cahir and Holycross on the Suir main channel. Brook lamprey may be present however in the River Suir within and outside the SAC boundary in the Suir main channel within the Site. No specific map of lamprey distribution is available in the SAC conservation objects document, however Lamprey require in clear gravel areas for spawning, often undertaking upstream migrations, as do Atlantic salmon (NPWS, 2017). Lamprey ammocoetes were recovered from kick samples undertaken at the Site, specifically on the Rossestown River, as detailed in Appendix C. Potential lamprey spawning habitat in the form of gravel substrate was also recorded during habitat suitability assessments for salmon and lamprey on the Rossestown River and the main channel of the River Suir. The main channel of the River Suir was also noted to have potential holding habitat for juvenile lamprey as a result of the habitat suitability assessment, as detailed in Appendix C. Twaite Shad, although being a mobile aquatic species are not likely to be found within the Site or upper	**Yes**

Qualifying Interests	Source	Pathway	Likely Significant Effects	Included further in Screening (Yes / No)
			reaches of the River Suir as they are known to utilise lower reaches of main river channels and larger tributaries for spawning[20], in some catchments, artificial barriers block twaite shads' upstream migration, further limiting the species to lower areas (NPWS 2017 and Jolly et al 2011). Due to the numerous weirs along the Suir as well as the hydro stations at Cahir and Holycross, it is unlikely Twaite Shad are present in upstream areas of the catchment such as c. 7.8km downstream of the Site. However, due to uncertainty and taking the precautionary principal, there is potential for significant effects on this species. Due to barriers present, significant effects on Sea lamprey, River lamprey and Salmon may be unlikely however this cannot be ruled out in the absence of species-specific surveys as some individuals have potential to pass these barriers. IAS, should they be introduced / spread into the aquatic habitats on Site may have negative impacts on spawning habitat suitability. No third schedule invasive species were recorded during surveys of the Site, as outlined in Appendix C.	

[20] https://www.fisheriesireland.ie/species/twaite-shad-alosa-fallax last accessed (02 July 2024)

Qualifying Interests	Source	Pathway	Likely Significant Effects	Included further in Screening (Yes / No)
			Emissions to surface water could negatively affect silt deposits used by juvenile lampreys at this stage of their life cycle, as well as potential spawning habitat in the Rossestown River and the main channel of the River Suir downstream. There is potential for significant effects on these QIs. Considering the mobile nature of aquatic species there is potential for areas within and downstream of the proposed project to be utilised by these QI's, for which sources cannot be entirely ruled out in the absence of mitigation. Therefore, these QIs are brought forward for detailed assessment.	
Lutra lutra (Otter) [1355]	**Construction and Decommissioning phases:** Emissions to surface water Disturbance	Hydrological connection to the River Suir	Yes - Otter are included on a precautionary basis, owing to the fact they occupy large home ranges (mean: 7.5 ± 5km)[21], and may be indirectly affected by the development through a reduction in prey availability (i.e. fish, crayfish) as a result of deterioration in water quality. Otter is also a mobile species which may utilise upper reaches of the River Suir located downstream and	**Yes**

[21] Ó Néill, L., Veldhuizen, T., de Jongh A. & Rochford, J. (2009). Ranging behaviour and socio-biology of Eurasian otters (*Lutra lutra*) on lowland mesotrophic river systems. *European Journal of Wildlife Research* 55: 363–70.

Qualifying Interests	Source	Pathway	Likely Significant Effects	Included further in Screening (Yes / No)
			within the Site. Otter surveys were undertaken at the Site, with otter signs (prints, slides, couches and spraint) recorded in several locations throughout drainage channels on the Site, connected to the River Suir. Surveys along the grid connection route also identified potential holt, as detailed in Appendix C. Considering the mobile nature of aquatic species there is potential for areas within and downstream of the proposed project to be utilised by these QI's, for which sources cannot be entirely ruled out in the absence of mitigation. In relation to the grid connection route and the potential holt identified, disturbance / displacement impacts could also arise. Therefore, these QIs are brought forward for detailed assessment.	

4.4.1. Potential Impacts and Effects

There is a risk of emissions to surface water, disturbance and the introduction and / or spread of IAS during the construction and decommissioning phase of the project.

The following QIs / SCIs of the Lower River Suir SAC have been included in the screening given their mobile nature and potential to be found within the ZoI:

- Water courses of plain to montane levels with the *Ranunculion fluitantis* and *Callitricho-Batrachion* vegetation [3260]
- *Austropotamobius pallipes* (White-clawed Crayfish) [1092]
- *Petromyzon marinus* (Sea Lamprey) [1095]
- *Lampetra planeri* (Brook Lamprey) [1096]
- *Lampetra fluviatilis* (River Lamprey) [1099]
- *Salmo salar* (Salmon) [1106]
- *Alosa fallax fallax* (Twaite Shad) [1103]
- *Lutra lutra* (Otter) [1355]

Emissions to water

Potential impacts mainly relate to significant pollution events that may affect the QI species directly (i.e. loss of habitat / reduced suitability) or indirectly through a reduction in prey availability. Silt run-off may adversely affect local crayfish populations by reducing the availability of suitable refuges in-stream, while an influx of organic matter associated with this run-off may elevate nutrient levels, resulting in deterioration of water quality levels necessary for survival. Similarly, species like salmon, twaite shad, and lamprey may be adversely affected by deterioration in water quality, while suitable spawning gravels for salmon and lamprey, may be reduced on account of sedimentation. Juvenile lampreys could be affected by pollution events affecting silt deposits used at this stage of their life cycle. Any negative impacts that are experienced by fish or crayfish species associated with this SAC, can have negative indirect impacts on otter through a reduction in prey availability.

The release of hydrocarbons has further potential to impact on aquatic species and aquatic habitats. Hydrocarbons can bioaccumulate in salmonid species (McCain et al. 1990), and Atlantic salmon are known to be physically affected by short-term exposure to such emissions, leading to loss of condition, and avoidance of areas containing hydrocarbons (Weber and Maynard 1981), resulting in effective short-term loss of habitat or migration routes.

The release of suspended solids into watercourses within and surrounding the Site during the construction phase, directly (spillage of contaminant into watercourses, or siltation of watercourses through disturbance, vegetation clearance and/or drainage activities) may lead to direct negative effects, on aquatic species that require very high levels of water quality in order to complete their life cycles. As well as a reduction in habitat quality for aquatic plant species associated with qualifying habitat types brought forward.

While the works associated with this development are rather localised and short-term, in the absence of suitable water-quality mitigation there is considered to be a potential for significant adverse effects to occur affecting the QI species in this SAC. Significant adverse effects could also arise during the operational and decommissioning phases, with maintenance activities and access roads potentially resulting in negative water quality impacts also affecting QI species in this SAC.

Disturbance

For Otter, the disturbance distance is set at 150 m, as per the NRA (2009). Blasting activity proposed for the borrow pit will occur ca. 160 m from the closest water course (River Suir), outside the disturbance zone for otter, however turbine locations lie within the 150 m disturbance distance, for which ground works will be required. Otter surveys have confirmed presence of otter on the Site via otter signs such as prints, slides, couches and spraint, as outlined in Appendix C. Otter present on the Site are likely to be affected by the proposed development.

Female otter are considered to utilise home ranges of approximately 7.5 km (Marnell, 2011), and males can travel up to 15 km if food sources availability is reduced, however otter are usually found within a home range of 1-1.5 km. It is likely that Otter utilise the main channel of the River Suir within the Site, despite this being outside the boundary of the SAC some c. 7.8km downstream. Otter signs were also recorded on Site, as outlined in Appendix C. Due to this, there is potential for otter to be disturbed by the ground works at turbines, potentially by blasting activities, and noise / maintenance activities during the operational and decommissioning phases.

Fish species could also be affected by disturbance impacts occurring on the Site. Species such as lamprey, of which lamprey ammocoetes have been recorded on the Site and associated with the SAC, can be negatively impacted by noise or artificial lighting at night. Salmon, twaite shad or white-clawed crayfish, while unlikely to be present within the Site, could also be negatively impacted by disturbance. This could lead to displacement impacts whereby these species leave the area to utilise other habitats free from disturbance, such as downstream towards the SAC.

Invasive Alien Species

Invasions by alien species are a major threat to biodiversity. Terrestrial and aquatic habitats can be affected, resulting in negative impacts on species of conservation interest and overall conservation objectives. Under the Third Schedule of the European Communities (Birds and Natural Habitats) Regulations 2011 [S.I.477/2011], all the high-level invasive plant and animal species that are considered an immediate threat to our biosecurity. It is illegal to release, or allow to escape into the wild, any species listed in this Schedule.

Crayfish plague is an infectious (water-borne spore) disease which can be fatal to white-clawed crayfish populations (Edgerton, et al., 2004; Holdich, 2003). Aquatic invasive alien flora species coupled with eutrophication can cause macrophyte blooms that dominate areas of river beds, reducing habitat suitability for freshwater pearl mussel. Such species can also outcompete native aquatic species and reduce spawning habitat suitability.

There is potential for the introduction of terrestrial and aquatic IAS and disease during the proposed works via mechanical / plant movement. No third schedule invasive species were recorded during surveys of the Site, as outlined in Appendix C, however, IAS could be introduced to the Site through vectors such as machinery.

IAS (flora and fauna) have potential cause effects on the QIs of the Lower River Suir SAC through deterioration of water quality (including reduction of light availability), out-competing native species and mortality of species, therefore IAS are considered further within this assessment.

Cumulative Effects

As part of the impact assessment, the proposed project is considered in combination with other plans and projects that could result in cumulative effects. The proposed project is considered in-combination with the following plans:

- Tipperary County Development Plan 2022-2028, and
- Tipperary County Council Renewable Energy Strategy. Appendix 2 of the Tipperary County Development Plan (2022-2028).

Significant cumulative impacts are not predicted with the plans listed above, as each plan has a range of environmental and natural heritage policy safeguards in place. A Natura Impact Statement has been completed for the Development Plan. In terms of the proposed project at Brittas, the Tipperary County Development Plan 2022 to 2028 the proposed project area is 'open for consideration to wind energy' development. There is no other contradictory zoning for other project types or infrastructure in this area. There are no strategies or objectives outlined in the relevant county development plans that would act in-combination with the proposed project.

The planning portal[22], of Tipperary County Council was accessed for information on planning applications or other projects with potential to act in combination with the proposed project. An Bord Pleanála and the EIA Portal was also accessed within the search. Due to the scale and nature of the Site, its location within the Suir catchment, only projects that are connected to the same catchment, and projects for which the ZoI overlaps, have been considered for potential in-combination impacts.

Many of the proposed or granted developments within the ZoI or connected to the same catchment comprise small scale residential developments such as extensions, retention permissions for one-off housing, and construction of one-off houses. Due to the size of these developments, and the context of the proposed project, it is unlikely that any of these smaller developments would have any in-combination effect with the proposed project. Therefore, these smaller developments have been ruled out of the consideration for cumulative impacts.

Larger developments within the ZoI or connected to the same catchment are included in Table 6 below. Table 6 also outlines if any environmental assessments, AA Screening or NIS reports were submitted / carried out as part of the applications. Most of these developments have had either an AA Screening, EcIA with comments on designated sites, and NIS or comments from ABP Inspector's

[22] https://www.eplanning.ie/TipperaryCC/searchtypes (last accessed 24/05/2024)

reports on no requirement for AA. The only developments without any of these comments / assessments are PL92.309294 and PL92.301811, which are for a residential development of 63 houses in Thurles, Co. Tipperary, and the demolition of a house and construction of 3 new houses in Thurles, Co. Tipperary. The larger development of 63 houses is not located adjacent to the River Suir but is noted to discharge wastewater and surface water to the public sewer, which will eventually be discharged to the River Suir in Thurles. This could have cumulative impacts in-combination with the proposed project as emissions to surface water is a potential source of impact. This is due to the fact that the Thurles wastewater treatment plant (WWTP) discharges into the River Suir, in the same catchment as the proposed project, and connected to the Lower River Suir SAC. The latest Annual Environmental Report (AER) for the wastewater treatment plant (WWTP) is from 2023 (uploaded 2024) and this states that the Thurles plant is compliant with the conditions of the discharge licence emission limit values (ELVs) (EPA, 2023). An NIS was completed for the plant and is noted in the Inspector's Report, which states that if phosphate reduction measures continue at the plant, there should be no integrity level effects on the Lower River Suir SAC (EPA, 2013). The AER from 2023 states that improvement works for the achievement of orthophosphate (as P) ELVs set in the licence were completed in 2020 (AER, 2023). The AER from 2023 also notes that capacity is not expected to be exceeded in the next 3 years and there is remaining capacity. Therefore, it is considered that there will be no cumulative effects on water quality in-combination with the proposed project.

The second development of a demolition of a house and construction of 3 new houses, also includes wastewater and surface water discharge to the public sewer, i.e. Thurles WWTP as above. No cumulative effects on water quality are expected to arise from this second development in-combination with the proposed project.

Table 6 Developments currently permitted, under construction, or planned within the ZoI or Suir Catchment.

Planning Application Number	Development Description
ABP 306933 / 19602012	Construction and operation of solar PV arrays, inclusive of an electrical substation compound. Planning application is accompanied by an environmental report and NIS. NIS concluded that with mitigation measures proposed, no significant effects remaining on any designated sites.
PL92.309294	Construction of 63 no. dwellings. No EIA, AA Screening or NIS Completed. Development to discharge waste and surface water to public sewer.
PL92.311097	Demolition of 2 buildings and construction of 26 houses. Provision of new roads and footpaths, car parking areas, playgrounds & open spaces, boundaries. No AA Screening or NIS completed. EcIA submitted with FI Request, noted that there is no connectivity to designated sites.
PL92.301811	Permission to demolish and remove existing house and construct 3 new houses. No AA Screening, NIS or EcIA/EIAR submitted.
PL92.302913	Development of a Community Primary Healthcare Centre and Pharmacy including Change of Use, demolition and alterations to existing Structures. NIS submitted and concluded that with mitigation proposed, no significant effects remaining on any designated sites.
PL92.305908	Construction of 4 in total, 3-bedroom, 2 storey terraced dwelling houses. ABP Inspector's Report states no AA issues arise.
PL92.247557	Three years on development previously granted under PL22. 238797 for building material and plant yard/compound. ABP Inspector's Report states no AA issues arise in this case.

Planning Application Number	Development Description
PL92.310934	Completion of partially constructed overhead electricity line from Thurles electricity substation to the Borrisoleigh electricity substation as permitted under TCC Reg 08/511136. AA Screening completed determined no potential for significant effects and no NIS required.
19601012	Construction of solar PV arrays, inclusive of an electrical substation compound. Planning application is accompanied by an environmental report and NIS. NIS concluded that with mitigation measures proposed, no significant effects remaining on any designated sites.
19601159	Construction and operation of a solar PV array mounted on metal frames on a 37.6ha site, inclusive of electrical substation compound, inverter unites, temporary construction and ancillary facilities. An NIS was completed and concluded that with mitigation measures proposed, no significant effects remaining on any designated sites.
16600170	Construction, operation and decommissioning of a solar photovoltaic panel array, with 33,000 sqm of solar panels on ground mounted frames. AA Screening completed which determined no potential for significant effects and no NIS required.

4.4.2. Likelihood of Significant Effects on Natura 2000 sites

In accordance with Article 6(3) of the Habitats Directive, this AA Screening Report has examined the details of the proposed project and the relevant Natura 2000 sites. This report has concluded that on the basis of objective scientific information following screening and in light of the conservation objectives of Lower River Suir SAC, Likely Significant Effects cannot be ruled out during construction, operation and decommissioning activities for the proposed project. This report also concluded that it can be excluded, on the basis of objective scientific information that there will not be any significant effects on any other European Site.

Therefore, in line with the recommendations of guidance and case law it is considered that the proposed project should progress to the Stage 2 of the AA process to determine if the proposed project will adversely affect the integrity of the Lower River Suir SAC. An NIS has been carried out (see Section 5) to assist the competent authority, in this case An Bord Pleanála, to make its own determination on the AA.

5. Natura Impact Statement

This section of the report provides the Competent Authority, in this case An Bord Pleanála, with information to assist in carrying out an appropriate assessment. This section provides complete and definitive findings on whether the project, individually or in-combination with any other plan or project, will adversely affect the integrity of the Lower River Suir SAC.. The '*integrity of the site'* can be defined as '*the coherence of the site's ecological structure and function, across its whole area, or the habitats, complex of habitats and / or populations of species for which the site is or will be classified'*[23].

The headings within the appropriate assessment report template provided in the European Commission guidance document '*Assessment of plans and projects significantly affecting Natura 2000 sites*[24]*'* have been used to provide a basis to examine the potential effects of the project.

5.1. Assessment of the effects of the project or plan on the integrity of Natura 2000 sites

This section of the report sets out the potential effects of the proposed project (either alone or in combination with other projects or plans) on the integrity of the Lower River Suir SAC with respect to the conservation objectives of the site and to their structure and function. This section of the report demonstrates, with supporting evidence, that there will be no adverse effects on the integrity of Natura 2000 sites should the proposed project proceed. Where this cannot be demonstrated, adverse effects must be assumed.

The following QIs / SCIs of the Lower River Suir SAC have been brought forward for detailed assessment:

- Water courses of plain to montane levels with the *Ranunculion fluitantis* and *Callitricho-Batrachion* vegetation [3260]
- *Austropotamobius pallipes* (White-clawed Crayfish) [1092]
- *Petromyzon marinus* (Sea Lamprey) [1095]
- *Lampetra planeri* (Brook Lamprey) [1096]
- *Lampetra fluviatilis* (River Lamprey) [1099]
- *Salmo salar* (Salmon) [1106]
- *Alosa fallax fallax* (Twaite Shad) [1103]
- *Lutra lutra* (Otter) [1355]

[23] http://ec.europa.eu/environment/nature/natura2000/management/docs/art6/provision_of_art6_en.pdf (last accessed 27/08/24)
[24] http://ec.europa.eu/environment/nature/natura2000/management/docs/art6/natura_2000_assess_en.pdf (last accessed 27/08/24)

5.1.1. Elements of the project or plan (alone or in combination) that are likely to give rise to significant effects on Natura 2000 sites

The proposed project includes ten WTGS, an on-site 110kV electrical substation, a BESS and an underground electrical connection to an existing 110kV substation at Thurles which is connected to the National Grid. Please see section 3 for a detailed project description. The development involves ground works that may result in the movement of sediment into watercourses connected to the SAC and potential disturbance of mobile aquatic species utilising the River Suir and watercourses present on Site.

The elements of the project identified as having potential to affect the Lower River Suir SAC are;

- Emissions to water;
- Disturbance; and
- Invasive alien species.

Emissions to Water

Emissions to water (silt, hydrocarbons / oils and concrete waste) have potential to be generated from ground works and carried to surface waters by rainfall and wind, potentially affecting mobile QIs of the Lower River Suir SAC.

In the absence of a suitable design and control measures the proposed project will have the potential to result in emissions to surface waters. There is potential for run-off at locations of works close to watercourses within the Site. Run-off could contain silt, hydrocarbons or oils from machinery, and concrete waste. Silt-laden run-off can alter the physico-chemical conditions of receiving water bodies. Hydrocarbons are toxic to flora and fauna, including fish, and these chemicals tend to be persistent in the environment. They are also a nutrient supply for adapted micro-organisms, which can rapidly deplete dissolved oxygen in waters, resulting in death of aquatic organisms. The release of concrete and other cement-based products to an aquatic environment can have the effect of altering the levels of pH, nitrate, phosphate, total solids, total suspended solids, total dissolved solids, turbidity and biochemical oxygen demand (BOD) in the water.

Earthworks are required for turbine hardstands, the borrow pit and excavations are required along the length of the GCR and at pinch points along the local TDR. At all GCR watercourse crossings, of which there are 2, no in-stream works are required as the 110kV cable will cross each bridge via flatbed formation or HDD.

Disturbance

Disturbance has potential to affect mobile QIs of the Lower River Suir SAC in the ZoI. Disturbance to a European site is representative of an indirect impact arising as a result of anthropogenic activities generated by a project (i.e. increased human presence and associated pressures). Otter can experience disturbance if present within c. 150 m of works (NRA, 2008). Fish species present in watercourses on the Site could also be affected by noise and lighting.

Invasive Alien Species

IAS have potential to be introduced by machinery during ground works and can be carried to surface waters by rainfall and wind, potentially affecting QIs of the Lower River Suir SAC within the zone of influence.

Cumulative Impacts

As part of the impact assessment, the proposed project is considered in combination with other plans and projects that could result in cumulative effects. The Screening for Appropriate Assessment in section 4 outlined that there are no developments considered to act in combination with the proposed project or result in cumulative impacts on the Natura 2000 network. With regards to the Tipperary County Development Plan 2022-2028 and the Tipperary County Council Renewable Energy Strategy 2022-2028, a Natura Impact Statement has been completed for the Development Plan. In terms of the proposed project at Brittas, the Tipperary County Development Plan 2022 to 2028 the proposed project area is 'open for consideration to wind energy' development. There is no other contradictory zoning for other project types or infrastructure in this area. There are no strategies or objectives outlined in the relevant county development plans that would act in-combination with the proposed project.

Small scale developments were ruled out due to size and the context of the project, noting that it is unlikely that any of these smaller developments would have any in-combination effect with the proposed project. Therefore, these smaller developments have been ruled out of the consideration for cumulative impacts.

Larger developments within the ZoI or connected to the same catchment are included in Table 6. Two developments without assessments involved two residential developments in Thurles, Co. Tipperary, and the potential for in combination impacts was considered with respect to the Thurles WWTP which discharges into the River Suir and Lower River Suir SAC. The most recent AER (EPA, 2023) states that the WWTP is compliant with conditions set out in the licence and an NIS was prepared for the WWTP. Therefore, it is considered that there will be no cumulative effects on water quality in-combination with the proposed project. No significant in combination effects were identified.

5.2. Set out the Conservation objective of the site(s)

The conservation objectives for the Lower River Suir SAC and the list of specific attributes and targets defining the conservation objectives for each potentially affected qualifying interest, is listed in **Table 7**.

The conservation objectives for the Lower River Suir SAC can be summarised as "*To maintain or restore the favourable conservation condition of the Annex I habitat(s) and/or the Annex II species for which the SAC has been selected".*

Table 7. Attributes and Targets for Potentially affected QIs in the Lower River Suir SAC.

Qualifying Interest	Attribute	Measure	Target
Water courses of plain to montane levels with the *Ranunculion fluitantis* and *Callitricho-Batrachion* vegetation [3260]	Habitat area	Kilometres	Area stable or increasing, subject to natural processes
	Habitat distribution	Occurrence	No decline, subject to natural processes
	Hydrological regime: river flow	Metres per second	Maintain appropriate hydrological regimes
	Hydrological regime: groundwater discharge	Metres per second	Maintain appropriate hydrological regime
	Hydrological regime: tidal influence	Daily water level fluctuations - metres	Maintain natural tidal regime
	Substratum composition: particle size range	Millimetres	Maintain appropriate substratum particle size range, quantity and quality, subject to natural processes
	Water quality	Various	Maintain appropriate water quality to support the natural structure and functioning of the habitat
	Typical species	Occurrence	Maintain typical species in good condition, including appropriate distribution and abundance
	Floodplain connectivity	Hectares	Maintain floodplain connectivity necessary to support the typical species and vegetation composition of the habitat
	Fringing habitats	Hectares	Maintain marginal fringing habitats that support the typical species and vegetation composition of the habitat

Qualifying Interest	Attribute	Measure	Target
***Austropotamobius pallipes* (White-clawed Crayfish) [1092]**	Distribution	Occurrence	No reduction from baseline.
	Population structure: recruitment	Occurrence of juveniles and females with eggs	Juveniles and/or females with eggs in all occupied tributaries
	Negative indicator species	Occurrence	No alien crayfish species
	Disease	Occurrence	No instances of disease
	Water quality	EPA Q value	At least Q3-4 at all sites sampled by EPA
	Habitat quality: heterogeneity	Occurrence of positive habitat features	No reduction in habitat heterogeneity or habitat quality
***Petromyzon marinus* (Sea Lamprey) [1095]**	Distribution: extent of anadromy	Percentage of river accessible	Greater than 75% of main stem length of rivers accessible from estuary
	Population structure of juveniles	Number of age/size groups	At least three age/size groups present
	Juvenile density in fine sediment	Juveniles/m²	Juvenile density at least 1/m²
	Extent and distribution of spawning habitat	m² and occurrence	No decline in extent and distribution of spawning beds
	Availability of juvenile habitat	Number of positive sites in 3rd order channels (and greater), downstream of spawning areas	More than 50% of sample sites positive

Qualifying Interest	Attribute	Measure	Target
***Lampetra planeri* (Brook Lamprey) [1096]**	Distribution	Percentage of river accessible	Access to all water courses down to first order streams
	Population structure of juveniles	Number of age/size groups	At least three age/size groups of brook/river lamprey present
	Juvenile density in fine sediment	Juveniles/m²	Mean catchment juvenile density of brook/river lamprey at least 2/m²
	Extent and distribution of spawning habitat	m² and occurrence	No decline in extent and distribution of spawning beds
	Availability of juvenile habitat	Number of positive sites in 2nd order channels (and greater), downstream of spawning areas	More than 50% of sample sites positive
***Lampetra fluviatilis* (River Lamprey) [1099]**	Distribution	Percentage of river accessible	Access to all water courses down to first order streams
	Population structure of juveniles	Number of age/size groups	At least three age/size groups of river/brook lamprey present
	Juvenile density in fine sediment	Juveniles/m²	Mean catchment juvenile density of brook/river lamprey at least 2/m²
	Extent and distribution of spawning habitat	m² and occurrence	No decline in extent and distribution of spawning beds
	Availability of juvenile habitat	Number of positive sites in 2nd order channels	More than 50% of sample sites positive

Qualifying Interest	Attribute	Measure	Target
		(and greater), downstream of spawning areas	
***Salmo salar* (Salmon) [1106]**	Distribution: extent of anadromy	Percentage of river accessible	100% of river channels down to second order accessible from estuary
	Adult spawning fish	Number	Conservation limit (CL) for each system consistently exceeded
	Salmon fry abundance	Number of fry/5 minutes electrofishing	Maintain or exceed 0+ fry mean catchment-wide abundance threshold value. Currently set at 17 salmon fry/5 minutes sampling
	Out-migrating smolt abundance	Number	No significant decline
	Number and distribution of redds	Number and occurrence	No decline in number and distribution of spawning redds due to anthropogenic causes
	Water quality	EPA Q value	At least Q4 at all sites sampled by EPA
***Alosa fallax fallax* (Twaite Shad) [1103]**	Distribution: extent of anadromy	Percentage of river accessible	Greater than 75% of main stem length of rivers accessible from estuary
	Population structure: age classes	Number of age classes	More than one age class present
	Extent and distribution of spawning habitat	m^2 and occurrence	No decline in extent and distribution of spawning habitats
	Water quality: oxygen levels	Milligrams per litre	No lower than 5mg/l

Qualifying Interest	Attribute	Measure	Target
	Spawning habitat quality: Filamentous algae; macrophytes; sediment	Occurrence	Maintain stable gravel substrate with very little fine material, free of filamentous algal (macroalgae) growth and macrophyte (rooted higher plants) growth
***Lutra lutra* (Otter) [1355]**	Distribution	Percentage positive survey sites	No significant decline
	Extent of terrestrial habitat	Hectares	No significant decline. Area mapped and calculated as 116.17ha above high water mark (HWM) and 726.61ha along riverbanks
	Extent of marine habitat	Hectares	No significant decline. Area mapped and calculated as 712.27ha
	Extent of freshwater (river) habitat	Kilometres	No significant decline. Length mapped and calculated as 382.31km
	Couching sites and holts	Number	No significant decline
	Fish biomass available	Kilograms	No significant decline
	Barriers to connectivity	Number	No significant increase

5.3. Describe how the project or plan will affect key species and key habitats.

The key habitats and species of the Lower River Suir SAC considered likely to be affected by the potential impacts and effects as a result of the project, are:

- Water courses of plain to montane levels with the *Ranunculion fluitantis* and *Callitricho-Batrachion vegetation* [3260]
- *Austropotamobius pallipes* (White-clawed Crayfish) [1092]
- *Petromyzon marinus* (Sea Lamprey) [1095]

- *Lampetra planeri* (Brook Lamprey) [1096]
- *Lampetra fluviatilis* (River Lamprey) [1099]
- *Salmo salar* (Salmon) [1106]
- *Alosa fallax fallax* (Twaite Shad) [1103]
- *Lutra lutra* (Otter) [1355]

5.3.1. Emissions to water

As described in Section 4.4 sediments and contaminated surface water have the potential to cause deterioration in water quality. A deterioration in water quality has potential to indirectly affect Atlantic salmon and lamprey species by reducing upstream spawning habitat suitability, and juvenile habitat suitability, impacting the integrity of the Lower River Suir SAC and its ability to support these species. A deterioration in water quality could negatively affect aquatic plant species, sedimentation can reduce light reaching in-stream and lower oxygen content.

The Water courses of plain to montane levels with *Ranunculion fluitantis* and *Callitricho-Batrachion* vegetation [3260] located c. 7.8 km downstream could be negatively impacted by emissions to water, affecting the conservation objectives attributes '*particle size range*', '*water quality*', '*typical species*' and '*fringing habitats*' as in Table 7. Emissions to water involving sediments is likely to alter particle size ranges and thus the substratum required to support this habitat type in the SAC. Contaminated surface water reaching the SAC downstream could alter the water quality, noted in the conservation objectives as required to support the natural structure and functioning of this habitat type. Similarly, if altered sediments and substratum, as well as contaminated surface water, reach the SAC this could change the typical species present and the fringing habitat types required to sustain the extent of this habitat in the SAC. As the water courses of plain to montane levels habitat type required a certain substratum, water quality and vegetation composition of fringing habitats, emissions to water from the Site could reduce the ability of this SAC to meet its conservation objectives in the absence of mitigation measures.

For White-clawed crayfish, while there is crayfish plague known in the Suir this species could occur at the Site and downstream in the SAC. Emissions to water could affect the conservation objectives attributes for this species: *'water quality'* and *'habitat quality: heterogeneity'*. Contaminated surface water entering the Suir at the Site and potentially flowing downstream would negatively affect water quality, while as in Table 7, a rating of at least Q3-4 at all sites sampled by the EPA is required to support White-clawed crayfish in this SAC. Similarly, habitat quality and heterogeneity could be reduced by either sediment run-off or contaminated surface water from the Site. White-clawed crayfish require good water quality and habitat quality to meet its conservation objectives for this SAC, therefore emissions to water arising from the Site could reduce the ability of this SAC to meet its conservation objectives in the absence of mitigation measures.

Sea lamprey are unlikely to be present at the Site due to barriers to migration but are likely to be present further downstream. Brook / River lamprey are likely to be present at the Site, and ammocoetes were recorded in kick samples at the Site. Emissions to water could affect the following

attributes listed in the conservation objectives for these species: *'extent and distribution of spawning* habitat' and '*availability of juvenile habitat'*. If sediment run-off from the Site enters watercourses used by these species, there is potential that spawning habitat could be covered by sediment and thus this habitat extent could be lost or its quality or distribution reduced. The same can be said for the availability of juvenile habitat, as juveniles require silt deposits along the channel as this is the habitat they utilise at this life stage. Emissions to water such as contaminated surface water can also result in the degradation of these habitat types. Lampreys require these spawning beds and juvenile habitat to survive and to meet the conservation objectives for this SAC. Therefore, emissions to water arising from the Site could reduce the ability of this SAC to meet its conservation objectives in the absence of mitigation measures.

For Salmon and Twaite Shad, both of which could be unlikely to occur in the vicinity of the Site due to barriers to migration, but due to uncertainty must be considered as having potential to be present downstream of the Site, could be negatively impacted by emissions to water. As in Table 7, emissions to water could affect the following attributes in the conservation objectives: '*adult spawning fish'*, *'salmon fry abundance'*, '*number and distribution of redds'*, *'water quality'* for Salmon, *'extent and distribution of spawning habitat'*, *'water quality: oxygen levels'* and *'spawning habitat quality: filamentous algae, macrophytes; sediment'* for Twaite Shad. As for lampreys, sediment run-off from the Site could travel downstream and cover redds and affect spawning habitat quality, resulting in a reduction in these required habitat types for these species. Contaminated surface water is likely to reduce water quality and affect oxygen levels, which are also required for these species' survival and for these species to meet their conservation objectives. Emissions to water arising from activities at the Site could reduce the ability of this SAC to meet its conservation objectives for these species in the absence of mitigation measures.

For otters, these species are likely to be present on the Site and downstream, with evidence of their usage, as well as a potential holt, recorded during the surveys at the Site. Emissions to water could negatively affect the following conservation objectives for otter: *'extent of freshwater (river) habitat'* and *'fish biomass available'*. While the extent of freshwater habitat would not change as a result of the proposed project, the quality of this habitat could be reduced through the release of sediment run-off or contaminated surface water arising from the activities at the Site, and thus render this habitat unsuitable for use by otter. Contaminated surface water run-off, as noted above, would negatively impact fish habitat including spawning beds, required water quality status, which could in turn indirectly affect otters by reducing prey availability and thus the volume of fish biomass available for otter in the SAC. Emissions to water arising from activities at the Site could reduce the ability of this SAC to meet its conservation objectives for this species in the absence of mitigation measures.

5.3.2. Disturbance

Typically, otter are not considered to be sensitive to disturbance effects outside of 150 m from the proposed works where they include piling and blasting. For other construction activities, otters may be affected within 50 m of typical construction works. However, couches and slides have been recorded on the Site, as outlined in Appendix C, and thus the effects of disturbance could result in displacement of Otter from these locations, and as this is considered to be the same population as in

the main channel of the Suir downstream, this could result in significant effects of the Lower River Suir SAC.

Disturbance impacts could negatively affect the following conservation objectives for otter: *'Distribution'* and *'extent of freshwater (river) habitat'* as outlined in Table 7. Evidence of otter usage was noted on the Site and this species is known to occur downstream of the Site as well. Activities at the Site could result in disturbance and displacement of otters, through increased noise and human disturbance, and thus reduce the percentage of positive survey sites for distribution of otter in the SAC. Similarly, the extent of freshwater habitat available to be used by otter could be reduced by disturbance, if this species is displaced from an area and renders freshwater habitat unsuitable for use. Disturbance arising from activities at the Site is very unlikely to affect c. 7.8km downstream in the Lower River Suir SAC, however, as the Suir main channel is present within the Site, otters recorded here are the same population as the SAC. Thus, otters at the Site are considered within the same conservation objectives outlined for the SAC. Disturbance at the Site could reduce the ability of this SAC to meet its conservation objectives for this species in the absence of mitigation measures.

Disturbance impacts could also affect fish species in the watercourses within the Site. For example, lampreys are present on the Site, and there is some potential for salmon and twaite shad to also be present. Disturbance could arise through artificial lighting on the surface of watercourses on the Site, *or human activities and noise. This could affect the following attributes for the affected fish QIs:*

- Sea, Brook, River Lamprey
    - Extent and distribution of spawning habitat
    - Availability of juvenile habitat
- Salmon
    - Number and distribution of redds
- Twaite Shad
    - Extent and distribution of spawning habitat

Artificial lighting can disrupt the natural rhythm of spawning processes, and the process for migratory species which may utilise darkness to indicate appropriate timings for migration. Human disturbance could also affect spawning activities. Disturbance at the Site therefore could reduce the ability of this SAC to meet its conservation objectives for these species in the absence of mitigation measures.

5.3.3. Invasive Alien Species

Invasive alien species can out compete native species, especially aquatic plant species. While no third schedule invasive species were recorded on Site during the surveys, there is potential for invasive species to be introduced to the Site via machinery, humans or tools. Seeds or vegetated material can be brought onto Site from elsewhere and colonise the Site itself or result in this plant material flowing downstream via the watercourses on the Site. Seeds and roots can be transported via watercourses and colonise riparian banks, which can in turn affect river habitats, resulting in increased sedimentation once invasive species have died back during winter, or affecting levels of shade and thus affecting aquatic flora. Each of the potentially affected QIs of the Lower River Suir SAC, including water courses of plain to montane levels, white-clawed crayfish, lampreys, salmon, twaite shad and

otter, could be negatively affected by IAS affecting the aquatic environments that these species utilise. Conservation objectives attributes and targets for these QIs are outlined in Table 7. Attributes which could be affected are as follows:

- Water courses of plain to montane levels with the Ranunculion fluitantis and Callitrich-Batrachion vegetation
    - Habitat area
    - Habitat distribution
    - Substratum composition: particle size range
    - Water quality
    - Typical species
    - Fringing habitats
- White clawed crayfish
    - Water quality
    - Habitat quality: heterogeneity
- Sea, Brook and River lamprey
    - Extent and distribution of spawning habitat
    - Availability of juvenile habitat
- Salmon
    - Number and distribution of redds
    - Water quality
- Twaite Shad
    - Extent and distribution of spawning habitat
    - Water quality: oxygen levels
    - Spawning habitat quality: filamentous algae, macrophytes, sediment
- Otter
    - Distribution
    - Extent of terrestrial habitat
    - Extent of freshwater (river) habitat
    - Couching sites and holts
    - Fish biomass available

Of the above attributes, habitat area, quality and distribution, and water quality, as well as spawning habitat, can be negatively impacted by IAS. Aquatic IAS can alter sediment regimes in the water column, result in increased or decreased shade or alter flows which can change substratum composition. Riparian IAS can also affect sediment, during the winter when some riparian invasives die back, sediment run-off from the bankside can enter the watercourses. Riparian IAS can also affect

shade, which can in turn affect flora species and algal growth in the river itself. This can affect the water courses of plain to montane habitat type, and the spawning and juvenile habitat required by lampreys, salmon and twaite shad. Riparian IAS can also affect otters, reducing habitat availability for couching sites and holts, as well as the extent of terrestrial or freshwater habitat available for use by these species. It must be noted that IAS introduced to the Site could flow downstream to the SAC boundary resulting in negative effects on the conservation objectives for these species. In the absence of mitigation, IAS impacts can reduce the ability of this SAC to meet the conservation objectives for these QIs.

5.4. Describe what mitigation measures are to be introduced to avoid, reduce or remedy the adverse effects on the integrity of the site(s).

Deterioration in water quality, disturbance and the introduction of IAS have the potential to adversely affect qualifying interests of the Lower River Suir SAC. The mitigation measures proposed focus on the protection of QI species and their breeding habitats and on water quality during works.

5.4.1. Avoidance by design

The layout reflects the outcome of the iterative engineering and environmental analysis approach adopted during the wind farm design process which considered a number of factors including minimising any risk in terms of poor ground conditions, negative influences on the existing drainage, avoidance of sensitive ecological habitats and high flood risk areas, and any known archaeological features.

The project also includes additional components outside the boundaries of the application area including temporary works along the TDR and GCR. Both the GCR and TDR have been designed to use the existing road network therefore using existing infrastructure and avoiding sensitive habitat types and avoiding unnecessary impacts on watercourses.

Turbine locations and associated infrastructure will be placed at a minimum set-back distance of 50m from the watercourses, except at river crossings. The proposed buffer zone will avoid physical damage to watercourses and associated release of sediment; and avoid the entry of suspended sediment from earthworks into watercourses.

Where possible the layout of the wind farm has utilised already existing infrastructure such as access tracks, minimising the number of crossings required across the water course. To avoid in-stream works, HDD will be used at two locations on the Site and two locations along the GCR.

5.4.2. Roles and responsibilities

Environmental manager

The main contractor appointed for the project will be required to designate a member of staff, or engage a specific person, with experience of environmental management and monitoring of construction at wind farm sites, referred to hereafter as the “Environmental Manager” (EM). The EM will assume responsibility for overseeing the implementation of all environmental protective measures and mitigation measures set out in this document and in the Construction Environmental

Management Plan (CEMP). The EM will be responsible for employing good working practice during all phases of the project and for providing a briefing on environmental protection measures and ecological sensitivities of the Site to all site personnel in advance of commencement of works.

Ecological clerk of works

An Ecological Clerk of Works (ECoW) will be appointed to oversee all aspects of work. The ECoW will be a suitably experienced ecologist with knowledge and practical experience of wind farm development projects. The ECoW will deliver Toolbox Talks to contractors and will undertake audits of the site offering guidance and due diligence and ensure that ecological mitigation measures set out in all documents are implemented, working and reviewed.

The names and contact details of the individuals with responsibility for implementation and supervision of mitigation measures during all phases of the works will be clearly identified and displayed on notice boards at the site compounds as well as set out in documents such as the CEMP and site- specific method statements.

Construction Environmental Management Plan

A Construction and Environmental Management Plan (CEMP) has been prepared and will be updated in accordance with the parameters in the CEMP and to incorporate any planning conditions during the preconstruction and construction phases and implemented on site. The CEMP will be a key construction contract document, which will ensure that measures, considered necessary to protect the environment, prior to construction, during construction and during operation and decommissioning of the proposed project, are implemented.

The environmental commitments of the project will be managed through the CEMP and will be secured in contract documentation and arrangements for construction and later development stages. The CEMP will mainly address the construction phase however, if mitigation and monitoring is required to continue into the operational and deconstruction phases these commitments will be communicated and transcribed into operational process documentation. A CEMP accompanies this planning submission.

Good Working Practice

Good work practices such as those set out in *Guidelines on Protection of Fisheries During Construction Works In and Adjacent to Waters* (IFI, 2016), *Environmental Good Practice on Site Guide* (CIRIA, 2015) will be employed at all times on site during the construction of the proposed project. The CEMP submitted as part of the documentation supporting the planning application will be finalised by the appointed contractor and will be treated as a live document to be updated as required throughout the lifetime of the proposed project.

All personnel involved with the proposed project will receive an on-site induction relating to operations and the environmentally sensitive nature of the Lower River Suir SAC and to re-emphasize the precautions that are required as well as the measures to be implemented.

All staff and subcontractors have the responsibility to:

- Work to agreed plans, methods and procedures to eliminate and minimise environmental impacts;
- Understand the importance of avoiding emissions on-site, including pollutants, sediments and noise, and how to respond in the event of an incident to avoid or limit environmental impact;
- Respond in the event of an incident to avoid or limit environmental impact;
- Report all incidents immediately to their site environmental manager;
- Monitor the workplace for potential environmental risks and alert the immediate line manager if any are observed; and
- Co-operate as required, with site inspections.

5.4.3. Specific Mitigation Measures

The mitigation measures proposed are tried and tested standard environmental protection measures applied at construction sites that will protect mobile QI species and their breeding sites, prevent deterioration of water quality and prevent the spread of invasive alien species to the River Suir as a result of the proposed project.

Deterioration of water quality

Construction Phase

Pollution Prevention

A Surface Water Management Plan (SWMP) will be developed to include all mitigation measures required to protect surface water.

A key mitigation measure is the avoidance of hydrological features, by the implementation of buffer zones (i.e. 50 m to main watercourses, and 10 m to main drains, except for watercourse crossings). No works will take place within the buffer zones unless under supervision by the EM or ECoW. Works at watercourse crossings will be undertaken under supervision by the EM or ECoW.

All fuels, oils and construction fluids will be stored at the designated contractor's compound. Within the compounds they will be stored in bunds of 110% storage capacity and located in a secure area away from any drains and / or watercourses. A floating hydrocarbon boom and spill kit will be available and operated by trained personnel in the event of any accidental spills. All workers on Site will be given a toolbox talk addressing the environmental topics prior to commencement of work.

All equipment and machinery will be checked for leaks and other potential sources of contaminants before arriving on Site and on a daily basis. All plant and machinery will be serviced before being mobilised to site. Any equipment or machinery likely to introduce contaminants will not be brought on Site or will be removed from Site immediately if any leak is discovered and determined to be unfixable. Spill kits will be available to machine operators, and they will be trained in their use.

No plant maintenance will be completed on-site, with any broken-down plant removed from site to be fixed.

No refuelling should take place on Site outside of the designated bunded areas within the temporary construction compounds, save in exceptional circumstances where it is necessary; if necessary it will only be completed in a controlled manner using drip trays at all times on impermeable surfaces; mobile bowsers, tanks and drums stored in secure, impermeable bunded storage areas a minimum of 50 m from water courses; only designated trained operators authorised to refuel plant on-site; and procedures and contingency plans set up to deal with emergency accidents or spills. Refer to the CEMP for the spill management plan.

No crossing of rivers or streams by machinery will be permitted, all machinery must stay within the designated routes.

The proposed surface water management system, including existing and proposed infrastructure, will be inspected and confirmed to be of sufficient capacity to prevent any potential emissions to water entering the watercourses on Site. Drainage measures will be provided to attenuate runoff and guard against soil erosion / soil compaction, safeguarding local water quality.

No in-stream works will be undertaken, and no works shall take place during periods of high rainfall in order to reduce risk of runoff into watercourses. Suitable weather windows (dry, no weather warnings or heavy rainfall expected within 5 days of works) will be chosen when undertaking the HDD at watercourse crossings.

There will be no concrete batching on the Site and a dedicated, bunded area will be created to cater for concrete wash-out. Any excess construction material shall be disposed of off-site in a fully licensed landfill. A wheel wash facility will be set up on Site for biosecurity measure to reduce the likelihood of spreading IAS. The wheel wash facility should be used upon entering / exiting the Site. Once machinery arrives on Site, it will be checked for any vegetative material such as roots or seeds that could contain IAS. If found, this should be removed and appropriately disposed of before using the machinery on Site.

Sediment Barriers

Triple layer silt fencing will be used in the areas of highest risk of surface water run-off, and single- or double-layer silt fencing at frequent intervals along pathways towards aquatic zones . It will be the responsibility of the EM and / or the ECoW to determine which locations require triple, double- or single-layer silt fences. Silt fencing will be removed only when bare soil is revegetated, and sediment movement is no longer a risk. This will act to prevent entry to the existing drainage network of sand and gravel-sized sediment in surface water runoff. Inspection and maintenance of these structures during construction phase is critical to ensure they are fit for purpose and as such inspection will be carried out on a regular basis. They will remain in place throughout the entire construction phase. All surface water run-off within the Site will be directed into a planned drainage system. A silt fence will be erected around any spoil heaps as part of surface water management for the Site.

The silt curtain will be installed before any works commence and will be checked daily by the EM or ECoW.

Operational Phase

Any herbicide / weed killer will be an ecologically safe product, including safe for the aquatic environment to ensure that any run-off from the site will not contain harmful herbicide / weed killer that could affect surface water.

Any maintenance required will avoid hydrological features as in the construction phase mitigation, by the implementation of buffer zones (i.e. 50 m to main watercourses, and 10 m to main drains, except for watercourse crossings). Any maintenance vehicles will also be checked for leaks and other potential sources of contaminants before arriving on Site and on a daily basis for the maintenance time required. No fuels, oils or construction fluids will be stored on the Site, unless within a designated area with bunds of 110% storage capacity and away from any drains and / or watercourses. Spill kits will be available in areas where these chemicals are stored. No plant maintenance will be completed on-site, with any broken-down plant removed from site to be fixed.

No crossing of rivers or streams by machinery will be permitted, all machinery must stay within the constructed access routes.

Decommissioning Phase

The decommissioning phase will follow mitigation measures outlined for the construction phase.

Disturbance

Construction Phase

Before works commence, the Site and up to 150 m of the works areas will be checked for evidence of otter by a suitably experienced ecologist. Should an otter holt be recorded, no works in proximity to this identified holt will proceed until a suitably experienced and qualified ecologist has advised on appropriate mitigation.

The following measures will be implemented to minimise as far as possible the disturbance to aquatic species:

- Methods to reduce noise and vibration[25];
- Soft-start techniques will be employed during working hours; and
- Machinery will not be used early in the day or late in the day (i.e., they will not start until at least one hour after sunrise and will cease not later than one hour prior to sunset). Lamprey species typically migrate in darkness, so this restriction will benefit them particularly. In addition to the above, to further minimise the potential for disturbance to be caused.

25 https://safety.networkrail.co.uk/wp-content/uploads/2019/11/NR_GN_ESD25-Guidance-on-Best-Practicable-Means-BPM-for-the-Control-of-Noise-and-Vibration.pdf (last accessed 28/08/2024)

Depending on the timing of the proposed works, different life stages of migratory fish species may be impacted by factors such as noise and disturbance associated with the installation of hardstands, or by increased sediment ingress into the watercourse during works involving excavation. Spawning and egg incubation for salmon occurs from October to February and for lamprey species from March to May, so works within 50m of watercourses, including the watercourse crossings required, will be carried out over summer if possible, bearing in mind that juveniles of these species may be present at any time of year.

To reduce noise and vibration impacts, as outlined in Network Rail (2019)[Error! Bookmark not defined.], the following measures will be employed:

- Road vehicles should not wait or queue up with engines running on the site
- Noise from reversing alarms should be controlled and limited through adoption of the following:
    - Site layout designed to limit and where reasonably practicable, avoid the need for reversing vehicles by installing one-way systems or turning circles.
    - The contractor shall ensure that drivers are familiar with the site layout
    - Reversing alarms should be set to the minimum output noise level required for health and safety compliance
- Equipment, including vehicles, should be shut down when not in use
- Engine compartments should be closed when equipment is not in use
- Plant and equipment should be examined for defects daily prior to the start of works and under no circumstances is defective plant to be used
- Generators, compressors and pumps etc. required for 24-hour operation should be super silenced and screened/enclosed as appropriate
- Modern, silenced and well-maintained plant fitted with efficient attenuators, mufflers or acoustic covers, where appropriate, should be used
- The appointed EM will perform weekly checks on Site to ensure that noise and vibration is monitored on a regular basis and if noise or vibration is found to be above acceptable levels, this will be remedied immediately

Operational Phase

Artificial lighting will be kept to a minimum as required for security. Light spill will be minimised near any watercourses by employing lighting restrictions. Consideration should be given to restrictions during dark hours from 9pm to 5am such as reducing light levels, turning off lights, or using motion sensor lighting only near access roads beside watercourses. White LED lighting has been shown to have greater impacts on wildlife and so alternative warmer colour wavelengths should be considered, between 2700 and 3000 Kelvin (Institute of Lighting Professionals 2018). Lighting installed near watercourses should also be directional, i.e. pointing towards the access road, with no lighting directed along the surface of the watercourse.

Decommissioning Phase

The decommissioning phase will follow mitigation measures outlined for the construction phase.

Invasive Alien Species

Construction Phase

While no plant species listed under the Third Schedule of the European Communities (Birds and Habitats) Regulations 2011 as 'non-native species subject to restrictions under Regulations 49' were recorded on the Site, there is potential for IAS to be introduced to the Site. The EM and ECoW will be responsible for monitoring potential introduction of IAS to the Site. If IAS are identified, the areas of IAS will be screened (fenced) off, including an appropriate buffer and no personnel or machinery will enter this area. Should the IAS be within or adjacent to the proposed construction areas or corridors, they will be managed and removed by a contractor with appropriate experience in dealing with IAS and disposed of appropriately. This will prevent machinery hitting and spreading the IAS. All personnel and machinery will follow biosecurity measures to prevent the spread of IAS.

The 'check, clean dry' method from the Northern Ireland Environment Agency[26] and the 'Inspect, Remove, Dispose, Clean and Disinfect' method from the IFI[27] (refer also to Appendix C) will be employed as general biosecurity measures on site for any works required within the 50m watercourse buffer, including any watercourse crossings and HDD. Any machinery, tools or equipment required within this buffer will also use the above methods post-works to avoid any contamination to other locations. This will also provide appropriate protection with regards to the spread of crayfish plague which is known within the catchment.

Operational Phase

Any maintenance works required during the operational phase will follow mitigation measures outlined above for the construction phase. Site personnel should also be made aware to check for signs of IAS colonising the Site. Where this is identified, the IAS should be dealt with appropriately and immediately to prevent further spread.

Decommissioning Phase

The decommissioning phase will follow mitigation measures outlined for the construction phase.

Efficacy of Mitigation Measures

All works will follow the best practice guidance outlined in the following documents:

- TII/NRA 'Guidelines for the crossing of Watercourses During Construction of National Road Schemes (2008); and,
- Inland Fisheries Ireland requirements publication" Guidelines on protection of fisheries during construction works in and adjacent to waters" (2016)

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[26] https://invasivespeciesni.co.uk/what-can-i-do/check-clean-dry/check-clean-dry-resources/ (last accessed 01/08/2024)

[27] https://www.fisheriesireland.ie/what-we-do/education-and-outreach/safeguarding-and-governance/biosecurity#:~:text=Biosecurity%20is%20the%20prevention%20of,boats%2C%20protective%20gear%20and%20clothing. (last accessed 01/08/2024)

The NRA publication details design and construction requirements for watercourses which interact with national road schemes which is also relevant to these works.

In addition to this guidance, there is also a requirement to consult and comply with the relevant statutory authority e.g. Inland Fisheries Ireland (IFI) for works within and adjacent to watercourses. Prior to the commencement of works, IFI will be consulted on proposed construction methods and mitigation measures to be employed for all works within 50 m of watercourses, including the watercourse crossings. This consultation will ensure that IFI are included going forward and any additional measures required or suggested as a result of this consultation will be employed. Additional mitigation may not be recommended for the protection of qualifying interests of Natura 2000 sites but may relate more generally to aquatic species outside of these protections.

The environmental measures set out above are proven to work and provide certainty that the integrity of the Lower River Suir SAC will not be affected by the proposed works. Each mitigation measure has been proposed to reduce the significance of potential impacts identified which could affect QIs of the Lower River Suir SAC. The mitigation measures proposed cover the protection of surface water, the reduction of disturbance impacts, and protection of biosecurity, i.e. reducing the potential for significant effects with respect to IAS.

These measures will ensure that suspended solids or other pollutants will not be discharged to surface waters during construction, operation and decommissioning and that there will be no effect on the water quality downstream of the Site. The measures proposed for disturbance ensure that noise, vibration and human disturbance are reduced insofar as no significant impacts relating to disturbance will negatively affect QIs of the SAC. Finally, measures proposed to ensure IAS are not introduced or spread are considered to be sufficient to ensure that no significant impacts arise with respect to IAS.

Table Summary of Mitigation Measures, Responsibilities and Efficacy in Preventing Adverse Effects on Natura 2000 sites

Effect	Mitigation Measures	Responsibility for Implementation	Efficacy of Mitigation	Adverse effect on integrity of Natura 2000 sites
Deterioration of Water quality	Surface water management during construction	Developer and Contractor	Established and proven working near watercourse measures	No
	Pollution Prevention	Developer and Contractor	Established and proven working near watercourse measures	No
	Sediment control	Developer and Contractor	Established and proven working near watercourse measures	No
	Water quality monitoring during works	Developer and Contractor	Established and proven working near watercourse measures	No
Disturbance	Pre-construction checks for otter holts and fish habitat	Developer	Established and proven working near watercourse measures	No
	Following best practice for working in streams – timing of works	Developer and Contractor	Established and proven working near watercourse measures	No
IAS	Biosecurity Measures	Developer and Contractor	Established and proven working within terrestrial habitats and near watercourse measures	No
	Management and removal of IAS	Developer and Contractor	Established and proven working within terrestrial habitats and near watercourse measures	No

5.1. Consideration of Findings

The mitigation measures outlined in this report are considered to be sufficient to prevent any effect on Qualifying Interests or the integrity of the Natura 2000 sites identified as potentially affected by the project.

It is considered that the Brittas Wind Farm, individually or in-combination with any other plan or project, will have no adverse effects on the integrity of the Lower River Suir SAC or any other Natura 2000 sites.

Based on the information set out in this report, we consider that the competent authority has sufficient information to allow them to determine, with reasonable scientific certainty, that the proposed project, individually or in combination with other plans or projects, will have no adverse effect on the integrity of any European (Natura 2000) sites.

References

Chanin, P., (2003). *Ecology of the European Otter. Conserving Natura 2000 Rivers Ecology Series No. 10..* Peterborough: English Nature.

CIEEM, (2018). *Guidelines for Ecological Impact Assessment in the UK and Ireland: Terrestrial, Freshwater and Coastal. ,* s.l.: Chartered Institute of Ecology and Environmental Management.

European Commission (2001). *Assessment of Plans and Projects significantly affecting Natura 2000 sites: Methodological guidance on the provisions of Article 6(3) and (4) of the Habitats Directive 92/43/EEC.* Office for Official Publications of the European Communities, Luxembourg.

Edgerton, B., Henttonen, P., Jussila, J., Mannonen, A., Paasonen, P., Taugbøl, T., Souty-Grosset, C. (2004). *Understanding the Causes of Disease in European Freshwater Crayfish.* Conservation Biology, 18:1466-1474.

EPA (2013). Inspector's Report: Application for a Waste Water Discharge Licence from North Tipperary County Council, for the agglomeration names Thurles Reg No. [D0026-01].

EPA (2023). Annual Environmental Report 2023: Thurles D0026-01.

European Commission (2018). *Managing Natura 2000 Sites: The Provisions of Article 6 of the 'Habitats Directive' 92/43/EEC.* Office for Official Publications of the European Communities, Luxembourg

European Union Habitats Directive, (1992). *Council Directives 92/43/EEC of 21 May 1992 on the conservation of natural habitats and of wild fauna and flora.*

Harding, H., Bruintjes, R., Radford, A. N., & Simpson, S. D. (2016). Measurement of Hearing in the Atlantic salmon (Salmo salar) using Auditory Evoked Potentials, and effects of Pile Driving Playback on salmon Behaviour and Physiology. Marine Scotland Science.

Hawkins, A. D., & Johnstone, A. D. F. (1978). The hearing of the Atlantic salmon, Salmo salar. Journal of Fish Biology, 13(6), 655-673.

Holloway, S. (1997). *Winter Distribution and Disturbance of Wildfowl and Waders on Findhorn Bay.* BTO Research Report No. 179. British Trust for Ornithology

Holdich, D. (2003). Ecology of the White-clawed Crayfish. Conserving Natura 2000 Rivers Ecology Series No. 1. Peterborough: English Nature.

Institute of Lighting Professionals (2018) Bats and Artificial Lighting in the UK. Guidance Note 08/18 Institute of Lighting Professionals, Warwickshire.

Irwin, S., Wilson, W., O'Donoghue, B., O'Mahony, B., Kelly, T., O'Halloran, J. (2012). Optimum scenarios for Hen harrier Conservation in Ireland; Final Report 2012. Prepared for the Department of Agriculture, Food and the Marine by the School of Biological, Earth and Environmental Sciences, University College Cork.

Kalleberg, H. (1958). Observations in a stream tank of territoriality and competition in juvenile salmon and trout (Salmo salar L. and S. trutta). Report of the Institute of Freshwater Research 39: 55-98.

Kettunen, M, Terry, A., Tucker, G. & Jones A. (2007). *Guidance on the maintenance of landscape features of major importance for wild flora and fauna - Guidance on the implementation of Article 3 of the Birds Directive (79/409/EEC) and Article 10 of the Habitats Directive (92/43/EEC).* Institute for European Environmental Policy (IEEP), Brussels, 114 pp. & Annexes.

Lenhardt, M. & Sismour, E., (1995). Hearing in the Sea Lamprey (Petromyzon marinus) and the Long Nose Gar (Lepisosteus spatula).. *Association for Research in Otolaryngology Abstracts:,* Issue 259.

Marnell, F., Néill, L.Ó. and LYNN, D., (2011). How to calculate range and population size for the otter? The Irish approach as a case study. *IUCN Otter Specialist Group Bulletin*, *28*(8), pp.15-22.

Maarten, P & Henkensj, R. H. G (1997). Possible Impacts of Disturbance to Waterbirds: Individuals, Carrying Capacity and Populations. *Wildfowl* 48: 225-236.

McCain, B. B., Malins, D. C., Krahn, M. M., Brown, D. W., Gronlund, W. D., Moore, L. K., & Chan, S. L. (1990). Uptake of aromatic and chlorinated hydrocarbons by juvenile chinook salmon (Oncorhynchus tshawytscha) in an urban estuary. Archives of Environmental Contamination and Toxicology, 19, 10-16.

MWP (2024). Preliminary Grid Route Options Assessment Report, Brittas Wind Farm. January 2024.

NPWS (2013). Site Synopsis: Lower River Suir SAC, Site Code: 002137. Department of Arts, Heritage and the Gaeltacht.

NPWS (2015). Hen harrier Conservation and the Forestry Sector in Ireland. National Parks and Wildlife Service.

NPWS (2017). Conservation Objectives: Lower River Suir SAC, Site Code 004158. Version 1. National Parks and Wildlife Service, Department of Arts, Heritage, Regional, Rural and Gaeltacht Affairs.

NRA (2008). *Guidelines for the treatment of otters prior to the construction of national road schemes.*

Weber, D. D., Maynard, D. J., Gronlund, W. D., & Konchin, V. (1981). Avoidance reactions of migrating adult salmon to petroleum hydrocarbons. Canadian Journal of Fisheries and Aquatic Sciences, 38(7), 779-781.

Woodrow APEM Group (2024). Ornithology Report. *Woodrow APEM Report P00008667*. Ørsted. Popper, A., (2005). *A review of Hearing by Sturgeon and Lamprey,* s.l.: U.S. Army Corps of Engineers, Portland District .

Ruddock, M., Wilson-Parr, R., Lusby, J., Connolly, F., J. Bailey, & O'Toole, L. (2024). The 2022 National Survey of breeding Hen Harrier in Ireland. Report prepared by Irish Raptor Study Group (IRSG), Birdwatch Ireland (BWI), Golden Eagle Trust (GET) for National Parks & Wildlife Service (NPWS). Irish Wildlife Manuals, No. 147. National Parks and Wildlife Service, Department of Housing, Local Government and Heritage, Ireland.

Scarton, F. (2018). Disturbance of Non-Breeding Waders by Pedestrians and Boats in a Mediterranean Lagoon. *Ardeola* 65: 209-220. 10.13157/arla.65.2.2018.ra1.

Scott Wilson and Levett-Therivel, (2006). *Appropriate Assessment of Plans.* Scott Wilson, Levett-Therivel Sustainability Consultants, Treweek Environmental Consultants and Land Use Consultants.

Twaite shad (Alosa fallax), (2024). Inland Fisheries Ireland. Available at: https://www.fisheriesireland.ie/species/twaite-shad-alosa-fallax (Accessed: 02 July 2024).

Jolly, M. T., P. S. Maitland, and M. J. Genner (2011). Genetic monitoring of two decades of hybridization between allis shad (Alosa alosa) and twaite shad (Alosa fallax). *Conservation Genetics* 12: 1087-1100.

Department of the Environment Heritage and local Government (2006) Wind Energy Development Guidelines.

Department of Housing Planning and Local Government (2019) Draft Revised Wind Energy Development Guidelines.

Appendix A: Relevant Legislation

European Nature Directives (Habitats and Birds)

The Habitats Directive (Council Directive 92/43/EEC on the Conservation of Natural Habitats and of Wild Fauna and Flora) forms the basis for the designation of Special Areas of Conservation. Similarly, Special Protection Areas are classified under the Birds Directive (Council Directive 2009/147/EEC on the Conservation of Wild Birds). Collectively, Special Areas of Conservation (SAC) and Special Protection Areas (SPA) are referred to as the Natura 2000 network. In general terms, they are considered to be of exceptional importance for rare, endangered or vulnerable habitats and species within the European Community.

Under Article 6(3) of the Habitats Directive an appropriate assessment must be undertaken for any plan or project that is likely to have a significant effect on the conservation objectives of a Natura 2000 site. An appropriate assessment is an evaluation of the potential impacts of a plan or project on the conservation objectives of a Natura 2000 site[28], and the development, where necessary, of mitigation or avoidance measures to preclude negative effects.

Article 6, paragraph 3 of the EC Habitats Directive 92/43/EEC ("the Habitats Directive") states that:

> "*Any plan or project not directly connected with or necessary to the management of the site but likely to have a significant effect thereon, either individually or in combination with other plans or projects, shall be subject to appropriate assessment of its implications for the site in view of the site's conservation objectives. In the light of the conclusions of the assessment of the implications for the site and subject to the provisions of paragraph 4, the competent national authorities shall agree to the plan or project only after having ascertained that it will not adversely affect the integrity of the site concerned and, if appropriate, after having obtained the opinion of the general public*"

The Habitats Directive is transposed into Irish law by the EC (Birds and Natural Habitats) Regulations 2011 – 2015. Part XAB of the Planning and Development Acts 2000 to 2020 transposes Article 6(3) and 6(4) of the Habitats Directive in respect of land use plans and proposed projects requiring development consent.

European Commission (Birds and Natural Habitats) Regulations 2011 to 2021 – Part 5

Part 5 of the European Commission (Birds and Natural Habitats) Regulations 2011 – 2021 sets out the circumstances under which an 'appropriate assessment' is required. Section 42(1) requires that '*a screening for Appropriate Assessment of a plan or project for which an application for consent is received, or which a public authority wishes to undertake or adopt, and which is not directly connected with or necessary to the management of the site as a Natura 2000 site, shall be carried out by the public authority to assess, in view of best scientific knowledge and in view of the conservation*

[28] Also referred to as European Sites in the Planning and Development Acts 2000 – 2020.

objectives of the site, if that plan or project, individually or in combination with other plans or projects is likely to have a significant effect on the European site.'

Section 42(2) expands on this, stipulating that a public authority must carry out a screening for Appropriate Assessment before consent for a plan or project is given, or a decision to undertake or adopt a plan or project is taken. To assist a public authority to discharge its duty in this respect, Section 42(3)(a) gives them the authority to direct a third party to provide a Natura Impact Statement and Section 42(3)(b) allows them to request any additional information that is considered necessary for the purposes of undertaking a screening assessment.

Section 42(6) requires that '*the public authority shall determine that an Appropriate Assessment of a plan or project is required where the plan or project is not directly connected with or necessary to the management of the site as a European Site and if it cannot be excluded, on the basis of objective scientific information following screening under this Regulation, that the plan or project, individually or in combination with other plans or projects, will have a significant effect on a European site*'.

Appendix B – Ornithology Desk Study

Brittas Wind Farm, Co. Tipperary

Ornithological desk study:

Brittas Wind Farm Limited, Ørsted Onshore Ireland Midco Limited

Report prepared by APEM Group Woodrow

APEM Group Woodrow Ref: P00008667

Date: 29 October 2024

woodrow
APEM Group

Client: **Brittas Wind Farm Ltd - Ørsted Onshore Ireland Midco Ltd**

Address: Floor 5, City Quarter Lapps Quay Cork T12 A2XD

Project reference: P00008667

Date of issue: 29 October 2024

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Revision and amendment register

Version Number	Date	Section(s)	Page(s)	Summary of Changes	Approved by
1	08/05/2024	All	All	V.01 for internal review	JP
2	26/09/2024	All	All	V.02 for client review	MT
3	29/10/2024	All	All	V.03 final issue	MT/EH

Statement of Authority

This report was compiled by Adrian Walsh and Julieta Pedrana, assisted by Conn Barry and Bruno Mels. The report has been reviewed and approved by Mike Trewby.

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).

QUALIFICATIONS

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B.Sc. – Zoology, National University of Ireland, Galway, 2018
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B.Sc. – Biological Sciences, University of Mar del Plata, Argentina, 2006
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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 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.

This report documents the results from the desk study

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. 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.

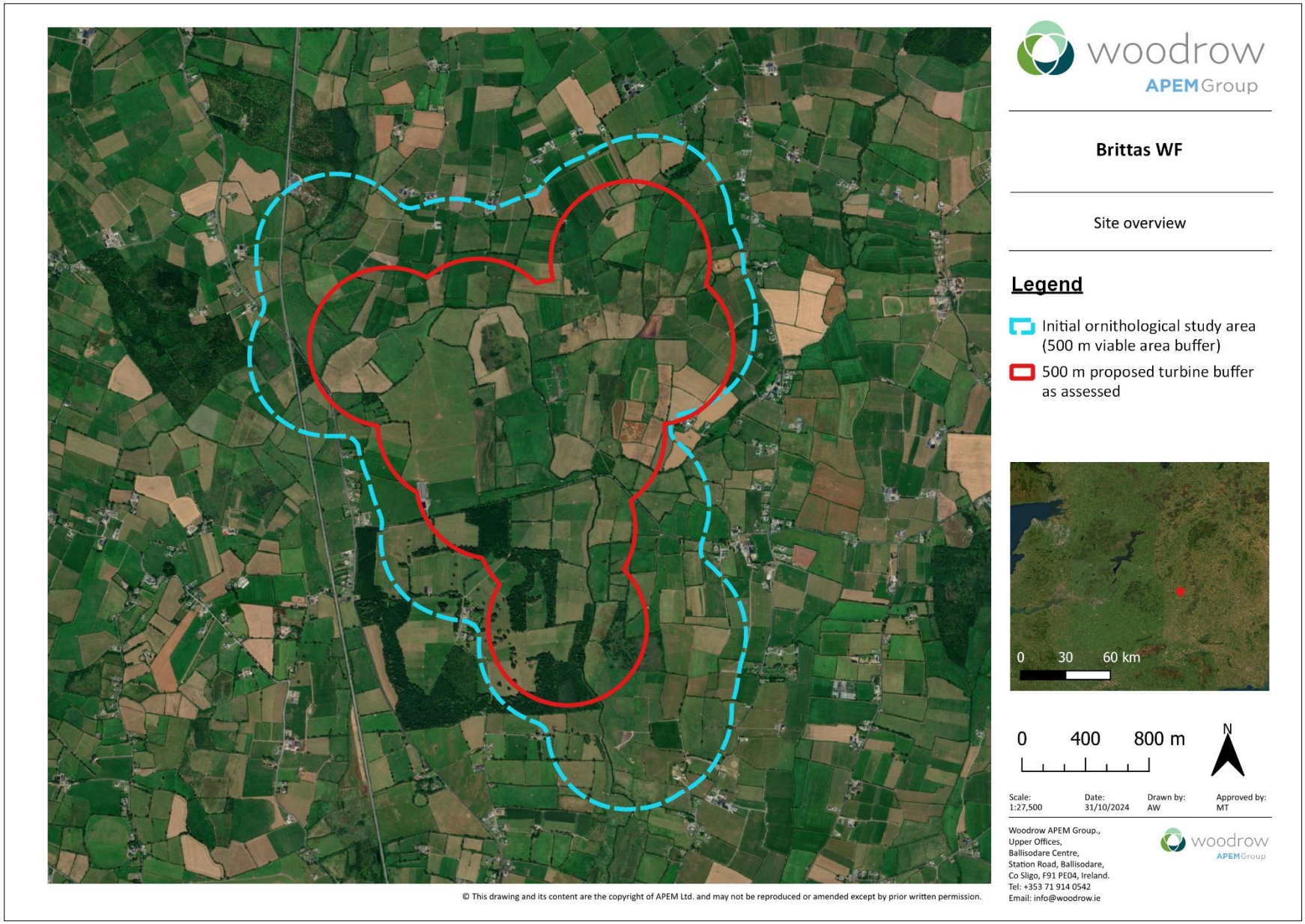

Figure 7A.1: Overview map showing ornithological study area – 500 m turbine buffer

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. I-WeBS sites

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. Kingfisher

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.

[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

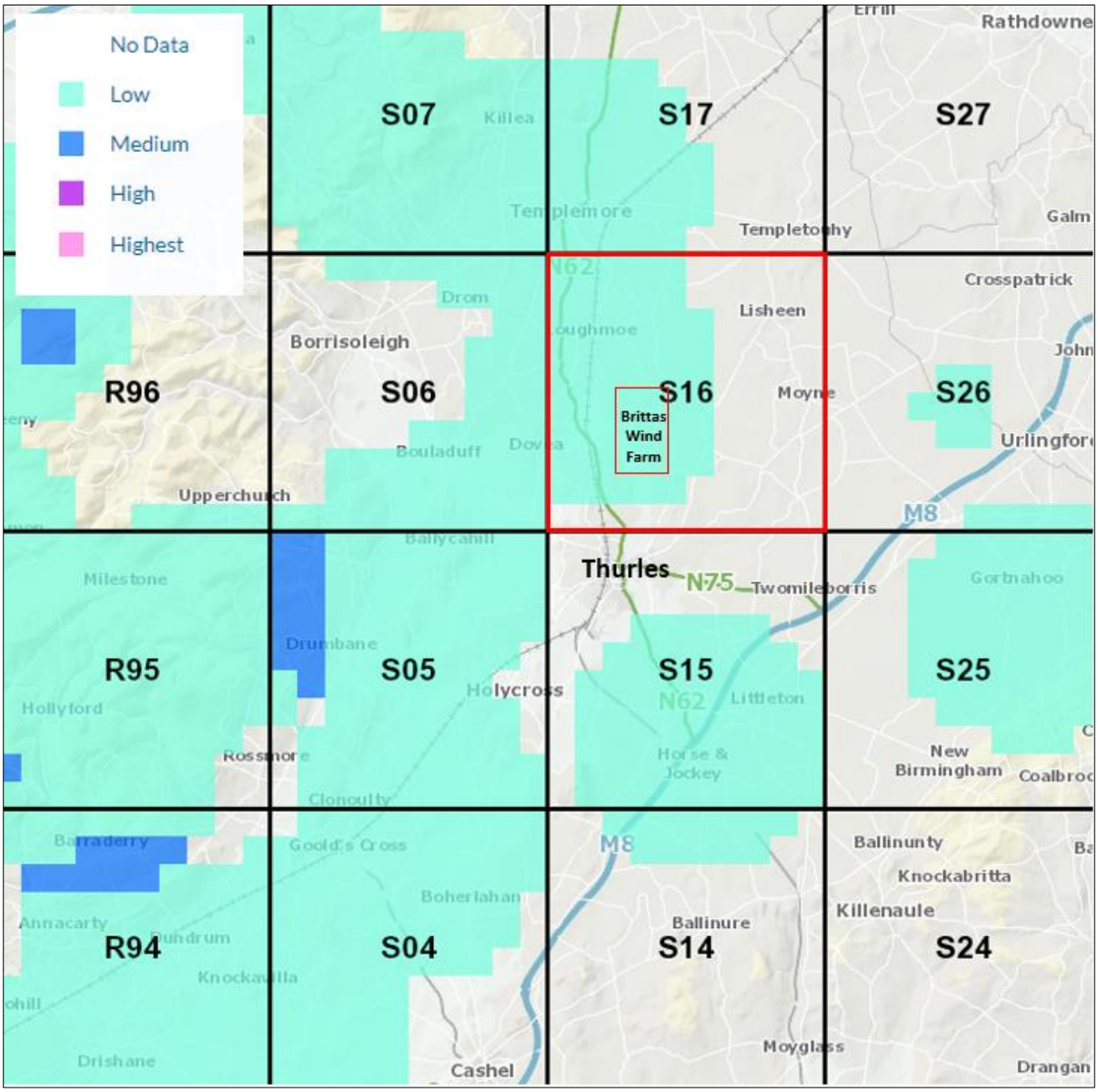

Figure 7A.2: Bird sensitivity to wind energy

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

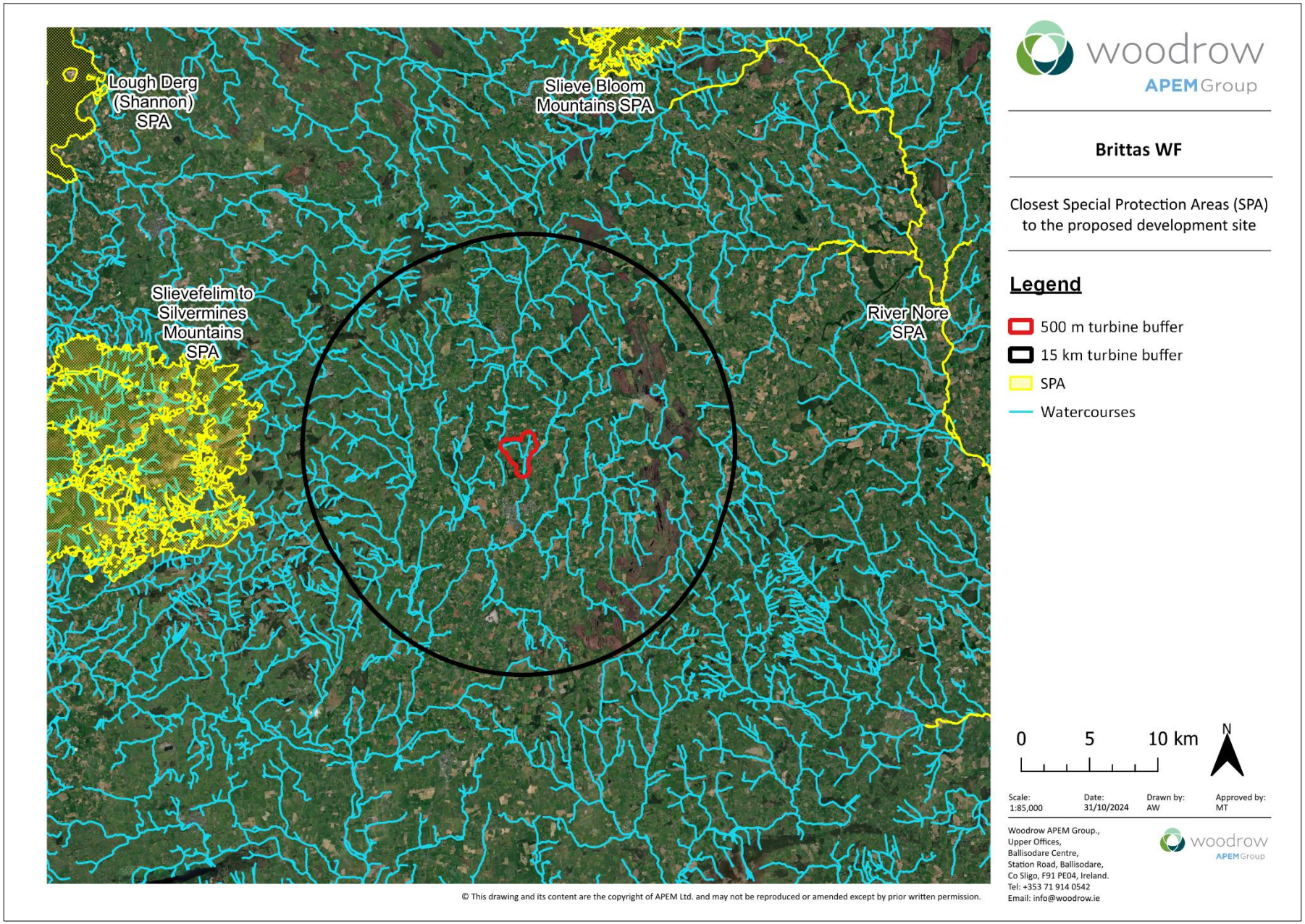

Figure 7A.3: Location of SPAs in relation the proposed Wind Farm Site

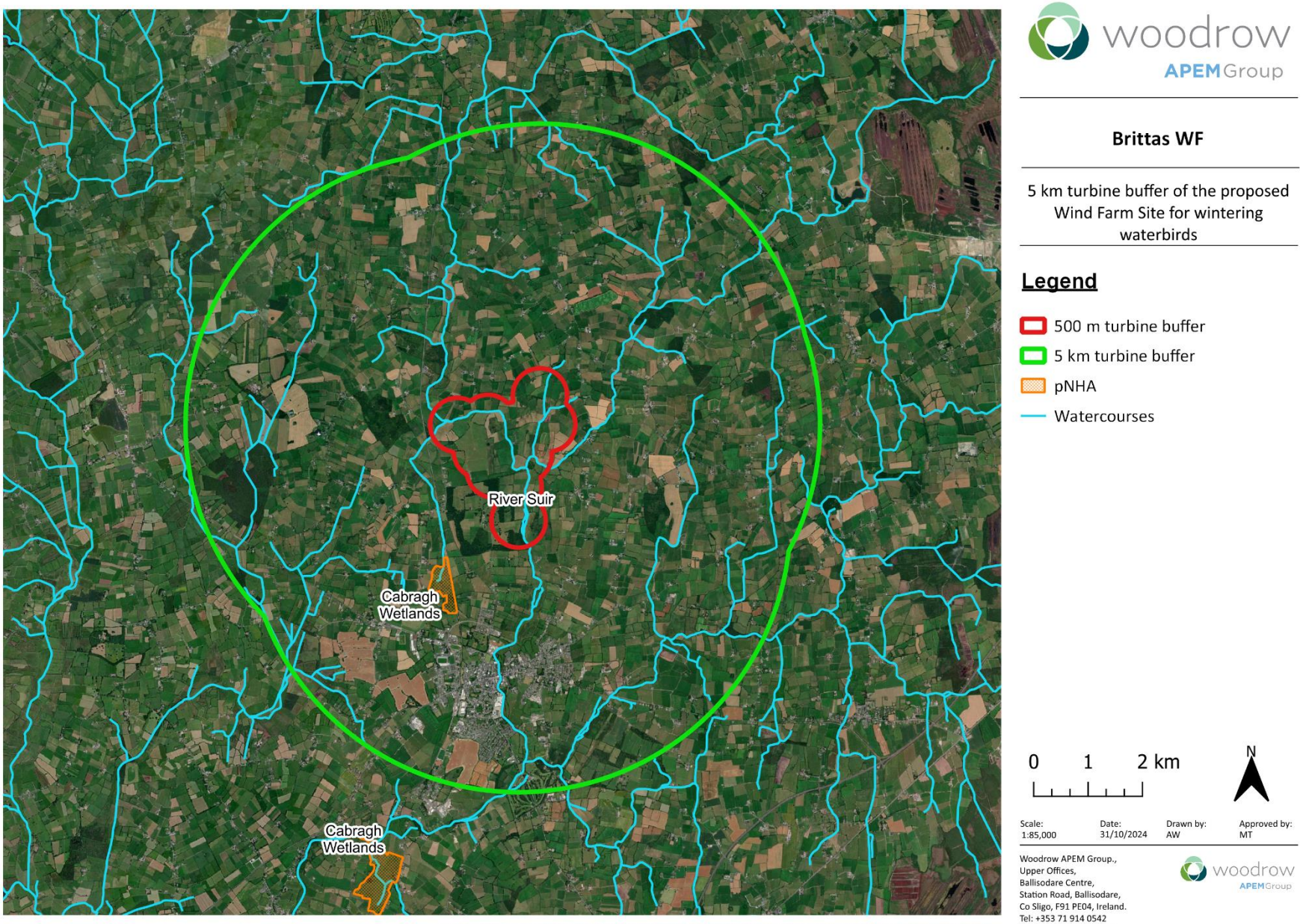

Figure 7A.4: Location of pNHAs with an ornithological interest in the vicinity of the proposed Wind Farm Site

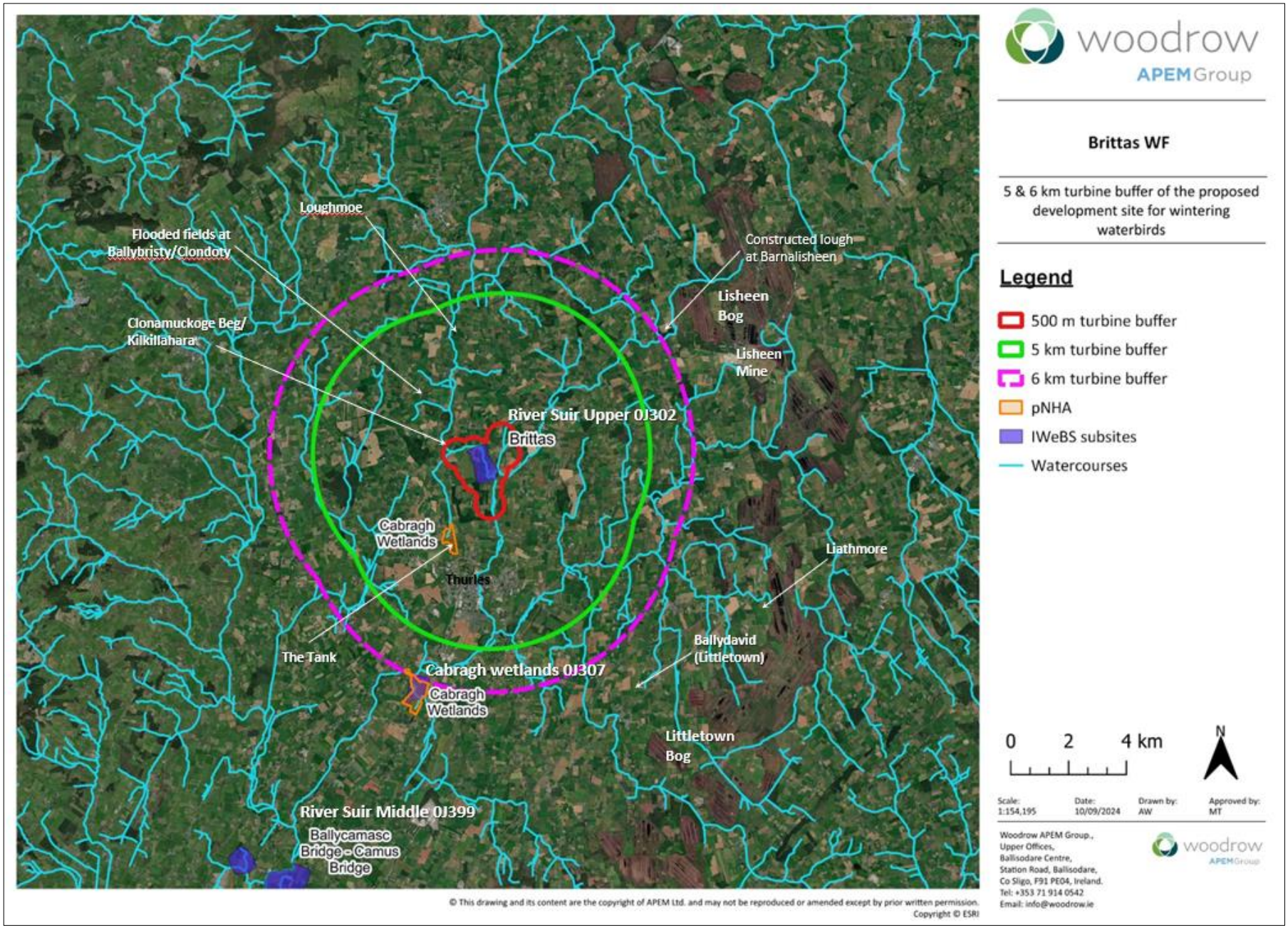

Figure 7A.5: I-WeBS count sections and other wetlands identified for monitoring

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. REFERENCES

Alerstam, T., Rosen M., Backman J., G P., Ericson P., and Hellgren O. (2007). Flight Speeds among Bird Species: Allometric and Phylogenetic Effects. *PLoS Biol*, 5, 1656-1662.

APEM (2024). *Brittas Wind Farm Appropriate Assessment Screening and Natura Impact Statement*. September 2024, APEM

Aschwanden, J., Stark, H., Peter, D., Steuri, T., Schmid, B. & Liechti, F. (2018). Bird collisions at wind turbines in a mountainous area related to bird movement intensities measured by radar. *Biological Conservation* 220: 228-236.

APEM (2013). *East Anglia ONE Offshore Windfarm: Lesser black-backed gull. Technical Clarification Note*. APEM Scientific Report 512547 – 6.

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

Band, W., Madders, M., & Whitfield, D. P. (2007). Developing Field and Analytical Methods to Assess Avian Collision Risk at Wind Farm Sites. In: de Lucas, M., Janss, G. & Ferrer, M. (Eds) 2007. *Birds and Wind Farms – Risk Assessment and Mitigation*. Quercus Editions, Madrid, 259-279.

BirdWatch Ireland (2010). *Action Plan for Upland Birds in Ireland 2011-2020*. BirdWatch Ireland's Group Action Plan for Irish Birds. BWI Kilcoole, Co. Wicklow.

Barn Owl Trust (2015). *Barn Owls and Rural Planning Applications- a Guide*. The Barn Owl Trust. Available at: Wind turbines and Barn Owls - The Barn Owl Trust

Barton, C., Pollock, C., Norriss, D.W., Nagle, T., Oliver, G.A. & Newton, S. (2006). The second national survey of breeding hen harriers *Circus cyaneus* in Ireland 2005. *Irish Birds* 8, 1-20.

Bastos, R., Pinhanços, A., Santos, M., Fernandes, R.F., Vicente, J.R., Morinha, F., Honrado, J.P., Travassos, P., Barros, P. & Cabral, J. A. (2016). Evaluating the regional cumulative impact of wind farms on birds: how can spatially explicit dynamic modelling improve impact assessments and monitoring? *Journal of Applied Ecology*, 53, 1330-1340.

Beston, J., Diffendorfer, J.E, Loss, S.R., & Johnson, D.H. (2016). Prioritizing Avian Species for Their Risk of Population-Level Consequences from Wind Energy Development. *PLoS One* 11(3)

Bibby, C. J., Burgess, N. D. & Hill, D. A. & Mustoe, S. (2000). *Bird Census Techniques (Second edition)*. Academic Press, London.

Blew, J., Hoffman, M., Nehls, G. & Hennig, V. (2008). Investigations of the bird collision risk and the responses of harbour porpoises in the offshore wind farms Horns Rev, North Sea, and Nysted, Baltic Sea, in Denmark. *Part I: Birds. Universität Hamburg and BioConsult SH Report*.

Boland, H. & Crowe, O. (2008). An assessment of the distribution range of Greylag (Icelandic-breeding & feral populations) in Ireland. Final BWI report to the NPWS and the NIEA.

Boland, H. & Crowe, O. (2012). *Irish wetland bird survey: waterbird status and distribution 2001/02 – 2008/09*. BirdWatch Ireland, Kilcoole, Co. Wicklow.

Bregnballe, T., Aaen, K. & Fox, A.D. (2009). Escape distances from human pedestrians by staging waterbirds in a Danish wetland. *Wildfowl* 2: 115-130.

Bruderer, B. & Boldt A. (2001). Flight characteristics of birds: I. radar measurements of speeds. *Ibis* 143, pp 178-204.

Brown, L. & Amadon, D. (1989). *Eagles, Hawks and Falcons of the World*. Spring Books, London

Burke, B. (2017). Species Focus: Mute Swan. *Wings* Spring 2017 BirdWatch Ireland.

Burke, B., Lewis, L. J., Fitzgerald, N., Frost, T., Austin, G. & Tierney, T. D. (2018). Estimates of waterbird numbers wintering in Ireland, 2011/12 – 2015/16. *Irish Birds* 11, 1-12.

Burke, B., McElwaine, J. G., Fitzgerald, N., Kelly, S. B. A., McCulloch, N., Walsh, A. J. & Lewis, L.J. (2021). Population size, breeding success and habitat use of Whooper Swan *Cygnus cygnus* and Bewick's Swan Cygnus *columbianus bewickii* in Ireland: results of the 2020 International Swan Census. *Irish Birds,* 45, 57-70.

Burke, B., Fitzgerald, N., Kelly, S. & Lewis, L.J. (2022). *Greylag and Pink-footed geese in Ireland 2017/18-19/20*. Irish Wetland Bird Survey (I-WeBS) Report. BirdWatch Ireland, Wicklow.

BWI (2010). *Action Plan for Upland Birds in Ireland 2011-2020*. BirdWatch Ireland's Group Action Plans for Irish Birds. BirdWatch Ireland, Kilcoole, Co. Wicklow.

BWI & NPWS. *I-WeBS Counter Manual. Guidelines for Irish Wetland Bird Survey counters*. BirdWatch Ireland.

Chamberlain, D., Freeman, S. & Rehfisch. M. (2005). *Appraisal of Scottish Natural Heritage's Wind Farm Collision Risk Model and its Application*. BTO Research Report 401. BTO. Thetford.

Clarke, R. & Watson, D. (1990). The Hen Harrier *Circus cyaneus* winter roost survey in Britain and Ireland, *Bird Study*, 37(2), 84-100.

Clifford, D. & Mather, L., (2021a). *Report 1: Initial Scoping Investigation, Cormorant Roosting in Offshore Wind Farms – An Investigation into Bird Behaviour, Conflicts and Mitigation Measures at Burbo Bank*. Internal Ørsted report, Unpublished.

Clifford, D. & Mather, L., (2021b). *Report 2: Environmental Distribution & Solution Design, Cormorant Roosting in Offshore Wind Farms – An Investigation into Bird Behaviour, Conflicts and Mitigation Measures at Burbo Bank*. Internal Ørsted report, Unpublished.

Colhoun, K. & Cummins, S. (2013). Birds of Conservation Concern in Ireland 2014–2019. *Irish Birds* 9: 523-544.

Colhoun, K., Flannelly, F., O'Neill, J., Phelan, E., Servignat, H., O'Donoghue, B. & Kelly, S. (2022). Status and distribution of breeding Eurasian Curlew in Ireland 2021. *Irish Wildlife Manuals*, No. 138. National Parks and Wildlife Service, Department of Housing, Local Government and Heritage, Ireland.

Collins, K. (2017). Site Guide: Cabragh Wetland, Co. Tipperary. *Wings* 84 Spring 2017, BirdWatch Ireland.

Cook, A.S.C.P., Humphreys, E.M., Masden, E.A., & Burton, N.H.K. (2014). *The avoidance rates of collision between birds and offshore turbines*. Scottish Marine and Freshwater Science Volume 5 Number 16. Marine Scotland Science, Aberdeen.

Creme, G.A., Walsh, P.M., O'Callaghan, M. & Kelly, T.C. (1997). The changing status of the lesser black-backed gull *Larus fuscus* in Ireland. *Biology and Environment: Proceedings of the Royal Irish Academy* 97B(2): 149-156.

Crockford, N. (1992). *A review of the possible impacts of wind farms on birds and other wildlife*. JNCC Report No. 27. Joint Nature Conservation Committee, Peterborough.

Crowe, O. (2005). *Ireland's Wetlands and their Waterbirds: Status and Distribution*. BWI, Co. Wicklow.

Crowe, O., G. Webb, E. Collins & Smiddy, P. (2008). *Assessment of the distribution and abundance of Kingfisher Alcedo atthis and other riparian birds on two SAC river systems in Ireland*. A report commissioned by the National Parks and Wildlife Service and prepared by BirdWatch Ireland

Crowe, O., Musgrove, A. J. & O'Halloran, J. (2014). Generating population estimates for common and widespread breeding birds in Ireland. *Bird Study,* 61(1), 82-92.

Crowe. O, Tierney, T. D. & Burke, B. (2021). Status of Rare Breeding Birds across the island of Ireland, 2013–2018. *Irish Birds* 43 29-38.

Cullen, C. & Williams, H. (2010). Sparrowhawk *Accipiter nisus* mortality at a wind farm in Ireland. *Irish Birds*, 9, 125-126.

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

Cummins, S., Lauder, C., Lauder, A. & Tierney, T. D. (2019). The Status of Ireland's Breeding Seabirds: Birds Directive Article 12 Reporting 2013 – 2018. *Irish Wildlife Manuals*, No. 114. National Parks and Wildlife Service, Department of Culture, Heritage and the Gaeltacht, Ireland.

Cutts, N., Hemingway, K. & J Spencer, J. (2013). *Waterbird Disturbance Mitigation Toolkit Informing Estuarine Planning & Construction Projects*. University of Hull, TIDE – Tidal River Development, Environment Agency.

Darvill, B. (2020,). *Tracking Short-eared Owls: Notes from the field.* BTO January 28, BTO Available at: https://www.bto.org/community/blog/tracking-short-eared-owls-notes-field

Department of Environment, Heritage and Local Government (2010). *Appropriate Assessment of Plans and Projects in Ireland – Guidance for Local Authorities*.

Derouaux, A., Everaert, J., Brackx, N., Driessens, G., Martin-Gìl, A., Paquet, J.-Y. (2012): Reducing bird mortality caused by high- and very-high voltage power lines in Belgium. Final Report, Elia and Aves-Natagora, 56 pp.

Desholm, M. & Kahlert, J. (2005). Avian collision risk at an offshore wind farm.

Devereux, C. L., Den`ny, M. J. H. & Whittingham, M. J. (2008). Minimal effects of wind turbines on the distribution of wintering farmland birds. *Journal of Applied Ecology* 45: 1689-1694.

Dorka, U. Straub, V.F. & Trautner, J. (2014). Wind power above forest - Courtship of the woodcock at risk? Findings from a case study in Baden-Wuerttemberg (Northern Black Forest) *Naturschutz und Landschaftsplanung*, 46: 69-78.

Drewitt, A. L. & Langston, R. H. (2006). Assessing the impacts of wind farms on birds. *Ibis* 148, 29–42.

Drewitt, A. L. & Langston, R. H.W. (2008). Collision Effects of Wind-power Generators and Other Obstacles on Birds. *Annals of the New York Academy of Sciences* 1134:1, 233-266.

Dürr, T. (2023). *Vogelverluste an Windenergieanlagen in Deutschland*. Bird losses at wind turbines in Germany, Documentation from the central database of the State Ornithological Institute at the Brandenburg State Office for the Environment complied by Tobias Dürr, 09 August 2023. Accessed via Auswirkungen von Windenergieanlagen auf Vögel und Fledermäuse: https://lfu.brandenburg.de/lfu/de/aufgaben/natur/artenschutz/vogelschutzwarte/arbeitsschwerpunkt-entwicklung-und-umsetzung-von-schutzstrategien/auswirkungen-von-windenergieanlagen-auf-voegel-und-fledermaeuse/

Dürr, T. & Langgemach, T. (2021). *Informationen über Einflüsse der Windenergieerzeugung auf Vögel*. Stand: 7. Mai 2021, Landesamt für Umwelt Brandenburg, Staatliche Vogelschutzwarte.

Dürr, T. & Langgemach, T. (2023). *Informationen über Einflüsse der Windenergieerzeugung auf Vögel*. Stand: 9. August 2023, Landesamt für Umwelt Brandenburg, Staatliche Vogelschutzwarte.

Enderson, J. H. & Craig, G. R. (1997). Wide ranging by nesting peregrine falcons (*Falco peregrinus*) determined by radiotelemetry. *Journal of Raptor Research,* 31(4), 333-338.

Erickson, W.P., Johnson, D.J., Strickland, M.D., Young Jr, D.P., Sernka, K.J. & Good, R.E. (2001). *Avian Collisions with Wind Turbines: A Summary of Existing Studies and Comparisons to Other Sources of Avian Collision Mortality in the United States*. Resource document compiled for National Wind Coordinating Committee (NWCC) by Western EcoSystems Technology Inc.

Erickson, W.P., Wolfe, M.M., Bay, K.J., Johnson, G.D. & Gehring, J.L. (2014). A Comprehensive Analysis of Small-Passerine Fatalities from Collision with Turbines at Wind Energy Facilities. *PLoS ONE* 9(9).

Erritzøe, J. (1999). Causes of mortality in the Long-eared Owl *Asio otus*. *Dansk Orn. Foren. Tidsskr.* 93 (1999): 162-164.

Everaert, J. (2003). Wind turbines and birds in Flanders: Preliminary study results and recommendations. *Natuur*.*Oriolus*, 69 (4), 145–155.

Everaert, J. (2014). Collision risk and micro-avoidance rates of birds with wind turbines in Flanders. *Bird Study* 61, 220–230.

Ewing, S. R., Rebecca, G. W., Heavisides, A., Court, I., Lindley, P., Ruddock, M., Cohen, S. & Eaton, M. A. (2011). Breeding status of the Merlin *Falco columbarius* in the UK in 2008. *Bird Study*, 58, 379–389.

Fehily Timoney FTC (2022). *Brittas Wind Farm Planning: Bird Surveys – Baseline ornithological surveys – Brittas Wind Farm winter 2020/2021 and summer 2021*. Results report prepared by FTC on behalf of Enerco (Lissarda) Ltd, March 2022.

Fernández-Bellon, D., Wilson, M.W., Irwin, S. & O'Halloran, J. (2018). Effects of development of wind energy and associated changes in land use on bird densities in upland areas. *Conservation Biology* 33(2): 413-422.

Fox, T., Francis, I., Norriss, D. & Walsh, A. (2021). *Report of the 2019/20 International census of Greenland white-fronted geese*. Greenland White-fronted Goose Study, Rønde, Denmark and Wexford, Ireland.

Furness, R.W., Wade, H.M. & Masden, E. (2013). Assessing vulnerability of marine bird populations to offshore wind farms. *Journal of Environmental Management*. 119, 56-66

Furness, R.W. (2019). *Avoidance rates of herring gull, great black-backed gull and common gull for use in the assessment of terrestrial wind farms in Scotland*. Scottish Natural Heritage Research Report No. 1019.

Gibbons, D.W., Reid, J.B. & Chapman, R.A. (1993). *The New Atlas of Breeding Birds in Britain and Ireland: 1988-1991*. T. & A.D. Poyser.

Gilbert, G., Gibbons, D.W. & Evans, J. (1998). *Bird Monitoring Methods*. Published by the RSPB in association with BTO, WWT, JNCC, ITE & Seabird Group, Sandy.

Gilbert, G., Stanbury, A., & Lewis, L. (2021). Birds of Conservation Concern in Ireland 2020 – 2026. *Irish Birds*, 43, 1–22.

Gitting, T. (2019). *Castlebanny Wind Farm: EIAR Volume 3 Appendix 7-5: Castlebanny Wind Farm woodcock surveys*. Report No. 1912-F1 Revision 2, 08 August 2019 access via https://castlebannyplanning.ie/environmental/

Gittings, T. (2022). *Ballivor Wind Farm: EIAR Volume 2, Appendix 7-6 Collision Risk Assessment – Appendix 1 Golden Plover Avoidance Rates*. Report No. 2211-F1, version 2, 18 July 2022 accessed via Bord Pleanála Case reference: PA25M.316212 https://www.pleanala.ie/en-ie/case/316212

Gómez-Catasús, J., Garza, V. & Traba, J. (2018). Wind farms affect the occurrence, abundance and population trends of small passerine birds: The case of the Dupont's lark. *Journal of Applied Ecology* 55(40): 2033-2042.

Gonzalez, J., Düttmann, H. & Wink, M. (2009). Phylogenetic relationships based on two mitochondrial genes and hybridization patterns in Anatidae. *Journal of Zoology* 279 (3): 310–318.

Goodship, N. & Furness, R.W. (2019). Seaweed hand-harvesting: literature review of disturbance distances and vulnerabilities of marine and coastal birds. *Scottish Natural Heritage Research Report* No. 1096.

Goodship, N. M. & Furness, R. W. (2022). *Disturbance Distances Review: An updated literature review of disturbance distances of selected bird species*. *NatureScot Research Report* No. 1283.

Green, R.M., Thaxter, C.B., Johnston, D.T., Boersch-Supan, P.H., Bouten, W. & Burton, N.H.K. (2023). *Assessing Movements of Lesser Black-backed Gulls using GPS Tracking Devices in Relation to the Galloper Wind Farm*. Final Report British Trust for Ornithology.

Grünkorn, T. (2011). *Bird fatalities at wind turbines - How many birds actually collide with wind turbines at a well-known hotspot of bird migration, the island of Fehmarn in northern Germany*? Poster for Conference on wind energy and wildlife impacts (CWW-2011), Norway

Grünkorn, T. (2015). *A large-scale, multispecies assessment of avian mortality rates at onshore wind turbines in northern Germany* (Progress). Conference on wind energy and wildlife impacts (CWW-2015), Berlin.

Grünkorn, T., von Rönn, J., Blew, J., Nehls, G., Weitekamp, S., Timmermann, H., Reichenbach, M., Coppack, T., Potiek, A. & Krüger, O. (2016). *Prognosis and assessment of bird collision risks at wind turbines in northern Germany (PROGRESS)*. Project period; Nov-2011 to Jun-2015, Research & development project wind energy, Final report 2016 commissioned by the Federal Ministry for Economic Affairs & Energy in the framework of the 6. Energy research programme of the federal government. Reference no. FKZ 0325300A-D.

Gue, T., Walker, J. Mehl, K. & Gleason, J.S. (2013). The Effects of a Large-Scale Wind Farm on Breeding Season Survival of Female Mallards and Blue-Winged Teal in the Prairie Pothole Region. *Journal of Wildlife Management* 77(7): 1360-1371.

Hardey, J., Crick, H., Wernham, C., Riley, H., Etheridge, B. & Thompson, D. (2013). *Raptors: A field guide to survey and monitoring* (Third Edition). The Stationary Office, Edinburgh.

Hötker, H. (2006). *The impact of repowering of wind farms on birds and bats.* Nature and Biodiversity Conservation Union.

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

Hötker, H. (2017). Birds: Displacement, pp 157-190, in Perrow, M.R. (Ed.), *Wildlife and wind farms, conflicts and solutions. Onshore: Potential Effects*, *Vol. 1*. Exeter, UK: Pelagic Publishing.

Humphreys, E.M., Cook, A.S.C.P., & Burton, N.H.K. (2015). *Collision, Displacement and Barrier Effect Concept Note*. BTO Research Report, 669.

Humphreys, E.M., Masden, E.A., Cook, A.S.C.P. & Pearce-Higgins, J.W. (2016). *Review of Cumulative Impact Assessments in the context of the onshore wind farm industry*. SWBSG Commissioned report number 1505.

Humphreys, E.M., Marchant, J.H., Wilson, M.W. & Wernham, C.V. (2015, updated 2017a). *Kestrel* (*Falco tionunculus*): *SWBSG Species Dossier 10*. Report by BTO Scotland to SWBSG as part of Project 1403. Updated by SWBSG March 2017.

Humphreys, E.M., Marchant, J.H., Wilson, M.W. & Wernham, C.V. (2015, updated 2017b). *Peregrine* (*Falco peregrinus*): *SWBSG Species Dossier 12*. Report by BTO Scotland to SWBSG as part of Project 1403. Updated by SWBSG March 2017.

Humphreys, E.M., Marchant, J.H., Wilson, M.W. & Wernham, C.V. (2015, updated 2017c). *Golden plover* (*Pluvialis apricaria*): *SWBSG Species Dossier 13*. Report by BTO Scotland to SWBSG as part of Project 1403. Updated by SWBSG March 2017.

Humphreys, E.M., Marchant, J.H., Wilson, M.W. & Wernham, C.V. (2015, updated 2017d). *Snipe* (*Gallinago gallinago*): *SWBSG Species Dossier 15*. Report by BTO Scotland to SWBSG as part of Project 1403. Updated by SWBSG March 2017.

Hutchinson, C. (1989). *Birds in Ireland*. Poyser, London.

Kennedy, J., Burke, B., Fitzgerald, N., Kelly, S.B.A., Walsh, A.J. & Lewis, L.J. (2022). *Irish Wetland Bird Survey: I-WeBS National and Site Trends Report 1994/95 – 2019/20*. BirdWatch Ireland Waterbird Report to the National Parks and Wildlife Service. BirdWatch Ireland, Wicklow. Available at: https://birdwatchireland.ie/app/uploads/2022/04/iwebs_trends_report.html

Kingsley, A. & Whittam, B. (2005). *Wind turbines and birds. A background review for environmental assessment*. Prepared by Bird Studies Canada for Environment Canada, Canadian Wildlife Service, Quebec, unpublished report draft May 2005.

Krijgsveld, K.L., Akershoek, K., Schenk, F., Dijk, F. & Dirksen, S. (2009). Collision risk of birds with modern large wind turbines. *Ardea* 97: 357–366.

Krijgsveld, K., Heunks, C., Collier, M. & Dirksen, S. (2011a). *Collision victims at wind farms in the Netherlands*. Bureau Waardenburg, The Netherlands. In May, R. & Bevanger, K. (eds.) Norwegian Institute for Nature Research *Proceedings: Conference on Wind energy and Wildlife impacts*. 2-5 May 2011, Trondheim, Norway.

Krijgsveld, K.L., Fijn, R.C., Japink, M., van Horssen, P.W., Heunks, C., Collier, M.P., Poot, M.J.M., Beuker, D. & Dirksen, S. (2011b). *Effect Studies Offshore Wind Farm Egmond aan Zee. Final report on fluxes, flight altitudes and behaviour of flying birds*. Report 10-219, prepared by Bureau Waardenburg, Culemborg, Report No. 10-219, commissioned by: NordzeeWind.

Krijgsveld, K.L. (2014). *Avoidance behaviour of birds around offshore wind farms - Overview of knowledge including effects of configuration*. July 2014, Report 13-268, prepared by Bureau Waadenburg bv, commissioned by: Rijjkswaterstaat Sea and Delta.

LAG VSW Länderarbeitsgemeinschaft der Vogelschutzwarten - Working Group of German State Bird Conservancies (2015). Recommendations for distances of wind turbines to important areas for birds as well as breeding sites of selected bird species. *Vogelschutz* 51, 15-42.

Langston, R.H.W. & Pullan, J. (2003). *Windfarms and Birds: An analysis of the effects of windfarms on birds, and guidance on environmental assessment criteria and site selection issues*. RSPB/BirdLife.

Larsen, S., Sorace, A. & Mancini, L. (2010). Riparian Bird Communities as Indicators of Human Impacts Along Mediterranean Streams. *Environmental Management* 45(2): 261-273.

Lauder, A. (2020). *Cabragh Wetlands Habitat Study including conservation and centre management recommendations*. Report to Cabragh Wetlands Trust, September 2020.

Lauder, C. & Donaghy, A. (2008). *Breeding Waders in Ireland 2008: A Review and Recommendations for Future Action*. Unpublished report to the National Parks and Wildlife Service, Dublin, Ireland.

Lauder, A. & Lauder, C. (2020). Identification of breeding waterbird hotspots in Ireland. *Irish Wildlife Manuals*, No. 129. National Parks and Wildlife Service, Department of Housing, Local Government and Heritage, Ireland.

Lewis, L. J. & Tierney, T. D. (2014). Low tide waterbird surveys: survey methods and guidance notes. *Irish Wildlife Manuals*, No. 80. National Parks and Wildlife Service, Department of Arts, Heritage and the Gaeltacht, Ireland.

Lewis, L. J., Coombes, D., Burke, B., O'Halloran, J., Walsh, A., Tierney, T. D. & Cummins, S. (2019a) Countryside Bird Survey: Status and trends of common and widespread breeding birds 1998-2016. *Irish Wildlife Manuals*, No. 115. National Parks and Wildlife Service, Department of Culture, Heritage and the Gaeltacht, Ireland.

Lewis, L. J., Burke, B., Fitzgerald, N., Tierney, T. D. & Kelly, S. (2019b). Irish Wetland Bird Survey: Waterbird Status and Distribution 2009/10-2015/16. Irish Wildlife Manuals, No. 106. NPWS, Department of Culture, Heritage and the Gaeltacht, Ireland.

Lewis, L. J., Coombes, R, H., Burke, B., Tierney, T. D., Cummins, S., Walsh, A. J., Ryan, N. & O'Halloran, J. (2020). *Countryside Bird Survey Report 1998-2019*. BirdWatch Ireland. Wicklow.

Lin, J. (1995). *Reactions of summering waterfowl to three types of human disturbance at Lee Metcalf National Wildlife Refuge*. MSc Dissertation, University of Montana

Lindeboom, H. J., Kouwenhoven, H. J., Bergman, M. J. N., Bouma, S., Brasseur, S., Daan, R. Fijn, R.C., de Haan, D., Dirksen, S., van Hal, R. & Hille Ris Lambers, R., ter Hofstede, R. Krijgsveld, K., Leopold, M.F. & Scheidat, M. (2011). Short-term ecological effects of an offshore wind farm in the Dutch coastal zone; a compilation. *Environmental Research Letters* 6(3) 1-13.

Loesch, C.R., Walker, J.A., Reynolds, R.E., Gleason, J.S., Niemuth, N.D., Stephens, S.E., & Erickson, M.A. (2013). Effect of wind energy development on breeding duck densities in the Prairie Pothole Region. *Journal of Wildlife Management*, 77(3), 587–598.

Loss, S.R., Lao, S. Anderson, A.W., Blair, R.B., Eckles, J.W. & Turner, R.J. (2020). Inclement weather and American woodcock building collisions during spring migration. *Wildlife Biology* 2020(1).

Lusby, J. (2011). Species Focus: Buzzard comeback – Numbers continue to soar. *Wings,* Spring 2011, BirdWatch Ireland publication.

Lusby, J. & O'Cleary, M. (2014). *Barn Owls in Ireland: Information on the ecology of Barn Owls and their conservation in Ireland*. BirdWatch Ireland.

Lusby, J., Corkery, I., McGuiness, S., Fernández-Bellon, D., Toal, L., Norriss D., Breen D, O'Donaill, A., Clarke, D. & Irwin, S. (2017). Breeding ecology and habitat selection of Merlin *Falco columbarius* in forested landscapes. *Bird Study,* 64, 445–454.

Lusby, J., O'Clery, M., McGuinness, S., Tosh, D., & Crowe, O. (2021). *The interactions between Barn Owls and major roads: informing management and mitigation*. TII Publications reference RE-ENV07004

Madders, M. & Whitfield, P. (2006). Upland raptors and the assessment of wind farm impacts. *Ibis,* 148(1), 43-56.

Marchant, J.H. (1983). *Common Birds Census instructions*. BTO, Tring.

Marchant, J.H., Hudson, R., Carter, S.P. & Whittington, P. (1990). *Population Trends in British Breeding Birds*. BTO, Tring.

Masden, E. A., Haydon, D. T., Fox, A. D., Furness, R. W., Bullman, R., & Desholm, M. (2009). Barriers to movement: impacts of wind farms on migrating birds. *ICES Journal of Marine Science*, 66(4): 746–753.

Mathiasson, S. (1993). Mute swans, *Cygnus olor*, killed from collision with electrical wires, a study of two situations in Sweden. *Environmental Pollution* 80(3): 239-246.

Mc Guinness, S., Muldoon, C., Tierney, N., Cummins, S., Murray, A., Egan, S. & Crowe, O. (2015). *Bird Sensitivity Mapping for Wind Energy Developments and Associated Infrastructure in the Republic of Ireland*. BirdWatch Ireland, Kilcoole, Wicklow.

Mee, A. (2012). An overview of monitoring for raptors in Ireland. *Acrocephalus* 33 (154/155): 239−245

Mikkola, H. (1983). *Owls of Europe*. AD & T Poyser, Calton.

Moore, N. P., Kelly, P. F., Lang, F. A., Lynch, J. M. & Langton, S. D. (1997). The Peregrine *Falco peregrinus* in quarries: current status and factors influencing occupancy in the Republic of Ireland. *Bird Study*, 44:2, 176-181.

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

Morinha, F., Travassos, P., Seixas, F., Martins, A., Bastos, R., Carvalho, D., Magalhães, P., Santos, M., Bastos, E. & Cabral, J. A. (2014). Differential mortality of birds killed at wind farms in Northern Portugal, *Bird Study* 61, 255-259.

Musters, C.J.M., Noordervliet, M.A.W. & ter Keurs, W.J. (1996). Bird casualties caused by a wind energy project in an estuary. *Bird Study* 43: 124-126.

Muyllaert, M. (2006). *Cabragh Wetlands Management Plan*. The Heritage Council.

NatureScot (2023). *Guidance Note 3: Guidance to support Offshore Wind applications: Marine Birds - Identifying theoretical connectivity with breeding site Special Protection Areas using breeding season foraging ranges*. NatureScot: https://www.nature.scot/doc/guidance-note-3-guidance-support-offshore-wind-applications-marine-birds-identifying-theoretical

Newton, I., Meek, E. R. & Little, B. (1978). Breeding ecology of the Merlin in Northumberland. *British Birds,* 71, 376–398.

Norriss, D.W., Marsh, J., McMahon, D. & Oliver, G.A. (2002). A national survey of breeding hen harriers *Circus cyaneus* in Ireland 1998-2000. *Irish Birds* 7, 1–10.

NPWS (2013). *A review of the SPA network of sites in the Republic of Ireland*. December 2013, NPWS, Department of Arts, Heritage and the Gaeltacht. Available at: https://www.npws.ie/sites/default/files/publications/pdf/SPA%20Review%20Document-December%202013.pdf

NPWS (2019). *Annex B – Bird species' status and trends report format (Article 12) for the period 2013 – 2018*. Accessed (August 2024) via EIONET Central Data Repository: https://bit.ly/34jqBx2

NPWS (2022). *Hen Harrier Conservation and the Wind Energy Sector in Ireland*. Supporting document to the Hen Harrier Threat Response Plan. National Parks and Wildlife Service, Department of Housing, Local Government and Heritage. Available at: https://irishriverproject.com/wp-content/uploads/2022/12/hen-harrier-and-the-wind-energy-sector.pdf

NPWS (2023). Site Synopsis: Lower River Suir SAC [Site Code: 002137]. National Parks & Wildlife Service, Department of Housing, Local Government & Heritage, July 2023.

NRA (2009). *Ecological Surveying Techniques for Protected Flora and Fauna during the Planning of National Road Schemes*. NRA - National Roads Authority, now TII – Transport Infrastructure Ireland. Available at: https://www.tii.ie/media/kzldoawo/guidelines-for-assessment-of-ecological-impacts-of-national-road-schemes.pdf

O'Brien, M. & Smith, K. W. (1992). Changes in the status of waders breeding on wet lowland grassland in England and Wales between 1982 and 1989. *Bird Study,* 39, 165-176.

O'Donoghue, B. (2012). *Hen harrier roost types & guidelines to roost watching*. NPWS, Ely Place, Dublin.

O'Donoghue, B. (2019). Survey Guide: *Hen harrier roost types and guidelines to roost watching*. IHHWS - Irish Hen Harrier Winter Survey.

O'Donoghue, B., Donaghy, A. & Kelly, S. B. A. (2019). National survey of breeding Curlew in the Republic of Ireland, 2015–2017. *Wader Study* 126 (1) 43-48.

Pearce-Higgins, J. W., Stephen, L., Langston, R. H. W., Bainbridge, I. P., and Bullman, R. (2009). The Distribution of Breeding Birds around Upland Wind Farms. *The Journal of Applied Ecology*, 46(6), 1323-1331.

Pearce-Higgins, J. W., Stephen, L., Douse, A. and Langston, R. H. W. (2012). Greater impacts of wind farms on bird populations during construction than subsequent operation: results of a multi-site and multi-species analysis. *The Journal of Applied Ecology*, 49, 386-394. Accessed via https://doi.org/10.1111/j.1365-2664.2012.02110.x

Pease, M. L., Rose, R. K., & Butler, M. J. (2005). Effects of human disturbances on the behavior of wintering ducks. *Wildlife Society Bulletin* 33(1): 103-112.

Perrins, C.M. & Sears, J. (1991). Collisions with overhead wires as a cause of mortality in Mute Swan *Cynus olor*. *Wildfowl* 42: 5-11.

Percival, S.M. (2003). *Birds and Wind Farms in Ireland: A Review of Potential Issues and Impact Assessment*. Sustainable Energy Ireland.

Percival, S., Percival, T., Hoit, M., Langdon, K. & Lowe, T. (2008). *Blood Hill Wind Farm, Norfolk: Post-construction wintering bird surveys (2006-07 and 2007-08)*. Ecology Consulting, Durham report to Renewable energy Systems UK & Ireland, June 2008. Accessed via index (ecologyconsult.co.uk)

Percival, S., Percival, T., Hoit, M. & Langdon, K. (2009a). *Red Tile Wind Farm, Cambridgeshire: Post-construction breeding bird surveys 2008*. Ecology Consulting, Durham report to Fenland Windfarms Ltd, July 2009. Accessed via index (ecologyconsult.co.uk)

Percival, S., Percival, T., Hoit, M. & Langdon, K. (2009b). *Deeping St Nicholas Wind Farm, Lincolnshire: Post-construction breeding bird and marsh harrier surveys 2008*. Ecology Consulting, Durham report to Fenland Windfarms Ltd, July 2009. Accessed via index (ecologyconsult.co.uk)

Percival, S., Percival, T. & Hoit, M. (2009c). *Glassmoor Wind Farm, Cambridgeshire*: *Post-construction wintering and breeding bird surveys 2006-07 and 2008*. Ecology Consulting, Durham report to Fenland Windfarms Ltd, March 2009. Accessed via index (ecologyconsult.co.uk)

Percival, S. & Percival, T. (2011a). *Knabs Ridge Wind Farm: Post-construction breeding bird surveys 2010*. Ecology Consulting, Durham report to RWE NPower Renewables Ltd, January 2011. Accessed via index (ecologyconsult.co.uk)

Percival, S., Percival, T., Langdon, K., Lowe, T. & Hoit, M. (2011b). *Stag's Holt Wind Farm, Cambridgeshire*: *Post-construction breeding bird surveys 2011*. Ecology Consulting, Durham on behalf of E.ON Climate and Renewables Ltd, December 2011. Accessed via index (ecologyconsult.co.uk)

Percival, S., Percival, T., Lowe, T., Hoit, M. & Langdon, K. (2015a). *Red House Farm Wind Cluster, Lincolnshire: Post-construction breeding bird, marsh harrier surveys and collision monitoring 2009*. Ecology Consulting, Durham report to Fenland Windfarms Ltd, July 2009. Accessed via index (ecologyconsult.co.uk)

Percival, S.M., Percival, T. & Piner, S. (2015b). *Hellrigg Wind Farm: Goose Refuge Monitoring Report Winter 2014-15*. Ecology Consulting report to RWE Innogy UK, September 2015. Accessed via index (ecologyconsult.co.uk)

Percival, S.M., Percival, T., Piner, S. & Lowe, T. (2016a). *Kelburn Wind Farm: Post-construction phase breeding bird surveys 2016*. Ecology Consulting, Durham report to Renewable Energy Systems UK & Ireland Ltd. Accessed via index (ecologyconsult.co.uk)

Percival, S., Percival, T. & Grundy, D. (2016b). *Rusholme Wind Farm Ornithological Monitoring Programme: Breeding bird surveys 2016*. Ecology Consulting report to Cumbria Wind Farms, October 2016. Accessed via index (ecologyconsult.co.uk)

Percival, S., Percival, T. & Lowe, T. (2018a). *Goole Fields Wind Farm, East Yorkshire: Post-Construction Phase Bird Surveys Autumn/Winter 2015-16 to 2017-18*. Ecology Consulting, Durham report to RWE Innogy Ltd, November 2018. Accessed via index (ecologyconsult.co.uk)

Percival, S., Percival, T. & Lowe, T. (2018b). *Goole Fields II Wind Farm, East Yorkshire: Post-Construction Year 1 Bird Surveys 2017-18*. Ecology Consulting, Durham report to RWE Innogy Ltd, June 2018. Accessed via index (ecologyconsult.co.uk)

Percival, S., Percival, T. & Lowe, T. (2018c). *Minnygap Wind Farm: Post-construction Phase Breeding Bird Surveys 2018 (Year 2)*. Ecology Consulting, Durham report to Renewable Energy Systems UK & Ireland Ltd. Accessed via index (ecologyconsult.co.uk)

Percival, S., Percival, T. & Lowe, T. (2018d). *Goole Fields Wind Farm, East Yorkshire: Post-Construction Phase Bird Surveys Breeding Season 2017*. Ecology Consulting, Durham report to RWE Innogy Ltd, June 2018. Accessed via index (ecologyconsult.co.uk)

Platteeuw, M. & Henkins, R.J.H.G. (1997). Possible impacts of disturbance to waterbirds: individuals, carrying capacity and populations. *Wildfowl* 48, 225-236.

Potiek, A., Collier, M.P., Schekkerman, H. & Fijn, R.C. (2019). *Effects of turbine collision mortality on population dynamics of 13 bird species*. Bureau Waardenburg Report 18-342. Bureau Waardenburg, Culemborg.

Powlesland, R.G. (2009). *Impacts of wind farms on birds: a review*. Science for Conservation 289, Dept of Conservation – Te Papa Atawhai, Wellington, New Zealand.

Provan, S. & Whitfield, D.P. (2006). *Avian flight speeds and biometrics for use in collision risk modelling. Report from Natural Research to Scottish Natural Heritage*. Natural Research Ltd, Banchory.

Ratchliffe, D. A. (1976). Observations on the Breeding of the Golden Plover in Great Britain. *Bird Study*, 23(2), 63-116.

Robinson Willmott, J.R., Forcey, G. & Vukovich, M. (2023). New insights into the influence of turbines on the behaviour of migrant birds: implications for predicting impacts of offshore wind developments on wildlife. *Journal of Physics*: *Conference Series* 2507: 1-14 WindEurope Annual Event 2023, 25-27 April, Copenhagen, Denmark.

Rose, P. & Baillie, S. (1989). *The effects of collisions with overhead lines on British birds: an analysis of ringing recoveries*. BTO Research Report No. 42. British Trust for Ornithology, Thetford, UK.

Ross-Smith, V., Robinson, R.A. & Clark, J.A. (2015). *Dispersal and movements of Lesser Black-backed Gull in Europe*. BTO Research Report No. 671. British Trust for Ornithology, Thetford.

Rooney, E. & Montgomery, W. I. (2013). Diet diversity of the Common Buzzard (*Buteo buteo*) in a vole-less environment. *Bird Study* 60:2

RPS (2016). EirGrid *Evidence Based Environmental Studies Study 5: Birds Literature review and evidence based field study on the effects of high voltage transmission lines on birds*. May 2016, RPS report to Eirgrid.

Ruddock, M. & Whitfield, D. (2007). *A review of disturbance distances in selected bird species*. A report from Natural Research (Projects) Ltd to Scottish Natural Heritage.

Ruddock, M. & Dunlop, B.J., O'Toole, L., Mee, A., Nagle, T. (2012) Republic of Ireland National Hen Harrier Survey 2010. *Irish Wildlife Manual*, No. 59. National Parks and Wildlife Service, Department of Arts, Heritage and the Gaeltacht, Dublin, Ireland.

Ruddock, M., Mee, A., Lusby, J., Nagle, T., O'Neill, S. & O'Toole, L. (2016). The 2015 National Survey of Breeding Hen Harrier in Ireland. *Irish Wildlife Manuals*, Dublin, Ireland. Irish Wildlife Manual, No. 93. National Parks and Wildlife Service, Department of Arts, Heritage and the Gaeltacht, Dublin, Ireland.

Ruddock, M., Wilson-Parr, R., Lusby, J., Connolly, F., J. Bailey, & O'Toole, L. (2024). The 2022 National Survey of breeding Hen Harrier in Ireland. Report prepared by Irish Raptor Study Group (IRSG), BirdWatch Ireland (BWI), Golden Eagle Trust (GET) for National Parks & Wildlife Service (NPWS). *Irish Wildlife Manuals*, No. 147. National Parks and Wildlife Service, Department of Housing, Local Government and Heritage, Ireland.

Rushton, S. P., Hill D. & Carter, S. P. (1994). The Abundance of River Corridor Birds in Relation to Their Habitats: A Modelling Approach. *Journal of Applied Ecology* 31(2): 313-328.

Rydell, J., Engström, H., Hedenström, A. Larsen, J. K., & Green, M. (2012). *The effect of wind power on birds and bats – A synthesis report*. Report 6511. Swedish Environmental Protection Agency.

Schmal, V.G. (2015). Sensitivity of the woodcock to wind power plants – contribution to the current discussion. *Naturschutz und Landschaftsplanung*, 47: 43-48.

Scottish Natural Heritage, now NatureScot – SNH (2000). *Windfarms and Birds - Calculating a theoretical collision risk assuming no avoiding action*. SNH Guidance Note.

Scottish Natural Heritage, now NatureScot - SNH (2009). *Monitoring the impact of onshore wind farms on birds*. Scottish Natural Heritage, Inverness, Scotland.

Scottish Natural Heritage, now NatureScot - SNH (2010). *Use of Avoidance Rates in the SNH Wind Farm Collision Risk Model*. Guidance Note Series. Scottish Natural Heritage.

Scottish Natural Heritage, now NatureScot - SNH (2013). *Avoidance rates for wintering species of geese in Scotland at onshore wind farms*. Scottish Natural Heritage.

Scottish National Heritage, now NatureScot - SNH (2016). *Assessing Connectivity with Special Protection Areas (SPAs).* SNH Guidance Note.

Scottish Natural Heritage, now NatureScot - SNH (2017). *Recommended Bird Survey Methods to Inform Impact Assessment of Onshore Wind Farms*. SNH Guidance Note (Version 2: March 2017 update).

Scottish Natural Heritage, now NatureScot – SNH (2018a). *Avoidance rates for the onshore SNH wind farm collision risk model*. Version 2.

Scottish National Heritage, now NatureScot - SNH (2018b). *Assessing significance of impacts from onshore wind farms out with designated areas*. Scottish Natural Heritage, Inverness, Scotland.

Scottish National Heritage, now NatureScot - SNH (2018c). *Assessing the cumulative impacts of onshore wind farms on birds*. Scottish Natural Heritage, Inverness, Scotland.

Schütz, C. & Schulze, C. (2018). Park size and prey density limit occurrence of Eurasian Sparrowhawks in urban parks during winter. *Avian Research* 9, 30.

Shaffer, J.A. & Buhl, D.A., (2016). Effects of wind-energy facilities on breeding grassland bird distributions: wind-energy effects on grassland birds. *Conserv*. *Biol*. 30, 59–71.

Sharrock, J. T. R. (1976). *The Atlas of Breeding Birds in Britain and Ireland*. Calton, England: T. & A. D. Poyser.

Smallwood, K.S. (2007). Estimating wind turbine-caused bird mortality. *The Journal of Wildlife Management* 71: 2781–2791.

Snow, D. & Perrins, C.M. (1998). *The Birds of the Western Palearctic.* Concise Edition 2 Volume Set: Volume 1, Non-passerines; Volume 2, Passerines London Oxford University Press.

Steinborn, H. & Reichenbach, M. (2011). Lapwing and wind turbines. *Naturschutz und Landschaftsplanung* 43(9): 261-270.

Stevens, T.K., Hale, A.M., Karsten, K.B. & Bennett, V.J. (2013). An analysis of displacement from wind turbines in a wintering grassland bird community. *Biodivers*. *Conserv*. 22, 1755–1767.

Straub, V.F., Trautner, J. & Dorka, U. (2015). Woodcocks are sensitive to wind power plants, and their harming can break legislation on species protection – Reply to Schmal (2015) in the context of the publication by Dorka *et al*. (2014). *Naturschutz und Landschaftsplanung*, 47: 49-58.

Suddaby, D., O'Brien, I., Breen, D. & Kelly, S. (2020). A survey of breeding waders on machair and other coastal grasslands in Counties Mayo and Galway. *Irish Wildlife Manuals*, No. 119. National Parks and Wildlife Service, Department of Culture, Heritage and the Gaeltacht, Ireland.

Thaxter, C.B., Lascelles, B., Sugar, K., Cook, A.S.C.P., Roos, S., Bolton, M., Langston, R.H.W. & Burton, N.H.K. (2012). Seabird foraging ranges as a preliminary tool for identifying candidate Marine Protected Areas. *Biological Conservation*, 156, 53–61.

Thaxter, C.B., Ross-Smith, V.H., Bouten, W., Clark, N.A., Conway, G.J., Rehfisch, M.M. & Burton, N.H.K. (2015). Seabird-wind farm interactions during the breeding season vary within and between years: A case study of lesser black-backed gull *Larus fuscus* in the UK. *Biological Conservation*, 186, 347-358.

Thomas, C., Troake, P., Karsch, A.& O. Crowe, O. (2007). *Waterways Birds Survey 2006 & 2007*. Unpublished report. BirdWatch Ireland, Newtownmountkennedy.

TII – Transport Infrastructure Ireland (2021). *Survey and Mitigation Standards for Barn Owls to inform the Planning, Construction and Operation of National Road Projects*. TII Publications: Planning and Evaluation PE-ENV-07005, April 2021.

Tolvanen, A., Routavaara, H., Jokikokko, M. & Rana, P. (2023). How far are birds, bats, and terrestrial mammals displaced from onshore wind power development? – A systematic review. *Biological Conservation* 288.

Tome, D. (2011). Post-fledging survival and dynamics of dispersal in Long-eared Owls *Asio otus*. *Bird Study* 58 (2): 193-199.

Tosh, D.G., Montgomery, W.I. & Reid, N. (2014). *A review of the impacts of wind energy developments on biodiversity*. Report prepared by the Natural Heritage Research Partnership (NHRP) between Quercus, Queen's University Belfast and the Northern Ireland Environment Agency (NIEA) for the Research and Development Series No. 14/02.

Tuite, C.H., Hanson, P.R. & Owen, M. (1984). Some ecological factors affecting winter wildfowl distribution on inland waters in England and Wales, and the influence of water-based recreation. *J. Appl. Ecol.* 21: 41–61.

University College Cork Ornithology Group (2021). *Breeding Woodcock Survey 2021*. Available at: https://ornithology.ucc.ie/current-projects/ecology-cryptic-game-species-woodcock-phd-project/breeding-woodcock-survey/

Urquhart, B., Hulka, S. & Duffy, K. (2015). Game birds do not surrogate for raptors in trails to calibrate observed raptor collision fatalities. *Bird Study* 62: 552–555.

Village, A. (1990). *The Kestrel*. Poyser, London.

Whitfield, D.P. (2010). *Avoidance rates of swans under the 'Band' collision risk model*. Natural Research Information Note 5. Natural Research Ltd, Banchory, UK.

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

Wilson, M, Fernández-Bellon, D., Irwin, S. & O'Halloran, J. (2015). *The interactions between Hen Harriers and wind turbines*. Windharrier. Final project report, prepared by School of Biological, Earth & Environmental Sciences, University College Cork, Ireland.

Wilson, M., Gittings, T., O'Halloran, J., Kelly, T., Pithon, J. (2006). *The distribution of Hen Harriers in Ireland in relation to land use cover, particularly forest cover*. COFORD Connects Note, Dublin.

Wilson-Parr, R. & O'Brien, I. (Eds.) (2019) *Irish Raptor Study Group Annual Review* 2018.

Winkelman, J.E., 1989. *Birds at a Wind Park near Urk: Bird Collision Victims and Disturbance of Wintering Ducks, Geese and Swans* [in Dutch]. RIN-Rapport 89/15, Arnhem, Netherlands.

Winkelman, J.E., 1992. *The Impact of the SEP Wind Park near Oosterbierum (Fr.), the Netherlands, on Birds, Vol. 1: Collision Victims* [in Dutch]. RIN-report 92/2, Arnhem, Netherlands.

Woodward, I.D., Ross-Smith, V.H., Pérez-Dominguez, R., Rehfisch, M. & Austin, G.E. (2015). *The Wash bird decline investigation 2014*. BTO Research Report No. 660.

Xu, H., Zhao, S., Song, N., Liu, N. Zhong, S., Li, B. & Wang, T. (2021). Abundance and behaviour of little egrets (*Egretta garzetta*) near an onshore wind farm in Chongming Dongtan, China. *Journal of Cleaner Production*, 312, 9, Aug-2021.

Zehtindjiev, P., Bedev, K., Marinov, M. & Yordanov, N. (2023). *The common buzzard – a model species for bird-wind turbine interaction: GPS/GSM data from Kaliakra, NE Bulgaria*. Poster presentation by Institute of Biodiversity and Ecosystem Research, Bulgarian Academy of Sciences at the 7th Conference on Wind energy and Wildlife impacts 2023 (CWW2023), Šibenik, Croatia, 18-22 September 2023.

Zhao, S., Xu, H., Song, N., Wang, Z., Li, B. & Wang, T., (2020). Effect of wind farms on wintering ducks at an important wintering ground in China along the East Asian-Australasian Flyway. *Ecol. Evol*. 10: 9567–9580.

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Appendix C: Surveys Undertaken

Introduction

Ecological surveys were undertaken as part of the EIAR for the proposed Brittas Wind Farm Development. Relevant surveys for the supporting information and context for the NIS have been outlined in this Appendix. Relevant surveys included invasive species surveys (as part of habitat surveys), aquatic and fisheries assessments and otter surveys.

Surveyors

APEM Group Woodrow is an established and accomplished environmental consultancy committed to delivering robust ecological assessment services for clients in the private and public sectors. APEM Group Woodrow provides an in-house team of ecologists and environmental professionals whose primary specialisms include botany, habitats, birds, bats, mammals, invertebrates and aquatic ecology. APEM Group Woodrow staff are fully conversant with wildlife legislation in both Ireland and the UK, and work to exacting standards, according to established guidelines issued by the Chartered Institute of Ecology and Environmental Management (CIEEM). All the ecological surveys to inform this report were undertaken by appropriately experienced and licensed surveyors. Table 8 includes a list of personnel involved with the surveys, there experience is located in Table 10.

Table 8: List of surveyors

Habitat and botanical Surveys		Aquatics and Fisheries Assessment	
Name	**Initials**	**Name**	**Initials**
Aoife Hughes	AH	Adon McFarlane	AMcF
Brittany Arendse	BA	James O'Connor	JOC
Bridget Keehan	BK	Patrick Quinn	PQ
Bruno Mels	BM		
Emmeline Cosnett	EC		
Emma Horgan	EH		

Habitat and botanical Surveys		Aquatics and Fisheries Assessment	
Giulia Mazzotti	GM		
Julie Kohlstruck	JK		
Meadhbh Costigan	MC		
Mike Trewby	MT		
Patrick Power	PP		
Róisín O'Connell	ROC		

Methodology

The following ecological surveys were undertaken with regards to the appropriate assessment, an overview of which is provided in Table 9

Table 9: Overview of ecological surveys, dates and surveyors

Ecological surveys	Description	Dates & personnel (initials)
Site scoping	Initial site scoping of the proposed project site, walkover to identify ecological constraints and inform site layout, undertaking multidisciplinary surveys including habitat mapping, invasive species surveys, amphibian/reptile habitat suitability assessments, mammal surveys and bat habitat assessments (Preliminary Roost Assessment (PRA) and Potential Roost Features (PRF) surveys)	11 and 12 May 2022 AH, MT and ROC 16 and 22 June 2022 MT, BK, EC, JK, AMcF and GM 19, 20 and 21 July 2022 GM and AH 16 August 2022 AH and GM 13, 14 and 15 September 2022 AH, and GM 20 September 2023 BM 08 and 21 February 2024 PP, BM, BA and MC 31 May 2024 PP and BM

		05 June 2024 MC
Habitat surveys	Habitat descriptions and classification to Fossitt (2000) level 3, concentrating on highlighting areas of conservation importance – semi-natural woodland areas. Invasive species surveys were also undertaken.	11 and 12 May 2022 AH, ROC, MT, ATC 16 June 2022 MT, BK, EC, GM, JK 22 June 2022 AMcF, JK, MT 19, 20 and 21 July 2022 GM, AH 16 August 2022 AH, GM 13, 14 and 15 September 2022 AH, GM 08 February 2024 PP, BM 21 February 2024 MC 05 June 2024 MC
Aquatic & Fisheries Assessment	River Hydro-morphology Assessment Techniques (RHAT) and baseline water quality assessment (Q-values). Also conducted otter *Lutra lutra* survey and kingfisher *Alcedo atthis* habitat suitability.	01, 07 and 08 October 2022 AMcF
Protected terrestrial mammals survey	Habitat suitability and field signs surveys for badger *Meles meles*, otter, Irish hare *Lepus timidus hibernicus*, red squirrel *Scuirus vulgaris*, pine marten *Martes martes* and other mammals. Recording of field signs for terrestrial mammal signs was undertaken during multi-dispensary site walkovers, including when undertaking habitat surveys, bat habitat suitability surveys and bird surveys.	11 and 12 May 2022 AH, ROC, MT, EH 16 and 22 June 2022 MT, EC, GM, BK, JK 19, 20 and 21 July 2022 AH GM 16 August 2022 AH 13, 14 and 15 September 2022 AH and GM 20 September 2023 BM 21 February 2024 MC and BA 31 May 2024 PP and BM
Turbine delivery route	Multidisciplinary surveys, including mammal surveys, bat habitat suitability surveys (PRF surveys). Anecdotal surveys for habitats & invasive species (out of season),	21 February 2024 PP, BA

Grid connection route (GCR)	Multidisciplinary surveys, including habitat mapping & invasive species (out of season), mammal surveys, bat habitat suitability surveys (PRF surveys)	21 February 2024 PP, BA
Substation	Multidisciplinary surveys, including habitat mapping & invasive species, mammal surveys, bat habitat suitability surveys (PRF surveys)	08 February 2024 PP, BM 31 May 2024 BM, PP 05 June 2024 MC

Invasive Species

Invasive species surveys were undertaken both as part of multidisciplinary walkover surveys and as part of habitat surveys which were undertaken on 11 and 12 May 2022, 16 June 2022, 22 June 2022, 19, 20 and 21 July 2022, 16 August 2022, 13, 14 and 15 September 2022, 8 and 21 February 2024 and 5 June 2024. Invasive species were identified and mapped in accordance with the habitat guidance.

Habitat surveys and mapping were undertaken following standard guidance (Smith et al. (2011), with all habitats classified into recognised communities defined by Fossitt (2000) and cross-referenced to Annex I habitats of the EU habitats directive. Given the higher level of classification required to Annex I habitats, careful consideration was given to species composition, location, and physical characteristics of the surveyed habitats, as described in European Commission (2013). In cross checking habitat classifications for semi-natural woodland, reference was made to Rodwell (1991), Hall et al. (2004), Perrin et al. (2008) and Perrin et al. (2010). The use of the Irish Vegetation Classification (IVC) guidelines were also used in determining habitat classifications. During these surveys target areas, such as the proposed turbine locations and access tracks, were walked and ecological features of interest were recorded using handheld GIS and recording software (ArcGIS Survey123), enabling ecological information and photographs to be georeferenced in the field and subsequently incorporated into GIS. During the survey, consideration was given to identifying important or protected habitats, such as Annex I habitats listed under the E.U. Habitats directive, invasive alien species, and habitats with the potential to support protected species. Particular attention was paid to searching suitable habitat for rare or protected flora species, to determine presence within, or close to the proposed project.

Updated habitat surveys focused on areas around the finalised turbine locations and access tracks, as revised, and the location of the proposed substation and grid connection route.

Habitats along the grid connection route and focal areas of the turbine delivery route were mapped in February 2024, while the finalised substation location was assessed and mapped in June 2024. This substation survey focused on defining potential areas of Annex I habitat.

Aquatic and Fisheries Assessments, Otter Surveys

Aquatic and Fisheries Assessments, which included otter surveys, were undertaken on 1, 7 and 8 October 2022. These surveys involved River Hydro-morphology Assessment Techniques (RHAT) and baseline water quality assessments (Q-Values), habitat suitability assessments for salmon and lamprey, kingfisher habitat assessment and white-clawed crayfish surveys.

An ecological assessment of the streams within and draining the proposed project (noted with respect to white clawed crayfish *Austropotamobius pallipes*, salmon *Salmo salar*, river lamprey *Lampetra fluviatilis*, brook lamprey *Lampetra planeri*, sea lamprey *Petromyzon marinus* suitability) was conducted at key locations. Sections of waterbodies potentially directly impacted by the works were walked and assessed for salmonid/lamprey suitability using the Life Cycle Unit (LCU) approach, where aquatic habitats are classified according to type: nursery, holding, spawning, and quality: excellent (1) to marginal (4), as detailed in Kennedy (1984) and O'Connor & Kennedy (2002).

While conducting stream assessments, banks and drains were searched for signs of otter activity and were assessed for kingfisher *Alcedo atthis* suitability.

Q Value assessment were conducted at nine sample locations (n=9) on the existing river network. Seven of these were located on the main River Suir channel while two were located on the Rossestown River, a tributary of the River Suir. Biological scoring was undertaken by adopting a sampling method currently employed by the EPA. A handheld pond net (1mm mesh size) was used to collect a two-minute multi-habitat kick sample that was followed by a one-minute stonewash where possible. Where kick sampling was not a viable option (e.g. due to soft substrate), bankside sweeps were undertaken. This involved sweeping along the marginal area until such time as a representative sample was obtained. Live macroinvertebrate samples were assessed int eh field, where they were assigned to the lowest taxonomic resolution for scoring, and the categorical relative abundance determined using approximate counts. Basic water quality parameters were also measured at a total of 10 location using an Aquaread Multiparameter Water Quality Probe to provide a baseline profile of water chemistry in the water bodies assessed. Parameters measured included temperature (°C, pH, DO (% and mg/l) as well as conductivity (µs/cm).

White-clawed Crayfish assessments (i.e. presence / absence) were carried out at 10 sample locations using a string of four trappy funnel crayfish traps that were baited with approx. 40 g of mackerel *Scomber scombrus*. These were laid out and left to soak overnight in areas of suitable habitat. Traps were spaced approximately 4 m apart and laid parallel to the riverbank. Each end of the string was secured to the riverbank in order to prevent the traps from being moved. Traps were left overnight and checked for crayfish the following morning.

All aquatic survey work was carried out in line with IFI (2010) *Biosecurity Protocol for Field Survey Work,* which involved dipping and rinsing sampling equipment (e.g. pond nets) in a 1% solution of Virkon aquatic, inspecting footwear and PPE for debris or vegetation prior to leaving a site, and cleaning footwear and PPE with Virkon.

Results

Invasive Species

Snowberry *Symphoricarpos albus* was recorded c. 220 m and c. 770 m from the proposed substation field entrance along the grid connection route. Cherry laurel *Prunus laurocerasus* was identified c. 560 m from the proposed substation field entrance along the grid connection route. No plant species listed under the Third Schedule of the European Communities (Bird and Habitats) Regulations 2011 as ' non-native species subject to restrictions under Regulations 49' were recorded.

Aquatic and Fisheries Assessments, Otter Surveys

Q value assessments ranged from Q3 (Moderately Polluted) to Q3-4 (Slightly Polluted) for the Sites surveyed. A total of 29 taxa were recorded within the study area, ranging from 9-16 taxa per site, most sites were dominated by Group C taxa, which are tolerant to pollution. The Q-value results provided, together with the water quality parameters obtained (e.g. DO % saturation), suggest that much of the river network assessed has been impacted to varying degrees by pollution, as well as channel modification and dredging. This was most evident on the main river channel (i.e. the River Suir), which was characterised by steep banks, depositing habitat, soft substrates and emergent riparian vegetation indicative of enrichment (e.g. *Sparganium erectum, Phragmites* sp.).

One of the sample locations on the Rossestown River, and one on the main River Suir channel, scored higher in the Q-value assessments (Q3-4) and were among the few locations assessed that contained proper eroding habitat (e.g. riffle / run), cobble / gravel substrates and areas considered suitable for juvenile salmonids. Incidentally at the site on the Rossestown River, three lamprey ammocoetes were recovered in the kick sample, while a brown trout *Salmon trutta* was also recovered in one of the crayfish traps. An adult salmonid (likely trout) was also observed feeding near the surface on the site on the main River Suir channel, downstream of Rossestown bridge.

No crayfish were recovered during the baited trap surveys, nor were there any signs of crayfish predation along the riverbanks (e.g. in otter spraint). Crayfish plague, caused by the water mould *Aphanomyces astaci*, is present within the River Suir catchment and may partially explain the absence of crayfish in the section of the river assessed. Additionally, much of the main channel appears unsuitable for crayfish due to siltation and subsequent dredging works.

Otters are a Qualifying Interest of the downstream of the Lower River Suir SAC which is hydrologically connected to the River Suir channel running through the proposed project. Otters are reported as occurring throughout the SAC. Otter signs (paw prints, a slide and lay-up couches) were recorded in several locations along drainage channels within the proposed project. It is considered that otter utilise the network of drains and River Suir channel to commute through the area. There were two slides recorded beside each other in the field in the most southeastern section close to T.10. There was also otter spraint recorded in the proposed substation field. Surveys along the grid connection route also confirmed the presence of otters, with slides, prints, mammal tracks and possible otter spraint recorded. There was a potential holt with two connected entrances and slides also recorded along the grid connection route.

References

Cross, J.; Perrin; P. & Little, D. (2010). The Classification of Native Woodlands in Ireland and its Application to Native Woodland Management. Native Woodland Information Note No. 6. NPWS, BEC Consultants Ltd & Woodlands of Ireland. (Accessed 04/09/2024)

European Commission (2013) The Interpretation Manual of European Union Habitats - EUR28 (Accessed 04/09/2024)

Hall, J.E.; Kirby, K.J. & Whitbread, A.M. (2004). National Vegetation Classification: Field guide to woodland. Joint Nature Conservation Committee (JNCC) (Accessed 04/09/2024)

IFI (2010). IFI Biosecurity Protocol for Field Survey Work. Inland Fisheries Ireland, Dublin, Ireland.

Kennedy G.J.A. (1984) Evaluation of techniques for classifying habitats for juvenile salmon (*Salmo salar* L.) *Proceedings of the Atlantic Salmon trust workshop on stock enhancement*.

National Biodiversity Data Centre (2024) Classification explorer. Accessible at https://biodiversityireland.ie/ivc-classification-explorer/. (Accessed 04/09/2024).

O'Connor L. & Kennedy, R.J (2002). *A comparison of catchment-based salmon habitat survey techniques on three rivers in N. Ireland*. Fisheries Management & Ecology, 9, 149-161

Perrin P., Martin J., Barron S. O'Neil F., McNutt K. & Delaney A. (2008) National Survey of Native Woodlands 2003-2008. Volume I: Main report. Botanical, Environmental & Conservation Consultants Ltd. report submitted to the NPWS. (Accessed 04/09/2024)

Rodwell, J S (ed.) (1991) British Plant Communities. Volume 1. Woodlands and scrub. Cambridge University Press, Cambridge (Accessed 04/09/2024)

Table 10: Surveyor experience

Adon McFarlane - AMcF	Dr Adon McFarlane is a senior freshwater ecologist, specialising in protected species. He is an experienced field scientist, with extensive skills in the fields of freshwater habitat assessment; freshwater pearl mussel survey; white-clawed crayfish survey, macroinvertebrate survey, fish habitat assessment and electrofishing survey. He has built up skills in the collection of data both in the field and laboratory, analysis of data using statistical software programs such as R, BORIS, RAVEN and Minitab, creation of distribution maps using GIS. Adon has very strong technical skills in both freshwater and marine laboratory and fieldwork instrumentation and equipment usage. Adon has worked on a number of ecological reports, including Appropriate Assessments, Ecological Impact Assessments (EcIA), Preliminary Ecological Appraisal Reports (PEAR) and Invasive Species Reports.
Aoife Hughes - AH	Aoife Hughes was an Ecologist with Woodrow Sustainable Solutions. She has worked on a wide range of projects, including NIS, EcIAs, a successful EU Life Funding Application and various community projects. She has carried out various habitat and mammal surveys, with a specialist focus on botany. She completed a BSc (Hons) in Environmental Science at National University of Ireland, Galway. She was awarded the title of University Scholar for years one-three of her Environmental Science undergraduate course and graduated top of her class with a first-class honours degree. She completed a Masters by Research in University College Cork on how single-use plastics can be eliminated from the UCC campus.
Bridget Keehan - BK	Bridget Keehan is Senior Ecologist and Botany Lead at Woodrow Sustainable Solutions Ltd. She is an accomplished field botanist with over 30 years of experience in plant identification, including bryophytes, and fifteen years of experience working as a professional ecologist. With Woodrow, Bridget has worked on habitat surveys, monitoring and reporting for a wide range of developments including numerous wind farm and quarry sites. She has excellent habitat classification skills at Phase 1, Fossitt and NVC levels and regularly undertakes specialist surveys for Annex I habitats as well as protected plant, mammal and bird surveys. She is proficient in the analysis and interpretation of data, developing strategies and producing detailed reports. Bridget maintains a thorough knowledge of both European and national environmental legislation and has experience producing a wide range of reports as required by planning legislation, including Ecological Impact Assessments, Natura Impact Statements, Habitat Management Plans and Compliance Reports. Bridget is also experienced in preparing digital habitat maps using ArcGIS.
Brittany Arendse - BA	Brittnay joined the Woodrow team in January 2024 as an Ecologist within the Botany team. She hails from South Africa where she completed her tertiary education at the University of Cape Town and obtained her MSc in Pollination biology, focusing on Ericaceae (heath family). She went on to work for the South African National Biodiversity Institute (SANBI) surveying for and monitoring endangered wildflowers in South Africa. She then spent a further

	eight years working for a conservation NPO on the southern coast of South Africa. Here she honed her skills in a myriad of different biomes and landscape types including, endemic fynbos, forests, dune systems, rivers and estuaries as well as in the social and human-animal conflict spaces. In her spare time, Brittany enjoys hiking and has an array of creative outlets. She also does website design and dabbles in illustrations, both traditional and digital.
Bruno Mels - BM	Bruno joined the Woodrow team in September 2022. He obtained a MSc in Conservation Biology at the University of Antwerp and worked for several conservation organisations in South-Africa and Seychelles after his studies. His main duties there were to monitor the breeding success of shorebirds and the ensure the protection of endangered species such as the green turtle and the Aldabra giant tortoise. Besides being a biologist, Bruno is also a self-taught digital illustrator. He is capable of creating infographics and animations and, among others, has designed several information boards for UNESCO world heritages sites in the Seychelles.
Emma Horgan - EH	Emma Horgan was an Assistant Project Manager within Woodrow Sustainable Solutions (APEM Group). During her time at Woodrow, she first joined as a scientist, and soon progressed to the project management team after proving exceptional competence in the area. She has amassed experience in different field survey methods and scientific analysis as well as strongly developed skills in project management. She has completed a BSc. in Marine science from University College Galway (previously National University of Ireland, Galway) and a MSc. in Applied Environmental Geoscience from University College Cork. For her final dissertation as part of her masters degree, she partnered with INFOMAR, Ireland's marine mapping programme. She used statistical means in GIS software to classify offshore seabed by sediment classification Folk 7. This was a comprehensive reclassification of the Porcupine Seabight and first ever classification of the Rockall Trough. The data she produced was donated to the EU to become part of EMODnet, the European Union's online data viewer. Since coming to Woodrow, Emma has been trained in bat survey, botany survey and mammal survey skills. She has honed her GIS skills and used them to create a new standardised template for Woodrow projects in GIS. After developing skills in project management and financial tracking software, she advanced to take on the role of assistant project manager, where she now liaises with the 13 technical leads across Woodrow to deliver projects.
Emmeline Cosnett - EC	Emmeline is a field ecologist and part of the botany and habitat team with Woodrow Sustainable Solutions Ltd who has worked in a variety of terrestrial and aquatic environments. She has carried out published research on independent botany/pollination ecology as well as two academic internships with Dr Dara Stanley's Ecology lab NUIG, with a focus on agri-environmental schemes and botanical habitat surveys across Ireland. Emmeline has worked as part of the Eva Crane Project creating a pollen library of the Burren and is currently completing an accredited CIEEM MSc on Wildlife Biology and Conservation with Edinburgh Napier University. She has an BSc (Hons) in

	Environmental Science from NUI Galway (2018) with a focus on Botany and Entomology. Emmeline has excellent habitat classification skills at Phase 1, Fossitt and NVC levels as well as experience with mammal surveys, bird and bat surveys and with reporting requirements for clients.
Guilia Mazzotti - GM	Giulia Mazzotti was a Graduate Ecologist and Data Co-Ordinator with Woodrow Sustainable Solutions Ltd. She has completed a B.Sc. in Biological Sciences at University of Bologna and obtained full marks with honours (110/110 Cum Laude) in Ecology and Nature Conservation M.Sc. from University of Parma. During her studies she learnt to use R for data analysis and became proficient in the use of ArcGIS and QGIS for mapping. Since joining Woodrow Giulia developed experience undertaking ecological surveys including habitat mapping using Fossitt (2000) in ROI and Phase 1 classifications in NI, mammal, bat, and invertebrate surveys. She also assists senior members of staff with GIS mapping activity and reporting for Ornithology Report, Ecological Impact Assessment (EcIA) and Biodiversity Chapters for Environmental Impact Assessment Reports (EIAR). Furthermore, Giulia took the lead of the H&S of the company, producing risk assessments and RAMS, keeping track of all the new hazards, near misses and incidents related to fieldwork. She is a qualifying member of CIEEM.
James O'Connor - JOC	James O'Connor is a senior ecologist with Woodrow, who has a PhD in aquatic sciences and a primary technical specialism in freshwater ecology. James has prior experience in monitoring wild bird populations with Birdwatch Ireland and is heavily involved in ornithological work as part of his role with Woodrow. Here, he regularly carries out mammal surveys and also performs a supporting role as Ecological Clerk of Works (ECoW). James is first author on several peer-reviewed academic research papers and has helped draft reports to disseminate key research findings to state agencies such as the Irish Environmental Protection Agency (EPA) as well as Irish county councils.
Julie Kohlstruck - JK	Juliane Kohlstruck is senior ecologist at Woodrow. Juliane holds a MSc and BSc in landscape ecology. During a semester at NUI Galway she was able to expand her knowledge on European environmental legislation and its implementation in Irish law. She has carried out extensive vegetation and habitat surveys for research projects in Northern Germany, Central America, and South America, and with Woodrow she regularly undertakes JNCC Phase 1, Fossitt, and National Vegetation Classification (NVC) surveys. She has worked on many upland sites, undertaking pre-development site assessments as well and post-construction compliance monitoring. Her faunistic survey skills include mammals, bats, amphibia, and invertebrates. Her abiotic skills include chemical analysis of soil and water as well as pedological/ geological mapping of soils. Juliane is proficient in mapping, spatial analysis, and data analysis using ArcGIS, QGIS, Excel, R, and SPSSis, QGIS, Excel, R, and SPSS.

Meadhbh Costigan - MC	Meadhbh Costigan is an Ecologist with Woodrow. Since joining the Woodrow APEM Group, Meadhbh has conducted fieldwork in the Republic of Ireland and Northern Ireland – gaining experience in habitat identification (according to Fossitt 2000, Phase 1 JNCC, NVC, and the National Survey of Upland Habitats), botanical identification, the biodiversity-metric, and specialised marsh Fritillary surveys. She has been lead author on Appropriate Assessment's, Habitat Regulation Assessment's, Ecological Impact Assessments', Habitat Management Plans, and Local Biodiversity Action Plan's. She is a qualifying member of CIEEM and is an elected member of the CIEEM Irish Section Committee.
Mike Trewby - MT	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). QUALIFICATIONS B.Sc.- Zoology & Botany, University of Namibia, 1997. PGDip - Environmental Studies, University of Strathclyde, 2002.
Patrick Power - PP	Patrick Power is an ecologist with Woodrow. Patrick has completed a BSc in Forestry, BSc (Hons) in land management in Forestry with Waterford Institute of Technology and a PGCert in Wildlife Biology and Conservation. His work with Woodrow is focused on bat data analysis including bat call identification and bat roost/habitat suitability surveys. Patrick has developed a high level of proficiency with Kaleidoscope and BatExplorer, the analysis software used to assess bat calls and activity. Patrick also possess Reptile, mammal and woodland habitat surveying skills. Patrick is a student member of CIEEM and currently has a training licence to survey bat roosts from the Department of Culture Heritage and the Gaeltacht.
Patrick Quinn - PQ	Patrick Quinn has over 7 years' experience in a wide array of construction projects, including large scale wind farm construction, 110kV overhead transmission lines, roads/bridges and other infrastructure projects, including works within sensitive and designated areas (including Natura 2000 sites). He has a significant level of experience in aquatic ecology and monitoring include water treatment plants and water scheme infrastructure projects that require ecological supervision throughout Ireland

Róisín O'Connell - ROC	Róisín O'Connell an assistant ecologist at Woodrow APEM Group. Róisín obtained a B.Sc. (Hons) in Environmental Science at Atlantic Technological University in Sligo, Ireland. Her final year thesis involved carrying out aquatic macrophyte surveys of lough Doon in County Leitrim. Róisín possesses marine and freshwater habitat survey skills from her time studying at ATU. Róisín has authored multiple bat activity reports, and contributed to sections in EcIA, HRA and NIS reports. Since joining Woodrow, she has developed excellent field survey skills and regularly conducts a broad range of protected species surveying including bats, badger, otter, and amphibians. Róisín is also trained in habitat assessment and has knowledge and experience of JNCC Phase 1 and Fossitt 2020. Róisín is a qualifying member of the Chartered Institute of Ecology and Environmental Management and holds a license to survey bat roosts from the Department of Culture Housing. Local Government and Heritage.