FEHILY TIMONEY

DESIGNING AND DELIVERING A SUSTAINABLE FUTURE

ENVIRONMENTAL IMPACT ASSESSMENT REPORT (EIAR) FOR THE PROPOSED DERRYNADARRAGH WIND FARM, CO. KILDARE AND CO. OFFALY

Volume 2 - MAIN EIAR

Chapter 9 - Biodiversity

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9. BIODIVERSITY

9.1 Introduction

This chapter examines the likely significant direct and indirect effects of the proposed Derrynadarragh Wind Farm, associated grid connection and turbine delivery routes on existing biodiversity, including flora (plants), non-volant fauna (animals) and habitats in both the terrestrial and aquatic environment. *Wetland Surveys Ireland Ltd*. was commissioned by Fehily Timoney and Company to prepare the Biodiversity and Bird Chapters of an Environmental Impact Assessment Report (EIAR) for the proposed Derrynadarragh Wind Farm, associated grid connection and turbine delivery route in Counties Offaly, Kildare and Laois. Separate reports assessing the effects on bats and the aquatic environment have also been prepared. The overall results of the latter two reports are summarised here; the standalone reports are presented in Appendix 9-1 and 9-2 respectively. The assessment of the effects on birds is presented in Chapter 10 (Ornithology), Volume 2. This chapter assesses likely significant effects that may arise from the Proposed Development on biodiversity within the receiving environment. Mitigation measures to reduce or eliminate effects on the existing biodiversity are prescribed as necessary. The assessment also considers the cumulative effects associated with other nearby developments.

The aims of this section of the EIAR were to:

- Establish baseline ecological data for the Proposed Development.
- Determine the ecological value of the ecological features within the Proposed Development.
- Assess the likely significant effects arising from the implementation of the Proposed Development on features of ecological value.
- Recommended mitigation measures to reduce or prevent the above effects.
- Identify residual effects (if any) after mitigation.

This section of the assessment was prepared in cognisance with the following guidelines:

- Chartered Institute of Ecology and Environmental Management (CIEEM) (2018) Guidelines for Ecological Impact Assessment.
- Fossitt, J. A. (2000) A Guide to Habitats in Ireland.
- The Heritage Council (2011) Habitat Survey Guidelines: A Standard Methodology for Habitat Survey and Mapping in Ireland.
- Environment Agency (2003). River Habitat Survey in Britain and Ireland Field Survey Guidance Manual: 2003 Version' published by the Environment Agency, United Kingdom.
- Environmental Protection Agency (2022). Guidelines on the Information to be contained in Environmental Impact Assessment Reports (EIAR).
- European Commission (2017) Environmental Impact Assessment of Projects: Guidance on the preparation of the Environmental Impact Assessment Report.
- European Commission (2020). Guidance Document on Wind Energy Developments and EU Nature Legislation.
- Scottish Natural Heritage (now NatureScot) (2021). Bats and Onshore Wind turbines – survey, assessment and mitigation
- Collins (2023). Bat Surveys for Professional Ecologists: Good Practice Guidelines (4th edition).

In addition, in considering the ecological effects of the Proposed Development regard was made to the following guidance and information documents:

- Department of Agriculture for Northern Ireland's Fisheries Division (DANI, 1995). *Evaluation of habitat for Salmon and Trout;*
- Department of Housing, Local Government and Heritage (2024). *Ireland's 4th National Biodiversity Action Plan 2023-2030;*
- EPA (2003) Advice notes on current practice (in the preparation of Environmental Impact Statements);
- Smith *et al*. (2011). Best Practice Guidance for Habitat Survey and Mapping in Ireland.
- IFI, (2016). Guidelines on Protection of Fisheries During Construction Works in and Adjacent to Waters. Inland Fisheries Ireland.
- Murphy, D.F., (2004). Requirements for the Protection of Fisheries Habitat during Construction and Development Works at River Sites. Eastern Regional Fisheries Board, Dublin, Ireland.
- NatureScot (2024) Good practice during wind farm construction. https://www.nature.scot/doc/guidance-good-practice-during-wind-farm-construction
- EIA Directive 2014/52/EU
- The Wildlife Act 1976 and (amendment) Act 2000
- Flora (Protection) Order 2015

A full description of the Proposed Development assessed in this EIAR is provided in Volume2, *Chapter 2: Description of the Proposed Development* and comprises the following elements:

- The 'Proposed Wind Farm' (also referred to in this EIAR as the '**Site'**);
- The 'Proposed Grid Connection' (also referred to in this EIAR as the **'GC'**);
- The 'Turbine Delivery Route' (also referred to in this EIAR as the **'TDR'**);
- The 'Biodiversity Enhancement Management Plan Lands' (also referred to in this EIAR as the **'BEMP Lands'**).

The Proposed Development consists of a 9 no. turbine wind farm and associated infrastructure including internal access tracks, hard standings, onsite 110 kV substation and associated grid connection infrastructure, internal electrical and communications cabling between turbines and on-site substation (medium voltage) and between on-site substation to Bracklone Substation (high voltage), temporary construction compounds, drainage infrastructure, amenity provision, biodiversity enhancement measures, temporary accommodations works along the Proposed Turbine Delivery Route and all associated works related to the construction of the Proposed Development.

The following defines terms utilised in this chapter:

- Where the 'Proposed Development' is referred to, this relates to all the project components described in detail in Chapter 2 of this EIAR.
- Where 'The Site' is referred to, this relates to the lands as delineated by the EIAR Site Boundary in red as shown in Figure 9-1, which comprises the primary 'survey area' for the development (exclusive of the GCR and TDR).

- Where the 'Grid Connection' is referred to, this relates to all grid infrastructure, as detailed within Chapter 2, outside the Wind Farm Site, within the local road network to Bracklone 110 kV substation in Portarlington.
- Where the 'TDR Accommodation Works' are referred to, this relates to all lands along the TDR within the EIAR Site Boundary in red as shown in Figure 9-1.
- A "Key Ecological Receptor" (KER) is defined as a species or habitat determined to be of International, National, County or Local Importance (Higher) (as per NRA 2009) occurring within the zone of influence of the development upon which likely significant effects are anticipated.
- "Zones of Influence" (ZOI) for individual ecological receptors refers to the zone within which likely effects are anticipated. ZOIs differ depending on the sensitivities of particular habitats and species and were assigned in accordance with best available guidance and through adoption of a precautionary approach.

The general layouts of the Proposed Development and TDR are presented in Figures 2.2 to 2.4 in Volume IV.

The plans and particulars submitted with this application for consent are precise and provide specific dimensions for the turbine structures. This EIAR assesses 4 no. turbines will have a tip height of 186m above existing ground level with a hub height of 105m and rotor diameter of 162m, and 5 no. turbines will have a tip height of 187m above existing ground level with a hub heigh of 106m and rotor diameter of 162m.

This Chapter is supported by Figures 2.1 – 2.5 provided in Volume IV, and should be read in conjunction with the following:

Appendix 9.1 Volume III – Bat Report

Appendix 9.2 Volume III – Aquatic Ecology Report

9.2 Statement of Authority

This chapter has been prepared by Caroline Lalor, Patrick Crushell and Mary Catherine Gallagher, all Ecologists with Wetland Surveys Ireland (WSI) Ltd. Other trained and experienced WSI staff members contributed to various aspects of the preparation, including conducting field work. Mr. Pat Doherty completed the bat surveys and Bat Assessment Report while the Aquatic Ecology was surveyed by Dr. William O'Connor of EcoFact.

Caroline Lalor (BSc., MSc., MCEIEEM) received an honours degree in Applied Ecology from University College Cork and a Masters degree in Ecosystem Conservation and Landscape Management from National University of Ireland, Galway. She is a full member of the Institution of Ecology and Environmental Management (CIEEM). Caroline has 20 years of postgraduate experience, working in peatland conservation and ecological consulting. She has experience working on environmental impact assessment for various developments, including renewable energy projects, preparing chapters of the EIARs, preparing AA Screening and NIS reports.

Dr. Patrick Crushell (BSc., MSc., PhD., CEcol., MCIEEM) has been working in the area of nature conservation and ecological assessment since 2002. He has worked as a consultant ecologist in the preparation of Ecological Impact Assessments on over 500 different projects for a range of organisations including government agencies, engineering firms, local environmental groups and NGOs and has appeared as an expert witness on numerous occasions. Projects that he has been involved in include impact assessments of various development proposals; pre and post – construction monitoring; wetland surveys; evaluation of proposed designated sites; bird surveys; flora and fauna surveys; restoration and management of habitats and baseline ecological surveys. He established and managed three successful agri-environmental results-based schemes.

Dr. Mary Catherine Gallagher (BSc., MSc., PhD.) received honours degree (BSc) in Zoology and a Masters degree (MSc) in Marine Biology in UCC from UCC. She followed this with a PhD on an invasive barnacle species. Mary Catherine has experience in project management, coastal and freshwater habitat and biodiversity surveys, monitoring surveys and mapping, Geographical Information Systems (GIS), report compilation and has created a range of public information resources and educational materials for various clients including the Pearl Mussel Project.

The Aquatic Ecology Report was prepared by Dr. William O'Connor, Senior Ecologist with EcoFact. Dr. O'Connor has over 30 years professional experience and holds an MSc in Applied Hydrobiology from the University of Wales, Cardiff and a PhD in Zoology from the National University of Ireland, Galway. He is a Fellow of the Royal Society of Biology and a full member of the Chartered Institute of Ecology and Environmental Management. The surveys for this report were also completed by Dr. Will O'Connor with the assistance of junior staff.

The Bat Survey Report has been prepared by Mr. Pat Doherty BSc., MSc, MCIEEM, of Doherty Environmental Consultants (DEC) Ltd. Mr. Doherty is a consultant ecologist with over 20 years' experience in completing ecological impact assessments and environmental impact assessments. Pat has been involved in the completion of assessment reports for Proposed Developments and land use activities under the EIA Directive and Article 6 of the Habitats Directive since 2003 and 2006 respectively. He has extensive experience completing such reporting for projects located in a variety of environments and has a thorough understanding to the biodiversity issues that may arise from proposed land use activities. Pat was responsible for completing one of the first Appropriate Assessment reports for large scale infrastructure developments in Ireland when he prepared the Appropriate Assessment for the N25 New Ross Bypass in 2006/07. Since then, Pat has completed multiple examinations of both plans and projects in Ireland. He has completed Natura Impact Statements for national scale plans such as Ireland's CAP Strategic Plan and National Seafood Development Plan and regional and county scale plans including County Development Plans, Local Area Plans, Tourism Strategies and Climate Action Plans. Pat has completed multiple Natura Impact Statements for a range of development types that include large scale infrastructure developments in sectors such as transport and energy as well as industrial, commercial and residential developments.

9.3 Study Area

The Study Area is predominantly within the Proposed Development Site boundary (for birds it extended further: see Chapter 10). Ecological features that were outside of the Site boundary but connected hydrologically were also considered. Nationally and internationally designated sites and sites proposed for designation within 15Km were taken into account in this assessment.

The Site is approximately 213.67ha in extent and is located in a lowland setting in Counties Offaly and Kildare. Part of the underground cable route (UGR) occurs in County Laois. The Site is located approximately 6.5km north-east of Portarlington. Agriculture is the primary land use in the study area. The Site lies to the north and north-east of Derrylea Bog (cutover), while the north-central area of the Site surrounds another cutover bog actively harvested for peat. A conifer plantation occurs in the northern part of the Wind Farm Site comprising Sitka spruce. The Cushina River divides the Site and acts as the county boundary between Counties Offaly and Kildare. The lands immediately to the north of the River Cushina are mapped as being 'liable to flooding' as per the old 25 inch maps and the lands north and south of the River Cushina in the east of the Site are mapped as having a High Probability of flooding in the present day according to Ireland's Catchment Flood Risk and Management (CFRAM) Programme (see. https://www.floodinfo.ie/map/floodmaps/#). There are no other naturally occurring watercourses within or bounding the Wind Farm, although there are numerous field drains draining water into the Cushina. The River Cushina joins the River Figile approximately 290m downstream of the Proposed Development Site to the east. A new access route from the R419 is proposed and this extends the study area from the main Wind Farm area westwards along the proposed access route.

The large area cutover bog in the north-central area of the Site lies outside the Site boundary and was subject to ongoing peat extraction at the time of survey.

The Study Area also included the lands within and immediately adjacent to the proposed underground Grid Connection Route (GCR) and the Transport Delivery Route (TDR) as per Figure 9-1.

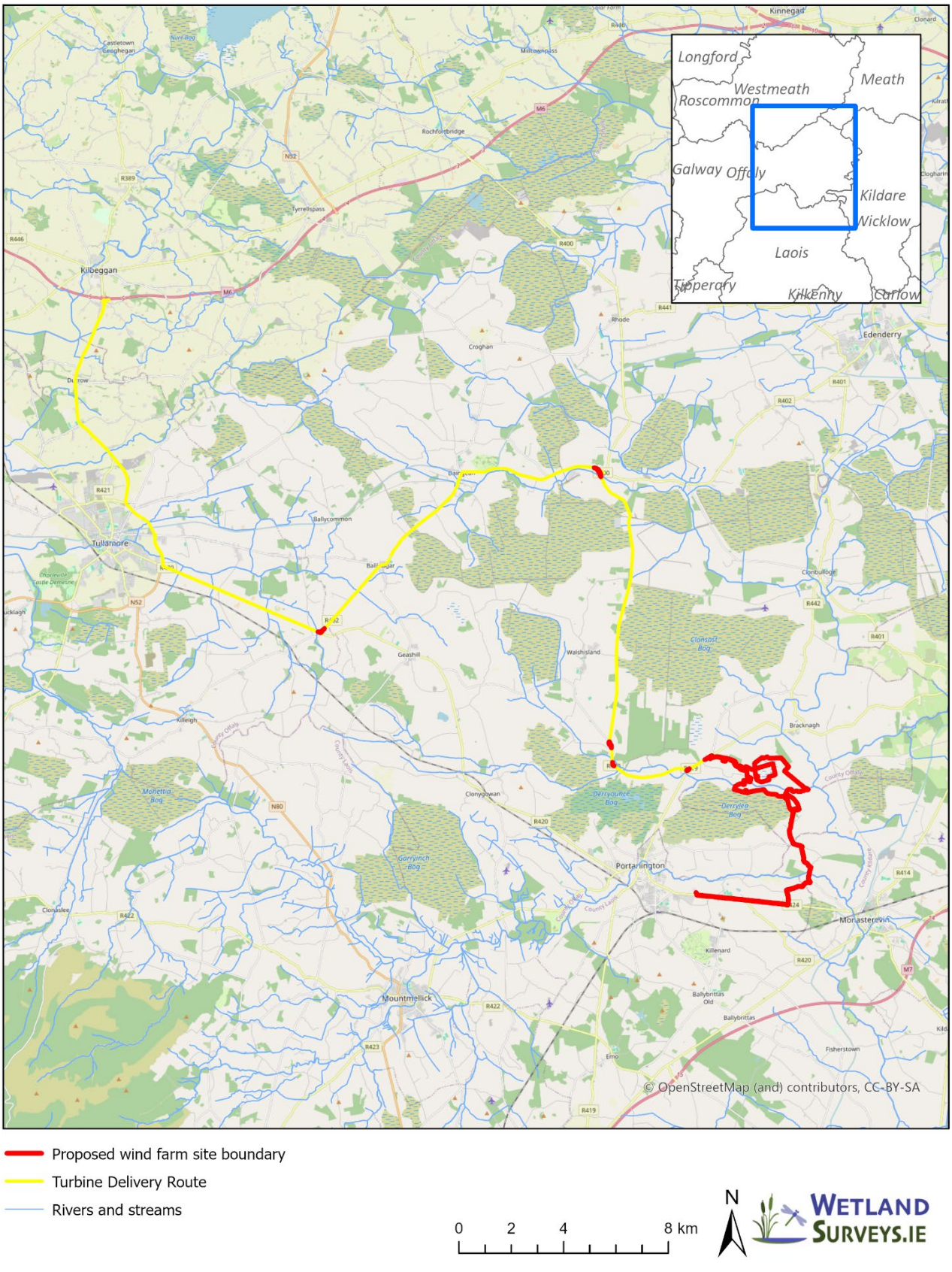

Figure 9-1: Map illustrating the location of the Proposed Site, underground grid connection route (GCR) and turbine delivery route (TDR).

9.4 Consultation

This EIAR chapter has been compiled in light of the comments received from consultees throughout the EIA process, the relevant elements of which are summarised hereunder and presented in detail in Chapter 5 - Scoping and Consultation.

Consultee	Date Response Received	Response	Addressed in Section
An Taisce	N/A	No response received to date	N/A
Bat Conservation Ireland (BCI)	N/A	No response received to date	N/A
BirdWatch Ireland	N/A	No response received to date	N/A
Botanical Society of Britain and Ireland	N/A	No response received to date	N/A
Butterfly Conservation Ireland	N/A	No response received to date	N/A
Department of Housing, Local Government and Heritage	N/A	No response received to date	N/A
Development Application Unit	N/A	No response received to date	N/A
Department of Environment, Climate and Communications	N/A	No response received to date	N/A
Environmental Protection Agency	N/A	No response received to date	N/A
Forestry Service	N/A	No response received to date	N/A
Heritage Council	N/A	No response received to date	N/A

Consultee	Date Response Received	Response	Addressed in Section
Inland Fisheries Ireland	09/01/2025	Noted that historical modifications to the river channel (over-deepening and over-widening) have caused damage to the Cushina River and significantly reduced the suitability of the river for salmon-spawning. IFI stated that human intervention would be required to facilitate recovery of the fisheries habitat here and they requested that the Proposed Development include habitat restoration of the section of Cushina River flowing through the Proposed Development Site. Noted that excellent riparian/terrestrial habitat has been noted along the banks of the Cushina River. Request that any new crossings of the Cushina River would be clear span bridges and would not necessitate the removal of any high-quality habitat. Requested also that the design and construction method statement be agreed with IFI. Noted that the Proposed Development may require new crossing of the Bracknagh Stream, a small tributary of the Figile River. Requested that the design and construction method statement be agreed with IFI.	It was deemed that instream restoration works would be beyond the scope and responsibility of the Proposed Development. Such works would need planning permissions of their own. However, the Proposed Development is committed to implementing measures to improve water quality and restoring certain areas of damaged habitat along riverbanks. These are outlined in the BEMP which is presented in Volume 3, Appendix 2.2. Inland Fisheries Ireland (IFI) will be consulted in advance of watercourse crossing works. The Inland Fisheries Ireland (2016): Guidelines on Protection of Fisheries During Construction Works in and Adjacent to Waters; and the Scottish Natural Heritage (SNH) Good Practice During Wind Farm Construction (SNH, 2019, 4th Edition) will also be adhered to. No high-quality riparian habitats will be impacted by the proposed new river crossing. Both water crossings (one over the River Cushina and one over the Philipstown River) will be clear-span bridges. The Bracknagh Stream no longer lies within the proposed footprint of the Proposed Development.
Irish Peatland Conservation Council	N/A	No response received to date	N/A
Irish Raptor Study Group	N/A	No response received to date	N/A
Irish Wildlife Trust	N/A	No response received to date	N/A

Consultee	Date Response Received	Response	Addressed in Section
Kildare County Council	N/A	No response received to date	N/A
Laois County Council	N/A	No response received to date	N/A
National Parks and Wildlife Service	N/A	NPWS Divisional Ecologist met with WSI staff (CL and PC) on 9th May 2025 to discuss various elements of the Proposed Development. In relation to Biodiversity, the following were discussed: • To detail the mitigation measures that might be needed for bats and post construction monitoring • Peatland Habitats – address potential air quality impacts during construction • Ensure appropriate surveys completed and mitigation included e.g. pine marten, red squirrel, badger, otter.	Addressed in Sections: • 9.14 • 9.13.1.2 • 9.5.2.2 • 9.5.2.3 and • 9.14
Offaly County Council	N/A	No response received to date	N/A
Waterways Ireland	N/A	No response received to date	N/A

9.5 Methodology

9.5.1 Desk Study

A desktop review of aerial photography and existing GIS datasets was undertaken to determine the previously recorded ecological value of the study area and its surroundings and also to identify sites designated for nature conservation and other features of ecological significance such as rivers and streams. Resources such as the National Parks and Wildlife Service, National Biodiversity Centre, and EPA Maps were utilised to accumulate data on the Proposed Development Site and its connectivity to sites designated for nature conservation or sensitive aquatic receptors.

The desk study undertaken for this assessment included a thorough review of available ecological data including the following:

- Review of NPWS Article 17 maps 2019, 2013 and 2007.
- Review of online web-mappers: National Parks and Wildlife Service (NPWS), EPA (Envision), Water Framework Directive (WFD), National Biodiversity Data Centre (NBDC) and Inland Fisheries Ireland (IFI).
- Inland Fisheries Ireland (IFI) Reports, where available.
- Data on potential occurrence of Flora Protection Order species – as per NPWS online Flora Protection Order Map Viewer.
- Review of relevant Plans, including the National Biodiversity Action Plan 2017-2021, County Biodiversity Plans and the All Ireland Pollinator Plan 2021-2025.
- Review of Bat Landscapes (Lundy *et al.* 2011)

Potential for in-combination effects have been considered in Section 9.17 of this Chapter. This was informed by a review of the EIARs, environmental assessments prepared and publicly available information for other plans and projects occurring in the wider area.

9.5.2 Field Assessment

9.5.2.1 Habitat Survey

This EIAR was informed by both desktop and field-based surveys. Multidisciplinary ecological walkover surveys were undertaken by qualified ecologists working with WSI as per Table 9-1 below. These preliminary walkover surveys were conducted to determine the characteristics of the Proposed Development Site on the ground and to complete a habitat survey. Target notes were made of all semi-natural habitats encountered during the survey including notes on dominant vegetation, qualitative assessment of plant species diversity, vegetation structure, topography, drainage, disturbance, and management. Habitats onsite were identified according to Fossitt (2000) Guide to Habitats in Ireland and assessed with regards their vegetation, condition and conservation status. The habitats were mapped using GIS software. Methods used during the habitat survey and mapping followed best practice guidance as outlined in Smith *et al.* (2010). In addition, raised bog habitats were mapped using ecotope classification (as per ecotope methodology developed by Kelly and Schouten 2002).

Surveys were strategically selected based on the characteristics of the habitats present, and more specialized groups such as protected/rare invertebrate and bryophyte species, were excluded due to their likely absence.

Table 9-1: Summary details of ecological surveys undertaken at the Site to inform the EIAR

Survey	Season	Survey methods	Surveyor
19th April 2021	Spring	Multidisciplinary walkover	WSI
24th November 2021	Autumn	Multidisciplinary walkover	WSI
19th April 2022	Spring	Targeted Mammal Surveys	WSI
29th & 30th September 2022	Autumn	Multidisciplinary survey (windscreen and targeted walkover) of TDR and CGR	WSI
14th November 2023	Winter	Multidisciplinary walkover	WSI
13th February 2025	Spring	Multidisciplinary walkover	WSI
03rd April 2025	Spring	Multidisciplinary walkover of access route; Cable Grid Route Survey	WSI
4th April 2025	Spring	Multidisciplinary survey (windscreen and targeted walkover) of TDR	WSI
7th May 2025	Summer	Multidisciplinary walkover; Targeted Mammal Survey	WSI
12th May 2025	Summer	Multidisciplinary walkover; Targeted Mammal Survey	WSI
2021 Bat Activity Season	Summer & Autumn	Extended automatic monitoring for bat activity	Doherty Environmental
2022 Bat Activity Season	Spring	Extended automatic monitoring for bat activity	Doherty Environmental
2023 Bat Activity Season	Spring, Summer & Autumn	Extended automatic monitoring for bat activity	Doherty Environmental
2024 Bat Activity Season	Spring, Summer & Autumn	Extended automatic monitoring for bat activity	Doherty Environmental
17th April and 1st May 2024	Spring/Summer	Bat Roost Surveys	Doherty Environmental
September 2021	Autumn	Aquatic Ecology surveys	Ecofact
September 2024	Autumn	Aquatic Ecology surveys	Ecofact

9.5.2.2 Terrestrial Mammal Survey

The results of the desktop study, scoping replies, incidental records of protected species during ecological survey work and multidisciplinary walkover surveys were used to inform the scope of targeted ecological surveys required. Targeted terrestrial mammal surveys were undertaken within suitable habitat in the Site on 19th April 2022, on 7th May 2025 and 15th May 2025 by WSI to assess the Site for any evidence of mammal activity, with a particular focus on Badger, Otter, Pine Marten and Red Squirrel.

The otter survey was conducted as per NRA (2009) guidelines (Ecological Surveying Techniques for Protected Flora and Fauna during the Planning of National Road Schemes). This involved searching for all otter signs e.g. spraints, scat, prints, slides, trails, couches and holts. In addition to the width of the rivers/watercourses, a 10m riparian buffer (both banks) was considered to comprise part of the otter habitat (NPWS 2009). The dedicated otter survey also followed the guidance as set out in NRA (2008) 'Guidelines for the Treatment of Otters Prior to the Construction of National Roads Schemes' and following CIEEM best practice competencies for species surveys (CIEEM, 2013a).

Areas identified as providing potential habitat for badger were subject to specialist targeted surveys. Targeted surveys were also undertaken in areas where incidental badger signs, setts or sightings were recorded during walkover surveys of the Site. The badger survey was not constrained by vegetation given the nature of the habitats within the Site and the timing of the surveys (NRA, 2005). The badger surveys were conducted in order to determine the presence or absence of badger signs within areas of identified suitable habitats within the Site of the Proposed Development and wider survey area. This involved a search for all potential badger signs as per NRA (2009) (latrines, badger paths, badger hairs and setts). Where setts were identified, these were assigned likely levels of activity based on the observations made on the day of the survey (e.g. signs of fresh digging, fresh bedding etc.). The badger survey was conducted adhering to best practice guidance (NRA, 2009) and followed the 'Guidelines for the Treatment of Badger Prior to the Construction of National Roads Schemes' (NRA, 2005) and CIEEM best practice competencies for species surveys (CIEEM, 2013).

The Red Squirrel survey was conducted in accordance with the survey methodology outlined jointly by the Forestry Commission and JNCC (Gurnell *et al*. 2009). The Pine Marten Survey was conducted with regard to NRA (2009) guidelines. Signs of these animals (scats, feeding signs, dreys/dens etc.) were searched for in suitable habitat. Activity surveys for red squirrel were also conducted.

All mammals recorded during site visits were noted (MacDonald & Barrett 1993). Signs and tracks of mammals are the best way of assessing a site without conducting night surveys. All signs and tracks (Bang and Dahlstrom 2004) were assessed as they were encountered in the field.

9.5.2.3 Bat Survey

Detailed descriptions of the survey methodologies undertaken at the Site during the multi-year surveys from June 2021 to November 2024 are provided within the standalone Bat Assessment Report included as Appendix 9-1, Volume III of this EIAR. This report includes full details of the survey times and the surveyors (from Pat Doherty Consultants) who carried out the bat survey and assessment work. Survey design and effort in 2020 was created in accordance with the best practice guidelines available at the time, '*Bat Surveys for Professional Ecologists: Good Practice Guidelines'* prepared by the Bat Conservation Trust (Collins, 2023). Surveys undertaken were undertaken in strict accordance with those prescribed in NatureScot (2021) 'Bats and Onshore Wind Turbines: Survey, Assessment and Mitigation'. This is in line with standard best practice industry guidelines.

Bat surveys were undertaken at the Site by Doherty Environmental and surveys included extended automatic monitoring of bat activity and bat roost surveys.

9.5.2.4 Aquatic Survey

Detailed descriptions of the survey methodologies undertaken at the Site during the survey period are provided within the standalone Aquatic Report included as Appendix 9-2 in Volume 3 of this EIAR, together with full details of the survey times and the surveyors who carried out the survey and assessment work. Aquatic habitat surveys were completed with reference to the Environment Agency's "*River Habitat Survey in Britain and Ireland Field Survey Guidance Manual 2003*" (EA, 2003) and "*A Guide to Habitats in Ireland*" (Fossitt, 2000). Lamprey habitats in the study area were assessed with reference to the manuals 'Ecology of the River, Brook and Sea Lamprey *Lampetra fluviatilis*, *L. planeri* and *Petromyzon marinus'* by Maitland (2003) and 'Monitoring the River, Brook and Sea Lamprey' by Harvey and Cowx (2003). Salmonid habitat was evaluated with reference the Department of Agriculture for Northern Ireland's Fisheries Division document, the '*Evaluation of habitat for Salmon and Trout'* (DANI, 1995), and the English Nature manuals 'Ecology of the Atlantic Salmon' by Hendry K & Cragg-Hine D (2003).

9.5.2.5 Invasive Species Survey

During the multi-disciplinary walkover surveys, a search for non-native invasive species was undertaken. The survey focused on the identification of invasive species listed under the Third Schedule of the European Communities (Birds and Natural Habitats) Regulations 2011 (As Amended). Under this legislation, "*any person who plants, disperses, allows or causes to disperse, spreads or otherwise causes to grow in any place [a restricted non-native plant], shall be guilty of an offence*" (unless under licence granted by the relevant Minister).

Similarly, under the Wildlife (Amendment) Act, 2000, it is an offence for any person to cause "*to grow in a wild state in any place in the State any species of flora, or the flowers, roots, seeds or spores of flora, ['refers only to exotic species thereof'][...] otherwise than under and in accordance with a licence granted in that behalf by the Minister".*

The legislative framework governing the control of Invasive Alien Species (IAS) includes:

- Wildlife Acts, 1976 to 2012
- European Communities (Birds and Natural Habitats) Regulations, 2011 to 2015
- EU Invasive Alien Species Regulation (Regulation (EU) 1143/2014

Any non-native invasive species found was recorded in the field using ESRI GIS mapping.

9.5.2.6 Biodiversity Enhancement Management Plan (BEMP)

A Biodiversity Enhancement Management Plan has been prepared to outline a set of land management prescriptions (commitments and monitoring) as part of the proposed Derrynadarragh Wind Farm Project. The BEMP provides a commitment to yield a lasting biodiversity benefit to the area within and around Derrynadarragh. The BEMP is presented as Appendix 2.2 in Volume 3 of this EIAR.

9.5.2.7 Survey Limitations

Seasonal factors that affect distribution patterns and habits of species were taken into account when conducting the surveys. The potential of the Site to support faunal populations of conservation importance whose presence onsite may vary due to seasonal absence or nocturnal/cryptic habits was considered, and surveys were designed to provide a comprehensive temporal and seasonal spread. The specialist studies, analysis and reporting have been undertaken in accordance with the appropriate guidelines. The habitats and species on the Site were readily identifiable, and robust assessments were made during the field visits. Terrestrial walkover surveys did not identify a need for more specialised botanical surveys during the summer months. No limitations in the scope, scale or context of the assessment have been identified.

9.5.3 Relevant Legislation and Guidance

The assessment has regard to the following documents and legislation:

- CIEEM (2016) Guidelines for Ecological Impact Assessment in the UK and Ireland: Terrestrial, Freshwater and Coastal, 2nd edition. (Chartered Institute of Ecology and Environmental Management)
- DAHG (2011). Irelands National Biodiversity Plan: Actions for Biodiversity 2011 – 2016;
- European Commission (2010). Wind energy development and Natura 2000. Guidance document.
- DoEHLG (2009). Appropriate Assessment of Plans and Projects in Ireland.
- EPA (2022). Guidelines on the Information to be Contained in Environmental Impact Assessment Reports.
- EPA (2003). Advice notes on current practice (in the preparation of Environmental Impact Statements).
- European Commission (2002). Assessment of plans and projects significantly affecting Natura 2000 sites.
- The European Communities (Birds and Natural Habitats) Regulations 2011 (SI 411/11)
- EIA Directive 85/337/EEC (as amended by 97/11/EC)
- The Wildlife Act 1976 and (amendment) Act 2000
- The Habitats Directive 92/43/EEC (under SI 94/97)
- The Birds Directive 79/409/EEC
- Flora (Protection) Order 2015

9.5.3.1 Objectives of the Offaly County Development Plan 2021-2027 and Kildare County Development Plan 2023-2029 for Biodiversity

The Offaly County Development Plan 2021-2027 and Kildare County Development Plan 2023-2029 set out strategies for the proper planning and sustainable development of the relevant County over the Plan periods. The Plans also contain development management standards, policies and objectives and references statutory guidelines which will inform decision making over the period of the Plans. In terms of Biodiversity, the County Development Plans (CDPs) aim to protect, manage and enhance the Counties Biodiversity for future generations. The Proposed Development complies with all relevant Biodiversity objectives of each of the CDP's as set out in Chapter 4, Volume 2 of this EIAR.

9.6 Evaluation Criteria

9.6.1 Determining Importance of Ecological Receptors

The method of evaluating ecological significance used in this study is based on guidelines issued by IEEM (2016) and the NRA (2009). The results of the habitat and fauna surveys were evaluated to determine the significance of identified ecological features located in the study area on an importance scale ranging from International → National → County → Local. The local scale is approximately equivalent to one 10km square but can be operationally defined to reflect the character of the area of interest. Because most sites will fall within the local scale, this is sub-divided into Local Importance (Higher Value) and Local Importance (Lower Value). The criteria shown in Table 9-2 have been used in assessing ecological value within the study area. In addition to the criteria listed in Table 9-2, the evaluation of habitats and species also considers other factors such as potential ecological value, secondary supporting values where habitats may perform a secondary ecological function and social values of an ecological feature such as educational, recreational and economic value.

The impact significance is a combined function of the value of the affected feature (its ecological importance), the type of impact and the magnitude of the impact. It is necessary to identify the value of ecological features within the study area in order to evaluate the significance and magnitude of possible impacts.

Any ecological features that are determined to be of National or International, County or Local importance (Higher Value) following the criteria set out in NRA (2009) are considered to be Key Ecological Receptors (KERs) for the purposes of ecological impact assessment if there is a pathway for effects thereon. Any receptors that are determined to be of Local Importance (Lower Value) are not considered to be Key Ecological Receptors.

Table 9-2: Criteria used in assessing the ecological importance of sites

[Source: Guidelines for Assessment of Ecological Impacts of National Road Schemes (2009)]

International Importance:

- 'European Site' including Special Area of Conservation (SAC), Site of Community Importance (SCI), Special Protection Area (SPA) or proposed Special Area of Conservation.
- Proposed Special Protection Area (pSPA).
- Site that fulfils the criteria for designation as a 'European Site' (see Annex III of the Habitats Directive, as amended).
- Features essential to maintaining the coherence of the Natura 2000 Network.[1]
- Site containing 'best examples' of the habitat types listed in Annex I of the Habitats Directive.
- Resident or regularly occurring populations (assessed to be important at the national level)[2] of the following:
  - Species of bird, listed in Annex I and/or referred to in Article 4(2) of the Birds Directive; and / or
  - Species of animal and plants listed in Annex II and/or IV of the Habitats Directive.
- Ramsar Site (Convention on Wetlands of International Importance Especially Waterfowl Habitat 1971).
- World Heritage Site (Convention for the Protection of World Cultural & Natural Heritage, 1972).
- Biosphere Reserve (UNESCO Man & The Biosphere Programme).
- Site hosting significant species populations under the Bonn Convention (Convention on the Conservation of Migratory Species of Wild Animals, 1979).
- Site hosting significant populations under the Berne Convention (Convention on the Conservation of European Wildlife and Natural Habitats, 1979).
- Biogenetic Reserve under the Council of Europe.
- European Diploma Site under the Council of Europe.
- Salmonid water designated pursuant to the European Communities (Quality of Salmonid Waters) Regulations, 1988, (S.I. No. 293 of 1988).[3]
-

National Importance:

- Site designated or proposed as a Natural Heritage Area (NHA).
- Statutory Nature Reserve.
- Refuge for Fauna and Flora protected under the Wildlife Acts.
- National Park.
- Undesignated site fulfilling the criteria for designation as a Natural Heritage Area (NHA); Statutory Nature Reserve; Refuge for Fauna and Flora protected under the Wildlife Act; and/or a National Park.
- Resident or regularly occurring populations (assessed to be important at the national level)[4] of the following:
  - Species protected under the Wildlife Acts; and/or
  - Species listed on the relevant Red Data list.
- Site containing 'viable areas'[5] of the habitat types listed in Annex I of the Habitats Directive.

[1] See Articles 3 and 10 of the Habitats Directive.

[2] It is suggested that, in general, 1% of the national population of such species qualifies as an internationally important population. However, a smaller population may qualify as internationally important where the population forms a critical part of a wider population or the species is at a critical phase of its life cycle.

[3] Note that such waters are designated based on these waters' capabilities of supporting salmon (*Salmo salar*), trout (*Salmo trutta*), char (*Salvelinus*) and whitefish (*Coregonus*).

[4] It is suggested that, in general, 1% of the national population of such species qualifies as a nationally important population. However, a smaller population may qualify as nationally important where the population forms a critical part of a wider population or the species is at a critical phase of its life cycle.

[5] A 'viable area' is defined as an area of a habitat that, given the particular characteristics of that habitat, was of a sufficient size and shape, such that its integrity (in terms of species composition, and ecological processes and function) would be maintained in the face of stochastic change (for example, as a result of climatic variation).

Local Importance (higher value):

- Locally important populations of priority species or habitats or natural heritage features identified in the Local BAP, if this has been prepared;
- Resident or regularly occurring populations (assessed to be important at the Local level)[6] of the following:
  - Species of bird, listed in Annex I and/or referred to in Article 4(2) of the Birds Directive;
  - Species of animal and plants listed in Annex II and/or IV of the Habitats Directive;
  - Species protected under the Wildlife Acts; and/or
  - Species listed on the relevant Red Data list.
- Sites containing semi-natural habitat types with high biodiversity in a local context and a high degree of naturalness, or populations of species that are uncommon in the locality;
- Sites or features containing common or lower value habitats, including naturalised species that are nevertheless essential in maintaining links and ecological corridors between features of higher ecological value.

Local Importance (lower value):

- Sites containing small areas of semi-natural habitat that are of some local importance for wildlife;
- Sites or features containing non-native species that are of some importance in maintaining habitat links.

[6] It is suggested that, in general, 1% of the local population of such species qualifies as a locally important population. However, a smaller population may qualify as locally important where the population forms a critical part of a wider population or the species is at a critical phase of its life cycle.

9.7 Characterisation of Impacts and Effects

The Proposed Development will result in a number of impacts. The ecological effects of these impacts are characterised as per the CIEEM 'Guidelines for Ecological Impact Assessment in the UK and Ireland' (2018). These guidelines are the industry standard for the completion of Ecological Impact Assessment in the UK and Ireland. This chapter has also been prepared in accordance with the corresponding EPA guidance (EPA 2022). The headings under which the impacts are characterised follow those listed in the guidance document and are applied where relevant. A summary of the impact characteristics considered in the assessment is provided below:

- **Beneficial or Adverse.** Assessment of whether the Proposed Development results in a beneficial or adverse effect on the ecological receptor.
- **Extent**. Description of the spatial area over which the effect has the potential to occur.
- **Magnitude.** Refers to size, amount, intensity and volume. It should be quantified if possible and expressed in absolute or relative terms e.g. the amount of habitat lost, percentage change to habitat area, percentage decline in a species population. Duration is defined in relation to ecological characteristics (such as the lifecycle of a species) as well as human timeframes. For example, five years, which might seem short-term in the human context or that of other long-lived species, would span at least five generations of some invertebrate species.
- **Frequency and Timing.** This relates to the number of times that an impact occurs and its frequency. A small-scale impact can have a significant effect if it is repeated on numerous occasions over a long period.
- **Reversibility.** This is a consideration of whether an effect is reversible within a 'reasonable' timescale. What is considered to be a reasonable timescale can vary between receptors and is justified where appropriate in the impact assessment section of this report.

9.8 Determining the Significance of Effects

The ecological significance of the effects of the Proposed Development are determined following the precautionary principle and in accordance with the methodology set out in Section 5 of CIEEM (2018).

For the purpose of Ecological Impact Assessment (EcIA), 'significant effect' is an effect that either supports or undermines biodiversity conservation objectives for 'important ecological features' or for biodiversity in general. Conservation objectives may be specific (e.g. for a designated site) or broad (e.g. national/local nature conservation policy) or more wide-ranging (enhancement of biodiversity). Effects can be considered significant at a wide range of scales from international to local (CIEEM, 2018).

When determining significance, consideration is given to whether:

- Any processes or key characteristics of key ecological receptors will be removed or changed.
- There will be an effect on the nature, extent, structure and function of important ecological features.
- There is an effect on the average population size and viability of ecologically important species.
- There is an effect on the conservation status of important ecological habitats and species.

The assessment of impacts is broadly based on guidance offered by the Chartered Institute of Environmental and Ecological Management (CIEEM) in the published Guidelines for Ecological Impact Assessment (2016) with reference to national guidance given in NRA (2009), and EPA (2022). Impacts are discussed and assessed in

relation to impact type (positive, neutral or negative), character and sensitivity of the affected feature, magnitude, duration, timing and frequency.

Criteria for assessing impact type and impact magnitude are presented in Table 9-3 and Table 9-4, respectively. In assessing the magnitude and significance of effects it is important to consider the value of the affected feature as shown in Table 9-2 above. Criteria for assessing the duration and frequency of an effect are listed below in Table 9-5.

Table 9-3: Criteria for assessing effect type

Impact type	Criteria
Beneficial effect:	A change is likely to improve the ecological feature in terms of its ecological value.
Neutral	No effects or effects that are imperceptible, within normal bounds of variation or within the margin of forecasting error.
Adverse effect:	The change is likely to adversely affect the ecological value of the feature.

Table 9-4: Criteria for assessing effect magnitude.

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

Table 9-5: Definitions of effects of different duration and frequency

Effect Duration and Frequency of Effects	Definition
Momentary Effects	Effects lasting from seconds to minutes.
Brief Effects	Effects lasting less than a day.
Temporary Effects	Effects lasting less than a year.
Short-term Effects	Effects lasting one to seven years.
Medium-term Effects	Effects lasting seven to fifteen years.
Long-term Effects	Effects lasting fifteen to sixty years.
Permanent Effects	Effects lasting over sixty years.
Reversible Effects	Effects that can be undone, for example through remediation or restoration.
Frequency of Effects	Describe how often the effect will occur (once, rarely, occasionally, frequently, constantly – or hourly, daily, weekly, monthly, annually).

The conventional source-pathway-receptor model is applied to assess potential effects on environmental receptors resulting from the Proposed Development. The source is the activity that results in the potential effect or the potential source of pollution; the pathway is the route by which a potential source of effect can transfer or migrate; and the receptor is the part of the natural environment that could potentially be affected, having regard to its sensitivity.

As per TII (NRA, 2009) and CIEEM (2018) best practice guidelines, the following key elements should also be examined when determining the significance of effects:

- The likely effects on 'integrity' should be used as a measure to determine whether an impact on a site is likely to be significant (NRA, 2009).
- A 'significant effect' is an effect that either supports or undermines biodiversity conservation objectives (CIEEM, 2018).

Integrity

In this context 'integrity' refers to the coherence of the ecological structure and function, across the entirety of a site, that enables it to sustain all of the ecological resources for which it has been valued (NRA, 2009). Impacts resulting in adverse changes to the nature, extent, structure and function of component habitats and effects on the average population size and viability of component species, would affect the integrity of a site, if it changes the condition of the ecosystem to unfavourable.

Conservation Status

An impact on the conservation status of a habitat or species is considered to be significant if it will result in a change in conservation status. According to CIEEM (2018) guidelines the definition for conservation status in relation to habitats and species are as follows:

- Habitats – conservation status is determined by the sum of the influences acting on the habitat that may affect its extent, structure and functions as well as its distribution and its typical species within a given geographical area
- Species – conservation status is determined by the sum of influences acting on the species concerned that may affect its abundance and distribution within a given geographical area.

As defined in the EU Habitats Directive 92/43/EEC, the conservation of a habitat is favourable when:

- Its natural range, and areas it covers within that range, are stable or increasing
- The specific structure and functions which are necessary for its long-term maintenance exist and are likely to continue to exist for the foreseeable future
- The conservation status of its typical species is favourable.

The conservation of a species is favourable when:

- Population dynamics data on the species concerned indicate that it is maintaining itself on a long-term basis as a viable component of its natural habitats
- The natural range of the species is neither being reduced nor is likely to be reduced for the foreseeable future
- There is and will probably continue to be, a sufficiently large habitat to maintain its population on a long-term basis.

According to the NRA/CIEEM methodology, if it is determined that the integrity and/or conservation status of an ecological feature will be impacted on, then the level of significance of that impact is related to the geographical scale at which the impact will occur (i.e. local, county, national, international).

9.8.1.1 Incorporation of Mitigation

Section 9.14 of this EIAR assess the likely effects of the Proposed Development to ensure that all effects on sensitive ecological receptors are adequately addressed. Where significant effects on sensitive ecological receptors are predicted, mitigation has been incorporated into the project design or layout to address such impacts. The implementation of mitigation measures seeks to avoid, or where avoidance is not possible, to reduce or offset likely significant residual effects, post mitigation. The mitigation measures proposed are judged to be appropriate and adequate to remove the potential for significant effects on ecological receptors assuming their full implementation.

9.8.1.2 Assessment of Cumulative Impacts

The assessment of cumulative effects on biodiversity considers the combined likely effects of other developments (existing, approved but not yet built or operational, or proposed), with the potential to affect the same sensitive ecological receptors as the Proposed Development, as discussed further in Section 9.17.

9.9 Survey Limitations

No major survey limitations were identified bar the usual limitations associated with inaccessible areas such as dense scrub or wooded areas. Survey work was completed within appropriate seasons and followed appropriate guidance.

9.10 Existing Environment and Project Description

9.10.1 Site Location and General Description

The Wind Farm site comprises approximately 213.67 hectares of land, and is contained within the townlands of Cushina, Clonsast Lower, and Chevychase or Derrynadarragh in County Offaly, and Aughrim and Derrylea in County Kildare. It is located within both the jurisdictions of Kildare County Council and Offaly County Council, approximately 1.7km south of the village of Bracknagh, 5km northwest of Monasterevin, and approximately 6.5km northeast of Portarlington. The landscape here is dominated by agricultural grassland, cutover bog, commercial forestry and rural one-off houses. The Quaternary Sediments (subsoils) in the Site are largely either Cutover Raised Peat or Lake Marl, with small pockets of Limestone Till.

The Proposed Wind Farm comprises a total of 9 no. turbines, with 4 no. turbines to be located in the jurisdiction of County Kildare, and 5 no. turbines to be located in the jurisdiction of County Offaly.

The Proposed Grid Connection (GC) identified to supply power from the proposed development to the Irish National Electricity Grid will exit the site to the south and follow the public road to Bracklone Substation (currently under construction). It will exit the Site to the south and will comprise 11.4km of underground electrical cabling which will pass through the townlands of Cushina in County Offaly; Aughrim and Derrylea in County Kildare, and Inchacooly, Coolnaferagh, Ullard or Controversyland, Clonanny, Lea, Loughmansland Glebe, and Bracklone in County Laois. The underground cabling will traverse the following roads; L70481 (Derrylea Road); L71764; L7050; L-7051; L7176; L71761; R424; and R420 (Lea Road).

The Turbine Delivery Route (TDR) will begin at the port of entry of Galway from Lough Atalia Road, R339, crossing junction with R338, continuing on R339, R336, N6, onto the M6, exiting M6 at Junction 5 Tullamore, N52, R420, R402, R400, R419, onto the proposed new site entrance off the R419. For the purpose of this EIAR, the following transport route has been selected and assessed to facilitate turbine delivery to the Site:

The Turbine components will be delivered to the Galway Port and travel to the M6.

At Junction 5, depart the M6 and continue south on the N52.

Depart the N52 to the east of Tullamore and turn left onto the R420, eastbound.

Turn left onto the R402 northbound.

Continue north and then east on the R402 through Ballinager and Daingean.

Turn right from the R402 onto the R400 travelling south.

Remain on the R400 until reaching R419.

Turn left from to join the R419 then proceed northeast towards the site entrance.

The BEMP lands are wholly located within the Site and include lands in the townlands of Cushina and Aughrim.

A full description of the Proposed Development is given in Chapter 2, Volume 2 of this EIAR and the BEMP is presented in Appendix 2.2, Volume 3.

9.10.2 Local Hydrology

The Site is located wholly within one sub-catchment, the Barrow_SC_040. The Site covers two sub-basins, the FIGILE_070 and the FIGILE_080. However, the GCR and the TDR pass through several other sub-catchments and sub-basins. For instance, the GCR also crosses two additional sub-basins, the BARROW_080 and the BARROW_090. The proposed TDR will pass through numerous additional sub-catchments and sub-basins, including the Figile_SC_020 where the construction of new access roads and a watercourse crossing is proposed.

The Proposed Wind Farm Site drains to the Cushina River (EPA Name: Cushina 14), which flows from west to east through the southern section of the Site for approximately 2.4rkm. The Cushina flows to join the Figile River approx. 290rkm downstream of the Site. The Site is linked hydrologically, via the Cushina and Figile rivers to the River Barrow approximately 6rkm downstream of the Site.

In addition, the TDR Accommodation Works are hydrologically linked to the River Barrow and River Nore SAC via the Philipstown River, which lies within TDR Node 29/30. The Philipstown River is linked hydrologically, via the Figile River, to the River Barrow approximately 29rkm downstream.

9.10.2.1 Watercourse-crossings

Within the Wind Farm Site there are 36 no. proposed drain crossings and 1 no. proposed watercourse crossing. For further details on drain and watercourse crossings please refer to Chapter 12, Volume 2 of the EIAR.

It is proposed to install 1 no. clear span bridge crossing where the internal wind farm access track crosses the Cushina River. Please refer to Planning Drawing No. P22-145-0300-0001. This will be a clear-span bridge, the construction of which will be scheduled to align with fisheries seasonal restrictions. The Inland Fisheries Ireland (2016) *Guidelines on Protection of Fisheries During Construction Works in and Adjacent to Waters* and the Scottish Natural Heritage (SNH) *Good Practice During Wind Farm Construction* (SNH, 2019, 4th Edition) will also be adhered to.

Other drain crossings within the wind farm Site comprise bottomless box culverts and pipe culverts where the proposed wind farm access track crosses land drains. For more information and illustrations of proposed single span bridge crossings, box culverts and piped culverts, see Chapter 12, located in Volume 2 of the EIAR.

With regards to the TDR, there will be 1 no. watercourse crossing point over the Philipstown River (also known as the Daingean River). This will be a clear-span bridge, the construction of which will be scheduled to align with fisheries seasonal restrictions. The Inland Fisheries Ireland (2016) *Guidelines on Protection of Fisheries During Construction Works in and Adjacent to Waters* and the Scottish Natural Heritage (SNH) *Good Practice During Wind Farm Construction* (SNH, 2019, 4th Edition) will also be adhered to.

With regards to the Grid Connection, there will be 7 no. crossing points comprising 6 no. watercourse crossings and one dry stone arch bridge crossing at a disused canal. There will be 6 no. Horizontal Directional Drilling (HDD) and 1 no. flat formation crossing within the road above an existing culvert.

It is proposed to cross the GC cable on the Barrow River (BARROW_090) where there is an existing bridge (Baylough Bridge) and to use HDD to bring the cable under the river. This crossing point is also a crossing point of the River Barrow and River Nore SAC. For further detailed description of the HDD crossing methodology please refer to Chapter 12 (Hydrology) in Volume 2 of this EIAR and Section 9.14.2 of this Chapter.

The proposed crossing designs have been designed in accordance with Inland Fisheries Ireland (IFI) requirements for salmonid watercourses as included in their 2016 'Guidelines on Protection of Fisheries During Construction Works in and Adjacent to Waters' and TII 2008 'Guidelines for the Crossing of Watercourses During the Construction of Road Schemes'. Details of proposed crossing structures are presented in 0500-Series planning application drawings.

9.10.3 Designated Sites

The Proposed Development does not lie within any sites designated or under consideration for designation for nature conservation. Table 9-6: presents details of designated sites that occur within 15km of the Proposed Development Site while Figure 9-2 shows their distribution in relation to the Proposed Development Site.

Natural Heritage Areas (NHAs) and proposed Natural Heritage Areas (pNHAs) are sites of national importance due to the presence of listed species and habitats that have been recognised as being important on a national level. The nearest of these is the Grand Canal pNHA (site code: 002104), which occurs approximately 4.3km to the east of the Site at its nearest point. The pNHA is located circa 1km downstream from the point where the Figile River and the Barrow River meet, in Monasterevin Town. There is potential for connectivity between the Site and the Grand Canal pNHA (circa 7.2km downstream of the Site) via semi-aquatic species such as Otter (and possibly newt).

The TDR passes immediately adjacent to Daingean Bog NHA on an 800m stretch of the public road, R402.

Special Areas of Conservation (SACs) are sites of international importance due to the presence of listed habitats or species that are of European importance. The nearest designated SAC to the Proposed Development Site is the River Barrow and River Nore SAC (site code: 002162), located circa 2.3 km south at its nearest point. The site is of conservation value for twelve habitats listed on Annex I, and ten species listed on Annex II of the EU Habitats Directive. The Cushina River, which occurs within the central region of the Site, provides surface water connectivity to the Figile River circa 250m downstream, eventually joining the Barrow River (within the River Barrow and Nore SAC) 5.9km downstream. Therefore, there is hydrological connectivity between the Proposed Development Site and the River Barrow and River Nore SAC via the Cushina River.

In addition, the GCR includes a crossing of the River Barrow and River Nore SAC, which will involve drilling under the riverbed using HDD methodology. The HDD launch and receiver pits will be set back a minimum of 50m of the River Barrow River Nore SAC.

The TDR Accommodation Works include the installation of the clear-span bridge over the Philipstown River, which is a tributary of the Figile River. The Philipstown River flows south-east to join the Figile River approximately 11rkm downstream. The Figile then flows south and joins the River Barrow approximately 18rkm downstream. Hence, the overall hydrological connection from the TDR accommodation works at Philipstown are 29rkm downstream to the River Barrow and River Nore SAC.

Special Protection Areas (SPAs) for Birds are designated based on the presence of internationally significant populations of listed bird species. The nearest SPA to the Proposed Development Site is the Slieve Blooms SPA (site code: 004160) located circa 19.6 km south-west of the Proposed Development Site.

The SPA is designated for the protection of breeding Hen Harrier. There are no designated SPAs within 15km of the Proposed Development Site.

Legal backing for the protection of candidate SPAs and SACs in Ireland is provided by the EU Directive on the Conservation of Natural Habitats and of Wild Flora and Fauna (92/43/EEC; commonly known as the 'Habitats Directive') which has been transposed into Irish Law through the enacted European Communities (Birds and Natural Habitats) Regulations 2011 (SI 411/11). A Stage 2 Appropriate Assessment Report (Natura Impact Statement, NIS) was prepared in order to determine the likelihood for adverse significant effects on Natura 2000 sites in the surroundings. This assessment concluded that, *following an examination, analysis and evaluation of the relevant information, including in particular the nature of the predicted impacts from the proposed development and with the implementation of the mitigation measures proposed, that the proposed development will not adversely affect (either directly or indirectly) the integrity of any European site, either alone or in combination with other plans or projects, and there is no reasonable scientific doubt in relation to this conclusion.*

Table 9-6: Designated sites within 15km of the study area (Source: www.npws.ie 2025) and Likely Zone of Impact Assessment

Site Name	Site Code	Site Description	Distance and direction from Proposed Development Site	Likely Zone of Impact Determination
River Barrow and River Nore SAC	002162	This site consists of the freshwater stretches of the Barrow and Nore River catchments as far upstream as the Slieve Bloom Mountains, and it also includes the tidal elements and estuary as far downstream as Creadun Head in Waterford. The site passes through eight counties – Offaly, Kildare, Laois, Carlow, Kilkenny, Tipperary, Wexford and Waterford. This large site is of high ecological importance as it contains a high number of habitats and species listed on Annexes I and II of the E.U. Habitats Directive, including the priority habitats Alluvial Forests and Petrifying Springs. This is one of only a handful of spawning grounds in the country for Twaite Shad and the site supports other Annex II species such as the Freshwater Pearl Mussel, Otter and all three Irish Lamprey species. The site is important for a host of other animal species also including three Red Data Book species and many bird species including some listed on Annex I of the E.U Birds Directive such as Whooper Swan, Peregrine and Kingfisher.	The SAC occurs approximately 2.4km south of the Proposed Development Site at its nearest point and is connected hydrologically from the Cushina River via the Figile River approximately 6km downstream of the point where the Cushina leaves the Site. The proposed underground GCR crosses this SAC at Baylough Bridge approx. 2.4km south south-east of the Site.	The Proposed Development consists of construction works within the flood plain of the Cushina River which is hydrologically connected to this SAC. Hence, there is a potential pathway for indirect effects on this SAC during the construction phase due to a deterioration in water quality. The underground GCR also passes over this SAC at Baylough Bridge. Hence, there is a potential pathway for direct effects on this SAC during the construction phase due to negative impacts on water quality. **This SAC is therefore considered to be within the Zone of Likely Impact and further assessment is required.**

Site Name	Site Code	Site Description	Distance and direction from Proposed Development Site	Likely Zone of Impact Determination
Grand Canal pNHA	002104	The Grand Canal is a man-made waterway linking the River Liffey at Dublin with the Shannon at Shannon Harbour and the Barrow at Athy. The Grand Canal proposed Natural Heritage Area (pNHA) comprises the canal channel and the banks on either side of it. The canal system is made up of a number of branches - the Main Line from Dublin to the Shannon and a number of branches such as the Barrow Line from Lowtown to Athy and the feeder at Milltown. Water is fed into the summit level of the canal at Lowtown from Pollardstown Fen, itself a pNHA. A number of different habitats are found within the canal boundaries - hedgerow, tall herbs, calcareous grassland, reed fringe, open water, scrub and woodland. Otter spraints are found along the towpath, particularly where the canal passes over a river or stream. The ecological value of the canal lies more in the diversity of species it supports along its linear habitats than in the presence of rare species. It crosses through agricultural land and therefore provides a refuge for species threatened by modern farming methods.	The pNHA lies approximately 4.1km to the east of the Proposed Development Site at its nearest point.	Although not connected hydrologically, there is suitable habitat within the Site for a protected species, the Otter, that is also resident of this designated site and the two sites are connected by suitable habitat. Taking the precautionary approach, a potential pathway for indirect effects on the pNHA during the construction phase due to deterioration of water quality was identified. **This pNHA is therefore considered to be within the Zone of Likely Impact and further assessment is required.**
Derries Wood pNHA	000416	This site comprises disturbed bog habitat, a mixed conifer plantation, reed beds associated with Rathdoire Lake and an area of fen in the shallow, Dease's Lake. Derries Wood is of conservation significance, particularly for the presence of populations of several rare insects, most notably *Criorhina ranunculi* (Diptera, Syrphidae) in Beechwood and *Chrysops caecutiens* (Diptera, Tabanidae) on old bog habitat.	The pNHA lies approximately 8.4km to the south of the Site at its nearest point.	This designated site is not connected hydrologically and it is considered that the species of interest of the site are unlikely to have territories that extend to the Proposed Development Site due to the distance involved.

Site Name	Site Code	Site Description	Distance and direction from Proposed Development Site	Likely Zone of Impact Determination
				This pNHA is not considered to be within the Zone of Likely Impact and no further assessment is required.
Emo Court pNHA		Emo Court contains a large mixed woodland, a freshwater lake, parkland and amenity grassland which are surrounded by rich agricultural land and conifer plantations. Emo Lake is a medium sized shallow lake with an extensive fringe of reed-beds. The aquatic flora is rather sparse but there is a rich bird and invertebrate fauna. This lake is one of the few remaining freshwater lakes in County Laois. A study of its invertebrate fauna found it to contain several species of interest such as the Cladocera species *Scapholeberis mucronata* and *Disparalona rostrata,* which is rare in the British Isles, and the Copepoda species, *Eudiaptomus gracilis*. The semi-natural woodland has been impacted by the spread of the invasive species, *Rhododendron ponticum*, and also from the non-native conifer and deciduous trees in the canopy. Despite this, it is recognised as one of the few remaining vestiges of mature climax forest in this region.	9.1km to the south-east of the Site at its nearest point.	This designated site is not connected hydrologically and it is considered that the species of interest of the site are unlikely to have territories that extend to the Proposed Development Site due to the distance involved. **This pNHA is not considered to be within the Zone of Likely Impact and no further assessment is required.**
Raheen Lough pNHA	000917	The main interest of this lake is in the variety and numbers of wildfowl and waders it attracts, particularly as open water bodies are infrequent in this area. The open water and the adjacent level wet pasture are much used by feeding birds. Birds that use the site include Whooper Swans, diving ducks such as Pochard and Goldeneye, waders such as Greenshank, Jack Snipe and Purple Sandpipers.	This pNHA lies approx. 10km to the west of the Site at its nearest point.	This designated site is not connected hydrologically. However, some of the species of conservation interest, such as Whooper Swans, potentially have territories that extend to or use other areas that result in flyover of the Proposed Development Site. Birds are considered in Chapter 10.

Site Name	Site Code	Site Description	Distance and direction from Proposed Development Site	Likely Zone of Impact Determination
				This pNHA is therefore not considered to be within the Zone of Likely Impact for the purposes of biodiversity and no further assessment is required within this chapter.
The Curragh pNHA	000392	The Curragh is a very large site located on an extensive plain adjacent to the southern side of the Curragh racecourse in Co. Kildare. The site has been designated as the Curragh pNHA (000392). Dry acidic grassland, Annex I habitat Species-rich Nardus grassland (6230) and semi-improved dry-humid acidic grassland occur on the site, as well as dry calcareous grassland and wet grassland. Much of the site contains dry acidic grassland of Annex I habitat 6230 quality. Improved areas within the site are very heavily grazed or trampled. The dry calcareous grassland covers a very small area and but contains some indicator species for the Annex I habitat Festuco-Brometalia (6210). There are two types of wet grassland present. The first is species-poor, dominated by Juncus effusus and the other is more acidic in character, containing *Juncus effusus*.	This pNHA lies approx. 13.1km to the east of the Site at its nearest point.	This site is not connected hydrologically. There is no direct link between the two sites and no source-pathway-receptor route for indirect effects was identified. **This pNHA is not considered to be within the Zone of Likely Impact and no further assessment is required.**
The Great Heath of Portlaoise pNHA	000881	The main habitat of ecological significance on this site is acidic grassland and other semi-natural grassland habitats. There are two small wetlands within the site, the open-water Bog Lough and a fen fed by calcareous springs. Much of the pNHA comprises the Heath Golf Club.	This pNHA lies approx. 14.1km to the south south-west of the Site at its nearest point.	This site is not connected hydrologically. There is no direct link between the two sites and no source-pathway-receptor route for indirect effects was identified. **This pNHA is not considered to be within the Zone of Likely Impact and no further assessment is required.**

Site Name	Site Code	Site Description	Distance and direction from Proposed Development Site	Likely Zone of Impact Determination
The Long Derries, Edenderry SAC	000925	This SAC is located in eastern County Offaly along a low esker ridge consisting primarily of glacial gravels. It is designated for the priority Annex I habitat, Orchid-rich Calcareous Grassland (6210). The dominant habitat within the site is dry calcareous grassland. There are a number of Red Data Book plant species present (such as Blue Fleabane, *Erigeron acer*) and the summer birdlife of this site includes Sand Martin, Whinchat and Cuckoo. The Nightjar, a rare species listed in Annex I of the EU Birds Directive, breeds on the site.	This SAC lies approx. 13.8km to the north-east of the Site at its nearest point.	This site is not connected hydrologically. There is no direct link between the two sites and no source-pathway-receptor route for indirect effects was identified. **This SAC is not considered to be within the Zone of Likely Impact and no further assessment is required.**
Daingean Bog, NHA.	002033	This site is designated for the Peatland habitats, namely raised bog. It is located approximately 3km south-west of Daingean in east Co. Offaly. The site supports the Midland Raised Bog type of peatland and cutover bog.	This NHA lies approx. 13.5km to the north-west of the Site at its nearest point. This is also within 5m of the public road, R402, along which the proposed TDR passes.	The proposed TDR has no accommodation works proposed in the vicinity (the nearest will be 5km to the south-west). The TDR here is an existing public road which is already in use by cars and lorries. This NHA is not linked hydrologically to the Site and no source-pathway-receptor route for indirect effects was identified. **This NHA is not considered to be within the Zone of Likely Impact and no further assessment is required.**

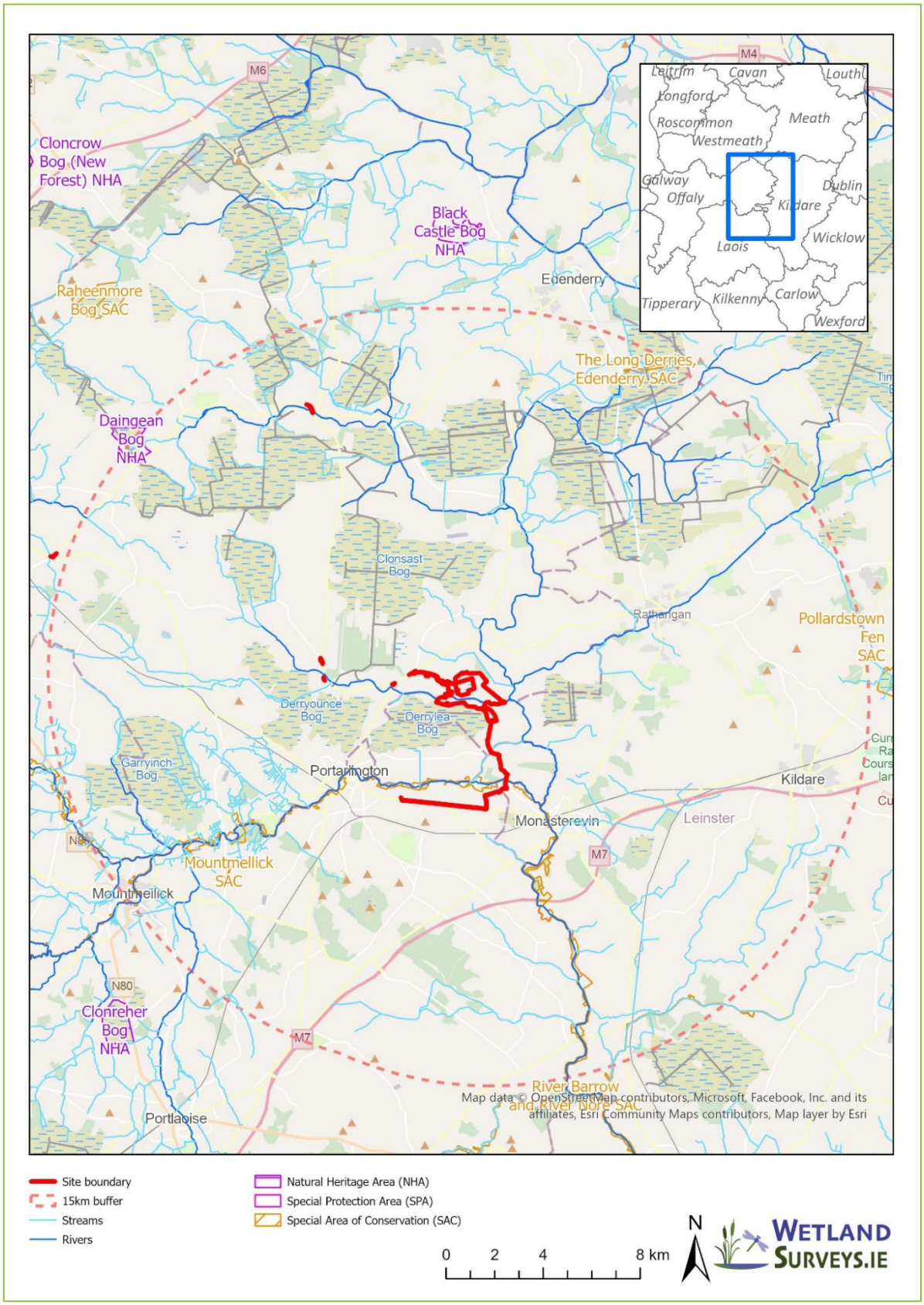

Figure 9-2: Map of Designated Sites for conservation within 15km of the Proposed Wind Farm at Derrynadarragh

9.10.4 Terrestrial Ecology

9.10.4.1 Habitats

The habitat descriptions of the habitats within the Site are given below. These are based on the survey work completed by WSI as outlined above in Section 9.5.2.1. The different habitat types (as classified according to Fossitt, 2000) were identified and mapped and any correspondence to Annex I habitats was identified. The habitat maps are presented below in Figure 9-11 and Figure 9-12.

A description of the various habitats recorded is presented below. The habitat code according to Fossitt (2000) is in brackets after the habitat name. A table listing all the habitats recorded and their corresponding cover (ha) within the Proposed Wind Farm Site is presented in Table 9-7. A list of all plant species recorded on site is presented in Appendix 9-3, Volume 3 of this EIAR. Table 9-19 lists each habitat recorded within the Proposed Development boundary and the ecological evaluation of each habitat. Note all aquatic habitats surveyed are described below in Section 9.10.5 – Aquatic Ecology.

9.10.4.1.1 *Improved Agricultural Grassland (GA1)*

The western, central and eastern areas of the Site consist of improved agricultural grassland. This habitat type is intensively managed for agriculture, predominantly for livestock grazing. It is relatively species poor and is subject to nutrient inputs. Perennial Ryegrass (*Lolium perenne*) is the dominant species. Improved agricultural grassland occurs mainly on the north bank of the Cushina River which flows through the centre of the Site. Drains are common within this habitat and appear to be regularly maintained. Much of the grassland is on peat soils.

Evaluation: This habitat is of Local Importance (Lower Value).

Figure 9-3: Improved Agricultural Grassland (GA1) at the Proposed Development Site at Derrynadarragh

9.10.4.1.2 Wet Grassland (GS4)

Wet grassland occurs in the southern part of the Site. Some areas of this habitat are used for spreading peat and comprise a mixture of peaty and mineral soils. Species recorded here include Purple Moor-grass (*Molinia caerulea*), Yellow Flag-iris (*Iris pseudocorus*),*I* Creeping Buttercup (*Ranunculus repens*), Common Knapweed (*Centaurea nigra*), Rushes (*Juncus* spp.), Meadowsweet (*Filipendula ulmaria*), Mint (*Mentha* sp.), Cuckooflower (*Cardamine pratensis*), Dandelion (*Taraxacum officinale* agg.), Thistles (*Cirsium* spp.), and Clover (*Trifolium* sp.). At the time of survey the sward was tall, dominated by Purple Moor-grass with some Carnation Sedge (*Carex panicea*) and Devils-bit Scabious (*Succisa pratensis*). The density of Devils-bit Scabious was low and the habitat was quite disturbed. It was assessed as not being suitable for the protected Annex II Marsh Fritillary butterfly.

A small pond occurs in the north-west of the wet grassland habitat and this is associated with a treeline and a small area of scrub. Species within the treeline include semi-mature Alder (*Alnus glutinosa*), Willow (*Salix* sp.), Birch (*Betula* sp.), Spindle (*Euonymus europaeus*), Bramble (*Rubus fruticosus* agg.,), Tufted Hair-grass(*Deschampsia cespitosa*) and Sedges (*Carex* spp.). The treeline habitat may provide suitable foraging and roosting habitat for local populations of bats and birds. The scrub is dominated by Willow, Hawthorn (*Crataegus monogyna*) and Blackthorn (*Prunus spinosa*), with Common Reed (*Phragmites australis*) also present.

Evaluation: This habitat is of Local Importance (Lower Value).

Figure 9-4: Wet Grassland (GS4) in the vicinity of the proposed location of T06 at Derryndarragh.

9.10.4.1.3 Improved Agricultural Grassland/Wet Grassland Mosaic (GA1/GS4)

Most of the grassland in the south of the Site is a mosaic of GA1 and GS4. This is a semi-improved wet grassland with Perennial Rye-grass and other common agricultural grasses and herbs (e.g. Dandelion and Common Daisy) occurring with species indicative of less intensive management and wet conditions. Such species include Sedges (*Carex* spp.), Yellow Flag-iris (*Iris pseudacorus*), Silverweed (*Potentilla anserina*) and Rushes (*Juncus* spp.).

9.10.4.1.4 Raised Bog (PB1)

There is a remnant of approx. 4ha of raised bog habitat along the edges of the cutover bog, in the north of the Site. These remnants have been subject to drainage and so the habitat has been damaged by these drains and the drains bordering with industrial cutaway on one side and the domestic cutting on the other. The drainage and cutting associated with the cutover have contributed to the drying out of the raised bog remnants. Two ecotopes were recorded here, marginal and facebank. The facebank ecotope is the more disturbed of these two and the peat bank is collapsing in places. The facebank was impacted by regular drains and was dominated by tall Heather (*Calluna vulgaris*) with occasional Bog Cotton (*Eriophorum* sp.), Birch (*Betula* sp.) and Pine (*Pinus* sp.). In the areas of marginal ecotope, drains were present but more typical raised bog species were recorded here including various Sphagnum mosses (e.g. *Sphagnum cuspidatum* and *S.capillifolium*), White Beak-sedge (*Rhynchospora alba*), Bog Asphodel (*Narthecium ossifragum*), Cross-leaved Heath (*Erica tetralix*), Reindeer Moss (a lichen) (*Cladonia portentosa*), and Pine (*Pinus* sp.) seedlings. The habitat present onsite has been damaged through drainage, desiccation and subsidence – it does not correspond to the Annex I priority habitat *Active Raised Bogs [7110]. And neither does it correspond to the Annex I habitat of Degraded raised bogs [7120] still capable of natural regeneration based on the size (>30ha) and hydrological characteristics as defined by NPWS (2019).

Evaluation: This habitat is of Local Importance (Higher Value).

Figure 9-5: Degraded Raised Bog (PB1) habitat in the north of the Site at Derrynadarragh.

9.10.4.1.5 Cutover Bog (PB4)

Areas of cutover bog to the north and west are actively being harvested for peat on the edges of industrial cutaway. Some of the vegetation present in this habitat includes Many-headed Bog-Cotton (*Eriophorum angustifolium*), Soft Rush (*Juncus effusus*), Willow (*Salix* sp.), Birch (*Betula* sp.) and Gorse (*Ulex europaeus*). Small pockets of Bog Woodland (WN7) occur in a mosaic on the cutover. In general on the cutover there are numerous, large drains, some several metres deep, which are regularly maintained. In places where the drains have been widened, larger areas of open water are present. Snipe were observed during the winter suggesting that the habitat is of some local importance for birds. This habitat does not correspond to the Annex I habitat of Degraded raised bogs still capable of natural regeneration [7120] (DRB). The Annex I habitat, as defined by the National Parks and Wildlife Service (NPWS, 2019), is restricted to areas with particular hydrological characteristics on the high bog. The cutover bog is, by definition, not on the high bog, and is not considered Annex I DRB.

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Evaluation: This habitat is of Local Importance (Lower Value).

Figure 9-6: Cutover Bog (PB4) habitat at Derryndarragh in the north of the Site.

9.10.4.1.6 Wet Pedunculate Oak-Ash Woodland (WN4)

A small parcel of remnant Wet Oak-Ash Woodland (WN4) occurs in the south-west of the Site. On the Site this habitat is dominated by Ash (*Fraxinus excelsior*), with some Ash trees having abundant Ivy (*Hedera helix*) growing on them. Other species here include Holly (*Ilex aquifolium*) and Bramble (*Rubus fruticosus* agg.). Willow scrub is locally abundant within the woodland.

This habitat has a high level of ecological connectivity, via a number of Treelines, to other wooded habitats such as larger areas of Bog Woodland along the southern boundary of the Site and Treelines along the River Cushina.

Evaluation: This habitat is of Local Importance (Higher Value).

9.10.4.1.7 Bog Woodland (WN7)

Bog Woodland occurs in pockets in the north-west and north-central areas of the Site, in the south-western extent and the south-central area of the Site and finally along a section of the proposed access route in the very west of the Site. These woodland areas provide refuge for a variety of species. Birch was the dominant canopy species throughout, with other species including Willow, Holly, Ash and Ivy. Field layer species include Bramble, Ling Heather (*Calluna vulgaris*), Purple Moor-Grass and Honeysuckle (*Lonicera periclymenum*). In areas where cattle have access, the ground and field layers are sparse. This habitat would provide foraging habitat and breeding habitat for small mammals and birds. In general, the bog woodland in the Site is relatively dry and does not have a high cover of Sphagnum moss. Hence, it does not correspond to the Annex I habitat, Bog Woodland [91D0].

Evaluation: This habitat is of Local Importance (Higher Value).

Figure 9-7: Bog Woodland (WN7) habitat at the Proposed Development Site.

9.10.4.1.8 Conifer Plantation (WD4)

Mature conifer forestry occurs in the north of the Site and also in the western extent along a small section of the proposed new access route. In both situations, the forestry has been planted on cutover peat soils. This habitat comprises Norway Spruce (*Picea abies*), Scots Pine (*Pinus sylvestris*) and Lodgepole Pine (*Pinus contorta*). The plantation is mature and supports a low level of native biodiversity. Ash (*Fraxinus excelsior*) and Birch (*Betula pendula*) occur in the south-eastern region of the plantation. Conifer plantations typically support poor biodiversity and are of low ecological value, though they can have a positive impact on biodiversity if properly planned.

Evaluation: This habitat is of Local Importance (Lower Value).

9.10.4.1.9 Scrub (WS1)

Scrub habitat occurs in the eastern extent of the Site, bordering the Cushina River on both the northern and southern banks. This habitat is dominated by Hawthorn, Blackthorn and Bramble. Other species here include Ivy. This habitat is maturing towards a semi-natural woodland and provides refuge and habitat for small mammals and birds.

Evaluation: This habitat is of Local Importance (Lower Value).

9.10.4.1.10 Hedgerows (WL1)

The majority of Hedgerow habitat occurs to the north of the Cushina River. Hedgerows form a physical boundary between improved agricultural grassland pastures. These habitats are important wildlife corridors. Some of the hedgerows on the Site are intensively managed and tightly cut, others are allowed grow taller. A large hedgerow occurs along the southern boundary of the Site between improved agricultural grasslands and cutover bog, to the south. Species noted within this habitat onsite include Holly, Hawthorn, Willow, Gorse (*Ulex europaeus*) and Alder Buckthorn (*Frangula alnus*). This habitat is capable of supporting small mammals including bats, nesting birds and a variety of invertebrates and provides ecological connectivity for some woodland species and enables them to move across the landscape between woodlands.

Evaluation: This habitat is of Local Importance (Higher Value).

Figure 9-8: Hedgerows onsite are typically dominated by native species. Current management varies from non-intensive (as in top image) to an intensive cutting regime (as in bottom image).

9.10.4.1.11 Treelines (WL2)

Treelines occur throughout the Site and are more abundant in the west of the Site, gradually declining toward the eastern parts of the Site. The habitat is relatively species rich and capable of supporting nesting birds, as well as important foraging habitat for bird and bat species. Species noted include Ash, Willow, Holly, Hazel (*Corylus avellana*) and Bramble. This habitat provides ecological connectivity for some woodland species and enables them to move across the landscape between woodlands.

Evaluation: This habitat is of Local Importance (Higher Value).

Table 9-7: Total area of habitats within the Proposed Wind Farm Site

Habitat Type	Area (ha)
Bog Woodland (WN7)	11.9
Conifer plantation (WD4)	9.9
Cutover bog (PB4)	20.6
Cutover bog / Bog woodland (PB4 / WN7)	0.4
Cutover bog / Wet grassland (PB4 / GS4)	22.2
Improved agricultural grassland (GA1)	83.2
Improved agricultural grassland / Wet grassland (GA1 / GS4)	52.9
Mixed broadleaved / conifer woodland (WD2)	1.8
Raised bog (PB1)	4.6
Scrub (WS1)	2.2
Wet grassland (GS4)	2.8
Wet pedunculate oak-ash woodland (WN4)	0.8
Total site area	**213.5**

Habitats along the Proposed Grid Cable Route (GCR)

The proposed underground GCR is approximately 11.4km and follows existing or proposed tracks and roadways. All of the tracks and roads it follows are categorised as Buildings and Artificial Surfaces (BL1). Adjacent habitats include Hedgerows (WL1), Treelines (WL2), Dry meadows and grassy verges (GS2) Depositing/lowland rivers (FW2) and Drainage ditches (FW4). The GCR also includes a number of water crossings of minor streams and one crossing of the River Barrow (FW2).

Habitats along the Proposed Turbine Delivery Route (TDR)

The TDR follows existing public roads for the most part. It also includes some proposed new access tracks and proposed new sections of roads in order to avoid certain junctions or bends. All of the tracks and roads it follows are categorised as Buildings and Artificial Surfaces (BL3). Adjacent habitats include Hedgerows (WL1), Treelines (WL2), Dry meadows and grassy verges (GS2) Depositing/lowland rivers (FW2) and Drainage ditches (FW4). At the TDR nodes where new sections of road are proposed, the habitats include Improved Agricultural Grassland (GA1), Arable Crops (BC1), Hedgerows (WL1) and a small area of a mosaic of Improved Agricultural Grassland and Dry Calcareous Grassland (GA1/GS1) which includes some species typical of dry calcareous grassland. The Red Listed (Least Concern) species, Field Madder (*Sherardia arvensis*) was recorded here.

Proposed sites of accommodation works along the TDR are outlined in Table 9-8 below.

Table 9-8: TDR Accommodation Works and Habitats

TDR Node Reference	Location	Details	Summary Description of Proposed Temporary Accommodation Works	Habitats within Footprint of Accommodation Works	Habitat/s Evaluation	Invasive Species Present
13	M6 Slip Road / N52 Roundabout	Loads will take the third exit at the roundabout to join the N52 southbound, undertaking a contraflow manoeuvre.	Installation of Load Bearing Surface on southern verge of entry arm and the central reservation.	Buildings and artificial surfaces (BL3)	Local Importance (Lower Value)	
19	R420 / R402 Junction	Loads will turn left using the option area identified by the client.	Installation of Load Bearing Surface on the inside of the left turn.	Grassy Verge (GS2). Rank grasses and Plantain. Exposed gravel (ED1). Hedgerow (WL1) Hawthorn, Alder and Ash.	Local Importance (Lower Value) Local Importance (Higher Value)	None
22	R402 St Joseph's National School	Loads will turn right at the junction to head east, remaining on the R402	Installation of Load Bearing Surface on the western footway/verge, the northern footway/verge and the traffic island.	Stonewall (BL1). Buildings and artificial surfaces (BL3) Treeline (WL2). Copper Beech, New Zealand Flax, Poplar, Hawthorn, Birch.	Local Importance (Lower Value) WL2: Local Importance (Lower Value)	None
25	Daingean Main Street / Edenderry Road	Loads will continue through Daingean on the R402	Installation of Load Bearing Surface in the northern footway.	Buildings and artificial surfaces (BL3).	Local Importance (Lower Value)	None
29/30	R402 / R400 Junction & River Philipstown Bridge	Loads will turn right prior to the junction, through the field and rejoin the R400.	Construction of new access road and bridge bypassing R402/R400 Junction.	Improved Agricultural Grassland (GA1). Dominated by Perennial Rye-grass. Other species include Sweet-vernal grass and Silverweed. In the north of the field is a small area on steep ground with GA1/GS1 grassland. Species here include Yarrow, Oxeye Daisy, Common Knapweed, Birdsfoot Trefoil and Field Madder.	GA1: Local Importance (Lower Value)	None

TDR Node Reference	Location	Details	Summary Description of Proposed Temporary Accommodation Works	Habitats within Footprint of Accommodation Works	Habitat/s Evaluation	Invasive Species Present
				Lowland River (FW2). Abundant aquatic vegetation on banks.	GA1/GS1 : Local Value (Lower Value) FW2: Local Importance (Higher Value)	
31	R400 North of Drumcaw Or Mountlucas	Loads will head south-east on the R400 through a left bend.	Installation of Load Bearing Surface on the southern verge.	Treeline (WL2) and Hedgerow (WL1). Ash, Hawthorn, Blackthorn. Drainage Ditch (FW4)	Local Importance (Higher Value)	None
32	R400 East of Mountlucas	Loads will continue on the R400 southbound.	Installation of Load Bearing Surface on the western verge.	Hedgegrow (WL1). Hawthorn, Holly, Eder, Lords-and-Ladies. Grassy Verge (GS2).	Local Importance (Higher Value)	None
33	R400 South-east of Mountlucas	Loads will continue on the R400 southbound.	Installation of Load Bearing Surface on the eastern verges.	Hedgegrow (WL1). Hawthorn, Holly, Blackthorn, Bramble. Grassy Verge (GS2). Cowslips.	Local Importance (Higher Value)	None
34	R400 Northeast of Brackagh	Loads will continue on the R400 southbound.	Trimming of vegetation and trees on both verges.	n/a	n/a	n/a
35/36	R400 South of Enaghan	Loads will drive over a bridge, then continue straight at the junction through the field and rejoin the R400 following the right bend.	Construction of new offline track to bypass bend on R400.	Arable Crops (BC1). Treeline (WL2) of Willow, Hawthorn and Sycamore. Drainage Ditch (FW4) dry at time of survey with Horsetail.	BC1: Local Importance (Lower Value) WL2/FW4: Local Importance (Lower Value)	Snowberry and Sycamore present in treeline. T
38	R400 East of Moanvane	Loads will continue on the R400 heading south-east through a left bend.	Installation of Load Bearing Surface on the northeastern verge.	Hedgerow (WL1) with Ash, Hawthorn & Sycamore. Ground flora includes Meadowsweet, Reed Canary Grass and Bramble. Drainage Ditch (FW4) also present, dry at time of survey.	Local Importance (Lower Value)	Sycamore

TDR Node Reference	Location	Details	Summary Description of Proposed Temporary Accommodation Works	Habitats within Footprint of Accommodation Works	Habitat/s Evaluation	Invasive Species Present
46/47	R400 / R419 Junction	Loads will head east on the R400 through two right bends then turn left onto the R419 at the junction heading northeast.	Installation of Load Bearing Surface on the south-eastern verge.	Treeline (WL2) with Hawthorn, Willow, Ash & Sycamore. Grassy Verge (GS2) dominated by rank grasses	Local Importance (Lower Value)	Sycamore

Figure 9-9: GA1/GS1 habitat at TDR Node 29/30 near Philipstown Bridge

Figure 9-10: Philipstown River at TDR Node 29/30 at location of proposed new access bridge. Abundant submergent and emergent aquatic vegetation.

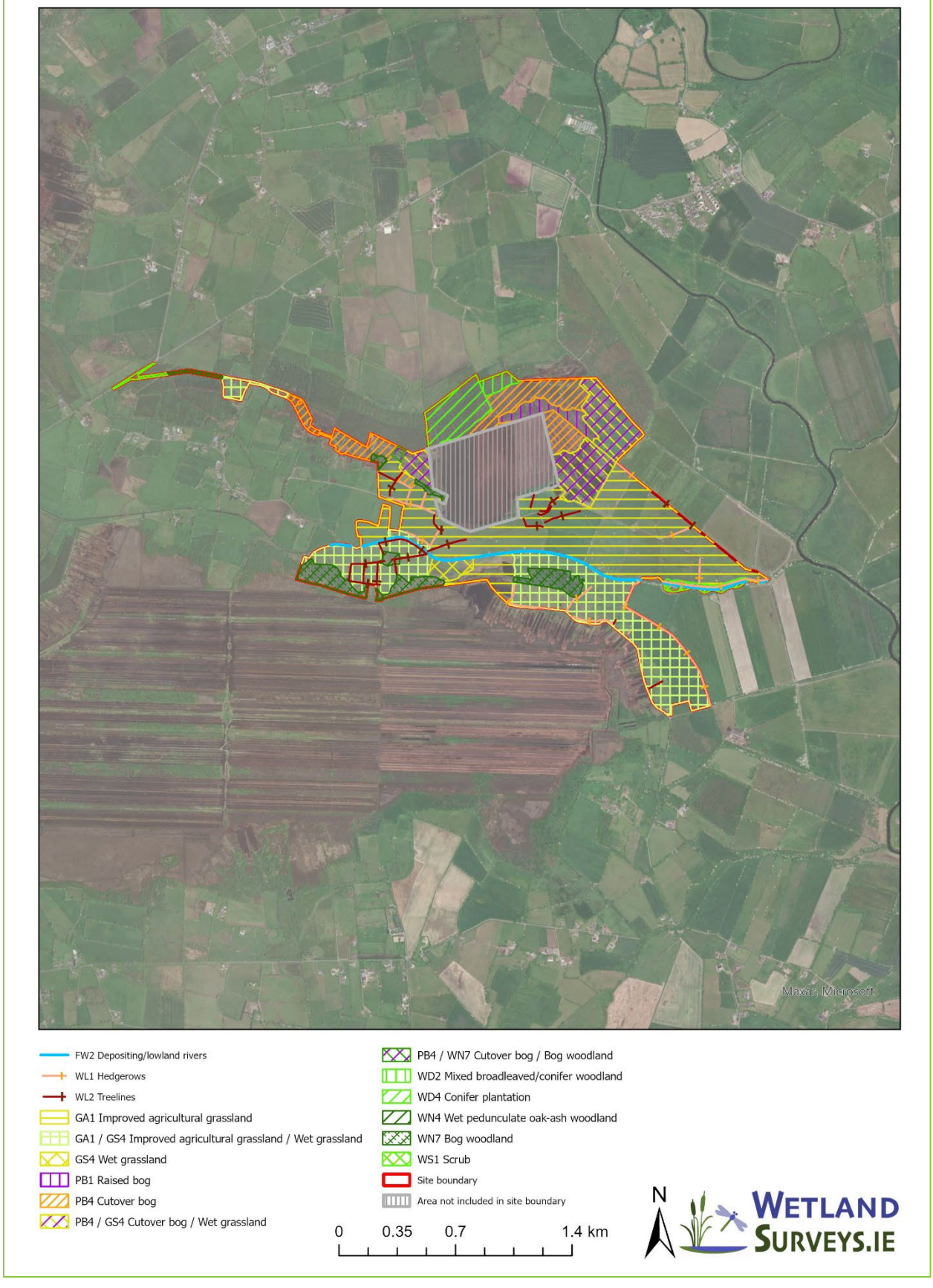

Figure 9-11: Habitat map of the Proposed Development Site at Derrynadarragh.

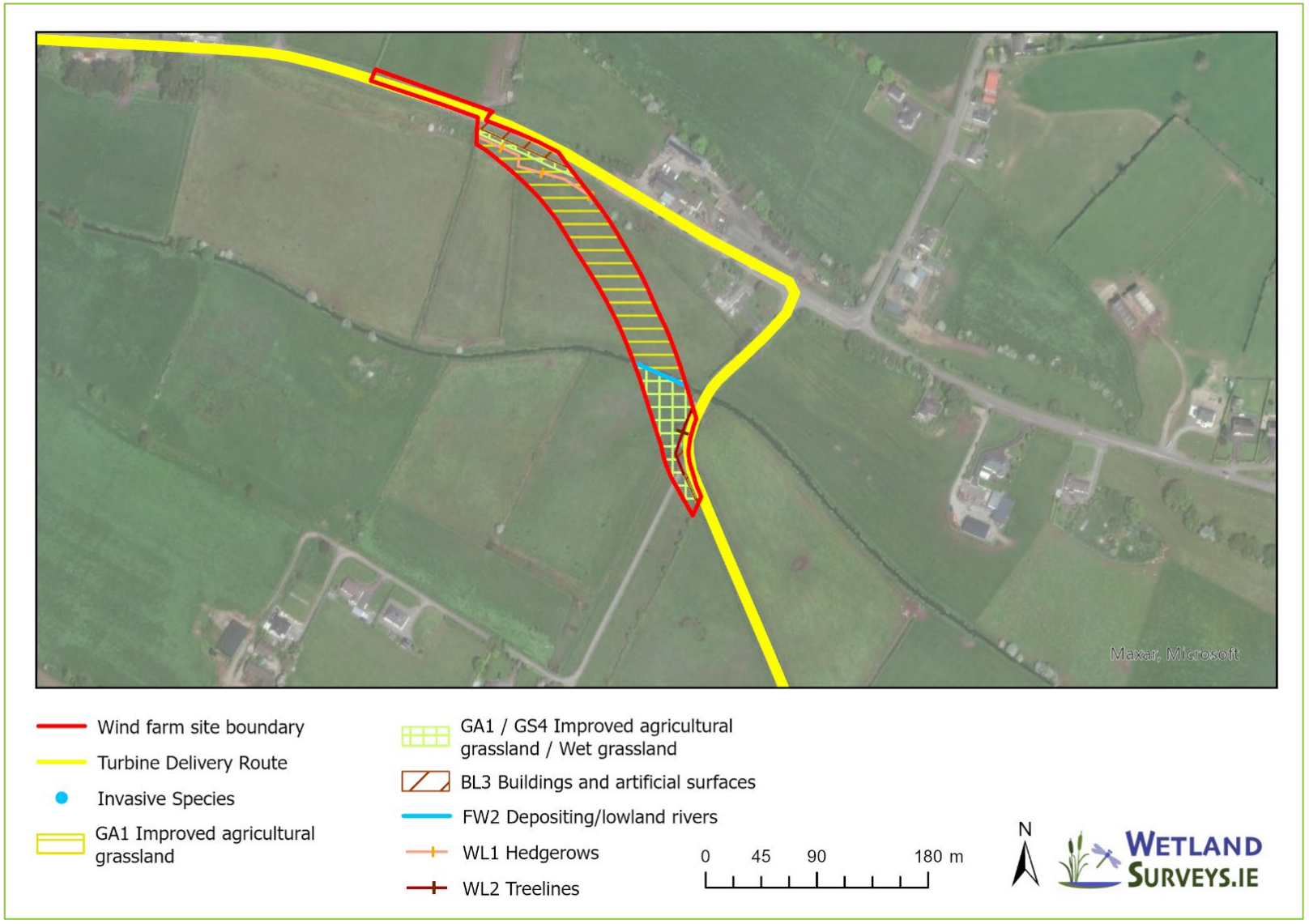

Figure 9-12: Habitat map of TDR Node 29/30 at proposed bridge crossing of the Philipstown River

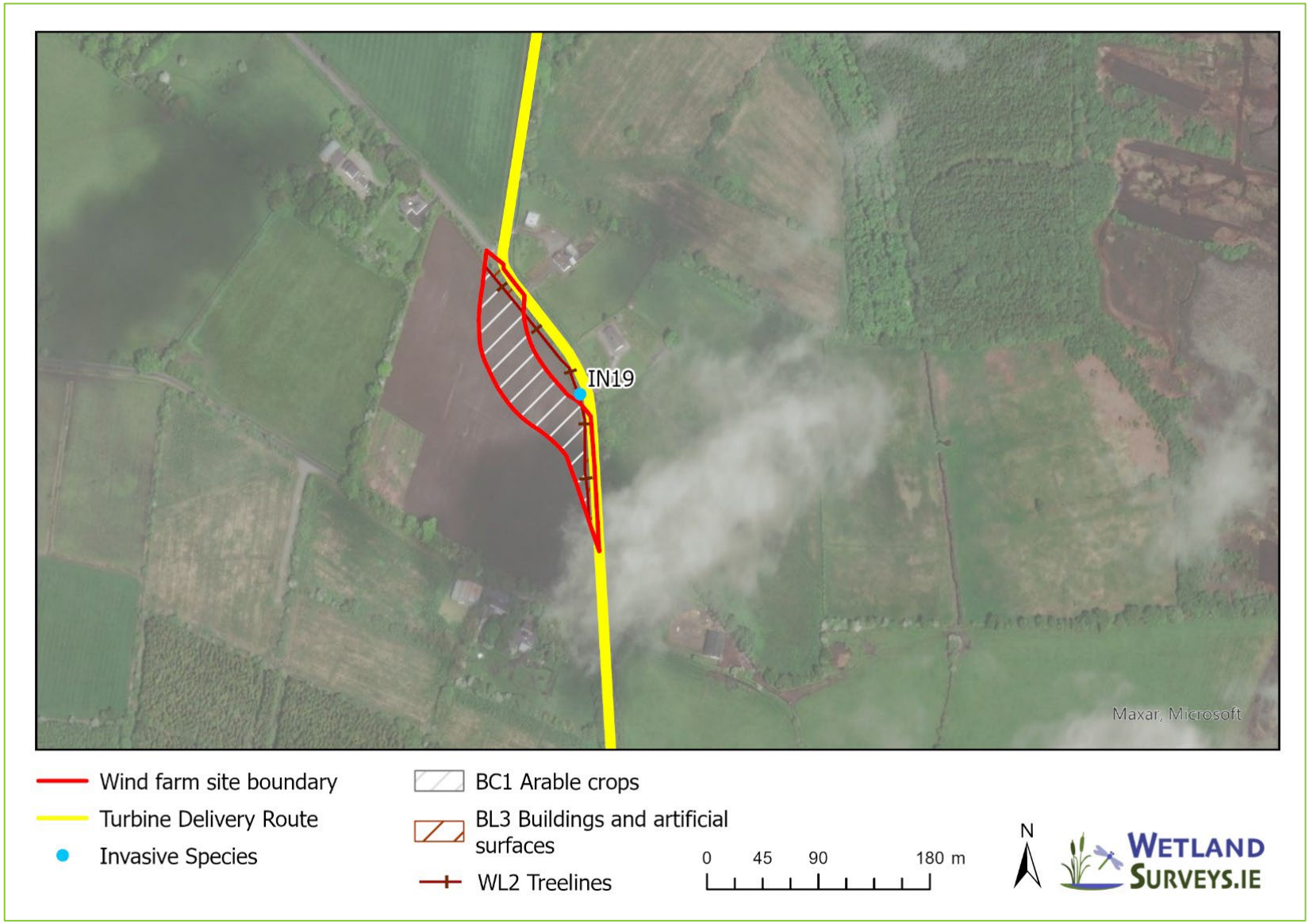

Figure 9-13: Habitat map at TDR Node 35/36 where new section of road is proposed.

9.10.4.2 Plant Species

A list of all plants species within the Site recorded during survey work is given in Appendix 9.3 in Volume 3 of this EIAR. Below are records of plant species that were recorded within one or both of the hectads (N51 and N61) within which the Site lies. These records were obtained from the NBDC database and/or the NPWS online data viewer for protected species.

Table 9-9: Records of Rare and Protected Flora. Threat status listed as per Ireland Red List No. 10: Vascular Plants 2016 (Wyse-Jackson et al. 2016). Note: FPO stands for Flora Protection Order.

Species Name	Status	Species Description	10km grid square (portion of Site within square)		Species Record data set	Occurrence on Site.
			N51 (West)	N61 (East)		
Alder Buckthorn (*Frangula alnus*)	Threatened Species: Least concern (Ireland Red List 2016).	Rare as a native tree, found in the west and central Ireland. Often planted in hedges and gardens. Usually found in damp woods, scrub, fens and heaths in lowland areas but tends to avoid permanently water-logged ground.	P		NBDC	Yes, confirmed.
Blue Fleabane (*Erigeron acer)*	Threatened Species: Least concern (Ireland Red List 2016).	Mainly found in central and south-east Ireland on sandy or gravelly ground, dry pastures and waste ground	P		NBDC	Unlikely, suitable habitat limited.
Irish Whitebeam (*Sorbus hibernica*)	Threatened Species: Vulnerable (Ireland Red List 2016).	A small deciduous tree mostly growing on moist, calcareous soils on cliff edges and rock areas. Mainly found across the midlands, but found scattered across the whole country.	P✓		NBDC	Unlikely, suitable habitat very limited on Site.
Least Bur-reed (*Sparganium natans*)	Threatened Species: Near threatened (Ireland Red List 2016).	A native, aquatic perennial that can be found growing in both still and moving water and even on muddy ground.	P✓		NBDC	Possible, suitable habitat present.

Species Name	Status	Species Description	10km grid square (portion of Site within square)		Species Record data set	Occurrence on Site.
			N51 (West)	N61 (East)		
Marsh Saxifrage (*Saxifraga hirculus*)	Protected Species: Flora Protection Order; EU Habitats Directive Annex II and Annex IV;	In Ireland, *S. hirculus* is found to be restricted to mineral flushes in blanket bog in the west. Previous populations in midland, lowland counties have been lost. Records of occurrence here are from the mid-19th century.	P		NPWS - FPO	Unlikely, suitable habitat absent.
Round-leaved Wintergreen (*Pyrola rotundifolia*)	Threatened Species: Near threatened (Ireland Red List 2016).	An evergreen, perennial, rare in Ireland. Two subspecies occur in Ireland, *P. rotundifolia* subsp. *rotundifolia* and *P. rotundifolia* subsp. *maritima*, the latter occurring in coastal areas. In the midlands, *P. rotundifolia* subsp. *rotundifolia* occurs and this is likely the one recorded in N51. This species grows on bogs and fens and, according to the BSBI, appears to be increasing on cutaway bog. Recorded within N51 on cutover bog habitats.	P		NBDC	Possible, potential suitable habitat present.
Opposite-leaved Pondweed (*Groenlandia densa*)	Protected Species: Flora Protection Order. Threatened Species: Endangered	A perennial herb of shallow, clear, base-rich water. Can grow in lakes, rivers, streams, canals, ditches and ponds. Can benefit from disturbance such as dredging and tidal disturbance.		P	NPWS - FPO	Unlikely, suitable habitat not present Records for this hectad (N61) from the late 19th century
Vervain (*Verbena officinalis*)	Threatened Species: Near threatened (Ireland Red List 2016).	Grows in grassy places, preferring bare, well-drained calcareous soils. An introduced species.		P	NBDC	Unlikely, suitable habitat extremely limited or absent within the Site.
Upright Brome (*Bromopsis erecta*)	Threatened Species: Near threatened (Ireland Red List 2016).	A tufted perennial grass of dry, relatively infertile, calcareous soils.		P	NBDC	Unlikely, suitable habitat extremely

Species Name	Status	Species Description	10km grid square (portion of Site within square)		Species Record data set	Occurrence on Site.
			N51 (West)	N61 (East)		
						limited or absent within the Site.
Slender Tufted-sedge (Carex acuta)	Threatened Species: Near threatened (Ireland Red List 2016).	Grows in shallow water or wet ground in margins of rivers and lakes or marsh ground.		P	NBDC	Possible, suitable habitat present.

The NPWS Flora Protection Order database did not list any bryophytes for these hectads.

9.10.4.3 Non-Volant Mammals

Table 9-10 lists the terrestrial mammal species that have been recorded from the 10 km grid squares (Q94) of the study area (National Biodiversity Data Centre (NBDC) 2025). These species are likely to be found in suitable habitat within the 10km squares of the study area.

Table 9-10: Summary of protected terrestrial non-volant mammal species recorded from the two relevant hectads the Site lies within.

Species Name	Status	Species Description	10km grid square (portion of Site within square)		Species Record data set	Field Obs. within Site	Occurrence onsite
			N51 (West)	N61 (East)			
Eurasian Badger (*Meles meles*)	Protected Species: Wildlife Acts	Widespread in Ireland and occurs in a variety of habitats but generally associated with mosaics of grassland, woodland, scrub or hedgerow.	P	P	NBDC	YES	Yes - confirmed
Eurasian Pygmy Shrew (*Sorex minutus*)	Protected Species: Wildlife Acts	Small animal living in woodlands, hedgerows, farmland, gardens and bogs. Common throughout the country.		P	NBDC	NO	Likely, suitable habitat present onsite.
Eurasian Red Squirrel (*Sciurus vulgaris*)	Protected Species: Wildlife Acts; Threatened species: Least Concern (Ireland Red List 2019)	Dependent on mature woodland and forested areas. Can live in coniferous, deciduous and mixed woodland.	P	P	NBDC	NO	Possible, some suitable habitat present and in the local area
European Otter (*Lutra lutra*)	Protected Species: EU Habitats Directive Annex II & Annex IV; Wildlife Acts; Threatened species: Least Concern (Ireland Red List 2019)	Found in aquatic environments such as rivers, lakes and coastal habitats.	P	P	NBDC	YES	Yes - confirmed
Pine Marten (*Martes martes*)	Protected Species: EU Habitats Directive Annex V || Protected Species: Wildlife Acts; Threatened species: Least Concern (Ireland Red List 2019)	Found in wooded habitats including deciduous woodland, coniferous woodland and scrub.	P	P	NBDC	NO	Likely, some suitable habitat present and in the local area

Species Name	Status	Species Description	10km grid square (portion of Site within square)		Species Record data set	Field Obs. within Site	Occurrence onsite
			N51 (West)	N61 (East)			
West European Hedgehog (*Erinaceus europaeus*)	Protected Species: Wildlife Acts	Found in all lowland habitats where sufficient food and ground cover for nesting occurs. Most common where grassland abuts mixed woodland and scrub.	P	P	NBDC	NO	Likely, suitable habitat present onsite.

Within the Site, potential suitable habitat occurs for all of the species listed above so it is possible that they all occur, or could occur at certain times. Presence of two of these protected species was confirmed within the Site during field surveys, the Badger and the Otter. No evidence of the remaining species was recorded onsite.

Badger sett entrances were recorded in the scrub habitat along the embankments along the River Cushina, in one hedgerow in the south-east of the Site, on the edge of some scrub habitat within the improved agricultural grassland and in the semi-natural woodland in the south-west of the Site. Figure 9-14 below highlights the locations of observations of signs of Badgers and Table 9-11 describes the observations.

The presence of Otter within the Site was determined from the observation of Otter scat at one location along the River Cushina where it exits the Site in the East. Otter prints were also observed here. Other mammal prints were noted at various points along the length of the River Cushina indicating the importance of the River Cushina for other small mammals and likely for Otter too. Figure 9-15 below illustrates the locations of observations of signs of Otter and other fauna (excepting bats) within the Site. Table 9-12 lists the corresponding notes.

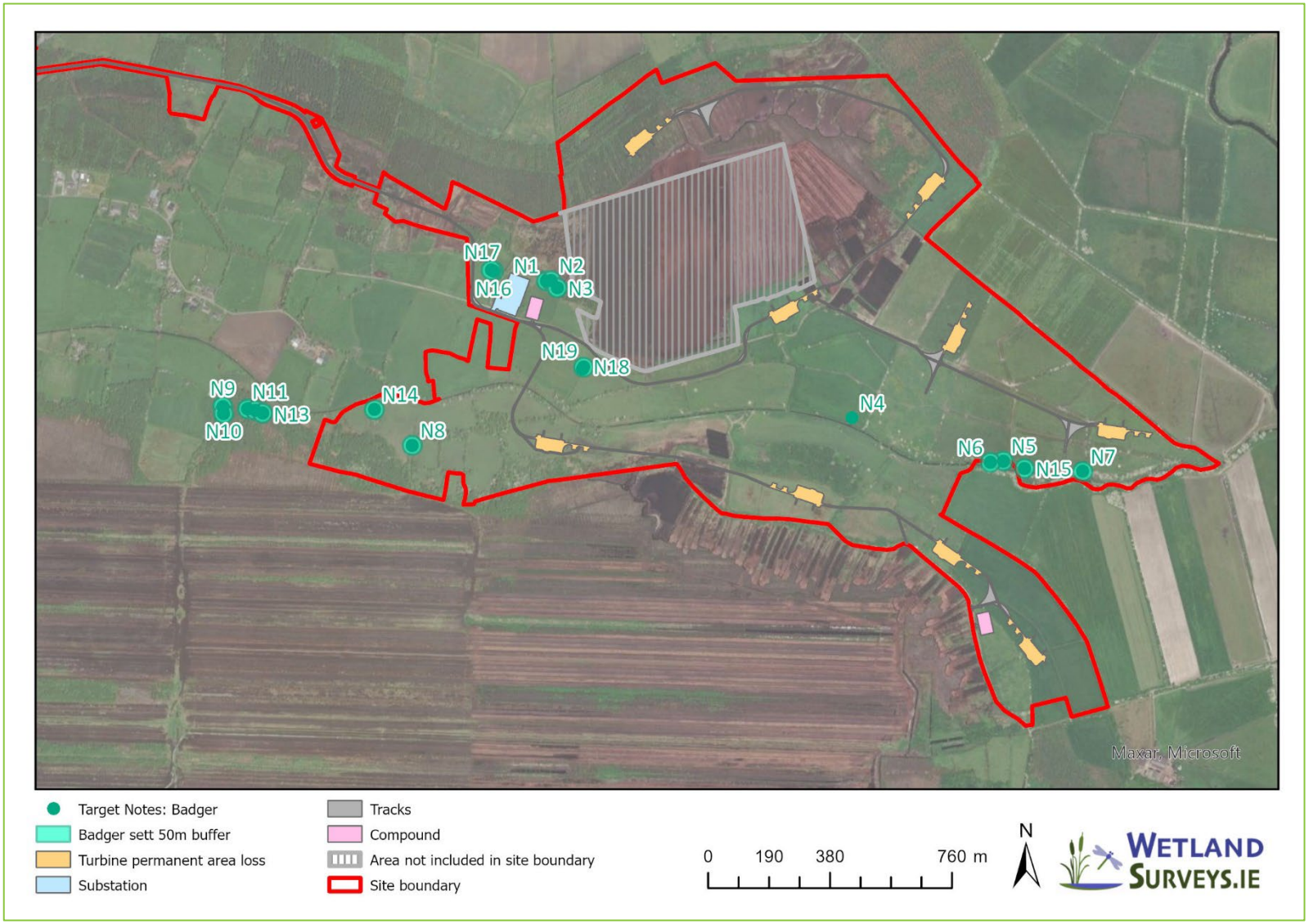

Figure 9-14: Map showing locations of observations of evidence of Badgers. cf. Table 9-11

Table 9-11: Target note information on badger setts and signs. c.f. Figure 9-14

Target Note Number	Details
N1	Badger sett
N2	Badger sett
N3	Badger sett
N4	Badger print
N5	Badger sett, recent spoil, bedding present.
N6	Badger sett, recent spoil heap and bedding.
N7	Badger sett
N8	Badger sett, fresh spoil
N9	Badger sett, fresh spoil
N10	Badger sett, fresh spoil
N11	Badger sett, fresh spoil, latrines.
N12	Badger sett, disused
N13	Badger sett
N14	Badger sett, fresh spoil and bedding.
N15	Badger sett, snuffle holes
N16	Badger sett
N17	Badger sett, badger hair
N18	Badger signs, snuffle hoes
N19	Badger sett, snuffle holes

Figure 9-15: Map showing location of other fauna observations (cf. Table 9-12)

Table 9-12: Target notes for faunal observations (excluding bats) (c.f. Figure 9-15)

Target Note Number	Details
N46	Otter signs: spraint and print
N47	Hare
N48	Hare
N49	Fox

9.10.4.4 Bats

The bat surveys conducted on-site confirmed the presence of four species of bats and *Myotis* species as summarised in Table 9-13 below.

Table 9-13: List of historical records of bat species recorded within 3km of the Site and list of the species recorded on-site during annual bat surveys in 2021-2024

Common English Name	*Latin Name*	Latest Historical Record within 3km of Site	Recorded during Bat Surveys 2021-2024 in Site
Brown Long-eared Bat	*Plecotus auritus*	2009	Yes
Common Pipistrelle	*Pipistrellus pipistrellus*	2009	Yes
Daubenton's Bat	*Myotis daubentonii*	2018	No
Leisler's Bat	*Nyctalus leisleri*	2018	Yes
***Myotis* species**	*Myotis* spp.	2018 (Daubenton's)	Yes
Soprano Pipistrelle	*Pipistrellus pygmaeus*	2018	Yes

This Bat Report assesses the foraging habitat at the Site to be moderate to high value. The connectivity to the wider landscape is considered to be of moderate potential. Bat activity levels were assessed to be predominantly low during monitoring at the Site. However, there were some spikes of High levels of activity for Leisler's Bat, Common and Soprano Pipistrelle Bats. No bat roosts were recorded during bat roost surveys within 200m radii of T1, T5 and T6. Bat roost surveys were also undertaken near two identified structures within the Site – these were determined to not function as bat roosts. For the full details of the bat surveys and results, please refer to Appendix 9-1, Volume 3 of this EIAR.

Evaluation: The bat population at the Site is of Local Importance (Higher Value).

9.10.4.5 Amphibians and Reptiles

Table 9-14 lists the amphibian and reptile species that have been recorded from the 10 km grid squares (Q94) of the study area (National Biodiversity Data Centre (NBDC) 2025). These species are likely to be found in suitable habitat within the 10km squares of the study area.

Table 9-14: Records of amphibian and reptile species from the two hectads within which the Site lies.

Species Name	Designation	Description	10km grid square (portion of Site within square)		Species Record data set	Field Obs. within Site	Occurrence on Site
			N51 (West)	N61 (East)			
Common Frog (*Rana temporaria*)	Protected Species: EU Habitats Directive Annex V; Protected Species: Wildlife Acts	Amphibian common across Ireland, dependent on wetland habitats to breed. Can be found in or near lakes, ponds, wet grassland, bogs, fens and riparian habitats.	P	P	NBDC	Yes	Yes – confirmed. Likely to be relatively common within suitable habitat on the Site.
Smooth Newt (*Lissotriton vulgaris*)	Protected Species: Wildlife Acts	Amphibian that returns to water body to breed but as adults can be found in long grass, woodland or scrubland habitats.	P	P	NBDC	No	Likely, suitable habitat present.
Common Lizard (*Zootoca vivipara*)	Protected Species: Wildlife Acts	Lives in bogs, coastal sites, grasslands and uplands.		P	NBDC	No	Likely, suitable habitat present.

9.10.4.6 Other Terrestrial Faunal Groups

Table 9-15 lists the protected terrestrial other faunal species that have been recorded from the 10 km grid squares (N51 and N61) of the study area (National Biodiversity Data Centre (NBDC) 2025). These species are likely to be found in suitable habitat within the 10kms square of the study area. Designation is from *Ireland Red List No. 4 – Butterflies* (Regan *et al.*, 2010).

Table 9-15: Records of other terrestrial fauna from the two hectads within which the Site lies

Species Name	Designation	Description	10km grid square (portion of Site within square)		Species Record data set	Occurrence onsite
			N51 (West)	N61 (East)		
Dingy Skipper (*Erynnis tages*)	Threatened Species : Near Threatened	Small butterfly of dry calcareous grassland and limestone pavement.	P		NBDC	Unlikely, suitable habitat extremely limited.
Small Heath (*Coenonympha pamphilus*)	Threatened Species : Near Threatened	Small butterfly of unimproved, dry grasslands, coastal dunes and machair. If suitable dry habitat exists in pockets of wet habitats, this can be enough to support a population of this butterfly.	P	P	NBDC	Unlikely, suitable habitat extremely limited.
Marsh Fritillary (*Euphydryas aurinia*)	Protected Species: EU Habitats Directive Annex II; Threatened Species: Vulnerable	A colonial butterfly of a variety of habitats including sand dunes, calcareous grassland, fens, bogs and grasslands. The presence of its foodplant Devil's-bit Scabious, *Succisa pratensis*, is an essential habitat component. Suitable habitat needs to have three or more well-developed Devil's-bit Scabious plants per square metre, across more than twenty percent of the habitat. A structured sward height of various heights is also needed.		P	NBDC	Unlikely, suitable habitat not present.
Wall *(Lasiommata megera)*	Threatened Species: Endangered	Medium-sized butterfly found on unimproved, dry calcareous grassland, coastal habitats and cutover bog. Larval foodplants includes a variety of grasses such as Bents, Cock's-foot, Yorkshire Fog and others.		P	NBDC	Possible, suitable habitat present.

Species Name	Designation	Description	10km grid square (portion of Site within square)		Species Record data set	Occurrence onsite
			N51 (West)	N61 (East)		
Scarce Blue-tailed Damselfly *(Ischnura pumilio)*	Threatened Species: Vulnerable	Found mainly in seepages and flushes in heaths and bogs, in quarries, dune slacks, and shores of large lakes. Prefers slow-moving or still waters. Habitats usually lack an abundance of vegetation, but emergent, soft-stemmed plants are need when females laying their eggs.		P	NBDC	Unlikely, suitable habitat not present.
Andrena (Melandrena) nigroaenea	Threatened Species: Vulnerable	Not common. Known from various habitats including parks and gardens.		P	NBDC	Unlikely, suitable habitat not present.
Gooden's Nomad Bee (Nomada goodeniana)	Threatened Species: Endangered	Found in a range of habitat types. Cleptoparasite. Breeds in nests of *Andrena nigroaenea* & *A. cineraria*. *A. nigroaena* is found in flower-rich habitats on well-drained soils. *A. cineraria* is found in a variety of habitats with Willow.		P	NBDC	Possible, suitable habitat for one host species (*A. cineraria)* present.
Halictus (Seladonia) tumulorum	Threatened Species : Near Threatened	Small ground-nesting solitary bee; known from a range of habitat types.		P	NBDC	Possible, suitable habitat present.
Large Red Tailed Bumble Bee (Bombus (*Melanobombus) lapidarius*)	Threatened Species : Near Threatened	Cavity-nesting species found in a wide range of habitats including gardens and parks. Has declined from the agricultural landscape but can be found in non-intensively managed farmland.	P	P	NBDC	Possible, suitable habitat present.
Megachile* (Megachile) *centuncularis	Threatened Species : Near Threatened	Not common. Medium-sized, cavity nesting solitary bee. Majority of known populations in Ireland are from parks and gardens		P	NBDC	Unlikely, suitable habitat not present.

Species Name	Designation	Description	10km grid square (portion of Site within square)		Species Record data set	Occurrence onsite
			N51 (West)	N61 (East)		
Moss Carder-bee (*Bombus (Thoracombus) muscorum*)	Threatened Species : Near Threatened	Associated with flower-rich grassland habitats and flower-rich bogs and heaths. Nests occur above ground in tall open grassland. Found near Umeras Bog 1.5km to east in 2022.	P	P	NBDC	Possible, some suitable habitat present.
English Chrysalis Snail (*Leiostyla (Leiostyla) anglica*)	Threatened Species: Vulnerable	Suitable habitat is mature broadleaf woodland or hazel woodland. Found in woodland near Portarlington (1993) and near Monasterevin (1971).	P	P	NBDC	No, suitable habitat not present.

9.10.4.7 Invasive Species

Table 9-16 lists the non-native invasive species that have been recorded from the 10 km grid squares (N51 and N61) of the study area. It is possible that these species are present within suitable habitat within the 10km squares of the study area.

Table 9-16: List of non-native invasive species that have been recorded from the two hectads within which the Site occurs (N51 and N61).

Species Name	Designation	Description	10km grid square (portion of Site within square)		Species Record data set	Field Obs. within Site	Occurrence within Site
			N51 (West)	N61 (East)			
Crayfish Plague (*Aphanomyces astaci*)	Invasive Species: Invasive Species || Invasive Species: Invasive Species >> High Impact Invasive Species	A water mould that is not visible to eye which lives in its native range in a balanced host-parasite relationship. In Ireland, where it is non-native however, it causes a disease known as Crayfish Plague.	P	P	NBDC	No	Likely, suitable habitat present although host species no longer found.
Canadian Waterweed (*Elodea canadensis*)	Invasive Species: High Impact || Invasive Species Regulation S.I. 477 (Ireland)	A long, submerged plant which is found in inland, surface waters including lakes and rivers, and also estuaries.	P	P	NBDC	No	Possible, suitable habitat present.
Himalayan Balsam (*Impatiens glandulifera*)	Invasive Species: High Impact || Invasive Species Regulation S.I. 477 (Ireland)	Annual plant to 2m, commonly found on riverbanks. Also occurs on bogs, fens, heath, woodland and scrub. Can cause soil erosion on riverbanks and can outcompete native species.	P		NBDC	No	Unlikely – not detected during surveys. Suitable habitat present.
Japanese Knotweed (*Fallopia japonica*)	Invasive Species: High Impact || Invasive Species Regulation S.I. 477 (Ireland)	An aggressive coloniser and easily outcompetes native species. Extremely difficult to control due to its ability to regenerate from small fragments. Can grow in a wide range of habitats including artificial surfaces.	P	P	NBDC	No	Unlikely – not detected during surveys. Suitable habitat present.

Species Name	Designation	Description	10km grid square (portion of Site within square)		Species Record data set	Field Obs. within Site	Occurrence within Site
			N51 (West)	N61 (East)			
Sycamore (*Acer pseudoplatanus*)	Invasive Species: Medium Impact	Typically found in wooded areas or industrial and artificial habitats. Prefers acidic soils.	P	P	NBDC	Yes	Yes – confirmed.
American Mink (*Mustela vison*)	Invasive Species: High Impact || Invasive Species Regulation S.I. 477 (Ireland)	Semi aquatic, medium sized mustelid found in a wide variety of habitats including coastal & inland surface waters, bogs & fens, heath, scrub and wooded areas.	P	P	NBDC	No	Likely, suitable habitat present.
Brown Rat (*Rattus norvegicus*)	Invasive Species: High Impact || Invasive Species Regulation S.I. 477 (Ireland)	Known to occur in agricultural, industrial or other artificial habitats.	P	P	NBDC	No	Likely – suitable habitat present.
Eastern Grey Squirrel (*Sciurus carolinensis*)	Invasive Species: High Impact || Invasive Species EU Regulation No. 1143/2014 || Invasive Species Regulation S.I. 477 (Ireland)	Omnivorous, feeding mainly on seeds and plant material, sometimes bird eggs and nestlings. Known to occur in a range of habitats including wooded areas, agricultural, horticultural and artificial habitats.	P	P	NBDC	No	Likely, suitable habitat present.
European Rabbit (*Oryctolagus cuniculus*)	Invasive Species: Invasive Species || Invasive Species: Invasive Species >> Medium Impact Invasive Species	Medium sized mammal predominantly associated with grasslands. Also known to occur in scrub and woodland, regularly or recently cultivated agricultural, horticultural or	P	P	NBDC	No	Likely, suitable habitat present.

Species Name	Designation	Description	10km grid square (portion of Site within square)		Species Record data set	Field Obs. within Site	Occurrence within Site
			N51 (West)	N61 (East)			
		domestic habitat; Constructed, industrial or other artificial habitats; Miscellaneous					
Fallow Deer (*Dama dama*)	Invasive Species: High Impact || Invasive Species Regulation S.I. 477 (Ireland) Protected Species: Wildlife Acts	Medium sized deer grazing in wooded areas and agricultural grasslands.	P		NBDC	No	Likely, suitable habitat present.
Greater White-toothed Shrew (*Crocidura russula*)	Invasive Species: Medium Impact	Shrew of woodland, agricultural and grassland habitats.		P	NBDC	No	Likely, suitable habitat present.

9.10.4.7.1 Third Schedule, High Impact Species

One invasive species listed on Schedule 3 of the European Communities (Birds and Natural Habitats) Regulations 2011 (SI477) was recorded onsite (N51) during field surveys. This was Giant Hogweed (*Heracleum mantegazzianum*), assessed to present a risk of High Impact and was recorded within a hedgerow in the south-western area of the Site. This is also a regulated invasive species of Union concern under the European Regulation on the prevention and management of the introduction and spread of invasive alien species [1143/2014]. A relatively small infestation of the plant (<10 plants) was present and appeared to be contained within the hedgerow. It is likely that it has only relatively recently established here. This species spreads by seed and can form extensive stands decreasing the cover of native species underneath it. It can occur in a wide range of habitats and is often associated with rivers or freshwater in Ireland where it can cause erosion of riverbanks and influx of soil into rivers. It also presents a human health hazard.

Species Name	Designation	Description	10km grid square (portion of Site within square)		Species Record data set	Field Observation within Site
			N51 (West)	N61 (East)		
Giant Hogweed (*Heracleum mantegazzianum*)	Invasive Species: High Impact || Invasive Species Regulation S.I. 477 (Ireland)	A tall perennial, living 3-5 years. Spreads by seed. Found on bogs, grasslands, woodlands and artificial habitats.		P	NBDC	Yes - confirmed

Other non-native invasive species recorded within and adjacent to the site are listed below. The focus of the survey for invasive plant species along the TDR was in areas of accommodation works that would involve the removal of vegetation. The GCR is not expected to involve vegetation removal as the trench for the cable will be within the existing road infrastructure. However, the recorded locations of invasive species along the verges of the roads of the GCR highlight the need for pre-construction surveys should there be any need to disturb the vegetation along the verge of the GCR roads.

9.10.4.7.2 High Impact Species

Cherry Laurel (*Prunus laurocerasus*) was recorded at various locations along the GCR. It does not fall within the footprint of the Proposed Development unless for some reason the GCR trench needs to leave the existing road corridor onto the road verge.

9.10.4.7.3 Medium Impact Species

Sycamore (*Acer pseudoplatnanus*) was recorded at various locations along the GCR.

It was also recorded at one of the TDR accommodation works nodes (node 35/36).

9.10.4.7.4 Low Impact Species

Snowberry (*Symphoricarpos albus*) was recorded within the Site in the vicinity of T04 in the south of the Site. It was also recorded at one of the TDR accommodation works nodes (node 35/36).

Ground Elder (*Aegopodium podagraria*) and Snowberry (*Symphoricarpos albus*) were both recorded along the GCR.

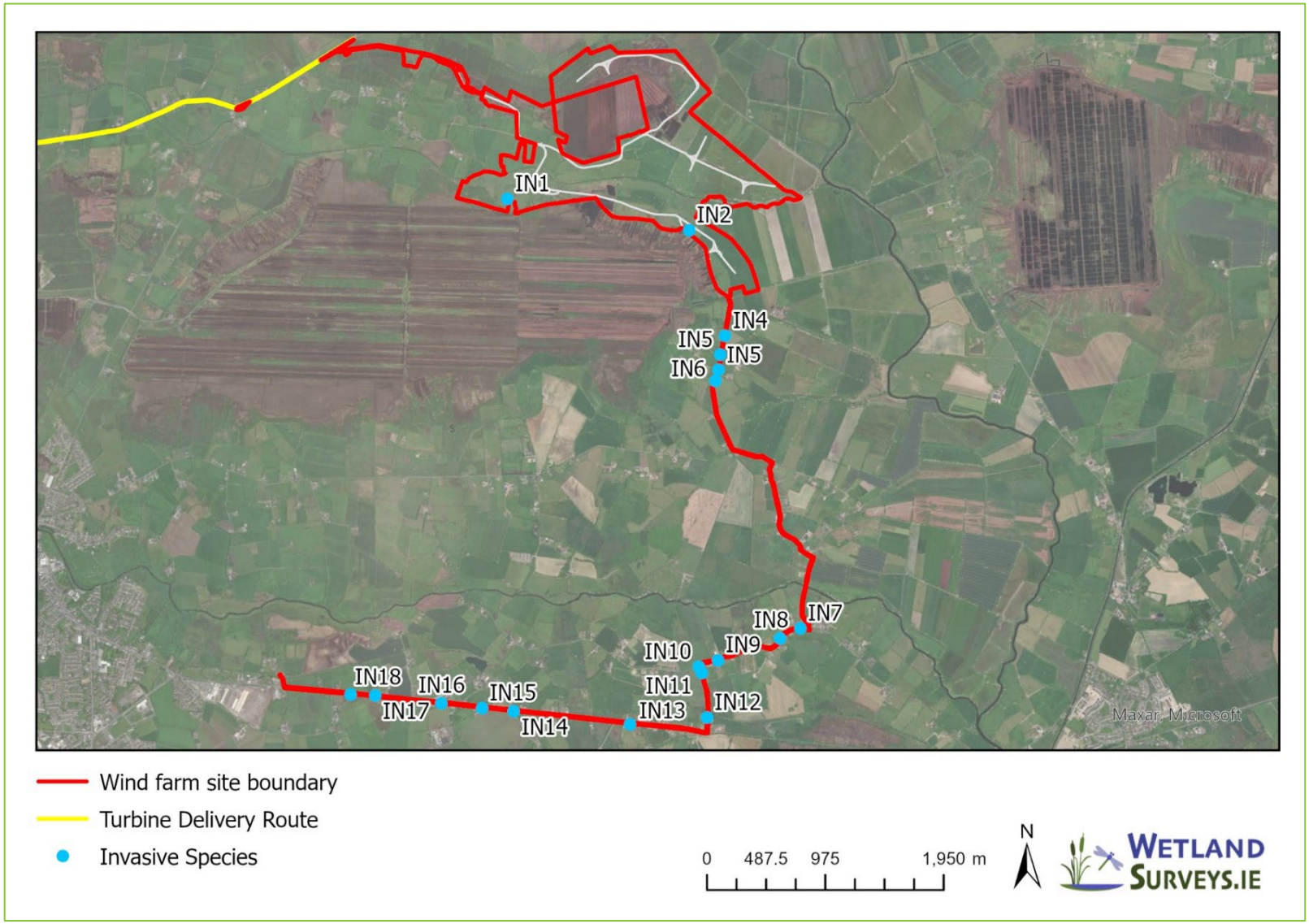

Figure 9-16: Map of location of invasive species within Site and along GCR

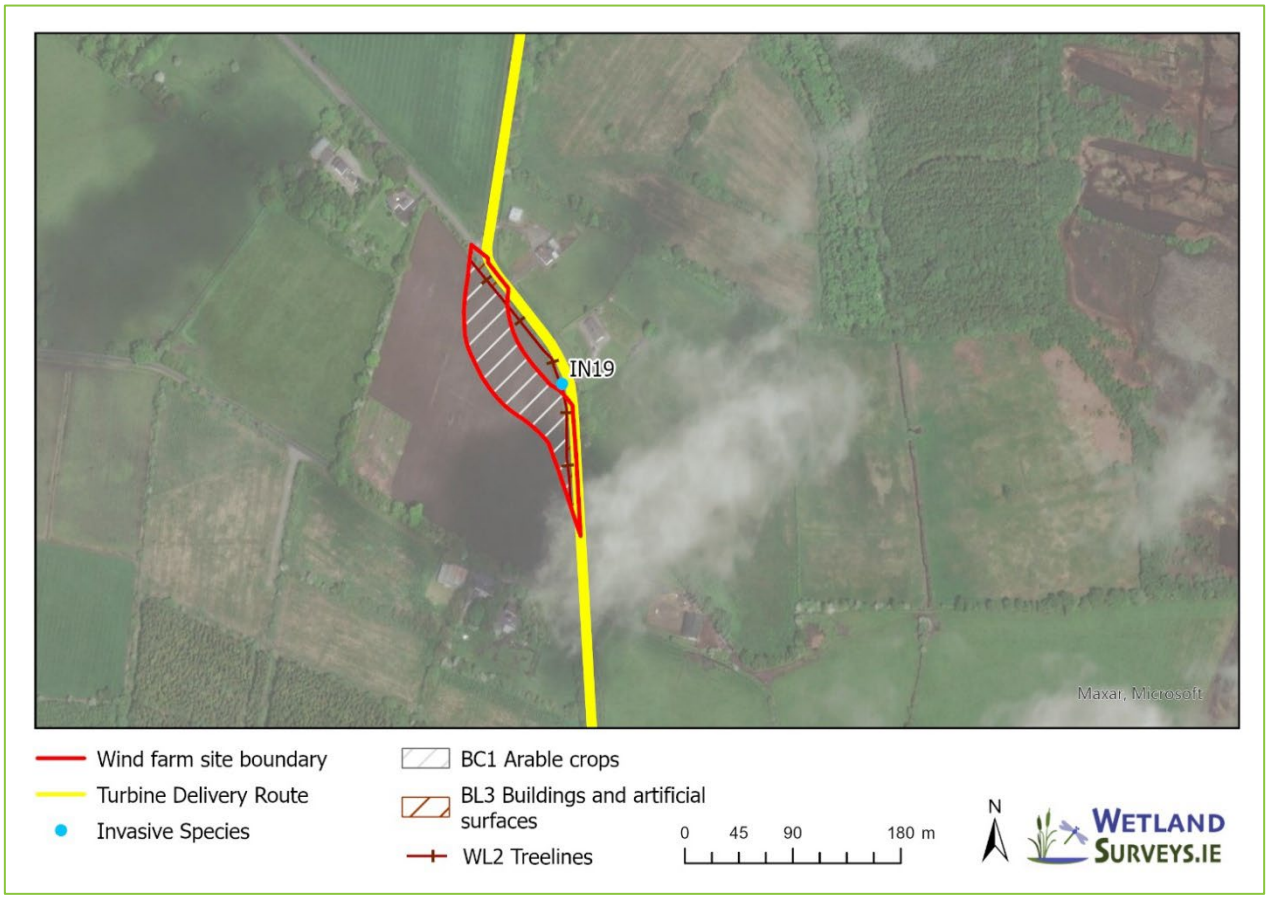

Figure 9-17: Map showing location of invasive species in relation to proposed TDR accommodation works at Node 35/36.

Table 9-17: List of invasive species target notes corresponding with maps shown in Figure 9-16 and Figure 9-17

Target Note Number	NOTE TYPE	Species
IN1	Invasive Species	Giant Hogweed
IN2	Invasive Species	Snowberry
IN4	Invasive Species	Sycamore
IN5	Invasive Species	Snowberry and Sycamore
IN6	Invasive Species	Snowberry
IN7	Invasive Species	Cherry Laurel
IN8	Invasive Species	Ground Elder
IN9	Invasive Species	Cherry Laurel
IN10	Invasive Species	Cherry Laurel
IN11	Invasive Species	Snowberry
IN12	Invasive Species	Cherry Laurel
IN13	Invasive Species	Cherry Laurel
IN14	Invasive Species	Cherry Laurel
IN15	Invasive Species	Cherry Laurel
IN16	Invasive Species	Cherry Laurel
IN17	Invasive Species	Cherry Laurel
IN18	Invasive Species	Cherry Laurel
IN19	Invasive Species	Snowberry

9.10.5 Aquatic Ecology

9.10.5.1 Desktop Survey

A review of rare and protected species records for the two hectads within which the Site is located was undertaken. The results are presented below in Table 9-18.

Table 9-18: Results of desktop survey of rare and protected species records for the two hectads, N51 and N61

Species Name	Designation	Description	10km grid square (portion of Site within square)		Species Record data set	Field Obs. within Site	Occurrence within Site
			N51 (West)	N61 (East)			
Freshwater White-clawed Crayfish (*Austropotamobius pallipes*)	Protected Species: EU Habitats Directive Annex II & Annex V; Protected Species: Wildlife Acts	Found in rivers, streams and lakes in Ireland particularly in those with a calcareous influence. This species prefers pH above 7 and calcium levels of minimum 5mg/l and generally good quality, cool water but can tolerate some variation.	P		NBDC	No	Unlikely at present. There are records from the Cushina River in 1993 and 2015 but Crayfish Plague is likely to have drastically reduced the population.
Pale Evening Dun (Mayfly) *Procloeon bifidum*	Threatened Species: Vulnerable	Generally encountered in sluggish-flowing sections of rivers but it has also been located in a small number of lakes. It tends to inhabit aquatic vegetation and is moderately tolerant of siltation. It is likely to be sensitive to organic pollution/ eutrophication.	P	P	NBDC	No	Unlikely. Habitat onsite is sub-optimal.

Species Name	Designation	Description	10km grid square (portion of Site within square)		Species Record data set	Field Obs. within Site	Occurrence within Site
			N51 (West)	N61 (East)			
Desmoulin's Whorl Snail *(Vertigo (Vertigo) moulinsiana)*	Protected Species: EU Habitats Directive Annex II; Protected Species: Wildlife Acts Threatened Species: Endangered	Optimal habitat is where water level is at or slightly above ground level for much of the year, with a good cover of tall sedges and grasses. Most often found in calcareous conditions. Records exist (from 1971) from immediately adjacent to the GCR at Bergin's Bridge just outside Portarlington.	P	P	NBDC	No	Unlikely, suitable habitat absent. Possible adjacent to the GCR at Bergin's Bridge.
Common Whorl Snail *(Vertigo (Vertigo) pygmaea)*	Threatened Species: Near Threatened	Found in habitats such as damp pastures, the margins of wetlands and coastal dune grasslands. Records exist (from the mid-late 1990's) from immediately adjacent to the GCR at Bergin's Bridge and Wheelahan's Bridge, both just outside Portarlington.	P	P	NBDC	No	Unlikely, suitable habitat absent. Possible adjacent to the GCR at Bergin's Bridge.
Glutinous Snail (Myxas glutinosa)	Threatened Species: Endangered	Requires pollution-free water in habitats such as ponds, lakes and canals. Recorded in Portarlington and Monasterevin, both in 1940.	P	P	NBDC	No	Unlikely, suitable habitat absent.

9.10.5.2 Depositing / Lowland Rivers (FW2)

A single natural watercourse, the Cushina River, occurs within the footprint of the Proposed Development. The river flows east from the western boundary, through the centre, exiting the Site at the eastern boundary. Recent canalisation of the river and possible dredging has occurred. This river has been deepened and widened over the years (IFI *pers comm.)*. The river had circa 1-1.5m of water depth at the time of survey and was circa 3-4m wide. The river substrate was comprised of fine material, possibly as a result of canalising of the river, and had a moderate flow. The banks are relatively steep throughout the Site, with some slumped areas present where cattle access. There are occasional trees along the watercourse and for the last approx. 600m of the river before it exits the Site, the banks (and embankments) support a scrub habitat that is developing into woodland. Baseline ecological surveys of the Cushina within and adjacent to the Site determined that the water quality was Poor (Q3) and the river has been degraded from being channelized and from regular dredging (See Appendix 9-2, Volume 3 of this EIAR for full Aquatic Ecology report). This section of the River Cushina provides very suboptimal habitat for salmonids and none were recorded in either the 2021 or 2024 aquatic survey within the Site. Approximately 50m downstream of the Proposed Site boundary there were small numbers of salmonids and lampreys present. The fish community at both locations was dominated by coarse fish. White-clawed Crayfish and Freshwater Pearl Mussel were not recorded from the river.

Evaluation: This habitat is of Local Importance (Higher Value) with a direct connectivity to the Internationally Important site, the River Barrow and River Nore SAC.

9.10.5.3 Drainage Ditches (FW4)

Drainage ditches occur throughout the Site, within coniferous forest, agricultural grassland, raised bog and cutover bog habitats. This habitat is prominent in the south-eastern section of the Site in the improved grassland on the floodplain of the Cushina River. These drains are relatively deep (up to approx. 1m deep) and appear to be regularly maintained in relation to agricultural practices. The width of the drains across the Site vary from approx. 1m to 4m. There are significant loads of peat sediments in some of the drains coming from the commercially harvested peat area just outside the Site and stock access drains to drink at some points along the drains.

This habitat also occurs in association with the raised and cutover bog in the north and west of the Site. Some of these drains support aquatic vegetation and have a slow flow of water. Vegetation includes Bulrush, Purple Loosestrife and Broad-leaved Pondweed.

Evaluation: This habitat is Local Importance (Lower Value) with a direct connectivity to the Internationally Important site, the River Barrow and River Nore SAC.

9.11 Identification of Key Ecological Receptors

Table 9-19 lists all identified receptors and assigns them an ecological importance in accordance with the Guidelines for Assessment of Ecological Impacts of National Road Schemes (NRA, 2009). This table also provides the rationale for this determination and identifies the habitats and species that are Key Ecological Receptors (KERs). These KERs are considered in Section 9.13 of this report and mitigation/ measures will be incorporated into the Proposed Development where required, to avoid any likely significant effects on the features.

Table 9-19: Key Ecological Receptors identified during the assessment.

Ecological Feature or Species	Reason for Inclusion as a KER	KER
Designated Sites	**Nationally Designated Sites** The following Nationally designated sites have connectivity to the Proposed Development and have been identified as being within the likely Zone of Impact: o The Grand Canal pNHA (002104) Following a highly precautionary approach, this designated site is included as a KER as likely significant effects on this site via during the construction stage of the development via impacts on Otters cannot be ruled out..	Yes
	European Designated Sites The River Barrow and River Nore SAC (002162) has connectivity to the Proposed Development and has been identified as being within the likely Zone of Impact.	Yes
Depositing/ Lowland Rivers (FW2) and the aquatic species it supports.	This habitat was assessed as being of **Local Importance (Higher Value)** due to its existing and potential value to aquatic ecology and its hydrological connectivity to downstream waterbodies in the local area. It also provides a direct conduit downstream to the European designated site, River Barrow and River Nore SAC, which is of international importance. Likely direct and indirect effects on this habitat from the construction of the Proposed Development cannot be ruled out at this stage. It is considered that the likely effects on this habitat will correspond to the likely effects on the aquatic species that were identified within it during the Aquatic surveys such as salmonids and lampreys, and any other sensitive aquatic species that may be downstream. Hence the assessment of this habitat is considered to also be the assessment of effects on these aquatic species.	Yes
Drainage Ditches (FW4)	The drains on the Site are all within the River Barrow catchment. They are man-made habitats, intensively managed through regular maintenance, but they do provide some aquatic habitat for local wildlife. They are evaluated to be of **Local importance, Lower Value**.	Yes

Ecological Feature or Species	Reason for Inclusion as a KER	KER
	However, due to the hydrological connection between this habitat and European Designated site, the River Barrow and River Nore SAC, further downstream, the Drainage Ditches are assessed to be a KER.	
Raised Bog (PB1)	This rare habitat was present on Site but in poor condition. Never-the-less, due to its threatened status across Europe, it was evaluated as being of **Local Importance (Higher Value)**.	Yes
Wet Pedunculate Oak-Ash Woodland (WN4)	There is a small area of this habitat within the Site and it provides habitat for woodland species. It is well connected to the other woodlands within the Site by hedgerows and treelines. It was evaluated as being of **Local Importance (Higher Value)**.	Yes
Bog Woodland (WN7)	The Bog Woodland on the Site has developed on cutover bog and does not correspond to the Annex I Bog Woodland habitat. It is dominated by Birch but does support other woodland species. It likely supports breeding and foraging habitat for a variety of woodland species including Badger and other small mammals and birds. It was evaluated as being of **Local Importance (Higher Value)**.	Yes
Hedgerows (WL1)	The hedgerows onsite are dominated by native species, provide habitat and ecological connectivity in the landscape for numerous species of wildlife. **Local Importance (Higher Value)**.	Yes
Treelines (WL2)	The treelines onsite are dominated by native species, provide habitat and ecological connectivity for native wildlife. **Local Importance (Higher Value)**.	Yes
Improved (agricultural) Grassland (GA1) **Wet Grassland (GS4)** **Improved Agricultural Grassland/Dry Calcareous Grassland mosaic (GA1/GS1)** **Cutover Bog (PB4)**	These habitats, although some contain small areas of semi-natural habitat that are of some local importance for wildlife are common and widespread in the local and wider landscape. These habitats are assigned **Local Importance (Lower Value)** and are therefore not included as KERs.	No

Ecological Feature or Species	Reason for Inclusion as a KER	KER
Scrub (WS1) **Conifer Plantation (WD4)**		
Alder Buckthorn (*Frangula alnus*)	Species of **Least Concern.** Recorded onsite at a number of locations within hedgerows alongside the access track from the south and scrub on cutover bog. Effects are likely from the Proposed Development but not a KER due to Least Concern assessment.	No
Least Bur-reed (*Sparganium natans*)	Potentially suitable habitat is present onsite. However, it was not detected at any of the potentially suitable habitat within the footprint of the Proposed Development and hence, it is considered unlikely to be impacted by the Proposed Development.	No
Round-leaved Wintergreen (*Pyrola rotundifolia*)	Potentially suitable habitat on-site. Not recorded within the Site. Assessed as being unlikely to be present within ZOI of the Proposed Development.	No
Field Madder (*Sherardia arvensis*)	Species of **Least Concern.** Recorded along the TDR including within the ZOI of a proposed new access road. Least Concern species are not considered at risk and includes species determined to be common and widespread in the wild (Wyse-Jackson *et al.*, 2016).	No
Slender Tufted-sedge (*Carex acuta*)	Species assessed as **Near Threatened.** Not recorded on-site and potentially suitable habitat not considered to lie within the ZOI of the Proposed Development.	No
Eurasian Badger (*Meles meles*)	Badger setts identified within the Site and within the footprint of the Proposed Development. There are likely expected direct and indirect impacts on this species. The likely population size within the Site based on the higher than average density of badgers recorded in midland counties compared to the rest of Ireland (>0.7 social groups/km^2) is a maximum of 2 social groups. This represents 0.006% of the national population and 0.1% of the estimated County population[7]. Hence, this species is assessed as being of **Local Importance, Higher Value.**	Yes

[7] Population estimates are based on Smal (1995) research indicating a density of badgers of and a total population of 34,000 social groups in Ireland and a density of 0.73 social groups per km^2 in Co. Offaly (higher than the density recorded in Laois of 0.47 social groups/km^2). Area of Co. Offaly 2001km

Ecological Feature or Species	Reason for Inclusion as a KER	KER
Eurasian Pygmy Shrew (*Sorex minutus*)	Likely to be present on-site and suitable habitat is within the footprint of the Proposed Development. Species is considered widespread and not at threat from habitat loss or disturbance.	No
Eurasian Red Squirrel	No evidence of their presence on-site.	No
European Otter (*Lutra lutra*)	Present on-site. Dependant on aquatic habitat and uses the River Cushina. The River Cushina is within the Zone of Influence of the Proposed Development.	Yes
Pine Marten (*Martes martes*)	No evidence was found to indicate the presence of this species within the Site.	No
West European Hedgehog (*Erinaceus europaeus*)	This species is considered widespread in the country in a variety of habitats. Likely to be present on the Site but unlikely that a significant impact on the local population will result from the Proposed Development.	No
Bats	The habitats within and surrounding the Proposed Development Site are used by a bat population of **Local Importance (higher value).** All bat species in Ireland are protected under both national legislation – (Wildlife Act, 1976, as amended in 2019) and European legislation – (Habitats Directive (92/43/EEC). Bats are likely to forage and commute within the vicinity of the Proposed Development, particularly along hedgerows, treelines and wooded areas. Potential bat roosting features were identified within 200m of T1, T5 and T6, but no bat roosts were found. Likely significant direct and indirect effects from the Proposed Development on bats cannot be ruled out. Therefore, bats are included as a KER for further assessment.	Yes
Reptiles and Amphibians	It is considered that the Proposed Development will not result in a significant loss of suitable habitat for reptiles and amphibians. No evidence of populations of amphibians being significant at more than a local level was recorded. No likely significant effects on these species are anticipated and therefore further survey/ assessment was not deemed necessary. Based on the low number of amphibian records for the Site and the highly wooded nature of parts of the Site, amphibians and reptiles have been assessed as of **Local Importance (lower value).**	No
Giant Hogweed (*Heracleum mantegazzianum*)	This invasive species was recorded on the Site associated with a hedgerow. It is a relatively small infestation but due to the risk of High Impact, this species is of high local concern. Adopting a precautionary approach, it is included as a KER, despite lying outside the footprint of any construction works.	Yes

Ecological Feature or Species	Reason for Inclusion as a KER	KER
Invasive species (general)	Other invasive species were recorded from both the GCR and the TDR. No high-impact species were recorded, only medium and low-impact species such as Snowberry, Ground Elder, Sycamore and Cherry Laurel. Potential for construction activities to cause an increase in the spread of these species. Likely significant effects cannot be ruled out.	Yes
Desmoulin's Whorl Snail (Vertigo (Vertigo) moulinsiana) ***Common Whorl Snail (Vertigo (Vertigo) pygmaea)***	Assessed as being unlikely to be present within the Site due to lack of suitable habitat. However, possible suitable habitat adjacent to GCR at Bergin's Bridge and Wheelahan's Bridge on GCR to east of Portarlington. Horizontal Directional Drilling (HDD) will be undertaken to bring the grid cables across Bergin's Bridge.	Yes
Moss Carder-bee (Bombus (Thoracombus) muscorum)	Possibly present due to some suitable habitat (GS4, PB4/GS4, PB4) present on site which will be within the construction footprint. As a precautionary measure, included as a KER.	Yes
Large Red Tailed Bumble Bee (Bombus (Melanobombus) lapidarius) ***Halictus (Seladonia) tumulorum*** ***Gooden's Nomad Bee (Nomada goodeniana)*** ***Wall (Lasiommata megera)***	Invertebrates found in a variety of habitats or cutover bog. Potentially suitable habitat within ZOI of Proposed Development. As a precautionary measure these are included as KERs.	Yes

Where previous records of other threatened species exist in N51 and N61 listed in Section 9.10.4 and 9.10.5 were considered unlikely to occur within the Site and the ZOI of the Proposed Development, these have not been considered as KERs.

9.12 Ecological Impact Assessment

9.12.1 Do Nothing Scenario

The Proposed Development Site is situated in an area where a well-established pattern of mixed land use pertains. These comprise predominantly low-intensity agriculture, local small scale peat extraction, intensive peat harvesting, commercial forestry and low-density residential development. If the Proposed Development does not progress beyond the planning application stage, it is likely that the current land-use practices within the Site and within the wider landscape, will continue. Similarly, it is likely that the current pressures on water-quality and ecological integrity will continue and there will be a missed opportunity to improve the ecology of aquatic and terrestrial habitats as outlined in the BEMP and the opportunity to contribute to reducing our greenhouse gas emissions.

9.12.2 Effects

Ecological effects can occur by several different mechanisms, the means of characterising and assessing effects is outlined in Sections 9.7 and 9.8 above. The main types of impacts are discussed in a general context in this Section (9.12) while predicted impacts specific to the Site and the identified features of ecological value are assessed in Section 9.13 below.

The Proposed Development comprises the construction, operation and subsequent decommissioning of a windfarm comprising nine no. wind turbines, access tracks, and an electrical substation. The proposed site layout is presented in Figure 9-18 overlain on a habitat map of the Proposed Development Site.

9.12.3 Potential Effects

The potential effects of the Proposed Development on KERs are considered in this section. Likely or predicted effects are outlined in 9.13.

There are three main types of effects considered in this Section

1. Direct Effects
2. Indirect Effects and
3. Cumulative Effects.

Direct ecological impacts are those that result in physical loss or degradation of a habitat or species as a direct result of the Proposed Development. Indirect or secondary impacts are those, which contribute to the long-term decline in the quality of the habitat or feature as an indirect consequence of the Proposed Development. Cumulative impacts are impacts from the Proposed Development assessed taking into account the impacts from other developments in the area.

9.12.4 Direct Effects

The direct effects that could potentially occur as a result of the Proposed Development include:

- Habitat Loss
- Habitat Degradation
- Disturbance
- Collision

The footprint of the development will cause a direct loss of habitat where the turbine bases, substation, new access tracks and other associated infrastructure are to be placed. Areas outside of the footprint of the development will not suffer direct habitat loss. Temporary habitat loss is likely where for instance, peat deposition areas will be placed. Habitat loss can impact on flora, invertebrates, birds and mammals that utilise the affected habitat. In addition, there is potential for habitat degradation to occur and for direct effects on species such as disturbance and collision. Habitat degradation can occur in areas where construction vehicles will be working and general traffic will be moving. The effects could include an increase in disturbances such as from noise, lights, dust, pollutants, damage to vegetation and/or soil. Such effects could potentially be direct to habitats and/or species. Collision risk is from the moving blades of the turbines. Collision is generally regarded as a risk to birds and bats.

Noise from construction machinery, artificial lighting and the visibility of humans and machinery could cause a direct disturbance to sensitive species such as Otter (NatureScot, 2024c), Badgers (Natural England, 2025) and Bats (Bat Conservation Trust, online) if they occur in proximity to Otter holts, Badger setts or Bat roosts. Light pollution can also reduce the efficiacy of

9.12.5 Indirect Effects

The development of a wind farm can have a number of indirect or secondary ecological impacts. If these impacts significantly alter the type and/or quality of the habitat, then such changes represent additional habitat losses. In the case of the proposed wind farm at Derrynadarragh, indirect impacts on terrestrial and aquatic ecology could include:

- Hydrological impacts
- Habitat fragmentation
- Changes in habitat management
- Displacement / Barrier Effect

These types of impacts are discussed below.

9.12.5.1 Hydrological impacts

Hydrological impacts to habitats have potential to result from changes to patterns of surface water and/or ground water drainage. While it can be relatively straightforward to prevent changes to surface water drainage patterns, changes to ground water hydrology can be much more difficult to predict at a scale relevant to potential ecological impacts. Habitats such as bog, fen, lakes, and marshy grassland are potentially susceptible to hydrological impacts, and even quite subtle and localised hydrological changes may have significant habitat effects. The raised bog habitat on-site would be sensitive to hydrological changes. However, significant drainage associated with turbary and forestry has already altered the hydrological regime of this raised bog habitat.

9.12.5.2 Habitat fragmentation

Habitat fragmentation can occur when a contiguous patch of habitat is crossed by a road, creating one or more smaller habitat patches. Reducing the size of the habitat patches can cause declines in species numbers if the patches become too small to support viable populations. The increased proportion of 'edge' to 'interior' in these smaller patches can cause changes to the species composition due to increased invasion or predation by 'edge' species. The presence of access roads, past peat cutting, agriculture and forestry has already caused significant fragmentation of the semi-natural habitats on-site.

9.12.5.3 Changes in habitat management

Changes in the present management of the Site can cause adverse or beneficial effects on the ecological value of the habitats within the Site. Changes in present management can include changes in agricultural practices and forestry management.

9.12.5.4 Displacement / Barrier Effect

Displacement and barrier effects are impacts that can occur at the Operational phase of a windfarm. Species do not return to the Site or use the Site in lower numbers than before are said to be displaced by the development. This can be a result of habitat loss, reduction in habitat quality (perhaps from pollution or fragmentation) or excessive disturbance for that species from the turbine operations. The result is a significant reduction in the number of individuals of a species utilising the Site at the Operational Phase compared to the scenario before construction.

Most of these impacts can be minimised or reduced by avoiding areas with sensitive habitats and key populations of vulnerable and endangered species. Indeed, as part of the iterative design process of the Proposed Development, the identification of badger setts on-site resulted in an adjustment of the proposed access road layout and the position of the substation and temporary compound within the Site in order to avoid the buffer zones for the badger setts. This is described in further detail in Section 3.4 of Chapter 3 – Site Selection and Alternatives.

Predicted effects arising from the construction and operational phase of the Proposed Development are dealt with separately in the following sections.

9.12.6 Cumulative Effects

Cumulative effects can arise from actions that, when taken individually, are insignificant, but when considered collectively with other actions taking place over a period of time or concentrated in a location, can be considered significant. Cumulative impacts can be additive/incremental or associated/connected.

Cumulative impacts that could arise from the Proposed Development include:

- Cumulative collision risk to birds and bats.
- Cumulative effect on water quality of local watercourses.
- Cumulative effect on sensitive habitats in terms of habitat loss or degradation.

9.13 Predicted Effects

As mentioned previously, a full explanation of the methods and terminology used in assessing the effects of the Proposed Development is presented in Sections 9.7 and 9.8. The main characteristics of the Proposed Development is outlined below. A full description of the Proposed Development is given in Chapter 2: Description of Proposed Development of the EIAR.

Elements of the Proposed Development for which Development Consent is being Sought

The Proposed Development for which consent is being sought will consist of the following:

- A 10-year permission and a 35-year operational life from the date of commissioning of the entire Wind Farm.
- Construction of 9 no. wind turbines – 4 no. turbines will have a tip height of 186m above existing ground level with a hub height of 105m and rotor diameter of 162m, and 5 no. turbines will have a tip height of 187m above existing ground level with a hub heigh of 106m and rotor diameter of 162m.
- Construction of permanent turbine foundations and crane pad hardstanding areas and associated drainage;
- Construction of 1 no. new main site entrance on Regional Road R419 to serve as construction and operation access, and upgrade works to 1 no. existing site entrance (Derrylea Road) to the south to service for construction only;
- Construction of 9,360m of new internal access tracks and associated drainage infrastructure;
- Upgrading of 550m of existing tracks and associated drainage infrastructure;
- All associated drainage and sediment control including interceptor drains, cross drains, sediment ponds and swales;
- Installation of 1 no. permanent single span bridge crossing Cushina River within the proposed Wind Farm site;
- All associated infrastructure, services and site works including excavation, earthworks, peat and spoil management;
- Creation of dedicated peat and spoil deposition areas for the management of peat and spoil within the site;
- Establishment of 3 no. temporary construction compounds and associated ancillary infrastructure including parking;
- Establishment of 2 no. temporary wheel washing areas during construction only;
- Forestry felling of 6.01ha (60,100 m2) to facilitate construction and operation of the Proposed Development;
- Provision of recreational amenity area comprising 2 no. parking spaces and picnic table;
- Biodiversity enhancement measures within the site boundary;
- Construction of 1 no. IPP Substation and associated compound including:
    - Wind farm Control building with welfare facilities
    - Electrical infrastructure
    - Parking
    - Security Fencing

    - Rainwater harvesting tank;
    - Security fencing.
- Installation of medium voltage electrical and communication cabling underground between the proposed turbines and the proposed on-site TSO substation and associated ancillary works;
- Installation of 11.4km of permanent high voltage (110kV) and communication cabling underground, primarily within the public roads between the proposed on-site substation and the Bracklone Substation (within the townland of Bracklone in Co. Laois) and associated ancillary works. The proposed grid connection cable works will include trenching, laying of ducting, installing 15 no. joint bays and 7 no. watercourse crossings, pulling cables and the back filling of trenches and reinstatement works, within the townlands of Cushina in County Offaly; Aughrim and Derrylea in County Kildare, and Inchacooly, Coolnaferagh, Ullard or Controversyland, Clonanny, Lea, Loughmansland Glebe, and Bracklone in County Laois. The underground cabling will traverse the following roads; L70481 (Derrylea Road); L71764; L7050; L-7051; L7176; L71761; R424; and R420 (Lea Road);
- Accommodation works required along the Proposed Turbine Delivery Route (TDR) to facilitate turbine component deliveries at the following six locations:
    - Construction of load bearing surface, removal of vegetation and trees, and reprofiling of embankment on R420/R402 Junction within the townland of Ballina, Co. Offaly;
    - Construction of load bearing surface, removal of railing and planters, and reprofiling of road on R402 at junction to L2025 Ballinagar, within the townland of Ballinagar, Co. Offaly;
    - Construction of load bearing surface, removal of vegetation and trees, reprofiling on R400, within the townland of Drumcaw or Mountlucas, Co. Offaly;
    - Installation of 1 no. permanent single span bridge crossing Daingean River at R402/R400 Junction and Philipstown Bridge along Turbine Delivery Route, within the townlands of Esker Beg and Drumcaw or Mountlucas, Co. Offaly;
    - Construction of load bearing surface, removal of vegetation and trees, reprofiling on R400 at junction to L1013 Enaghan, within the townland of Enaghan, Co. Offaly;
    - Construction of load bearing surface, removal of vegetation and trees, and reprofiling of embankment on R419 at junction to R400, within the townland of Cushina, Co. Offaly.

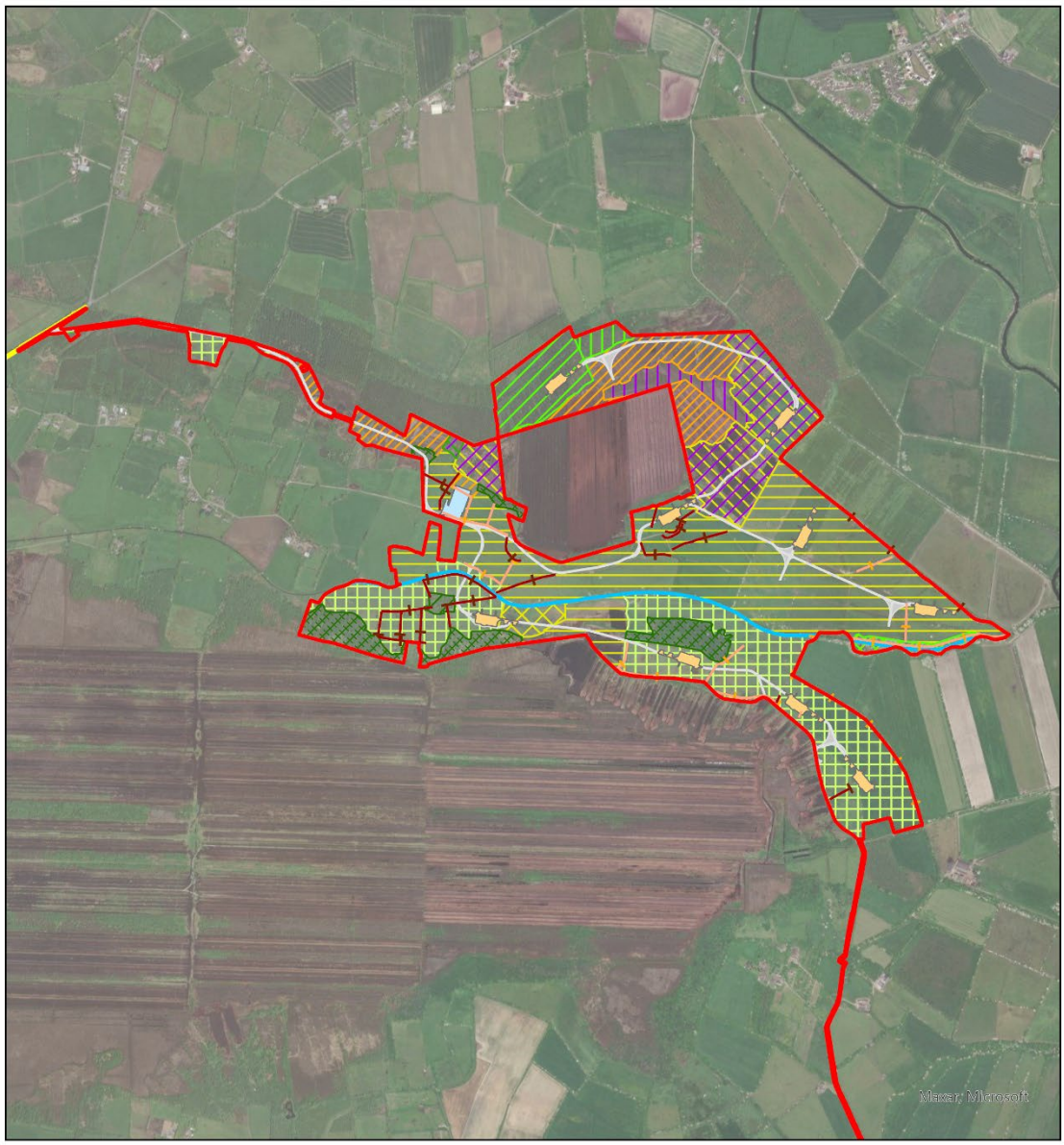

Figure 9-18: Map showing habitats of Site with main infrastructure of the Proposed Development

9.13.1 Construction Phase Effects

9.13.1.1 Direct Effects

9.13.1.1.1 Designated Sites

One European Site, the River Barrow and River Nore SAC, has been identified as a KER. This SAC is hydrologically connected to the Site and there will be one crossing along the GCR within the Site. There are potential direct effects during the construction phase. A Natura Impact Statement (NIS) has been prepared for the Proposed Development and has been submitted with the planning application. The NIS assesses the likely significant effects on European Sites resulting from the Proposed Development.

9.13.1.1.2 Natural Heritage Areas or Proposed Natural Heritage Areas

One nationally designated site, the Grand Canal pNHA, has been included as a KER. However, this is not linked to the site hydrologically and it lies approximately 4.3km to the east of the Proposed Development Site at its nearest point. ***It is considered that there will be no direct adverse, likely significant effects on the Grand Canal pNHA.***

9.13.1.1.3 Habitats

Direct impacts to habitats will be in the form of habitat loss, habitat degradation/alteration and habitat fragmentation. Direct effects are likely to occur in those areas where turbines, substation, crane stand areas and new access tracks are to be constructed. Stockpiling of material within the Site is likely to cause additional habitat loss should it be placed in a manner that would smother vegetation. The estimated areas of habitat loss are shown in Table 9-4. Habitat loss figures are based on calculations from a GIS intersection of habitats and development features, taking overlapping of features into account. It should be noted that the use of existing access tracks where possible has reduced the requirement for some new road infrastructure.

The Grid Cable will be predominantly contained within the public road corridor throughout its length with the exception of the start and finish points where the cables will be terminated in the proposed network substation at Bracklone, and the proposed on-site substation which is located within the Site. Hence, there is very little risk of likely impacts on roadside verge habitats.

The Grid Cable Route will not result in any loss of semi-natural habitat as it is within the confines of the existing road infrastructure. Where horizontal directional drilling is required there may be minor disturbance to roadside habitats. If this occurs, this disturbance will be minor and temporary as the habitats will be reinstated following infilling of the cable trench.

TDR Accommodation works will be required at selected locations along the TDR to facilitate the delivery of large components to the Site. This will include some temporary hardcore surfacing at roundabouts or areas of oversail, and overhead utilities and obstructions will need to be removed at several locations to provide adequate overhead clearance. The removal of overhead utilities will be by either temporary disconnections or permanent re-routing. Such works will be carried out by the utility providers in advance of turbine delivery to Site. The majority of the temporary accommodation works associated with the TDR will be fully reinstated following the construction stage, with the exception of the permanent Bridge Crossing at Philipstown Bridge (see Node 29/30 within Table 9-8).

The TDR will result in some habitat loss where a new section of road and bridge over the Philipstown River is proposed at Esker Beg near where the R400 joins the R402. The dominant habitat here is improved agricultural grassland (GA1), and there is a small area of dry, calcareous grassland / improved grassland mosaic (GA1/GS1) in the north of the field, some of which will also be removed (approximately 0.006ha). However, care will be taken with the sod of this section when constructing the access track such that it will be replaced on the verge of the access road once construction is finalised.

TDR accommodation works at Node 35/36 will also result in some habitat loss where a new section of road is proposed– here the main habitat loss will be Arable Crops (BC1) and approximately 10m of treeline (WL2).

Remaining TDR accommodation works result in the temporary habitat loss of 240m of Treelines (Lower value due to presence of non-natives) only be required during the operational phase in the unlikely event of a major turbine component replacement. The accommodation works will not be required for the decommissioning phase as turbine components can be broken up on-site and removed using standard HGVs.

Table 9-20: Area/Length (ha/m) of KER habitats likely to experience direct habitat loss from the Proposed Development within the Proposed Wind Farm Site

Location	Lowland River (FW2)	Drainage Ditches (FW4)	Raised bog (PB1)	Wet Oak-ash Woodland (WN4)	Bog Woodland (WN7)	Hedgerow (WL1)	Treeline (WL2)
Turbines	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Tracks	n/a	**0.0245ha**	n/a	n/a	**0.219ha**	**15m**	**20m**
Peat Deposition Areas	n/a	n/a	n/a	n/a	**0.054ha**	n/a	n/a
Bat Buffer Zones	n/a	n/a	n/a	n/a	**1.89ha**	**458m**	**484m**
Substation	n/a	n/a	n/a	n/a	n/a	**64m**	n/a
Temporary Compounds	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Amenity Area	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Car park	n/a	n/a	n/a	n/a	n/a	n/a	n/a
TDR Accommodation Works	n/a	**0.0025ha**	n/a	n/a	n/a	**350m**	**20m**
GCR works	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Total	**0ha**	**0.027ha**	**0ha**	**0ha**	**2.163ha**	**887m**	**524m**
% loss (on Wind Farm Site)					**18%**	**17%**	

The total area of KER habitat directly lost as a result of the Proposed Development is 2.19ha of habitat area and 1,411m of linear habitats. Direct habitat loss will occur in other habitats which are not assessed to be KERs including Improved Agricultural Grassland (GA1) (4.8ha), Cutover Bog (PB4) (1.1ha), Cutover Bog/Wet Grassland (PB4/GS4) (1.37ha) and Wet Grassland (GS4) (0.21ha). In addition, 2.8ha of Conifer Plantation (WD4) will be felled for the creation of a bat buffer zone at T02.

These habitats are quite common within the Site.

It is estimated that there is at least 2km of drainage ditches, 7.5km of WL1/WL2 and 11.9ha of Bog Woodland (WN7) within the Proposed Development Site. This indicates that approximately 18% of Bog Woodland and 17% of Hedgerows/Treelines will be lost as a result of the Proposed Development. However, it is important to note that the vast majority of habitat loss for these habitats is as a result of the felling required for the bat mitigation buffer zones. These habitats will be felled and will remain treeless for the lifetime of the wind farm, but they will form other semi-natural habitats as natural vegetation colonises these areas.

It is worth noting that the iterative process of layout design has resulted in a layout that is avoiding the most sensitive receptors on-site, namely the Lowland River (FW2), the Cushina River, and the numerous Badger setts identified on-site. It is also worth noting that most of the felling for the bat buffer zones will be within Conifer Plantation (WD4) habitat, which is a highly modified habitat of recent origin and with limited biodiversity value, managed primarily for the production of timber. Felling of this woodland is part of the commercial forestry life-cycle and will happen at some point in the future regardless of the Proposed Development. The proposed felling in the WD4 and WN7 habitat will be subject to a separate felling licence which will be applied for.

It is considered that the overall habitat loss on KER habitats will constitute a long-term adverse, likely slight effect.

The Proposed Development is likely to result in other direct effects (not including habitat loss) on some KER habitats and species. These are assessed below.

9.13.1.1.4 Depositing/Lowland River (FW2) (Cushina, Philipstown and Barrow Rivers)

Direct effects on this habitat will be largely avoided due to the avoidance of construction activities within 50m of the habitat. However, there will be three water crossings over this habitat in three separate rivers:

- Crossing of the Philipstown River by a new section of the proposed TDR. A clear-span bridge will be used for this crossing.
- Crossing of the Cushina River by a proposed new internal access track within the Proposed Wind Farm Site. A clear-span bridge will be used for this crossing.
- Crossing of the River Barrow by the grid connection cable at Baylough Bridge. This crossing will use HDD technology.

At each of these locations there is a risk of sediment, diesel and other pollutants from entering the watercourses.

In the absence of mitigation it is concluded that the construction phase will result in short-term adverse, likely significant effects on water quality within this KER habitat (FW2) and aquatic species within.

9.13.1.1.5 Drainage Ditches (FW4)

Similarly, during the construction phase, there will be numerous crossings of drains using culverts. Machinery will be working very close to this habitat and there are risks associated with this. It is possible that sediment, diesel and other pollutants could enter the drainage ditches and impact upon sensitive aquatic receptors downstream.

In the absence of mitigation, it is concluded that the construction phase will result in short-term adverse, likely significant effects on water quality within this KER habitat (FW4).

9.13.1.1.6 Raised Bog (PB4)

Direct effects on this sensitive but degraded habitat have largely been avoided by avoiding placing any infrastructure on the habitat. In general, the closest infrastructure (access track) will be >70m away. The closest infrastructure will be approx. 17m away at the western end of this habitat. ***No direct, significant effects are likely to occur to Raised Bog.***

9.13.1.1.7 Wet Pedunculate Oak-Ash Woodland (WN4)

There are no expected direct effects on this habitat as it lies outside of the proposed construction footprint. ***No direct, significant effects are likely to occur to Wet Pedunculate Oak-Ash Woodland.***

9.13.1.1.8 Bog Woodland (WN7)

There will be some felling of this habitat (as assessed above). Other direct impacts include disturbance and increased edge effect of the remaining habitat. ***In the absence of mitigation, it is concluded that the construction phase will result in long-term adverse, likely slight effects on Bog Woodland (WN7).***

9.13.1.1.9 Hedgerows (WL1) and Treelines (WL2)

Habitat loss is assessed above. Other likely direct effects will be disturbance and fragmentation.

Disturbance effects are likely to be insignificant and short-term.

Fragmentation will be a long-term adverse, likely moderate effect.

9.13.1.1.10 Eurasian Badger

Direct impacts on Badger are not likely as a results of the set-back of all active and inactive badger setts identified onsite. These set-back distances are in line with current guidelines (NRA, undated) and have been set so as to avoid disturbance and damage to setts. There is no requirement for a derogation licence for this species based on the current baseline and proposed site layout.

There will be some loss of suitable habitat, which will reduce the availability and connectivity of remaining habitat for badger.

In the absence of mitigation, it is concluded that habitat loss from the construction phase will result in long-term adverse, likely slight effects on Badger.

Artificial light and noise can cause displacement of Badgers if their setts, commuting routes or foraging areas are impacted. The impacts from noise and artificial lighting during the construction phase will be restricted to working hours (07:00 – 19:00 Mon-Fri and 8:00-14:00 Sat). This means that for most of the year, the construction hours will predominantly avoid the dark and hence the need for artificial lighting will be minimal. In winter, it is expected that there will be artificial lighting used from approx.. 07:00-09:900 and 16:30-19:00. As Badgers are largely nocturnal and the 50m set-back ensures avoidance of disturbance to setts, it is expected that the effects from noise and lights will be restricted to foraging and commuting routes and will be minimal during the spring, summer and autumn and slightly higher in the winter months.

In the absence of mitigation, it is concluded that disturbance from the construction phase will result in long-term adverse, likely slight effects on Badger.

9.13.1.1.11 European Otter

No evidence of Otter breeding (holts) or resting (couches) sites was found within the proposed Wind Farm Site or within the vicinity of the proposed new TDR crossing of the Philipstown River. One observation of signs of Otters (spraint and prints) was observed approx. 230m from the construction footprint at the Proposed Wind Farm Site. No signs were observed on the Philipstown River in the vicinity of the proposed crossing.

There is no requirement for a derogation licence for this species based on the current baseline and proposed site layout.

In the absence of mitigation, it is concluded that disturbance from the construction phase (including habitat loss, noise and artificial light) will result in long-term localised, adverse, imperceptible effects on Otter.

9.13.1.1.12 Bats

Bats were found to use the site for foraging and commuting. No bat roosts were identified within 200m of any of turbine. The loss of woodland and hedgerows/treelines will represent a loss and fragmentation of foraging and commuting habitat.

Bat activity within the vicinity of T02 in the Conifer Plantation (WD4) was found to be low overall for all species for each bat activity season – spring, summer and autumn. One species, Common Pipistrelle, showed moderate levels of activity at this location in spring. Some spikes of high levels of activity for Leisler's Bat, Common and Soprano Pipistrelle bats were recorded in the vicinity of T01 and T05 in particular. The field boundaries in the vicinity of T03, T04, T05, T07 and T06 are well developed and are representative of high potential foraging habitat for bats.

In the absence of mitigation, it is concluded that habitat loss from the construction phase will result in a localised, long-term adverse, likely moderate effects on Bats.

Direct effects on bats are also likely from the increase in vehicular activity and associated lighting and lighting associated with the temporary compounds and substation. Artificial light can reduce the success of bats' foraging and can increase their chances of being preyed upon (Bat Conservation Ireland, 2010). However, lighting during the Construction Phase will be limited to working hours (07:00 – 19:00 Mon-Fri and 8:00-14:00 Sat). Hence, for the active bat seasons (spring, summer and autumn), artificial lighting will not be needed for the majority of the time, except for early spring and late autumn when the working hours overlap with darkness and there may be some bat activity.

In the absence of mitigation, it is concluded that lighting during the construction phase will result in a localised, short-term adverse, likely slight effect on Bats.

9.13.1.1.13 Giant Hogweed

Giant Hogweed is not located within the footprint of the construction and is 230m away from the nearest location of works associated with the Proposed Development (felling for bat buffer zone nr T6). There are no likely interactions with or effects on or from this species and the Proposed Development.

In the absence of mitigation, it is concluded that direct impacts (which could cause an increase in spread of this invasive species) from the construction phase will result in a neutral effect on Giant Hogweed.

9.13.1.1.14 Invasive Plant Species

As with any construction project, the movement of vehicles to and from the Site increases the risk of spreading invasive plant species into and from the Site through the potential for plant fragments or seeds to be transported in soil caught on the wheels or other parts of vehicles and through the movement of uncertified soil and /or fill material that can contain fragments or seeds of invasive species. Invasive species have been recorded along the TDR route in close proximity to some of the TDR accommodation works (Nodes 35/36, 38 and 46/47). One invasive species was recorded within the footprint of works at the Proposed Development Site (within the bat buffer zone of T04).

In the absence of mitigation, it is concluded that direct impacts (which could cause an increase in spread of this invasive species) from the construction phase will result in a short-term adverse, likely significant effect on Invasive Species.

9.13.1.1.15 Common Whorl Snail (*Vertigo (Vertigo) pygmaea*) and *Desmoulin's Whorl Snail (Vertigo (Vertigo) moulinsiana)*

It is not considered that suitable habitat for these species lies within the Proposed Wind Farm Site. However, both species have been recorded in the past at Bergin's Bridge just outside Portarlington (in 1971 and 1990's). Bergin's Bridge is within the footprint of the GCR so direct effects are possible. Although direct effects are largely minimised through the implementation of HDD to cross this watercourse, if not properly managed there remains a risk of pollution from accidental release of pollutants (HDD drilling fluids, cement material and hydrocarbons).

In the absence of mitigation, it is concluded that direct impacts from the construction phase (specifically from the HDD at Bergin's Bridge) will result in a short-term local adverse, likely significant effect on Vertigo moulinsiana* and *V. pygmaea.

9.13.1.1.16 Large Red Tailed Bumble Bee (*Bombus (Melanobombus) lapidarius*), *Halictus (Seladonia) tumulorum*, Gooden's Nomad Bee (*Nomada goodeniana*), *Wall (Lasiommata megera)*

These threatened species may be present in suitable habitat within the Site. Habitat loss suitable habitats (flower-rich grasslands, raised bog, cutover bog, non-intensively managed farmland, hedgerow/treelines and their margins) will reduce available habitat (loss of approximately 12ha). However, the creation of the bat buffer zones is likely to result in the creation of some suitable habitat (approx. 4.5ha) and for these bees and a further approximately 84ha of potentially suitable habitat will remain within the Site (93% of suitable habitat in the Proposed Wind Farm Site will remain).

In the absence of mitigation, it is concluded that habitat loss from the construction phase will result in a local adverse, long-term, imperceptible effect on threatened terrestrial invertebrate KER species.

9.13.1.2 Indirect Effects

Indirect effects from the construction phase will include disturbance to habitats and species. Such disturbances could include noise, air pollution, lighting and presence/movement of humans and traffic.

9.13.1.2.1 Air Pollution

Pollution from emissions can impact on sensitive habitats and species, particularly habitats naturally low in nutrients such as Raised Bogs (PB1) and species sensitive to enrichment such as Sphagnum mosses. It is generally recognised that annual deposition of less than 5kg N/ha/yr is within the favourable range for raised bogs for this pollutant (Bobbink and Hettelingh, 2011). In Ireland, the pressure from nitrogen deposition on raised bog habitats is largely from agriculture and quarries (NPWS, 2016). Air pollution can also have adverse effects on other semi-natural habitats including the woodland and aquatic KER habitats identified at the Proposed Development Site. Construction vehicles and machinery have the potential to increase concentrations of compounds such as NO_2 and Benzene in the receiving environment and as a result, during the construction phase, all of the KER habitats are likely to experience short-term, intermittent exposure to these emissions. The rural setting of the Proposed Development — characterised by open space and low background pollution — will facilitate rapid dispersion of pollutants. ***As a result, any air quality effects on KER habitats and species are expected to be short-term local adverse, and likely not significant.***

It is predicted that construction works have are likely to also cause a decrease in water quality in drainage ditches and the Cushina River as a result of increased sediment and pollutants entering watercourses on-site. This will result in a likely, negative effect on aquatic species such as lampreys, salmonids and Otter.

9.13.1.2.2 Natural Heritage Areas or Proposed Natural Heritage Areas

The Grand Canal was identified as being indirectly linked to the Proposed Development as it is possible that the Otter population within the pNHA also use watercourses within and/or adjacent and downstream of the Site. However, as no likely significant effects have been identified on the Otter, it is concluded that there will be ***no likely significant effects*** on the Grand Canal pNHA.

A summary of the various effects described here are summarised below in Table 9-21.

Table 9-21: Summary of likely effects during the construction phase of the Proposed Development as discussed in Section 9.13.1.

CONSTRUCTION PHASE			
KER	**Summary of Effect**	**Un-mitigated Effect**	**Mitigation necessary**
River Barrow and River Nore SAC [002162]	Linked hydrologically approximately 6rkm downstream and lies within the footprint of the GCR.	Has been assessed in the NIS submitted with the planning application.	Assessed in the NIS
Grand Canal pNHA [002104]	No direct effects likely. Indirect effects assessed as effects on Otter as this species is the only identified pathway for effects on this pNHA. Due to low use of Site by Otter and no expected significant disturbance or habitat loss effects on Otter, this means there is a corresponding effect on the pNHA expected.	***Long-term localised adverse, likely imperceptible effect.***	No
Depositing/Lowland Rivers (FW2) and aquatic species.	Effects on this habitat will have corresponding likely effects on the aquatic species that depend on it. During the construction phase, there will be risks for water quality to be degraded from the risk of sediment, diesel and other pollutants entering the watercourses: Cushina River, Philipstown River and the River Barrow. Indirect air pollution effects were assessed to not to be significant.	***Short-term adverse, likely significant effects.*** ***Indirect effects short-term local adverse, likely not significant.***	Yes
Drainage Ditches (FW4)	It is possible that sediment, diesel and other pollutants could enter the drainage ditches and impact upon sensitive aquatic receptors downstream. Indirect air pollution effects were assessed to not to be significant.	***Short-term adverse, likely significant effects.*** ***Indirect effects short-term local adverse, likely not significant.***	Yes

CONSTRUCTION PHASE			
KER	**Summary of Effect**	**Un-mitigated Effect**	**Mitigation necessary**
Raised Bog (PB1)	Infrastructure largely avoids this habitat. No direct habitat loss. Indirect air pollution effects were assessed to not to be significant.	***No direct likely significant effects.*** ***Indirect effects short-term local adverse, likely not significant.***	No
Wet Pedunculate Oak-Ash Woodland (WN4)	No direct effects expected as it lies outside of the construction and felling footprints. Indirect air pollution effects were assessed to not to be significant.	***No direct likely significant effects.*** ***Indirect effects short-term local adverse, likely not significant.***	No
Bog Woodland (WN7)	Direct effects from felling – loss of habitat and increase in edge effect. Indirect air pollution effects were assessed to not to be significant.	Direct effects are expected to result in a ***long-term adverse, likely slight effect.*** ***Indirect effects short-term local adverse, likely not significant.***	No
Hedgerows (WL1) **Treelines (WL2)**	Direct habitat loss (approx. 887m WL1 and 524m WL2). Disturbance and habitat fragmentation will occur. Indirect air pollution effects were assessed to not to be significant.	Habitat loss is expected to result in a ***long-term adverse, likely slight effect.*** Direct disturbance will result in ***short-term adverse, likely insignificant effects*** Habitat fragmentation will result in ***long-term adverse, likely moderate effects.*** ***Indirect effects short-term local adverse, likely not significant.***	No

CONSTRUCTION PHASE			
KER	**Summary of Effect**	**Un-mitigated Effect**	**Mitigation necessary**
Eurasian Badger (*Meles meles*)	Loss and fragmentation of habitat through the loss of WL1, WL2, WN7 will result in direct effects. Also disturbance from noise and lighting. Indirect air pollution effects were assessed to not to be significant.	Habitat loss, fragmentation and disturbance will have ***long-term adverse, likely slight effects.*** ***Indirect effects short-term local adverse, likely not significant.***	No
European Otter (*Lutra lutra*)	There are no likely effects from habitat loss due to set back distances and clear-span bridges at watercourse crossings. Low level of activity within Site. Disturbance effects (from habitat loss, noise and artificial lighting) were assessed. Indirect air pollution effects were assessed to not to be significant.	Habitat loss, noise and artificial lighting will result in ***a long-term localised adverse, likely imperceptible effect.*** ***Indirect effects short-term local adverse, likely not significant.***	No
Bats	Direct effects are habitat loss and fragmentation of foraging and commuting habitat. No roosts were identified within 200m of any turbine. Disturbance from artificial lighting. Will largely avoid bats due to working hours being predominantly during daylight hours during active bat season. Indirect air pollution effects were assessed to not to be significant.	Habitat loss will result in ***long-term localised adverse, likely moderate effects*** Artificial lighting will result in ***localised, short-term adverse, likely slight effects*** ***Indirect effects short-term local adverse, likely not significant.***	No
Giant Hogweed (*Heracleum mantegazzianum*)	Not in the construction footprint of the Proposed Development. Nearest works (felling) 230m away.	Construction phase will have ***neutral effect.***	No

CONSTRUCTION PHASE			
KER	**Summary of Effect**	**Un-mitigated Effect**	**Mitigation necessary**
Invasive species (general)	Low Impact invasive species (Snowberry) within felling zone for bat buffer of T04. Also common along the GCR and adjacent to one TDR accommodation works node. Risk of spread through movement of construction vehicles between construction sites and movement of uncertified soil and fill.	Construction phase will have ***short-term adverse, likely significant effect*.**	Yes
Desmoulin's Whorl Snail *(Vertigo (moulinsiana)* Common Whorl Snail *(Vertigo pygmaea)*	Risk of accidental release of pollutants at HDD site if not properly managed. Indirect air pollution effects were assessed to not to be significant.	Construction works will have ***short-term local adverse, likely significant effects.*** ***Indirect effects short-term local adverse, likely not significant.***	Yes
Large Red Tailed Bumble Bee (*Bombus (Melanobombus) lapidarius*), *Halictus (Seladonia) tumulorum*, Gooden's Nomad Bee (*Nomada goodeniana*), *Wall (Lasiommata megera)*	Loss of habitats was assessed as being low (7% of suitable habitat). Indirect air pollution effects were assessed to not to be significant.	Loss of habitgat will have a ***local adverse, long-term, imperceptible effect*** ***Indirect effects short-term local adverse, likely not significant.***	No

Mitigation measures have been assessed to be necessary for all aquatic KER habitats and species and for invasive species.

9.13.2 Operational Phase Effects

This section assesses the likely significant effects associated with the operational phase of the Proposed Development. During the operational phase, there will be no ground-disturbing works, no natural drainage features will be altered and there will be no direct or indirect discharges to natural watercourses.

The operation of the wind turbines will be monitored remotely, and an operative working from a remote headquarters will oversee the day to day running of the proposed wind farm.

The turbine manufacturer or a service company will carry out regular maintenance of the turbines. Scheduled services will typically occur twice a year. Wind farms are designed to operate largely unattended and during the operational phase the wind farm will normally be unmanned. Each turbine will have its own in-built supervision and control system that will be capable of starting the turbine, monitoring its operation and shutting down the turbine in the case of fault conditions.

Visits will be necessary to carry out routine inspection and preventive maintenance. A light vehicle will be required for routine access, occurring about once weekly, and in the event of any unscheduled fault conditions. In the unlikely event of a major component failure, a mobile crane will be required on site.

Lights will be installed on the turbines in accordance with the Irish Aviation Authority (IAA) requirements for aviation visibility purposes.

The implementation of the Biodiversity Enhancement and Management Plan will be ongoing during the Operational Phase. This is presented in Appendix 2.2, Volume 3 and will result in beneficial effects on local biodiversity.

9.13.2.1 Increase in Impermeable Surfaces

There will be an increased cover of impermeable surfaces during the Operational phase compared to the baseline, which could lead to increased run-off which could alter surface water flow. However, this has been assessed in detail in the Hydrology chapter and assessed to result in **a *direct, long-term and not significant effect*** on surface water flow and flood extents. This corresponds to ***direct, long-term and not significant effect*** on Lowland River (FW2), Drainage Ditches (FW4) and all aquatic species.

9.13.2.2 Collision

The risk of collision with turbine blades is a potential risk for bats. No other KER is considered at risk of collision. The Proposed Wind Farm Site has been identified as a site of low risk to bats, based on the size of the proposed wind farm and the habitats occurring within and adjacent to it.

The results of the bat monitoring on site and subsequent analysis using Kepel (2011) indicate that activity by Leisler's bat, Common pipistrelle, Soprano pipistrelle, Myotis species and Brown Long-eared bat within and adjacent to the proposed wind farm site is overall Low throughout the site and throughout the bat activity season.

Myotis species and Brown Long-eared bats are considered to be at low risk of collision with operating turbines (NatureScot, 2021) and given the low levels of activity recorded for these species during monitoring the proposed wind farm is predicted to present a low risk of collision to these species.

However, pre-mitigation, the site risk (which includes collision risk) for Leisler's Bat, Common and Soprano pipistrelle bats, was estimated to be high at certain times around turbines T05, T06 and T07. The authors consider this to result in a ***long-term adverse, likely moderate effect.***

9.13.2.3 External Lighting

The presence of lights on the turbines for aviation safety is considered to present a low risk of effects on bats. Some research indicates that there is no effect from the lights on turbines on bats (Bennett and Hale, 2014).

However, the presence of artificial lighting during the hours of darkness can have a detrimental effect on roosting, foraging and commuting bats (Bat Conservation Trust, 2023). Similarly for Badgers and Otters, if their commuting or foraging areas are lit, this will have an adverse effect.

The proposed Wind Farm will have external security lighting and illumination to provide adequate light for personnel to move safely around the site. Such lighting will be restricted to the external areas around the substation and access gates. Under normal operating conditions, these external lights will be switched off during the hours of darkness, to avoid creating any unnecessary glare in the night sky. The exception would be for emergency repairs to outdoor equipment, where high-level illumination would be switched on. The use of motion sensor technology is likely to be implemented to control lighting at access doors, security gates etc.

This means that the effect of artificial lighting will be minimal during the operational phase of the Proposed Development.

Due to the limited need lighting during the operational phase (it will largely be operated remotely) it is expected that disturbance from lights will result in an ***adverse intermittent, likely imperceptible-slight effect on Bats, Badgers & Otters.***

The remaining KERs are not expected to experience likely significant effects during the Operational phase.

No mitigation has been assessed as being necessary for the operational phase. However, it is desirable for bats as the collision risk is assessed as being of moderate significance.

Table 9-22: Summary of the likely operational effects on KERs

OPERATIONAL PHASE			
KER	**Summary of Effect**	**Un-mitigated Effect**	**Mitigation necessary**
River Barrow and River Nore SAC [002162]	Assessed in NIS	Assessed in NIS	Assessed in the NIS
Grand Canal pNHA [002104]	No direct effects likely. Indirect effects assessed as effects on Otter as this species is the only identified pathway for effects on this pNHA. Due to low use of Site by Otter and limited sources of disturbance during the operational phase, significant disturbance effects on Otter are unlikely, this means there is a corresponding effect on the pNHA expected.	***Intermittent adverse, likely imperceptible-slight effect***	No
Depositing/Lowland Rivers (FW2) and aquatic species.	None foreseen. No ground-disturbing works, no alteration to natural drainage features and no direct discharges to natural watercourses. Slight increase in run-off due to increased impermeable area	***Direct, long-term and not significant effect***	No
Drainage Ditches (FW4)	None foreseen. No ground-disturbing works. Slight increase in run-off due to increased impermeable area	***Direct, long-term and not significant effect***	No
Raised Bog (PB1)	No effects foreseen during operational phase.	***No likely significant effects.***	No
Wet Pedunculate Oak-Ash Woodland (WN4)	No effects foreseen during operational phase.	***No likely significant effects.***	No
Bog Woodland (WN7)	No effects foreseen during operational phase.	***No likely significant effects.***	No
Hedgerows (WL1) **Treelines (WL2)**	No effects foreseen during operational phase.	***No likely significant effects.***	No

OPERATIONAL PHASE			
KER	**Summary of Effect**	**Un-mitigated Effect**	**Mitigation necessary**
Eurasian Badger (*Meles meles*)	Operational effects from artificial lighting.	***Adverse intermittent, likely imperceptible-slight effect***	No
European Otter (*Lutra lutra*)	Operational effects from artificial lighting.	***Adverse intermittent, likely imperceptible-slight effect***	No
Bats	Operational effects from artificial lighting.	***Adverse intermittent, likely imperceptible-slight effect***	No
Giant Hogweed (*Heracleum mantegazzianum*)	No effects foreseen during operational phase.	***No likely significant effects.***	No
Invasive species (general)	No effects foreseen during operational phase.	***No likely significant effects.***	No
Desmoulin's Whorl Snail *(Vertigo (moulinsiana)* **Common Whorl Snail *(Vertigo pygmaea)***	No effects foreseen during operational phase.	***No likely significant effects.***	no
Large Red Tailed Bumble Bee (*Bombus (Melanobombus) lapidarius*), ***Halictus (Seladonia) tumulorum*,** **Gooden's Nomad Bee (*Nomada goodeniana*),** ***Wall (Lasiommata megera)***	No effects foreseen during operational phase..	***No likely significant effects.***	No

9.14 Mitigation Measures

9.14.1 Mitigation By Avoidance

A process of 'mitigation by avoidance', as informed by constraints assessment and consultation, was undertaken by the EIA team during the design of the wind farm layout and selection of grid connection (refer to Volume 2, Chapter 3 - Site Selection and Alternatives for further detail) with the objective of avoiding / minimising the likely significant effects on biodiversity. The Site layout has been designed such that it is has avoided impacting upon the identified sensitive ecological features onsite, such as Badger setts, woodland, peatland and aquatic habitats.

The following is a summary of the measures which have been incorporated into the project design to eliminate risk of significant effects on the aquatic ecology of downstream of the proposed development.

- All infrastructure has been located outside of the setback zones applied by the Proposed Development: a minimum 50m setback zone from all mapped surface waters and a minimum 10m setback from non-mapped streams and drainage features (except for water crossing points and HDD points).
- Vegetation clearance to take place only outside of the bird breeding season (March-August) where possible.
- Felling operations to avoid combined Pine Marten and Red Squirrel breeding period (January – April) where possible.
- A Construction Environmental Management Plan (CEMP) has been prepared by the contractor and will be implemented.
- A Surface Water Management Plan (SWMP) for the construction, operation and decommissioning of the Proposed Development (Appendix 12.2) has been developed and will be implemented.
- The following mitigation measures will be applied to protect water quality:
    - Settlement ponds will collect surface water runoff from the footprint of the Proposed Development (during construction, operation and decommissioning).
    - Settlement ponds will not discharge directly to any drain or watercourse, rather they will allow for dispersal via diffuse overland flow and percolation within the catchment;
    - Surface water runoff upgradient of the Proposed Development will be collected via interceptor drains and this 'clean' water will be redistributed downstream of the Proposed Development via diffuse outfalls to vegetated areas or into the existing network serving the catchment;
    - Swales and silt traps will be used to intercept surface water runoff and prevent the ingress of silt and suspended solids;
    - Foul flows from welfare units, will be retained in holding tanks and removed from site by a licenced contractor to a facility licenced to accept such waste material.
    - The following measures will be implemented for the storage and use of hydrocarbons on site:
        - Diesel tanks, used to store fuel for the various items of machinery, will be self-contained and double-walled.
        - Refuelling will be carried out from these tanks or from delivery vehicles and will not be left unattended.
        - There will be no refuelling within 50m of the watercourse. Onsite re-fuelling of machinery will be carried out a minimum of 50 m from watercourses using a mobile double skinned fuel bowser.
        - Fuels, lubricants and hydraulic fluids for equipment used on the construction site will be carefully handled to avoid spillage, properly secured against unauthorised access or vandalism, and provided with spill containment according to best codes of practice - (Enterprise Ireland BPGCS005).

  - Drip trays and spill kits will be kept available on site, to ensure that any spills from vehicles are contained and removed off site.
  - A fuel spill emergency response team will be set up on site before commencement of construction on-site.
  - Any spillage of fuels, lubricants or hydraulic oils will be immediately contained and the contaminated soil removed from the site as per the emergency response procedure outlined in the SWMP (Appendix 12.2 Volume III) and properly disposed of.
  - Waste oils and hydraulic fluids will be collected in leak-proof containers and removed from the site for disposal or re-cycling.
- All relevant personnel will be fully trained in the use of spill kits and hydrocarbon absorbent packs. Guidelines such as "*Control of Water Pollution from Construction Sites, Guidance for Consultants and Contractors*" (CIRIA 532, 2001) will be referred to.
- Settlement ponds will provide containment capacity in In the event of a spill or leak within the drained area and the outflow can be closed off by a penstock device or similar to contain any potential pollutants within the settlement ponds. In the event of contaminated runoff being contained in a settlement pond, the incident will be reported in accordance with the CEMP (Appendix 2.1 Volume III), samples taken of the contaminated liquid for classification, as required, and the liquid pumped out of the pond using a suitable vacuum truck and disposed of at a licensed waste facility off-site.
- Works will be carried out in accordance with standard best international practice and will be in accordance with the latest guidance (e.g. *Environmental good practice on site guide (fifth edition) C811 2023*).
- All construction related activity will be confined to the footprint of the proposed development.
- Material stockpiles will be covered with plastic sheeting to protect from washout during periods of rain.
- A Peat and Spoil Management Plan (Appendix 11.3) will be implemented throughout the construction, operation and decommissioning of the Proposed Development.
- Use of weather forecasting to plan dry days for concrete pouring.
- The cable trenches will be excavated in dry weather where possible and infilled and revegetated if required to prevent soil erosion or generation of silt pollution of nearby surface water.
- Works will occur adjacent to the Cushina River and Philipstown River at the two new watercourse crossings. These will be clear-span structures to avoid in-stream works. The proposed crossing designs have been designed in line with Inland Fisheries Ireland (IFI) requirements for salmonid watercourses as included in their 2016 *'Guidelines on Protection of Fisheries During Construction Works in and Adjacent to Waters'* and NRA (now TII) 2008 *'Guidelines for the Crossing of Watercourses During the Construction of Road Schemes'*.
- The excavations will be set back 2.5m from the riverbanks. There will be no works conducted closer than this to the banks
- Should soil / material be required to be taken off site, it will be disposed of by contractors licensed under the Waste Management Act of 1996 (as amended 2001), the Waste Management (Facility Permit & Registration) Regulations of 2007 and the Waste Management (Collection Permit) Regulations of 2016 as amended *OR* notified to the EPA and treated as a byproduct.
- The key features of the surface water drainage scheme which was largely informed by SuDS include; rainwater harvesting, filter drains and swales.
- Concrete trucks will not be washed out on Site. Where chutes, hoppers/skips and equipment (e.g. vibrating wands) associated with concrete works need to be washed down this will be done into a sealed mortar bin / skip with the appropriate capacity and which has been examined in advance for any defects.
- The location of wash down areas will be set back as far as practically possible from any drain or watercourse, and at a minimum of 50m distance.

9.14.1.1 Best Practices

Best practice construction methods will be used to avoid potential for effects on water quality and hydrology following the documents and guidelines listed below:

- Water Run-Off from Construction Sites - SEPA - (WAT-SG-75)
- The SUDS Manual - CIRIA C753.
- Site Handbook for the Construction of SUDS - CIRIA C698 ISBN 0 86017 698 3.
- Works and maintenance in or near water - PPG5 - (October 2007)
- Environmental good practice on site guide (fourth edition) (C741)
- Guidance for Pollution Prevention, dealing with spills: GPP 22-(October 2018)
- Temporary Construction Methods - SEPA -(WAT-SG-29)
- Guidelines on protection of Fisheries During Construction Works in and Adjacent to Waters - Inland Fisheries Ireland - (IFI 2016)
- Guidelines for the Crossing of Watercourses During the Construction of National Road Schemes - TII Publications (2008)

9.14.1.2 Monitoring

A comprehensive suite of monitoring has been developed as part of the embedded mitigation of the Proposed Development. Such monitoring will ensure that any unexpected effects are picked up quickly and corrective action is taken.

- The EnCoW / ECoW will continually monitor the pH of any watercourse during concrete works in or adjacent to a watercourse or drain. Should any change in pH +/-0.5 be detected, concrete works will immediately be ceased. Steps will then be taken to identify the entry point to the drain or watercourse and appropriate measures will be implemented to prevent further escape to the environment. The ECoW will choose the most appropriate measure with regard to CIRIA C532 (*Control of Water Pollution from Construction Sites: Guidance for consultants and Contractors*).
    - Monthly water quality grab samples will be taken from the Cushina River and Philipstown River at locations approximately 10m downstream of the proposed watercourse crossings. Water quality sampling will be undertaken in accordance with BS EN ISO 5667 - Water Quality Sampling. The samples will be checked in situ for:
        - pH;
        - Temperature;
        - Turbidity;
        - Conductivity; and
        - Dissolved Oxygen

using a fully calibrated portable pH/temperature/conductivity meter (with pH resolution of 0.01 pH), turbidity probe and a flow impellor.

The samples will then be submitted to an appropriately certified laboratory (ILAB or similar) in accordance with the laboratory custody protocol for assessment of the following parameters:

- Biological Oxygen Demand;
- Chemical Oxygen Demand;
- Total Hardness;
- Total Suspended Solids;
- Total Dissolved Solids;

- Nitrate;
- Nitrite;
- Ammoniacal Nitrogen;
- Molybdate Reactive Phosphorus;
- Total Coliforms; and
- Faecal Coliforms (E.coli).

A record of monthly meteorological conditions (as a minimum precipitation and temperature) will be maintained. Biological water quality assessment using the EPA Q-value methodology will be carried out once prior to the commencement of construction and on a six-month basis during the monitoring period.

If any of the monitoring results show deviation beyond the 95%ile in comparison to baseline data, the ECoW/EnCoW will take action to determine the source of the changes (e.g. take samples upstream of the Proposed Development). If the source determined to be from within the Site, the EnCoW/EcoW will ensure that emergency control measures (set out in the Surface Water Management Plan and CEMP) are put in place to return the levels to the baseline.

During the construction and commissioning phase, daily inspection of environmental protection measures e.g. silt traps, check dams, ponds and outfalls and drainage channels will be carried out and any improvement works deemed necessary will be carried out promptly. If deemed necessary, works will cease until the improvement works are complete.

9.14.2 Mitigation Measures for the Construction Stage

Mitigation measures has been assessed as being necessary for all aquatic habitats and species and invasive species (general).

9.14.2.1 General

- In order to ensure air pollution and noise pollution are minimised, all machinery will be switched of when stationary - no idling of machinery.
- Machinery will only be operational between the hours as set out in Chapter 2, Volume 3.
- Exhaust emissions from vehicles operating within the site, including trucks, excavators, diesel generators or other plant equipment, will be minimised through regular servicing of machinery.
- The access and egress of construction vehicles will be controlled to designated locations, along defined routes, with all vehicles required to comply with onsite speed limits, which shall be reduced in periods of dry, windy weather.
- Wheel washing facilities will be provided at the two main entrance/exit points of the Proposed Development site.

These mitigation measures are incorporated into the CEMP which is presented in Appendix 2.1, Volume 3.

9.14.2.2 Lowland/depositing Rivers (FW2): Water Quality

The Proposed Development will increase the impermeable area within the Site, however as per Chapter 12 (Hydrology), this is not expected to result in a significant effect. None-the-less, mitigation measures to address surface water runoff and drainage are proposed for this project as set out in Chapter 12, in the Surface Water Management Plan (SWMP), and in the planning drawings which are primarily for the purposes of maintaining water quality but provide attenuation of flows in addition. These mitigation measures will also help ensure that no significant effects will occur on sensitive local and downstream habitats and aquatic species. A summary is presented here but for further details refer to mitigation outlined in Chapter 12, the Construction and Environmental Management Plan (CEMP) and the SWMP.

The SWMP for the construction, operation and decommissioning stages of the Proposed Development is presented as Appendix 12.2 Volume III of this EIAR). The proposed drainage design will:

- Collect surface water runoff upgradient of the Proposed Development via interceptor drains and will redistribute this 'clean' collected runoff downgradient of the Proposed Development by means of cross drains which will release via diffuse outfalls to vegetated areas (within the same catchment) or will divert the runoff back into the existing network serving the catchment. This drainage design maintains the hydrological regime at the Site.

- Collect surface water runoff from the footprint of the Proposed Development (during construction, operation and decommissioning) and discharge diffusely to adjacent vegetated areas via settlement ponds, such that a deterioration in water quality does not occur.

The cable trenches will be excavated in dry weather where possible and infilled and revegetated if required to prevent soil erosion or generation of silt pollution of nearby surface water.

Swales and drainage channels will discharge runoff from access roads and areas of hardstanding to settlement ponds. These will be suitably sized to accommodate flows from storm events up to and including the 1 in 100-year storm event.

Settlement ponds will not discharge directly to any drain or watercourse. Rather, flows from the ponds will be dispersed diffusely over land to allow natural overland flow and percolation within the catchment.

Control of Accidental Spills and Leaks

The SWMP outlines mitigation measures to control for accidental spills and leaks. These mitigation measures will help ensure no significant effects on local water quality and aquatic habitats and species.

<u>Accidental spillage from leaking or damaged fuel lines</u>

Emergency spill kits with oil boom and absorbent materials will be kept on-site in the event of an accidental spill. Spill kits will be kept in construction compound, the 4x4 vehicle transporting the fuel bowser and smaller spill control kits will be kept in all construction machinery. All construction personnel will be notified of where the spill kits are located as part of the site induction and will be trained on the site procedures for dealing with spills.

In the event of a leak or a spill in the field, the spill kits will be used to contain and absorb the pollutant and prevent any further potential contamination. The absorbed pollutants and contaminated materials will be placed into leak proof containers and transferred to a suitable waste container for hazardous materials in the construction compound. Where a leak has occurred from machinery, the equipment will not be permitted to be used further until the issue has been resolved.

The SHEQ Officer (or equivalent appointed person) will be notified of any spills on-site and will determine the requirement to notify the authorities.

Accidental break out of silt from settlement ponds

The settlement ponds will be equipped with a spillway to control overflow scenarios related to the not manageable storm events (more extreme than the design return period provided for the settlement ponds). To ensure to avoid erosion due to the overflow, scour protection (riprap or equivalent) will be provided along and the outfall location of the spillway.

The drainage engineer shall be contacted if there is an accidental spillage or break out of silt on the Site.

Control of Concrete

Only ready-mixed concrete will be used during the construction phase, delivered from local batching plants in sealed concrete delivery trucks. This approach eliminates potential environmental risks associated with onsite batching.

Placing of concrete in or near watercourses will be carried out only under the supervision of the Ecological Clerk of Works (ECoW).

The EnCoW / ECoW will continually monitor the pH of any watercourse during concrete works in or adjacent to a watercourse or drain. Should any change in pH +/-0.5 be detected, concrete works will immediately be ceased. Steps will then be taken to identify the entry point to the drain or watercourse, and appropriate measures will be implemented to prevent further escape to the environment. The ECoW should consult CIRIA C532 to consider the most appropriate measure.

Concrete trucks will not be washed out on site. Washing of equipment associated with concrete works (e.g. chutes, hoppers, skips, and vibrating wands) will take place only in designated sealed mortar bins or skips, which will be pre-inspected for defects. These wash-down areas will be set back as far from drains or watercourses as practically possible, at a minimum of 50 m.

Concrete washing will be contained and managed appropriately. Regular inspections of wash-down areas and associated mortar bins will be undertaken, with adequate records maintained. Waste concrete slurry, washings, and supernatant will be allowed to settle and dry, and will then be disposed of at a licensed waste facility.

Concrete, cement, grout, or similar materials will not be hosed into surface water drains under any circumstances. Any concrete spills shall be contained immediately, and runoff prevented from entering nearby watercourse

Control of Sediment Runoff

The drainage and surface water management systems proposed for the Site as set out in the SWMP and the 1:500-Series planning application drawings will be installed concurrent with the main construction activities in order to control increased runoff and associated suspended solids loads.

Waters arising from dewatering during excavation works will be diverted into the surface water management system such that it is captured in settlement ponds and discharged diffusely over land. Where sediment loading from dewatering works is high, the flow will first pass through settlement tank(s) e.g. Silt Buster or similar. For smaller areas of dewatering, it may be sufficient to dewater onto adjacent lands within the Planning Boundary via filter bags, filter mats or natural vegetation. This will be determined by the EnCoW / ECoW. Water quality in the nearby downstream drains and watercourses will be monitored in real time for turbidity. Where turbidity equals or exceeds 28 Nephelometric Turbidity Units (NTU) the works will be stopped and an investigation into cause carried out and measures taken as appropriate.

A Peat and Spoil Management Plan will be implemented throughout the construction, operation and decommissioning of the Proposed Development and is presented as Appendix 11.3 Volume III of the EIAR.

Earthworks will be scheduled during dry weather conditions where feasible to reduce the elevated risk of runoff and will avoid any foreseen intense rainfall event (>3mm/hour) and will not proceed during any yellow (or worse) rainfall warning issued by Met Éireann.

Works in or Adjacent to Waters

In-stream works will be required at new culvert crossings. All works within and adjacent to watercourses will be carried out in accordance with Inland Fisheries Ireland Biosecurity Protocols: https://www.fisheriesireland.ie/Biosecurity/biosecurity.html and will be monitored by the ECoW / EnCoW. There will be no instream works in natural watercourses. A Surface Water Management plan has been prepared which can be found in Appendix 12.2 Volume III of the EIAR It contains methodology for drainage, water quality management and silt control. The measures contained within the plan will be applied by the Contractor.

Works will occur adjacent to the Cushina River and Philipstown River at the two new watercourse crossings. These will be clear-span structures to avoid in-stream works. The proposed crossing designs have been designed in line with Inland Fisheries Ireland (IFI) requirements for salmonid watercourses as included in their 2016 *'Guidelines on Protection of Fisheries During Construction Works in and Adjacent to Waters'* and NRA (now TII) 2008 *'Guidelines for the Crossing of Watercourses During the Construction of Road Schemes'*. Details of proposed crossing structures are presented in 0500-Series planning application drawings. Drainage design and watercourse crossing details can be found on the 100 series and 500 series planning drawings.

The excavations will be set back 2.5m from the riverbanks. There will be no works conducted closer than this to the banks. Ducts for the later pulling of power and communication cables for the wind farm will be pre-cast into the bridge deck sections. Construction of the water crossings will be scheduled to align with fisheries seasonal restrictions and will not be undertaken during a period of flooding. All drainage measures, including check-dams and /or silt traps, along the proposed access track will be installed in advance of the works along with the first layer of access track construction.

At drain crossings, bottomless culverts and piped culverts will be used. The culverts will be installed on-line (i.e. within the existing channel) and the works will be carried out under dry conditions in accordance with IFI (2016) 'Guidelines on protection of fisheries during construction works in and adjacent to waters'. Where water is diverted through the use of flumes or by over-pumping, the water will be discharged back to the same watercourse at a downstream location to maintain continuity and avoid flooding and water quality effects to adjacent drains.

Horizontal Directional Drilling

In-stream works will be avoided in natural watercourses through the use of HDD under the bed of the watercourse (and/or through the construction of clear-span bridges). HDD will be carried out under the River Barrow at Baylough Bridge to accommodate the crossing of the grid cable. A set back of a minimum of 50m from the River Barrow to the launch and receiving pits for the HDD will be strictly adhered to and has been inbuilt into the design. HDD will be employed along the GCR in accordance with the following methodology:

- A specialist contractor will be appointed to prepare Method Statements of works.
- Fuels, lubricants and hydraulic fluids for equipment use on Site will be carefully handled to avoid spillage, properly secured and provided with spill containment kits in case of incident.

- The depth of the bore should be at least 3m below the level of the stream bed so as not to conflict with the watercourse;
- Fluid return lines used in HDD process will be tested for leaks prior to use to check their reliability;
- Inert, biodegradable drilling fluid will be used;
- All practices involving bentonite will be monitored closely, that is: pumping pressure, drilling mud formulation i.e., drilling fluid volume and the volume of mud returns.
- A comprehensive monitoring system will be established to closely oversee any procedures involving bentonite, encompassing the careful observation of pumping pressure, the precise formulation of drilling mud (including drilling fluid volume), and the accurate measurement of mud returns.

The methods outlined here and in Chapter 12 (Hydrology), Volume 2 of this EIAR, will ensure very low risk to water quality from the HDD.

River Habitat Enhancement

A number of habitat enhancement measures will be undertaken as part of the Biodiversity Enhancement and Management Plan (BEMP) which will have a positive impact on the FW2 habitat. The entire length of 2.4km of riparian zone and riverbank of the Cushina River as it flows through the Site will be protected as part of the BEMP. This will involve ensuring stock-proof fencing is in place along both banks of the river and that no stock can access the river. New fencing will be installed at least 2m back from the top of the river bank for 1.4km, which will create a narrow riparian zone where native vegetation will grow, stabilise the river bank and provide a buffer for the river habitat. For the last 1km in the east of the Site, the fencing will be approximately 30m back from the top of the riverbank. This is to allow for the natural succession of the existing scrub/woodland habitat to continue to native woodland development. This will create an area of approximately 2.7ha of native habitat in the riparian zone of the river which will also contribute to the protection and enhancement of water quality in the Cushina River.

The final measure which will contribute to habitat enhancement within the Cushina is the creation of in-ditch wetlands within the main drains flowing into the Cushina from the north. Some of these drains were noted to have a heavy peat sediment load and the creation of the in-ditch wetlands will allow for sediment deposition to occur before the water reaches the Cushina. These wetlands will also increase the aquatic biodiversity within the Site. Regular maintenance will be required to remove sediment as it builds up within the wetlands. For further details please refer to the BEMP presented in Appendix 2.2. in Volume 3 of this EIAR.

9.14.2.3 Hedgerows and Treelines (WL1 and WL2)

In general, the development has been designed avoid these habitats. The habitat loss of these is expected to be 887m and 524m respectively and is assessed to be not significant. Where possible, hedgerows which are within the footprint of the Proposed Development will be translocated. Where this is not possible, new hedgerows and treelines with native species of native provenance will be planted on non-peat soils in the east of the Site as part of the BEMP. This planting will result in a total of 950m of hedgerow and 550m of treelines, where possible reconnecting the hedgerows and treelines which have been fragmented.

9.14.2.4 Invasive Species Plan

Invasive species are recognised as one of the major threats to native biodiversity and can cause significant economic as well as ecological impacts (Invasives.ie). In Ireland, it is an offence to cause the spread or propagation of species that are listed on the Third Schedule of S.I. No. 477/2011 European Communities (Birds and Natural Habitats) Regulations 2011 to 2021. They can cause damage to the environment and, for some species, to human health.

To manage invasive species, an approach of containment, eradication and prevention of spread will be applied. An Invasive Species Plan has been prepared which is outlined below.

General procedures to prevent spread of invasive species into the Site are as follows:

- Prior to being transported to the Site, validation will be provided by all suppliers that construction plant, machinery and vehicles are free from invasive species. Certification will be obtained from suppliers for all raw materials imported to Site including soil, fill, sand, gravel and landscaping materials that they are free from invasive species.
- All equipment and footwear arriving at the Site will have been thoroughly cleaned to prevent transferring invasive seeds or plant fragments. This means that all vehicles, machinery and tools/equipment will arrive on-site clean and steam-washed. Visual inspections will take place. All Personal Protective Equipment (PPE) brought to site is to be clean and dry without any vegetation or debris attached.
- Toolbox talks will be delivered to site workers to inform them of the biosecurity protocol, of the invasive species present on-site, what to look out for and what procedure to follow if they observe an invasive species.
- Toolbox talks will be delivered to all workers on the TDR accommodation works areas and the GCR to inform them of the importance of avoiding spread of invasive species and what protocol to follow at specific sites.
- Toolbox talks will highlight the potential damage and mechanisms of spread of these species. They will also highlight the risks to human health these species pose. For instance, the berries of Snowberry plants are poisonous to humans and the sap from Giant Hogweed can cause severe blistering on skin once exposed to sunlight.
- Any invasive species identified on the Site will need to be cordoned off to prevent workers and vehicles from entering the contaminated area and increasing the risk of spread.
- Where any eradication or control works of non-native invasive species takes place, all vehicles, equipment/tools, footwear etc. used in the contaminated areas will be thoroughly cleaned in a designated, contained area once leaving the contaminated area in order to prevent spread of these species.

Giant Hogweed (*Heracleum mantegazzianum*)

A Third Schedule, High Impact non-native invasive species, Giant Hogweed (*Heracleum mantegazzianum*) is highly invasive and presents a real threat to human health. Giant Hogweed can form dense stands that outcompetes native floral biodiversity. The sap of this plant contains a chemical that can lead to severe blistering of the skin. Giant Hogweed is present in a hedgerow in the south-west of the Proposed Development Site. As construction work is not planned for this area (the nearest construction works will be 226m to the east near T06), it is not necessary to ensure eradication before the construction phase. No significant likely effects habe been identified. However, the proponent of the wind-farm has agreed with the landowner to remove this invasive species as a positive action for the environment. A detailed Invasive Species Management Plan will be developed in conjunction with the Project Ecologist, in order to detail how to eradicate this species. The implementation of this measure will prevent the future spread of this invasive species from the Site and improve the habitat condition of the hedgerow in which it currently occurs. The following points will be adhered to.

- It is advisable to implement this measure at the earliest opportunity in order to reduce the risk of this species increasing from its current level. The smaller the infestation, the easier it will be to control and eradicate.
- A qualified ecologist will be employed to develop an Invasive Species Management Plan
- This will include plans for eradicating Giant Hogweed from the site
- A pre-construction survey will be conducted to ascertain if the occurrence of this species has changed since the baseline or indeed if any other third schedule, non-native species have become established within the Site.
- A detailed method statement will be produced and this will be followed.
- Methodology will follow best practice guidelines.
- Contaminated areas will be marked out clearly. These areas will include a 4m buffer around the plants to account for seeds in the soil.
- All construction personnel will be made aware of the contaminated area and will avoid it.
- Vehicles with caterpillar tracks will not work within contaminated area.
- Methods for eradication may be mechanical, chemical or a combination of both. Because of the relatively small size of the infestation it is advised that mechanical methods are used.
- Mechanical methods will involve the following procedure:
    - The operator will wear full protective clothing to prevent skin contamination by the sap of the plant.
    - Infestation will be controlled by digging out the whole plant as cutting through the stem must be done below ground level to ensure damage to the rootstock and to prevent regrowth from the base.
    - For safety, this is best done while the plant leaves are still quite small.
    - The taproot will be cut approximately 15cm below ground level using a spade or other implement with a large, sharp edge.
    - When cutting the root, it is necessary to separate the thick stem base bearing old leaf scars from the root below.
    - The cut part of the plants should be removed from the soil and left out to dry or bagged and disposed of through an appropriately licenced haulier to a licensed landfill.
    - Tools and PPE must be cleaned thoroughly before exiting the contaminated area.
- Giant Hogweed seeds can remain viable in the soil for several years.
- As the infestation is quite small, if chemical methods are also being used, the herbicide will be applied manually as a spot treatment to individual plants.
- Follow-up work will be necessary to ensure regrowth and seedings are also controlled. This is likely to be necessary for about 7 years.

Cherry Laurel (*Prunus laurocerasus*) – Risk of High Impact
Sycamore (*Acer pseudoplatanus*) – Risk of Medium Impact
Snowberry (*Symphoricarpos albus*) and Ground Elder (*Aegopodium podagraria*) – Risk of Low Impact

These non-native invasive species are not a Third Schedule species. As such, there is no legal obligation to eradicate this species from within the Site. However, in the interest of avoiding negative effects on the environment by increasing the spread of these invasives, mitigation for the prevention of spread of these species will be undertaken.

Snowberry has been recorded within the Site, within the bat buffer zone (an area which will be felled of all trees) of T04.

Snowberry, Ground Elder, Sycamore and Cherry Laurel have been found along the GCR route. In general, the footprint of the GCR will not include the road verge habitats where these species occur. If for some reason, the GCR works will need to leave the existing road corridor and move to the road verge, these locations will be surveyed by an ecologist to confirm if the presence/absence of non-native invasive species has changed from the baseline.

Snowberry and Sycamore have been recorded within and immediately adjacent to one of the TDR accommodation works areas (TDR node 35/36).

Where present within the footprint of the Proposed Development, the soil and vegetation cuttings containing, or likely to contain, any parts of these plants including seeds or root fragments, will present a risk of spread. In such situations where works (including felling) will be occurring within or adjacent to known infestations of non-native invasive species (such as at T04), the contaminated areas will be cordoned off. Mechanical removal will be undertaken by a licenced invasive species contractor and no other persons or machinery will be permitted within the cordoned off area. Machinery and footwear used in the vicinity of the infested areas will be thoroughly cleaned and all washings contained. Washings will be disposed of appropriately (as described below). Unwanted material originating from the site (including soil, rhizomes, plant fragments and washings) will immediately be transported off site by an appropriately licensed waste contractor and disposed of properly at a suitably licenced facility, in accordance with the (NRA, 2010) guidelines, i.e., where cut, pulled or mown non-native invasive plant material arises, its disposal will not lead to a risk of further spread of the plants.

Care will be taken near watercourses as water is a fast medium for the dispersal of plant fragments and seeds. All disposals will be carried out in accordance with the Waste Management Acts.

All management and control measures implemented on-site will be carried out in accordance with best practice guidance as set out in '*The Management of Invasive Alien Plant Species on National Roads (GE-ENV-01104)'* TII (2020), '*The Management of Noxious Weeds and Non-native Invasive Species on National Roads*' NRA (now TII) (2010) and '*Best Practice Management Guidelines Rhododendron Rhododendron ponticum and Cherry Laurel Prunus laurocerasus'* Maguire, *et al*., (2008).

Once eradication treatments are completed, monitoring will be undertaken approximately 6-8 weeks after treatment to determine the success of the measures.

Annual monitoring of non-native invasive species at the site of eradication near T04 will continue annually and follow-up treatment will be undertaken on any regrowth. Once no regrowth occurs, monitoring can be reduced to every 3-5 years.

Species that were treated along the public roads of the GCR and TDR will be surveyed in the year following treatment for comparison from the baseline. Their status at this point will be reported to the relevant County Council as these are the local authority with responsibility for the management of roadside verges.

9.14.2.5 Bats

While no likely significant effects are expected, it is desirable to reduce the expected adverse, likely moderate effects from habitat loss. The BEMP translocation and/or planting of native hedgerows and treelines will serve to do this. Planting will only be on non-peat soils (so as not to contribute to further CO_2 emissions from drained peat soils) and

9.14.2.6 Pre-Construction Surveys

No likely significant effects from disturbance on any of the KER fauna has been identified. Hence, based on the baseline, there is no requirement for any derogation licence for the Proposed Development. However, taking the precautionary approach and in recognition of the time that can elapse from the time of the baseline surveys and the beginning of the construction phase, a number of pre-construction surveys will be carried out. These pre-construction surveys will be carried out by competent and experienced ecologists in order to identify if there are any changes from the baseline and, if so, whether these changes will result in likely significant effects on any KER. The following is a list of pre-construction surveys that will be undertaken (for information on preconstruction bird and hydrological surveys, please refer to Chapters 10 and 12 in Volume II of this EIAR.

9.14.2.6.1 Otter Survey

A pre-construction survey will be undertaken for Otter on watercourses within 250m of any works associated with the Proposed Development including along the TDR and GCR, to confirm the pre-application survey findings. As per NatureScot (2024b) guidelines, this survey will be undertaken no more than 3 months before the start of the works associated with the Proposed Development. If any active holts or shelters are located, exclusion zones of a 200m radius around these features will be marked where works cannot take place as per NatureScot (2024c) guidance. The exclusion zones could potentially be reduced if, based on the judgement from an experienced ecologist and based on the nature of the works, topography and natural screening, it is determined there is sufficient screening available (NatureScot, 2024c). In no circumstances will a holt or resting place be removed or destroyed. For holts and shelters where otters are not breeding, the exclusion zone will be 30m. If, for any reason, the exclusion zone cannot be implemented, a derogation licence will be sought from the NPWS.

9.14.2.6.2 Badger Survey

As per NRA (undated) guidelines, a pre-construction survey will be undertaken for Badgers within suitable habitat within a minimum of 50m of any works associated with the Proposed Development including along the TDR and GCR, to confirm the pre-application survey findings. As per NatureScot (2024b) guidelines, this survey will be undertaken no more than 3 months before the start of the works associated with the Proposed Development. If any active setts are located, exclusion zones of 50m around these features will be marked where works cannot take place as per NRA (undated) guidance. If for any reason, these exclusion zones are not possible, the Project Ecologist will, in consultation with NPWS, design a badger exclusion in accordance with NRA (undated) guidelines. This will involve the exclusion of badgers from any currently active sett within 30m of construction works. Exclusion of badgers from an active sett should only be carried out during the period from July to November to avoid the Badger breeding season. The objective is to allow the badgers to remain within their territory. If the sett marked for exclusion is inactive at the time, then exclusion may occur at any time of year. Exclusion of a sett, if necessary, will be undertaken by a competent ecologist, experienced in Badger survey and exclusion and will only be conducted under licence from the NPWS.

9.14.2.6.3 Bat Roost Survey

Based on the baseline, there is no expected disturbance to bat roosts. It is not expected that a derogation licence will be required. However, as a precautionary measure, pre-construction / pre-felling surveys will be undertaken to determine if the baseline has changed. As there is a restricted survey period for bat roost surveys, pre-construction surveys for bats should be completed as close to the start of works as possible, and always within the most recent survey period (NatureScot 2024b). For bat roosts surveys, this period is May-September for most roosts and winter, when looking for hibernation roosts. Hence, there will be pre-construction surveys conducted for both the summer and winter seasons preceding the start of works at the Proposed Development Site. The ECoW will be required to inspect any vegetation with potential to support preferred bat roost features prior to removal. This is required to ensure that changes to vegetation (e.g. newly cracked limbs, crevices etc. formed on mature trees to be cleared) will be inspected and appraised for the presence of roosting bats prior to removal. In the event that bat roosts, established in the intervening period between the completion of baseline surveys and the completion of construction phase inspections, are identified all further vegetation clearance will be completed in accordance with legislative and best practice requirements pertaining to bat roosts.

9.14.2.6.4 Pine Marten and Red Squirrel

Pre-construction and pre-felling surveys (of hedgerows or trees outside of the forestry) will be conducted for these species within suitable habitats to determine if more than two years elapses between the pre-application surveys and the commencement of construction works. These surveys will follow best practice guidelines (NatureScot, 2024d; NatureScot, 2024e). If the pre-construction surveys determine that there is a change from the baseline and Pine Marten or Red Squirrel are present, appropriate mitigation will be applied.

Surveys required for pre-felling of forestry will be dealt with as part of the felling licence.

9.14.3 Proposed Mitigation Measures for Operation and Maintenance Stage

9.14.3.1 Lowland/Depositing Rivers (FW2)

Interceptor drains installed upslope of access tracks and areas of hardstanding will divert surface water runoff from undeveloped land around the constructed areas to disperse naturally within open ground without mixing with the construction drainage.

The proposed swales will intercept surface water runoff from access tracks and areas of hardstanding. The grass within the swales will provide some filtration to remove a portion of silt and suspended solids. Silt traps will be provided upstream of outfalls from roadside swales.

The settlement ponds will be designed to provide sufficient retention time and a low velocity environment to allow suspended solids of a very small particle size to fall out of suspension prior to discharge. Additional treatment will be provided upstream of the settlement pond with the use of drainage stone at the inlet to provide filtration. In an emergency, the outfall from a settlement pond will be blocked to provide a temporary holding area for accidental spillages on site.

As stated in the SWMP, to adhere to CIRIA C753, part of the maintenance routine that will mitigate issues relating to surface water will be the inspection of the following: drains, check-dams, cross-drains and culverts for blockages; outfalls to existing field drains and watercourses, existing roadside swales for obstructions; progress of re-vegetation.

9.14.3.2 Bats

Bat Habitat Buffer Zones

While no likely significant effects are expected from the Proposed Development, it is desirable to reduce the long-term adverse, likely moderate effect expected from collisions. The creation of Bat Habitat Buffer Zones is essentially the creation of zones around the turbines which are kept free of suitable bat habitat by felling and maintain as a treeless habitat. See Appendix 9-1 for details on how the appropriate area of bat buffer zones was calculated. The bat buffer zones for the Proposed Development will be 95m around all turbines. This will involve the felling of bog woodland, conifer plantation, treelines and hedgerows. This will serve to reduce the likelihood of bats coming into the collision risk zone as they will not be attracted in by suitable habitat.

Blade Feathering

There is evidence that bat casualties at wind farms is reduced by pitching the blades out of the wind ("feathering") to reduce rotation speeds below 2 rpm while idling. Arnett *et al.* have reported this reduction to be in the order of 50% when compared with normal idling. In view of this, all turbine blades will be required to be feathered during idling.

Adaptive Mitigation

Adaptive mitigation will be implemented during the operation phase to ensure that operating turbines present a low risk of collision to bat species. This is a way of using monitoring and a flexible approach to ensure that mitigation is working and, if it's not, to implement suitable further mitigation which is evidence-based. In this case, the monitoring will be in the form of further bat survey and carcass searches in order to ascertain if the bat habitat buffer mitigation strategy is working effectively to avoid bat collisions.

This will involve post-construction monitoring at turbine locations to establish bat activity levels during the post construction phase. Monitoring will be completed in accordance with Section 8 of the NatureScot 2021 guidelines "Bats and Onshore Wind Turbines: Survey, Assessment and Mitigation". The activity monitoring will be completed at all turbine locations throughout the site with particular focus (i.e. extended periods of monitoring) given to areas of the site where high levels of bat activity have been recorded during baseline monitoring.

The monitoring will involve static detector monitoring at each of the turbine locations as well as overlapping weather monitoring for wind speed, rainfall and temperature. The monitoring will commence during year 1 of the operation phase of the project. In addition to the monitoring carcass searches will be completed at each turbine location. These searches will be completed in line with SNH guidelines and will require searcher efficiency trials. Casualty rates will be estimated in accordance with the methods outlined by SNH (2019).

Following the completion of Year 1 monitoring the requirement for turbine curtailment to minimise/avoid impacts to bat species will be identified. In the event that curtailment is required the curtailment scheme will be informed by the results of the Year 1 monitoring. This will facilitate targeting of curtailment to the turbines and times of years where bat fatalities were identified during the monitoring.

Where the need for curtailment has been identified, a curtailment regime will be developed and presented as a part of the annual reporting. The proposed operating regime will specify, and be designed around the values for the key weather parameters and other factors that are known to influence collision risk which may include any or all of the following:

- Wind speed in m/s (measured at nacelle height),
- Time after sunset,
- Month of the year,

- Temperature (ºC), and
- Precipitation (mm/hr)

Where any curtailment strategy has been utilised it will be reviewed on an annual basis to review the level of success of same, and amended as appropriate for the following season in order to increase the efficiency with respect to both preventing bat casualties and minimising turbine downtime.

The monitoring will continue for at least the first 3 years of the operation phase so that a clear understanding of the patterns of bat activity and the turbines and times of years that pose a risk to bats are identified.

Detailed curtailment schemes can be designed based on the finding of the operation phase monitoring and the above listed parameters and can be programmed into wind turbine SCADA operating systems to only pause/feather the rotating blades in certain wind speeds, wind directions, in a certain temperature range all within specified time periods (e.g. dawn and dusk) (i.e. the SCADA can be used to temporarily curtail turbines in certain conditions when risks to bats are high). Thus, the periods of high bat activity can be identified in relation to key weather parameters and wind turbine SCADA can be programmed to appropriately curtail the operation of specific turbines in these periods.

The effectiveness of any curtailment scheme needs to be monitored in order to determine (a) whether it is working effectively (i.e. the level of bat mortality is considered to be incidental), and (b) whether the curtailment regime can be refined such that turbine down-time can be minimised whilst ensuring that it remains effective at preventing casualties.

The implementation of the monitoring regime and the measures to avoid significant risks to bats by regulating turbine operations where fatality risks are identified will ensure that the potential for the operation phase of the wind farm to impact local bat populations will be mitigated to an insignificant level.

9.14.3.3 Lighting

Although not strictly necessary as a mitigation strategy as no likely significant effects from lighting were identified. However, it is desirable to reduce artificial lighting as much as possible. As a result, the applicant commits to the use of lights during construction, operation, and decommissioning (such that they are necessary) in line with the following guidance in the Dark Sky Ireland Lighting Recommendations:

- Every light needs to be justifiable,
- Limit the use of light to when it is needed,
- Direct the light to where it is needed,
- Reduce the light intensity to the minimum needed,
- Use light spectra adapted to the environment,
- When using white light, use sources with a “warm” colour temperature (less than 3000K).

Where external lighting is required, lighting will be oriented away from mature trees and treelines located along the site perimeter. Lighting selected will use shields to ensure light is focused only on necessary areas and to eliminate upward light spill and to significantly reduce horizontal dispersion. Lighting shall be designed in accordance with the Institute of Lighting Professionals Guidance Note 08/23 Bats and artificial lighting at night.

9.14.3.4 Invasive Species

Invasive species within the Wind Farm Site that have been treated in order to eradicate (as per Section 9.14.2.3) will be monitored annually as outlined and eradication treatment will be undertaken annually until the plants are fully eradicated.

9.14.4 Proposed Mitigation Measure for Decommissioning Stage

The access tracks will remain in situ for land management purposes, after the end of the operational period. Additionally, the turbine foundations and hardstanding will remain in situ and be covered over with soil from the site to re-vegetate naturally. This inherently mitigates disturbance through decommissioning process. Silt protection procedures, similar to during construction will be re-instated for decommissioning. If there is perceived to be risk of erosion during inspection of the revegetated hardstanding then erosion control measures will be taken.

A Decommissioning Plan will be agreed with the relevant authority at the time of decommissioning, with updated methodologies that may exist at that time. This approach aligns with SNH guidance, *Research and Guidance on Restoration and Decommissioning of Onshore Wind Farms* (SNH, 2013)

There is no additional habitat loss with Decommissioning of the Proposed Development, therefore there will be no significant effects in this regard.

The proposed wind turbines are expected to have a lifespan of approximately 30-35 years. Following the end of their useful life, the equipment may be replaced with a new technology, subject to planning permission being obtained, or the Wind Farm may be decommissioned fully.

Turbine foundations would remain underground and covered with earth and allowed to revegetate. Wind farm underground electrical cable connecting the turbines to the substation will be removed. The cable ducting will be left in-situ avoiding unnecessary excavation and soil disturbance.

The 110kv substation and compound and grid connection to Bracklone will remain in place as it will be part of the National grid infrastructure and under the control and ownership of ESBN/Eirgrid.

The effects on biodiversity will also be similar in nature to those experienced during construction but on a far lesser scale and magnitude. There will be no additional or ancillary effects associated with the decommissioning phase.

The same mitigation to prevent significant effects on water quality and associated aquatic fauna and other terrestrial fauna during construction will be applicable and implemented during the decommissioning phase.

It can be concluded that following the implementation of preventative mitigation, there is no potential for the decommissioning of the Proposed Development to result in likely significant effects on biodiversity.

9.14.5 Additional BEMP Measures

While the BEMP measures are not necessary to mitigate any significant effects, they serve to enhance to environment and contribute to an overall positive effect on biodiversity.

- Hedgerow translocation and Hedgerow / Treeline planting – this will serve to replace lost foraging and commuting habitat for bats, badgers and other wildlife. Where possible, these will be placed in order to maintain ecological connectivity and continuity. No hedgerows/treelines will be planted on peat soils. Only native species suited to the local conditions will be planted. 950m of hedgerow and 550m of treeline will be translocated and/or planted.
- Protection and enhancement of 2.6ha of bog woodland (WN7) habitat. This will allow recovery and enhancement of this habitat as stock will be excluded.

9.14.6 Monitoring

An Environmental / Ecological Clerk of Works (EnCoW / ECoW) will be appointed by the Developer with responsibility for monitoring at the Site during the construction phase of the Development. The Clerk of Works will have the authority to temporarily stop works to prevent negative effects on biodiversity or to ensure corrective action is taken to mitigate adverse effects. In addition, there will be post-construction monitoring of a number of KER features. Post-construction monitoring is an important measure of the detectable impacts of wind turbines and is fully endorsed and encouraged by Bat Conservation Ireland (Bat Conservation Ireland, 2012). The monitoring outlined in the BEMP will be carried out by, or under supervision of, the EcOW or Project Ecologist. Monitoring will be carried out as outlined here, in Chapter 10 (Ornithology), Chapter 12 (Hydrology) and in the BEMP. Monitoring in relation to identified KERs is outlined here. Post-construction monitoring for birds is outlined in Chapter 10.

9.14.6.1 Lowland / Depositing River

The EnCoW / ECoW will continually monitor the pH of any watercourse during concrete works in or adjacent to a watercourse or drain. Should any change in pH +/-0.5 be detected, concrete works will immediately be ceased. Steps will then be taken to identify the entry point to the drain or watercourse, and appropriate measures will be implemented to prevent further escape to the environment. The ECoW should consult CIRIA C532 to consider the most appropriate measure.

An Environmental / Ecological Clerk of Works (EnCoW / ECoW) will be appointed by the Developer with responsibility for monitoring at the Site during the construction phase of the Development. The Clerk of Works will have the authority to temporarily stop works to prevent negative effects on hydrology or to ensure corrective action is taken to mitigate adverse effects.

A Surface Water Quality Monitoring Programme will be established which will commence 12 months prior to construction in order to confirm the baseline physio-chemical conditions and hydromorphological conditions of the watercourses within the Site and will continue throughout construction and for three months post-commissioning phase of the Proposed Development.

Monthly water quality grab samples will be taken from the Cushina River and Philipstown River at locations approximately 10m downstream of the proposed watercourse crossings. Water quality sampling will be undertaken in accordance with BS EN ISO 5667 - Water Quality Sampling. The samples will be checked in situ for:

- pH;
- Temperature;
- Turbidity;
- Conductivity; and
- Dissolved Oxygen.

using a fully calibrated portable pH/temperature/conductivity meter (with pH resolution of 0.01 pH), turbidity probe and a flow impellor.

The samples will then be submitted to an appropriately certified laboratory (ILAB or similar) in accordance with the laboratory custody protocol for assessment of the following parameters:

i. Biological Oxygen Demand;
ii. Chemical Oxygen Demand;
iii. Total Hardness;
iv. Total Suspended Solids;
v. Total Dissolved Solids;
vi. Nitrate;
vii. Nitrite;
viii. Ammoniacal Nitrogen;
ix. Molybdate Reactive Phosphorus;
x. Total Coliforms; and
xi. Faecal Coliforms (E.coli).

A record of monthly meteorological conditions (as a minimum precipitation and temperature) will be maintained. Biological water quality assessment using the EPA Q-value methodology will be carried out once prior to the commencement of construction and on a six-month basis during the monitoring period.

The hydromorphological baseline at the proposed watercourse crossings within the Site will be reconfirmed pre-construction using the River Hydromorphology Assessment Technique (RHAT). Annual RHAT assessments will be carried out which will be compared against the baseline. The Design and Construction of the bridge crossing and culverts will minimise upstream afflux, avoid turbulence and minimise loss of the natural channel bed due to the culvert or structure in order to ensure that hydromorphology is not affected. The Design will ensure that the baseline river Hydromorphological Condition Score derived from the initial RHAT assessment is not altered such that it would impact the derived WFD hydromorphology classification.

The Contractor will ensure that the daily visual monitoring of the surface water network for visible signs of construction impact is carried out on a daily basis for example, riparian vegetation loss, evidence of oil/fuel slick, sediment plumes, fish kill.

During the construction and commissioning phase, water quality monitoring results will be recorded and compared against baseline data and where there is a deviation beyond the 95%ile, the Contractor will investigate and as necessary sample further upstream and determine if elevated concentrations are coming from the Site, in which case the Contractor will ensure that emergency control measures (set out in the Surface Water Management Plan and CEMP) are put in place to return the levels to the baseline. Similarly, the Contractor will compare results of water quality monitoring with the 95%ile High Status Environmental Quality Standards arising from the European Union Environmental Objectives (Surface Waters) Regulations 2009 as amended. Any deviation beyond these standards will be investigated and the findings will be report to the Community Water Officer, South East Region.

During the construction and commissioning phase, daily inspection of environmental protection measures e.g. silt traps, check dams, ponds and outfalls and drainage channels will be carried out and any improvement works deemed necessary will be carried out promptly. If deemed necessary, works will cease until the improvement works are complete.

9.14.6.2 Otter

Post-construction monitoring for Otter is not necessary based on the current baseline and the lack of likely disturbance effects. It is not anticipated that a derogation licence will be needed. However, taking a precautionary approach, pre-construction surveys will be undertaken to re-confirm the baseline. If there is a change to the baseline and active Otter holts and shelters are within the Site and specifically within 250m of the footprint of the Proposed Development (including crossings of Philipstown River, Cushina River and River Barrow), then post-construction monitoring may be necessary. The pre-construction monitoring for Otter will be conducted by an experienced and competent ecologist and the design of post-construction monitoring, if necessary, will be based on their expert judgement.

9.14.6.3 Badger

Post-construction monitoring for Badger is not necessary based on the current baseline. However, if pre-construction monitoring detects a change in baseline such that there are active setts within 50m of the construction footprint (in breeding season) or within 30m of the construction footprint (outside of breeding season) then post-construction monitoring will be necessary to monitor the effects of the mitigation employed. This will involve monitoring the status of any active setts within the construction footprint post mitigation (if necessary) and post-construction.

9.14.6.4 Bats

Post-construction monitoring surveys will be carried out in order to assess the effectiveness of the mitigation measures for bats – the implementation of bat buffer zones through removing suitable vegetation within 95m of all turbines. Post-construction surveys will take place on the first, second, third, tenth and fifteenth year of the operational phase.

Whilst the overall activity levels of all bat species across the wind farm site were predominantly low, instances of high levels of activity for high collision risk species, namely Leisler's bat, Soprano pipistrelle and Common pipistrelle were recorded at T5 during spring; T6 during spring and autumn; and T7 during spring. These three species are considered to be of medium population vulnerability to collision with turbines. The implementation of the bat buffers as mitigation is expected to reduce the collision risk to bats.

Given the high levels of activity recorded at this time for these high collision risk species an adaptive mitigation and monitoring strategy will be implemented for the operational phase of the wind farm. Such a strategy aims to minimise and/or avoid fatalities caused by operating turbines by adjusting turbine operations in response to real-time conditions, if fatalities are occurring. The conditions for which real-time adjustments to operation can be made comprise a combination of bat activity and weather particularly wind speed and temperature.

This will involve post-construction monitoring at turbine locations to establish bat activity levels during the post construction phase. The activity monitoring will be completed at all turbine locations throughout the site with particular focus (i.e. extended periods of monitoring) given to areas of the site where high levels of bat activity have been recorded during baseline monitoring.

The monitoring will involve static detector monitoring at each of the turbine locations as well as overlapping weather monitoring for wind speed, rainfall and temperature. The monitoring will commence during year 1 of the operation phase of the project. In addition to the monitoring carcass searches will be completed at each turbine location. These searches will be completed in line with SNH guidelines and will require searcher efficiency trials. Casualty rates will be estimated in accordance with the methods outlined by SNH (2019).

Following the completion of Year 1 monitoring the requirement for turbine curtailment to minimise/avoid impacts to bat species will be identified. In the event that curtailment is required the curtailment scheme will be informed by the results of the Year 1 monitoring. This will facilitate targeting of curtailment to the turbines and times of years where bat fatalities were identified during the monitoring.

In accordance with NIEA (2021) guidance, carcass searches shall be carried out concurrently with bat activity monitoring using static detectors to provide a comparison between bat activity levels, weather conditions and actual mortality.

While no likely significant effects are expected post-mitigation for bats, this monitoring will allow for certainty and the implementation of suitable additional mitigation if necessary. This additional mitigation will be Curtailment.

Curtailment

Curtailment involves raising the cut-in speed with associated loss of power generation in combination with reducing the blade rotation below the cut-in speed, as above. It should be considered where feathering below cut-in normal speed (above) will not provide sufficient reduction in risk to bats. The curtailment is achieved by feathering (not the actual braking of the turbine) so that the blades continue to rotate slowly (at ~2 rpm or less).

Where the need for curtailment has been identified, a curtailment regime will be developed and presented as a part of the annual reporting. The proposed operating regime will specify, and be designed around the values for the key weather parameters and other factors that are known to influence collision risk which may include any or all of the following:

- Wind speed in m/s (measured at nacelle height),
- Time after sunset,
- Month of the year,
- Temperature (ºC), and
- Precipitation (mm/hr)

If a curtailment strategy is deemed necessary and is implemented, it will be reviewed on an annual basis to review the level of success of same, and amended as appropriate for the following season in order to increase the efficiency with respect to both preventing bat casualties and minimising turbine downtime.

The monitoring will continue for at least the first 3 years of the operation phase so that a clear understanding of the patterns of bat activity and the turbines and times of years that pose a risk to bats are identified.

Detailed curtailment schemes can be designed based on the finding of the operation phase monitoring and the above listed parameters and can be programmed into wind turbine SCADA operating systems to only pause/feather the rotating blades in certain wind speeds, wind directions, in a certain temperature range all within specified time periods (e.g. dawn and dusk) (i.e. the SCADA can be used to temporarily curtail turbines in certain conditions when risks to bats are high). Thus, the periods of high bat activity can be identified in relation to key weather parameters and wind turbine SCADA can be programmed to appropriately curtail the operation of specific turbines in these periods.

The effectiveness of any curtailment scheme needs to be monitored in order to determine (a) whether it is working effectively (i.e. the level of bat mortality is considered to be incidental), and (b) whether the curtailment regime can be refined such that turbine down-time can be minimised whilst ensuring that it remains effective at preventing casualties.

The implementation of the monitoring regime and the measures to avoid significant risks to bats by regulating turbine operations where fatality risks are identified will ensure that the operational phase of the wind farm will not cause likely significant effects on the local bat populations.

9.14.6.5 Invasive Species

Invasive species monitoring will be undertaken annually for the first 10 years after eradication and full follow-up treatment/control work will be undertaken if invasive species are still present. Once there has been full eradication of Giant Hogweed from the Site and Snowberry from the construction footprint as outlined in the BEMP, then monitoring can be reduced to every 3-5 years. Eradication and monitoring details are detailed in Section 9.14.3.4 above and in the BEMP.

9.15 Risk of Major Accidents and Disasters

This section assesses the likely significant adverse effects of the proposed project on biodiversity deriving from its vulnerability to Major Accidents and/or Natural Disasters, as well as the potential of the proposed project itself to cause potential Major Accidents and/or Natural Disasters during the construction, operation and decommissioning phases which can result in likely significant effects on biodiversity.

9.15.1 Potential Vulnerability to Risks

The Proposed Development is vulnerable to flooding as part of the Site is within the flood plain of the Cushina River. A Site-Specific Flood Risk Assessment (SSFRA) has been prepared for the Proposed Development and is presented as Appendix 12.1, Volume 3. The SSFRA investigated the local hydrological conditions relevant to the proposed wind farm and the TDR watercourse crossing. The study indicates that the proposed development, including a section of the TDR, is susceptible to fluvial flooding during 1-in-100-year (Flood Zone A) flood events, as identified in Stage 1 – Flood Risk Identification and further analysed in Stage 2 – Initial Flood Risk Assessment. It was also established that the site is affected by pluvial flooding, as evidenced by historical records.

A Stage 3 Detailed Flood Risk Assessment was undertaken to establish design flood levels and assess any likely impacts that the proposed bridge structures—for both the wind farm and the TDR watercourse crossing—may have on existing flood conditions. Hydraulic modelling concluded that a single-span bridge of 19.0 m clear span is required to cross the River Cushina, while a 20.0 m clear span bridge with five flood relief culverts is required to cross the Philipstown River and its associated floodplain.

Mitigation measures have been incorporated to minimise likely significant effects, protect the proposed development and its surroundings, and reduce any residual flood risks. It is therefore considered that any residual risks associated with the development can be managed to an acceptable level and that the proposed works are not likely to have a negative impact on flood extents or levels either on-site or elsewhere. The increase in flood levels resulting from the inclusion of the proposed bridge and associated infrastructure is within acceptable limits and not considered significant. In the case of the TDR watercourse crossing, the increase in flood levels is considered negligible.

Accordingly, the proposed development is considered to comply with the core principles of the Planning System and Flood Risk Management Guidelines. More detailed information can be found in the SSFRA, presented as Appendix 12.1 and also in Chapter 12 (Hydrology), Volume 2 of this EIAR.

9.15.2 Potential to Cause Accidents or Disasters

Reduction in Water Quality

Severe weather may cause increased mobilisation of sediment. However, this will be controlled via the project surface water design. Additionally, mitigation measures to protect water quality are fully set out in this Chapter as well as procedures and measures described in the Construction and Environmental Management Plan (CEMP) and the Biodiversity Enhancement and Management Plan (BEMP). These will ensure that the risk of water contamination is low.

Increase in spread of Invasive Species

Unplanned interaction with non-native, invasive species could cause an unwanted increase in their spread as a result of construction activities. However, the plan identified in Section 9.14 below for the eradication and monitoring of these species will ensure that this risk is kept low.

9.16 Residual Effects

The residual effects are the effects likely to remain once mitigation measures have been taken into account. These are summarised below in Table 9-23.**Error! Reference source not found.**

Table 9-23: Residual effects of Proposed Development on KERs

KER	Effect/Rationale	Pre-Mitigation Effect	Mitigation	Residual Effects
River Barrow and River Nore SAC [002162]	Assessed in NIS	n/a	n/a	Assessed in NIS
Grand Canal pNHA [002104]	No direct effects likely. Otter is potential link to this pNHA. Baseline indicates very low use of Proposed Development Site by Otter.	***Long-term localised adverse, likely imperceptible effect.***	None necessary	***Long-term localised adverse, likely imperceptible effect.***
Depositing / Lowland River (FW2) and aquatic species within. **Corresponds to Cushina River, Philipstown River and River Barrow**	During the construction phase, risk of sediment, diesel and other pollutants entering the watercourses.	***Short-term adverse, likely significant effects.***	• *Mitigation by avoidance.* • *Presence of competent EnCoW/ECoW.* • *Water Quality monitoring* • *HDD Drilling Methodology and management.* • *Riparian Enhancement (BEMP)* • *In-Ditch Wetlands (BEMP)*	***Long-term, likely beneficial effect.***
	Indirect air pollution effects were assessed to not to be significant.	***Short-term local adverse, likely not significant.***	None necessary	***Short-term local adverse, likely not significant.***

KER	Effect/Rationale	Pre-Mitigation Effect	Mitigation	Residual Effects
Drainage Ditches (FW4)	During the construction phase, risk of sediment, diesel and other pollutants entering drainage ditches and impacting upon sensitive aquatic receptors downstream	***Short-term adverse, likely significant effects.***	• *Mitigation by avoidance.* • *Presence of competent EnCoW/ECoW.* • *Water Quality monitoring* • *HDD Drilling Methodology and management.* • *Riparian Enhancement (BEMP)* • *In-Ditch Wetlands (BEMP)*	***Long-term, likely beneficial effect***
	Indirect air pollution effects were assessed to not to be significant.	***Short-term local adverse, likely not significant.***	None necessary	***Short-term local adverse, likely not significant.***
Raised Bog (PB1)	Infrastructure largely avoids this habitat. No direct habitat loss	***No direct likely significant effects.***	None necessary	***No direct likely significant effects.***
	Indirect air pollution effects were assessed to not to be significant.	***Indirect effects short-term local adverse, likely not significant.***		***Indirect effects short-term local adverse, likely not significant.***
Wet Pedunculate Oak-Ash Woodland (WN4)	No direct effects expected as it lies outside of the construction and felling footprints.	***No direct likely significant effects.***	None necessary	***No direct likely significant effects.***
	Indirect air pollution effects were assessed to not to be significant.	***Indirect effects short-term local adverse, likely not significant.***		***Indirect effects short-term local adverse, likely not significant.***

KER	Effect/Rationale	Pre-Mitigation Effect	Mitigation	Residual Effects
Bog Woodland (WN7)	Direct effects from felling – loss of habitat and increase in edge effect.	***Long-term adverse, likely slight effect.***	None necessary. Some enhancement through implementation of the BEMP	***Long-term adverse, likely slight effect.***
	Indirect air pollution effects were assessed to not to be significant.	***Short-term local adverse, likely not significant.***	None necessary	***Short-term local adverse, likely not significant.***
Hedgerows (WL1) **Treelines (WL2)**	Direct habitat loss (approx. 887m WL1 and 524m WL2).	***Long-term adverse, likely slight effect.***	None necessary. Replacement planting via implementation of the BEMP will result in 950m of hedgerow and 550m of treeline being translocated or planted.	***Long-term adverse, likely imperceptible effect.***
	Disturbance and habitat fragmentation will occur.	***Short-term adverse, likely insignificant effects***	None necessary. BEMP planting of hedgerows and treelines will result in reduction of significance of effect.	***Short-term adverse, likely imperceptible effects***
	Indirect air pollution effects were assessed to not to be significant.	***Short-term local adverse, likely not significant.***	Non necessary.	***Short-term local adverse, likely not significant.***
Eurasian Badger	Loss and fragmentation of habitat through the loss of WL1, WL2, WN7 will result in direct effects. Also disturbance from noise and lighting during construction.	***Long-term adverse, likely slight effects.***	None necessary. BEMP planting of hedgerows and treelines will result in reduction of significance of effect.	***Long-term adverse, likely imperceptible-slight effects.***
	Indirect air pollution effects were assessed to not to be significant.	***Short-term local adverse, likely not significant.***	None necessary.	***Short-term local adverse, likely not significant.***

KER	Effect/Rationale	Pre-Mitigation Effect	Mitigation	Residual Effects
European Otter (and Grand Canal pNHA)	There are no likely effects from habitat loss due to set back distances and clear-span bridges at watercourse crossings. Low level of activity within Site. Disturbance effects (from habitat loss, noise and artificial lighting) were assessed.	***Long-term localised adverse, likely imperceptible effect.***	None necessary. Dark Sky Ireland Lighting Recommendations will be followed.	***Long-term localised adverse, likely imperceptible effect.***
		Short-term local adverse, likely not significant.	None necessary	***Short-term local adverse, likely not significant.***
Bats	Habitat loss and fragmentation	***Long-term localised adverse, likely moderate effects***	Translocation and/or planting within the Site of hedgerows and treelines of native species. Protection and enhancement of suitable foraging habitat (Bog Woodland and riparian zone) as part of BEMP onsite.	***Long-term localised adverse, likely slight effects***
	Artificial lighting	***Localised, short-term adverse, likely slight effects***	None necessary. Dark Sky Ireland Lighting Recommendations will be followed.	***Localised, short-term adverse, likely slight effects***
	Indirect air pollution	***Local adverse, likely not significant.***	None necessary.	***Local adverse, likely not significant.***
	Collision risk	***Long-term adverse, likely moderate effect.***	• Bat Habitat Buffer Zones • Blade Feathering • Adaptive Management Strategy	

KER	Effect/Rationale	Pre-Mitigation Effect	Mitigation	Residual Effects
Giant Hogweed	A Third Schedule, non-native invasive species. Not within construction footprint.	***Neutral effect***	Implementation of Invasive Species Plan including eradication of Giant Hogweed.	***Long-term, likely beneficial effect***
Invasive Species (general)	Risk of spread of non-native species identified within site where these overlap with construction footprint (felling). Also risk in contributing to spread through movement of construction vehicles and soil.	***Short-term adverse, likely significant effect.***	Implementation of Invasive Species Plan	***Long-term, likely beneficial effect***
Desmoulin's Whorl Snail (Vertigo (Vertigo) moulinsiana)	Likely impact if HDD in vicinity of Bergin's Bridge on the GCR causes pollution through accidental release of pollutants.	***Short-term local adverse, likely significant effect.***	HDD Drilling Methodology and management as outlined.	***Short-term local adverse, likely imperceptible effect.***
Common Whorl Snail (Vertigo (Vertigo) pygmaea)	Indirect air pollution effects were assessed to not to be significant.	***Indirect effects short-term local adverse, likely not significant.***	None necessary	***Short-term local adverse, likely not significant***
Large Red Tailed Bumble Bee (*Bombus (Melanobombus) lapidarius*), *Halictus (Seladonia) tumulorum*, Gooden's Nomad Bee (*Nomada goodeniana*), *Wall (Lasiommata megera)*	Loss of habitats was assessed as being low (7% of suitable habitat).	***Local adverse, long-term, imperceptible effect***	None necessary.	***Local adverse, long-term, imperceptible effect***
	Indirect air pollution effects were assessed to not to be significant.	***Local adverse short-term, likely not significant effect.***	None necessary.	***Local adverse short-term, likely not significant effect.***

9.17 Cumulative Effects

A cumulative effect arises from the incremental changes caused by other past, present or reasonably foreseeable actions together with the Proposed Development. Climate change and agriculture are other considerations. The landscape surrounding the Proposed Development is dominated by agriculture, degraded bog and conifer plantation. The projects considered in relation to the potential for cumulative effects are those listed below:

- Cloncreen Wind Farm (operational)
- Mount Lucas Wind Farm (operational)
- Cushaling Wind Farm (under construction)
- Moanvane Wind Farm (under construction)
- Yellow River Wind Farm (under construction)
- Dernacart Wind Farm (High Court ruled in favour of this development June 2025)
- Clonarrow Wind Farm (currently in Planning and awaiting decision)
- Ballydermott Wind Farm (Pre-Application stage)
- Cushina Wind Farm (Pre-Application stage).
- Peat Extraction
- Water Supply Project – Eastern and Midlands Region (Pre-Application stage)

9.17.1.1 Climate Change

Climate change can cause negative effects on ecologically sensitive features including species and habitats. Increased occurrence of extremes in terms of rainfall events, heat or cold, storms and floods can all add to existing pressures on the environment such as increasing erosion of riverbanks and sediment loads of rivers. Climate change can also exacerbate the problems arising from non-native invasive species if it results in conditions favourable to the further spread of existing, or the introduction of new, non-native invasive species. There is potential for climate change to exacerbate potential effects of the Proposed Development. However, taking into account the degraded nature of the landscape in which the Site located (degraded Cushina River, degraded Figile River, degraded bogs and conifer plantations) and given that the mitigated impact of the Proposed Development will not result in any likely, significant effects, the potential for cumulative impacts are considered unlikely to be significant. The Proposed Wind Farm will reduce the need for fossil fuels to be used to generate electricity and hence will have a positive impact on CO_2 emissions. In this regard, the long-term cumulative effect of Climate Change and the Proposed Development is assessed as beneficial.

9.17.1.2 Peat Extraction

Peat extraction has been ongoing in the region for many decades. The expected ecological impacts from peat extraction are habitat loss and alteration of raised bog habitat, sedimentation of water-courses and an increase in carbon emissions. The drainage and cutting of peat from the bogs in the surrounding landscape has resulted in a loss of intact raised bog habitat. It has resulted in an altered, degraded habitat, cutover bog. In many instances, the cutover bog has been converted to other habitats such as improved agricultural grassland, wet grassland, bog woodland and conifer woodland. The Proposed Project is set in cutover bog which has, in the past, been altered and degraded and now supports those habitats listed. The Proposed Development Site also includes part of the flood plain of the Cushina River. The Proposed Project avoids the any development on the raised bog remnant and will not results in likely significant habitat loss or alteration of any peatland habitats. The Proposed Project will contribute to improving the water quality draining from the site due to the extensive mitigation that will be applied during construction and the biodiversity enhancement measures designed to trap and reduce sediment loads within the drains draining to the Cushina. As the Proposed Development will result, post-mitigation, in a *likely imperceptible to moderately beneficial effect* on water quality, it is not foreseen that the Proposed Development will contribute to any adverse significant cumulative effects with Peat Extraction on water quality.

9.17.1.3 Wind Farm Developments

A number of wind energy developments have taken place or are planned in the surrounding area. Many of those listed above are located within the same catchment as the Proposed Development. It is possible that each of these developments will contribute imperceptible, negative effects on water quality and hence there is potential for the Proposed Development to contribute to cumulative effects on water quality within the same catchment. However, with the mitigation and biodiversity enhancement measures planned for water quality as part of this Proposed Development, the likely effects on water quality and river habitat are considered to be imperceptible over the short-term and beneficial over the long-term. It is considered that the Proposed Development will not contribute to any significant cumulative effects with Wind Farm Developments.

9.17.1.4 Agriculture

There is a mix of extensive and intensive agriculture in the wider landscape. There is potential for the Proposed Development to contribute to cumulative effects on water quality in drains within the Site and in the Cushina River. Impacts from agricultural practices can result in sedimentation and pollution, for instance from the occurrent of unexpected wet weather after slurry spreading, run-off from areas of bare soil or run-off containing organic matter, herbicide or other chemical residues. However, with the mitigation and biodiversity enhancement measures planned for water quality as part of this Proposed Development, it is considered that there will be no likely significant cumulative effects with Agriculture.

9.17.1.5 Water Supply Project – Eastern and Midlands Region

This project is in the pre-planning phase and is in the process of public consultation. The aim of the project is to provide a new supply of drinking water to address the projected need and to increase the reliability of supplies in the Eastern and Midlands Region. The proposed project will abstract water from the Parteen Basin on the Lower River Shannon in County Tipperary and treat the water to drinking water standards before being transferred, via a 172km pipeline to Peamount in County Dublin. The pipeline will, at its closest point, pass approximately 10km to the north-east of the Proposed Wind Farm Site and will most likely need to cross the Figile River in that area. As with any construction project near waterways, there will be potential for effects on water quality such as sedimentation and pollution. The Proposed Project has the potential to contribute to cumulative effects on water quality of the watercourses downstream of the Cushina, including the Figile River. However, with the mitigation and biodiversity enhancement measures planned for water quality as part of this Proposed Development, it is considered that there will be no likely significant cumulative effects with the Water Supply Project.

9.18 Conclusion

The Proposed Wind Farm Site is dominated by habitats typical of the agricultural landscape of the Irish Midlands. Dominant habitats present are improved agricultural grassland (GA1), improved agricultural and wet grassland mosaic (GA1/GS4), hedgerows (WL1), treelines (WL2), bog woodland (WN7), conifer plantation (WD1) and cutover bog (PB4). There is a small area of raised bog habitat (PB1), albeit in poor condition. There are also freshwater habitats onsite which are lowland river (FW2) and drainage ditch (FW4) habitats. No Annex I habitats were identified onsite.

Potential significant effects on KERs identified has been avoided, through sensitive siting of infrastructure, project design and mitigated by specific mitigation measures as detailed in Section 9.14.

Faunal species were identified through Surveys carried between 2021 and 2025. Protected species such as bats, badger and otter were identified within the Site and prescribed avoidance and mitigation measures have been incorporated into the Proposed Project to ensure that no significant effects will occur.

Having regard to the precautionary principle, the Proposed Project will not result in a significant residual effect on any habitat of high ecological significance and will not have any significant effects on the ecology of the wider area.

Provided that the Proposed Project is constructed, operated and decommissioned in accordance with the design, best practice and mitigation that is described within this EIAR, significant effects on biodiversity are not anticipated at any geographic scale.

9.19 References

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