# Derrynadarragh Wind Farm, County Kildare and County Offaly

# Appropriate Assessment Screening and Natura Impact Statement

**September 2025**

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# 1 INTRODUCTION

*Wetland Surveys Ireland (WSI) Ltd.,* were commissioned by *Dara Energy Limited* to assess the likely significant effects on any European site of developing Derrynadarragh Wind Farm, Co. Kildare and County Offaly, on sites designated as European conservation areas known as Natura 2000 sites (hereafter referred to as European sites).

The Proposed Development will consist of the construction of a nine-turbine windfarm development with a total site area of approximately 213.67 hectares (detailed description of the Proposed Development is provided in Appendix 1 - Ch 2 Description of Proposed Development). The nearest European site to the proposed development site is the River Barrow and River Nore Special Area of Conservation (SAC) (NPWS site code: 002162) located approximately 2.4km to the south at its nearest point (or approximately 6rkm) from the proposed wind farm site.

## 1.1 STATEMENT OF AUTHORITY

This Natura Impact Statement (NIS) was prepared by Ms. Caroline Laor and Dr. Patrick Crushell, professional ecologists with Wetland Surveys Ireland (WSI) Ltd. They completed all ecological field work on behalf of WSI.

***Caroline Lalor***

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 conducting baseline ecological surveys and impact assessments of various developments, including renewable energy projects; conducting protected species surveys; restoration and management of farmland habitats; conducting during and post-construction ecological monitoring; preparing Biodiversity chapters of the EIARs; and preparing AA Screening and NIS reports.

***Dr. Patrick Crushell***

Dr. Crushell (BSc Applied Ecology; MSc Environmental Resource Management, PhD Environmental Sciences, MCIEEM) received an honors degree in Applied Ecology from UCC, a Masters degree in Environmental Resource Management from UCD and defended his PhD at Wageningen University, the Netherlands. He is a Chartered Member of the Chartered Institute of Ecology and Environmental Management (MCIEEM). Dr. Crushell has been working in the area of nature conservation and ecological impact assessment for the past twenty five years. Projects that he has been involved in include wetland inventory surveys; evaluation of proposed designated sites; restoration and management of peatland habitats; baseline ecological surveys and impact assessments of various development proposals including solar farms, wind-farms, waste facilities, arterial drainage schemes, and residential developments; during and post-construction ecological monitoring.

Other experts contributed to the gathering of data in terms of conducting field work and specialised surveys. Their statements of authority are given below.

**Ornithology**

***Daniel Moloney***

Daniel is a respected local ornithologist who has been conducting bird surveys since 2006 for wind farm impact assessments and other construction works across a range of projects and consultancy companies in the Republic of Ireland, Northern Ireland, and Scotland. Daniel has been working

with BirdWatch Ireland for over 15 years across a range of projects and species including the Corncrake Conservation project on behalf of the NPWS, Curlew in the border counties as part of the Halting Environmental Loss project in conjunction with the RSPB, a project manager on the INTERREG VA Cooperation Across Borders for Biodiversity project on waders in the border counties and more recently a bird specialist on the ACRES Co-operation Project in Donegal.

***Mark Davenport***

Mark Davenport is an ecologist specialising in ornithology who has been conducting bird surveys for wind farm impact assessment and other various construction projects for several years. Mark has experience working with red listed species such as breeding Curlew on the NPWS Curlew Conservation Project. Through this project, Mark has gathered a wealth of experience in assisting and implementing conservation measures for threatened wader species in Ireland. Mark is a committee member of the Inishtrahull Bird Observatory conducting conservation measures for endangered seabird species.

***Brendan Dunlop***

Brendan is a highly experienced avian fieldworker specialising in a wide range of EIA and research surveys. He is skilled in surveying farmland, upland and coastal birds including Brown & Shepard walked transects and vantage point methodology for breeding season, winter / spring migratory and over wintering surveys and is conversant in habitat mapping for a wide range of protected species. Brendan has worked closely with the Irish Raptor study group Red Kite projects monitoring nest locations, breeding productivity and winter roosts. He is particularly experienced in Hen harrier and Merlin surveys of Northern Ireland SPAs for windfarm proposals. He has worked on numerous wind farm projects across the UK and Ireland. Brendan has in depth experience and a sound knowledge of SNH Guidelines and protocols for wind farm monitoring and post construction monitoring. Brendan has been an active member of the Northern Ireland Raptor Study Group since 2004 and previously held the posts of Treasurer and assistant secretary. He also worked closely with the Ulster Wildlife Trust and RSPB monitoring Barn Owls and Red Kites.

***Gary Wilkinson***

Gary has been an active Ornithologist for over fifty years. He is currently Chairman of the Northern Ireland Ornithologists Club 2005-present and was formerly Treasurer from 1987-2005. Gary is also the field trip leader for the NIOC leading trips from 1984 in the U.K. and Ireland as well as in Europe and Africa. Gary is a member of the NI Raptor Study Group and has been a life fellow of the RSPB and Norfolk Ornithologists Association since 1992. Gary has taken part in a variety of ornithological surveys for BTO and NIOC over the last 50 years including being the Regional Co-ordinator of *Project Barn Owl* for Northern Ireland for BTO/Hawk & Owl Trust; conducting BTO Waterway Breeding Bird Surveys at Annacloy River, Co. Down and conducting the BTO Wetland Bird Census for part of Belfast Lough.

***Rob Wheeldon***

Rob Wheeldon is an experienced ornithologist possessing a comprehensive knowledge and experience of bird identification and surveys. He has worked undertaken numerous bird surveys to inform impact assessment and has contributed to targeted bird survey work on contract to NPWS and Birdwatch Ireland. Rob previously worked with BirdWatch Ireland, RSPB, Norfolk Wildlife Trust, and the National Trust.

**Aquatic Ecology**

***Dr. William O'Connor***

The Aquatic Ecology survey and reporting was completed by Dr. William O'Connor, Senior Ecologist with EcoFact. Dr. Will O'Connor was assisted by junior staff when conducting field work. 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.

**Bat Ecology**

***Pat Doherty***

Mr. Pat Doherty BSc., MSc, MCIEEM, of DEC Ltd. 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. 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 focused certified professional development training in Appropriate Assessment as well as in a range of ecological survey techniques and assessment processes. Training has been completed for National Vegetation Classification (NVC) and Irish Vegetation Classification (IVC) surveying, bryophyte survey for habitat assessment and identification, professional bat survey and assessment training, mammal surveying and specific training for bird and bat survey techniques. Ongoing training has been completed by approved training providers such as CIEEM, British Trust for Ornithology, the Botanic Gardens and the Field Studies Council.

## 1.2 STATUTORY CONTEXT

This Natura Impact Statement has been prepared in accordance with the provisions of Part XAB, Section 177U and Section 177V of the Planning and Development Act, 2000 (as amended) ("the 2000 Act") and in accordance with the European Commission Methodological Guidance on the provisions of Article 6(3) and 6(4) of the Habitats Directive 92/43/EEC (European Commission 2021), the European Commission Guidance Managing Natura 2000 Sites (European Commission 2018) and with reference to the Department of the Environment and Heritage and Local Government guidance on Appropriate Assessment (AA) of plans and projects in Ireland (DEHLG 2010) and guidance from the Office of the Planning Regulator (OPR) (2021).

The EU Habitats Directive (92/43/EEC) provides the framework of legal protection for habitats and species of European importance. The directive provides the legislative means to establish a network of sites (known as the Natura 2000 network) throughout the EU with the objective of conserving habitats and species deemed to be of Community Interest. These sites include Special Areas of Conservation (SACs) designated under the Habitats Directive and Special Protection Areas (SPAs) designated under the Birds Directive (formally known as the Conservation of Wild Birds Directive 79/409/EEC).

Article 6(3) and 6(4) of the Habitats Directive lay down the procedure to be followed when planning new developments that might affect a European site. This stepwise procedure requires that a plan or project having a likely significant negative effect on a Natura 2000 site undergoes an 'Appropriate Assessment' by the competent authority to study these effects in detail and to see how they relate to the site's conservation objectives.

The competent authority may agree to the plan or project as it stands if, on the completion of its Appropriate Assessment, it has ascertained that it will not adversely affect the integrity of the European site(/s) concerned having regard to the sites' conservation objectives.

# 2 METHODOLOGY

## 2.1 APPROPRIATE ASSESSMENT

This Natura Impact Statement has been prepared in accordance with the following guidance:

- *Appropriate Assessment of Plans and Projects in Ireland.* Guidance for Planning Authorities. Department of the Environment, Heritage and Local Government (2010).
- *Assessment of plans and projects in relation to Natura 2000 sites* – Methodological guidance on Article 6(3) and (4) of the Habitats Directive 92/43/EEC. European Commission (2021).
- *Managing Natura 2000 sites: The Provisions of Article 6 of the Habitats Directive* 92/43/EECA European Commission (2018).
- *Appropriate Assessment Screening for Development Management:* Office of the Planning Regulator (OPR) Practice Note PN01 (2021).

There are four main stages involved in the Appropriate Assessment (AA) process (European Commission 2021). The outcome at each stage determines whether the next stage in the process is required. The following describes each of the stages:

*Stage 1 – Screening (under Article 6(3))*

This is the first stage in the process and is carried out to determine the necessity for a more detailed Stage 2 Appropriate Assessment where the possibility of likely significant effects on European sites is identified. The following question needs to be addressed in the AA screening stage:

Is the project likely to have a significant effect, either individually or in combination with other plans or projects, on European site(s) in view of the site's conservation objectives?

The following steps are involved in Stage 1 AA Screening:

- Description of the project / plan and site characteristics (existing environment)
- Determination of whether the project is directly connected with, or necessary to, the management of a Natura 2000 site
- Identification and description of European sites that could potentially be affected
- Identification and description of potential impacts
- Assessment of potential impacts
- Exclusion of sites where no likelihood of significant effects arising

*Stage 2 – Appropriate Assessment (under Article 6(3))*

If there is a possibility of significant effects with respect to any or all European sites, within the Zone of Influence of the proposed development, in view of their conservation objectives, then the project must undergo Stage 2 Appropriate Assessment. The following question needs to be addressed in the Stage 2 Appropriate Assessment:

Will the project adversely affect the integrity of a European site(s) either individually or in combination with other plans and projects in view of the site's conservation objectives?

This stage involves assessing the impact of the plan or project on the integrity of the European site, either alone or in combination with other plans or projects, with respect to the structure and function of the site and its conservation objectives. Additionally, where there are adverse impacts, an assessment of the potential mitigation of those impacts is carried out. If adequate mitigation is prescribed to ensure no significant adverse effects on European sites, then the process may end at this stage. However, if there remains a significant effect on the integrity of a European site(s) remains, then planning permission may not be granted and if the project or plan is to proceed then the process must progress to Stage 3.

*Stage 3 – Assessment of Alternatives*

If the Appropriate Assessment determines that adverse effects are likely upon a European site, this stage examines the possibility of implementing the proposed project in an alternative way which would avoid adverse effects. For the avoidance of doubt, the developer of Derrynadarragh Wind Farm will not be relying on Stage 3.

*Stage 4 – Procedure under Article 6(4) Assessment where no Alternative Solutions Exist and where Adverse Impacts Remain*

Where imperative reasons of overriding interest (IROPI) exist, an assessment to consider whether compensatory measures will or will not effectively offset the damage to the European site will be necessary before the project can proceed. For the avoidance of doubt, the developer of Derrynadarragh Wind Farm will not be relying on Stage 4.

The Habitats Directive promotes a hierarchy of avoidance, mitigation and compensatory measures. First, the project or plan should aim to avoid any impacts on European sites by identifying possible impacts early in the process and designing / writing the project or plan in order to avoid such impacts. Second, if significant effects on European Sites cannot be excluded, mitigation measures should be applied, if necessary, during the AA process to the point where no adverse impacts on the site(s) remain. If the project or plan is still likely to result in impacts on European sites, and no further practicable mitigation is possible, then it must be either rejected or proceed to Stage 3. If no alternative solutions are identified and the plan is required for imperative reasons of overriding public interest (IROPI test) under Article 6(4) of the Habitats Directive, then compensation measures are required for any remaining adverse effect.

In the case of this Natura Impact Statement, it was found that the proposed development requires Stage 2 Appropriate Assessment as the likelihood of significant effects could not be ruled out at Screening for Appropriate Assessment stage (See Section 3 of this NIS).

## 2.2 BASELINE ECOLOGICAL SURVEYS

This NIS was informed by both desktop and field-based surveys as outlined below.

### 2.2.1 Desktop Review and Consultation

A desktop review of existing datasets and published reports was undertaken. This review included references to the following resources:

- OSI Aerial photography and other basemaps
- National Parks and Wildlife Service (NPWS) Data, including designated sites, conservation objectives, and habitats and species distribution
- National Biodiversity Data Centre (NBDC) datasets
- Geological Survey Ireland (GSI) maps
- Environmental Protection Agency (EPA) catchment maps
- Other information sources and reports as referenced throughout the document
- (Commission of the European Communities) (2013) Interpretation manual of European Union Habitats EUR28.

A thorough consultation process was undertaken for the Proposed Development. A summary of the results of consultation with bodies relevant to European sites is presented below in Table 1.

**Table 1 Summary of consultation and responses received relevant to ecology**

| 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.<br><br>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.<br><br>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. | Instream restoration works would be beyond the scope and responsibility of the proposed development. Such works would likely 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 river-banks. These are outlined in Appendix 2 (*Biodiversity Enhancement and Management Plan*).<br><br>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 NatureScot (2024a) *Good Practice During Wind Farm Construction* (SNH, 2019, 4th Edition) shall also be adhered to.<br><br>No high-quality riparian habitats will be impacted by the proposed new river crossing.<br><br>The Bracknagh Stream (and the requirement for a new crossing) 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 (Patrick Crushell and Caroline Lalor) to discuss various elements of the Proposed Development including any concerns regarding potential effects on the Natura 2000 network. No specific concerns were raised regarding Natura 2000 sites, including the River Barrow and River Nore SAC. | The NIS documents the full and robust assessment of the potential for the proposed project to adversely impact on European sites and the conservation objectives of the QIs/SCIs in the identified zone of Influence of the proposed development |
| **Offaly County Council** | N/A | No response received to date | N/A |
| **Waterways Ireland** | N/A | No response received to date | N/A |

### 2.2.2 Field Surveys

The following targeted field surveys were undertaken to inform the existing ecological environment and potential connectivity with designated European sites:

#### *2.2.2.1 Birds Surveys*

In order to obtain baseline information on the occurrence of bird species within and adjacent to the Site and to inform impact assessment on the bird population, ornithological surveys were designed and undertaken in accordance with *'Recommended bird survey methods to inform impact assessment of onshore wind farms'* (SNH, 2017). Data collected from field surveys undertaken from October 2021 to September 2023 largely informs the assessment of significant effects. The survey period covered by the dataset includes two full non-breeding (winter) and breeding seasons. The data has been collected within 5 years of the planning submission, as specified for sites where bird populations are not rapidly changing. The ornithologists who conducted these surveys are Mark Davenport, Daniel Moloney, Brendan Dunlop and Gary Wilkinson.
Additional supplementary surveys were undertaken over a 24 month period between April 2017 and March 2019. These additional surveys were completed by Mr. Rob Wheeldon.

The following surveys were completed between October 2021 and September 2023:

- Vantage Point (VP) Surveys
- Winter Walkover Surveys
- Breeding Walkover Surveys
- Breeding Raptor Surveys
- Breeding Wader Surveys
- Breeding Woodcock Surveys

Additional comprehensive bird surveys were undertaken at the Site by Mr. Rob Wheeldon from April 2017 though to December 2018, covering two full breeding seasons (2017, 2018) and one full winter season (October 2017 to March 2018) and half of the next winter season (October 2018 to December 2018).

Surveys followed SNH (2017) guidelines and included VP watches, winter and breeding walkover surveys, breeding woodcock surveys, and waterbird distribution and abundance surveys. Surveys undertaken at that time covered a similar area to the current Proposed Wind Farm Site and 500m buffer.

Further details on the ornithological surveys completed are presented in Appendix 3.

#### *2.2.2.2 Aquatic Ecology*

An ecological assessment of six sites on the Cushina and Figile Rivers, upstream, within and downstream of the Proposed Development, was undertaken by Will O'Connor of EcoFact Ltd. 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 to 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 manual 'Ecology of the Atlantic

Salmon' by Hendry K & Cragg-Hine D (2003). Further details of aquatic surveys undertaken as part of the ecological assessment of the proposed development are presented in Table 2. Further details are presented in Appendix 4.

**Table 2 Summary of Aquatic Ecology surveys completed which partly informs the NIS**

| Survey | Season | Survey methods | Surveyor |
|---|---|---|---|
| Aquatic Ecology | Summer 2024 (Repeat of earlier survey dated 2021) | Desktop review<br>Aquatic habitat surveys<br>Fisheries surveys (electrofishing: Salmonid, Lamprey) | Will O'Connor of Ecofact Ltd |
| Aquatic Ecology | September 2021 | Desktop review<br>Aquatic habitat surveys<br>Fisheries surveys (electrofishing: Salmonid, Lamprey) | Will O'Connor of Ecofact Ltd |

#### *2.2.2.3 Terrestrial Ecology (habitats, terrestrial flora & fauna, invasive species)*

Multidisciplinary walkover and targeted surveys of terrestrial ecology of the wind farm and associated underground Grid Connection Cable (GCC) route and Turbine Delivery Route (TDR) were undertaken to determine the ecological characteristics of the project area (see Table 4). This included habitat survey, habitat mapping, invasive alien plant species (IAPS) surveys, Badger surveys, Otter surveys, Red Squirrel, Pine Marten and Bat surveys. Only those surveys related to habitats or species listed on Annex I or Annex II of the EU Habitats Directive are described here.

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). Suitable habitat for Marsh Fritillary Butterfly (*Euphydryas aurinia*) was searched for. A dedicated Marsh Fritillary Survey was completed.

During the multi-disciplinary walkover surveys, a search for IAPS was undertaken. The survey focused on the identification of IAPS listed under the Third Schedule of the European Communities (Birds and Natural Habitats) Regulations 2011 (As Amended). Any non-native invasive species found was recorded in the field using ESRI GIS mapping.

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 within areas of suitable habitat. 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).

Bat surveys were conducted to gather baseline data on the bat ecology of the Site. Multi-year surveys were undertaken by Doherty Environmental Ltd. from June 2021 to November 2024 and survey design and effort 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 included extended automatic monitoring of bat activity and bat roost surveys. Surveys 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.

For further details on terrestrial surveys completed please refer to Appendix 5.

**Table 3 Summary of terrestrial ecology surveys completed which informs the NIS.**

| Survey | Season | Survey methods | Surveyor |
|---|---|---|---|
| 19th April 2021 | Spring | Multidisciplinary walkover (windfarm site) | Patrick Crushell, WSI |
| 24th November 2021 | Autumn | Multidisciplinary walkover (windfarm site) | Patrick Crushell, WSI |
| 19th April 2022 | Spring | Targeted terrestrial mammals (windfarm site) | Patrick Crushell, WSI |
| 29th and 30th September 2022 | Autumn | Multidisciplinary survey (windscreen and targeted walkover – UGC and TDR); | Patrick Crushell, WSI |
| 14th November 2023 | Winter | Multidisciplinary walkover (windfarm site) | Patrick Crushell, WSI |
| 13th February 2025 | Spring | Multidisciplinary walkover (windfarm site) | Patrick Crushell and Caroline Lalor, both WSI |
| 3rd and 4th April 2025 | Spring | Multidisciplinary survey (windscreen and targeted walkover - UGC and TDR) | Caroline Lalor, WSI |
| 7th and 12th May 2025 | Summer | Multidisciplinary walkover; Targeted Mammal Survey (windfarm site) | Patrick Crushell and Caroline Lalor |
| **BATS** | | | |
| 2021 Bat Activity Season | Summer & Autumn | Extended automatic monitoring for bat activity | Pat Doherty of Doherty Environmental |
| 2022 Bat Activity Season | Spring | Extended automatic monitoring for bat activity | Pat Doherty of Doherty Environmental |
| 2023 Bat Activity Season | Spring, Summer & Autumn | Extended automatic monitoring for bat activity | Pat Doherty of Doherty Environmental |
| 2024 Bat Activity Season | Spring, Summer & Autumn | Extended automatic monitoring for bat activity | Pat Doherty of Doherty Environmental |
| 17th April and 1st May 2024 | Spring/Summer | Bat Roost Surveys | Pat Doherty of Doherty Environmental |

# 3 APPROPRIATE ASSESSMENT SCREENING

## 3.1 PROJECT DESCRIPTION

### 3.1.1 Site Location and Context

The proposed development Site (the 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. A map showing the extent of the Site is shown in Figure 1. Specific locations along the GCR and TDR are also shown in Figure 2 and Figure 3. The Wind Farm Site is located within both the jurisdictions of Kildare County Council and Offaly County Council, approximately 2km south of the village of Bracknagh, 5km northwest of Monasterevin, and approximately 6.5km northeast of Portarlington. The lowland landscape here is dominated by agricultural grassland, cutover bog, commercial forestry and rural one-off houses. The Quaternary Sediments (subsoils) underlying the Site are largely either Cutover Raised Peat or Lake Marl, with small pockets of Limestone Till.

The Proposed Development comprises a total of 9 no. turbines, with 4 no. turbines located in the jurisdiction of County Kildare, and 5 no. turbines located in the jurisdiction of County Offaly.
The Cushina River flows through the Site and part of the flood plain of this river is within the Site. The Figile River occurs in proximity to the eastern boundary of the Site. Both rivers meet approximately 290m downstream of the Proposed Wind Farm Site to the east. The south of the Site borders the north-eastern edge of Derrylea Bog and another raised bog lies partly within the north of the Site. The main landuses within the Site include agriculture (cattle grazing), forestry, and turf harvesting. The dominant habitats within the Site are a mosaic of wet grassland and improved agricultural grassland (GS4/GA1), bog woodland (WN7), cutover bog (PB4), conifer plantation (WD4), hedgerows (WL1), treelines (WL2), and drainage ditches (FW2). Large areas of cutover (subject to recent peat cutting) and cutaway bog (under active peat mining operations) occur adjacent to the Site.

The proposed underground Grid Connection Route (GCR) is approximately 11.4km and follows existing or proposed tracks and roadways from the Site to the existing national grid infrastructure at the Bracklone Substation. The GCR will exit the Site to the south and follow the public road to Bracklone Substation (currently under construction) through the following townlands; Derrylea, Inchacooly, Ballyhast, and Loughmansland Glebe. 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).

The Turbine Delivery Route (TDR) is described in Chapter 2 of the EIAR (Appendix 1). The TDR will exit the M6 at junction 5 and continue along existing public road network to the Site via Tullamore and Daingean. The TDR encompasses one location where a watercourse crossing is required. This will be a clear-span bridge over the Philipstown River (also known as the Daingean River) approximately 5km east of Daingean, Co. Offaly. 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 existing access 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.

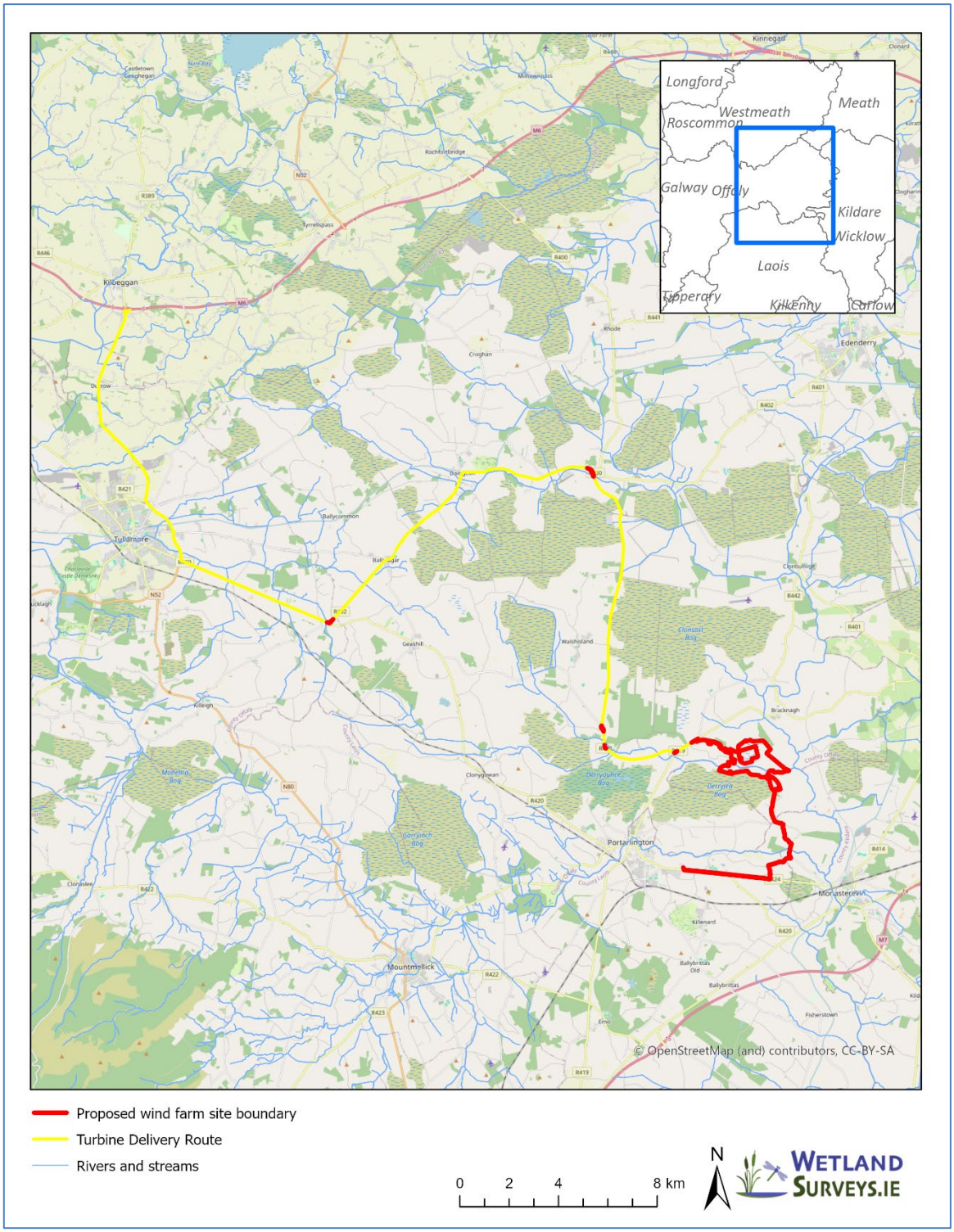



**Figure 1: Site Location of Proposed Wind Farm site boundary including the Turbine Delivery Route and underground Grid Connection Route.**

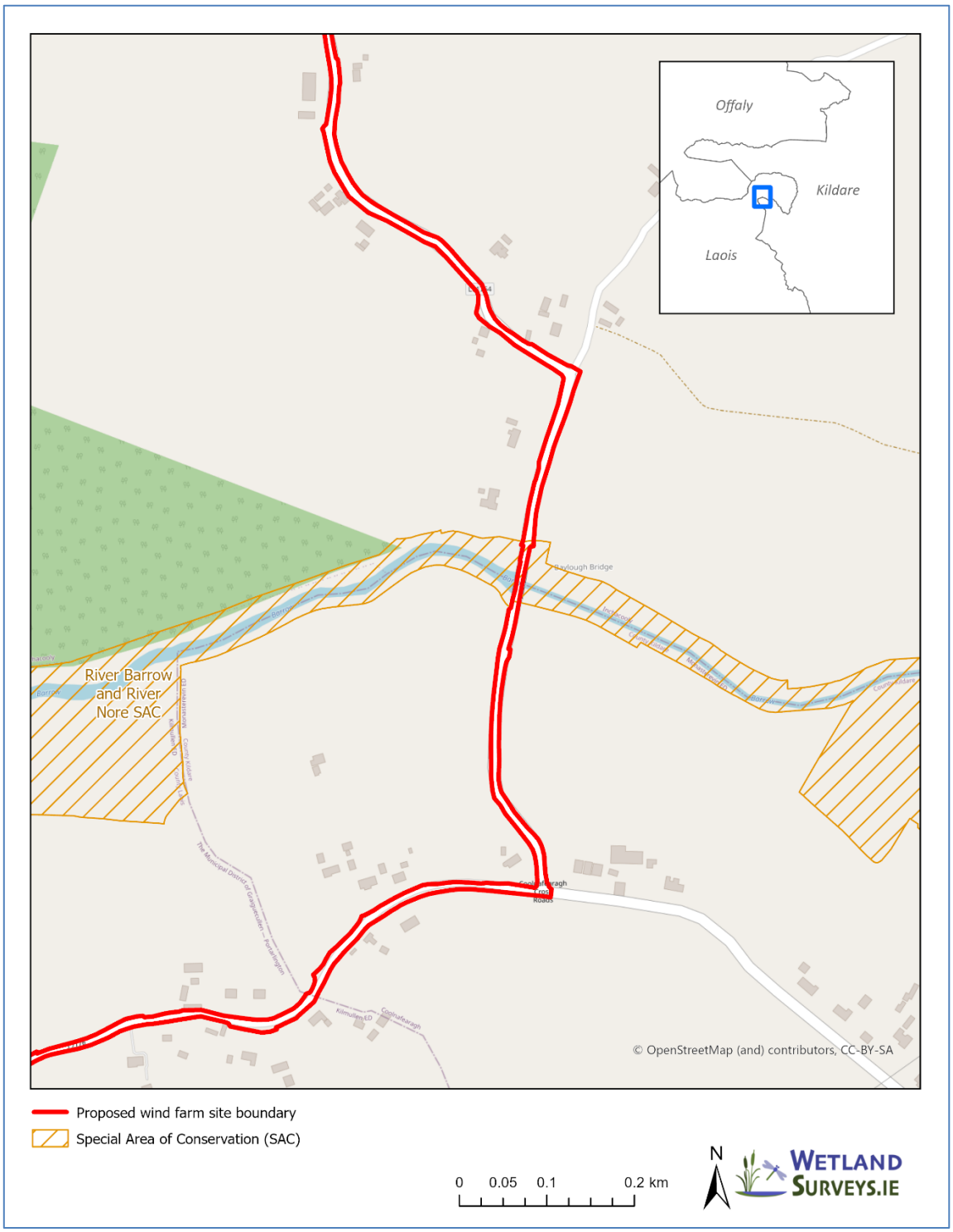



**Figure 2. Location of underground Grid Connection Route where it crosses the River Barrow approx. 2.5km south of the Proposed Derrynadarragh Wind Farm Site.**




**Figure 3. Site location of the proposed Turbine Delivery Route (TDR) at the point where it proposes to cross the Philipstown River 5km east of Daingean, Co. Offaly.**

### 3.1.2 Characteristics of the Proposed Development

The Proposed Wind Farm comprises a total of 9 no. turbines, with the positioning of 4 no. turbines to be located in County Kildare, and 5 no. turbines in County Offaly. The turbine specifications are as follows; 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. The Proposed Development includes associated infrastructure including internal access tracks, hard standings, an onsite 110 kV substation and associated grid connection infrastructure, internal electrical and communications cabling, temporary construction compounds, welfare facilities, drainage infrastructure, biodiversity enhancement measures, accommodations works along the proposed Turbine Delivery Route and all associated works related to the construction of the proposed development.

A proposed new access road will link the Site to the R419 road and there will be new and upgraded access tracks within the Site. In addition to the nine turbines, there is also a proposed substation in the west of the Site, three proposed temporary construction compounds, 6 no. spoil deposition areas, associated surface water management systems, laying of approximately 11.4km of underground 110kV electrical cabling to facilitate the connection to the national grid from the proposed onsite substation and all underground electrical and communications cabling connecting the proposed turbines to the proposed onsite substation.

The Proposed Wind Farm will include a new Site entrance along the R419 Regional Road to serve as construction and operation access to the proposed wind farm and onsite 110kV substation, an additional access from L-70481 will be used for construction to the south of the Cushina River, prior to completion of a new bridge crossing included as part of the development.

The proposed Grid Connection Route (GCR) 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) through the townlands of Cushina in County Offaly; Derrylea, and Inchacooly in County Kildare, and Coolnaferagh, Ullard or Controversyland, Clonanny, Lea, Loughmansland Glebe, and Bracklone in County Laois. Works for the grid connection will involve trenching, laying of ducting, installing 15 no. joint bays and 5 no. watercourse crossings, pulling cables and the back filling of trenches and reinstatement works. The route will run through 0.3km in existing tracks and 2km in new access tracks on the wind farm Site and 9.1 Km of existing public road, 0.3km in existing tracks and 2km in new access tracks on the wind farm Site. Of the 5 no. crossing points, 4 no. comprise watercourse crossings and one is a dry stone arch bridge crossing at a disused canal. There will be 4 no. Horizontal Directional Drilling (HDD) and 1 no. flat formation crossing within the road above an existing culvert.

The Turbine Delivery Route (TDR) route is described in Chapter 2 of the EIAR (see Appendix 1). It will include a number of accommodation works (see Table 5), some of which will include ground works and construction. The turbine components will be delivered to the port of entry of Galway and the delivery route will extend from Lough Atalia Road, R339, crossing junction with R338, continuing on R339, R336, N6, onto the M6, from the M6 the route will progress as follows:

- 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 Ballinagar 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.

At TDR Node 29/30 accommodation works proposed include the construction of 282m of new road across an existing field including a 20m clear-span bridge across the Philipstown River (also known as Daingean River) in order to by-pass the R402/R400 junction. At Node 35/36 it is proposed to construct approximately 178m of new access road to bypass a bend on the R400.

The Biodiversity Enhancement Management Plan (BEMP) lands are wholly located within the proposed development Site and include lands in the townlands of Cushina and Aughrim. The BEMP is presented in Appendix 2. This includes:

- plans to install in-ditch wetlands to reduce existing sediment loads in drains and prevent same from reaching the Cushina River.
- riparian enhancement measures to prevent stock access to the 2.4km of northern riverbank and the 2.4km of southern riverbank along the River Cushina. This is expected to result in enhanced river and riverbank habitats and greater riverbank stability.
- 2.7ha woodland development in the riparian zone to the north of the most eastern 1km of the Cushina River. This will lead to woodland habitat enhancement and creation and will further contribute to the protection and enhancement of the aquatic ecology of the Cushina River within the Site.
- 2.6ha bog woodland protection and enhancement.

A 10-year planning permission and an operational period of 35 years from the date of commissioning of the Proposed Wind Farm is being sought. This reflects the lifespan of modern-day turbines.

A full description of the Proposed Development is given in Chapter 2 of the EIAR (see Appendix 1). The general layouts of the Proposed Development and TDR are presented in Appendix 6.

**Table 4 Turbine Delivery Route (TDR) Accommodation Work Nodes**

| TDR Node Reference | Location | Details | Summary Description of Proposed Temporary Accommodation Works |
|---|---|---|---|
| 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. |
| 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. |
| 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. |
| 25 | Daingean Main Street / Edenderry Road | Loads will continue through Daingean on the R402 | Installation of Load Bearing Surface in the northern footway. |
| 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. |
| 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. |
| 32 | R400 East of Mountlucas | Loads will continue on the R400 southbound. | Installation of Load Bearing Surface on the western verge. |
| 33 | R400 South-east of Mountlucas | Loads will continue on the R400 southbound. | Installation of Load Bearing Surface on the eastern verges. |
| 34 | R400 Northeast of Brackagh | Loads will continue on the R400 southbound. | Trimming of vegetation and trees on both verges. |
| 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. |
| 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. |
| 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. |

### 3.1.3 Development Phases

#### *3.1.3.1 Construction Phase*

The construction phase will comprise several stages including site investigations, site preparation, turbine foundation works, erection of turbines, and initial commissioning. It is foreseen that these stages will overlap and the total timeframe up to commissioning is expected to be approximately 24 months from the date planning permission is granted or any subsequent judicial review is resolved or determined, whichever is the later.

The proposed development will include the following elements that need to be considered:

- 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 hard standing 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 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 the Cushina River within the proposed Wind Farm Site;
- All associated infrastructure, services and site works including excavation, earthworks 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;
- Installation of medium voltage electrical and communication cabling underground between the proposed turbines and the proposed on-site substation and associated ancillary works;
- Installation of 11.4km of high voltage (110kV) and communication underground cabling between the proposed on-site substation and the Bracklone Substation and associated ancillary works.
- Construction of 1 no. permanent onsite 110kV electrical substation and associated compound including:
    - Welfare facilities;
    - Wind farm control building with welfare facilities;
    - Electrical infrastructure;
    - Parking;
    - Wastewater holding tank;
    - Rainwater harvesting tank;
    - Security fencing;
- Enabling works to accommodate turbine delivery including:
    - Installation of a new watercourse crossing comprising a 1 no. single span bridge crossing at Daingean River/Philipstown Bridge;

- Load bearing surfaces and temporary watercourse and drain crossings;
- Temporary removal of road signage, poles, bollards and fencing;

Environmental Management During Construction

Construction will be undertaken in strict compliance with the Construction and Environmental Management Plan (CEMP) that is submitted as part of this application (see Appendix 7).

The CEMP sets out the key environmental management measures associated with the construction, operation and decommissioning of the Proposed Development, to ensure that during these phases of the Proposed Development, the environment is protected, and any likely significant adverse impacts are minimised. The live CEMP will be developed further at the construction stage, on the appointment of the main contractor to the Proposed Development to address the requirements of any relevant planning conditions and environmental authorisations, including any additional mitigation measures that are conditioned.

Surface Water Management Plan (SWMP): A detailed SWMP (Appendix 8) has been developed and all environmental mitigation measures within the SWMP will be implemented locally in advance of the works. The SWMP includes the following:

- The procedures which will be followed by the Contractor to identify and plan the appropriate erosion and sediment controls which need to be put in place for each element of the Works;
- The procedures which will be followed by the Contractor to ensure the proper implementation of the appropriate sediment and erosion control measures during the construction of each element of the Works;
- Details of the Contractor's obligations with respect to the supervision, monitoring and documentation of the implementation of the erosion and sediment control measures included in the Works in accordance with the requirements of the SWMP;
- Requirement for appropriate training to be provided for and recorded for all personnel engaged by the Contractor for the Works.

The following environmental controls will be in place during construction to safeguard downstream water quality:

- Concrete washing of machines will take place off-site at an appropriate dedicated wash facility that will pose no threat to surface waters.
- Re-fueling of machinery will only be carried out in designated areas removed from any natural watercourses. All fuels used on Site will be stored in bunded units. Plant and vehicles will be inspected regularly for leaks. Drip trays will be fitted to all plant machinery.
- Use of weather forecasting to plan dry days for concrete pouring.
- Stockpiling of materials during construction will only occur in suitably designated areas away from watercourses with adequate measures taken to prevent any surface water run-off. Silt traps and silt fencing will be employed to safeguard the protection of watercourses in the vicinity of the proposed works.
- The following dust-control measures will be put in place during construction and decommissioning works:
    - Compaction of the sides of all stockpiled soil
    - The internal access roads will be constructed prior to the commencement of other major construction activities. These roads will be finished with high quality graded aggregate;
    - A water bowser will be available to spray work areas and haul roads, especially during periods of excavations works coinciding with dry periods of weather, in order to suppress dust migration from the Site;
    - All loads which could cause a dust nuisance will be covered to minimise the potential for fugitive emissions during transport;

- Re-vegetate earthworks and exposed areas/soil stockpiles to stabilise surfaces as soon as practicable;
- 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.

In addition, the Surface Water Management Plan (SWMP) (Appendix 8) outlines emergency response procedures in the event of leaks or silt breakouts. A trained and dedicated environmental and fuel spill emergency response team will be set up on Site before commencement of construction on-site. All personnel working on site will be trained in pollution incident control response and will be familiar with the emergency response procedures set in place for this Proposed Development. These procedures include:

- Suitable spill kits and absorbent material for dealing with oil spills will be maintained on site and will be provided in all construction vehicles.
- The drainage engineer will be contacted if there is an accidental spill or breakout of silt on Site.
- In the event of pollution or potential risk of pollution the relevant Local Authority will be informed immediately.
- In the case of water pollution in addition to the Local Authority, Inland Fisheries Ireland will also be informed immediately.
- Works will stop immediately where safe to do so.
- The size of the incident will be assessed and determined if it can be controlled by Site staff or if emergency services are required to attend.

The implementation of the CEMP and SWMP will be overseen by the Environmental / Ecological Clerk of Works (EnCoW / ECoW). The (EnCoW / ECoW) will be appointed by the Developer and will have 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 water quality or biodiversity and/or to ensure corrective action is taken to mitigate adverse effects.

The Project Ecologist and/or EnCoW/ECoW will oversee the implementation of the Biodiversity Enhancement and Management Plan (BEMP). One element of this will be completed before any works begin – the removal of invasive alien plant species (IAPS) from the construction / felling footprint. The felling footprint within the Site includes one location (near T04) where the Low Impact Species, Snowberry (*Symphoricarpos albus*) is present and a second location (TDR Node 35/36) where Snowberry and Sycamore (Medium Impact) were recorded. All of these will be safely removed by a licenced invasive species contactor and disposed of to an appropriately licenced waste facility prior to the beginning of construction/felling in these areas. These works will follow the procedures of the Invasive Species Plan as outlined in Chapter 9 (see Appendix 5) and summarised below.

Where present within the footprint of the Proposed Development, the soil and vegetation cuttings containing, or likely to contain, any parts of IAPS including seeds or root fragments, will present a risk of spread. In such situations where works (including felling) will occur within or adjacent to known infestations of non-native invasive species (such as at T04 and TDR Node 35/36), 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. Before contact with water is made, any equipment or machinery that will be used in the water, including Personal Protective Equipment (e.g. footwear, gloves), will undergo the Clean-Check-Dry biosecurity protocol: https://www.fisheriesireland.ie/Biosecurity/biosecurity.html. This will similarly be carried out upon completion of the work or moving the equipment or machinery from the water. 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).

The BEMP also includes the removal of Giant Hogweed (*Heracleum mantegazzianum*) from within the Site, although this is not within the construction footprint or the Zone of Impact of the Proposed Development. This Third Schedule, High Impact IAPS, is highly invasive and presents a real threat to human health. Giant Hogweed can form dense stands that outcompete native floral biodiversity. The seeds, which are the sole means of dispersal of the plant, are heavy and disperse well in water which is why this species spreads well along riverbanks. Mechanical removal will be undertaken by an licenced invasive species contractor and all contaminated materials (soil, root fragments, plant fragments etc.) will be disposed of through an appropriately licenced haulier to a licensed landfill.

Once eradication treatments are completed, monitoring will be undertaken approximately 6-8 weeks after treatment to determine the success of the measures. Follow-up eradication treatment is likely to be necessary for about 7 years.

#### *3.1.3.2 Operational Phase*

It is envisaged that the project will remain in operation for about 35 years following its commissioning, subject to planning. Wind farms are designed to operate largely unattended and during the operational phase, the wind farm will normally be unmanned.

Maintenance activities will include the following:

- Six-month service - three week visit by four technicians
- Annual service - six week visit by four technicians
- Weekly visit by Developer or agents to check over the site, notices etc.

Once the onsite underground cable has been constructed and installed, its operation will be for the main part, fully autonomous.

For security purposes the Site will remain fenced in from the surrounding lands and artificial/security lighting will be in place together with CCTV equipment. Security lighting will be intermittent and localised; it will be motion controlled and may be augmented using infrared cameras. Turbine lighting will include lighting on the turbines in accordance with the Irish Aviation Authority (IAA) requirements for aviation visibility purposes.

#### *3.1.3.3 Decommissioning Phase*

On decommissioning, cranes will disassemble the above ground turbine components which will be removed off site for recycling. All the major component parts are bolted together, so this is a relatively straightforward process.

The foundation pedestals will be covered over and allowed to re-vegetate naturally. Leaving the turbine foundations *in situ* is considered a more environmentally sensible option. The alternative of removing the reinforced concrete associated with each turbine would result in unnecessary environmental nuisances such as noise and vibration, and dust and the ensuing potential disturbance to biodiversity, including mobile species of Qualifying Interest (QIs) that might by then be using the area.

It is proposed that all the internal Site access tracks and turbine hard standings will be left in place. These will continue to be available for future land uses.

The temporary accommodation works along the TDR will not be required for the decommissioning phase as turbine components can be dismantled on site and removed using standard HGVs.

Grid connection infrastructure including the on-site substation and ancillary electrical equipment will form part of the national grid and will remain *in situ*.

It is expected that the decommissioning phase will take no longer than 6 months to complete.

## 3.2 EXISTING ECOLOGICAL ENVIRONMENT

The following description of the existing ecological environment at the proposed development Site was informed by a series of ecological surveys as outlined in Section 2.2.2 above. The ecological characteristics of the Site with particular relevance to designated European sites and Annex II species in the surroundings are presented.

A detailed description of the existing ecological environment within and immediately surrounding the proposed development Site is also presented in Chapters 9 and 10 of the Environmental Impact Assessment Report (EIAR) that accompanies the application. A habitat map of the Proposed Wind Farm Site following the Fossitt (2000) classification scheme is presented in Figure 4 below. Habitat maps for specific areas along the TDR where accommodation works are proposed are presented in Figure 5 and Figure 6.

### 3.2.1 Habitats and Flora

#### *3.2.1.1 Terrestrial habitats*

The two most widespread habitats of the study area include agricultural grasslands, either Improved Agricultural Grassland (GA1) or a mosaic of Improved Agricultural Grassland and Wet Grassland (GA1 / GS4), and Cutover Bog habitat (PB4). The GA1 grassland is intensively managed for agriculture, predominantly for livestock grazing. It is relatively species-poor and is subject to significant nutrient inputs. Perennial Ryegrass is the dominant species. GA1 is the dominant grassland to the north of the Cushina River but to the south the grassland is wetter and is largely classified as a mosaic of GA1 with Wet Grassland (GS4). A relatively small area of GS4 also occurs to the south of the river. The GA1/GS4 habitat is more species-rich with species indicative of wet conditions and a less intensive management regime. Species here include Yellow Flag-Iris (*Iris pseudacorus*), Sedges (*Carex* spp.), Mint (*Mentha* sp.), Silverweed (*Potentilla anserina*), Rushes (*Juncus* spp.), Meadowsweet (*Filipendula ulmaria*) and Cuckooflower (*Cardamine pratensis*). The grassland gets gradually less species-rich towards the south-east of the Site where grasses such as Cocksfoot (*Dactylis glomerata*), Perennial Rye-Grass (*Lolium perenne*) dominate and common agricultural herbs such as Ragwort (*Jacobaea vulgaris*) and Dandelion (*Taraxacum officinale* agg.) are frequent. The grasslands that occur within the Site do not correspond with any EU Habitats Directive Annex I habitats.

Cutover bog habitats are common within the Site, indeed some of the grassland has been converted from cutover. Cutover Bog (PB4) occurs in the north of the Site and represents the remnants of a lobe of raised bog (PB1) which once was part of the extensive network of raised bogs of this region, otherwise known as the Bog of Allen. There remains some Raised Bog (PB1) habitat within the Site on the edge of the industrial cutaway (this cutaway lies just outside of the Site). The Cutover Bog is used for peat harvesting with many bare peat fields and regular drains throughout. Within the Raised Bog (PB1) habitat, two ecotopes were recorded ecotope (as per ecotope methodology developed by Kelly and Schouten 2002), 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. Overall, the raised bog habitat onsite is in poor ecological condition with an absence of high quality raised bog communities.

The peatland habitats present onsite have been damaged through drainage, desiccation and subsidence – they do **not correspond** with any EU Annex I habitat as outlined below.

- Annex I priority habitat **Active Raised Bogs* [7110] : NO as there is an absence of the ecotopes corresponding to ARB (central and sub-central) (NPWS, 2019).
- Annex I habitat *of Degraded Raised Bogs still capable of natural regeneration* [7120]: NO as the requirements of size (>30ha) and hydrological characteristics as defined by NPWS (2019) are not met.
- Annex I habitat *Depressions on peat substrates of the Rhynchosporion* [7150] : NO. These vegetation communities can be found extensively in man--modified situations such as degraded raised bog (e.g. tracks and cutover areas) but in these situations, they do not correspond to the Annex I habitat in the Irish context (NPWS, 2019).
- Annex I habitat *Bog Woodland* [91D0] : NO. This Annex I habitat typically has a luxuriant growth of *Sphagnum* mosses. None of the bog woodland onsite conforms to this and is quite dry.

Other terrestrial habitats common on the windfarm Site include Conifer Plantation (WD4), Scrub (WS1), Hedgerows (WL1), Treelines (WL2) and Depositing/lowland River (FW4). The Third Schedule IAPS, Giant Hogweed (*Heracleum mantegazzianum*) was recorded within one hedgerow in the south-west of the Site outside of the construction footprint.

The proposed underground grid connection route (GCR) is approximately 11.4km and follows existing or proposed tracks and roadways. All these tracks and roads correspond to Buildings and Artificial Surfaces (BL1). Adjacent habitats include Hedgerows (WL1), Treelines (WL2), and Dry meadows and grassy verges (GS2).

The proposed turbine delivery route (TDR) is along existing road infrastructure categorised as Buildings and Artificial Surfaces (BL3). Adjacent habitats include Improved Agricultural Grassland (GA1), Conifer Plantation (WD4), Cutover Bog (PB4) and Raised Bog (PB1) habitats. It also passes by rural houses, villages and towns (BL3).

At the TDR Node 29/30, the TDR will include a new section of road and bridge over the Philipstown River (FW2) near where the R400 joins the R402. The dominant habitat here is improved agricultural grassland (GA1), though 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. 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.

At the TDR Node 35/36, a new section of road will be constructed to bypass a bend on the R400. The construction footprint here is predominantly arable crops (BC1) with a small length of Treeline (WL2). The Low Impact invasive species, Snowberry (*Symphoricarpos albus*) is present within this treeline but outside of the construction footprint.

Habitat maps of the Site and Nodes 29/30 and 35/36 are presented in Figure 5 and Figure 6 below.

#### *3.2.1.2 Drainage*

Drainage Ditches (FW4) are common in the Site occurring adjacent to cutover bog, raised bog and grassland habitats. Most of the drains are deep and carry water throughout the year, though levels vary seasonally. The drains in the grassland habitats north and south of the Cushina River, drain into the Cushina. The drains from the north in particular, often carry a high load of peat sediment, likely originating from peat mining activities in the surroundings.

#### *3.2.1.3 Watercourses*

A single natural watercourse (Depositing/lowland River FW2), the Cushina River, occurs within the Proposed Wind Farm Site. The river flows eastwards through the central part of the Site, exiting the Site at its eastern extent. The river channel has been subject to channelisation as indicated by its straightened course, deep channel, and near vertical banks.

This river has been deepened and widened (IFI *pers comm.*). The river had circa 1-1.5m of water depth at the time of survey and is circa 3-4m wide. The river substrate was comprised of fine material and had a moderate flow. The banks are relatively steep throughout the Site, with some slumped areas present where cattle access the river as a drinking source. There are occasional trees along the watercourse and for the last approximately 700m of the river before it exits the Site, the banks (and embankments) support a scrub habitat that is developing into woodland.

Baseline aquatic surveys of the Cushina River by Ecofact in 2021 & 2024, within and adjacent (50m downstream of the Site) to the proposed development Site, determined the water quality to be Poor (Q3) and concluded that the river is degraded due to the effects of channelisation and regular dredging. Approximately 1.8rkm upstream of the Proposed Development the Cushina River was also surveyed by EcoFact in 2021 & 2024. Here, the habitats here were noted as being very suboptimal for salmonids and lampreys. However, potential spawning habitat for lamprey at this location was found to be present. The Cushina River is also monitored by the EPA and was classed as having a Moderate Q-Value (3-4) status in 2023 at a monitoring station approximately 2km upstream of the Site. The section of the Cushina River which includes the 2.4km that flows through the Sit has been assessed as having 'Good' ecological status or potential following the most recent WFD monitoring (River Waterbody WFD Status 2016-2021). However, it is noted that this assessment is based on modelling and it is stated that there is a 'low confidence' in this status. The risk of not achieving good status in the third cycle is listed as being 'in review' (EPA River Waterbodies Risk). No Annex I habitats were recorded in the Cushina River with the Site.

Approximately 290m east of the Site, the Cushina joins the Figile River, which then flows in a southerly direction for approximately 6.2km before entering the River Barrow (or 5.8rkm before it reaches the River Barrow and River Nore SAC [002162]). Downstream of the Cushina-Figile confluence, EPA monitoring from 2023 has classified it as having Moderate status (Q-value 3-4).

The underground GCR crosses the River Barrow at one point on its route approximately 2.4km south-east of the Site. There is an existing bridge, Baylough Bridge, at this crossing point, and it is within the River Barrow and River Nore SAC. The cabling will be installed using HDD methodology, the entry and exit points for which will be located 50m beyond the SAC boundary (i.e. greater than 50m from the River Barrow) within the existing road corridor. This section of the River Barrow has been assessed as having 'Poor' Ecological Status or Potential and also 'Poor' Fish Status or Potential following the most recent WFD monitoring (River Waterbody WFD Status 2016-2021). This assessment is based on monitoring. The closest upstream and downstream EPA monitoring stations both assess the water quality to be Moderate (Q-value 3-4).

The TDR crosses a number of watercourses along its length including the Cushina River, Enaghan Stream, the Silver and the Brosna Rivers. A new bridge is required at the Philipstown River (aka Daingean River). The Philipstown River has an EPA monitoring point just 50m downstream of the proposed new crossing-point. The EPA has found the water quality here to be of Poor Quality (Q-Value 3 The Philipstown River was classed as having 'Poor' ecological status or potential following the most recent WFD monitoring (River Waterbody WFD Status 2016-2021) and is listed as being at risk of not achieving good status in the third cycle (EPA River Waterbodies Risk). The Philipstown River at the proposed new crossing point is approximately 5m wide and supports plentiful macrophytes.

The total area of habitats within the Proposed Development Site are presented below in Table 6 below.

#### *3.2.1.3.1 Flora*

The only EU Annex II plant species record from within the 10km grid squares (N51 and N61) which overlap with the Proposed Wind Farm Site is Marsh Saxifrage (*Saxifraga hirculus*). This species is restricted in Ireland to mineral flushes in blanket bogs in the west. Records of occurrence in this area are from the miid-19th century when Marsh Saxifrage also occurred in the midlands of Ireland. There is no suitable habitat present on-site for this species so it is considered unlikely to occur.

Evaluation

The habitats present on site are generally of Local Importance (Lower value) and Local Importance (higher value). No habitats of high conservation concern occur on site. There are no EU Habitats Directive Annex I listed habitats present within or immediately surrounding the Site. The River Cushina within and downstream of the Proposed Development Site was assessed to not have any salmonid nursery or fishery habitat. It was assessed to have potential lamprey nursery habitat but no potential lamprey spawning habitat present. It has been assessed as being of Local Importance (Higher Value) with direct connectivity to the River Barrow and River Nore SAC, approximately 6rkm downstream from the Site.

**Table 5. Total area of habitats identified within the Proposed Development**

| 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** |

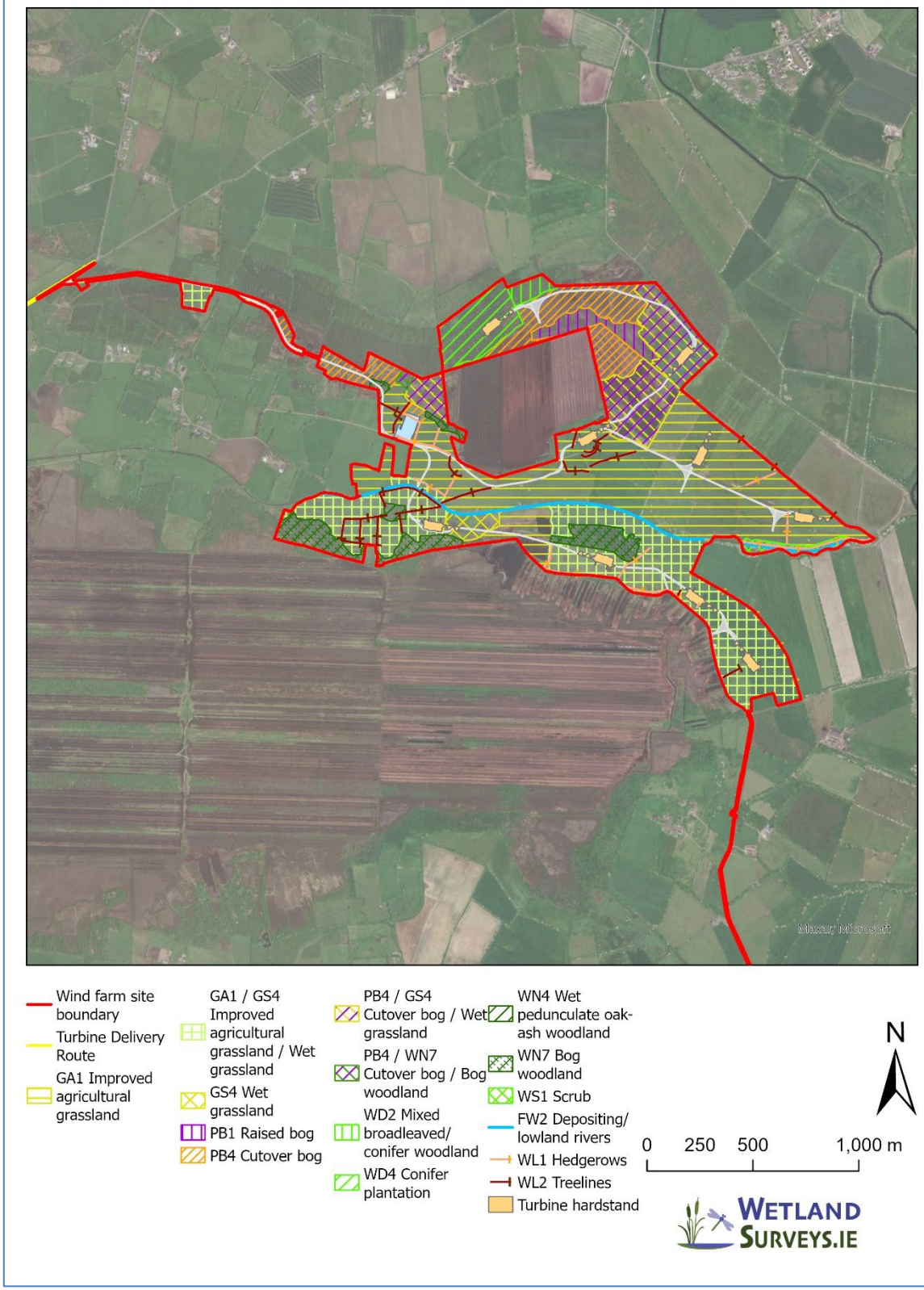



**Figure 4 Habitat Map of Proposed Wind Farm Site at Derrynadarragh, Co. Offaly and Co. Kildare with proposed turbine and internal tracks layout.**

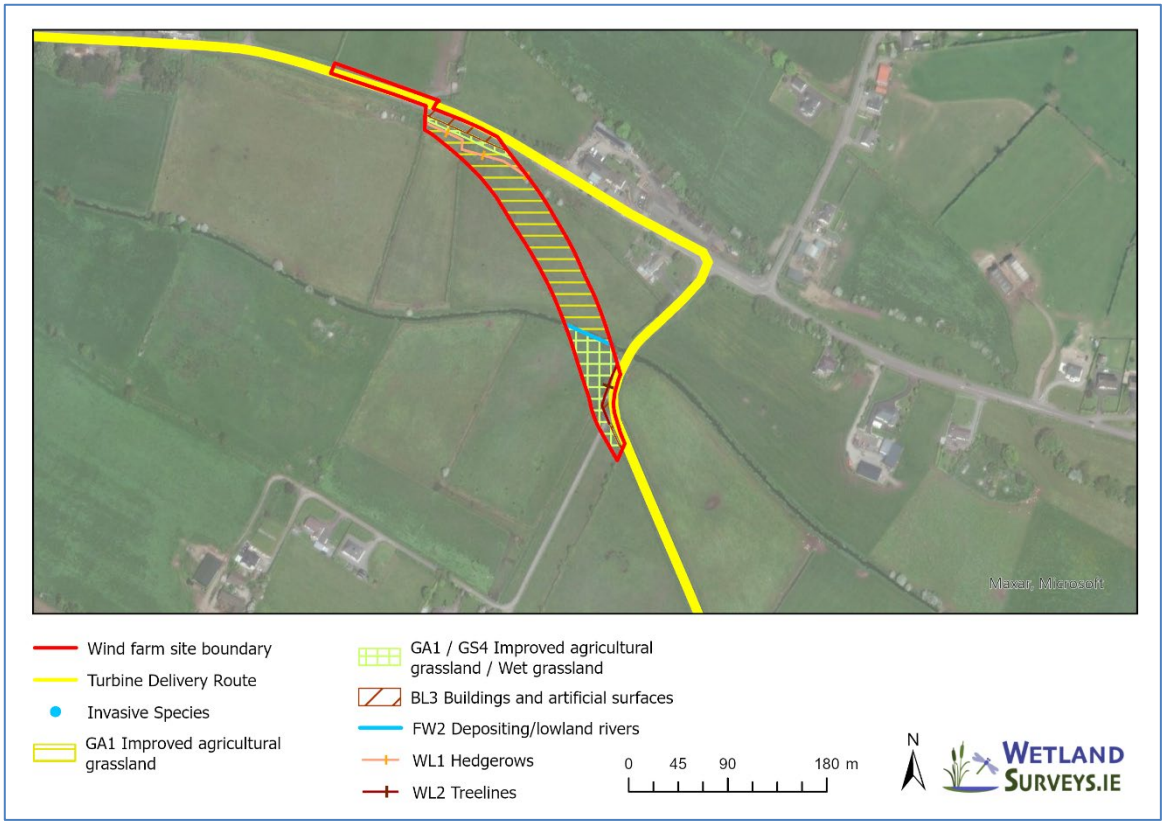



**Figure 5 Map of habitats at TDR Node 29/30 where new section of road and bridge over Philipstown River is proposed.**

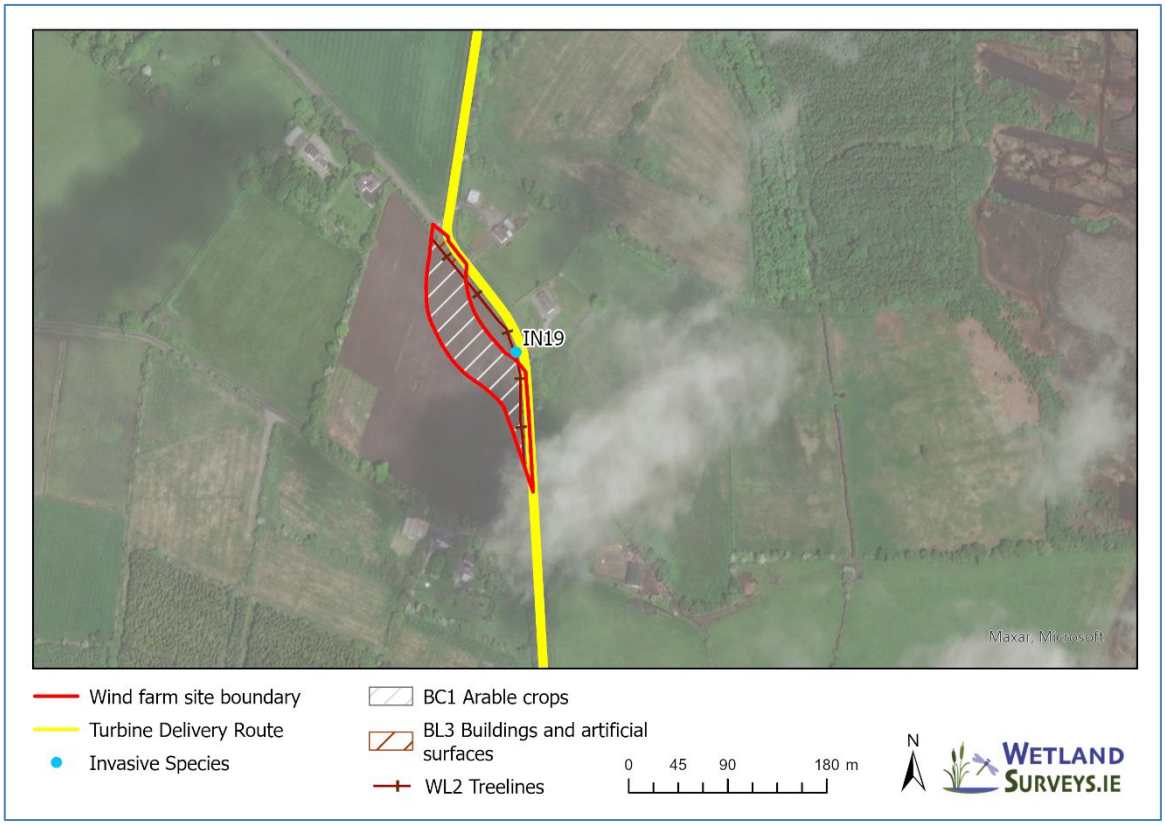



**Figure 6. Map of habitats at TDR Node 35/36 where new section of road is proposed.**

### 3.2.2 Fauna

#### *3.2.2.1 Mammals*

Annex II mammal species for which evidence of presence was recorded within the Site were Bats and Otter.

##### *3.2.2.1.1 Bats*

The Lesser Horseshoe Bat (*Rhinolophus hipposideros*) is the only Irish bat species listed on Annex II of the EU Habitats Directive. The Lesser Horseshoe Bat in Ireland is confined to the west of the country and would not be expected in County Kildare or County Offaly. The bat surveys conducted onsite did not record the presence of Lesser Horseshoe Bats.

##### *3.2.2.1.2 Otter (Lutra lutra)*

Otter is listed on Annex II of the EU Habitats Directive and is a QI for the River Barrow and River Nore SAC. Otter have been recorded from both N51 and N61 hectads. Evidence of Otter was recorded at one location approximately 17m west of the point where the Cushina River exits the Site. In total, the signs consisted of an otter spraint on the riverbank and some otter prints in mud nearby. Signs of Otter were searched for in suitable habitat along the Cushina River within the Site and along the Philipstown River at Node 29/30. No further signs of Otter were noted. Given that male Otters in Ireland have a territory of approximately up to 20km of river and females up to approximately 10km (O'Neill, 2008), the signs of Otter observed at the Site could possibly be from an Otter of the River Barrow and River Nore QI population.

The River Barrow at Baylough Bridge, where the proposed GCR will cross, is not expected to support Otter due to 'Poor' ecological and fisheries status here.

No signs of otter were observed on the Philipstown River at TDR Node 29/30. Given the 'Poor' ecological status and potential assessment for this river, it is considered not likely that Otter are using this river with any frequency. Records of Otter using the Philipstown River are noted in 2015 (NBDC online records). These records are unlikely to be linked to the River Barrow and River Nore SAC due to the distance (29rkm) upstream of the SAC.

#### *3.2.2.2 Birds*

Those bird species of high conservation concern recorded occurring within and surrounding the proposed development Site are presented in Table 7 below. Species listed on Annex I of the EU Birds Directive observed during the bird surveys are Golden Plover, Hen Harrier, Merlin, Peregrine Falcon, and Whooper Swan.

**Table 6: Bird species of high conservation concern recorded within and surrounding the proposed development Site.**

| Species | EU Birds Directive Status |
|---|---|
| **Buzzard** | N/A |
| **Curlew** | Annex II |
| **Golden Plover** | Annex I |
| **Hen Harrier** | Annex I |
| **Kestrel** | NA |
| **Lapwing** | Annex II |
| **Merlin** | Annex I |
| **Peregrine Falcon** | Annex I |
| **Snipe** | Annex II |
| **Sparrowhawk** | NA |
| **Whooper Swan** | Annex I |
| **Woodcock** | Annex II |

In Ireland, SPAs are sites that are designated for the conservation of species listed on Annex I of the Birds Directive. Hence, the Annex I species that were identified onsite are assessed below to help inform the Zone of Impact.

#### *3.2.2.3 Field Study Results 2021-2023 for Annex I Species*

***Golden Plover***

*Vantage Point Survey*

Golden Plover (*Pluvialis apricaria*), a Red Listed species (Gilbert *et al.* 2021) also listed on Annex I of the EU Birds Directive, were recorded on 34 occasions over the survey period. All observations were from the winter period (September to April). All observations related to flocks, with flock size ranging from 4 individuals to an estimate of 4,000 birds in a single flock observed during October 2022. In all, an estimated 15,358 bird flights were recorded. The range of flock sizes is as follows:

- Fifteen observations related to flocks of between 4 and 100 birds.
- Fourteen observations related to flocks of between 100 and five hundred birds.
- Five observations related to flocks of more than 1,000 birds

Golden Plover were not observed utilising the habitats within the site for feeding or roosting. They were generally concentrated in lands to the east and southeast of the wind farm site in proximity to the River Figile. An off-site observation of ca 8,000 birds was made on 25th October 2022 from this area where birds were seen circling and dropping (assumed foraging) throughout much of the day. Based on the occurrence of the large numbers of birds during the migration period it is likely that the birds may on occasion use the lands nearby the wind farm site as a staging area. The regularly observed circling flight behaviour is typical. Based on observed flight times and behaviour it is likely that the birds roost in proximity to the Derryounce lakes 4km WSW of site.

*Winter Walkover*

Four observations of Golden Plover were made during winter walkover surveys. All of these records were of birds flying over the site. Two records were of flocks estimated to include 1,500 birds and 200 birds respectively. Both observations were made on the 31st of October 2022 and are likely to be the same flock as recorded during VP watches in late October 2022.

*Breeding Walkover*

A single observation of Golden Plover was made during the breeding walkover surveys from September 2023. It comprised a flock of 20 individuals flying over the site. The autumn migration period for Golden Plover is typically September to November, and this record therefore relates to wintering birds.

The breeding and non-breeding buffer zone recommended by Goodship and Furness (2022) is 200m-500m. Based on field survey observations, only wintering and Golden Plovers on migration occur near the Site. They were not observed foraging within the 200m buffer zone of the proposed turbines and over the 8 years of observations, Golden Plovers were observed foraging within the 500m buffer once (in 2025).

***Hen Harrier***

*Vantage Point Survey*

A total of five Hen Harrier (Circus cyaneus) observations were recorded during the survey period. Flightlines were recorded in Winter 2021/2022 (November 2021), Summer 2022 (June and July 2022), and Winter 2022/2023 (February 2023). Each flightline recorded a single individual. Hen Harrier flightlines were concentrated in the east of the proposed Wind Farm site, often adjacent to areas of cutover peatland. Flightlines were recorded in the vicinity of proposed turbines T01, T03, and T08.

The two winter records indicate that the site is visited on occasion by wintering birds. A single observation (7 Feb 2023) of a bird dropping into vegetation around dusk suggested a possible roost. However, based on no further observations it is concluded that the site is not regularly used as a winter roost. Anecdotal records suggest the presence of a roost ca 3.5km from the site.
Hen Harrier were not recorded during the winter walkover, breeding walkover, or breeding raptor surveys.

In a study on Hen Harriers by University College Cork, the maximum foraging range for female Hen Harriers 7.5km and for male Hen Harriers was found to be 11.4km (Irwin et al. 2012). Goodship and Furness (2022) found that the disturbance range for Hen Harrier is 300-750m during the breeding and non-breeding seasons.

**Kingfisher**
There were no records of Kingfisher during Vantage Point Surveys. A single observation of Kingfisher was observed along the Cushina River in the central part of the site during December 2021 during a Winter Walkover Survey. No other observations throughout the survey period. No observations of Kingfisher during the breeding walkover surveys.

**Merlin**
Merlin was recorded on two occasions during the survey period on Vantage Point Surveys, once in December 2021 and once in March 2022. A single bird was recorded on each occasion. Merlin were not observed during the winter walkover, breeding walkover, or breeding raptor surveys.

**Peregrine Falcon**
*Vantage Point Survey*
Two Peregrine (*Falco peregrinus*) flightlines were recorded during the winter 2021/2022 season, one in November 2021 and the other in March 2022. Both flightlines recorded an individual bird flying within the proposed Wind Farm site boundary (eastern part of the proposed development site) in proximity to T08 and T09. Merlin were not observed during the winter walkover, breeding walkover, or breeding raptor surveys.

**Whooper Swan**
*Vantage Point Survey*
Three Whooper Swan flightlines (*Cygnus cygnus*), an Annex I listed species, were recorded over the two-year survey period. One flightline (4 birds) was recorded in November 2021, one flightline (7 birds) in December 2022, and one flightline (8 birds) in March 2023. All Whooper Swan flightlines were recorded across the northern part of the site and two of them were within rotor height. Whooper Swans were not observed foraging or roosting within the site. A flock of Whooper Swans are known to occasionally forage in farmland areas adjacent the River Figile to the southeast of the site (River Barrow (Monasterevin-Portarlington) IWEBS Site Code OS 301). Whooper Swan were not observed during winter or breeding walkover surveys.

#### *3.2.2.4 Fish*

The fish community as sampled within and immediately adjacent to the Site is dominated by coarse fish, while small numbers of brown trout and lampreys (EU Annex II species) are present.

The Cushina River was also surveyed approximately 1.8rkm upstream of the Proposed Development. At this location Atlantic Salmon, Brown Trout and Brook lamprey (all EU Annex II species) were recorded. The habitats here are noted as being very suboptimal for salmonids and lampreys. However, potential spawning habitat for lamprey at this location was found to be present.

Two locations downstream of the Site were also sampled. Both of these sampling sites were dominated by coarse fish. Small numbers of Atlantic Salmon were recorded at one of these sites in 2021 but not in 2024. In addition, Brook Lamprey was present at both locations.

The fish community recorded was again dominated by coarse fish species. The most abundant species was Minnow. Three-spined stickleback were recorded in small numbers. Small numbers of Brook lamprey were also present. Salmonids were recorded during the 2021 survey but not in the 2024 survey. This does not mean they were absent, but they are present in very low numbers in suboptimal habitat here and were not detected during the September 2024 survey. The river levels were slightly lower during the 2021 survey, and this may have affected sampling efficiency.

#### *3.2.2.5 Invertebrates*

Marsh Fritillary (*Euphydryas aurinia*) was recorded within one of the hectads (N61) with which the extreme east of the Wind Farm Site overlaps. No suitable breeding habitat was identified within the Site. As a result it is considered unlikely that this species occurs within the Site as no suitable habitat is present.

White-clawed crayfish (*Austropotamobius pallipes*) and Freshwater Pearl Mussel (*Margaritifera margaritifera*) (EU Annex II species) were not recorded within, upstream or downstream of the Site during the surveys.

Desmoulin's Whorl Snail (*Vertigo (Vertigo) moulinsiana*) was recorded at Bergin's Bridge in 1971. This bridge will be crossed by the GCR as part of the Proposed Development.

### 3.3 IS THE PROJECT NECESSARY TO THE MANAGEMENT OF EUROPEAN SITES

Under the Habitats Directive, projects that are directly connected with or necessary to the management of a European site do not require AA. For this exception to apply, management is required to be interpreted narrowly as nature conservation management in the sense of Article 6(1) of the Habitats Directive. This refers to specific measures to address the ecological requirements of annexed habitats and species (and their habitats) present on a site(s). The relationship should be shown to be direct and not a by-product of the project, even if this might result in positive or beneficial effects for a site(s).

The primary purpose of the proposed development is not the nature conservation management of European sites, but to develop a wind farm. Therefore, the proposed development is not considered by the Habitats Directive to be directly connected with or necessary to the management of European sites.

### 3.4 IDENTIFICATION OF EUROPEAN SITES

This section of the screening process identifies and describes the European sites within the potential zone of influence of the Proposed Development. The ecological receptors in Table 8 were taken into account when determining the Zone of Influence. Based on these ecological receptors and the European sites in the vicinity, an adequate Zone of Influence is assessed to be 20km. Taking a precautionary approach the Zone of Influence for the Proposed Development was set at 30km.

**Table 7 Ecological receptors taken into account to inform Zone of Influence**

| Ecological Receptor | EU Protection | Zone of Influence | Comment/European Sites within ZOI |
|---|---|---|---|
| **River Barrow and River Nore SAC** | EU Habitats Directive | Downstream | Includes all aquatic Annex II species it supports e.g. Desmoulin's snail, White-Clawed Crayfish, Lamprey etc. |
| **Eurasian Otter** | Annex II EU Habitats Directive | SPA within foraging range - 20km | Max. range for foraging along rivers for male Otters is 20km. ZOI is likely to include River Barrow and River Nore SAC Otter population. |
| **Golden Plover** | Annex I EU Birds Directive | | Nearest SPA with Golden Plover as SCI is located approximately 41km to the north-west, Lough Iron SPA.<br>Wintering IWeBS site approx. 180m to the south-east.<br>Field observations indicate feeding within approx. 1km to the east and south-east along the River Figile. Observations were predominantly in October and November suggesting this area is used as a staging area for birds on migration to main wintering grounds. No regular connectivity between the Golden Plover onsite and any SPA was identified. |
| **Hen Harrier** | Annex I EU Birds Directive | Nearest SPA – 20km | The nearest SPA for which Hen Harrier is an SCI is the Slieve Bloom SPA [004160] located 19.6km to the south-west. It is determined there is no connectivity between the proposed Wind Farm and the SPA during the breeding season as the Proposed Development Site lies outside of the breeding foraging range of the Hen Harrier. However, as Hen Harrier disperse from their upland breeding sites to lowland areas during winter there is a possibility for birds associated with SPAs to be interacting with the Proposed Wind Farm site during winter. |
| **Kingfisher** | Annex I EU Birds Directive | n/a | Nearest SPA for this species is the River Nore SPA approximately 32km to the south-west from the Proposed Development Site at the nearest point. This site is designated for Kingfisher which hold territories in the site. The species was rarely encountered during the bird surveys. This species is known to rarely move from their territory (www.birdwatchireland.ie). Hence, it can be concluded that there is no connectivity between the Proposed Development site and the Kingfisher in this SPA. |

| Ecological Receptor | EU Protection | Zone of Influence | Comment/European Sites within ZOI |
|---|---|---|---|
| **Merlin** | Annex I EU Birds Directive | n/a | This species was only very infrequently recorded at the Site. The nearest SPA for this species is 42km to the east in the Wicklow Mountains SPA [0004040]. There is no evidence of regular connectivity between the Proposed Wind Farm Site and this SPA. |
| **Peregrine Falcon** | Annex I EU Birds Directive | n/a | Nearest SPA for this species is 42km to the east in the Wicklow Mountains SPA [0004040]. The results of the bird surveys show a low use of the site by this species. Hence, there is no evidence of regular connectivity between this SPA and the Proposed Development Site for this species. |
| **Whooper Swan** | Annex I EU Birds Directive | 5km | The results of the latest International Swan Census show that Whooper Swans are becoming more abundant in the midlands of Ireland than in previous years. In general, the foraging range of wintering Whooper Swan from night roosts is estimated to be less than 5km (Scottish Natural Heritage, 2016), but this can vary depending on site and landscape. There are no SPAs for Whooper Swan within 5km of the Proposed Development. The nearest SPA for Whooper Swans is Lough Iron SPA, approx. 41km to the north-west. There is no evidence of connectivity between the Proposed Wind Farm and this SPA. |

Fourteen European sites occur within a 30km radius of the proposed development as presented in Table 9 and Figure 7 below. Thirteen of these sites are designated Special Areas of Conservation (SACs) designated for the protection of habitats and or species listed on Annex I and Annex II of the EU Habitats Directive. One site is a designated Special Area of Conservation designated for the protection of birds as per the EU Birds Directive.

Further details of these fourteen SACs are presented in Table 8 below where the information presented provides sufficient evidence to screen out some of the European sites from further assessment.

**Table 8: Summary of European Sites within 15km of the proposed development Site.**

| European Site | Distance from proposed development Site | Hydrological / Ecological connectivity to proposed development Site |
|---|---|---|
| **River Barrow and River Nore SAC (Site Code: 002162)** | The SAC occurs ca 2.3km (nearest point) (approximately 6rkm hydrological downstream distance) to the south of the proposed development Site. | The Proposed Development Site lies within the catchment of the River Barrow.<br>The Proposed Development is hydrologically connected to the River Barrow and River Nore SAC via the Cushina and Figile Rivers which discharge into the SAC ca 6rkm downstream of the proposed development.<br>The underground cable route includes a crossing of the River Barrow within the SAC at Baylough Bridge. It is proposed to cross by means of horizontal directional drilling (HDD).<br>Works to facilitate turbine transport to the Site are only required at one watercourse crossing where a new bridge is to be constructed at the Philipstown River near Dangean approximately 29rkm upstream of the River Barrow and River Nore SAC.<br>The Cushina River flows east through the proposed development Site and exits from the south-east of the Site. It flows for approximately 290m from the Site before entering the Figile River which flows south. From this point, the Figile continues southwards and enters the River Barrow and River Nore SAC approx. 5.8rkm to the south-east and enters the River Barrow 450m south of this point.<br>Various drainage ditches within the Site discharge to the Cushina River. |
| **Mountmellick SAC (Site Code: 002141)** | The SAC occurs ca 10.6km to the south-west of the proposed development Site. No ecological connection between the SAC and the wind farm Site has been identified. | This SAC comprises a disused stretch of the Grand Canal between Dangan's Bridge and Skeagh Bridge, approximately 3km east of Mountmellick, Co. Laois. No source-pathway-receptor link, hydrological or otherwise, has been identified between this SAC and the Proposed Development. This SAC does not need to be further assessed. |
| **The Long Derries, Edenderry SAC (Site Code: 000925)** | The SAC occurs ca 13.8km to the north-east of the proposed development Site. No ecological connection between the SAC and the wind farm Site has been identified. | This SAC comprises primarily of glacial gravels interspersed with loam and peat soil. It is designated for the protection of orchid-rich calcareous grasslands. The SAC drains to the Figile River and lies upstream of the proposed development. No source-pathway-receptor link, hydrological or otherwise, has been identified between this SAC and the proposed development. This SAC does not need to be further assessed. |

| European Site | Distance from proposed development Site | Hydrological / Ecological connectivity to proposed development Site |
|---|---|---|
| **Slieve Bloom Mountains SPA (Site Code: 004160)** | This SPA occurs ca. 19.6km to the south-west of the Proposed Development. | The Slieve Bloom Mountains SPA supports breeding Hen Harrier, the only SCI for this designated site. While the Proposed Development lies outside of the foraging range for breeding Hen Harrier (11.5km) it is within range of wintering Hen Harrier which generally disperse from the breeding grounds to lowland wintering areas. There is a potential link between wintering Hen Harriers and the SPA. |
| **Slieve Bloom Mountains SAC (Site Code: 000412)** | This SAC occurs ca. 23km to the south-west of the Proposed Development. | This Slieve Bloom Mountains SAC is designated to protect Wet Heath, Active Blanket Bogs and Alluvial Forest Annex I habitats. There is no connectivity between these habitats in the Slieve Bloom Moutnains SAC and the Proposed Wind Farm Site. No source-pathway-receptor has been identified for this SAC. This SAC does not need to be further assessed. |
| **Pollardstown Fen SAC (Site Code: 000396)** | This SAC lies approximately 15.5km to the east of the Proposed Development. | Pollardstown Fen SAC is designated for three Annex II habitats and three Annex II species. These are : [7210] Cladium Fens*, [7220] Petrifying Springs*, [7230] Alkaline Fens, [1013] Geyer's Whorl Snail (*Vertigo geyeri*), [1014] Narrow-mouthed Whorl Snail (*Vertigo angustior*) and [1016] Desmoulin's Whorl Snail (*Vertigo moulinsiana*). Although Pollardstown Fen SAC is within the same catchment as the Proposed Development (the Barrow Catchment), they are within different sub-catchments and there is no direct connectivity, hydrological or otherwise between them. No source-pathway-receptor link has been identified. This SAC does not need to be further assessed. |
| **Mouds Bog SAC (Site Code: 002331)** | This SAC lies approximately 17km to the east of the Proposed Development | This SAC has been designated for the following Qualifying Interests: [7110] Raised Bog (Active)*, [7120] Degraded Raised Bog, [7230] Alkaline Fens, [1016] Desmoulin's Whorl Snail (*Vertigo moulinsiana*), [1065] Marsh Fritillary (*Euphydryas aurinia*), and [7150] Rhynchosporion Vegetation. Part of this SAC is within the same catchment as the Proposed Development (the Barrow Catchment). However, it is within a different sub-catchment to the Proposed Development and there is no direct connectivity, hydrological or otherwise between the two sites. No source-pathway-receptor link has been identified between this SAC and the Proposed Development This SAC does not need to be further assessed. |

| European Site | Distance from proposed development Site | Hydrological / Ecological connectivity to proposed development Site |
|---|---|---|
| **Raheenmore Bog SAC (Site Code: 000582)** | This SAC lies approximately 20km to the northwest of the Proposed Development. | This SAC is designated for the protection of [7110] Raised Bog (Active)*, [7120] Degraded Raised Bog [7150] and Rhynchosporion Vegetation. It lies within a different catchment to the Proposed Development. there is no direct connectivity, hydrological or otherwise between the two sites. No source-pathway-receptor link has been identified between this SAC and the Proposed Development This SAC does not need to be further assessed. |
| **Ballyprior Grassland SAC (Site Code: 002256)** | This SAC lies approximately 22km to the south of the Proposed Development. | This SAC is designated for the Annex I habitat, [6210] Orchid-rich Calcareous Grassland*. There is no connectivity between this SAC and the Proposed Development Site, hydrological or otherwise. No source-pathway-receptor link has been identified. This SAC does not need to be further assessed. |
| **Ballynafagh Lake SAC (Site Code: 001387)** | This SAC lies approximately 24km to the north-east of the Proposed Development. | This SAC is designated for the following Qualifying Interests: [7230] Alkaline Fens, [1016] Desmoulin's Whorl Snail (*Vertigo moulinsiana*) and [1065] Marsh Fritillary (*Euphydryas aurinia*). Part of this SAC is within the same catchment as the Proposed Development (the Barrow Catchment). However, it is within a different sub-catchment to the Proposed Development and there is no direct connectivity, hydrological or otherwise between the two sites. No source-pathway-receptor link has been identified between this SAC and the Proposed Development. This SAC does not need to be further assessed. |
| **Ballynafagh Bog SAC (Site Code: 000391 )** | This SAC lies approximately 24km to the north-east of the Proposed Development. | This SAC is within the same catchment as the Proposed Development (the Barrow Catchment). However, it is within a different sub-catchment to the Proposed Development and there is no direct connectivity, hydrological or otherwise between the two sites. No source-pathway-receptor link has been identified between this SAC and the Proposed Development. This SAC does not need to be further assessed. |
| **Charleville Woods SAC (Site Code: 000571 )** | Approx. 26km to the west of the Proposed Development Site. | This SAC is designated for the protection of one Annex I habitat, 91E0] Alluvial Forests* [1016] and one Annex II species, Desmoulin's Whorl Snail (*Vertigo moulinsiana*). There is no connectivity between this SAC and the Proposed Development Site, hydrological or otherwise. No source-pathway-receptor link has been identified. This SAC does not need to be further assessed. |

| European Site | Distance from proposed development Site | Hydrological / Ecological connectivity to proposed development Site |
|---|---|---|
| **Split Hills and Long Esker SAC (Site Code: 001831)** | Approx. 26km to the north-west of the Proposed Development Site. | This SAC is designated for the Annex I habitat, [6210] Orchid-rich Calcareous Grassland*. There is no connectivity between this SAC and the Proposed Development Site, hydrological or otherwise. No source-pathway-receptor link has been identified. This SAC does not need to be further assessed. |
| **Clonaslee Eskers and Derry Bog SAC (Site Code: 000859)** | This SAC lies approximately 29km to the west of the Proposed Development. | This SAC is designated for the Annex I habitat, [6210] Orchid-rich Calcareous Grassland*. There is no connectivity between this SAC and the Proposed Development Site, hydrological or otherwise. No source-pathway-receptor link has been identified. This SAC does not need to be further assessed. |

**River Barrow and River Nore SAC [002162]**

Proposed Development is located ca 2.3km north of the SAC at its nearest point and approximately 6km upstream of the SAC. NPWS (2025) describe this SAC as consisting 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. Major towns along the edge of the site include Mountmellick, Portarlington, Monasterevin, Stradbally, Athy, Carlow, Leighlinbridge, Graiguenamanagh, New Ross, Inistioge, Thomastown, Callan, Bennettsbridge, Kilkenny and Durrow. The larger of the many tributaries include the Lerr, Fushoge, Mountain, Aughavaud, Owenass, Boherbaun and Stradbally Rivers of the Barrow, and the Delour, Dinin, Erkina, Owveg, Munster, Arrigle and King's Rivers on the Nore. This SAC contains excellent examples of a number of Annex I habitats, including the priority habitats Alluvial Forests [91E0] and Petrifying Springs [7220]. The site also supports populations of several important animal species, some of which are listed on Annex II of the Habitats Directive or listed in the Irish Red Data Book. These include Atlantic Salmon (*Salmo salar*), Otter (*Lutra lutra*), Freshwater Pearl Mussel (*Margaritifera margaritifera*) and White-Clawed Crayfish (*Austropotamobius pallipes*). The SAC is also recognised as being of ornithological importance for a number of EU Birds Directive Annex I species including Whooper Swan, Peregrine and Kingfisher. Nationally important numbers of Golden Plover and Bar-tailed Gowit are found in the SAC during the winter.

*Recognised Threats and Vulnerabilities*

NPWS (2025) note that the land use within the SAC consists mainly of agricultural activities – mostly intensive in nature and principally grazing and silage production. Slurry is spread over much of the area. Arable crops are also grown. The spreading of slurry and fertiliser poses a threat to the water quality of the salmonid river and to the populations of E.U. Habitats Directive Annex II animal species within the site. Many of the woodlands along the rivers in the SAC belong to old estates and support many non-native species. Fishing is a main tourist attraction along stretches of the main rivers and their tributaries and there are a number of Angler Associations, some with a number of beats. Fishing stands and styles have been erected in places. Both commercial and leisure fishing takes place on the rivers. Other recreational activities such as boating, golfing and walking, particularly along the Barrow towpath, are also popular. There is a golf course on the banks of the Nore at Mount Juliet and GAA pitches on the banks at Inistioge and Thomastown. There are active and disused sand and gravel pits throughout the SAC. Several industrial developments, which discharge into the river, border the site. New Ross is an important shipping port.

The main threats to the site and current damaging activities include high inputs of nutrients into the river system from agricultural run-off and several sewage plants, over-grazing within the woodland areas, and invasion by non-native species, for example Cherry Laurel (*Prunus laurocerasus*) and Rhododendron (*Rhododendron ponticum*). The water quality of the site remains vulnerable. Good quality water is necessary to maintain the populations of the Annex II animal species listed above. Good quality is dependent on controlling fertilisation of the grasslands, particularly along the Nore. It also requires that sewage be properly treated before discharge.

Drainage activities in the catchment can lead to flash floods which can damage the many Annex II species present. Capital and maintenance dredging within the lower reaches of the system pose a threat to migrating fish species such as lamprey and shad. Land reclamation also poses a threat to the salt meadows and the populations of legally protected species therein.

*3.4.1.1 Qualifying Interests*

The site has been selected for the protection of those habitats and species listed in Table 9.

**Table 9: Qualifying Interests (QIs) of the River Barrow and River Nore SAC (source: www.npws.ie)**

| EU Annex I Habitats | EU Annex II Species |
|---|---|
| Estuaries [1130] | Desmoulin's Whorl Snail (*Vertigo moulinsiana*) [1016] |
| Tidal Mudflats and Sandflats [1140] | Freshwater Pearl Mussel (*Margaritifera margaritifera*) [1029] |
| Reefs [1170] | White-clawed Crayfish (*Austropotamobius pallipes*) [1092] |
| *Salicornia and other annuals colonising mud and sand* [1310] | Sea Lamprey (*Petromyzon marinus*) [1095] |
| Atlantic Salt Meadows (Glauco-Puccinellietalia maritimae) [1330] | Brook Lamprey (*Lampetra planeri*) [1096] |
| Mediterranean Salt Meadows (Juncetalia maritimi) [1410] | River Lamprey (*Lampetra fluviatilis*) [1099] |
| Water courses of plain to montane levels with the Ranunculion fluitantis and Callitricho-Batrachion vegetation [3260] | Twaite Shad (*Alosa fallax fallax*) [1103] |
| European Dry Heaths [4030] | Atlantic Salmon (*Salmo salar*) [1106] |
| Hydrophilous Tall Herb [6430] | Otter (*Lutra lutra*) [1355] |
| Petrifying Springs with tufa formation (Cratoneurion) * [7220] | Killarney Fern (*Trichomanes speciosum*) [1421] |
| Old sessile oak woods with ***Ilex*** and ***Blechnum*** in the British Isles [91A0] | |
| Alluvial forests with ***Alnus glutinosa*** and ***Fraxinus excelsior*** (Alno-Padion, Alnion incanae, Salicion albae)* [91E0] | |

*Denotes Priority Habitat

**The Slieve Bloom Mountains SPA [004160]**

The Proposed Wind Farm lies approximately 19.6km to the north-east of this SPA. The NPWS (2015) site synopsis describes the site as having a near continuous ridge mountain blanket bog, with wet and dry heaths also well represented. It notes that this SPA is one of the strongholds for Hen Harrier in the country and is the easterly, regular population. The SPA is also a traditional breeding site for Peregrine Falcon and Merlin are also known to breed within the SPA.

*Recognised Threats and Vulnerabilities*

There are no threats and vulnerabilities listed for this SPA. However, general pressures and threats are identified in NPWS (2022) "*Conservation Objectives Supporting Document: Breeding Hen Harrier*". This document identifies the threats (within its breeding range) considered of most significance to the conservation of Hen Harrier in Ireland to be linked to forestry, agriculture and wind energy developments.

#### *3.4.1.2 Qualifying Interests*

The Slieve Bloom Mountains SPA has one Qualifying Interest:
A082 Hen Harrier (*Circus cyaneus*)

### 3.4.2 Conservation Objectives

The overall aim of the Habitats Directive is to maintain or restore the favourable conservation status of habitats and species of community interest. These habitats and species are listed in the Habitats and Birds Directives and Special Areas of Conservation and Special Protection Areas are designated to afford protection to the most vulnerable of them. These two designations are collectively known as the Natura 2000 network.

Favourable conservation status of a habitat is achieved when:

- its natural range, and area it covers within that range, are stable or increasing, and
- 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, and
- the conservation status of its typical species is favourable.

The favourable conservation status of a species is achieved 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, and
- the natural range of the species is neither being reduced nor is likely to be reduced for the foreseeable future, and
- there is, and will probably continue to be, a sufficiently large habitat to maintain its populations on a long-term basis

#### *3.4.2.1* Connectivity *Between the Proposed Development and European Sites*

##### *3.4.2.1.1 River Barrow and River Nore SAC*

The proposed development occurs 2.3km north of the boundary of the River Barrow and River Nore SAC (see Figure 7 below). The proposed development is located within the hydrological catchment of the SAC and therefore drainage and associated watercourses provide a potential impact pathway from the proposed development site to the SAC which is designated for a range of aquatic habitats and species.

##### *3.4.2.1.2 The Slieve Bloom Mountains SPA*

The Proposed Development lies approximately 19.6km to the north-east of this SPA. The SPA is designated for Hen Harrier (*Circus cyaneus*). This species is known to move from its upland breeding territory to lowland wintering sites around the coast and midlands of Ireland. Hen Harrier have been observed using the Site. Hence, there is a potential source-pathway-link between this SPA and the Proposed Development.

All other identified European sites have been screened out due the absence of any connectivity (see Table 8 above).

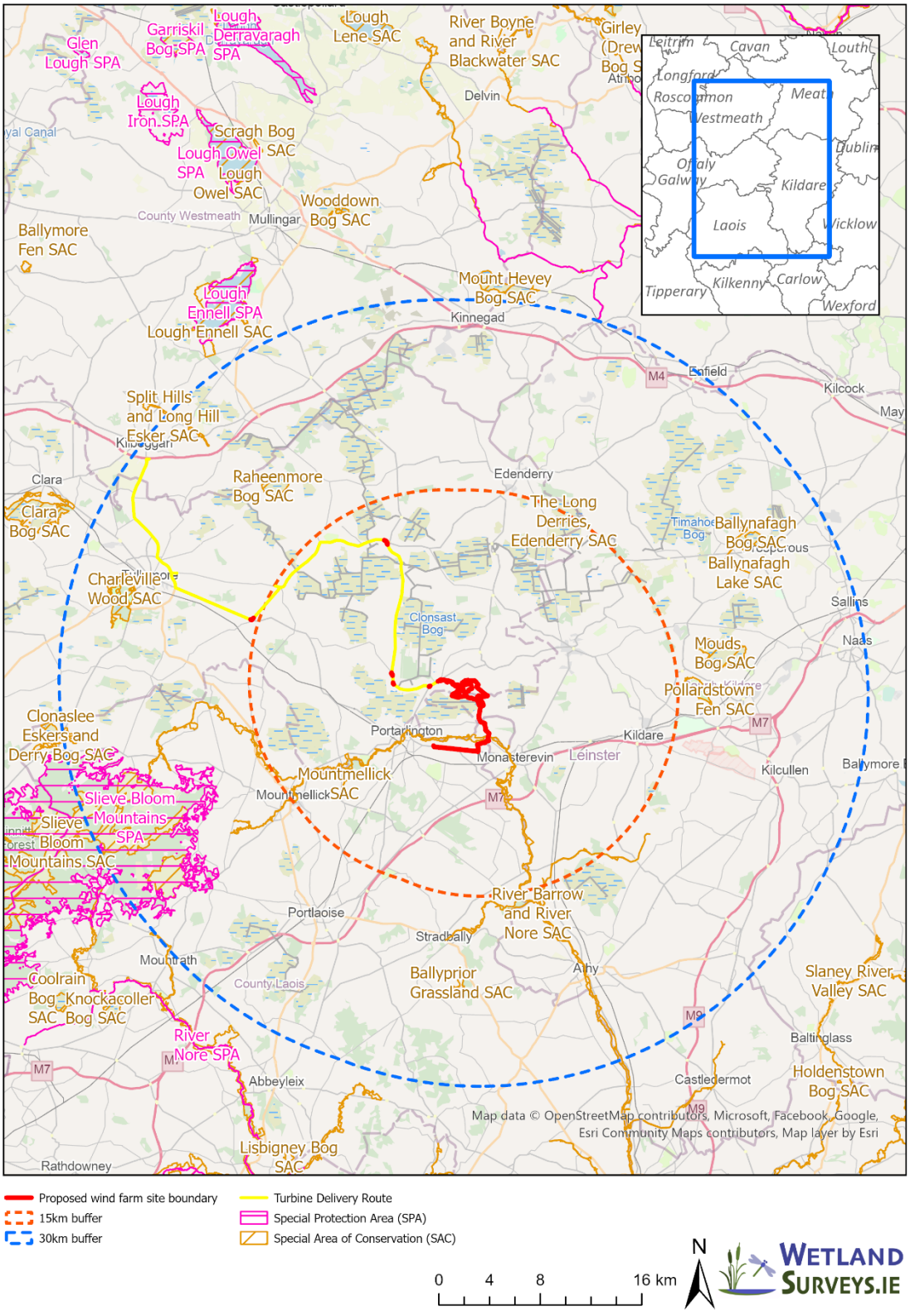



**Figure 7: European sites within 15km and 30km of the proposed development site.**

## 3.5 IDENTIFICATION AND DESCRIPTION OF POTENTIAL IMPACTS

Ecological receptors of the potentially affected European sites (River Barrow and River Nore SAC and the Slieve Blooms SPA) that are sensitive to likely impacts from the proposed development habitats and species for which the site is designated (see Section 3.4 above) are assessed here.

The characteristics, location, and scale of the development together with the ecological requirements of the conservation interests of the European site potentially affected have been taken into consideration in identifying potential impacts.

**Elements of the proposed Project with Potential to Give Rise to Significant Effects**

Considering the characteristics of the development as described in Section 3.1 above, it is considered that the following activities have the potential to give rise to significant effects:

*3.5.1.1 Construction Phase*

- Construction of turbines, site access tracks, construction compound, and other site infrastructure can result in habitat loss, and disturbance to resident species of fauna.
- Habitat loss can result in displacement of fauna, including EU Habitats Directive Annex II and Birds Directive Annex I species (e.g. Hen Harrier).
- Noise, vibration, and light during construction can lead to disturbance of resident fauna.
- Excavation and earthworks associated with the construction phase can give rise to sediment run-off and potentially impact aquatic receptors downstream.
- Potential run-off of hydrocarbons or other harmful substances can lead to deterioration of downstream water quality.
- Movement, management, and storage of unconsolidated material can give rise to pollution events in surrounding aquatic receptors. This can occur should material become entrained by surface water runoff during site works.
- Accidental spillages of cementitious material, fuels or other harmful substances can impact on sensitive aquatic ecosystems.

*3.5.1.2 Operational Phase*

- Operation of nine turbines could present a collision risk to bird species that use (or fly through) the proposed wind farm site.
- Operation of machinery and personnel has the potential to cause disturbance to sensitive fauna resident in the area due to noise, vibration, light etc.
- The presence of fencing around the perimeter of the Wind Farm may displace fauna species from utilising the proposed development site;
- Routine maintenance of the Wind Farm and associated electricity substation compound may cause temporary disturbance to wildlife; and
- Artificial lighting could potentially impact on resident mammal species, including Otter.

*3.5.1.3 Decommissioning Phase*

- Site works during decommissioning could give rise to similar type and scale of impacts as the construction phase.

### 3.5.2 Direct, Indirect or Secondary Impacts

The likelihood of significant effects through the implementation of the Proposed Wind Farm Development can be assessed under the following headings (as outlined by guidelines issued by the European Commission (2001)):

- Loss / reduction of habitat area.
- Disturbance/displacement to key species.
- Direct collision.
- Habitat or species fragmentation.
- Reduction in species density.
- Changes in key indicators of conservation value such as decrease in water quality and quantity.

In determining the potential for significant effects, the conservation requirements of the Qualifying Interests of each European site are considered together with the characteristics of the proposed development. The outcome of the assessment is described in the following paragraphs in relation to each site with reference to the different types of potential impact outlined above.

### 3.5.3 Identification of Potential Impacts

The potential for impacts to occur through the implementation of the proposed development can be assessed under the following headings:

- Loss / reduction of habitat area:

Total expected habitat loss from the Proposed Development is presented in Table 10 and Table 11.

**Table 10 Expected habitat loss arising from the Proposed Development**

| Habitat Code | Area of permanent habitat loss (ha) |
|---|---|
| **GA1** | 4.79 |
| **GA1 / GS4** | 3.27 |
| **GS4** | 0.178 |
| **PB4 (includes some PB4/GS4)** | 2.39 |
| **WD4** | 0.227 |
| **WN7** | 0.2 |
| **Total Permanent Habitat Loss** | **11.055** |

**Table 11 Expected temporary habitat loss arising from the Proposed Development**

| Habitat Code | Area of temporary habitat loss (ha) |
|---|---|
| **GA1** | 1.1 |
| **GA1 / GS4** | 2.11 |
| **PB4 (includes some PB4/GS4)** | 4.817 |
| **WD4** | 3.94 |
| **WN7** | 1.915 |
| **Total Temporary Habitat Loss** | **13.882** |

Direct habitat loss within a European site will not occur as the Proposed Development is located more than 2.3km (and approximately 6rkm downstream) from the nearest European site (River Barrow and River Nore SAC). Terrestrial habitats directly affected through either permanent or temporary habitat loss by the proposed development do not correspond with any EU Habitats Directive (HD) Annex I habitats.

Hen Harrier were observed occasionally flying over the Proposed Development Site during the survey period. Flightlines were concentrated near to areas of cutover peatland. There is a possibility, based on a single observation (on 7th Feb 2023) of one bird possibly roosting within the Site, that the Proposed Development Site is sometimes used as a wintering roost. However, the infrequency of such observations indicates that this, if it is a winter roost, is a very infrequently used one.

The winter foraging habitat of Hen Harrier includes cutover bog (PB4), semi-natural and non-intensively managed grassland (within the Site this corresponds to GA1, GA1/GS4 and GS4). Hence, potential permanent loss of winter foraging habitat for Hen Harrier is expected to be approximately 5.84ha. There is expected to be a further temporary loss of 6.93ha, some of which may revert to suitable foraging habitat during the operational phase of the Proposed Development. The following habitats are considered suitable foraging habitat for Hen Harrier within the Site: GA1/GS4, GS4, PB1, PB4, PB4/GS4 and PB4/WN7 of which there is a total of 103.5ha within the Site. The Proposed Development will result in the permanent habitat loss of approximately 5.84ha of these habitats which is approx. 5.6% of the available suitable habitat within the Site. It is concluded, that, due to the high proportion of remaining suitable habitat and the low frequency of Hen Harrier observations, that habitat loss will not have a significant effect on this species, and hence will not have a likely significant effect on the Conservation Objectives of the Slieve Bloom Mountains SPA.

- Disturbance to key species:

Based on the risk to water quality and construction works at proposed river crossings, it is determined that there is potential for the Proposed Development to result in disturbance to Otter and other QI species of the downstream River Barrow and River Nore SAC. No evidence of breeding or resting sites were found within the Proposed Development and only two signs of Otter presence were found at one location along the Cushina River at the edge of the Site. Results of the Otter survey conducted onsite indicate that the Cushina River is used only infrequently by Otter and no evidence of usage at the Philipstown crossing was found. However, records of Otter spraint and slides were recorded in 2015 (NBDC online records) along the Philipstown River both upstream and downstream of the proposed TDR crossing. It is possible that the river is still occasionally used. In addition, the Philipstown River has been assessed as being of 'Poor' ecological status or potential following the most recent WFD monitoring (River Waterbody WFD Status 2016-2021) which indicates that it does not provide suitable foraging habitat for Otter. Hence it is unlikely that Otter use this river with great frequency. A 50m set-back of all development from all natural watercourses has been applied (except at crossing points). Given the low usage of the Site by Otter as determined from the baseline, significant disturbance effects are not considered likely.

While is some potential to cause disturbance to Hen Harrier (the SCI of the Slieve Blooms SPA), it is considered that the low frequency of observations onsite means that any disturbance during construction is likely to be a short-term, insignificant effect on this species.

During the Operational phase of the Proposed Wind Farm there is the potential for the wind turbines to present a barrier-effect for Hen Harriers. This could possibly result in avoidance behaviour of the turbines which would increase energy output of foraging Hen Harriers. However, the paucity of observations confirm that the Site is not a frequent hunting ground of either breeding or wintering Hen Harriers. Hence, there are no likely significant effects on foraging Hen Harriers and hence there are no likely significant effect on the conservation objectives of the Slieve Bloom Mountains SPA.

- Habitat or species fragmentation:

The proposed development site is in an agricultural area deemed to be of relatively low ecological importance. The proposed development will not give rise to fragmentation of any semi-natural habitat within European sites or of any habitat used by a European protected species. The impacts on the rivers within the Proposed Development are not expected to cause fragmentation of habitat as where new crossings are proposed, these will be by clearspan bridges which allow for the continued use of the riparian habitat. These clear-span bridges will leave the natural bed and banks undisturbed. It is therefore concluded that there is no potential for fragmentation impacts on any of the three SACs which have been identified.

- Reduction in species density:

A number of QI species of the River Barrow and River Nore SAC were recorded from the Cushina River, namely Otter, Brook Lamprey and Atlantic Salmon. The Proposed Development presents a risk to water quality within the Cushina River and, if water quality deteriorated, this could result in a reduction in density of these QI species.

- Direct Collision/Mortality

The Collision Risk Modelling (CRM) report (see Appendix 13) which was conducted to inform the Ornithology Chapter of the EIAR, predicts that there will be 0.001 collisions with Hen Harrier per year. This predicts that one Hen Harrier would collide with the turbines every 1,000 years. Hence, it is concluded that the operation of the Proposed Wind Farm will not have a likely significant effect the Conservation Objectives of the Slieve Blooms SPA.

Direct mortality of any of the Annex II species of the River Barrow and River Nore SAC are not expected as there will be 50m set-back buffers from the river and no instream works in either the Cushina or Philipstown Rivers.

- Changes in key indicators of conservation value:

A principal indicator of conservation value within the River Barrow and River Nore SAC is hydrological integrity and water quality (and quantity). Should the proposed development give rise to significant aquatic pollution, there is potential for this to have a likely significant effect on water quality in the SAC via hydrological connectivity between the proposed development site and the SAC. Drains and watercourses that occur in proximity to the development provide a potential impact pathway whereby potential pollutants could be transported from the proposed development to the SAC. There is therefore potential for impacts on downstream waterbodies and associated aquatic habitats and species of the River Barrow and River Nore SAC to occur. No such pathway was identified for the Slieve Blooms SPA. A further description of the potential impacts that could arise from the proposed development relevant to the Qualifying Interests of the River Barrow and River Nore SAC is provided in the following paragraphs.

### 3.6 DESCRIPTION OF LIKELY IMPACTS

Potential impacts would mainly relate to the effects on aquatic communities from sediment inputs during construction. Sediment loss from the construction site could arise from earth works associated with: access tracks, turbine foundation works, trenching (site ducting, internal cable trenches, proximity to drain and watercourse crossings), and installation of site drainage features and the clear-span bridge over the Cushina River. There is also some potential for sediment release associated with machinery movements during the construction and disassembly of the turbines and associated infrastructure.

Excessive sediment losses to downstream watercourses could locally give rise to increased suspended solids and bottom sedimentation in small streams, and could negatively affect aquatic habitat quality through smothering of macroinvertebrate habitats and fish nursery areas when deposited. Elevated concentrations of suspended solids within the water column also reduce water quality and are potentially damaging to gills of salmonid fish and/or benthic macroinvertebrates. Lamprey nursery areas are unlikely to be adversely affected by small amounts of instream sedimentation as juveniles (ammocoetes) inhabit areas of silt deposition during their nursery stage. However, lampreys do depend on clean gravels for spawning, similar to salmonids. Such negative impacts on these Annex II species would correspond to a likely significant effect on the River Barrow and River Nore SAC.

The nature of the works means there is also potential for the loss of hydrocarbons (diesel, oils and hydraulic fluid) and/or wet concrete during the construction phase. Hydrocarbon spills from poorly secured or non-bunded fuel storage areas, leaks from vehicles or plant or spills during re-fuelling can all lead to the escape of hydrocarbons from construction sites to watercourses. These spills can pose a risk of fish tainting downstream or, if large enough, fish and invertebrate kills. Concrete spills, or release of concrete wash-out or wheel-wash water to nearby watercourses is potentially toxic to instream fauna, and can cause fish and invertebrate kills downstream, if in high concentration. Salmonids and lamprey were recorded circa 50m downstream of the proposed development Site (as part of the Aquatic Ecology surveys that were conducted to inform the EIAR – see Appendix 4). Pre-mitigation it is considered that there is a likely, significant effect on downstream water quality and surface water-dependent habitats and species of the River Barrow and River Nore SAC.

The nature of the works also have the potential to have a significant effect on the flow regime of the surface water. The bridges over the Cushina and Philipstown Rivers are designed in line with consultation feedback and in accordance with Inland Fisheries Ireland (IFI) 2016 'Guidelines on Protection of Fisheries During Construction Works in and Adjacent to Waters' and NRA (2008) 'Guidelines for the Crossing of Watercourses During the Construction of Road Schemes'. With such a suitably designed bridge, there will be no likely effect on flows within watercourses and the risk of flooding will not be increased as a result of the proposed bridge. In the long-term, the effect on the surface water flow was assessed to be a likely, insignificant effect.

## 3.7 OUTCOME OF SCREENING

The outcome of screening is presented in relation to the relevant European sites in the following paragraphs.

### 3.7.1 River Barrow and River Nore SAC [002162]

Following due consideration to the scale, location, and characteristics of the proposed development together with the ecological requirements of the habitats and species of the SAC it has been established that there is potential for significant effects on the conservation status of the River Barrow and River Nore SAC. The hydrological connectivity between the proposed development site and the SAC provides a pathway for potential impacts on aquatic habitats and species of the SAC. Likely significant effects on the qualifying features of the SAC therefore cannot be ruled out and require further consideration in the Appropriate Assessment. The potential for significant effects on individual Qualifying interests of the SAC is summarised in Table 12 below. It is concluded that the River Barrow and River Nore SAC is screened in for Appropriate Assessment and potential significant effects are considered further in Section 4 below.

**Table 12: Outcome of AA Screening on individual Qualifying Interest features of the River Barrow and River Nore SAC**

| EU Annex I Habitat [EU Code] | Potential for likely significant effects (in the absence of mitigation) | Potential for significant effects |
|---|---|---|
| Estuaries [1130] | No – these habitats are restricted to the tidal sections of the River Barrow and the River Nore located approximately 99km downstream of the development site at the nearest point. Considering distance and likely dispersal of any potential pollutants, there is no potential for likely significant effects. | No |
| Tidal Mudflats and Sandflats [1140] | | |
| Reefs [1170] | | |
| *Salicornia and other annuals colonising mud and sand* [1310] | | |
| Atlantic salt meadows (Glauco-Puccinellietalia maritimae) [1330] | | |
| Mediterranean salt meadows (Juncetalia maritimi) [1410] | | |
| Water courses of plain to montane levels with the *Ranunculion fluitantis* and *Callitricho-Batrachion* vegetation [3260] | In the absence of mitigation, the proposed development may potentially lead to a local deterioration of in local water quality. The main area of this habitat for which the SAC is designated is located in the Kings tributary of the River Nore. It is noted that the full distribution of this habitat in the SAC is not currently known (NPWS 2025). This habitat occurs in areas of good water quality, the water quality in the Figile sub-catchment is not sufficient to support this habitat type. However, pre-mitigation the effects on the water dependent designated site (River Barrow and River Nore SAC) due to potential effects on water quality are considered negative, indirect, short term and significant (see Appendix 11). Hence, likely significant effects on this QI cannot be ruled out at this stage. | Yes |
| European Dry Heaths [4030] | This habitat has not been mapped within the SAC but is indicated as occurring on the steep, free-draining, river valley sides especially of the River Barrow and tributaries in the foothills of the Blackstairs Mountains (NPWS, 2025). Considering the characteristics and requirements of the habitat and its distance from the Proposed Wind Farm, it is concluded that there is no potential for significant effects. | No |
| Hydrophilous tall herb fringe communities of plains and of the montane to alpine levels [6430] | This habitat has not been mapped within the SAC and its distribution within the SAC is currently unknown. NPWS (2025) notes that it is considered to occur in association with riparian woodlands, unmanaged river islands and in narrow bands along the floodplain of slow-flowing stretches of river. Pre-mitigation the effects on the water dependent designated site (River Barrow and River Nore SAC) due to potential effects on water quality are considered negative, indirect, short term and significant (see Appendix 11). Hence, likely significant effects on this QI cannot be ruled out at this stage. | Yes |
| Old sessile oak woods with *Ilex* and *Blechnum* in the British Isles [91A0] | This terrestrial woodland habitat type does not occur in proximity to the proposed development site (the nearest is approximately 96km downstream of the proposed development Site). This type of woodland is not dependent on surface water quality. Considering the nature and scale of the proposed development, the requirements of this habitat type, and the distance removed from the development site, it is concluded that there is no potential for significant effects. | No |

| EU Annex I Habitat [EU Code] | Potential for likely significant effects (in the absence of mitigation) | Potential for significant effects |
|---|---|---|
| Alluvial forests with Alnus glutinosa and Fraxinus excelsior (Alno-Padion, Alnion incanae, Salicion albae) [91E0] | This terrestrial woodland habitat types do not occur in proximity to the proposed development site (the nearest Alluvial forest is approximately 26km downstream of the proposed development Site). However, considering that without mitigation there is potential for likely effects on the surface water quality, there is potential for effects on alluvial forests. Considering the nature and scale of the proposed development, the requirements of this habitat type, and the likely significant effects pre-mitigation on surface water quality, likely significant effects for this habitat cannot be ruled out at this stage. | Yes |
| Petrifying Springs with tufa formation (Cratoneurion)* [7220] | The exact distribution of this habitat is not mapped within the SAC (NPWS 2025) and its extent within the SAC remains unknown. This Annex I habitat was not present within the proposed Wind Farm Site. The groundwater vulnerability of the site is mapped as low-moderate. This groundwater fed habitat is very sensitive to changes in water quality and quantity and land management (Denyer *et al.*, 2023). The unmitigated effects on groundwater are assessed as ranging from imperceptible to slight/moderate (see Appendix 12). Hence, likely significant effects cannot be ruled out at this stage. | Yes |
| *Vertigo moulinsiana* (Desmoulin's Whorl Snail) [1016] | This species is restricted to calcareous wetlands and is threatened from habitat loss. The nearest population identified in the SAC Conservation Objectives document (NPWS 2025) is near Borris, Co. Carlow and is sufficiently removed approximately 70km downstream of the proposed Wind Farm Site such that any likely significant effects on water quality are likely to have dispersed at this distance. Suitable habitat for this species was not identified within the Site. Old records within the area exist but are not associated with the SAC, instead they are associated with the canal network. | No |
| *Margaritifera margaritifera* (Freshwater Pearl Mussel) [1029] | This species is sensitive to effects on water quality. However, no impact pathways were identified between the Proposed Wind Farm Site and the listed populations of the SAC in Mountain River, Ballyroughan Little and the River Nore) (NPWS, 2025) due to its occurrence within different sub-catchments. Aquatic ecology surveys of the Cushina and Figile river found no evidence of FWPM. This species is screened out due to no potential for likely significant effects. | No |
| *Austropotamobius pallipes* (White-clawed Crayfish) [1092] | White-clawed crayfish have been recorded along almost the entire length of non-tidal water within the River Barrow and River Nore from the most upstream points at Clarahill Crossroads, near Clonaslee and downstream of Camross to Graiguenamanagh and Thomastown (NPWS 2025). This species is dependent on good water quality and high dissolved oxygen. Even though this species was not recorded at any of the sites surveyed as part of the aquatic ecology surveys, it is screened in due to potential risk to water quality downstream of the development site that could potentially give rise to significant effects. | Yes |
| *Petromyzon marinus* (Sea Lamprey) [1095] | The range in the Barrow catchment is limited to the lower reaches due to barriers to migration. – therefore is not present in these rivers of the Upper Barrow catchment. Due to the distance (99rkm) to the upper reaches of the River Barrow and the more local likely significant effects on water quality from the Proposed Development, likely significant effects on this species can be ruled out at this stage | No |

| EU Annex I Habitat [EU Code] | Potential for likely significant effects (in the absence of mitigation) | Potential for significant effects |
|---|---|---|
| *Lampetra planeri* (Brook Lamprey) [1096] | The exact distribution of these species is not mapped within the SAC (NPWS 2025). Lamprey depend on clean gravels on the river bed for breeding. Potential effects due to sedimentation of spawning beds cannot be ruled out. | Yes |
| *Lampetra fluviatilis* (River Lamprey) [1099] | | |
| *Salmo salar* (Salmon) [1106] | This species was recorded in the Cushina River during the Aquatic Ecology surveys conducted to inform the EIAR (see Appendix 4) and so can be assumed to pass through the proposed development Site on their upward and downward spawning migrations. The habitats within the Cushina and Figile surveyed were assessed as being sub-optimal for Salmon. The species is dependent on good water quality and clean gravel habitats for spawning. Given the hydrological connection between the proposed development Site and the SAC and the presence of Salmon within the Cushina upstream of the Site, potential effects due to sedimentation or water pollution cannot be ruled out. | Yes |
| *Lutra lutra* (Otter) [1355] | Evidence of Otter was recorded within the proposed development Site along the River Cushina. Otter are likely to occur in the Figile River and other rivers connected downstream of the development site, including the River Barrow. Considering the nature and scale of the proposed development, and the hydrological connectivity between the proposed development and the SAC, pre-mitigation the proposed development could potentially lead to a deterioration of water quality downstream which could cause significant effects on foraging habitat for Otter. No evidence of Otter was found in Philipstown River in the vicinity of the proposed new bridge. The low fisheries potential and low ecological status of this river indicates the low potential for Otter to occur at this locations and significant effects here are not likely. | Yes |
| Twaite Shad (*Alosa fallax fallax*) [1103] | This species is mostly confined to the tidal reaches of the River Barrow and River Nore within the SAC. Considering the distance removed from the development and the likelihood of any pollutants arising from the Proposed Development to be dispersed at this downstream distance, site it is concluded that potential significant effects on the species habitat are not likely. | No |

**CONCLUSION OF AA SCREENING**

In conclusion, there is no likelihood of significant effects on the following European Sites

- Mountmellick SAC [002141]
- The Long Derries, Edenderry SAC [000925]
- Slieve Bloom Mountains SPA [004160]
- Pollardstown Fen SAC [000396]
- Mouds Bog SAC [002331]
- Raheenmore Bog SAC [000582]
- Ballyprior Grassland SAC [002256]
- Ballynafagh Lake SAC [001387]
- Ballynafagh Bog SAC [000391]
- Charleville Woods SAC [000571]
- Split Hills and Long Esker SAC [001831]
- Clonaslee Eskers and Derry Bog SAC [000859]

The above sites have been screened out from further assessment.

However, the likelihood of significant effects cannot be excluded for the River Barrow and River Nore SAC [002162]. It is the considered view of the authors that Stage 2 Appropriate Assessment is required for the River Barrow and River Nore SAC [002162].

Further consideration of this SAC and the likely significant effects in the form of Stage 2 Appropriate Assessment is presented in Section 4 below.

# 4 STAGE 2: APPROPRIATE ASSESSMENT

This section of the NIS assesses the direct and indirect impacts of the proposed development on the European sites which fall within its zone of influence. For each of these European sites, the assessment below sets out the relevant ecological baseline information, the analysis of the potential impacts, the qualifying interests/special conservation interests at risk of these potential impacts, in view of the sites' conservation objectives, and the mitigation measures (if required) to avoid/reduce the effects of any potential impacts.

## 4.1 RIVER BARROW AND RIVER NORE SAC

As outlined in the previous sections, one European site, the River Barrow and River Nore SAC [Site Code: 002162], was identified as being potentially impacted by the proposed development. The SAC occurs ca 6rkm downstream to the south of the Proposed Development Site. The presence of drains and watercourses within and adjoining the proposed development site provides a potential impact pathway whereby pollutants could give rise to significant effects on the SAC. These effects are summarised below in Table 13.

**Table 13 Summary of likely significant effects on the screened-in European site, the River Barrow and River Nore SAC.**

| EU Annex I Habitat [EU Code] | Potential for likely significant effects (in the absence of mitigation) | Potential for significant effects |
|---|---|---|
| Estuaries [1130] | No – these habitats are restricted to the tidal sections of the River Barrow and the River Nore located approximately 99km downstream of the development site at the nearest point. Considering distance and likely dispersal of any potential pollutants, there is no potential for likely significant effects. | No |
| Tidal Mudflats and Sandflats [1140] | | |
| Reefs [1170] | | |
| *Salicornia and other annuals colonising mud and sand* [1310] | | |
| Atlantic salt meadows (Glauco-Puccinellietalia maritimae) [1330] | | |
| Mediterranean salt meadows (Juncetalia maritimi) [1410] | | |
| Water courses of plain to montane levels with the *Ranunculion fluitantis* and *Callitricho-Batrachion* vegetation [3260] | In the absence of mitigation, the proposed development may potentially lead to a local deterioration of in local water quality. The main area of this habitat for which the SAC is designated is located in the Kings tributary of the River Nore. It is noted that the full distribution of this habitat in the SAC is not currently known (NPWS 2025). This habitat occurs in areas of good water quality, the water quality in the Figile sub-catchment is not sufficient to support this habitat type. However, pre-mitigation the effects on the water dependent designated site (River Barrow and River Nore SAC) due to potential effects on water quality are considered negative, indirect, short term and significant (see Appendix 11). Hence, likely significant effects on this QI cannot be ruled out at this stage. | Yes |
| European Dry Heaths [4030] | This habitat has not been mapped within the SAC but is indicated as occurring on the steep, free-draining, river valley sides especially of the River Barrow and tributaries in the foothills of the Blackstairs Mountains (NPWS, 2025). Considering the characteristics and requirements of the habitat and its distance from the Proposed Wind Farm, it is concluded that there is no potential for significant effects. | No |
| Hydrophilous tall herb fringe communities of plains and of the montane to alpine levels [6430] | This habitat has not been mapped within the SAC and its distribution within the SAC is currently unknown. NPWS (2025) notes that it is considered to occur in association with riparian woodlands, unmanaged river islands and in narrow bands along the floodplain of slow-flowing stretches of river. Pre-mitigation the effects on the water dependent designated site (River Barrow and River Nore SAC) due to potential effects on water quality are considered negative, indirect, short term and significant (see Appendix 11). Hence, likely significant effects on this QI cannot be ruled out at this stage. | Yes |

| EU Annex I Habitat [EU Code] | Potential for likely significant effects (in the absence of mitigation) | Potential for significant effects |
|---|---|---|
| Old sessile oak woods with *Ilex* and *Blechnum* in the British Isles [91A0] | This terrestrial woodland habitat type does not occur in proximity to the proposed development site (the nearest is approximately 96km downstream of the proposed development Site). This type of woodland is not dependent on surface water quality. Considering the nature and scale of the proposed development, the requirements of this habitat type, and the distance removed from the development site, it is concluded that there is no potential for significant effects. | No |
| Alluvial forests with Alnus glutinosa and Fraxinus excelsior (Alno-Padion, Alnion incanae, Salicion albae) [91E0] | This terrestrial woodland habitat types do not occur in proximity to the proposed development site (the nearest Alluvial forest is approximately 26km downstream of the proposed development Site). However, considering that without mitigation there is potential for likely effects on the surface water quality, there is potential for effects on alluvial forests. Considering the nature and scale of the proposed development, the requirements of this habitat type, and the likely significant effects pre-mitigation on surface water quality, likely significant effects for this habitat cannot be ruled out at this stage. | Yes |
| Petrifying Springs with tufa formation (Cratoneurion)* [7220] | The exact distribution of this habitat is not mapped within the SAC (NPWS 2025) and its extent within the SAC remains unknown. This Annex I habitat was not present within the proposed Wind Farm Site. The groundwater vulnerability of the site is mapped as low-moderate. This groundwater fed habitat is very sensitive to changes in water quality and quantity and land management (Denyer *et al.*, 2023). The unmitigated effects on groundwater are assessed as ranging from imperceptible to slight/moderate (see Appendix 12). Hence, likely significant effects cannot be ruled out at this stage. | Yes |
| *Vertigo moulinsiana* (Desmoulin's Whorl Snail) [1016] | This species is restricted to calcareous wetlands and is threatened from habitat loss. The nearest population identified in the SAC Conservation Objectives document (NPWS 2025) is near Borris, Co. Carlow and is sufficiently removed approximately 70km downstream of the proposed Wind Farm Site such that any likely significant effects on water quality are likely to have dispersed at this distance. Suitable habitat for this species was not identified within the Site. Old records within the area exist but are not associated with the SAC, instead they are associated with the canal network. | No |
| *Margaritifera margaritifera* (Freshwater Pearl Mussel) [1029] | This species is sensitive to effects on water quality. However, no impact pathways were identified between the Proposed Wind Farm Site and the listed populations of the SAC in Mountain River, Ballyroughan Little and the River Nore) (NPWS, 2025) due to its occurrence within different sub-catchments. Aquatic ecology surveys of the Cushina and Figile river found no evidence of FWPM. This species is screened out due to no potential for likely significant effects. | No |
| *Austropotamobius pallipes* (White-clawed Crayfish) [1092] | White-clawed crayfish have been recorded along almost the entire length of non-tidal water within the River Barrow and River Nore from the most upstream points at Clarahill Crossroads, near Clonaslee and downstream of Camross to Graiguenamanagh and Thomastown (NPWS 2025). This species is dependent on good water quality and high dissolved oxygen. | Yes |

| EU Annex I Habitat [EU Code] | Potential for likely significant effects (in the absence of mitigation) | Potential for significant effects |
|---|---|---|
| | Even though this species was not recorded at any of the sites surveyed as part of the aquatic ecology surveys, it is screened in due to potential risk to water quality downstream of the development site that could potentially give rise to significant effects. | |
| *Petromyzon marinus* (Sea Lamprey) [1095] | The range in the Barrow catchment is limited to the lower reaches due to barriers to migration. – therefore is not present in these rivers of the Upper Barrow catchment. Due to the distance (99rkm) to the upper reaches of the River Barrow and the more local likely significant effects on water quality from the Proposed Development, likely significant effects on this species can be ruled out at this stage. | No |
| *Lampetra planeri* (Brook Lamprey) [1096] | The exact distribution of these species is not mapped within the SAC (NPWS 2025). Lamprey depend on clean gravels on the river bed for breeding. Potential effects due to sedimentation of spawning beds cannot be ruled out. | Yes |
| *Lampetra fluviatilis* (River Lamprey) [1099] | | |
| *Salmo salar* (Salmon) [1106] | This species was recorded in the Cushina River during the Aquatic Ecology surveys conducted to inform the EIAR (see Appendix 4) and so can be assumed to pass through the proposed development Site on their upward and downward spawning migrations. The habitats within the Cushina and Figile surveyed were assessed as being sub-optimal for Salmon. The species is dependent on good water quality and clean gravel habitats for spawning. Given the hydrological connection between the proposed development Site and the SAC and the presence of Salmon within the Cushina upstream of the Site, potential effects due to sedimentation or water pollution cannot be ruled out. | Yes |
| *Lutra lutra* (Otter) [1355] | Evidence of Otter was recorded within the proposed development Site along the River Cushina. Otter are likely to occur in the Figile River and other rivers connected downstream of the development site, including the River Barrow. Considering the nature and scale of the proposed development, and the hydrological connectivity between the proposed development and the SAC, pre-mitigation the proposed development could potentially lead to a deterioration of water quality downstream which could cause significant effects on foraging habitat for Otter. No evidence of Otter was found in Philipstown River in the vicinity of the proposed new bridge. The low fisheries potential and low ecological status of this river indicates the low potential for Otter to occur at this locations and significant effects here are not likely. | Yes |
| Twaite Shad (*Alosa fallax fallax*) [1103] | This species is mostly confined to the tidal reaches of the River Barrow and River Nore within the SAC. Considering the distance removed from the development and the likelihood of any pollutants arising from the Proposed Development to be dispersed at this downstream distance, site it is concluded that potential significant effects on the species habitat are not likely. | No |

### 4.1.1 Conservation Objectives

As described in Section 3.4.1 above detailed site-specific conservation objectives (SSCOs, version 2) for the SAC have been published (NPWS 2025).

The SSCOs for the following Qualifying Interest features of the SAC for which likely significant effects cannot be ruled out are presented in Table 14.

**Table 14: Overall SSCOs and associated attributes and targets for relevant Qualifying Interests (NPWS 2025).**

| **3260 Water courses of plain to montane levels with the Ranunculion fluitantis and Callitricho-Batrachion vegetation** | | |
|---|---|---|
| **To maintain the Favourable conservation condition of Water courses of plain to montane levels with the *Ranunculion fluitantis* and *Callitricho-Batrachion* vegetation in the River Barrow and River Nore SAC, which is defined by the following list of attributes and targets:** | | |
| **Attribute** | **Measure** | **Target** |
| Habitat Distribution | Occurrence | No decline, subject to natural processes |
| Habitat Area | Kilometers | Area stable or increasing, subject to natural processes |
| Hydrological regime: river flow | Metres per second | Maintain appropriate hydrological regimes |
| Hydrological regime: groundwater discharge | Metres per second | The groundwater flow to the habitat should be permanent and sufficient to maintain tufa formation |
| Substratum composition: particle size range | Millimetres | The substratum should be dominated by large particles and free from fine sediments |
| Water chemistry: minerals | Milligrammes per litre | The groundwater and surface water should have sufficient concentrations of minerals to allow deposition and persistence of tufa deposits |
| Water quality: suspended sediment | Milligrammes per litre | The concentration of suspended solids in the water column should be sufficiently low to prevent excessive deposition of fine sediments |
| Water quality: nutrients | Milligrammes per litre | The concentration of nutrients in the water column should be sufficiently low to prevent changes in species composition or habitat condition |
| Vegetation composition: typical species | Occurrence | Typical species of the relevant habitat sub-type should be present and in good condition |
| Floodplain connectivity | Area | The area of active floodplain at and upstream of the habitat should be maintained |
| **6430 Hydrophilous tall herb fringe communities of plains and of the montane to alpine levels** | | |
| **To maintain the favourable conservation condition of Hydrophilous tall herb fringe communities of plains and of the montane to alpine levels in the River Barrow and River Nore SAC, which is defined by the following list of attributes and targets:** | | |
| **Attribute** | **Measure** | **Target** |
| Habitat distribution | Occurrence | No declines, subject to natural processes |
| Habitat area | Hectares | Area stable or increasing, subject to natural processes |

| | | |
|---|---|---|
| Hydrological regime: flooding depth/height of water table | Metres | Maintain appropriate hydrological regimes |
| Vegetation structure: sward height | Centimetres | 30-70% of sward is between 40 and 150cm in height |
| Vegetation composition: broadleaf herb:grass ratio | Percentage | Broadleaf herb component of vegetation between 40 and 90% |
| Vegetation composition: typical species | Number | At least 5 positive indicator species present |
| Vegetation composition: negative indicator species | Occurrence | Negative indicator species, particularly non-native invasive species, absent or under control- NB Indian balsam (Impatiens glandulifera), monkeyflower (Mimulus guttatus), Japanese knotweed (Fallopia japonica) and giant hogweed (Heracleum mantegazzianum ) |
| **7220 Petrifying Springs with tufa formation (Cratoneurion)*** | | |
| **To maintain the Favourable conservation condition of Petrifying springs with tufa formation (Cratoneurion ) in the River Barrow and River Nore SAC, which is defined by the following list of attributes and targets:** | | |
| Habitat area | Square metres | Area stable or increasing, subject to natural processes |
| Habitat distribution | Occurrence | No decline. See map 6 for recorded location (in NPWS, 2025). |
| Hydrological regime: height of water table; water flow | Metres; metres per second | Maintain appropriate hydrological regimes |
| Water quality | Water chemistry measures | Maintain oligotrophic and calcareous conditions |
| Vegetation composition: typical species | Occurrence | Maintain typical species |
| **91E0 Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (Alno-Padion, Alnion incanae, Salicion albae)** | | |
| **To restore the Favourable conservation condition of Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (*Alno-Padion , Alnion incanae , Salicion albae* ) in the River Barrow and River Nore SAC, which is defined by the following list of attributes and targets:** | | |
| **Attribute** | **Measure** | **Target** |
| Habitat area | Hectares | Area stable or increasing, subject to natural processes, at least 181.54ha for sites surveyed: see map 6 in NPWS (2025) |
| Habitat distribution | Occurrence | No decline. Surveyed locations shown on map 6 in NPWS (2025) |
| Woodland size | Hectares | Area stable of increasing. Where topographically possible, "large" woods at least 25ha in size and “small” woods at least 3ha in size |
| Woodland structure: cover and height | Percentage and metres | Diverse structure with a relatively closed canopy containing mature trees; subcanopy layer with semimature trees and shrubs; and well-developed herb layer. |
| Woodland structure: Community diversity and extent | Hectares | Maintain diversity and extent of community types |

| | | |
|---|---|---|
| Woodland structure: natural regeneration | Seedling:sapling:pole ratio | Seedlings, saplings and pole age-classes occur in adequate proportions to ensure survival of woodland canopy |
| Hydrological regime: flooding depth/height of water table | Metres | Appropriate hydrological regime necessary for maintenance of alluvial vegetation |
| Woodland structure: dead wood | $m^3$ per hectare; number per hectare | At least $30m^3$/ha of fallen timber greater than 10cm diameter; 30 snags/ha; both categories should include stems greater than 40cm diameter (greater than 20cm diameter in the case of alder) |
| Woodland structure: veteran trees | Number per hectare | No decline |
| Woodland structure: indicators of local distinctiveness | Occurrence | No decline |
| Vegetation composition: native tree cover | Percentage | No decline. Native tree cover not less than 95% |
| Vegetation composition: typical species | Occurrence | A variety of typical native species present, depending on woodland type, including ash (*Fraxinus excelsior*), alder (*Alnus glutinosa*), willows (*Salix* spp.) and locally, oak (*Quercus robur*) |
| Vegetation composition: negative indicator species | Occurrence | Negative indicator species, particularly non-native invasive species, absent or under control |
| **1092 White-clawed Crayfish *Austropotamobius pallipes*** | | |
| **To maintain the favourable conservation condition of White-clawed Crayfish in the River Barrow and River Nore SAC, which is defined by the following list of attributes and targets:** | | |
| **Attribute** | **Measure** | **Target** |
| Distribution | Occurrence | No reduction from baseline. (See map 7 in NPWS, 2025) |
| Population structure: recruitment | Occurrence of juveniles and females with eggs | Juveniles and/or females with eggs in at least 50% of positive samples |
| Negative indicator species | Occurrence | No alien crayfish species |
| Disease | Occurrence | No instances of disease |
| Water quality | EPA Q value | At least Q3-4 at all sites sampled by EPA |
| Habitat quality: heterogeneity | Occurrence of positive habitat features | No decline in habitat heterogeneity or habitat quality |
| **1096 Brook Lamprey *Lampetra planeri*** | | |
| **To restore the favourable conservation condition of Brook Lamprey in the River Barrow and River Nore SAC, which is defined by the following list of attributes and targets:** | | |
| **Attribute** | **Measure** | **Target** |
| Distribution | Percentage of river accessible | Access to all water courses down to first order streams |
| Population structure of juveniles | Number of age/size groups | At least three age/size groups of brook/river lamprey present |
| Juvenile density in fine sediment | Juveniles/$m^2$ | Mean catchment juvenile density of brook/river lamprey at least 2/$m^2$ |
| Extent and distribution of spawning habitat | $m^2$ and occurrence | No decline in extent and distribution of spawning beds |
| Availability of juvenile habitat | Number of positive sites in $2^{nd}$ order channels (and greater), downstream of spawning areas | More than 50% of sample sites positive |

| 1099 River Lamprey *Lampetra fluviatilis* | | |
|---|---|---|
| **To restore the favourable conservation condition of River Lamprey in the River Barrow and River Nore SAC, which is defined by the following list of attributes and targets:** | | |
| **Attribute** | **Measure** | **Target** |
| Distribution: extent of anadromy | Percentage of river accessible | Greater than 75% of main stem and major tributaries down to second order accessible from estuary |
| Population structure of juveniles | Number of age/size groups | At least three age/size groups of river/brook lamprey present |
| Juvenile density in fine sediment | Juveniles/m² | Mean catchment juvenile density of brook/river lamprey at least 2/m² |
| Extent and distribution of spawning habitat | m² and occurrence | No decline in extent and distribution of spawning beds |
| Availability of juvenile habitat | Number of positive sites in 2nd order channels (and greater), downstream of spawning areas | More than 50% sample sites positive |
| **1106 Salmon *Salmo salar*** | | |
| **To restore the favourable conservation condition of Atlantic Salmon in the River Barrow and River Nore SAC, which is defined by the following list of attributes and targets:** | | |
| **Attribute** | **Measure** | **Target** |
| Distribution: extent of anadromy | Percentage of river accessible | 100% of river channels down to second order accessible from estuary |
| Adult spawning fish | Number | Conservation limit (CL) for each system consistently exceeded |
| Salmon fry abundance | Number of fry/5 minutes electrofishing | Maintain or exceed 0+ fry mean catchment-wide abundance threshold value. Currently set at 17 salmon fry/5 minutes sampling |
| Out-migrating smolt abundance | Number | No significant decline |
| Number and distribution of redds | Number and occurrence | No decline in number and distribution of spawning redds due to anthropogenic causes |
| Water quality | EPA Q value | At least Q4 at all sites sampled by EPA |
| **1355 Otter *Lutra lutra*** | | |
| **To maintain the favourable conservation condition of Otter in the River Barrow and River Nore SAC, which is defined by the following list of attributes and targets:** | | |
| **Attribute** | **Measure** | **Target** |
| Distribution | Percentage positive survey sites | No significant decline |
| Extent of terrestrial habitats | Hectares | No significant decline. Area mapped and calculated as 122.8ha above high water mark (HWM) and 1136.0ha along river banks/around ponds |
| Extent of marine habitat | Hectares | No significant decline. Area mapped and calculated as 857.7ha |
| Extent of freshwater (river) habitat | Kilometres | No significant decline. Length mapped and calculated as 616.6km |
| Extent of freshwater (lake) habitat | Hectares | No significant decline. Area mapped and calculated as 2.6ha |
| Couching sites and holts | Number | No significant decline |
| Fish biomass available | Kilograms | No significant decline |

## 4.2 LIKELY SIGNIFICANT EFFECTS

It has been established that owing to the physical characteristics of the proposed development site, its location in relation to, and hydrological connectivity to the River Barrow and River Nore SAC, the potential for likely significant effects on water quality impacts arising from the proposed

development must be considered further in this assessment. In addition, likely significant effects could not be ruled out

Baseline aquatic surveys of the Cushina River by Ecofact in 2021 & 2024 (Appendix 4), within and adjacent (50m downstream of the Site) to the proposed development Site, determined the water quality to be Poor (Q3) and concluded that the river here is degraded due to the effects of channelisation and regular dredging. However, the Cushina does provide connectivity to larger more sensitive rivers downstream. In addition, a number of EU Annex II species have been recorded in and/or adjacent to the proposed development Site, namely Otter, Salmon and Brook Lamprey, albeit in small numbers. Connectivity from the proposed development Site to the SAC is provided as follows (and see Figure 8, Figure 9 and Figure 10 below).

- The Cushina River flows east through the proposed development Site. A proposed new clear-span bridge is to be constructed over the River Cushina to facilitate construction and serve as an internal access track during the operational phase. A clear-span bridge was chosen to avoid in-stream works within the river. The Cushina River leaves the proposed development Site, flows for approximately 290m and then joins the Figile River.
- The Figile River flows in a south-easterly direction before joining the River Barrow approximately 5.8rkm downstream.
- The underground Grid Cable Route (GCR) crosses the River Barrow (and the River Barrow and River Nore SAC) at an existing crossing point at Baylough Bridge approximately 2.5km south of the proposed development Site. Horizontal Directional Drilling (HDD) techniques will be used for this crossing. Drilling entry and exit points have been designed to be beyond a 50m buffer of the SAC boundary. However, disturbance and/or displacement of Otter are not expected at this location due to the low ecological status and low fisheries potential of this stretch of the River Barrow.
- The proposed Turbine Delivery Route (TDR) involves the construction of a new clear-span bridge over the River Philipstown (Daingean River) near Mount Lucas to facilitate turbine delivery traffic. This location is approximately 29rkm upstream of the River Barrow and River Nore SAC. This clear-span bridge will avoid in-stream works as per Inland Fisheries Ireland (IFI) (2016) guidelines.

Further consideration of likely significant effects is discussed in relation to each phase and aspect of the proposed development in the following sections.

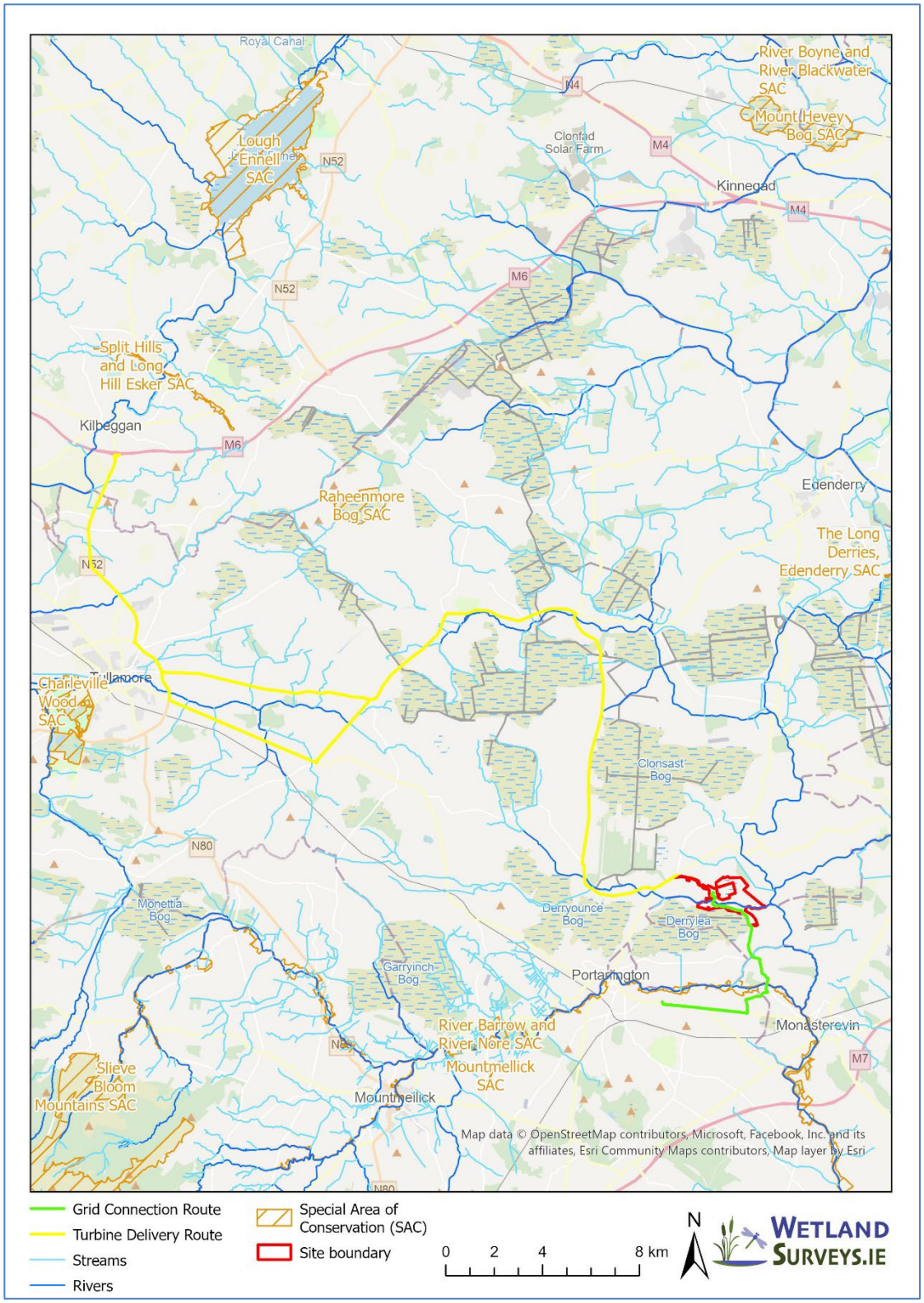



**Figure 8: Map showing watercourses in proximity to the proposed development.**

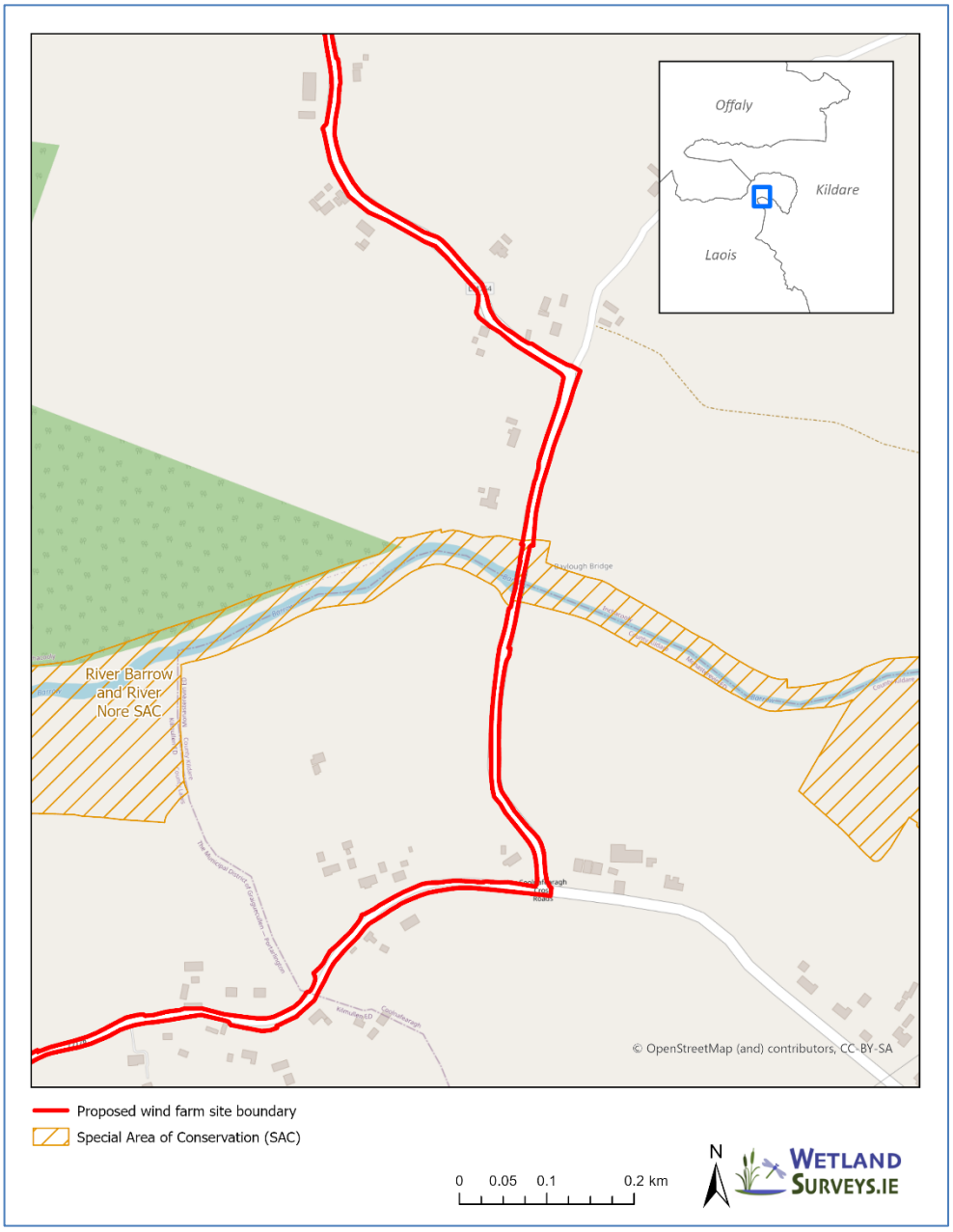



**Figure 9 Map showing the location of the proposed crossing of the Grid Connection Route (GCR) over the River Barrow within the River Barrow and River Nore SAC at Baylough Bridge.**




**Figure 10 Map illustrating the proposed new river crossing of the Philipstown River (Daingean River) to accommodate the proposed new Turbine Delivery Route (TDR).**

### 4.2.1 Construction Phase

As described above the downstream distance from the Proposed Derrynadarragh Wind Farm Site and the River Barrow and River Nore SAC is approximately 6rkm via the Cushina and Figile Rivers. Throughout the excavation, storage, and reuse of materials in the Proposed Development, suspended solids could be carried by surface water runoff and into the surface water networks. This likelihood is particularly high during sustained rainfall events. Water dewatered from excavations for foundations and roads can become contaminated whereby soil or water from areas of potential contamination is drawn down. If not properly controlled, such contaminated water can enter the aquatic environment.

During the construction phase of the Development, the utilization of plant, equipment and vehicles for excavation, material transport, and construction activities introduces the potential for hydrocarbon spillages and leaks which might enter the aquatic environment, especially during regular refuelling procedures. If hydrocarbons are accidentally introduced into the environment, they are expected to be intercepted by the drainage and surface water networks that will be constructed as part of the Proposed Development in accordance with the surface water management plan. However, areas of particular risk of water pollution are where works will be carried out in stream or on the riverbank i.e. for culvert and bridge construction.

The proposed development will require the excavation and removal of vegetation cover and soil, and replacement with less permeable surfaces with a resulting potential to contribute to the increase in rate and volume of rainfall runoff from the Site. Any alteration in the existing drainage regime / hydrology of the Site can impact on the volume of surface water which drains to the local streams and watercourses or to the rate at which such drainage occurs. This in turn can have an effect on hydromorphology and water quality through, for example, an increase in erosion and sediment transport, increase flow velocity, alteration of flood regime.

The Hydrology Chapter (see Appendix 11) concluded that:

- *Pre-mitigation, the likely effects on water quality (from accidental release of pollutants, cement material, and hydrocarbons) at the site are considered negative, direct/indirect, short term, moderate.*
- *Pre-mitigation, the likely effects on water quality (from accidental release of pollutants, HDD drilling fluids, cement material, and hydrocarbons) at the site are considered negative, direct/indirect, short term, moderate; and*
- *Pre-mitigation, the likely effects on the water dependent designated site (River Barrow and River Nore SAC) due to potential effects on water quality are considered negative, indirect, short term and significant.*

Taking this into account, it is concluded that, pre-mitigation, the export of sediment and small amounts of potentially damaging waterborne pollutants (e.g., sediment, wet cement, hydrocarbons) during the construction phase is likely to cause significant effects at the SAC boundary. Hence, significant effects on all the surface-water dependent QI habitats and species are considered likely.

In the absence of mitigation there may be temporarily elevated concentrations of suspended solids during the construction phase within the Cushina River. This may arise if heavy rain occurred during earth excavation and soil spreading during construction and trenching operations. In this event, the various drainage ditches within the site would provide a pathway for contaminants to enter the river and/or contaminants could enter the River Cushina and/or the Philipstown River directly. This could result in a temporary disturbance to any Salmon, Lampreys or White-clawed Crayfish that happen to be migrating or foraging in watercourses within and/or downstream of the construction site. The recruitment success of these species may be affected if spawning and / or nursery habitat occurred in vicinity. Similarly, White-clawed crayfish that may occur in these downstream watercourses would be susceptible to any significant decline in water quality.

It is proposed that a clear-span bridge will be installed over the River Cushina within the proposed development Site, between T6 and the on-site substation. In the absence of mitigation there could be temporarily elevated concentrations of suspended solids during installation of the bridge. The effect would be, at worst, a temporary disturbance on any Salmon, Lampreys or White-clawed Crayfish that happen to be migrating or foraging in watercourses within and/or downstream of the construction site. The recruitment success of these species may be affected if spawning and / or nursery habitat occurred in the vicinity. Similarly, White-clawed Crayfish that may occur in these downstream watercourses would be susceptible to any significant decline in water quality.

Evidence of Otter (scat and prints) were recorded along the Cushina River within the proposed development Site. It is possible that, without mitigation, impacts on this species could arise from reduction in water quality via temporarily elevated concentrations of suspended solids or other pollutants during construction of the clear-span bridge. This could cause direct and indirect impacts through reduced water quality for the otter and also through reduced prey availability.

The proposed HDD crossing of the River Barrow for grid connection cabling is proposed in proximity to the River Barrow and River Nore SAC. The HDD drilling points are designed to be outside of a 50m buffer of the River Barrow and also lie outside of the SAC (minimum 50m outside SAC), in order to avoid potential water pollution. However, there remains a risk of likely significant effects from the accidental release of pollutants which could have an impact on other QI habitats and species of this SAC.

Disturbance effects to Otter are considered unlikely here due to the 'Poor' Ecological Status or Potential and also 'Poor' Fish Status or Potential following the most recent WFD monitoring (River Waterbody WFD Status 2016-2021) on this section of the river, which make this habitat unlikely to be suitable as foraging habitat for Otter.

A new clear-span bridge is proposed over the Philipstown River (Daingean River) as part of the Turbine Delivery Route (TDR). This new bridge will be constructed in accordance with IFI (2016) '*Guidelines on protection of fisheries during construction works in and adjacent to waters*'. The construction of this will be scheduled to align with fisheries seasonal restrictions and the Scottish Natural Heritage (SNH) *Good Practice During Wind Farm Construction* (SNH, 2019, 4th Edition) will also be adhered to. Disturbance to the Otter population of the River Barrow and River Nore SAC is not expected at this point due to the lack of evidence of Otter here, its 'Poor' ecological status and the fact that it is greater than the foraging range of male Otter in Ireland (i.e. >20km) upstream of the SAC.

No invasive species were identified in the riparian zone where any construction works are proposed. One Third Schedule species, Giant Hogweed, was identified on the Proposed Wind Farm Site but is located 172m from the Cushina River and is not adjacent to a drain. In addition, it lies 220m away from the nearest site of works.

### 4.2.2 Operational Phase

The operational phase will include the operation of the turbines and substation and regular maintenance. During the operational phase, accidental pollution from spills and leaks of fuel, oil and chemicals from vehicles and maintenance works may locally occur. Additionally, transformer oil will be used in cooling the transformers associated with the sub-station which creates potential for oil spills during any oil replacement activity or leaks during the operational phase, although the likelihood of this is low. Permanent drains and settlement ponds will be installed and maintained across the Site as shown on the 1:500 series layout planning drawings (P22-145-0100-0006 to P22-145-0100-0059). These will act to attenuate any accidental spills such that they can be controlled and managed (see Appendix 8). The operational phase maintenance routine will involve the regular 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.

The Hydrology assessment (Appendix 11) concludes that *the significance of the likely effect of the release of the hydrocarbons into the receiving waters is Slight due to the low likelihood and low quantities involved.*

The increase in impermeable area caused by the constructed wind farm footprint can directly influence the volume and velocity of runoff. As the footprint expands, there is a larger proportion of lower permeability surfaces compared to natural or vegetated areas.

This alteration can disrupt the natural hydrological cycle, reducing the amount of water that can infiltrate the soil and increasing the amount of runoff generated. In accordance with *Drainage of Runoff from Natural Catchments (including Amendment no. 1 dated June 2015)* published by Transport Infrastructure Ireland (TII, 2015); the runoff from each of the three catchment areas associated with the Proposed Development has been calculated and is presented in Chapter 12 (Hydrology) of the accompanying EIAR (presented here in Appendix 11). The Hydrology Chapter concluded: *"At the scale being examined, where catchment areas have been delineated over small areas, the percentage increase in run-off is not significant*". It further concludes that "*the Proposed Development will have a direct, long-term and not significant effect on alteration of surface water flow and flood extents".*

### 4.2.3 Decommissioning

Potential impacts associated with possible future decommissioning of the Wind Farm are likely similar to those identified for the construction phase, albeit 35 years later. At decommissioning, it is proposed that wind turbines would be deconstructed by unbolting the components and disassembling using cranes. The hardstanding and foundation pedestals of the turbines would be covered over (with soil that was stripped during construction) and allowed to re-vegetate. This would be less disruptive to the environment than removing the hardstanding and foundations.

Infrastructure that would be left *in-situ* following decommissioning includes: internal site access tracks, the on-site substation and ancillary electrical equipment. Potential impacts at decommissioning would be similar to the construction phase but on a smaller scale.

There is a similar risk to water quality, without mitigation, during decommissioning. Hence, significant effects on all the surface-water dependent QI habitats and species are considered likely during Decommissioning stage, premitigation.

### 4.2.4 Potential Significant Effects in relation to Conservation Objectives of European Site/s

The assessment for significant effects in relation to the attributes and targets of Conservation Objectives for the River Barrow and River Nore SAC is presented below in Table 15..

**Table 15: Significant effects on attributes and targets as per the SSCOs for the River Barrow and River Nore SAC.**

| **3260 Water courses of plain to montane levels with the Ranunculion fluitantis and Callitricho-Batrachion vegetation** | | |
|---|---|---|
| **To maintain the Favourable conservation condition of Water courses of plain to montane levels with the *Ranunculion fluitantis* and *Callitricho-Batrachion* vegetation in the River Barrow and River Nore SAC, which is defined by the following list of attributes and targets:** | | |
| **Attribute** | **Target** | **Significant Effects** |
| Habitat Distribution | No decline, subject to natural processes | None. It is considered unlikely that the unmitigated effects will result in a change in the current baseline distribution of this habitat within the SAC. |
| Habitat Area | Area stable or increasing, subject to natural processes | None. It is considered unlikely that the unmitigated effects will result in a change in the current baseline distribution of this habitat within the SAC. |
| Hydrological regime: river flow | Maintain appropriate hydrological regimes | None. It is considered unlikely that the unmitigated effects will result in significant effects on the hydrological regime. |

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| Hydrological regime: groundwater discharge | The groundwater flow to the habitat should be permanent and sufficient to maintain tufa formation | In the absence of mitigation, the effect on groundwater has been assessed as ranging from low to slight/moderate. |
| Substratum composition: particle size range | The substratum should be dominated by large particles and free from fine sediments | In the absence of mitigation, it has been found that likely significant effects from sedimentation cannot be ruled out. |
| Water chemistry: minerals | The groundwater and surface water should have sufficient concentrations of minerals to allow deposition and persistence of tufa deposits | In the absence of mitigation, the effect on groundwater has been assessed as ranging from low to slight/moderate and hence similar effects on groundwater chemistry are likely. |
| Water quality: suspended sediment | The concentration of suspended solids in the water column should be sufficiently low to prevent excessive deposition of fine sediments | In the absence of mitigation, it has been found that likely significant effects from sedimentation cannot be ruled out. |
| Water quality: nutrients | The concentration of nutrients in the water column should be sufficiently low to prevent changes in species composition or habitat condition | None – the Proposed Development is not likely to alter the nutrients entering the water. |
| Vegetation composition: typical species | Typical species of the relevant habitat sub-type should be present and in good condition | Typical species of the relevant habitat sub-type are dependent on water quality. In the absence of mitigation there are likely significant effects. |
| Floodplain connectivity | The area of active floodplain at and upstream of the habitat should be maintained | None. The Proposed Development is proposing 5 turbines in the floodplain which will be set at 1m above the 1-in-100yr flood level. The access tracks within the floodplain have been designed to not be above the flood levels in order to avoid obstructing the floodplain and its storage capacity. Hence, it is considered that there will be no likely significant effects on the area of floodplain. |
| **6430 Hydrophilous tall herb fringe communities of plains and of the montane to alpine levels** | | |
| **To maintain the favourable conservation condition of Hydrophilous tall herb fringe communities of plains and of the montane to alpine levels in the River Barrow and River Nore SAC, which is defined by the following list of attributes and targets:** | | |
| **Attribute** | **Target** | **Significant Effects** |
| Habitat distribution | No declines, subject to natural processes | None. It is considered unlikely that the unmitigated effects would result in a change in the current baseline distribution of this habitat within the SAC. |
| Habitat area | Area stable or increasing, subject to natural processes | None. It is considered unlikely that the unmitigated effects would result in a change in the current baseline distribution of this habitat within the SAC. |

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| Hydrological regime: flooding depth/height of water table | Maintain appropriate hydrological regimes | None. It is considered unlikely that the unmitigated effects will result in significant effects on the hydrological regime. |
| Vegetation structure: sward height | 30-70% of sward is between 40 and 150cm in height | None. It is expected that the pre-mitigated Proposed Development will not result in an likely significant effects on vegetation height. |
| Vegetation composition: broadleaf herb:grass ratio | Broadleaf herb component of vegetation between 40 and 90% | None. It is expected that the pre-mitigated Proposed Development will not result in any changes in nutrient levels and hence there are no expected likely significant effects on broadleaf:herb ratio. |
| Vegetation composition: typical species | At least 5 positive indicator species present | Positive indicator species may be influenced by surface water quality. Hence, it is considered that the pre-mitigated Proposed Development will result in likely significant effects. |
| Vegetation composition: negative indicator species | Negative indicator species, particularly non-native invasive species, absent or under control- NB Indian balsam (Impatiens glandulifera), monkeyflower (Mimulus guttatus), Japanese knotweed (Fallopia japonica) and giant hogweed (Heracleum mantegazzianum ) | Invasive Species Plan will be implemented which will ensure that the Proposed Development will no result in an increase of these negative indicator species within the SAC. |
| **7220 Petrifying Springs with tufa formation (Cratoneurion)*** | | |
| **To maintain the Favourable conservation condition of Petrifying springs with tufa formation (Cratoneurion ) in the River Barrow and River Nore SAC, which is defined by the following list of attributes and targets:** | | |
| Habitat area | Area stable or increasing, subject to natural processes | Due to the sensitivities of this habitat to water quality and quantity, it is considered that the unmitigated Proposed Development will result in likely significant effects on habitat area. |
| Habitat distribution | No decline. See map 6 for recorded location (in NPWS, 2025). | Due to the sensitivities of this habitat to water quality and quantity, it is considered that the unmitigated Proposed Development will result in likely significant effects on habitat distribution. |
| Hydrological regime: height of water table; water flow | Maintain appropriate hydrological regimes | Due to the likely slight/moderate effects on groundwater from the Proposed Development during construction, there are short-term, likely significant effects on the hydrological regime of this GWDTE*. |
| Water quality | Maintain oligotrophic and calcareous conditions | It is considered that the unmitigated Proposed Development will result in likely significant effects on water quality . |

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| Vegetation composition: typical species | Maintain typical species | It is considered that the unmitigated Proposed Development will result in likely significant effects on water quality which could, in turn, impact on the typical species composition. |
| **91E0 Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (Alno-Padion, Alnion incanae, Salicion albae)** | | |
| **To restore the Favourable conservation condition of Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (*Alno-Padion, Alnion incanae, Salicion albae*) in the River Barrow and River Nore SAC, which is defined by the following list of attributes and targets:** | | |
| **Attribute** | **Target** | **Significant Effects** |
| Habitat area | Area stable or increasing, subject to natural processes, at least 181.54ha for sites surveyed: see map 6 in NPWS (2025) | None. It is considered unlikely that the unmitigated effects would result in a change in the current baseline distribution of this habitat within the SAC. |
| Habitat distribution | No decline. Surveyed locations shown on map 6 in NPWS (2025) | None. It is considered unlikely that the unmitigated effects would result in a change in the current baseline distribution of this habitat within the SAC. |
| Woodland size | Area stable of increasing. Where topographically possible, "large" woods at least 25ha in size and "small" woods at least 3ha in size | None. It is considered unlikely that the unmitigated effects would result in a change size of these woodland habitats within the SAC. |
| Woodland structure: cover and height | Diverse structure with a relatively closed canopy containing mature trees; subcanopy layer with semimature trees and shrubs; and well-developed herb layer. | None. It is considered unlikely that the unmitigated effects would result in significant change in the woodland structure of these woodland habitats within the SAC. |
| Woodland structure: Community diversity and extent | Maintain diversity and extent of community types | Community diversity could be impacted by changes in water quality. In the absence of mitigation there are likely significant effects. |
| Woodland structure: natural regeneration | Seedlings, saplings and pole age-classes occur in adequate proportions to ensure survival of woodland canopy | Natural regeneration could be impacted by changes in water quality. In the absence of mitigation there are likely significant effects on natural regeneration. |
| Hydrological regime: flooding depth/height of water table | Appropriate hydrological regime necessary for maintenance of alluvial vegetation | None. It is considered unlikely that the unmitigated effects will result in significant effects on the hydrological regime. |
| Woodland structure: dead wood | At least 30m³/ha of fallen timber greater than 10cm diameter; 30 snags/ha; both categories should include stems greater than 40cm diameter (greater than 20cm diameter in the case of alder) | None. It is considered unlikely that the unmitigated effects would result in a change in the occurrence of dead wood within the SAC. |
| Woodland structure: veteran trees | No decline | None. It is considered unlikely that the unmitigated effects would result in a change in occurrence of veteran trees within the SAC. |

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| Woodland structure: indicators of local distinctiveness | No decline | Indicators of local distinctiveness could be impacted by changes in water quality. In the absence of mitigation there are likely significant effects. |
| Vegetation composition: native tree cover | No decline. Native tree cover not less than 95% | None. Due to the Invasive Species Plan, it is considered unlikely that the unmitigated effects would result in a change in occurrence of native tree cover within the SAC. |
| Vegetation composition: typical species | A variety of typical native species present, depending on woodland type, including ash (*Fraxinus excelsior*), alder (*Alnus glutinosa*), willows (*Salix* spp.) and locally, oak (*Quercus robur*) | Typical species of this habitat are dependent on water quality. In the absence of mitigation there are likely significant effects. |
| Vegetation composition: negative indicator species | Negative indicator species, particularly non-native invasive species, absent or under control | None. Due to the Invasive Species Plan, it is considered unlikely that the unmitigated effects would result in a change in occurrence of native tree cover within the SAC. |
| **1092 White-clawed Crayfish *Austropotamobius pallipes*** | | |
| **To maintain the favourable conservation condition of White-clawed Crayfish in the River Barrow and River Nore SAC, which is defined by the following list of attributes and targets:** | | |
| **Attribute** | **Target** | **Significant Effects** |
| Distribution | No reduction from baseline. (See map 7 in NPWS, 2025) | In the absence of mitigation, it has been found that likely significant effects on water quality cannot be ruled out. Hence, significant effects on the distribution of this sensitive species are likely. |
| Population structure: recruitment | Juveniles and/or females with eggs in at least 50% of positive samples | In the absence of mitigation, it has been found that likely significant effects on water quality cannot be ruled out. Hence, significant effects on the population structure of this sensitive species are likely. |
| Negative indicator species | No alien crayfish species | None. The implementation of the Invasive Species Plan will ensure the Proposed Development will not impact on the occurrence of any alien crayfish species within the SAC. |
| Disease | No instances of disease | None. Following the Invasive Species Plan and in particular the Clean-Check-Dry biosecurity protocol, the Proposed Development is not likely to introduce disease to the SAC. |
| Water quality | At least Q3-4 at all sites sampled by EPA | In the absence of mitigation, it has been found that there are likely significant effects on water quality within the SAC. |
| Habitat quality: heterogeneity | No decline in habitat heterogeneity or habitat quality | In the absence of mitigation, it has been found that there are likely significant effects on water quality, including sedimentation, which could cause a decline in habitat heterogeneity within the SAC. |

| 1096 Brook Lamprey *Lampetra planeri* | | |
|---|---|---|
| **To restore the favourable conservation condition of Brook Lamprey in the River Barrow and River Nore SAC, which is defined by the following list of attributes and targets:** | | |
| **Attribute** | **Target** | **Significant Effects** |
| Distribution | Access to all water courses down to first order streams | None. The Proposed Development is not likely to cause any barrier effects. |
| Population structure of juveniles | At least three age/size groups of brook/river lamprey present | In the absence of mitigation, it has been found that there are likely significant effects on water quality, including sedimentation, which could result in a significant effect on population structure of brook lamprey. |
| Juvenile density in fine sediment | Mean catchment juvenile density of brook/river lamprey at least 2/m² | In the absence of mitigation, it has been found that there are likely significant effects on water quality, which could result in a significant effect on mean juvenile density of brook lamprey. |
| Extent and distribution of spawning habitat | No decline in extent and distribution of spawning beds | In the absence of mitigation, it has been found that there are likely significant effects on water quality, which could result in a significant effect on brook lamprey spawning beds. |
| Availability of juvenile habitat | Number of positive sites in 2nd order channels (and greater), downstream of spawning areas | In the absence of mitigation, it has been found that there are likely significant effects on water quality, which could result in a significant effect on juvenile habitat. |
| **1099 River Lamprey *Lampetra fluviatilis*** | | |
| **To restore the favourable conservation condition of River Lamprey in the River Barrow and River Nore SAC, which is defined by the following list of attributes and targets:** | | |
| **Attribute** | **Target** | **Significant Effects** |
| Distribution: extent of anadromy | Greater than 75% of main stem and major tributaries down to second order accessible from estuary | None. The Proposed Development is not likely to cause any significant barrier effects. |
| Population structure of juveniles | At least three age/size groups of river/brook lamprey present | In the absence of mitigation, it has been found that there are likely significant effects on water quality, including sedimentation, which could result in a significant effect on population structure of river lamprey. |
| Juvenile density in fine sediment | Mean catchment juvenile density of brook/river lamprey at least 2/m² | In the absence of mitigation, it has been found that there are likely significant effects on water quality, which could result in a significant effect on mean juvenile density of river lamprey. |
| Extent and distribution of spawning habitat | No decline in extent and distribution of spawning beds | In the absence of mitigation, it has been found that there are likely significant effects on water quality, which could result in a significant effect on river lamprey spawning beds. |

| | | |
|---|---|---|
| Availability of juvenile habitat | More than 50% sample sites positive | In the absence of mitigation, it has been found that there are likely significant effects on water quality, which could result in a significant effect on juvenile habitat. |
| **1106 Salmon *Salmo salar*** | | |
| **To restore the favourable conservation condition of Atlantic Salmon in the River Barrow and River Nore SAC, which is defined by the following list of attributes and targets:** | | |
| **Attribute** | **Target** | **Significant Effects** |
| Distribution: extent of anadromy | 100% of river channels down to second order accessible from estuary | None. The Proposed Development is not likely to cause any barrier effects. |
| Adult spawning fish | Conservation limit (CL) for each system consistently exceeded | In the absence of mitigation, it has been found that there are likely significant effects on water quality, including sedimentation, which could result in a significant effect on adult spawning fish. |
| Salmon fry abundance | Maintain or exceed 0+ fry mean catchment-wide abundance threshold value. Currently set at 17 salmon fry/5 minutes sampling | In the absence of mitigation, it has been found that there are likely significant effects on water quality, which could result in a significant effect on mean salmon fry abundance |
| Out-migrating smolt abundance | No significant decline | In the absence of mitigation, it has been found that there are likely significant effects on water quality, which could result in a significant effect on out-migrating smolt abundance. |
| Number and distribution of redds | No decline in number and distribution of spawning redds due to anthropogenic causes | In the absence of mitigation, it has been found that there are likely significant effects on water quality, including sedimentation, which could result in a significant effect on juvenile habitat. |
| Water quality | At least Q4 at all sites sampled by EPA | In the absence of mitigation, it has been found that there are likely significant effects on water quality. |
| **1355 Otter *Lutra lutra*** | | |
| **To maintain the favourable conservation condition of Otter in the River Barrow and River Nore SAC, which is defined by the following list of attributes and targets:** | | |
| **Attribute** | **Target** | **Significant Effects** |
| Distribution | No significant decline | In the absence of mitigation, it has been found there will be likely significant effects on water quality, which could impact on the distribution of this species. |
| Extent of terrestrial habitats | No significant decline. Area mapped and calculated as 122.8ha above high water mark (HWM) and 1136.0ha along river banks/around ponds | None. Significant declines in terrestrial habitat for Otter are not likely. |

| | | |
|---|---|---|
| Extent of marine habitat | No significant decline. Area mapped and calculated as 857.7ha | None. The Proposed Development will not result in any likely significant effects on any marine habitats due to the relatively local effects that are likely and the distance (>99rkm) to marine habitats. |
| Extent of freshwater (river) habitat | No significant decline. Length mapped and calculated as 616.6km | In the absence of mitigation, it has been found there will be likely significant effects on water quality, which could impact on the availability of suitable habitat for Otter. |
| Extent of freshwater (lake) habitat | No significant decline. Area mapped and calculated as 2.6ha | None. The Proposed Development will not result in any likely significant effects on lake habitats. |
| Couching sites and holts | No significant decline | The Proposed Development will not result in a decline in any couches or holts. No likely, significant effects. |
| Fish biomass available | No significant decline | In the absence of mitigation, it has been found there will be likely significant effects on water quality, which could impact on the availability of fish biomass. |

*GWDTE: Ground-water dependent terrestrial ecosystem

### 4.3 MITIGATION

As outlined above, in the absence of suitable mitigation, the Proposed Wind Farm has the potential to give rise to some significant adverse effects on the conservation objectives of the River Barrow and River Nore SAC. Potential impacts identified relate to downstream water quality during the construction phase of the proposed development. Mitigation has been proposed with the aim of avoiding likely adverse effects. Mitigation relating to water quality is presented below. Following the effective implementation of appropriate mitigation measures, it is concluded that the proposed development will not have an adverse effect on the conservation objectives, or the favourable conservation condition, of the Qualifying Interests of the SAC, in view of the site's Conservation Objectives (see Table 16).

#### 4.3.1 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 with the objective of avoiding / minimising the potential for significant effects on water quality and hydrology. The Proposed Development Site layout and drainage infrastructure has been designed such that it is sympathetic to the existing topography and aims to maintain the existing hydrological regime of the Site, such that it does not create a changed hydrological response to precipitation. The design has been informed by a detailed flood risk assessment for the Site (Appendix 14).

Mitigation measures for the proposed development are largely to manage surface water emanating from the proposed development during the construction phase and eliminate any risk to downstream water quality and by corollary adverse effects on QIs of European sites which fall within its zone of influence. It is necessary to ensure that water discharging from the proposed development site is regulated in relation to quality and quantity to ensure that it does not present a risk to downstream waterbodies nor Qis/SCIs that are reliant upon it.

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. In this instance, these measures will also have the effect of mitigating for likely significant effects on downstream European sites and their surface water dependent QI habitats and species:

- 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).
- 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 8) 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 8) 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 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 7), 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 10) 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.

#### *4.3.1.1 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)

#### *4.3.1.2 Monitoring*

A comprehensive suite of monitoring has been developed as part of the 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.

### 4.3.2 Mitigation for Risk of Pollution at Water Crossings

A 50m set-back from watercourses for all works has been applied across the site, except at proposed water-crossing sites. 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.

In addition, some of the previously outlined mitigation is relevant here:

- 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

#### *4.3.2.1 Invasive Species*

Mitigation to reduce the likelihood of spreading invasive species as a result of the construction works at the Site has been detailed for this Project in the Invasive Species Plan presented in Appendix 5. This is relevant to the River Nore and River Barrow SAC due to the hydrological link between the Proposed Development Site and the SAC and the risk of spreading downstream to the SAC. Much of this mitigation is relevant here and will serve to protect the SAC from an increased risk of spread of invasives. Of relevance to the Conservation Objectives is the presence of Giant Hogweed onsite. However, as outlined above, the risk of spread to the SAC is not considered likely due to the distance to the River Cushina (172m from the Cushina River and 220m from any planned construction / felling works). The Invasive Species Plan includes a detailed plan to eradicate this species and details are outlined within Appendix 5. This will involve following a detailed procedure and protective measures to ensure this species will be eradicated from the Site and that construction works (or eradication works) will not result in the spread of this species.

### 4.3.3 Pre-Construction Surveys

The risk of disturbance to QI species has been ruled out as unlikely and insignificant based on the baseline. However, as a precautionary measure and given the time that can elapse between the baseline surveys and the construction phase, pre-construction surveys for Otter, Salmon and Lamprey will be carried out to determine whether any change from the baseline has occurred. If the pre-construction surveys indicate that there is a change from the baseline that would bring any of these QI species within the zone of impact of the construction footprint (e.g. within 200m of a breeding Otter holt or within 30m set-back from a non-breeding Otter holt as per NatureScot 2024b). If, for any reason, the exclusion zone cannot be implemented, a derogation licence will be sought from the NPWS.

In addition, as a precautionary measures, a pre-construction Invasive Species survey will be undertaken across the Site, particularly at locations of works adjacent to drains and watercourses in order to ensure the baseline hasn't changed. If any invasive species are found within the construction or felling footprint, appropriate action will be taken as per the guidance in the Invasive Species Plan in Appendix 5.

### 4.3.4 Methods for 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 and River Nore SAC to the launch and receiving pits for the HDD will be strictly adhered to and has been inbuilt into the design to protect water quality. In order to mitigate for likely significant effects, the 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.

### 4.3.5 River Habitat Enhancement

A Biodiversity Enhancement and Management Plan (BEMP) has been prepared for the Proposed Development. 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 freshwater aquatic 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 currently 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. The final design of these in-ditch wetlands will be based on existing best practices and will be agreed with the Project Ecologist. It is expected that one in-ditch wetland will be created per drain.

- Each in-ditch wetland will be installed along a minimum 10m length of drain. The depth of water across the majority of the ditch should be around 50 cm deep and approximately 75 cm deep.
- The aim of the in-ditch wetland is to slow the flow of water, allowing excess sediment to fall out of the water column, thereby enhancing the quality of the water that reaches the Cushina River.
- At the in-ditch wetland location, ditches should also be widened to enable water flow to slow and allow sediments to settle out.

- As part of the in-ditch wetland creation, small barriers are usually installed in the drain to slow the flow of water in the drain and allow sediments to settle out.
- Barriers can be either solid structures such as earth bunds with an outlet pipe, or simple wooden barriers to slow the flow of water and allow it to escape slowly.
- The barriers need to be carefully designed so that storm flows can be accommodated.
- At least one of the banks of the drain along this length of drain will be reprofiled, creating a graded bank and increasing the width of the drain.
- The graded bank allows for different depths of water and for the development of a variety of wetland vegetation along the bank, thus enhancing biodiversity and contributing to water quality enhancement.
- Both banks of each of the drains with in-ditch wetlands will be fenced with stock-proof fencing to prevent stock access.
- It is important not to create the in-ditch wetland too close to the discharge point to the Cushina River.
- Regular maintenance will be required throughout the lifetime of these in-ditch wetlands to remove the trapped sediment. The removal of sediment will be carried out according to existing best practices. It is possible to include a sediment trap in the design of the in-ditch wetland to allow for ease of sediment removal.
- It is recommended when removing wetland vegetation during maintenance, not to remove all vegetation at the same time as this would impair the effectiveness of the wetland and remove valuable habitat.



**Figure 11 In-ditch wetland under construction. Note reprofiled drain with shelves of different depths creating different depths and widening the drain. Earth bunds are also visible as barrier to slow the flow of water within the drain. (source: Pearl Mussel Project)**

Regular maintenance will be required to remove sediment as it builds up within the wetlands. (see Appendix 2 for further details).

**Table 16: Assessment of impacts on attributes of relevant Qualifying Interests when mitigation measures are considered**

| Attribute | Relevant Qualifying Interest | Relevant mitigation measure(s) | Pre-Mitigation | Post-Mitigation |
|---|---|---|---|---|
| Water Quality (including pollution, suspended sediment and sedimentation on substratum) | Water courses of plain to montane levels with the *Ranunculion fluitantis* and *Callitricho-Batrachion* vegetation [3260] | All mitigation to protect water quality as described in detail above including elements of mitigation by avoidance, monitoring (and corrective action if necessary) and enhancement will ensure that no adverse, likely significant effects will occur due to water quality degradation. | Short-term, adverse likely significant effects. | Short-term, adverse, imperceptible effects. |
| | Hydrophilous tall herb fringe communities of plains and of the montane to alpine levels [6430] | | | |
| | Alluvial forests with *Alnus glutinosa and Fraxinus excelsior* (*Alno-Padion, Alnion incanae, Salicion albae*) [91E0] | | | |
| | *Austropotamobius pallipes* (White-clawed Crayfish) [1092] | | | |
| | *Lampetra planeri* (Brook Lamprey) [1096] | | | |
| | *Lampetra fluviatilis* (River Lamprey) [1099] | | | |
| | *Salmo salar* (Salmon) [1106] | | | |
| | *Lutra lutra* (Otter) [1355] | | | |
| Attributes impacted by Water Quality such as:<br>• Vegetation composition (typical species)<br>• Natural regeneration<br>• Habitat heterogeneity<br>• Annex II species distribution<br>• Life-cycle stages of aquatic species<br>• Spawning habitats<br>• juvenile habitats | Water courses of plain to montane levels with the *Ranunculion fluitantis* and *Callitricho-Batrachion* vegetation [3260] | All mitigation to protect water quality as described in detail above including elements of mitigation by avoidance, monitoring (and corrective action if necessary) and enhancement measures will ensure that no adverse, likely significant effects will occur on water quality and therefore on any attribute depending on water quality. | Short-term, adverse likely significant effects | Short-term, adverse, imperceptible effects. |
| | Hydrophilous tall herb fringe communities of plains and of the montane to alpine levels [6430] | | | |
| | Petrifying Springs with tufa formation (Cratoneurion)* [7220] | | | |
| | Alluvial forests with *Alnus glutinosa and Fraxinus excelsior* (*Alno-Padion, Alnion incanae, Salicion albae*) [91E0] | | | |
| | *Austropotamobius pallipes* (White-clawed Crayfish) [1092] | | | |
| | *Lampetra planeri* (Brook Lamprey) [1096] | | | |
| | *Lampetra fluviatilis* (River Lamprey) [1099] | | | |

| Attribute | Relevant Qualifying Interest | Relevant mitigation measure(s) | Pre-Mitigation | Post-Mitigation |
|---|---|---|---|---|
| • availability of prey species | *Salmo salar* (Salmon) [1106] | | | |
| | *Lutra lutra* (Otter) [1355] | | | |
| Groundwater | Water courses of plain to montane levels with the *Ranunculion fluitantis* and *Callitricho-Batrachion* vegetation [3260] | Mitigation outlined above, including the use of Sustainable Drainage Systems (SuDS) will result in no likely significant effects on groundwater. | Short-term, adverse slight/moderate effects. | Short-term, adverse, imperceptible effects. |
| | Petrifying Springs with tufa formation (Cratoneurion)* [7220] | | | |

### *Conclusion of Assessment for River Barrow and River Nore SAC and proposed development in isolation*

Following an examination, analysis and evaluation in light of best scientific knowledge, of all relevant information in respect of the Qualifying Interests of River Barrow and River Nore SAC, the potential impacts and mitigation measures, and whether or not the predicted impacts would affect the conservation objectives that support the conservation condition of the Qualifying Interests, it has been concluded that the proposed development does not pose a risk of adversely affecting (either directly or indirectly) the integrity of River Barrow and River Nore SAC.

### 4.4 IN COMBINATION ASSESSMENT

It is a requirement of Appropriate Assessment that the combined effects of the proposed development together with other plans or projects be considered.

As the potential effects are related to the water quality of the River Barrow and River Nore SAC, this in combination assessment only considers other developments that occur in the same catchment as the proposed development.

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 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)

#### 4.4.1 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. Therefore, there are no likely significant in-combination effects between the Proposed Development and climate change.

#### 4.4.2 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. Peatland habitats are not qualifying interests of the identified European Site (River Barrow and River Nore SAC) and neither are the quality of the raised bog or degraded bog habitats onsite of Annex I quality. In terms of sedimentation, 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.

In relation to carbon emissions, the Proposed Development is expected to contribute to a reduction in the reliance on fossil-fuel to generate electricity and hence will have a positive impact on $CO_2$ emissions. Hence, it is not foreseen that the Proposed Development will contribute to any significant cumulative effects with Peat Extraction. Therefore, there are no likely significant in-combination effects between the Proposed Development and peat extraction.

### 4.4.3 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. Therefore, there are no likely significant in-combination effects between the Proposed Development and other Wind Farm Developments.

### 4.4.4 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 in-combination effects with Agriculture.

### 4.4.5 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 Water Supply 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 in-combination effects with the Water Supply Project.

Considering the sensitive design of the Wind Farm, the planned mitigation and best practices, the Proposed Development is not expected to contribute to in combination effects on the River Barrow and River Nore SAC or other European sites. The implementation of the proposed mitigation and best practice measures during all phases of the proposed development - construction, operation and decommissioning will ensure that no significant adverse effects on the integrity of European sites will arise as a result of the project in isolation or in combination with other plans and projects.

### 4.5 CONCLUSION

This NIS assessment was informed by a desktop review and a series of field surveys. It has examined and analysed, in light of the best scientific knowledge, with respect to those European sites within the zone of influence of the proposed development, the potential impact sources and pathways, the manner in which these could potentially impact on the European sites' Qualifying Interest (and Special Conservation Interests) and whether the predicted impacts would adversely affect the integrity of any European sites.

Following this examination, analysis and evaluation, it has been determined in the Screening for Appropriate Assessment (Section 3 of this report) that the Proposed Development does, in the absence of mitigation measures, pose a risk of adversely affecting (either directly or indirectly) the integrity of effects on the River Barrow and River Nore SAC, which occurs 6rkm downstream of the proposed development site, being hydrologically connected via the Cushina River which flows through the wind farm site.

Avoidance, design requirements and embedded mitigation measures are set out within this NIS (and its appendices) and the effective implementation of these mitigation measures will ensure that any impacts on the conservation objectives of European sites will be avoided during the construction, operation and decommissioning phases of the proposed development, such that there will be no adverse effects on any European sites.

Taking into account all matters discussed, including the implementation of the mitigation measures and recommendations fully , it has been objectively concluded that the proposed Wind Farm at Derrynadarragh will not adversely affect (either directly or indirectly) the integrity and conservation status of the River Barrow and River Nore SAC [002162] or any other European Site in view of the conservation objectives for this site either alone or in combination with other plans or projects.

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# Appendix 1

# EIAR Chapter 2 - Description of Proposed Development

FEHILY TIMONEY

DESIGNING AND DELIVERING
A SUSTAINABLE FUTURE

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

## Volume 2 - Main EIAR

## Chapter 2 – Description of the Proposed Development

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# 2. DESCRIPTION OF THE DEVELOPMENT

## 2.1 Introduction

This chapter of the Environmental Impact Assessment Report (EIAR) describes the proposed location and components of the Proposed Development and provides details on the construction, operation and decommissioning of the Proposed Development in compliance with the EIA Directive ((Directive 2011/92 EU on the assessment of the effects of certain public and private projects on the environment (as amended)). This forms the basis of the assessments presented within the EIAR.

This chapter of the EIAR is supported by Figures in Volume IV, Planning Drawings accompanying the planning application and the following Appendix documents provided in Volume III:

- Appendix 2.1: Construction Environmental Management Plan (CEMP)
- Appendix 2.2: BEMP
- Appendix 2.3: Turbine Delivery Route Assessment

Common terms and acronyms used throughout this EIAR can be found in Chapter 1 - Introduction.

The Proposed Development assessed in this EIAR 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'**).

An overview of the Proposed Development is shown in Figure 2.1. The general layouts of the Proposed Wind Farm, Proposed Grid Connection, and Turbine Delivery Route and BEMP Lands are presented in Figures 2.2 to 2.4.

## 2.2 Overview of the Proposed Development

The Proposed Development consists of a 9 no. turbine wind farm and associated infrastructure including internal access tracks, hard standings, onsite 110kV substation and associated grid connection infrastructure, 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.

On 8th September 2025, An Coimisiún Pleanála deemed the Proposed Development is eligible as Strategic Infrastructure Development (SID) by way of a notice served under section 37B(4)(a) of the Planning and Development Act 2000 as amended and the application is being made directly to The Commission (SID Pre-App case ref. ACP- 320137-24). The Commission are the competent authority for the purposes of the Environmental Impact Assessment (EIA).

A 10-year planning permission and 35-year operational life from the date of commissioning of the Proposed Wind Farm is being sought. This reflects the lifespan of modern-day turbines.

A permanent planning permission is being sought for the Grid Connection and onsite 110 kV substation as these will become an asset of the national grid under the management of EirGrid and will remain in place upon decommissioning of the Proposed Wind Farm.

Derrynadarragh Wind Farm has been designed in accordance with the current Section 28 Ministerial Guidelines (section 28 of the Planning and Development Act 2000, as amended), 'Wind Energy Guidelines 2006'. and has regard to the 'Draft Revised Wind Energy Development Guidelines' (draft WEGs) where its best practice.Should new Guidelines be adopted before this application is assessed by An Coimisiun Pleanála, the applicant would welcome the opportunity to demonstrate compliance with same. Presented hereunder are the elements of the Proposed Development for which development consent is being sought, and all other associated project components subject to EIA but for which development consent is not being sought within the current application.

### 2.2.1 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.
- Construction of 1 no. permanent onsite 110kV TSO electrical substation and associated compound including:
    - Welfare facilities;
    - TSO control building
    - Electrical infrastructure;
    - Parking;
    - Wastewater holding tank;
    - 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 5 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; Derrylea Road; L71764; 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 seven 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;
    - 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, within the townlands of 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 on northeastern verge, removal of vegetation and trees, reprofiling on R400, within the townland of Moanvane, 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.

Certain minor accommodation works associated with the TDR, not specifically defined within the above description of development, including the provision of passing opportunities along the local road network are subject to and have been assessed through this EIA but for which planning consent is not being sought within the current application. These minor works to facilitate the delivery of turbine components and haulage to the Site are detailed further in Table 2.4 *'Turbine Delivery Route Accommodation Works'* and include hedge or tree trimming, temporary relocation of powerlines/poles, lampposts, signage and temporary local road widening. Permission for these minor works will be carried out as necessary through exempted development and under a Road Opening Licence to be sought from Offaly County Council.

## 2.3 Proposed Development Location

These sections describe the lands which make up the Proposed Development.

The Proposed Development covers 3 no. County Council jurisdictions including; Kildare County Council, Offaly County Council, and Laois County Council. Permission is being sought for a period of 10 years, for development comprising the construction and operation of a wind farm and related works within the townlands of Kilbeggan South, Hallsfarm, Stonehouse Farm; Ballybought, Durrow Demesne, Aghancarnan, Gormagh, Acantha, Ballynasrah or Tinnycross, Ardan, Puttaghan, Cappancur, Cloncollog, Meelaghans, Annagharvey, Ballycollin, Ballina, Ballyknockan, Ballymooney, Ballycue, Ballinagar, Knockballyboy, Clonad, Townparks, Castlebarnagh Big, Killoneen, Killeen, Esker Beg, Ballycon, Drumcaw or Mountlucas, Derrycricket, Ballaghassaan, Walshisland, Bunnagappagh, Coolagary, Raheenakeeran, Enaghan, Moanvane, Cushina, Clonsast Lower, and Chevychase or Derrynadarragh 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 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 Aughrin 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 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 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; Derrylea Road; L71764; L7176; L71761; R424; and R420 (Lea Road).

### 2.3.1 Wind Farm Development Boundary

The proposed application area (i.e. the red line boundary depicting the land to which the application relates) which comprises the Proposed Wind Farm site, Proposed Grid Connection and Proposed Turbine Delivery Nodes encompasses a total land area of 225.4ha (2.225km$^2$). The development footprint of the Proposed Wind Farm is 213.67ha, the Grid Connection comprises 9.06ha of land, and the Turbine Delivery Nodes amount to 2.68ha of land. Please refer to Figure 2-1 and the Site Location drawing (see Drawing No. P22-145-0100-0000) for the statutory redline boundary associated with this planning application.

### 2.3.2 Study Area

Based on the Wind Energy Development Guidelines published by the Department of the Environment, Heritage and Local Government (DOEHLG) (2006/2019 draft revision) (WEDG) specify different radii for examining the zone of theoretical visibility of proposed wind farm projects (ZTV). The extent of this search area is influenced by turbine height, as follows:

- 15km radius for blade tips up to 100m.
- 20km radius for blade tips greater than 100m.
- 25km radius where landscapes of national and international importance exist.

In the case of the proposed Site, 4 no. turbines are proposed have a tip height of 186m above existing ground level (Turbine T1, T2, T3, T6) and 5 no. turbines have a tip height of 187m above existing ground level (T4, T5, T7, T8, T9), therefore the radius recommended within guidance is 20km from the outermost turbines of the scheme.

Impacts pertaining to other aspects of the Proposed development such as the grid connection route, and turbine delivery route, are localised to the immediate environment, and as such the consideration of impacts focuses on the immediate landscape context within approximately 500m.

### 2.3.3 Existing Land Use and Site Context

The Site is located in the jurisdictions of Kildare County Council, Offaly County Council, and Laois County Council, with the turbine array located approximately 1.7km south of Bracknagh, 5.24km north-west of Monastervin and 6.5km north-east of Portarlington. Land use within the site is mainly dominated by agriculture, with areas of turbary activities located outside of, but adjacent to, the site boundary to the centre and south (Derrylea Bog). Furthermore, there is an area of forestry land within the northern portion of the site.

The settlement patterns in the area consists of one-off rural housing fronting onto the road network in a linear rural settlement pattern. There are approximately 208 no. residential and commercial properties within 2km of the site. The closest property to a turbine is located ca. 740 m distance and is roughly equidistant north between turbines T2 and T3. Bracknagh village is the most proximate settlement located 2km to the north-east.

The Site is located within the lowland topography with predominantly flatlands. Red Hill (194m), Dunmurry Hill (234m) and Grange Hill (223m) are located within 10km to the east of the site. The site is located on the Derrylea Bog which is connected to Clonsast Bog to the north and Derryounce Bog to the west.

The Corrine Land Cover database for Ireland (based on interpretation of satellite imagery and national vector mapping data) identifies Quaternary deposits present at the site mostly comprise cut over raised peat. There are sections in the north and west of the site that are underlain by till derived from limestones, while the eastern section of the site is underlain by lake marl. The site is predominantly underlain by the Lucan Formation (dark limestone and shale) with a section in the north of the site underlain by the Ballyadams Formation (crinoidal wackestones/ packstone limestone).

The Site is located within the Barrow Catchment (ID 14) and the Barrow_SC_040 sub-catchment as defined by the WFD. *The waterbody in this sub-catchment that is crossing the proposed site is known as FIGILE_080 (EPA Name: Cushina 14). The main hydrology feature within the wind farm site is the Cushina River (FIGILE_080). A large area of the surface runoff drains into this river within FIGILE_080 sub-basin. The Cushina River runs in an easterly direction, and it is a tributary of the Figile River (FIGILE_080). The remaining of the site drains into Figile_070 sub-basin or directly into Figile River. In addition, there are no lakes or reservoirs within the wind farm site study area.*

*The National Catchment Flood Risk Management (CFRAM) Programme has examined the flood risk, and possible mitigation measures to address flooding, in 300 communities throughout the country at potentially significant flood risk. These communities were identified through the Preliminary Flood Risk assessment (PFRA), which was a national screening assessment of flood risk. The communities recognized as being at a significant flood risk are called Areas for Further Assessment (AFA). For the AFAs a detailed hydraulic modelling has been carried out to produce indicative flood maps (CFRAM Maps). The subject site and the TDR watercourse crossing are within an AFA and therefore, flooding maps have been produced as part of the CFRAM mapping. The CFRAM Programme extends to the subject site and the TDR watercourse crossing showing that both locations are vulnerable to fluvial flooding. With regards to the wind farm site, the following turbine positions would be potentially affected by flooding – T04, T05, T08 and T09. Please refer to Chapter 12 – Hydrology and Water Quality for further details on flooding at the site.*

There is 1 no. European site designated for nature conservation within a 5km radius of the potential wind farm site, which is the River Barrow and River Nore Special Areas of Conservation (SAC) (Site code: 002162). The Grand Canal Proposed Natural Heritage Area (pNHA) (Site code: 002104) is located approx. 4km to east of subject site. The Site contains a number of habitats that are of ecological importance including treelines to the west of the site, woodland to the south-west and lowland rivers within the Cushina River. The proposed wind farm site also has designation for a number of fauna on site which include records of hare, a moderate-high value of Irish bat species, otter associated with the Cushina River and a number of identified badger setts within the site. The proposed site also has a number of river catchments located within the proposed site including the River Barrow Watercourse, River Figile Watercourse and the River Cushina Watercourse which are all dominated by coarse fish species.

Based on the National Monuments Service database map-viewer, 1 no. recorded monument is located within the proposed site within County Kildare. (A circular Enclosure Site Code KD021-009) approximately 0.4km from T04 on the south-eastern Boundary. There are no recorded monuments within the proposed site within County Offaly.

There are a number of sites in close proximity including a number of Record of Monuments and Places (RMPS) to the south. Within a wider 2km radius, there are approximately 13 no. RMP's. The most proximate recorded monuments are located approximate 800m south-east of the site in County Kildare, there are 5 RMP sites located in the townland of Derrylea approximately 800m south of the site (KD021-010: Enclosure, KD021-00805: Enclosure, KD021-00801: Enclosure, KD021-00804: Enclosure and KD021-00803: Enclosure). These 5 no. sites are linked small enclosures visible as cropmarks with no visible surface trace of the features.

There are several archaeological features located adjacent to the GC and TDR, including ringforts and enclosures. The GC 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 onsite substation which is located within the Site.

Through this planning application, consent is being sought for accommodation works required along the proposed TDR to facilitate turbine component deliveries at the following seven 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; **TDR Node 19**
- 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; **TDR Node 22**
- 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; **TDR Node 29/30**
- Construction of load bearing surface, removal of vegetation and trees, reprofiling on R400, within the townlands of Drumcaw or Mountlucas, Co. Offaly; **TDR Node 32**
- 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; **TDR Node 35/36**
- Construction of load bearing surface on northeastern verge, removal of vegetation and trees, reprofiling on R400, within the townland of Moanvane, Co. Offaly; **TDR Node 38**
- 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. **TDR Node 46/47**

Please refer to Chapter 14 – Traffic and Transportation, and the accompanying Appendix 2.2 Turbine Delivery Route Assessment, for further details of the TDR node works we are seeking planning permission for.

### 2.3.4 Land Ownership

The Site is located on lands under third-party private ownership. These landowners have consented to the application for the Proposed Development. With the Letters of consent accompanying this planning application (see Appendix 2.5).

The proposed GC is contained within public roads, with the exception of the start and end points where the proposed 110kV grid connection cable connects into both the onsite and network substations.

With regards to the TDR, accommodation works required to facilitate the delivery of large turbine components to the site shall be contained within the public road corridor and private lands as identified on planning application drawings. As previously noted, certain minor accommodation works associated with the TDR, not specifically defined within the above description of development, including the provision of passing opportunities along the local road network are subject to and have been assessed through this EIA but for which planning consent is not being sought within the current application. These minor works to facilitate the delivery of turbine components and haulage to the Site are detailed further in Table 2.4 *'Turbine Delivery Route Accommodation Works'* and include hedge or tree trimming, temporary relocation of powerlines/poles, lampposts, signage and temporary local road widening. Permission for these minor works will be carried out as necessary through exempted development and under a Road Opening Licence to be sought from Offaly County Council.

### 2.3.5 On-Site Wind Resource

The layout of the Proposed Wind Farm has been designed to minimise potential environmental impacts, while at the same time maximising the energy yields of the wind resource passing over the site. Available wind speed is a key factor in determining the economic viability of potential wind energy projects. The Sustainable Energy Authority of Ireland (SEAI) Wind Speed Atlas[1] displays onshore wind speeds at between 20 and 150 metres above ground level, based on 2013 data. The atlas identifies the site as having an average wind speed range within the Site of 8.6 m/s to 9.6 m/s at 150 m above ground level.

#### *Operational/Permitted*

There is a total of 5 no. permitted and operational wind farm developments located within 20 km of the proposed Derrynadarragh Wind Farm. Figure 2.2 illustrates the location of existing wind farms within 20 km of the Site. The closest operational wind farm is Cloncreen Wind Farm, Co. Offaly, located c.10.6km to the north of the site which has been in operation since 2022.

[1]https://www.seai.ie/technologies/seai-maps/wind-atlas-map/

**Table 2-1: Wind Energy Developments within 20 km of the Proposed Wind Farm Site**

| Wind Farm Name | Number of Turbines | Distance and Direction from Proposed Site | Status |
|---|---|---|---|
| Cloncreen Wind Farm | 21 | 10.6km to the north of the site | Operational since 2022. |
| Mount Lucas Wind Farm | 28 | 11.1km to the north of the site | Operational since 2015. |
| Cushaling Wind Farm | 9 | 12km to the north-east of the site | Permitted since 2020 & construction started in 2022. |
| Moanvane Wind Farm | 12 | 18.6km to the west of the site | Permitted since 2018 & construction started in 2022. |
| Yellow River Wind Farm | 29 | c.19km to the north of the site | Permitted since 2022 & construction began in 2022, with an expected completion date in 2025. |
| Dernacart Wind Farm | 8 | c.15km west of the site | High Court Ruled in favour of this development in June 2025.<br><br>An Bord Pleanala (now An Coimisiun Pleanala) approved the development in January 2024 (Appeal Case Ref: 310312) |
| Clonarrow Wind Farm | 4 | c.12km to the north of the site | Currently in Planning and awaiting decision (Planning Ref: 2560189) |
| Ballydermott Wind Farm | 47 | c.7.7km to the south east of the site | Pre-Application Stage |
| Cushina Wind Farm | 11 | c.4.3km north west of the site | Pre-Application Stage |

## 2.4 Proposed Development Infrastructure

### 2.4.1 Wind Farm

The Proposed Wind Farm will consist of 9 no. wind turbine generators (WTG's), 1 no. permanent onsite 110 kV electrical substation and associated infrastructure, dedicated peat and spoil deposition areas, 2 no. temporary construction compounds, along with ancillary civil, drainage and electrical infrastructure.

### *2.4.1.1 Wind Turbine Description*

The proposed turbine model will be a conventional three-blade horizontal axis turbine. Schematic drawings of the candidate turbine accompany the planning application. The plans and particulars are precise and provide specific dimensions for the turbine structures which have been used in this assessment and for which permission is being sought. The turbine specifications are as follows; 4 no. turbines (T1, T2, T3, T6) 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 (T4, T5, T7, T8, T9) will have a tip height of 187m above existing ground level with a hub heigh of 106m and rotor diameter of 162m. Table 2-2 details the elevation for each turbine (including those with the 1m foundation plinth) relative to existing ground levels.

**Table 2-2: Turbine Details (above ground level)**

| Turbine Number | Tip Height | Hub Height | Rotor Diameter |
|---|---|---|---|
| 1 | 187m | 106m | 162m |
| 2 | 186m | 105m | 162m |
| 3 | 186m | 105m | 162m |
| 4 | 187m | 106m | 162m |
| 5 | 187m | 106m | 162m |
| 6 | 186m | 105m | 162m |
| 7 | 186m | 105m | 162m |
| 8 | 187m | 106m | 162m |
| 9 | 187m | 106m | 162m |

### *2.4.1.2 Turbine Layout*

The proposed wind farm layout reflects the outcome of the iterative engineering and environmental constraints assessments aimed at eliminating or minimising adverse effects on the environment. The layout has been designed to minimise the potential environmental effects of the wind farm while at the same time maximising the energy yield of the wind resource passing over the Site. Please refer to Figure 2-3 for the Proposed Site Layout and Drawing No. P22-145-0100-0001.

The design rationale and evolution of the wind farm layout is described in Chapter 3 - Site Selection and Alternatives.

Turbine location co-ordinates in Irish Transverse Mercator (ITM) are detailed in Table 2-2.

**Table 2-3: Turbine Coordinates**

| Turbine Number | ITM Easting | ITM Northing |
|---|---|---|
| 1 | 659937 | 714994 |
| 2 | 658662 | 716607 |
| 3 | 659623 | 716518 |
| 4 | 659622 | 715347 |
| 5 | 659128 | 716060 |
| 6 | 658384 | 715670 |
| 7 | 659268 | 715518 |
| 8 | 659680 | 715968 |
| 9 | 660136 | 715709 |

The turbines will have multiple painted coatings to protect against corrosion with a light grey non-reflective finish.

It is proposed to install lighting on the turbines in accordance with the Irish Aviation Authority (IAA) requirements for aviation visibility purposes. The lighting configuration and type will be in accordance with the International Civil Aviation Organisation (ICAO) obstacle light requirements. The assessment has been carried out on the basis of required aviation standards/specifications.

#### 2.4.1.2.1 Turbine Tower and Foundation

Following detailed site investigations, it has been determined that the wind turbine foundations at Derrynadarragh will be standard shallow reinforced concrete foundations. The turbine foundation bases are circular in shape and will be 25 m in diameter and 3.6 m in depth.

The turbine foundations will be constructed using standard reinforced concrete construction techniques. Detailed construction methodologies for turbine foundations are provided in the CEMP in Appendix 2.1 of Volume II.

A section of reinforced concrete foundation called a plinth shall protrude above ground to which the turbine tower will be bolted.

Turbine foundations will be designed to Eurocode Standards. Foundation loads will be provided by the wind turbine supplier, and factors of safety will be applied to these in accordance with European design standards:

- EN 1992-1-1: Eurocode 2: Design of concrete structures.
- BS EN 61400-1:2005: Wind Turbines Design Requirements.

The tower of the turbine is a conical steel tube, delivered to site in sections and bolted together using flanged connections.

Once the turbine components arrive on site they will be placed on the hardstanding and lay down areas prior to assembly. The towers will be delivered in sections, and each blade will be delivered in a separate delivery. Once there is a suitable weather window the turbine will be assembled.

The first (base) section is bolted to a steel frame, which is cast into the turbine concrete foundation. The upper sections of the tower are bolted to the lower ones in sequence. The base of the tower is approximately 5m in diameter, tapering to approximately 3m where it is attached to the nacelle. Access to the top platform in the tower is by a ladder or service lift. Access to the nacelle from the top platform is by ladder. Access to the transformer room in the nacelle is controlled with an interlock.

### 2.4.2 Turbine Blades and Hub/Nacelle

The turbine blades comprise fibreglass reinforced epoxy, carbon fibres and solid metal tip. The blades are 79.35 m in length. The swept area of the blades is 20,612 $m^2$.

The turbines will have a cut in wind speed of 3 m/s and cut out speed of 25 m/s. Turbine rotor rotation is in a clockwise direction.

The dynamic operation range (the rate at which the blades rotate) of the turbines is approximately 12.1 revolutions per minute (rpm) which will be influenced by wind speed.

The cast iron hub supports the three blades and transfers the reaction loads to the nacelle which houses the generating components of the wind turbine including the generator and gearbox, electrical components and control unit. These convert the rotation of the blades to generator rotation.

A yaw mechanism turns the nacelle and blades into and out of the wind. A wind vane on the nacelle controls the yaw mechanism.

The blade bearings allow the blades to operate at varying pitch angles. Based on the prevailing wind conditions (determined by the wind vane), the blades are continuously positioned to optimise the pitch angle.

The turbines are equipped with an aerodynamic brake. Stopping the turbine is done by full feathering the three blades (individually turning each blade).

A glass fibre reinforced polyester hood covers the nacelle. The turbines are equipped with a Lightning Protection System (LPS) earthing and isolation to help protect the wind turbine against the physical damage caused by lightning strikes.

### 2.4.3 Turbine Installation

It is anticipated that each turbine will take approximately 3 to 5 days to erect (depending on weather) using two cranes.

### 2.4.4 Turbine Transformer and Wind Farm Power Output

The proposed wind turbines will feature a rotor diameter of 162 metres. Based on this rotor size, the Maximum Export Capacity (MEC) could range between 6.2MW and 7.2 MW. The range of installed capacity has been fully assessed in the Air and Climate chapter (Chapter 7) with respect to emissions calculations, and in the Noise chapter (Chapter 8) with respect to maximum sound power level.

The turbine will have a transformer located within the tower. The turbine transformer will step up the voltage to either 20kV or 33kV to reduce the electrical loss on the cabling connector circuits that connect to the site substation via a network of underground medium voltage cable circuits to be located adjacent to the proposed site track network.

The Proposed Development will have a maximum Export Capacity (MEC) of64.8 MW. This generation capacity has been used to calculate the power output of the proposed Wind Farm based on the following calculation:

*A x B x C = Megawatt Hours of electricity produced per year*

*where:*

*A = The number of hours in a year: 8,760 hours*

*B = The capacity factor, which takes into account the intermittent nature of the wind, the availability of wind turbines and array losses etc. A capacity factor of 31 % is applied here*[3]*.*

*C = Rated capacity of the wind farm: Between 55.8MW and 64.8 MW*

The proposed wind farm has the potential to produce approximately between 151,000-and198,000 MWh (megawatt hours) of electricity per year and over 7,700 GWh of electricity over the 35-year lifetime of the Proposed Development.

The electricity produced by the proposed wind farm would be sufficient to supply 45,990 households using an average of 4.2 MWh of electricity pear year each.[4]

## 2.5 Site Access, Internal Access Tracks, and Hard standings

### 2.5.1 Site Access Points

The Proposed Wind Farm will include a new site entrance along the R419 Regional Road to serve as construction and operation access to the proposed wind farm and onsite 110kV substation, an additional access from L-70481 will be used for construction on the south of the river Cushina, prior to completion of the bridge crossing.

The new site access has been selected with consideration for safety of public road users, construction staff and to ensure that it can be constructed to comply with the requirements of Offaly County Council, Kildare County Council, and TII design requirements for direct accesses.

During the construction phase, standard HGV's shall use the existing southern access, located within Co. Kildare, if transporting materials prior to the on-site bridge being constructed. Otherwise, all construction traffic shall use the main northern access, located in Co. Offaly.

[3] EirGrid in their All-Island Generation Capacity Statement (2017-2026) estimates a capacity factor of approximately 31% for onshore wind. The capacity factor applied for the proposed wind farm is greater than the EirGrid estimation as a result of improvements in turbine technology and the good wind flows at the site. The proposed turbine type allows for the use of fewer, taller turbines with an increased efficiency and in return greater economic benefit to the consumer.

[4] This figure is taken from the March 2017 Commission for Energy Regulation (CER) Review of Typical Consumption Figures Decision Paper and Commission for Regulation of Utilities Energy and Water Monitoring Report for 2021

All HGV traffic travelling to the site shall only be permitted to use approved transport routes and site access points as identified in the Traffic Management Plan (TMP) contained in the CEMP at Appendix 2.1.

The layout of site access points is shown on Site Layout at Figure 2-3, and Drawing No. P22-145-0100-0001.

### 2.5.2 Internal Access Tracks

The Proposed Wind Farm will include the construction of 9,360m of new internal access tracks and the upgrading of 550m of existing tracks and associated drainage infrastructure.

The proposed internal site track layout will permit access for vehicles during the construction phase, for maintenance during the operational phase and for vehicles to decommission the turbines at the end of the life of the Proposed Development.

Access tracks will be 5 m wide along straight sections, wider junctions and turning areas, as shown on accompanying planning application drawings in accordance with wind turbine manufacturer requirements for the wind turbines of this size.

Internal wind farm access tracks shall be constructed by a combination of founded and floating methods as required. The locations of floated sections of access track have been determined by geotechnical walkovers and detailed site investigations with further detail included within Chapter 11 – Soils, Geology and Hydrogeology, Chapter 12 – Hydrology and Water Quality, and Appendix 12.1 – Site Specific Flood Risk Assessment.

The proportion of access track construction within the Site is as follows:

Total length of new founded access track: 7,260m;

Total length of upgraded existing agricultural track: 550m;

Total length of new floating access track: 2,100m.

Access track formation will consist of a minimum 500 mm compacted hardcore on geo-textile membrane with a capping layer of compacted granular stone (CL 804) to form a suitable running surface. The proposed construction methodology for newly constructed tracks is as follows:

Excavated soil will be placed along the side of sections of the tracks in suitable locations as identified in the Soil Management Plan (within the CEMP in Appendix 2.1) and where appropriate to blend in with surrounding landscaping and partially obscure visibility of the track during operation. Surplus spoil material shall be deposited in designated areas as identified in the Soil Management Plan.

The stone required for the construction of the internal access tracks will be sourced from licenced quarries in the vicinity of the Proposed Development. The location of licensed quarries and haulage routes are identified in Chapter 14: Traffic and Transportation and in Figure 14.2, Volume IV.

Further details on access track construction are provided in the CEMP in Appendix 2.1, Volume II.

Internal access track drawings are presented in 100-Series planning application drawings.

A drainage system will be installed adjacent to the internal access tracks, this is presented in 100-Series planning application drawings and detailed within the Surface Water Management Plan (within the CEMP in Appendix 2.1). Existing drainage infrastructure will be maintained and upgraded where necessary. Existing drainage channels will be upgraded to the same standard as the proposed drainage infrastructure in accordance with the drainage design and Surface Water Management Plan (within the CEMP in Appendix 2.1).

Drainage infrastructure will be constructed in parallel with the access track construction.

Drainage ditches will be formed, within the excavated width and along the sides of the internal access tracks.

### 2.5.3 Hardstanding and Laydown Areas

Each wind turbine will have an associated turbine hardstanding and laydown area adjacent to the foundation to accommodate the delivery and temporary storage of the turbine components prior to their erection and to support the cranes during erection.

Once the turbine components arrive on site they will be placed on the hardstanding and lay down areas prior to assembly. The towers will be delivered in sections, and each blade will be delivered in a separate delivery. Once there is a suitable weather window the turbine will be assembled.

A turbine hardstanding area consists of a main crane pad hardstanding of 88 m x 30 m (2,640 m2) with a number of additional smaller hardstanding's that act as ancillary crane pads and set down and assembly areas, located as shown on the accompanying planning drawings. This area will accommodate a main crane and an assist crane during the assembly of the turbine, as well as during occasional maintenance periods during operation. It will also facilitate parking for operation and maintenance staff.

### 2.5.4 Watercourse Crossings Within the Site

Within the Wind Farm Site there are 36 no. drain crossings and 1 no. watercourse crossing, as set out in Table 2-3 below. 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.

Other drain crossings within the wind farm site comprise bottomless box culverts and pipe culverts where the proposed wind farm access track crosses minor streams and land drains. Details of these are shown in Table 2-3. 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 Grid Connection, there will be 5 no. crossing points comprising 4 no. watercourse crossings and one dry stone arch bridge crossing at a disused canal, as set out in Table 2-3 below. There will be 4no. 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 (reference WCC-GCR2 of Table 3-1).

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.

## Table 2-4: Drain and Watercourse Crossings

| | Feature ID | Element of Project | X (ITM) | Y (ITM) | WFD Waterbody (Yes/No) | Existing Culvert/ Structure | Proposed Crossing Method |
|---|---|---|---|---|---|---|---|
| 1 | WCC-WF1 | Wind Farm | 659082 | 716063 | No | No | Pipe Culvert |
| 2 | WCC-WF2 | Wind Farm | 659031 | 715998 | No | No | Pipe Culvert |
| 3 | WCC-WF3 | Wind Farm | 659513 | 716003 | No | Yes | Box Culvert |
| 4 | WCC-WF4 | Wind Farm | 659862 | 715831 | No | No | Pipe Culvert |
| 5 | WCC-WF5 | Wind Farm | 660099 | 715739 | No | No | Box Culvert |
| 6 | WCC-WF6 | Wind Farm | 659533 | 716372 | No | No | Box Culvert |
| 7 | WCC-WF7 | Wind Farm | 659129 | 716789 | No | No | Pipe Culvert |
| 8 | WCC-WF8 | Wind Farm | 659294 | 716786 | No | No | Box Culvert |
| 9 | WCC-WF9 | Wind Farm | 658817 | 716702 | No | No | Pipe Culvert |
| 10 | WCC-WF10 | Wind Farm | 658347 | 715857 | Yes | No | Bridge |
| 11 | WCC-WF11 | Wind Farm | 658504 | 716006 | No | No | Pipe Culvert |
| 12 | WCC-WF12 | Wind Farm | 658237 | 716098 | No | No | Pipe Culvert |
| 13 | WCC-WF13 | Wind Farm | 658183 | 716296 | No | No | Box Culvert |
| 14 | WCC-WF14 | Wind Farm | 658088 | 716388 | No | No | Box Culvert |
| 15 | WCC-WF15 | Wind Farm | 657968 | 716432 | No | No | Pipe Culvert |
| 16 | WCC-WF16 | Wind Farm | 658001 | 716418 | No | No | Pipe Culvert |
| 17 | WCC-WF17 | Wind Farm | 657885 | 716466 | No | No | Box Culvert |
| 18 | WCC-WF18 | Wind Farm | 657749 | 716523 | No | No | Pipe Culvert |
| 19 | WCC-WF19 | Wind Farm | 657807 | 716496 | No | No | Pipe Culvert |

| | Feature ID | Element of Project | X (ITM) | Y (ITM) | WFD Waterbody (Yes/No) | Existing Culvert/ Structure | Proposed Crossing Method |
|---|---|---|---|---|---|---|---|
| 20 | WCC-WF20 | Wind Farm | 657621 | 716718 | No | No | Box Culvert |
| 21 | WCC-WF21 | Wind Farm | 657438 | 716792 | No | No | Pipe Culvert |
| 22 | WCC-WF22 | Wind Farm | 656792 | 716839 | No | No | Pipe Culvert |
| 23 | WCC-WF23 | Wind Farm | 658985 | 715592 | No | Yes | Pipe Culvert |
| 24 | WCC-WF24 | Wind Farm | 658813 | 715638 | No | No | Pipe Culvert |
| 25 | WCC-WF25 | Wind Farm | 659330 | 715481 | No | No | Box Culvert |
| 26 | WCC-WF26 | Wind Farm | 659767 | 715175 | No | No | Pipe Culvert |
| 27 | WCC-WF27 | Wind Farm | 658725 | 715865 | No | No | Pipe Culvert |
| 28 | WCC-WF28 | Wind Farm | 656919 | 716853 | No | No | Pipe Culvert |
| 29 | WCC-WF29 | Wind Farm | 656944 | 716857 | No | No | Pipe Culvert |
| 30 | WCC-WF30 | Wind Farm | 657033 | 716864 | No | No | Pipe Culvert |
| 31 | WCC-WF31 | Wind Farm | 657269 | 716819 | No | No | Pipe Culvert |
| 32 | WCC-WF32 | Wind Farm | 658180 | 716261 | No | No | Box Culvert |
| 33 | WCC-WF33 | Wind Farm | 659337 | 716089 | No | No | Box Culvert |
| 34 | WCC-WF34 | Wind Farm | 659634 | 716590 | No | No | Pipe Culvert |
| 35 | WCC-WF35 | Wind Farm | 659359 | 716765 | No | No | Box Culvert |
| 36 | WCC-WF36 | Wind Farm | 659036 | 716783 | No | No | Pipe Culvert |
| 37 | WCC-WF37 | Wind Farm | 659719 | 715314 | No | No | Pipe Culvert |
| 38 | WCC-GCR1 | GC | 659966 | 713535 | No | Yes | HDD |
| 39 | WCC-GCR2 | GC | 660546 | 712416 | Yes | Yes | HDD |

| | Feature ID | Element of Project | X (ITM) | Y (ITM) | WFD Waterbody (Yes/No) | Existing Culvert/ Structure | Proposed Crossing Method |
|---|---|---|---|---|---|---|---|
| 40 | WCC-GCR3 | GC | 660321 | 711962 | No | Yes | Crossing Over |
| 41 | WCC-GCR4 | GC | 659745 | 711434 | No | Yes | HDD |
| 42 | WCC-GCR5 | GC | 658244 | 711382 | No | Yes | HDD |
| 43 | WCC-TDR5 | TDR | 652594 | 727645 | Yes | Yes | Bridge |

*Clear Span Bridge Details and Construction Methodology*

The abutments for the bridge will be founded on reinforced concrete pad footings. An excavator will be used to reach the subgrade on which the concrete pads will be founded. The excavations will be set back 2.5 m from the banks of the River. Based on site investigations the approach embankments to the bridge structure can be founded directly on existing stratum.

Dewatering of the excavations as per the Surface Water Management Plan will likely be required through sump pump or alternative means until completion of the footings. A layer of Class 6N2 fill will be laid as a regulating layer on top of the subgrade. A 75mm thick blinding concrete will be placed over the full extent of the rectangular foundation to produce a clean flat surface for the wet structural foundation concrete. The reinforcement cage for the pad footing will be fixed and tied with bars protruding vertically for subsequent concrete pours. Formwork will be placed around the perimeter of the footing ensuring sufficient concrete cover to the reinforcement. Approximately 18m$^3$ of concrete will be required for each abutment bank seat pad and will be delivered to site by ready mix trucks. The concrete will be placed in the formwork using a hopper or concrete pump and vibratory poker used to remove air bubbles.

Once the pad footing has achieved sufficient strength, the reinforcement for the abutment upstands will be cut, tied and fixed into position. A vertical formwork will be placed around the perimeter of the abutment wall. Each abutment upstand will require approximately 13m$^3$ of concrete which will be placed using a hopper or concrete pump. A vibratory poker will be used to remove any air pockets. Once the formwork has been removed and the concrete has cured, a waterproofing membrane will be applied to the concrete. At the top of the upstands, seatings for the precast deck beams will be prepared at the correct levels.

The bridge deck will be set above the 1% AEP flood height (100-year event) and will be made up of precast concrete beams with a clear span of c. 15m. The beams will be precast off site and delivered to site on a flatbed truck. A crane will be used to lift the beams into position onto the seatings formed on top of the abutment upstands. Side forms for the edge parapet beams will be secured and reinforcement for the deck slab and parapet edge beams will be cut, tied and fixed into position with bars protruding vertically from the edge beams for subsequent concrete pours for the concrete parapets. The bridge deck slab and edge beams will be concreted to the finished level. Once the deck slab has reached sufficient strength the abutment walls will be backfilled with a granular fill to access track formation level.

The bridge deck parapets will be constructed from reinforced concrete. Reinforcement for the parapets will be fixed to lap with the starter bars from the edge beams. Vertical formwork will be erected and secured in place. An in situ pour will be carried out to cast the parapets to the design height and vibratory poker used. Once the parapets have reached sufficient strength the formwork will be stripped. The deck surfacing is to be formed using an ST1 concrete mix. This will be placed on top of the deck slab with a minimum thickness of 100 mm and with a crossfall from the centre of the deck to the parapet to allow water to drain.

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 crossing will be scheduled to align with fisheries seasonal restrictions, and will not be undertaken during a period of flooding.

Vehicular access to the crossing location shall be available from both sides of the watercourse.

The access track on the approach to the watercourse will be completed to a formation level which is suitable for the passing of plant and equipment required for the installation of the watercourse crossing.

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.

All earthworks adjacent to the crossing locations will be carried out so as to prevent soil entering the watercourse and will be in accordance with the Soil Management Plan.

Further details on hydrology and drainage are contained in Chapter 12 - Hydrology and Water Quality, Surface Water Management Plan (SWMP) which is contained in the CEMP in Appendix 2.1, and on accompanying planning application drawings.

*Bottomless Culvert and Piped Culvert Construction Methodology*

Culverts will be made of precast units which will be sized specific to the hydraulic capacity required relative to the characteristics of the watercourse to be crossed. The crossing angle for the culverts will be set out in relation to access track alignment and the existing watercourse channel. The project engineer will determine the required gradient of the culvert. Standard details for piped and bottomless culverts are provided in the 0100 and 0500-Series planning application drawings.

The access track on the approach to the channel will be completed to a formation level which is suitable for the passing of plant and equipment required for the installation of the culvert crossings.

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*'. The watercourse flow will be diverted by over pumping or by fluming the flow as appropriate in order to facilitate construction of the culvert in dry conditions. The installation of the culvert will take place in low flow conditions. Mitigation for the protection of sensitive biological receptors when fluming/over pumping are presented in Chapter 9 – Biodiversity.

For piped culvert, the bed of the watercourse will be taken down to the desired levels to create a suitable platform for laying the culvert. The pipe culvert will be lifted into place with excavator with a lifting mechanism / crane and will have an invert level 500 mm below the existing watercourse bed level. The embedded section will be allowed to fill naturally.

For bottomless box culvert, the base will be excavated to rock or competent ground with a mechanical excavator with the foundation formed in-situ using a semi-dry concrete lean mix foundation and concrete panels. The base will be excavated along the stream bank with no instream works required. The bottom plate of the culvert will be bolted to the foundation on both sides of the watercourse. The top section of the culvert will be bolted together and lifted into position and bolted to the two bottom sections. Once the culvert is in position stone backfill will be placed and compacted against the culvert up to the required level above the foundations. A concrete beam will then be shuttered, fixed and poured along the two shoulders of the culvert. When the concrete beams are cured the filling and compaction of the access track will be completed.

*Minor Stream / Drain Crossing Construction Methodology*

All other minor streams or drains within the Site (which are not identified as Rivers by the EPA in their reporting under the Water Framework Directive) which are crossed by the wind farm infrastructure will be collected by interceptor drains and carried under the access track by cross drains. Further details on the locations of such cross drains are provided in the Surface Water Management Plan in Appendix D of the CEMP, and in the Drainage Drawings presented in 0100 and 0500-Series planning application drawings. The cross drains will be an appropriately sized pipe buried in the sub-base of the access track at the necessary invert level to ensure ponding or pooling doesn't occur above or below the cross drain and water can continue to flow as necessary.

For a minor stream/drain crossing the following will be employed:

- The access track construction will finish at least 10m from the nearside bank of the minor stream/drain.
- All environmental mitigation measures, described in detail in Chapter 12 - Hydrology and Water Quality and Chapter 9 - Biodiversity, will be implemented locally in advance of the works, in accordance with the measures outlined in the Surface Water Management Plan (SWMP) in the CEMP in Appendix D.
- The pipe is laid in one lift or in sections using a lifting mechanism attached to an excavator.
- Rock armour headwalls will be constructed where necessary to protect pipe ends and the base of slope embankments on either side of the track.

Instream works will only take place during the period July to September (as required by IFI for instream works).

Operation of machinery in-stream will be kept to an absolute minimum. All construction machinery operating in-stream will be mechanically sound to avoid leaks of oils, hydraulic fluid, etc. Machinery will be checked prior to commencement of in-stream works.

### *2.5.4.1 Construction of Peat /Spoil Deposition Areas*

Civil engineering assessment of the proposed Wind Farm indicates the requirement for approximately 54,868 $m^3$ of excavated peat and spoil volumes calculated for the Site. Further details are provided in the Peat and Soil Management Plan and Chapter 11 – Soils, Geology and Hydrogeology.

For the construction phase of the Proposed Development the activities that will generate peat and spoil are as follows:

(1) Upgrade of existing access tracks (excavate and replace) including temporary widening of local road to facilitate deliver of turbine components

(2) Construction of new excavated roads through peat

(3) Construction of floating roads over peat (will not generate peat and spoil but the methodology for construction is included for completeness)

(4) Excavation and placement of arisings

(5) Excavations in peat for turbine bases, hardstands and other infrastructure foundations

(6) Excavations in peat for underground cables

A total of 7 no. peat and spoil deposition areas are proposed as part of the proposed development, further details are provided within the Peat and Soil Management Plan at Appendix 11.2 of Chapter 11 – Soils, Geology and Hydrogeology.

The location and design of each of the peat and spoil deposition areas are shown on the 0100 series planning drawings.

The construction of the peat and spoil deposition areas shall follow the methodology provided in the CEMP in Appendix C.

### *Spoil and Overburden Management*

The proposed project will involve the removal of topsoil, peat and overburden for the construction of turbine foundations, hardstands, substation, temporary construction compounds, cable route and access roads.

Aggregate for construction of these access roads and hardstands will be imported to the Site.

Estimated volumes of overburden (topsoil and spoil) and bedrock to be removed are shown in Table 2-4 below. Excavated soil will be placed in designated spoil deposition areas, be used for reinstatement and landscaping works around the Site, as well as being side cast alongside the access roads. It is not intended or expected that any of the excavated material cannot be reused.

Please refer to the Peat and Soil Management Plan enclosed at Appendix 11.4 of Chapter 11 – Land, Soils, Geology and Hydrogeology.

**Table 2-5: Estimated excavation volumes**

| Infrastructure Element [1] | Proposed Dimensions | Peat Volume ($m^3$) [2] | Spoil (non-peat) Volume ($m^3$) [2] | Comment |
|---|---|---|---|---|
| 9 no. Turbines and Hardstands | 27m diameter excavation footprint (25m wide base with 1m of working space around the perimeter of the base) for turbine foundation with 80 x 33.5m hardstand area. | 30,449 | 18,921 | Hardstanding area and foundation footprint |

| Infrastructure Element [1] | Proposed Dimensions | Peat Volume ($m^3$) [2] | Spoil (non-peat) Volume ($m^3$) [2] | Comment |
|---|---|---|---|---|
| Access Roads | Assumed 5m running surface with 6m wide development footprint. | 13,776 | 9,184 | |
| Substation | Hardstanding area of 140 x 85m. | 2,881 | 2881 | |
| Temporary Construction Compounds (x2) | Footprint of 70 x 40m for both | 4313 | 5176 | |
| GCR | Calculated using Ground penetration radar Appendix 11.4. | 3450 | | Provided by client |
| | | | | |
| | **Total =** | **54,869$m^3$** | **36,162$m^3$** | **Total peat and spoil = 91,031$m^3$** |

Note 1 – A bulking factor of 15 and 10% has been applied to the excavated peat and non-peat soils respectively. This allows for expected increase in volume upon excavation and to allow for a variation in ground conditions across the Site.
Note 2 – Soil volumes given in this table are indicative and for information purposes only, and subject to detailed estimates

### *2.5.4.2 On-Site Electrical Cabling*

Electricity generated from wind turbines will be collected at medium voltage (33KV) by an internal circuit of buried cables. This circuit will be terminated at the proposed onsite substation. The internal collector circuit cable routes are shown on the 0100 series planning application drawings and will follow the alignment of the internal access tracks.

The electricity will be transmitted as a three-phase power supply so there will be three individual conductors (or individual cables) in each cable circuit. The three conductors will each be laid in separate ducts which will usually be laid in a trefoil formation but may also be laid in a flat formation where conditions require it, such as where the ducts need to cross an existing structure or culvert. In such cases, cable ducts will be cast into the structures to allow the power cables to cross the watercourses under the access tracks.

With a trefoil formation, the internal cable trench width will be 600 mm, and with a flat formation, the trench width will be 1200 mm. The depth of cover to the ducts carrying the cables will be 900 mm to the top of the upper ducts. The depth of trench for the cables will be 1200 mm. The diameter of the ducting will be selected to suit the range of cross-sectional areas of electrical cables and is likely to fall between 100 mm and 200 mm diameter.

Internal cable trench section types associated with on-site electrical cabling are presented in the accompanying 0100 series planning application drawings.

Further details on cable trench construction methodologies can be found in the CEMP.

#### *2.5.4.3 Felled Forestry*

Permanent felling of approximately 6.01 ha of forestry is required within the Site to accommodate the construction of the wind farm infrastructure, and as part of environmental mitigation measures for bat species. 4 no. turbines (T2, T3, T6 and T7) are located within, or next to, forestry.

It should be noted that the clear-felling of trees in the State requires a felling licence. The Forest Service of the Department of Agriculture, Food & the Marine is Ireland's national forest authority and is responsible for all forest licensing which is governed by the Forestry Act 2014 as amended and the Forestry Regulations 2017 (S.I. No. 191 of 2017). A felling licence will include the provision of relevant replant lands (afforestation area) to be planted in lieu of the proposed tree felling on the Site. The associated afforestation of alternative lands equivalent in area to those lands being permanently clear-felled is also subject to licensing ('afforestation licensing').

The area of trees to be felled will be the minimum required to accommodate the Proposed Development. However, for the purpose of the EIAR the area for felling has been identified as the maximum area that could conceivably be required to construct the Proposed Development.

The felling will be the subject of a Felling Licence Application to the Forest Service prior to construction as per the Forest Service's policy on granting felling licenses for wind farm developments. The Forest Service Policy requires that a copy of the planning permission for the wind farm be submitted with a felling license application therefore the felling license cannot be applied for until planning permission is received for the Proposed Development. The proposed replant lands, which will be subject to an afforestation licence, will not be located on lands that are hydrologically linked to the Site.

The Applicant commits to not commencing tree removal on site to accommodate the Proposed Development until both felling and afforestation licences are in place and this ensures the afforested lands are identified, assessed and licensed appropriately by the relevant consenting authority.

Prior to construction confirmatory surveys will be undertaken by suitably qualified person prior to the initiation of works at the Wind Farm Site. The survey will aim to identify nests or roosts. The removal of woody vegetation hedgerows and forestry will be undertaken in full compliance with Section 40 of the Wildlife Act 1976 – 2022 and will commence outside the bird nesting season 1st of March to 31st of August inclusive.

Approximately 0.9km of hedgerow/scrub, Treelines will be permanently removed within and around the footprint of the Proposed Project to facilitate some elements of infrastructure and new access roads, sections along the Transport and delivery route. Removal of this combined length hedgerow/treeline is also required to achieve the required buffer distance for the protection of bats, from the turbines to the canopy of the nearest habitat feature, as recommended by the Natural England (2014) and NatureScot (2021). It is proposed to plant 1.2km of new hedgerow to offset this potential loss and to provide additional habitat connectivity within the Site. Overall, the proposed replanting will result in a net gain within the Site.

### *2.5.4.4 Biodiversity Management / Enhancements*

Proposing to fence off bog woodland habitat to prevent stock access. This will allow recovery of the ground and field layers of the woodland and should encourage natural regeneration of this native habitat.

Riparian Zone identified on Northern bank of River Cushina. The riparian zone will be fenced off to create a riparian zone 5m to 35m wide, widest to the east) within the Site. The aim is to allow the developing semi-natural woodland in the east to further develop, to aid protection of the riverbank, enhance water quality and protect badger setts.

Invasive Species in the form of Giant Hogweed has been recorded on site. Careful management of this species is needed to ensure the safe removal of the species from the site prior to construction. Please refer to BEMP.

The following actions and objectives are proposed as part of the biodiversity management of the site. Please refer to the BEMP at Appendix 2.2 for further details.

**Action: Fencing off the Cushina River and main drains running into Cushina River.**

**Objective: Water Quality Enhancement**

- As necessary we will repair or install new fencing with suitable fencing to prevent livestock access to the main drains within the Site flowing into the Cushina River;
- As necessary we will repair or install new fencing with suitable fencing to prevent livestock access to the Cushina River and prevent damage to the riverbanks within the site.
- Fencing will be timber posts with 3 strands of barbed wire, and with new water troughs with solar pumps will be installed.
- All fencing will be installed **at least** 1.5m back from the **top** of the bank.
- Where necessary, new drinking troughs will be installed with solar pumps

**Action: Creation of In-Ditch Wetlands**

**Objective: Water Quality and Biodiversity Enhancement**

- All main drains within the Site boundary flowing into the Cushina River from the north will have in-ditch wetlands installed.
- The final design of these in-ditch wetlands will be based on existing best practices.
- It is expected that one in-ditch wetland will be created per drain.
- Each in-ditch wetland will be installed along at least a 10m length of drain.
- At least one of the banks of the drain along this 10m-minimum length of drain will then be modified, creating a graded bank and increasing the width of the drain.
- The aim of the in-ditch wetland is to slow the flow of water, allowing excess sediment to fall out of the water column, thereby enhancing the quality of the water that reaches the Cushina River.

- The graded bank allows for different depths of water and for the development of a variety of wetland vegetation along the bank, thus enhancing biodiversity and contributing to water quality enhancement.

- Maintenance will be required throughout the lifetime of these in-ditch wetlands to remove the sediment as it accumulates.

## 2.5.5 Grid Connection

### *2.5.5.1 On-Site Electrical Substation*

It is proposed to construct a 110 kV electricity substation within the Site as shown in Figure 2.4, and 0100 series planning drawings. The proposed substation is located in the townland of Cushina, County Offaly. Access to the substation will be from the R419 through internal wind farm site access tracks. Upon decommissioning of the Proposed Wind Farm, the 110kV substation within Cushina townland will remain part of the national grid infrastructure.

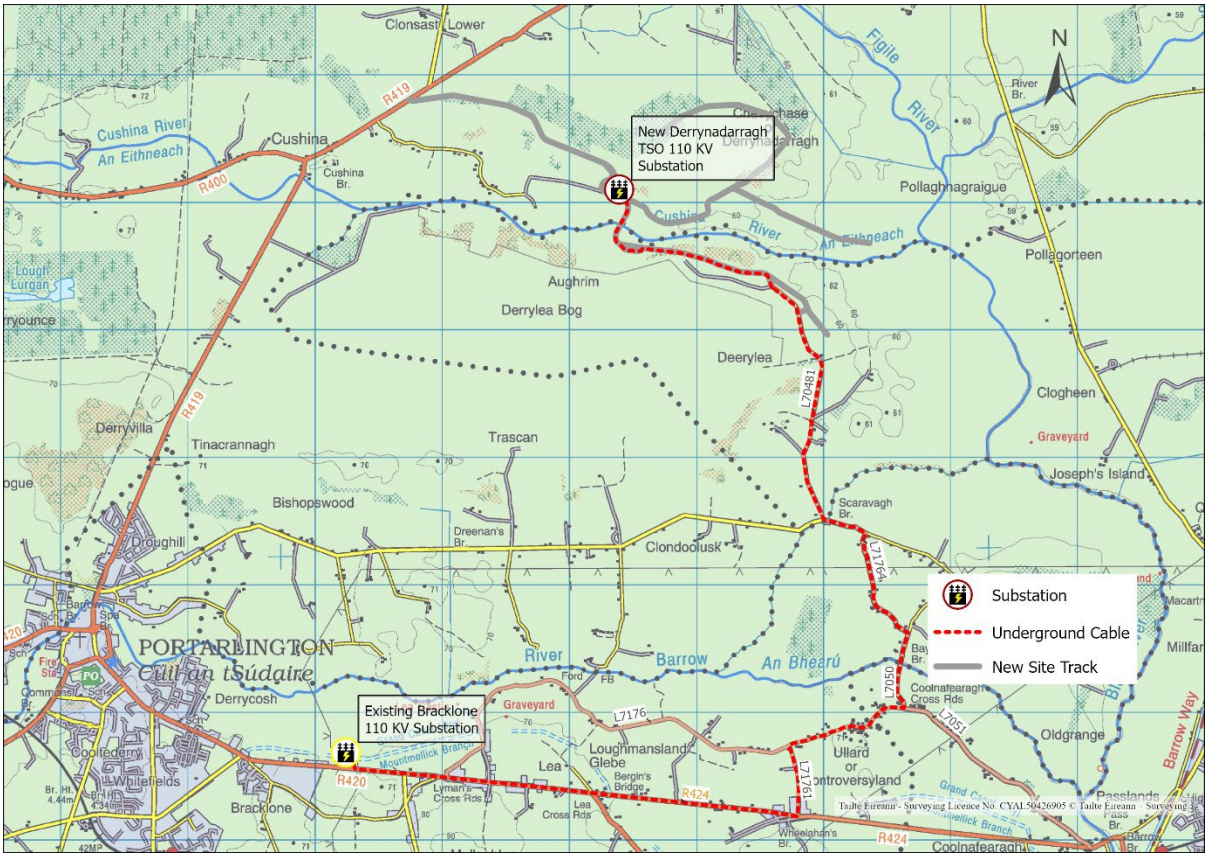



**Figure 2-1: Grid Connection Route**

The footprint of the proposed on-site (TSO) 110kV substation compound measures approximately 5,250m2 in area and will include 1 no. control building [18m x 25m and 7.4m high] and the electrical substation components necessary to consolidate the electrical energy generated by each wind turbine and export that electricity from the on-site 110kV substation to the national grid. The layouts and elevations of the proposed on-site 110kV substation are shown on drawing references DANU-DAR-SK004, DANU-DAR-SK005.

The building will include staff welfare facilities for the operational phase. Due the nature of the Proposed Development and the low frequency use, drinking water will be provided via bottled supply if needed. Toilet facilities will include a low-flush toilet and low-flow wash basin, with minimal water demand. This water will be sourced through a rainwater harvesting system from the building roofs, eliminating the need for a potable water supply. Wastewater from the welfare facilities will not be treated on-site. Instead, it will be collected in a sealed underground storage tank and removed periodically by a licensed waste collector to an approved wastewater treatment facility. This approach is widely accepted for wind farm developments and has been endorsed by multiple Planning Authorities and An Coimisiun Pleanála. The storage tank will be equipped with an automated alarm system to provide advance notice when emptying is required. Full specifications of the alarm system will be submitted to the Planning Authority prior to the commencement of site works. The alarm will be integrated into the site's remote monitoring system, which continuously tracks data from turbines, wind measurement devices, and the substation 24 hours a day, 7 days a week. Only waste collectors with valid permits under the Waste Management (Collection Permit) Regulations, 2007 (as amended) will be authorised to transport wastewater from the site.

The substation compound will also contain external electrical and ancillary infrastructure in the form of the following:

- Cable sealing ends;
- Surge arrestors;
- Cable disconnectors;
- Post insulators;
- Circuit breakers;
- Current and voltage transformers;
- Steel gantries and cable chairs;
- Power transformers;
- Power quality compensation equipment;
- Concrete plinths and bunds;
- External lighting;
- Lightening protection masts;
- Telecommunications masts;
- Security cameras;
- Palisade fencing and gates.

The on-site 110kV substation compound will include steel palisade fencing of 2.6 metre high as required by ESB, and internal fences will also segregate different areas within the main substation. Please see Drawing Ref: DANU-DAR-SK006for fencing details.

Lightning protection and telecommunications masts will represent the tallest structures in the compound and will not exceed 18 m in height.

The proposed substation compound is presented in accompanying planning application drawings references DANU-DAR-SK004, DANU-DAR-SK005.

### *Access to Grid Connection Infrastructure*

The Proposed Wind Farm will be connected to the existing electricity network by means of the following new grid connection infrastructure:

1. 1 no. new permanent 110kV substation compound (1 no. EirGrid control building with welfare facilities, 1 no. wind farm control building with welfare facilities, all associated electrical plant and apparatus, security fencing, underground cabling, wastewater holding tank, site drainage and all ancillary works) in the townland of Cushina (Coolstown By), County Offaly.

2. Grid connection works joining the new Transmission System Operator (TSO) 110KV Substation to the existing [110KV] GIS Bracklone Substation. The grid connection will require 11.4km of underground 110kV electrical cabling and the route will pass through the townlands of Cushina in County Offaly; Derrylea, and Inchacooly in County Kildare, and Coolnaferagh, Ullard or Controversyland, Clonanny, Lea, Loughmansland Glebe, and Bracklone in County Laois. Works for the grid connection will involve trenching, laying of ducting, installing 15 no. joint bays and 5 no. watercourse crossings, pulling cables and the back filling of trenches and reinstatement works. The route which will run through 9.1 Km of existing public road, 0.3km in existing tracks and 2km in new access tracks on the wind farm site.

If planning consent is granted, construction of the grid connection will be undertaken by a statutory undertaker having a right or interest to provide services in connection with the Proposed Wind Farm.

The grid connection route was chosen following consultation with EirGrid and a survey of potential route and connection options. Further information on the alternatives considered can be found in Chapter 3 – Site Selection and Alternatives. The grid connection route was selected because it minimises disruption to existing utility services in Portarlington. The Grid point of connection at Bracklone 110KV substation was identified based on the anticipated available capacity. EirGrid will carry out a high-level technical assessment to confirm the suitability of this connection point before issuing a formal connection offer.

### 2.5.6 IPP Wind Farm Control Building

The wind farm control building and associated compound will be situated adjacent to the 110 kV substation compound. The wind farm control building will measure approximately [20] metres by [6] metres, with a height of 7 metres. Layouts of the control buildings are illustrated in Figure [] and Figure [ ].

The building will include staff welfare facilities for the operational phase. Due the nature of the Proposed Development and the low frequency use, drinking water will be provided via bottled supply if needed. Toilet facilities will include a low-flush toilet and low-flow wash basin, with minimal water demand. This water will be sourced through a rainwater harvesting system from the building roofs, eliminating the need for a potable water supply. Wastewater from the welfare facilities will not be treated on-site. Instead, it will be collected in a sealed underground storage tank and removed periodically by a licensed waste collector to an approved wastewater treatment facility. This approach is widely accepted for wind farm developments and has been endorsed by multiple Planning Authorities and An Coimisiun Pleanála. The storage tank will be equipped with an automated alarm system to provide advance notice when emptying is required. Full specifications of the alarm system will be submitted to the Planning Authority prior to the commencement of site works. The alarm will be integrated into the site's remote monitoring system, which continuously tracks data from turbines, wind measurement devices, and the substation 24 hours a day, 7 days a week. Only waste collectors with valid permits under the Waste Management (Collection Permit) Regulations, 2007 (as amended) will be authorised to transport wastewater from the site.

### *Site Tracks containing 110 kV Cable Installation*

A total of 2000 metres of site tracks will be constructed to accommodate the cable ducts and 110 kV cables. Where peat is present on site, it will be excavated down to a suitable bearing stratum. The area will then be backfilled with appropriate material to the existing ground level, ensuring a stable foundation for the cable infrastructure. Marker posts will be installed along the route to indicate the location of the underground cable. The position of the 110 kV cable within the site is illustrated in the 0103 series planning drawings.

### 2.5.7 Trenching and reinstatement of existing road network

A trench of 1.35m deep and 0.60m wide will be excavated in existing roads to accommodate the underground grid cable. Part of the existing road sits on peat, and therefore to ensure that there is a suitable bearing stratum for the grid cable, the peat will be extracted along the existing road network. It is anticipated that quantity of peat will be extracted and stored on site see Chapter 11 – Soils, Geology, and Hydrogeology and the Peat and Soils Management Plan for details on Peat storage. A ground penetration radar survey was carried out to determine the depth of peat within the existing road along the route. The road will be reinstated in accordance with the Guidelines for Managing Openings in Public Roads and to a standard agreed with the County Councils. Road opening licences supported by a detailed Traffic Management Plan (TMP) will be secured prior to works and will be followed to maintain public access along the route during the trenching and reinstatement works. See the TMP for further detail and CEMP for detailed construction methodology.

### 2.5.8 Cable Ducts

Five cable ducts of which the three will be electrical cables, and the other two being communications cables, and copper cables, respectively see drawing [] for details. The ducts will be laid on bedding sand. These will then be surrounded by cement bound material, red cable protection strips, yellow warning tape and steel protective plates, where required. The trench will then be backfilled and reinstated.

110kV cables will be pulled from truck or trailer mounted cable reels through the ductwork from the Proposed Development new 110kV substation to existing [Bracklone GIS] substation.

### 2.5.9 Joint Bays

There are 15 no. Joint bays along the grid connection route, see 0103 series planning drawings. Joint bays will be to EirGrid standard specifications (6m x 2.5m) and will consist of 3 no. pre-cast concrete chambers with ducting. Once the cables have been jointed and commissioned, the entry and exit points and joint bay chamber will be filled with sand and a concrete cover fitted on top.

A manhole type cover will be fitted over the start and end points of the grid connection cable route and over the link bay chambers. Over-ground identification marker posts and marker plates will be installed along the grid connection route. The manhole covers and marker plates/posts will be the only surface expression of the underground cabling when works are completed. See table 2-5for coordinates of joint bays. All joint bays will be located outside of the Flood zone as per CFRAM 1:1000 flood model.

**Table 2-6: Joint Bay Coordinates**

| Joint Bays | Coordinates (ITM) | |
|---|---|---|
| No. | Easting | Northing |
| JB1 | 658366 | 715889 |
| JB2 | 658892 | 715617 |
| JB3 | 659504 | 715447 |
| JB4 | 659908 | 714797 |
| JB5 | 659814 | 714123 |
| JB6 | 660067 | 713508 |
| JB7 | 660333 | 712923 |
| JB8 | 660526 | 712309 |
| JB9 | 660149 | 711919 |
| JB10 | 659737 | 711519 |
| JB11 | 659303 | 711268 |
| JB12 | 658557 | 711346 |
| JB13 | 657812 | 711430 |
| JB14 | 657066 | 711505 |
| JB15 | 656319 | 711576 |

### 2.5.10 Crossings

There will be 5 no. crossing points comprising 4 no. watercourse crossings and 1 dry stone arch bridge crossing at disused canal. There will be 4 no. number Horizontal Directional Drilling (HDD) and one crossing and one flat formation crossing within the road above an existing culvert. HDD involves construction of a launch and retrieval pit either side of a crossing and cable conduits are then drilled from the launch pit to the retrieval pit. See figure [XX] for locations and table [XX] for coordinates of chambers. All pits will be outside of Flood zone as per CFRAM 1:1000 flood model and will maintain a buffer of 50 m outside of the River Barrow SAC. See CEMP for detailed construction methodology.

| Crossings | | | | |
|---|---|---|---|---|
| No. | Easting | Northing | Description | Type |
| 1 | 659966 | 713535 | Culvert 1 | HDD |
| 2 | 660546 | 712416 | Bridge Over River Barrow | HDD |
| 3 | 660321 | 711962 | Culvert 2 | Crossing Over |
| 4 | 659745 | 711434 | Culvert 3 | HDD |
| 5 | 658244 | 711382 | Old Canal Bridge | HDD |

### 2.5.11 Turbine Delivery Route

There are several ports that have proven capability to accept and store large wind turbine components. These ports include Waterford, Cork, Foynes, Galway and Dublin. Transportation of wind turbine components from these ports to the national motorway network has been demonstrated. The facilities within the ports and access to and from the ports is continually being upgraded as part of general improvements and as anticipated in the due to be released National Ports Policy. It is on this basis that it is not foreseen that this project will require any material change to the port or to the access to the national motorway network should the project be consented and enter the construction phase.

A Delivery Route Selection and Assessment was carried out by Pell Frischmann Consulting to identify the optimum delivery route to site and is presented within Chapter 3 – Site Selection and Alternatives and Appendix 2.3 in Volume III of this EIAR. The proposed turbine delivery route is presented in Figure 2.3.

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.

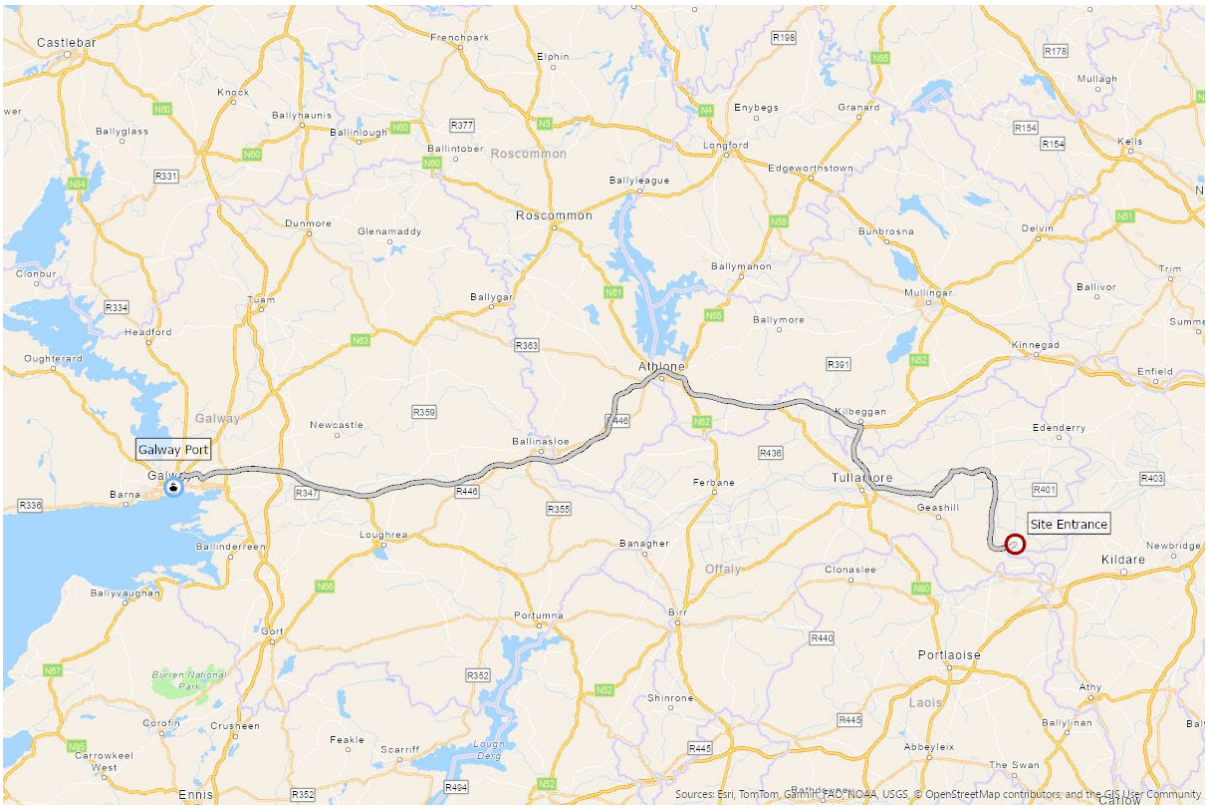



**Figure 2-2: Turbine Delivery Route (Galway Port to Site)**

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 over sail, 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. Most of the accommodation works associated with the TDR will be fully reinstated following the construction stage, except for the permanent Bridge Crossing at Philipstown Bridge (see Node 29/30 within Table 5-1).

Key elements of the accommodation works along the TDR for the delivery of turbines are summarised in Table 5-1. Works within private lands at TDR Nodes 19, 22, 29/30, 35/36, 38, 46/47, are included within the planning application red line boundary. All other works are within the public road corridor.

Key elements of all accommodation works for the delivery of turbines are summarised in Chapter 14. Their details are also contained in the Pell Frischmann Route Survey Review (RSR) in Appendix 2.3 and the Dara Energy Ltd. Amended Turbine Delivery Route Assessment Report in Appendix 2.4, EIAR Volume III.

**Table 2-7: TDR Accommodation Works**

| TDR Node Reference | Location | Details | Summary Description of Proposed Temporary Accommodation Works |
|---|---|---|---|
| 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. |
| 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. |
| 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. |
| 25 | Daingean Main Street / Edenderry Road | Loads will continue through Daingean on the R402 | Installation of Load Bearing Surface in the northern footway. |
| 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 bridge bypassing R402/R400 Junction. |
| 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. |
| 32 | R400 East of Mountlucas | Loads will continue on the R400 southbound. | Installation of Load Bearing Surface on the western verge. |
| 33 | R400 South-east of Mountlucas | Loads will continue on the R400 southbound. | Installation of Load Bearing Surface on the eastern verges. |
| 34 | R400 Northeast of Brackagh | Loads will continue on the R400 southbound. | Trimming of vegetation and trees on both verges. |
| 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 onR400. |
| 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. |
| 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. |

Further details and assessment of these works are provided in Chapter 14 - Traffic and Transportation and Appendix 14.1 – Traffic Management Plan.

Temporary accommodation works will only be required during the operational phase in the unlikely event of a major turbine component replacement. The temporary accommodation works will not be required for the decommissioning phase as turbine components can be broken up on site and removed using standard HGVs.

### 2.5.12 Overhead Utilities and Obstructions

Along the route, several overhead utilities and obstructions will need to be removed to ensure a minimum overhead clearance.. This will involve either temporary disconnection and re-routing of the utilities. These works will be carried out by the relevant utility providers prior to the delivery of the turbines to the site.

### 2.1.1 Overhanging Branch Trimming

At various points along the R400 as identified in the transport route assessment Apendix 2.3, hedge and tree trimming will be necessary to achieve the required clearance. A trial run will be conducted to reconfirm locations. All vegetation management activities will be scheduled outside of the bird breeding season.

The works described above will be assessed in the EIAR and the NIS for the proposed Project.
Further to pre-application discussions with Offaly County Council a Traffic Management Plan has been prepared as part of this EIAR and included at Appendix A of the CEMP.

### 2.1.2 Biodiversity Enhancements

Wetland Surveys have been commissioned by the Client to prepare a Biodiversity Enhancement Management Plan (BEMP) as part of the Proposed Development. All lands identified for biodiversity enhancement fall within the red line boundary of the application site – refer to letters of consent from landowners.

The BEMP provides an overview of the important habitats and species within the site and collates all relevant information on the proposed enhancement, management and monitoring measures in relation to biodiversity within the site, aiming to promote a multi-faceted approach to creating a landscape-scale framework for maximum BNG within the site over the lifetime of the Proposed Wind Farm (35 years)

All lands identified for biodiversity enhancement fall within the red line boundary of the application site – refer to letters of consent from landowners.

The BEMP can be found in Appendix 2.2 in Volume III of the EIAR. The following actions and objectives are proposed as part of the biodiversity management of the site:

**In-Ditch Wetlands**

The Cushina River, which flows through the Derrynadarragh Wind Farm site, is hydrologically connected to the River Barrow and River Nore SAC. Baseline surveys identified poor water quality in the field drains running into the Cushina, particularly those located north of the river due to Peat Harvesting North of the Site.

To address this, the Biodiversity Enhancement Management Plan proposes the installation of in-ditch wetlands within the main drainage channels discharging into the Cushina River. These wetlands are designed to intercept and retain sediment, thereby improving water quality before it reaches the river. This measure also contributes to the ecological integrity of the site and supports aquatic biodiversity, including amphibians, dragonflies, and foraging bats.

Each in-ditch wetland will be constructed along a minimum 10-metre section of drain. The design includes widening the ditch and grading one bank to create shelves of varying depths. These shelves will support the establishment of wetland vegetation and provide microhabitats for aquatic species. Water depths will range from approximately 50 cm to 75 cm to allow for sediment settling and habitat diversity.

To slow water flow and enhance sediment retention, small barriers will be installed within the drains. These may include earth bunds with outlet pipes or wooden dams, designed to accommodate storm flows while maintaining wetland function. The location of each wetland will be carefully selected to avoid proximity to turbine bat buffer zones and peat soils.

Stockproof fencing will be installed along both banks of each wetland to prevent livestock access, which can cause erosion and inhibit vegetation growth. Fencing will be set back at least 1.5 metres from the top of the drain to allow for riparian vegetation development. This measure will also contribute to water quality improvement and habitat protection.

In total, approximately 60–100 metres of in-ditch wetland habitat will be created. This enhancement is expected to yield measurable improvements in water quality, support biodiversity, and contribute positively to the overall ecological condition of the site.

### 2.1.1 Riparian Woodland Creation and Protection

A key biodiversity enhancement measure proposed for the Derrynadarragh Wind Farm is the creation and protection of riparian woodland along the Cushina River. This initiative targets a 2.7-hectare area of scrub and grassland habitat located on the northern bank of the river, within the eastern portion of the site. The area currently supports early successional scrub vegetation and is accessible to livestock, which has impeded natural woodland regeneration.

The proposed measure involves the installation of stockproof fencing approximately 30 metres back from the riverbank, effectively excluding cattle and other large herbivores from the riparian zone. This exclusion is expected to facilitate the natural succession of scrub to native woodland, enhancing structural and species diversity over time. The fencing will also protect active Badger setts and Otter spraint sites identified during ecological surveys, thereby improving habitat quality for these species.

The riparian woodland creation will contribute to improved water quality in the Cushina River by stabilising the riverbank and promoting the development of riparian vegetation.

The fencing will be constructed using wooden posts and three strands of barbed wire, allowing for the movement of small mammals while preventing livestock access. The measure will also support pollinators and invertebrates that rely on dead wood and understory vegetation, contributing to broader ecosystem resilience

## 2.2 Construction

### 2.2.1 Construction Activities

In the event that An Coimisiún Pleanála, decides to grant planning permission for the Proposed Development, tree felling, upgrading of existing site tracks and the provision of new site tracks will precede all other activities. Drainage infrastructure will be constructed in parallel with the access track construction. This will be followed by the construction of the turbine hardstanding areas and foundations.

In parallel with these works the on-site electrical works i.e., the sub-station and internal cable network as well as off-site connection works to the national grid will be completed. Construction methodologies are provided in the CEMP in Appendix 2.1.

### 2.2.2 Construction Programme

The construction of the Proposed Development in its entirety is expected to take 24 months. The proposed construction programme upon which assessments in the EIAR have been based is presented hereunder.

**Table 2-8: Construction Programme**

| | Month | | | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Activity | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 |
| Mobilisation and site setup | | | | | | | | | | | | | | | | | | | | | | | | |
| Site clearance and felling | | | | | | | | | | | | | | | | | | | | | | | | |
| Internal access tracks | | | | | | | | | | | | | | | | | | | | | | | | |
| Turbine hard standings | | | | | | | | | | | | | | | | | | | | | | | | |
| Turbine foundations | | | | | | | | | | | | | | | | | | | | | | | | |
| TDR accommodation works | | | | | | | | | | | | | | | | | | | | | | | | |
| Turbine Installation | | | | | | | | | | | | | | | | | | | | | | | | |
| Onsite substation | | | | | | | | | | | | | | | | | | | | | | | | |

| Activity | Month | | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 |
| Grid connection works | | | | | | | | | | | | | | | | | | | | | | | | |
| Private electrical network and commissioning | | | | | | | | | | | | | | | | | | | | | | | | |
| Landscaping, reinstatement, demobilisation | | | | | | | | | | | | | | | | | | | | | | | | |

### 2.2.3 Hours of Construction

The hours of construction activity for the Proposed Development will be limited to avoid unsociable hours as per Section 8.5 (d) of the code of practice for BS 5228: Part 1: 1997. Construction operations will generally be restricted to between 07:00hours and 19:00 Monday to Friday, and 08:00 hours and 14:00 hours on Saturday. It should be noted that it may be necessary to commence turbine base concrete pours earlier due to time constraints incurred by the concrete curing process. Work on Sundays or public holidays will only be conducted in exceptional circumstances or in an emergency. Turbine lifting works will be scheduled to accommodate low wind weather windows. Additional emergency works may also be required outside of normal working hours as quoted above. Further details on working hours and restrictions of same are provided in the CEMP in Appendix 2.1.

### 2.2.4 CEMP

A Construction and Environmental Management Plan (CEMP) is contained in Appendix 2.1 of Volume III.

The CEMP sets out the key environmental management measures associated with the construction, operation and decommissioning of the Proposed Development, to ensure that during these phases of the Proposed Development, the environment is protected, and any potential impacts are minimised. The CEMP will be developed further at the construction stage, on the appointment of the main contractor to the Proposed Development to address the requirements of any relevant planning conditions, including any additional mitigation measures that are conditioned.

The CEMP document is divided into six sections:

- **Section 1:** Introduction provides details on the existing site and the Proposed Development.

- **Section 2:** Existing Site Environmental Conditions provides details of the main existing geotechnical, hydrological, ecological and archaeological conditions onsite. These conditions will be considered by the Contractor in the construction, operation and decommissioning of this Proposed Development and the prescribed measures complied with.
- **Section 3**: Overview of Construction Works, this section provides an overview of the construction works proposed and drainage and sediment controls to be installed.
- **Section 4:** Environmental Management Plan (EMP), this section outlines the main requirements of the EMP and outlines controls for the protection of the environment for example soil management, waste management, traffic management, site drainage management, site reinstatement & decommissioning, habitat and archaeology management etc.
- **Section 5:** Safety & Health Management Plan, this section defines the work practices, procedures and management responsibilities relating to the management of health and safety during the design, construction and operation of the Proposed Development.
- **Section 6:** Emergency Response Plan contains predetermined procedures to ensure the safety, health and welfare of everybody involved in the Proposed Development and to protect the environment during the construction phase of the Proposed Development.

### 2.2.5 Traffic Management

A careful approach will be taken to planning the entirety of the works associated with the Proposed Development to ensure minimal impacts on road users and the public.

A Traffic Management Plan will be adopted, in consultation with Kildare County Council, Offaly County Council and Laois County Council, to provide a safe environment for road users and construction workers. A Traffic Management Plan is contained in the CEMP. In the event permission is granted for the Proposed Development the Traffic Management Plan will be finalised following the appointment of the contractor for the main construction works to address the requirements of any relevant planning conditions, including any additional mitigation measures that are conditioned and will be submitted to the planning authority for agreement.

#### *Construction Haul Routes*

The Site is surrounded by a comprehensive road network with routing options available via the main Site entrance. The proposed haul route for the delivery of materials associated with the construction of the Proposed Development are outlined in Figure 2-7 below.

Construction deliveries from Kilmurray Sand and Gravel Quarry will use the R400, M6, N52, R420, and the R419 as the designated delivery route to the main site entrance. Construction deliveries from Roadstone Quarry Tullamore will use the R443, N52, R420 and R419 as the designated delivery route to the main site entrance.

The haul routes are primarily along regional roads, with one motorway and one national road. The local road network does not form part of the haul routes.

It is anticipated that a succession of 20T and/or 8m³ trucks will transport the material at a peak frequency of 10 to 13 HGVs/hour. Peaks in construction traffic are typically associated with the pouring of turbine foundations. Specialist vehicles will be used for the delivery of the wind turbine components and substation transformer. These components will follow the Turbine Delivery Route outlined in Section 4.2 below and in the Route Survey Report completed by Pell Frischmann (refer to Appendix 2.3 in Volume III of this EIAR for more details).

Other materials are expected to be delivered on flatbed trucks (40ft or smaller depending on size of deliveries). Hours of operation will be limited for HGV movements to allow for residents to avoid conflict with commuter traffic during the morning and evening peak hours, during local school start and finish times.

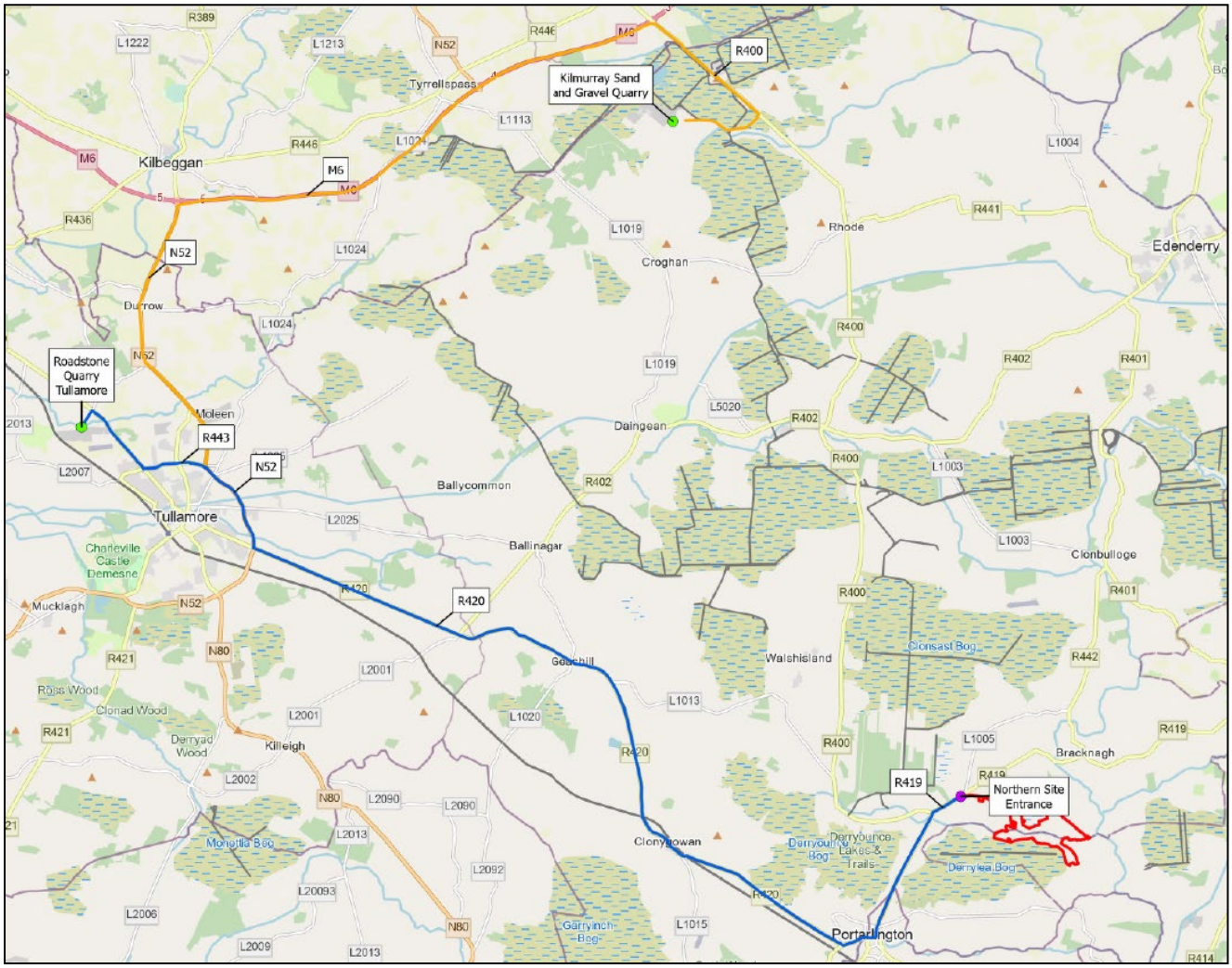



**Figure 2-3: Haul Routes**

### *Dust Suppression*

In periods of extended dry weather, dust suppression may be necessary along haul roads to manage dust, water will be taken from stilling ponds in the site's drainage system and will be pumped into a bowser or water spreader to dampen down haul roads and the construction compounds to prevent the generation of dust. Silty or oily water will not be used for dust suppression, because this would transfer the pollutants to the haul roads and generate polluted runoff or more dust. Water bowser movements will be carefully monitored, as the application of too much water may lead to increased runoff. A site speed limit will also be adhered to which will assist in suppressing dust on the Proposed Development site.

### *Vehicle Washing*

Wheels or vehicle underbodies are often washed before leaving sites to prevent the build-up of mud on public (and site) roads. A vehicle or wheel wash facility will be provided close to the northern and southern accesses at the Proposed Development and will be used where required Please refer to 0100 series planning drawings for locations and Drawing No. P22-145-0500-0010. The site roads will be well finished with non-friable, compacted hardcore, and so the public road-going vehicles will not be travelling over soft or muddy ground where they might pick up mud or dirt. A road sweeper will be available and utilised if any section of the public roads were to be dirtied by trucks associated with the Proposed Development.

### 2.2.6 Soil and Peat Management

For the construction phase of the Proposed Project the activities that will generate peat and spoil are as follows:

(1) Upgrade of existing access tracks (excavate and replace) including temporary widening of local road to facilitate deliver of turbine components

(2) Construction of new excavated roads through peat

(3) Construction of floating roads over peat (will not generate peat and spoil but the methodology for construction is included for completeness)

(4) Excavation and placement of arisings

(5) Excavations in peat for turbine bases, hardstands and other infrastructure foundations

(6) Excavations in peat for underground cables

Management of all excavated soils and peat will be carried out in accordance with the Peat and Soils Management Plan contained within Appendix 11.3 of Volume III of the EIAR.

### 2.2.7 Surface Water Management and Site Drainage

Site drainage at the Derrynadarragh Wind Farm will implement Sustainable Drainage Systems (SuDS). This design approach ensures that existing drainage patterns will be maintained throughout the site.

An appropriate drainage design as proposed for this development is the primary mitigation measure for the protection of waterbodies, incorporating silt protection infrastructure and control measures to reduce the rate of surface water runoff from the wind farm site.

The drainage system will be constructed alongside all turbine hardstands, internal access tracks, substation and the temporary construction compound. The drainage system for the existing tracks and roads will largely be retained. Where the roads require widening, this will involve the re-location of existing roadside swales to allow for widening.

As standard and best practice approach, surface water runoff attenuation and drainage management are key elements in terms of mitigation against impacts on surface water bodies.

Two distinct methods will be employed in the management of construction surface water runoff. The first method involves keeping clean water clean by avoiding disturbance to natural drainage features, minimising any works in or around drainage features, and diverting clean surface water flow around excavations and construction areas. The second method involves collecting any drainage waste from works areas within the site that might carry silt or sediment, and to route them towards settlement ponds prior to controlled diffuse release over vegetated natural surfaces. There will be no direct discharge to surface water.

'Clean' water is separated from 'dirty' water utilizing interceptor drains as illustrated in Image 2-1 below. The interceptor drains will be installed on the upslope side of the construction area. This will reduce the amount of water from the construction area that will need to be treated before it can be safely discharged into the environment. Collected clean water will be carried under wind farm infrastructures by cross drains at regular intervals to ensure the original hillside flow is not impeded. The maximum distance between the cross drains will be 250m. The cross drains will be connected to a diffuse outfall to allow collected water to disperse overland.

The proposed access tracks will be constructed from a permeable aggregate material which allows the runoff to infiltrate underground. The excess water will drain into the swales which will be connected, during the construction stage, to the settlement ponds. The settlement ponds will have a diffuse outfall which will disperse the flow across the site. On completion of the works the settlement ponds will be filled in and the swales will be connected to a diffuse outfall.

The proposed access tracks and associated drainage infrastructure will follow contours as much as possible to reduce the gradient of the access tracks and related drains (swales). This will reduce velocities within the swales, and consequently erosion.

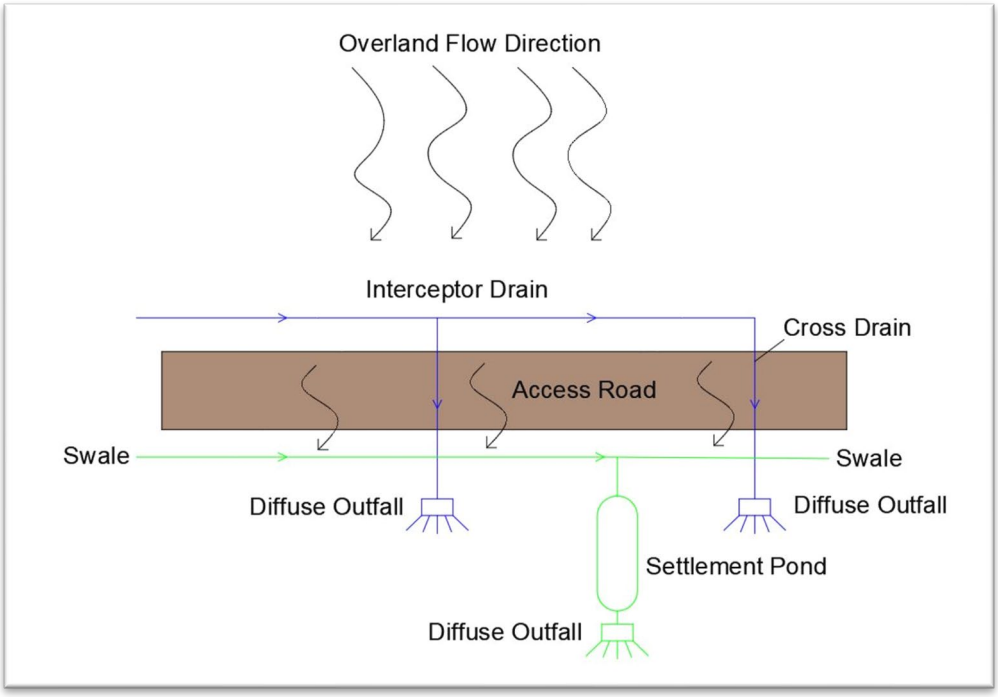



**Figure 2-4: Drainage Diagram**

The settlement ponds will be designed in the accordance with CIRIA C648. The volume of a settlement pond is related to the area draining into it. Any upslope runoff from site will be diverted from ponds. This is achieved by interceptor drains as discussed above.

Suspended solids will settle out only when the water is still. It is necessary to retain the water in the settlement pond for several hours to allow the suspended solids to settle out. Retention time depends on the particle size, disturbance of the water, depth of water, temperature and particle density. Retention time of two hours is applied for designing the ponds as outlined in CIRIA C648. This will allow silt to settle out.

CIRIA C648 recommends designing the outfall from the ponds to accommodate 1 in 10 years storm event, for this Proposed Development the outfalls will be designed to accommodate flows associated with 1 in 100-year event. The settlement ponds will be 1.0m deep. The proposed size of the settlement ponds is provided in the Surface Water Management Plan (SWMP) contained in the CEMP in Appendix D.

The existing access tracks, where required, will be upgraded. Where the existing drainage infrastructure does not prevent mixing of clean and dirty water, it is proposed to improve drainage at these locations by implementing drainage methodology proposed for new access tracks.

Further details on hydrology and drainage are contained in Chapter 12 Hydrology and Water Quality, the Surface Water Management Plan (SWMP) which is contained in the CEMP in Appendix D, and on accompanying planning application drawings. The proposed drainage is shown on Planning Drawings Series- 0100 and 0500.

### 2.2.8 Waste Management

A Waste Management Plan for the Proposed Development has been included in the CEMP, Volume III.

It will be the objective of the Developer in conjunction with appointed contractor to prevent, reduce, reuse and recover as much of the waste generated on site as practicable and to ensure the appropriate transport and disposal of residual waste off site. This is in line with the relevant National Waste Management Guidelines and the European Waste Management Hierarchy, as enshrined in the Waste Management Act 1996, as amended.

Any waste generated during the development construction phase will be collected, source separated and stored temporarily in dedicated receptacles at the temporary compound during construction pending removal to an appropriately licensed waste facility. Any materials containing invasive species will be appropriately managed and sent to authorised facilities.

A Construction Waste Management Plan has been prepared for the Proposed Development in line with the "Best Practice Guidelines on the Preparation of Waste Management Plans for Construction and Demolition Projects" (2021) as published by the Department of the Environment, Community and Local Government.

The Waste Management Plan will be finalised in accordance with this plan following the appointment of the contractor for the main construction works. This plan should be read in conjunction with the EIAR. The Construction Waste Management Plan will comply with the Statutory requirements of the National Waste Management Plan for a Circular Economy.

Any waste generated during the Proposed Development construction phase will be collected, source separated and stored in dedicated receptacles at the temporary compound during construction. It will be the responsibility of the contractor for the main construction works (when appointed) to nominate a suitable site representative such as a Project Manager, Site Manager or Site Engineer as Waste Manager who will have overall responsibility for the management of waste.

**Table 2-9: Licensed Waste Facilities in the Vicinity of Derrynadarragh Wind Farm**

| Licensed Waste Facility Location | Type of Waste |
|---|---|
| J. Ryan Haulage Ltd.<br>Cushina, Portarlington,<br>Co. Offaly<br>(c. 3.4km from site) | Soil and stones |
| Pat Mangan,<br>Ballycon Mount Lucas Daingean<br>Co. Offaly<br>(c. 16.4km from site) | Soil and stones |
| Killeshal Precast Concrete Ltd,<br>Killeshal, Daingean,<br>Co. Offaly R35 YK85<br>(c. 24km from site) | Concrete, soil and stones, mixed construction and demolition waste |
| T/A Oxigen Environmental<br>Barnan, Daingean<br>Co. Offaly R35 EE64<br>(c. 26km from site) | Waste plastics (except packaging), waste from forestry, waste metal, paper and cardboard packaging, plastic packaging, wooden packaging, metallic packaging, composite packaging, mixed packaging, glass packaging, textile packaging, concrete, bricks, tiles and ceramics, mixture of concrete, bricks, tiles and ceramics, wood, glass, plastic, copper, bronze, brass, aluminum, lead, zinc, iron and steel, tin, mixed metals, cables, soil and stones, insulation materials, gypsum-based construction materials, mixed construction and demolition wastes, paper and cardboard, ferrous metal, non-ferrous metal, plastic and rubber, glass, wood containing dangerous substances, wood, textiles, minerals (for example sand, stones), combustible waste (refuse derived fuel) |
| Anthony Cocoman,<br>Shean Edenderry Co. Offaly<br>(c. 17km from site) | Concrete, soil and stones |
| Hinch Plant Hire Ltd,<br>Ballydownan Geashill<br>Co. Offaly<br>(c. 15.6km from site) | Soil and stones |
| John Mallen,<br>Ballycon Mount Lucas<br>Co. Offaly,<br>(c. 15.1km from site) | Concrete, soil and stones, dredging spoil |

In accordance with national waste policy, source separation of recyclable material will take place. Receptacles will be clearly labelled, signposted and stored in dedicated areas in the construction compound.

The following sourced segregated materials container will be made available on site in the construction compound:

- timber;
- ferrous metals;
- aluminium;
- dry mixed recyclables;
- packaging waste;
- food waste.

**Table 2-10: Typical Waste Quantities for Wind Farm Development**

| | | Reuse | | Recycle/Recovery | | Disposal | |
|---|---|---|---|---|---|---|---|
| Waste Type | Tonnes | % | Tonnes | % | Tonnes | % | Tonnes |
| Mixed C&D | 1200 | 10 | 120 | 80 | 960 | 10 | 120 |
| Timber/Wood | 1000 | 40 | 400 | 55 | 550 | 5 | 50 |
| Plasterboard | 360 | 30 | 108 | 60 | 216 | 10 | 36 |
| Metals | 300 | 85 | 255 | 10 | 30 | 5 | 15 |
| Concrete | 200 | 20 | 40 | 65 | 130 | 15 | 30 |
| Other | 540 | 20 | 108 | 60 | 324 | 20 | 108 |
| Total | 3600 | | 1031 | | 2210 | | 359 |

### 2.2.9 Temporary Site Compounds

During the construction, it will be necessary to provide temporary facilities for construction personnel. Two temporary site compounds, the locations of which are shown on Figure 2.2, Volume IV will be constructed. Wheel wash facilities will be provided within the site near the site entrance point.

Facilities to be provided in the temporary site compounds will include the following:

- site offices, of Portacabin type construction;
- Portaloos;
- bottled water for potable supply;
- a water tanker to supply water used for other purposes;
- canteen facilities;
- material/non-fuel storage areas;
- employee parking;
- bunded fuel storage
- contractor lock-up facility;
- diesel generator;
- waste management areas.

The temporary site compounds will be established by removing topsoil down to a firm substrate, laying down geotextile material and then constructing a working surface of stone sourced from within the Site, and surrounded by security fencing. The topsoil will be removed and stored in accordance with the Spoil Management Plan contained within the CEMP in Appendix 2.1.

Temporary facilities will be removed, and the lands reinstated on completion of the construction phase.

## 2.3 Operation

Wind farm commissioning can take several months to complete from the erection of the final turbine to the commercial exportation of power to the national grid. It involves electrical and mechanical testing and control measures to check that the wind farm will perform and export power to the national grid, as designed and commissioning engineers working through an entire schedule of SCADA (Supervisory Control and Data Acquisition).

During the operational period, the turbines will operate automatically on a day-to-day basis, responding by means of anemometry equipment and control systems to changes in wind speed and direction. The turbine manufacturer or a service company will carry out regular maintenance of the turbines. Scheduled services will typically occur twice a year.

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 applicant requests the grant of permission is on the basis of a 35-year operational period from the date of full operational commissioning of the wind farm. With permission for the onsite substation and grid connection sought in perpetuity given that the substation will form part of the national electricity network. Therefore, the substation will be retained as a permanent structure and will not be removed.

Thirty-five years is the anticipated minimum useful lifespan of wind turbines which are being produced for the market today. The lifespan of wind turbines has been increasing steadily in recent years and allowing this duration will improve the overall carbon balance of the development, therefore maximising the amount of fossil fuel usage that will be offset by the wind farm. Leaving the wind turbines in-situ until the end of their useful lifespan would be optimum from an environmental viewpoint, particularly in relation to carbon savings.

### *Routine Maintenance*

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.

Supervisory operational and monitoring activities will be carried out remotely with the aid of computers connected via a telephone modem link.

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.

## 2.4 Decommissioning

In accordance with the CEMP, the following section provides an overview of the decommissioning phase works. The decommissioning works will be completed to approved standards, which include specified materials, standards, specifications and codes of practice (at the time decommissioning takes place).

An experienced main contractor will be appointed to undertake the of the decommissioning of the wind farm development. The main contractor will comply with the Construction and Environmental Management Plan (CEMP) prepared for the construction phase and the Operation and Environmental Management Plan (OEMP) implemented during operation and any revisions made to those documents throughout the phases in which they were adopted. The contractor will produce a detailed and site-specific Decommissioning Plan prior to commencement of decommissioning.

The key site targets are as follows;

- Ensure decommissioning works and activities are completed in accordance with mitigation and best practice approach presented in the accompanying Environmental Impact Assessment Report (EIAR) and associated planning documentation;
- Ensure decommissioning works and activities have minimal impact/disturbance to local landowners and the local community;
- Ensure decommissioning works and activities have minimal impact on the natural environment;
- Adopt a sustainable approach to decommissioning;
- Provide adequate environmental training and awareness for all project personnel.

The key site objectives are as follows;

- Using recycled materials if possible, e.g. soil and overburden material for backfilling and reinstatement;
- Ensure sustainable sources for materials supply where possible;
- Avoidance of any pollution incident or near miss as a result of working around or close to existing watercourses and having emergency measures in place;
- Avoidance of vandalism;
- Keeping all watercourses free from obstruction and debris;
- Correct implementation of the sustainable drainage system (SuDS) drainage design principles;
- Keep impact of decommissioning works to a minimum on the local environment, watercourses, and wildlife;
- Correct fuel storage and refuelling procedures to be followed;
- Good waste management and house-keeping to be implemented;
- Air and noise pollution prevention to be implemented;
- Monitoring of the works and any adverse effects that it may have on the environment.
- Decommissioning methods will be altered where it is found there is the potential to have an adverse effect on the environment;

An overview of the anticipated decommissioning methodologies is provided below.

### *Wind Turbines*

Prior to any works being undertaken on wind turbines, they will be disconnected from the grid by the site operator in conjunction with ESB Networks and EirGrid. The dismantling and removal of wind turbines of this scale is a specialist operation which will be undertaken by the turbine supplier that completed the installation where possible. Turbine dismantling will be undertaken in reverse order to methodology employed during their construction. A number of large-scale cranes will be brought back to site utilising the existing hard stand areas. The dismantling of turbines will be bound by the same safety considerations as was the case during construction in terms of weather conditions where works will not be undertaken during adverse weather conditions and in particular not during high winds.

The turbines will most likely be removed from site in a similar manner to how they were transported to the site originally in extended articulated trucks. The destination of the turbines post decommissioning is unclear at this time as a re-use option may be sourced if early decommissioning occurs. Therefore, the removal of turbines from site is considered in terms of all turbine components being removed intact and as they transported to site.

The transport of disassembled turbines from the site will be undertaken in accordance with a Transport Management Plan which will be issued to and agreed with the competent authority at that time as part of a permit application for the delivery of abnormal loads using the local roads under the Road Traffic (Special Permits for Particular Vehicles) Regulations 2007. The Transport Management Plan will provide for all necessary safety measures, including a convoy and Garda escort as required, off-peak turning/reversing movements and any necessary safety controls.

### *Turbine Foundations*

On the dismantling of turbines, it is not intended to remove the concrete foundation from the ground. It is considered that its removal will be the least preferred options in terms of having potential effects on the environment. Therefore, the nine turbine foundations will be backfilled and covered with soil material from areas of earthworks. The soil will be spread and graded over the foundation using a tracked excavator and revegetation allowed to occur naturally.

### *On-site Underground Cabling (for Turbines)*

The electrical and fibre optic cabling that connects each turbine will be removed from the cable ducting. The cabling will be pulled from the cable duct using a mechanical winch which will extract the cable and re-roll it on to a cable drum. This will be undertaken at each of the joint bays/pull pits along the cable. The access track will be excavated using a mechanical excavator at each cable pulling pit location and will be fully re-instated once the cables are removed. The cable ducting will be left in-situ as it is considered the most environmentally prudent option, avoiding unnecessary excavation and soil disturbance for an underground element that is not visible.

## 2.5 Risk of Major Accidents and Disasters

The CEMP includes an Emergency Response Plan (ERP) which provides details of procedures to be adopted in the event of an emergency relating to health & safety or environmental protection.

### *SEVESO*

The Proposed Development is not connected with or in close proximity of any site regulated under the Control of Major Accident Hazards Involving Dangerous Substances Regulations (SEVESO sites), therefore no significant effects associated with major industrial accidents involving dangerous substances are anticipated.

### *Fire*

In accordance with Chapter 19 of the Safety, Health and Welfare at Work Acts 2005 (as amended), the Proposed Development shall be subject to a fire safety risk assessment which will assist in the identification of any major risks of fire on site. Additionally, individual numbers will be painted on to the top of each turbine hub in order to assist any aerial fire service in navigation over the site and surrounding lands.

### *Ground Conditions*

Ground conditions within the Site were assessed against the Scottish Government's 2017 guidance document, '*Peat Landslide Hazard and Risk Assessments: Best Practice Guide for Proposed Electricity Generation Developments'.* Intrusive ground investigation works were carried out as part of the peat stability assessment included peat depth probing, shear strength testing and trial pitting.

A comprehensive Soil Management Plan has been developed for the Proposed Development which details the management of peat and other soils within the Site. This can be found in the CEMP in Appendix 2.1.

### *Traffic*

The Proposed Development will utilise the existing local road network during the construction phase.

Structural fill for access tracks, turbine hardstands, turbine foundations and on-site substation will be sourced from local quarries.

A Traffic Management Plan (TMP) is provided specifying details relating to traffic management (see CEMP Appendix 2.1, Volume III). Prior to the commencement of the construction phase of the Proposed Development a detailed Traffic Management Plan will be prepared by the Contractor for agreement with the relevant local authorities and An Garda Síochána.

### *Climate and Flooding*

The scientific community and governments across the world are in agreement that the global climate is changing at an unnatural rate. This is due to human activities, which have significantly contributed to natural climate change through our emissions of greenhouse gases. This interference is resulting in increased air and ocean temperatures, drought, melting ice and snow, rising sea levels, increased rainfall, flooding and other influences.

On the launch of the *Climate Action and Low Carbon Development* (Amendment) Bill (2021), the current Taoiseach, Michéal Martin, remarked at the time:

> *"The impact of our actions on the planet is undeniable. The science is undisputed. Climate change is happening, and we must act." (Government of Ireland, 2020)*

The CAP provides a framework for delivering the Government's target of a 51% reduction (relative to 2018) in greenhouse gas (GHG) emissions by 2030. CAP24 follows the *Climate Action and Low Carbon Development (Amendment) Act* 2021, which commits Ireland to a legally binding target of net zero greenhouse gas emissions no later than 2050, and a reduction of 51% by 2030. The Act provides a governance framework for annual revisions of the Climate Action Plan and the development of a National Long-Term Climate Action Strategy at least once every ten years. As part of this plan, the Government is also committed to reducing emissions by an average 7% per annum by 2030. The CAP is underpinned by a series of sectoral emissions reduction ambitions and enabling actions, with a selection of relevant actions that are relevant to the Proposed Development, as outlined below.

The Proposed Development will have an Export Capacity of electricity of between 55.8 MW and 64.8 MW. This will result in the net displacement of 65,461 to 76,019 tonnes of $CO_2$ per annum, depending on the power rating employed, as detailed in Chapter 7: Air and Climate. The Proposed Development will significantly increase indigenous renewable energy generation allowing Ireland to become less reliant on imported fossil fuel and bolster Ireland's energy security.

The Proposed Development will further assist in mitigating the effects of climate breakdown, and help Ireland achieve its climate neutral economy, by no later than 2050, as within the '*National Climate Objectives'*, as set out in the *Climate Action and Low Carbon Development* (Amendment) Act 2021.

A Flood Risk Assessment for the Proposed Development is included in at Appendix 12.1, Chapter 12 – Hydrology and Water Quality. This Site-Specific Flood Risk Assessment (SSFRA) has 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.

The areas particularly affected include turbines T1, T4, T5, T8, and T9, along with their associated access tracks, as well as other areas where localised impacts on access roads were identified. A proposed bridge crossing the River Cushina is necessary to access the turbines located on the southern side of the site and to facilitate the grid connection route.

The proposed wind farm has been designed so that critical or essential infrastructure, such as the substation and the joint bays along the grid connection route, are located outside of flood zones. However, other elements of the development, such as some turbines and access tracks, are situated within flood-prone areas. In these cases, turbine plinths have been elevated above the 1-in-100-year flood level, accounting for the effects of climate change and incorporating a freeboard (clearance) of 500 mm. This design ensures that floodwaters will not impact the electrical or mechanical components of the turbines.

Access tracks have not been raised above flood levels in order to avoid obstructing the floodplain and to preserve its storage capacity. Since these tracks will primarily be used for maintenance rather than emergency access, and during known weather conditions, this approach has been deemed to be in accordance with best practice guidance.

The development does not increase the risk to human life, as access will be controlled and managed during adverse conditions. There will be no permanent human occupation within the flood zone.

At the TDR watercourse crossing, which traverses a floodplain, five relief culverts have been designed alongside the proposed bridge to minimize any impact on existing flooding conditions.

All proposed bridges, both for the wind farm and the TDR watercourse crossing, have been designed to comply with OPW requirements. They are designed for a 1-in-100-year return period, including a 20% allowance for climate change, and a minimum freeboard of 300 mm.

The works programme for the construction stage of the development will take account of weather forecasts and work will be suspended in the case of extreme weather events. The following forecasting and weather warning systems are available and will be used on a daily basis at the site to direct proposed construction activities:

General Forecasts: Available on a national, regional and county level from the Met Eireann website (www.met.ie/forecasts). These provide general information on weather patterns including rainfall, wind speed and direction but do not provide any quantitative rainfall estimates;

Weather Warning or Advisories: Met Éireann's main suite of warnings are issued by the duty forecaster between 10am and midday and are updated as necessary as new information becomes available. In general, warnings will not be issued more than 60-hours ahead of the expected adverse weather but advisories on potential hazards are issued up to a week in advance. The three warning categories are:

- Yellow: Not unusual weather. Localised danger.
- Orange: Infrequent. Dangerous/disruptive.
- Red: Rare. Extremely dangerous/destructive.

MeteoAlarm: Alerts to the possible occurrence of severe weather for the next 2 days. Less useful than general forecasts as only available on a provincial scale.

Rainfall Maps: Forecast quantitative rainfall amounts for the next 3 hours but does not account for possible heavy localised events;

Rainfall Radar Images: Images covering the entire country are freely available from the Met Eireann website (www.met.ie/latest/rainfall_radar.asp). The images are a composite of radar data from Shannon and Dublin airports and give a picture of current rainfall extent and intensity. Images show a quantitative measure of recent rainfall. A 3-hour record is given and is updated every 15 minutes. Radar images are not predictive.

Consultancy Service: Met Eireann provide a 24-hour telephone consultancy service. The forecaster will provide interpretation of weather data and give the best available forecast for the area of interest.

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Appendix 2

# Biodiversity Enhancement and Management Plan (BEMP)

Derrynadarragh Wind Farm, County Kildare and County Offaly

# Biodiversity Enhancement Management Plan (BEMP)

August 2025

Prepared for:

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# 1 INTRODUCTION

This report presents a Biodiversity Enhancement and Management Plan (BEMP) that has been prepared for the proposed Derrynadarragh Wind Farm (hereafter referred to as the Proposed Development) in County Kildare and County Offaly. The Proposed Development proponent is committed to enhancing the condition and extent of certain habitats in the habitat management area.

The purpose of this BEMP is to ensure that biodiversity at the Proposed Development Site will be in a better condition after the development of the project than is currently the case, through the implementation of measures during the construction and operational stages. This document identifies the important habitats and environmental issues within the Proposed Development site and collates all relevant information on enhancement and management measures in relation to biodiversity within the site.

The habitat management area is defined as the Site Boundary as per Figure 1, corresponding to those lands under the control of the developer/landowners. Measures outlined in this document have been agreed with the individual landowners and will be implemented by the operator in conjunction with the landowners and overseen by a Project Ecologist and the Ecological Clerk of Works (ECoW). The Project Ecologist will undertake to report the success or otherwise of said measures via operational compliance to the National Parks and Wildlife Service (NPWS) and Offaly County Council or Kildare County Council, as relevant.

In addition there will be one Biodiversity Enhancement measure at node 29/30 of the Turbine Delivery Route accommodation works, to the north of the Philipstown River.

Measures that will be incorporated into the design of the Proposed Development to maintain and enhance the biodiversity value of the site are presented. The BEMP sets out to maintain and enhance ecological conditions of the site for the benefit of native flora and fauna. In developing the BEMP, a targeted approach has been adopted whereby consideration has been given to the physical and biological conditions that prevail at the site to ensure that the proposed measures are appropriate to the conditions of the site.

The management and enhancement measures outlined below will be of benefit to various habitats and species at the Proposed Development Site. This BEMP focuses on habitats and species which have been identified as Key Ecological Receptors (KERs) (i.e. habitats and/or species evaluated as Locally Important (higher value) or greater which are likely to be impacted significantly by the Proposed Development). The KERs were identified in Chapter 9 of the EIAR and are presented in Table 1 below). Based on the KERs and on the landowner agreements in place, the BEMP aims to positively impact as many of these KERs as possible.




**Figure 1 Site Boundary of lands under control of the developer/landowners at Derrynadarragh**

**Table 1 Summary of Key Ecological Receptors (KERs) at the Proposed Development Site.**

| Key Ecological Receptor (KER) | Description | Expected effects from the Proposed Development after mitigation | Likely Benefits from BEMP |
|---|---|---|---|
| **Depositing/ Lowland Rivers (FW2)** | The Cushina River flows through the Site Boundary and is hydrologically connected to the European designated site, the River Barrow and River Nore SAC [002162]. No significant impacts are expected from the Proposed Development, but it has been assessed as being degraded and having Poor water quality. | No significant effects | Yes |
| **Drainage Ditches (FW4)** | The drains on the site all drain to the River Barrow catchment via the Cushina River. 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)** but because of their hydrological connection to the River Barrow and River Nore SAC, further downstream, the Drainage Ditches are included as a KER. Some of them have very high sediment loads, which is likely contributing to the poor water quality in the River Cushina. | No significant effects | 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)**. | No significant effects | 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 and peatland species such as Willow, Holly, Bramble, Heather, Purple Moor-Grass and Honeysuckle. It likely supports breeding and foraging habitat for a variety of woodland species including Badger, Bats and other small mammals and birds. It was evaluated as being of **Local Importance (Higher Value)**. | Felling of approximately 1.8ha to accommodate peat deposition areas, tracks and bat buffers around T06 and T07. | Yes |
| **Hedgerows (WL1)** | Hedgerows onsite are mostly dominated by native species including Willow, Holly, Hawthorn and Gorse. They have been assessed as being of **Local Importance (Higher Value)**. There will be some felling of hedgerows associated with the Proposed Development. | Felling of approx. 887 linear metres to accommodate bat buffer zones around T04, T07 and T09, TDR accommodation works | Yes |

| Key Ecological Receptor (KER) | Description | Expected effects from the Proposed Development after mitigation | Likely Benefits from BEMP |
|---|---|---|---|
| | | and wind farm infrastructure. | |
| **Treelines (WL2)** | Treelines onsite are generally dominated by native species and are likely providing habitat and an ecological corridor for native small mammals and invertebrates. They have been assessed to be of **Local Importance (Higher Value)**. There will be some felling of treelines associated with the Proposed Development. | Felling of approx. 524 linear metres to accommodate bat buffer zones around T01, T04, T05 and T06 and some felling to for TDR accommodation works. | Yes |
| **Eurasian Badger (*Meles meles*)** | Badger setts identified within the Site and within the footprint of the Proposed Development. This species is assessed as being of **Local Importance, Higher Value.** Iterative design of the proposed layout has ensured no direct effects on this species. | No direct effects. Some insignificant indirect effects such as loss of suitable foraging habitat, temporary disturbance during construction. | Yes |
| **Eurasian Pygmy Shrew (*Sorex minutus*)** | Likely to be present onsite and suitable habitat does occur within the footprint of the Proposed Development. | Possibly reduction in suitable habitat. | Yes |
| **Eurasian Red Squirrel** | Likely to be present on site and suitable habitat does occur within the footprint of the Proposed Development. | Possibly reduction in suitable habitat. | Yes |
| **European Otter (*Lutra lutra*)** | Present on Site. Dependent on aquatic habitat and uses the River Cushina to some extent. No evidence of frequent use. The River Cushina is within the Zone of Influence of the Proposed Development. | No expected significant effects. | Yes |
| **Pine Marten (*Martes martes*)** | No evidence was found to indicate the presence of this species on the Site but it is likely to be present based on the presence of suitable habitat and existing records from the surrounding area. Suitable habitat does occur within the footprint of the Proposed Development. | Possibly reduction in suitable habitat. | Yes |
| **Bats** | 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). | Some reduction in suitable foraging and | Yes |

| Key Ecological Receptor (KER) | Description | Expected effects from the Proposed Development after mitigation | Likely Benefits from BEMP |
|---|---|---|---|
| | Bat species that were recorded onsite are Leisler's Bat, Soprano Pipistrelle, Common Pipistrelle, Brown long-eared Bat and *Myosotis* species. The Proposed Development has the potential to result in direct and indirect effects on this receptor. | commuting habitat. No roosts were identified within 200m of turbines. | |
| **Giant Hogweed (*Heracleum mantegazzianum*)** | This invasive species was recorded onsite. It is a relatively small infestation within a hedgerow but due to the risk of High Impact, this species is of high local concern. It lies outside the footprint of any works associated with the Proposed Development. | None expected | Yes |
| **Invasive species (general)** | Other invasive species were recorded from within the Site, adjacent to the GCR and adjacent to the TDR. Snowberry, Ground Elder, Sycamore and Cherry Laurel have been found along the GCR route. Snowberry and Sycamore have been recorded within and immediately adjacent to one of the TDR accommodation works areas. There is potential for construction activities to cause an increase in the spread of these species. | No significant impacts expected | Yes |

### 1.1 STATEMENT OF AUTHORITY

This report was prepared by Caroline Lalor with input from Patrick Crushell and Mary Catherine Gallagher, all Ecologists with Wetland Surveys Ireland (WSI) Ltd.

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 Biodiversity Action Plans, Conservation Management Plans, 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 received an honours degree (BSc) in Zoology and a Master's degree (MSc) in Marine Biology 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. Mary Catherine has prepared a Biodiversity Action Plans and Biodiversity Management Plans for a number of clients.

## 2 PROPOSED BIODIVERSITY ENHANCEMENT MEASURES

A range of biodiversity enhancement measures are included in this plan aiming to:

- improve the ecological condition of habitats that are currently degraded; or
- replace existing habitat that will be lost due to the Proposed Development.

These measures are outlined in the following sections. A map of the planned measures is presented in Figure 2. A summary of the planned biodiversity enhancement measures and their

expected benefits is given in Table 2. Note in Figure 2 the locations marked for In-ditch wetlands and hedgerow and treeline planting are indicative of the area in which they will occur. Final exact locations will be made at detail design stage.




**Figure 2. Map showing planned biodiversity measures at the Proposed Development Site. Proposed track and turbine layout also shown.**

**Table 2 Planned Biodiversity Enhancement measures, expected benefits and measurable gain**

| Biodiversity Enhancement Measure | Rationale and Summary | Expected benefits from implementation of the BEMP | Measurable area of creation /protection (ha/m) |
|---|---|---|---|
| 1. **In-Ditch Wetlands – Water Quality improvement** | The drainage ditches onsite, particularly on the north of the Cushina River are, in general, intensively managed through regular maintenance and some were noted to be carrying significant loads of peat sediment. Discharge of this sediment-laden water into the River Cushina is likely contributing to the Poor water quality of the River Cushina. In-ditch wetlands will be installed within each of the main drains discharging from the north into the Cushina River. These will allow for sediment to be trapped in the created wetlands within the drains, therefore improving the water quality being discharged to the Cushina River. | • Improvement of water quality in the drains discharging to the Cushina River.<br>• Reduced sediment load within the Cushina River.<br>• Creation of wetland habitats and an associated increase in the biodiversity of wetland plants.<br>• Suitable foraging area for Bats<br>• Suitable breeding and foraging habitat for Dragonflies, Damselflies, Frogs and other aquatic species. | Approx. 200m of in-ditch wetlands habitat will be created corresponding to approximately 0.03 ha |
| **2. Stockproof fencing – Riparian Zone and Lowland River (FW2) protection** | The Cushina River flows through the Site. Its banks have been damaged through channel deepening and widening, in addition to stock access. Stockproof fencing is planned to be installed at least 2m back from the top of the riverbank in places where it is necessary to protect the riverbank from stock access. Both the north and south banks will be protected in this way. Fencing on the north bank is mapped in Figure 2. On the southern bank, fencing is currently present in places. Replacement and/or new fencing will be installed as necessary. | • Recovery of natural vegetation on the riverbanks, which will aid stabilisation of the riverbank.<br>• The prevention of stock accessing the river should contribute to an improvement in water quality. | 1.4km of lowland river and riverbank will be protected. |
| **3. Stockproof fencing – Woodland creation and** | A riparian area along the Cushina River in the east of the Site was identified as having potential for woodland creation. It comprises an earthen bank (created from past river dredging perhaps) which now supports Scrub | • Allow for natural succession to woodland habitat along the river<br>• Protect and enhance habitat for Badger, Otter and other wildlife | • 1km of lowland river and riverbank will be protected |

| Biodiversity Enhancement Measure | Rationale and Summary | Expected benefits from implementation of the BEMP | Measurable area of creation /protection (ha/m) |
|---|---|---|---|
| **riparian zone protection** | (WS1) habitat which is starting to somewhat succeed naturally to woodland. There are a number of active Badger setts in this area. Otter spraint was observed along this section of river. Cattle currently have access within this habitat and are likely contributing to the prevention of the natural regeneration of woodland flora. | • Protect riverbank and river habitat<br>• The prevention of stock accessing the river should contribute to an improvement in water quality. | • 2.7ha woodland creation |
| **4. Stockproof Fencing - Bog Woodland (WN7) protection** | There will be a loss of approximately 1.8ha of bog woodland as a result of the Proposed Development. Cattle currently have access to most of the bog woodland onsite causing poaching and are likely contributing to the sparse field and ground layers of vegetation. An area of bog woodland to the north of T07, which currently has significant areas of bare peat caused by livestock, has been identified as part of the BEMP and stockproof fencing will be installed around this woodland to aid natural regeneration. | • The exclusion of cattle from this woodland should increase the habitat condition of the woodland by allowing the recovery of bare peat areas and an increase in the structural diversity of the woodland. | 2.6ha |
| **5. Hedgerow (WL1) planting** | Approximately 887m of hedgerow habitat will be felled as part of the Proposed Development. Hedgerows will either be translocated or, where this is not possible, newly planted, at a location within the Site. | • Translocation of the hedgerows will ensure that much of the mature vegetation and seedbank for the hedgerow species will be transplanted to the new location.<br>• Where translocation is not possible, the remaining length of hedgerow will be planted within the Site with whips of native species and of provenance. Species composition will be selected to create hedgerows with similar species to existing hedgerows. | 950m |

| Biodiversity Enhancement Measure | Rationale and Summary | Expected benefits from implementation of the BEMP | Measurable area of creation /protection (ha/m) |
|---|---|---|---|
| **6. Treeline (WL2) planting** | Approx. 524m of treelines will be felled in the bat buffer zones. Planting new treelines outside of bat buffer zones will, in time, create habitat to replace these felled areas | • Over time, the planting of treelines with native trees of native provenance will result in the replacement of lost habitat. | 550m |
| **7. Invasive Species Control** | The Third Schedule, High Impact non-native invasive species, Giant Hogweed (*Heracleum mantegazzianum*), has been identified onsite. An eradication programme will be implemented before the construction phase to safely eradicate this species from the Site.<br>Snowberry, a Low Impact non-native invasive species, was identified at one location within the footprint of the Proposed Development. This is within a short length of hedgerow which will be felled to create a bat buffer zone around T04. This will be eradicated before felling to remove risk of spreading.<br>Snowberry and Sycamore will be eradicated before TDR accommodation works commence, if these species are within the footprint. Invasive species removal will be undertaken by a licenced invasive species contractor.<br>For any reason, should the GCR trench need to leave the road corridor, any invasive species found within the footprint shall be appropriately removed prior to trench digging. Invasive species removal will be undertaken by a licenced invasive species contractor.<br>Strick biosecurity measures will be followed at all times by construction staff. | • Improve the ecological integrity of the native hedgerow where the Giant Hogweed occurs.<br>• Remove risk of introducing or causing dispersal of any non-native invasive species. | 90m |

A total of :

- 2.4km of Lowland River and riverbank habitat will be protected and enhanced
- Approximately 60m-100m of wetland habitat will be created
- 2.7ha of woodland created in riparian zone through natural succession
- 2.6ha of Bog Woodland protected and enhanced
- 1.5km of linear woody habitat (hedgerow / treelines) creation
- 90m of linear habitat enhancement through the removal of Giant Hogweed.

The BEMP measures, when completed, will also benefit the KER species that use these habitats. It is important to note that the creation, enhancement or protection of wooded habitats including hedgrerows, treelines, and woodland will not be conducted within the identified bat buffer zones. The bat buffer zones have been identified as areas within 95m of each turbine. In order to ensure that bats are not attracted this close to the turbines, it will be necessary to remove all hedgerows, treelines and woodland within the bat buffer zones and to maintain these buffer zones throughout the operational lifetime of the Proposed Development.

**Table 3 Overview of effects on KER species from the Proposed Development and the BEMP.**

| KER | Rationale and Summary | Expected benefits from implementation of the BEMP |
|---|---|---|
| **Eurasian Badger (*Meles meles*)**<br><br>**Eurasian Pygmy Shrew (*Sorex minutus*)** | Badger setts identified within the site have been avoided by the Proposed Layout. There will be some loss of suitable (hedgerow and woodland) habitat. Some minor loss of grassland habitat. | • Suitable (woodland) habitat will be protected and enhanced.<br>• Suitable (woodland and hedgerows) habitat will be created. |
| **Eurasian Red Squirrel (*Sciurus vulgaris*)**<br><br>**Pine Marten (*Martes martes*)** | Likely to be present on site. Some suitable habitat loss (woodland) | • Protection, enhancement and creation of foraging and commuting habitat and potentially breeding habitats. |
| **Bats** | There will be some reduction in suitable foraging and commuting habitat as a result of the Proposed Development. | • Protection, enhancement and creation of foraging and commuting habitat and, potentially, roosting habitats. |
| **European Otter (*Lutra lutra*)** | Present on Site. Dependent on aquatic habitat and uses the River Cushina. | • There will be an increase in suitable habitat for natal dens (woodland on riverbank).<br>• Otters may benefit from an improvement in water quality. |

Further details on the measures and their implementation are provided in the following sections.

## 2.1 MEASURE: IN-DITCH WETLANDS

### 2.1.1 Objective: Water Quality and Biodiversity Enhancement

The Cushina River flows through the site for approximately 2.5km. This river discharges to the River Barrow and River Nore SAC, an internationally important site designated for the protection of many aquatic habitats and species. Hence, the water quality of the Cushina could indirectly affect the sensitive habitats and species which are protected within this site. In addition, the water quality of the Cushina River will determine, to an extent, the suitability of the habitat for many aquatic species within the Proposed Development Site. Among other factors, the water quality of the Cushina is impacted by the quality of the water being discharged to the river, either via the network of open field drains or via overland flow. During the ecological surveys of the Proposed Development Site, it was noted that the water quality within a number of the main drains discharging to the Cushina from the north was very poor and was carrying a high sediment load. These drains were selected for enhancement measures as an opportunity to improve water quality. In addition, there will be alteration to approximately 245m of drainage ditches (FW4) habitat due to the culverting of drains at crossing points.

The implementation of measures to improve the water quality of the River Cushina within the Site is therefore expected to have significant benefits for the aquatic ecology of the Site.

All main drains within the Site boundary flowing into the Cushina River from the north will have in-ditch wetlands installed. No in-ditch wetlands will be installed within the identified bat buffer zones. The final design of these in-ditch wetlands will be based on existing best practices and will be agreed with the Project Ecologist.

It is expected that one in-ditch wetland will be created per drain.

- Each in-ditch wetland will be installed along a minimum 10m length of drain. The depth of water across the majority of the ditch should be around 50 cm deep and approximately 75 cm deep.
- The aim of the in-ditch wetland is to slow the flow of water, allowing excess sediment to fall out of the water column, thereby enhancing the quality of the water that reaches the Cushina River.
- At the in-ditch wetland location, ditches should also be widened to enable water flow to slow and allow sediments to settle out.
- As part of the in-ditch wetland creation, small barriers are usually installed in the drain to slow the flow of water in the drain and allow sediments to settle out.
- Barriers can be either solid structures such as earth bunds with an outlet pipe, or simple wooden barriers to slow the flow of water and allow it to escape slowly.
- The barriers need to be carefully designed so that storm flows can be accommodated.

- At least one of the banks of the drain along this length of drain will be reprofiled, creating a graded bank and increasing the width of the drain.
- The graded bank allows for different depths of water and for the development of a variety of wetland vegetation along the bank, thus enhancing biodiversity and contributing to water quality enhancement.
- Both banks of each of the drains with in-ditch wetlands will be fenced with stock-proof fencing to prevent stock access.
- It is important not to create the in-ditch wetland too close to the discharge point to the Cushina River.
- Regular maintenance will be required throughout the lifetime of these in-ditch wetlands to remove the trapped sediment. The removal of sediment will be carried out according to existing best practices. It is possible to include a sediment trap in the design of the in-ditch wetland to allow for ease of sediment removal.
- It is recommended when removing wetland vegetation during maintenance, not to remove all vegetation at the same time as this would impair the effectiveness of the wetland and remove valuable habitat.



**Figure 3 In-ditch wetland under construction. Note reprofiled drain with shelves of different depths creating different depths and widening the drain. Earth bunds are also visible as barrier to slow the flow of water within the drain. (source: Pearl Mussel Project)**



**Figure 4 Note widened sections of the drain. There are usually two widened chambers connected by a dam with pipe to allow water to flow through. (source: Pearl Mussel Project)**

## 2.2 MEASURE: STOCKPROOF FENCING

A number of habitats onsite are currently accessed by cattle and as a result are suffering varying levels of degradation and/or are not progressing with natural succession. The simple measure of installing stockproof fencing at strategic locations will greatly contribute to the creation, enhancement and protection of these habitats. Unless otherwise stated, the stockproof fencing used will be wooden posts with 3 strands of barbed wire. Further details of each of the objectives are given below.

### 2.2.1 Objective: Protection and Enhancement of River

One issue that was noted along the banks of the River Cushina during ecological surveys is that of cattle accessing the river. This can lead to erosion and degradation of the riverbank and a subsequent increase in sedimentation of the river substrate. The installation of stockproof fencing all along the northern bank of the river and as needed on the southern bank, will prevent further access to the river by cattle and other stock. This is expected to result in, over time, the recovery

of the riverbank, a reduction in erosion and increase in water quality. All fencing will be installed a minimum of 2m back from the top of the riverbank (except within the woodland creation area as outlined in Section 2.2.2), which will also allow the development of riparian vegetation along the riverbank. As needed, fencing of all the main drains discharging into the Cushina River will be repaired, replaced or installed. All fencing along drains will be installed a minimum of 1.5m back from the top of the drain. This will also contribute to improvement of water quality as drain-side vegetation will help trap sediments before discharging into the drain.

In certain places, it will be necessary to install water troughs to ensure cattle have adequate supply of drinking water. Where possible, this water will be sourced from a mains supply associated with a farmyard. However, where this is not possible, solar pumps will be used to pump water from the river. The troughs will be installed a minimum of 20m away from the bank of the river or drain.

### 2.2.2 Objective: Woodland Creation and Protection of River and Riparian Zone

The Proposed Development will result in the permanent felling of approximately 6.01ha of woodland within the Site to accommodate elements of the infrastructure of the Proposed Development including turbines, peat deposition areas and access tracks. Felling will be done to accommodate these and as part of environmental mitigation measures for bat species (see Chapter 9 and related Appendices). This felling will involve approximately 3.9ha of Coniferous Woodland (WD4) and 2.14ha of Bog Woodland (WN7).

The clear-felling of trees in Ireland requires a felling licence. The Forest Service of the Department of Agriculture, Food & the Marine is Ireland's national forest authority and is responsible for all forest licensing which is governed by the Forestry Act 2014 as amended and the Forestry Regulations 2017 (S.I. No. 191 of 2017). A felling licence will include the provision of relevant replant lands (afforestation area) to be planted in lieu of the proposed tree felling on the Site. The associated afforestation of alternative lands equivalent in area to those lands being permanently clear-felled is also subject to licensing ('afforestation licensing').

The area of trees to be felled will be the minimum required to accommodate the Proposed Development. However, for the purpose of the EIAR the area for felling has been identified as the maximum area that could be required to construct the Proposed Development.

The felling will be the subject of a Felling Licence Application to the Forest Service prior to construction as per the Forest Service's policy on granting felling licenses for wind farm developments. The Applicant commits to not commencing tree removal on site to accommodate the Proposed Development until both felling and afforestation licences are in place and this ensures the afforested lands are identified, assessed and licensed appropriately by the relevant consenting authority.

The measure for woodland creation onsite involves protecting an area of grassland and scrub in the riparian zone and allowing this to develop naturally into woodland. On the northern bank of the Cushina River for the last 1km before it leaves the Site in the east, there is Scrub habitat (WL1) which is already beginning to succeed to woodland. This habitat is accessible to livestock and natural succession seems to be impeded.

Stockproof fencing will be installed approximately 30m back from the riverbank along the last 1km stretch of the river within the Site. This will create approximately 2.7ha of scrub and grassland which will be fenced off from stock and is expected to naturally succeed to native woodland with a corresponding increase diversity and abundance of ground and field layer vegetation. Badger setts are present here and Otter also currently use this area. This measure will enhance the quality of the habitat available to them and other species including pollinators and invertebrates which utilise dead wood and other woodland features. The barbed wire fencing will facilitate the movement of small mammals within the landscape. This measure will ensure the last 1km of the River Cushina within the Site is not accessible to livestock and hence will protect the river, the riverbank and the wider riparian zone, leading to enhanced water quality and riparian habitat. It will result in approximately 2.7ha of woodland to be created in time.

### 2.2.3 Objective: Protection and Enhancement of Bog woodland

An area of Bog woodland (WN7) to the north of T07 is currently accessible by livestock. Clear signs of use by livestock were noted with resulting areas of bare soil, poaching and prevention of natural woodland field and ground layers within the woodland were noted. This measure will ensure the woodland will be protected from livestock, and it is expected that the habitat condition will improve once this happens. This measure should also make the woodland more suitable for wildlife onsite including Bats, Badgers and other woodland wildlife including birds such as Woodcock and invertebrates such as Bees. A total of 2.6ha will be protected in this way.

## 2.3 MEASURE: HEDGEROW TRANSLOCATION AND HEDGROW / TREELINE PLANTING

The Proposed Development will result in the removal of approximately 887m of hedgerow and 524m of treeline habitats to facilitate the proposed tracks, substation and the Bat buffer zones and TDR accommodation works. The BEMP however, will result in the creation of 950m of hedgerow and 550m of treeline outside of the bat buffer zones within the Site.

- Hedgerows / treelines will **not** be planted on peat soils.
- Where possible, hedgerows from the bat buffer zones will be translocated to suitable areas identified and prepared within the Site. Translocation will follow existing best practice guidance such as that given by Hedgerows Ireland (https://hedgerows.ie/wp-content/uploads/2024/06/Guidance-Note-Hedgerow-Translocation.pdf.)
- Where translocation is not possible, the remaining length of hedgerow will be planted using native species of native provenance. Species common in the vicinity will be planted.

- Treelines will be planted with native species of native provenance. Trees suited to for the conditions onsite will be chosen. It is likely that it will be necessary to select species suited to wet conditions. Such species would include Alder (*Alnus glutinosa*), Pedunculate Oak (*Quercus robur*), Willow (*Salix* spp.), and Downy Birch (*Betula pubescens*).
- It may be necessary for these to be ordered from a nursery well in advance to ensure availability of native provenance hedgerow and tree species.

### 2.4 MEASURE: INVASIVE SPECIES CONTROL

A qualified ecologist will be employed to develop an Invasive Species Management Plan for the Site. As part of this, a pre-construction survey will be conducted to determine if there are any changes from the baseline, particularly with regard to Giant Hogweed within the Site and in relation to the presence of any non-native invasive species within the footprint of the development. In addition to the measures outlined below, there will be strict adherence to the measures outlined in the Chapter 9 of the EIAR which outline preventative measures to be undertaken in order to prevent the spread of invasive species along the TDR, GCR and/or into the Site.

#### 2.4.1 Objective: Eradication of Giant Hogweed

A Third Schedule, High Impact non-native invasive species, Giant Hogweed (*Heracleum mantegazzianum*) is present in a hedgerow in the south-west of the Proposed Development Site. This is not within the footprint of the development. 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.

- 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 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.

- Methods may be mechanical, chemical or a combination of both.
- Follow-up work will be necessary to ensure regrowth and seedings are also controlled. This is likely to be necessary for about 7 years.

### 2.4.2 Objective: Eradication of Snowberry in Construction Footprint

Snowberry (*Symphoricarpos albus*) is not a Third Schedule species and according to the National Biodiversity Data Centre has a Low risk of Impact. However, as the aim of the BEMP is to enhance the biodiversity at the Site and there is a risk, when creating the Bat buffer zones, of causing a degradation of biodiversity if by clearing the hedgerow in which the Snowberry is growing, this causes it to become established elsewhere. Snowberry can spread via seed and root fragments. Hence, as part of the BEMP, the Snowberry within the footprint of the Proposed Development, will be eradicated before construction. This will be done following best available guidance. There are two main options currently recommended (source JKI Environmental):

1. **Mechanical:** Snowberry can be excavated and moved to a deep cell on-site or to a licensed waste facility.
2. **Chemical:** Snowberry can be treated by foliar spraying with herbicide or by drilling the base of the plant and applying herbicide into drill holes in April / May, this will be followed up with a second treatment in August. This treatment will have to be repeated on a yearly basis for 4-5 years.

## 3 MONITORING

A monitoring programme will be put in place to document and record the results for comparison to the expected benefits. Monitoring will focus on areas of habitat enhancement and other biodiversity enhancement measures as well as some other mitigation measures outlined in various chapters of the EIAR. A BEMP monitoring report will be compiled at the end of each monitoring year detailing the progress and findings of all management and monitoring activities. Monitoring and reporting will be undertaken by independent, suitably experienced and qualified ecologists employed by the wind farm operator. The BEMP will be considered as a dynamic document and will be reviewed at the end of each monitoring year and modified as required, pending submission to and approval by Kildare and Offaly County Councils and NPWS.

### 3.1 WATERCOURSES

Monitoring of watercourses will include monitoring of water quality protection measures as outlined in Chapter 12 (Hydrology) and those measures aimed at protecting and enhancing water quality outlined in this BEMP. This will include visual inspections of the outfalls of cross drains and settlement ponds as well as all in-ditch wetlands. When inspecting the in-ditch wetlands, it is important to monitor the structural integrity of the barrier structures as well as the clarity of the water within, and flowing out of, the wetlands. If visual inspections give rise to concerns regarding

water quality, field-testing and laboratory tests will be carried out to clarify if the measures are working properly. Any improvement works necessary will be carried out in a timely manner. Or, if the concerns are regarding the structural integrity of any features, these will be immediately addressed and if repairs are deemed necessary, repairs will be done in a timely manner. Surface water quality mitigation measures will be visually inspected daily during the construction stage and more frequently (up to several times a day) if there is significant surface water onsite after heavy rainfall events/periods.

As part of the monitoring of the in-ditch wetland monitoring, annual surveys of the wetland plants and aquatic faunal species will also be undertaken. Pre-construction surveys of the drains at the points where in-ditch wetlands will be created will be undertaken so that subsequent monitoring surveys can document the results and report on the expected benefits.

Inspection of the approx. 2.5km length of stockproof fencing will be undertaken regularly and especially after flooding events. Inspections should note the location of any issues to be resolved such as damaged posts, erosion around posts, damaged wires etc. Any damage that causes a breach in the fence will need to be repaired immediately. Annual inspections of the riverbank will monitor the progress of riverbank recovery.

Aquatic ecology surveys that were completed in the Cushina River within or downstream of the Site as part of the EIA process to monitor water quality will be repeated every 3-5 years for the first 15 years. In addition, there will be a pre-construction assessment of the biological water quality approximately 10m downstream of the watercourse crossing points of the Cushina River (within the Site) and the Philipstown River (at node 29/30 of the TDR accommodation works). These assessments will use the EPA Q-value methodology and will be carried out once prior to the commencement of construction and on a six-month basis until 6 months after construction works cease.

### 3.2 WOODLANDS

The woodland habitats protected as part of the BEMP will be monitored. The stockproof fences will be monitored regularly for signs of damage or any breaches. If found, these will be repaired immediately. The Bog Woodland that is protected in the BEMP and the riparian area where woodland creation is expected, will be resurveyed to monitor habitat condition in the first year of the operational phase of the wind farm and every 3-5 years thereafter. Monitoring will focus on species and structural diversity, damage, and threats.

### 3.3 HEDGEROWS AND TREELINES

Ecological surveys of the hedgerows and treelines to monitor the success of hedgerow translocation and the success of treeline and hedgerow establishment will be undertaken in the

first, second and third years after translocation or planting. Any issues such as failure of hedgerows or trees to establish, shall be rectified as soon as possible. Thereafter, monitoring for any failure/damage will be conducted annually while full ecological surveys will be undertaken every 3-5 years.

### 3.4 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 (as outlined in Chapter 9, Volume 2 of the EIAR). Once there has been full eradication of Giant Hogweed from the Site and Snowberry from the construction footprint as outlined in the BEMP and Chapter 9, then monitoring can be reduced to every 3-5 years. If monitoring reveals the need for follow-up treatment, this will be undertaken following best practice guidelines and methods outlined in Chapter 9.

### 3.5 BIRDS

Post-construction bird monitoring will take place to establish whether the construction and operation of the Proposed Development has had effects on the bird species associated with the Site identified prior to construction (as shown by the baseline surveys in the 2017-2025 period). The monitoring programme will comprise the following:

- Flight activity surveys
- Transect survey within the site
- Water bird surveys at nearby wetland sites as identified in the baseline surveys
- Collision searches

### 3.6 BATS

Post-construction monitoring surveys will be carried out in order to assess the effectiveness of the mitigation measures for bats (see Chapter 9, Volume 2 and Appendix 9-1, Volume 3 of this EIAR). Post-construction surveys will take place on the first, second, third, tenth and fifteenth year of the operational phase and will include the following elements:

- Detector surveys of bat activity near turbines
- Detector surveys to determine the continuing status of any nearby roosts
- Corpse-search regime. This can be undertaken in conjunction with bird corpse-searches and should take place over a number of consecutive days.
- Existing best practice guidelines will be followed.

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.

## 4 CONCLUSION

The overall effect of the BEMP after implementation and over time will be a positive benefit on the water quality, native woodland cover and aquatic habitat cover. It is expected that there will be a corresponding increase in biodiversity. Although the Proposed Development will result in some habitat loss of KERs, the BEMP will result in a greater amount of corresponding habitat creation. In addition, through the removal of the Third Schedule Invasive species, Giant Hogweed, the ecological integrity of the habitats in the vicinity will be improved and protected.

An overall summary and comparison of the expected habitat loss and habitat gains of KER habitats as a result of the Proposed Development, including the BEMP, are presented in Table 4 and Table 5 below.

**Table 4 Area of KER habitats and woodland habitats to be removed and gained from the Proposed Development**

| Habitat Type | Area of habitat to be removed (ha) | Habitat gain /benefit (ha) | Net gain (ha) | Description / rationale |
|---|---|---|---|---|
| **Drainage Ditches (FW2)** | 0.0245 | 0.0300 (minimum) | 0.0055 | A small amount of net gain will be achieved in terms of area but the actual gain is likely to be greater due to expected higher quality of habitat created in the in-ditch wetlands in comparison to the drains that will be culverted. At worst, no net loss is expected. |
| **Scrub (WS1) / native woodland** | 0 | 2.7 | 2.7 | An area of scrub habitat will be fenced off in the riparian zone to protect it from livestock, deer and other large animals. The area of scrub will increase and eventually succeed to woodland. |
| **Bog Woodland (WN7)** | (2.1) | 2.6 | 2.6 | An area of woodland will be planted offsite subject to felling and forestry licences to replace the 2.1ha of bog woodland that will be felled. Hence, the protection and enhancement of 2.6ha of bog woodland onsite corresponds to 2.6ha of net gain. This area of bog woodland will be fenced and there will be positive effects on overall woodland ecology. |

| | | | | |
|---|---|---|---|---|
| **Conifer Woodland (WD4)** | (3.9) | N/A | N/A | An area of woodland will be planted offsite subject to felling and forestry licences to replace the 3.9ha of conifer woodland that will be felled. |

***The total Net Gain from the implementation of the BEMP as part of the Proposed Development will be 5.31ha.***

**Table 5 Length of KER habitats to be removed and gained from the Proposed Development**

| Habitat Type | Length of habitat to be removed (m) | Habitat gain /benefit (m) | Net gain (m) | Description / rationale |
|---|---|---|---|---|
| **Lowland/ depositing River (FL2)** | 0 | 2400 | 2400 | The 2.4km stretch of the Cushina River within the Site is expected to benefit from the BEMP in terms of water quality, condition of substrate and integrity of riverbank. This will be achieved through the fencing off of livestock and the installation and maintenance of the in-ditch wetlands in drains. |
| **Hedgerows (WL1)** | 887 | 950 | 63 | The main reason for the hedgerow loss is the implementation of bat foraging buffers. Translocation and/or planting of native hedgerows onsite will only be carried out on non-peat soils. Where possible, hedgerows will be translocated/planted to reconnect severed habitats. The planned planting will yield a net gain of 63m of hedgerow. |
| **Treelines (WL2)** | 524 | 550 | 26 | 524m of treelines will be lost to accommodate the Proposed Development, mainly to facilitate the bat buffers. Planting of trees suited to the conditions on-site, likely to include mostly species suited to wet soils. |
| **Other Feature** | | | | |
| **Invasive Species** | n/a | 98 | 98 | Giant Hogweed will be removed from a hedgerow of approximately 98m in length. This hedgerow will improve in its overall ecology. Snowberry will be removed from a 34m length of hedgerow, but as this hedgerow will be felled to accommodate bat buffers, it will not result in a corresponding gain. (The gain from hedgerow planting has already been accounted for above). |

***The total Net Gain of linear habitat from the Proposed Development following the implementation of the BEMP will be 3.99km of linear habitat.***

# Appendix 3

# EIAR Chapter 10 - Ornithology

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 10 - Ornithology

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# 10. ORNITHOLOGY

## 10.1 Introduction

This chapter assesses the likely significant effects of the proposed Derrynadarragh Wind Farm on birds (ornithological receptors). Receptors including species deemed to be of high conservation interest that are afforded protection under national and international legislation such as the Wildlife Acts 1976-2024 as amended and the EU Birds Directive 2009/147/EC.

The chapter outlines the assessment methodology, describes the baseline environment from survey data, and evaluates key species. The assessment identifies potential impacts for all project phases, proposes corresponding mitigation measures, and concludes by determining the significance of any residual effects post-mitigation.

The Proposed Development refers to all elements of the application for the construction, operation and decommissioning phases (as described in detail in **Chapter 2 Description of the Proposed Development**).

This chapter is supported by several Appendices included in **Volume III** of the **EIAR (Appendix 10-1 to Appendix 10-5)**.

### 10.1.1 Outline Site Description

The Proposed Wind Farm Site (the Site) comprises approximately 213.64 hectares of land, and is contained within the townlands of Cushina, Clonsast Lower, and Chevychase or Derrynadarragh in County Offaly, and Aughrin and Derrylea in County Kildare. It is located within both the jurisdictions of Kildare County Council and Offaly County Council, approximately 2km south of the village of Bracknagh, 5km northwest of Monasterevin, and approximately 6.5km northeast of Portarlington.

The Cushina River flows through the Site and part of the flood plain of this river is within the Site. The Figile River occurs in proximity to the north eastern boundary of the Proposed Wind Farm Site. Both rivers meet approximately 260m downstream (to the east) of the Proposed Wind Farm Site. The south of the Site borders the north-eastern edge of Derrylea Bog and another raised bog lies partly within the north of the Site. The main land uses are agriculture and turf harvesting. The dominant habitats within the Site are a mosaic of wet grassland and improved agricultural grassland, bog woodland, cutover bog, conifer plantation, hedgerows, treelines, and drainage ditches. Large areas of cutover and cutaway bog occur adjacent to the Site.

The site is not located within or adjacent to any site designated for nature conservation. A detailed ecological description of the site is given in **Chapter 09 Biodiversity.**

### 10.1.2 Outline Proposed Development Description

A detailed description of the Proposed Development is presented in **Chapter 2** of the EIAR.
In summary, the Proposed Wind Farm Site comprises a total of 9 no. turbines, with the positioning of 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.

The Proposed Development also includes the following elements:

- A new proposed access road will link the site to the R419 road and there will be new and upgraded access tracks within the site.
- A proposed substation in the west of the site
- Three temporary construction site compounds
- Spoil deposition areas
- Surface water management system
- Laying of underground electrical and communications cabling connecting the proposed turbines to the proposed onsite substation
- The laying of an Underground Grid Connection. The Proposed Grid Connection (GC) will exit the site to the south and follow the public road to Bracklone Substation (currently under construction) through the following townlands; Derrylea, Inchacooly, Ballyhast, and Loughmansland Glebe.

The Turbine Delivery Route (TDR) route is described in Chapter 2 Section 2.5 It will exit the M6 at junction 5 and continue to the site via Tullamore and Daingean.

A 10-year planning permission and an operational period of 35 years from the date of commissioning of the Proposed Wind Farm is being sought. This reflects the lifespan of modern-day turbines.

### 10.1.3 Purpose of the Chapter

The purpose of this Chapter is to:

- Establish and evaluate the baseline ornithological environment as relevant to the Proposed Development;
- Identify, describe and assess any potentially significant ornithological effects associated with the Proposed Development;
- Set out the prevention and mitigation measures required to address any potentially significant ornithological effects and ensure compliance with relevant nature conservation legislation;
- Provide an assessment of the significance of any residual ornithological effects; and
- Identify any appropriate enhancement and / or post-construction monitoring requirements.

### 10.1.4 Statement of Authority

This chapter was prepared by Dr. Mary Catherine Gallagher (BSc. MSc. PhD.), Caroline Lalor (BSc. MSc. MCIEEM), and Dr. Patrick Crushell (BSc., MSc., PhD., CEcol., MCIEEM) all of whom are professional ecologists working with Wetland Surveys Ireland Limited (WSI). Field surveys were undertaken by Mr. Brendan Dunlop and Mr. Gary Wilkinson (October 2021 - September 2022 inclusive) and Mr. Daniel Moloney and Mr. Mark Davenport (October 2022 – September 2023). Bird surveys in 2017-2019 were undertaken by Mr Rob Wheeldon. All surveyors are experienced ornithologists with a familiarity with the locality of the Wind Farm Site.

### *Dr. Mary Catherine Gallagher*

Dr. Mary Catherine Gallagher received an honours degree (BSc) in Zoology and a Masters degree (MSc) in Marine Biology 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.

### *Caroline Lalor*

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 NIR reports.

### *Dr. Patrick Crushell*

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 various projects across Ireland 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.

### *Daniel Moloney*

Daniel is a respected local ornithologist who has been conducting bird surveys since 2006 for wind farm impact assessments and other construction works across a range of projects and consultancy companies in the Republic of Ireland, Northern Ireland, and Scotland. Daniel has been working with BirdWatch Ireland for over 15 years across a range of projects and species including the Corncrake Conservation project on behalf of the NPWS, Curlew in the border counties as part of the Halting Environmental Loss project in conjunction with the RSPB, a project manager on the INTERREG VA Cooperation Across Borders for Biodiversity project on waders in the border counties and more recently a bird specialist on the ACRES Co-operation Project in Donegal.

### *Mark Davenport*

Mark Davenport is an ecologist specialising in ornithology who has been conducting bird surveys for wind farm impact assessment and other various construction projects for several years. Mark has experience working with red listed species such as breeding Curlew on the NPWS Curlew Conservation Project. Through this project, Mark has gathered a wealth of experience in assisting and implementing conservation measures for threatened wader species in Ireland. Mark is a committee member of the Inishtrahull Bird Observatory conducting conservation measures for endangered seabird species.

***Brendan Dunlop***

Brendan is a highly experienced avian fieldworker specialising in a wide range of EIA and research surveys. He is skilled in surveying farmland, upland and coastal birds including Brown & Shepard walked transects and vantage point methodology for breeding season, winter / spring migratory and over wintering surveys and is conversant in habitat mapping for a wide range of protected species. Brendan has worked closely with the Irish Raptor study group Red Kite projects monitoring nest locations, breeding productivity and winter roosts. He is particularly experienced in Hen harrier and Merlin surveys of Northern Ireland SPAs for wind farm proposals. He has worked on numerous wind farm projects across the UK and Ireland. Brendan has in depth experience and a sound knowledge of SNH Guidelines and protocols for wind farm monitoring and post construction monitoring. Brendan has been an active member of the Northern Ireland Raptor Study Group since 2004 and previously held the posts of Treasurer and assistant secretary. He also worked closely with the Ulster Wildlife Trust and RSPB monitoring Barn Owls and Red Kites.

***Gary Wilkinson***

Gary has been an active Ornithologist for over fifty years. He is currently Chairman of the Northern Ireland Ornithologists Club 2005-present and was formerly Treasurer from 1987-2005. Gary is also the field trip leader for the NIOC leading trips from 1984 in the U.K. and Ireland as well as in Europe and Africa. Gary is a member of the NI Raptor Study Group and has been a life fellow of the RSPB and Norfolk Ornithologists Association since 1992. Gary has taken part in a variety of ornithological surveys for BTO and NIOC over the last 50 years including being the Regional Coordinator of *Project Barn Owl* for Northern Ireland for BTO/Hawk & Owl Trust; conducting BTO Waterway Breeding Bird Surveys at Annacloy River, Co. Down and conducting the BTO Wetland Bird Census for part of Belfast Lough.

***Rob Wheeldon***

Rob Wheeldon is an experienced ornithologist possessing a comprehensive knowledge and experience of bird identification and surveys. He has worked undertaken numerous bird surveys to inform impact assessment and has contributed to targeted bird survey work on contract to NPWS and Birdwatch Ireland. Rob previously worked with BirdWatch Ireland, RSPB, Norfolk Wildlife Trust, and the National Trust.

### 10.1.5 Relevant Legislation and Published Guidance

The main pieces of legislation and policy relevant to this chapter are:

- The Wildlife Act 1976 - 2021 as amended
- The EU Birds Directive (2009/147/EC)
- EU EIA Directive (2014/52/EU)
- European Communities (Birds and Natural Habitats) Regulations 2011, as amended (S.I. no. 477 of 2011).
- The National Biodiversity Action Plan (2023 – 2030)

The following guidance was consulted in relation to ornithological survey methods and assessment of effects of the Proposed Development:

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

- Band, W. (2024) Using a collision risk model to assess bird collision risks for onshore wind farms. NatureScot Research Report 909.
- Band, W. (2012) Using a collision risk model to assess bird collision risks for offshore wind farms.
- Band, W., Madders, M. and Whitfield, D.P. (2007). Developing field and analytical methods to assess avian collision risk at wind farms. In: Birds and wind power: risk assessment and mitigation. M. De Lucas, G.F.E. Janss and M. Ferrer, Eds.: 259-275. Quercus, Madrid.
- CIEEM (2024). Guidelines for Ecological Impact Assessment in the UK and Ireland: Terrestrial, Freshwater, Coastal and Marine. Version 1.3. Chartered Institute of Ecology and Environmental Management, Winchester
- EPA Guidelines on the Information to be contained in Environmental Impact Assessment Reports (2022)
- European Commission (2017) Environmental Impact Assessment of Projects. Guidance on the preparation of the Environmental Impact Assessment Report. (Directive 2011/92/EU as amended by 2014/52/EU)
- Gilbert, G., Stanbury, A. and Lewis, L. (2021). Birds of Conservation Concern in Ireland 4: 2020-2026. Irish Birds, Volume 43, 1-22
- Goodship, N.M. and Furness, R.W. (MacArthur Green) (2022). Disturbance Distances Review: An updated literature review of disturbance distances of selected bird species. *NatureScot Research Report* 1283.
- Irish Wind Energy Association (2012). Best Practice Guidelines for the Irish Wind Energy Industry. Available at https://windenergyireland.com/images/files/9660bdfb5a4f1d276f41ae9ab54e991bb600b7.pdf
- NRA (2009). Guidelines for Assessment of Ecological Impacts of National Road Schemes
- Percival, S.M. (2003). Birds and Wind Farms in Ireland: A Review of Potential Issues and Impact Assessment. Ecological Consulting.
- Scottish Natural Heritage (2017). Recommended Bird Survey Methods to Inform Impact Assessment of Onshore Wind Farms. Version 2. Scottish Natural Heritage
- Scottish Natural Heritage (2018). Avoidance Rates for the onshore SNH Wind Farm Collision Risk Model. September 2018 v2.
- Scottish Natural Heritage (2016). Assessing Connectivity with Special Protection Areas (SPAs). Version 3. Scottish Natural Heritage
- McGuinness, D., Muldoon, C., Tierney, N., Cummins, S., Murray, A., Egan, S. and Crowe, O. (2015). Bird Sensitivity Mapping for Wind Energy Developments and Associated Infrastructure in the Republic of Ireland. Birdwatch Ireland, Wicklow, Ireland.

## 10.2 Methodology

### 10.2.1 Desktop Study

A desktop study was undertaken to identify features of ornithological interest within the study area and surrounding area. The following key information sources were queried:

- National Parks and Wildlife Service (NPWS) website and web map for data on sites designated for nature conservation
- Environmental Protection Agency (EPA) AA tool for data on distance and connectivity to designated sites
- BirdWatch Ireland I-WeBS (Irish Wetland Bird Surveys) site information
- National Biodiversity Data Centre (NBDC) records for the 10km grid square within which the proposed Wind Farm occurs (N51) and the adjacent 10km grid square between the proposed Wind Farm and the Figile River (N61)
- Birds of Conservation Concern in Ireland 2020-2026 (Gilbert *et al.* 2021)
- The 2022 National Survey of breeding Hen Harrier in Ireland (Ruddock *et al*. 2024)
- European Bird Atlas 2 (second version) online maps (https://ebba2.info/maps/)
- General information available from the BirdWatch Ireland website
- Review of impact assessments associated with nearby developments including wind farms.
- Review of supplementary survey data collected at the Wind Farm Site.

### 10.2.2 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. The issues raised in consultation in relation to birds have been addressed within this Chapter.

**Table 10-1: Summary of consultation undertaken in relation to Ornithology**

| Consultee | Date Response Received | Response |
|---|---|---|
| **An Taisce** | N/A | No response received to date |
| **BirdWatch Ireland** | N/A | No response received to date |
| **Department of Housing, Local Government and Heritage** | N/A | No response received to date |
| **Development Application Unit** | 25/04/2025 | Facilitated organising a meeting between NPWS Ecologist and WSI |
| **Irish Raptor Study Group** | N/A | No response received to date |
| **Irish Wildlife Trust** | N/A | No response received to date |
| **Kildare County Council** | N/A | No response received to date |
| **Laois County Council** | N/A | No response received to date |

| Consultee | Date Response Received | Response |
|---|---|---|
| **National Parks and Wildlife Service** | N/A | Meeting held between NPWS and WSI staff members on 9th May 2025. Various issues were discussed, of relevance to Ornithology were the proximity of the site to a known Curlew breeding site; migratory species such as Whooper Swan; cumulative collision risk; post construction monitoring and lighting on turbines. |
| **Offaly County Council** | N/A | No response received to date |

### 10.2.3 Identification of Target Species and Valued Ornithological Receptors

Following the completion of the desk study, consultation and initial field visits, a list of targeted species likely to occur in the study area was identified. In particular, of the bird species known to frequent the site, the target species were identified from the following:

- Species of European conservation importance (as listed on Annex I of the Birds Directive); and
- Species Red-listed in Ireland under the latest list of Birds of Conservation Concern Ireland (BoCCI), (Gilbert et al. 2021).
- Species of known sensitivity to wind farm development.

The Field surveys were designed to obtain further information on the occurrence and use of the site by these targeted species in accordance with SNH (2017) guidance.

The identified list of target species for the current project based on known distribution of the above categories is presented in Appendix 10-1. Valued Ornithological Receptors (VORs) were subsequently identified from this list of target species based on the outcome of observations and their confirmed occurrence in proximity to the site and identified potential impact pathway.

### 10.2.4 Field Surveys of Target Species

In the absence of specific national bird survey guidelines, the ornithological surveys were designed and undertaken in accordance with 'Recommended bird survey methods to inform impact assessment of onshore wind farms' (SNH, 2017). Data collected from field surveys undertaken from October 2021 to September 2023 largely informs the assessment of significant effects. The survey period covered by the dataset includes two full non-breeding (winter) and breeding seasons. The data has been collected within 5 years of the planning submission, as specified for sites where bird populations are not rapidly changing. Additional supplementary surveys were undertaken over a 24 month period between April 2017 and March 2019 (see Section 10.2.4.8 below for further details). This data was reviewed as part of the scoping of bird survey requirements of the site.

#### *10.2.4.1 Initial Reconnaissance Surveys*

The likely bird interest of the site was determined following initial reconnaissance walkover surveys of the site together with the outcome of desktop studies. These initial site visits coupled with the desktop review of existing data (including previous data collected at the site between 2017-2019, see Section 10.2.4.8) informed the target species and the scope of the bird surveys to be undertaken at the site.

### *10.2.4.2 Vantage Point (VP) Watches*

Vantage Point (VP) Surveys comprise a series of watches from a fixed location/s to quantify the flight activity of birds at a Proposed Wind Farm Site. The data informs bird usage of the site while also providing data to estimate the turbine collision risk. The surveys were undertaken in accordance with SNH (2017) guidance from October 2021 to September 2023.

During the VP surveys, the flight behaviour of target species (see Section 10.2.3 above) was recorded. At the time of each observation information such as the time the bird was detected, flight duration within various height categories, and type of activity (hunting, displaying, flying etc.) was recorded. A unique identifier was assigned to each flight record. Flight height bands were split into three bands, 0-25m, 25-185m, and >200m. All birds recorded within the 25-185m flight band are within the Potential Collision Height (PCH), while a proportion of birds in the >200m band were deemed to also occur within the PCH, details on the calculations to determine this proportion is presented in the Collision Risk Assessment report as presented in Appendix 10-6. Prevailing weather conditions for each watch were also recorded. During the VP surveys, all other non-target/secondary species were also recorded, where recording did not infringe on recording of target species flight data.

Watches were undertaken monthly throughout the survey period from three fixed VP locations from which observations of all turbine locations including a 500m buffer were made (see Figure 10-1). A viewshed analysis of each VP was undertaken to determine coverage across the entire Wind Farm Site (see below).

In all, 432 hours of vantage point watches were undertaken across the two year period. A total of 159 hours of survey effort was carried out at VP1 and VP2 over the entire survey period. The total survey effort at VP3 was 117 hours. The survey effort at VP3 was lower than that at VP1 and VP2 as VP3 was only established in April 2022. Survey effort per VP and season is summarised in Table 10-2. A detailed summary of VP watches carried out between October 2021 and September 2023 is presented in Appendix 10-1, Table 1.

**Table 10-2: Details of vantage point watches carried out at Derrynadarragh Wind Farm**

| | Viewshed area (km²) | Seasonal surveys | Total survey effort (hrs) | VP Location |
|---|---|---|---|---|
| VP1 | 3.24 | Winter (Oct 21 – Mar 22): 36hrs<br>Summer (Apr – Sep 22): 36hrs<br>Winter (Oct 22 – Mar 23): 54hrs<br>Summer (Apr – Sep 23): 36hrs | 162 | 658138, 716055 |
| VP2 | 3.65 | Winter (Oct 21 – Mar 22): 36hrs<br>Summer (Apr – Sep 22): 36hrs<br>Winter (Oct 22 – Mar 23): 48hrs<br>Summer (Apr – Sep 23): 42hrs | 162 | 660008, 715795 |
| VP3 | 1.79 | Winter (Oct 21 – Mar 22): na<br>Summer (Apr – Sep 22): 36hrs<br>Winter (Oct 22 – Mar 23): 42hrs<br>Summer (Apr – Sep 23): 42hrs | 120 | 660224, 714647 |

** VP3 has a lower survey effort compared to VP1 and VP2 as it was not established until April 2022*

** A number of additional watches were undertaken during winter 2022-23 and summer 2023 to increase coverage of the Spring and Autumn migration periods.*

#### 10.2.4.2.1 Viewshed Analysis

Viewshed analysis was carried out to confirm coverage of the study area from fixed VP locations (i.e. VP1 – VP3). During the Winter 2021 – 2022 season two VPs were utilised (VP1 and VP2) and the third VP location (VP3) was added in Summer 2022 following a review by surveyors to provide further coverage of the very southern part of the site. Figure 10-1 illustrates the locations of the VPs and the extent of the 500m buffer from proposed turbine locations which formed the primary study area for Vantage Point Surveys and Walkover Surveys of the Wind Farm Site. While the relevance of being able to view as much of the site to ground level is acknowledged, the SNH (2017) guidance emphasises the importance of visibility of the 'collision risk volume' when the data is to be used to estimate the risk of collision with turbines by birds. Viewsheds were calculated using ESRI ArcGIS software using the Airbus World DEM4 Ortho 24m dataset. The input data for the viewshed analysis were:

- observer height (1.7m)
- height of objects being viewed (both 0m and 20m were used for each VP, 0m represents ground level while 20m is the lowest swept rotor height of most turbines)
- and the distance that an object could be viewed (2km in this case)

The resulting viewshed was then cropped to 180 degrees to give the viewshed orientation and visible survey area from each VP location in line with SNH (2017). In order to ensure that the viewsheds provided sufficient coverage of the turbines and the area within 500m of the turbines, a 500m buffer was applied to the outer most turbines of the wind farm in line with SNH (2017). The outputs of the viewshed analysis was reviewed and amended by surveyors based on actual viewshed considering nearby trees and other local obstacles. The final visible viewshed at 20m is presented for each VP in Figure 10-2 (VP1), Figure 10-3 (VP2), Figure 10-4 (VP3), and the combined overlapping viewshed of the entire study area is presented in Figure 10-5.

### *10.2.4.3 Winter Walkover Surveys*

Winter transect surveys were undertaken on eighteen occasions between October 2021 - March 2022 and October 2022 - March 2023 to record the presence of bird species of high conservation concern within areas of potentially suitable habitat for these species during winter. The overall aim of the walkover surveys at Derrynadarragh was to assess the general bird distribution throughout the site and gather data on bird usage of the site. The area subject to survey included the Wind Farm Site and included areas out to 500m from turbine locations.

Transects were selected in order to ensure good spatial coverage of the site and ensure that the full variation of habitat occurring within and surrounding the site was captured. The methodology was broadly based on an adapted Brown and Shepherd surveys (SNH 2017). Target species included raptors and waterbirds although all additional species observed were also recorded. Details of the winter walkover surveys (date, surveyor, time, weather conditions) are presented in Appendix 10-1, Table 2. The transect routes followed during walkover surveys are presented in Figure 10-6 Figure 10-7.

### *10.2.4.4 Breeding Walkover Surveys*

Breeding season walkover transect surveys were undertaken on seventeen occasions between April and September in 2022 and April and September 2023 (see Appendix 10-2 for details of survey effort). The surveys aimed to determine the presence of bird species of high conservation concern and identify areas of possible, probable, or confirmed breeding for bird species observed within the Wind Farm Site. The study area included the Wind Farm Site and included areas out to 500m from turbine locations. The survey methodology followed the Brown and Shepherd (1993) approach.

Transect routes were devised to ensure the required coverage of different habitat was achieved within the survey area. Transects were selected to ensure all areas of suitable breeding/ foraging habitat were approached to within 100m. The transect routes followed during walkover surveys are presented in Figure 10-6 and Figure 10-7.

Target species included waders, raptors, waterbirds, and other birds of conservation concern. Along with target species, all additional species observed were recorded to inform the evaluation of supporting habitat. Walkover surveys were carried out during daylight hours and were distributed throughout the day from dawn to dusk. Following all survey visits, the field maps were analysed to determine the number and location of breeding territories. All non-breeding individuals and species encountered were also recorded.

#### *10.2.4.5 Breeding Raptor Survey*

Breeding raptor surveys (i.e. birds of prey and owls) were undertaken within the hinterland of the proposed Wind Farm Site. Survey methodology followed Hardey et al. (2013) and the survey extended to 2km beyond the site. The breeding raptor surveys were conducted during the 2023 Breeding season (May, June and July 2023), totalling 18hrs of survey effort (see Appendix 10-2 for details of survey effort). The aim of these surveys was to determine if there were any breeding raptors within, or in the vicinity of, the proposed Wind Farm site. Survey effort details are provided in Appendix 10-2. This includes full details of dates, times, survey locations, survey duration and weather conditions for each survey. Figure 10-8 shows the area subject to the breeding raptor survey (targeted within suitable habitat within this area).

#### *10.2.4.6 Breeding Wader Survey*

Initial reconnaissance surveys of the study area within 2km of the Proposed Wind Farm Site were conducted to identify any potential areas suitable for breeding waders Figure 10-11 shows the extent of the area subject to the breeding wader survey (targeted within suitable habitat within this area). An area to the east of the proposed wind farm was identified as a possible breeding wader site, with Curlew, Lapwing and Snipe previously recorded in the area (data from supplementary surveys in 2017 and 2018 below). Targeted surveys for were carried out covering the 2022 breeding season in this area following the O'Brien and Smith (1992). Additional breeding wader surveys were undertaken during the 2025 survey season to establish the status of Curlew in areas in proximity to the Wind Farm Site. This includes a transects survey with shortened VPs in an area to the east of the site (in proximity to the 2022 survey area) and deploying passive acoustic recorders onsite to record displaying/territorial males when surveyors are not on site.

#### *10.2.4.7 Breeding Woodcock Surveys*

A targeted breeding woodcock survey were undertaken in June 2025 to confirm the current status as an update to the previous surveys undertaken at the site during 2017 and 2018 (see supplementary surveys from 2017 and 2018 below). The 2025 single night survey focussed on suitable habitat within the site and was also informed by the outcome of the 2017 / 2018 observations The aim of the survey was to determine the number of breeding woodcock. A transect was walked amongst areas of suitable woodland habitat in proximity the Wind Farm Site. The presence of roding (displaying) male woodcock was noted and mapped. Areas of suitable habitat identified within the 500m buffer zone of the Wind Farm Site were assessed for their suitability to support Woodcock. Areas that represented suitable habitat were subject to targeted surveys.

#### *10.2.4.8 Surveys of Turbine Transport Route and Grid Connection Route*

The ornithological value of the turbine transport and grid connection routes was assessed through multi-disciplinary ecological surveys. The potential for impacts on birds is considered low due to the nature of the proposed works—which are minor and primarily within existing road corridors—and the low sensitivity of the receiving environment. Given the project's limited scale in these areas, the surveys provided an adequate baseline to inform the impact assessment A map showing the route of the Turbine Delivery Route and the Grid Connection that were subject to survey is presented in Figure 10-9.

#### *10.2.4.9 Supplementary Surveys*

Additional comprehensive bird surveys were undertaken at the site by Mr Rob Wheeldon from April 2017 through to December 2018, covering two full breeding seasons (2017, 2018) and one full winter season (October 2017 to March 2018) and half of the next winter season (October 2018 to December 2018). Surveys followed SNH (2017) guidelines and included VP watches, winter and breeding walkover surveys, breeding woodcock surveys, and waterbird distribution and abundance surveys. Surveys undertaken at that time covered a similar area to the current Wind Farm Site and 500m buffer.

##### 10.2.4.9.1.1 Vantage Point Surveys

A total of 276hrs vantage point watches were undertaken from two of the VP locations used in the 2021-2023 assessment (VP1 and VP2). The VP surveys commenced in April 2017 and continued through March 2019 covering two breeding and non-breeding winter seasons. Thirty six hours from each VP were undertaken during each season.

##### 10.2.4.9.1.2 Breeding Wader Survey

Breeding wader surveys were undertaken during both the 2017 (8 visits) and 2018 (7 visits) breeding seasons from April through July. Survey methods followed O'Brien and Smith (1992).

##### 10.2.4.9.1.3 Breeding Woodcock Surveys

Woodcock breeding surveys were undertaken in areas of suitable habitat within the site in the summer of 2017 and 2018. Survey methods followed the BTO Woodcock Survey methods with minimum 2hr watches taking place from dusk over the breeding season. Surveys were undertaken on three dates in 2017 and on tow dates during summer 2018.

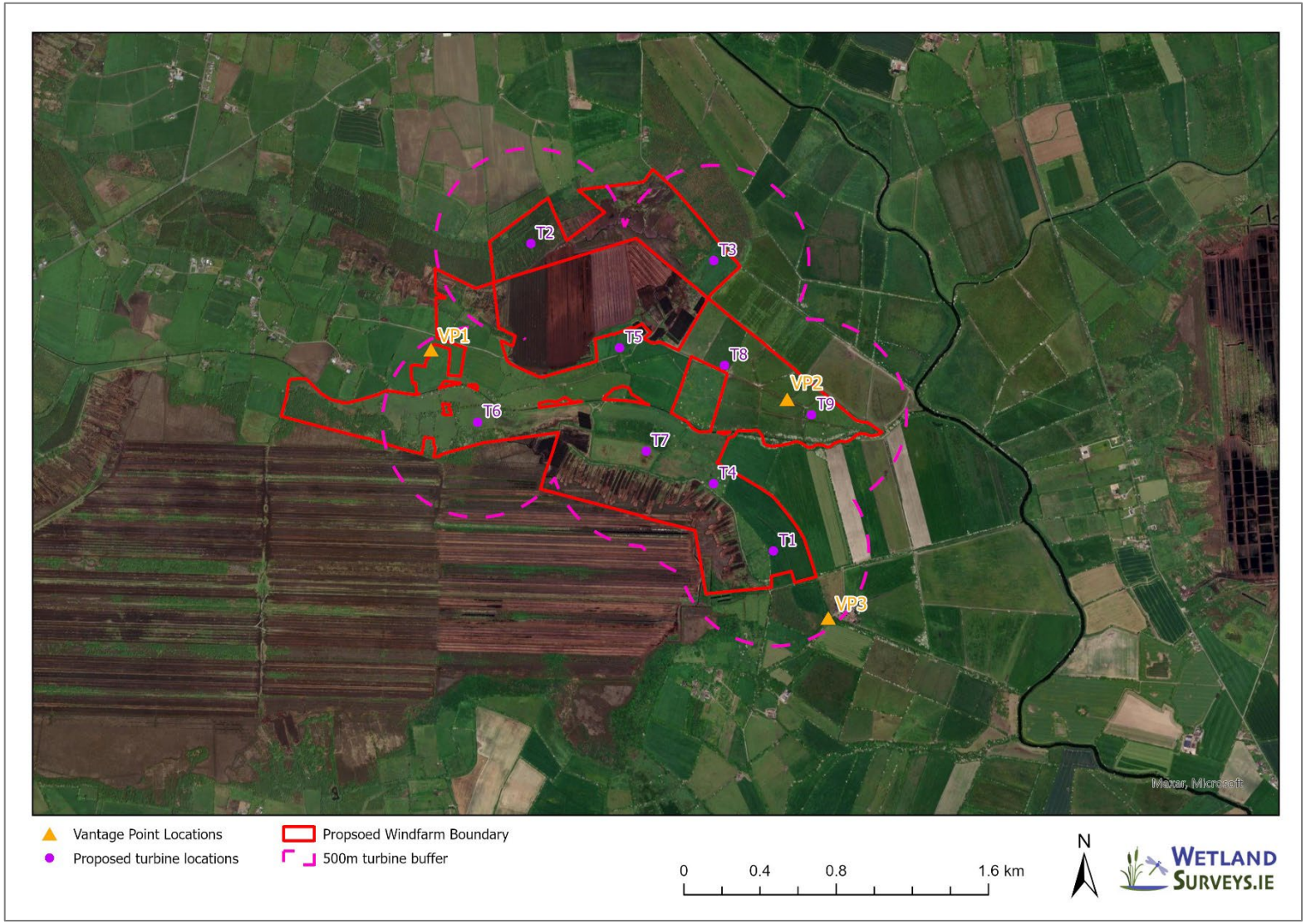



**Figure 10-1: Vantage Point locations at the proposed Derrynadarragh Wind Farm site.**

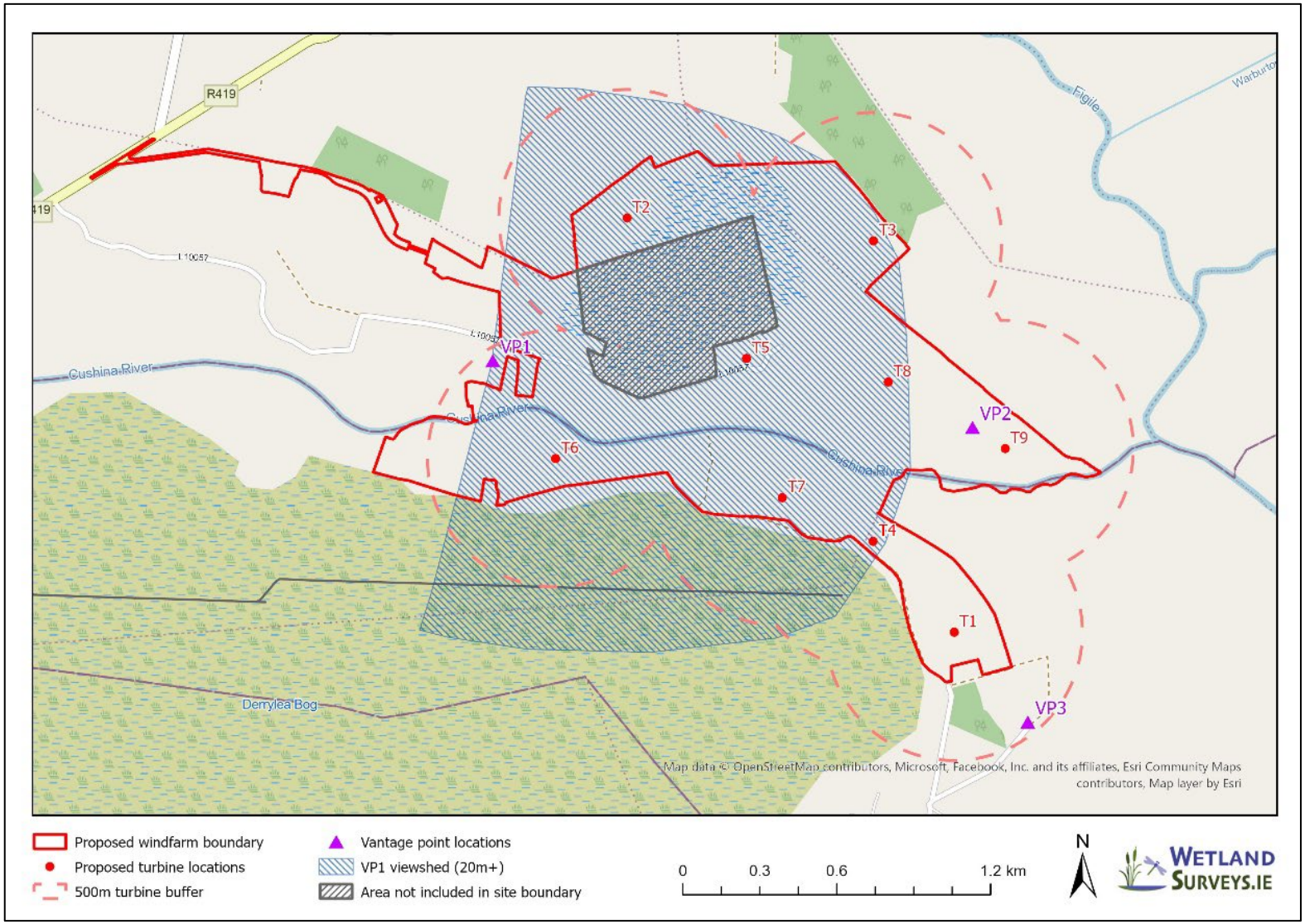



**Figure 10-2: Viewshed from VP1 (20m height).**

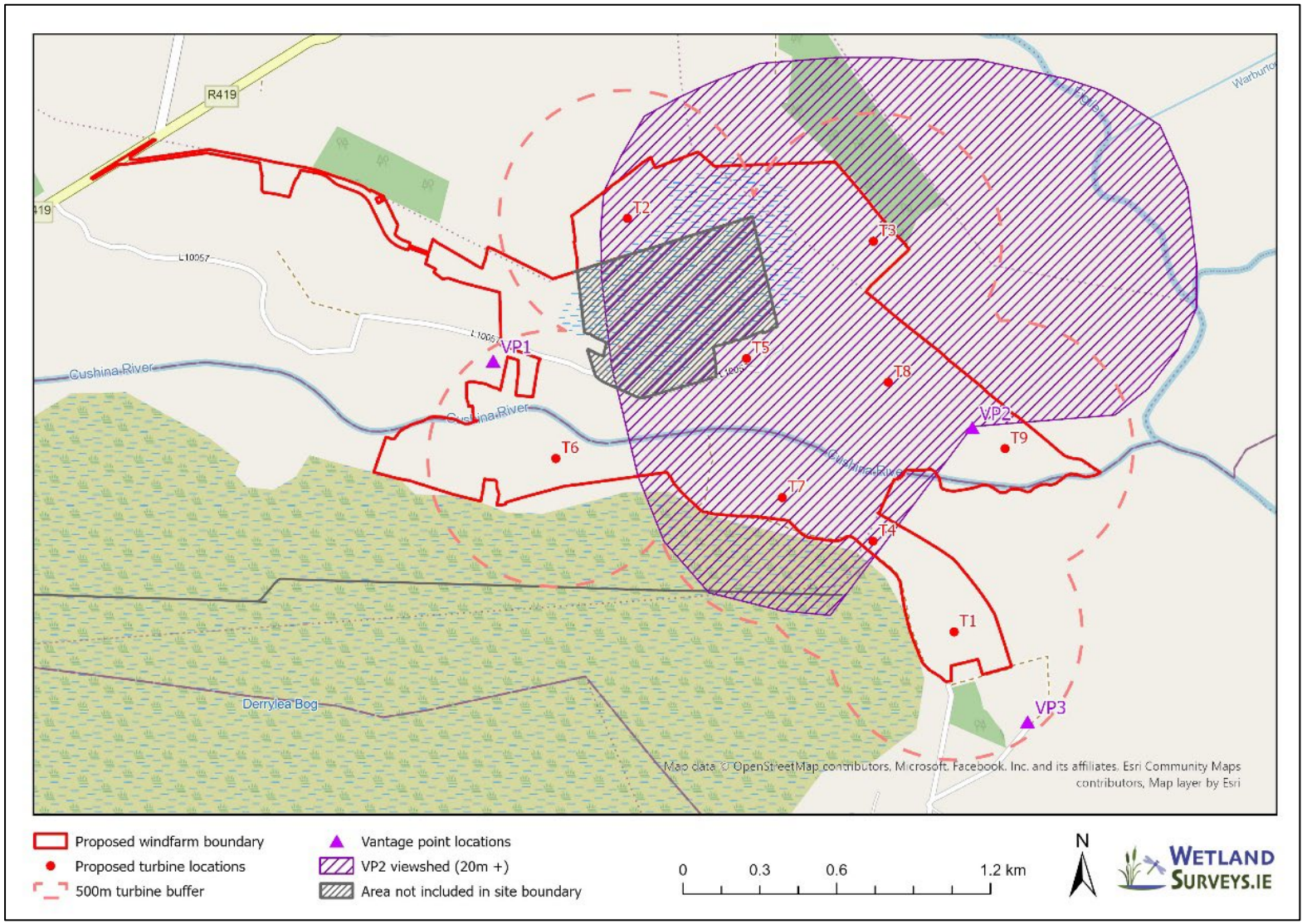



**Figure 10-3: Viewshed from VP2 (20m height).**

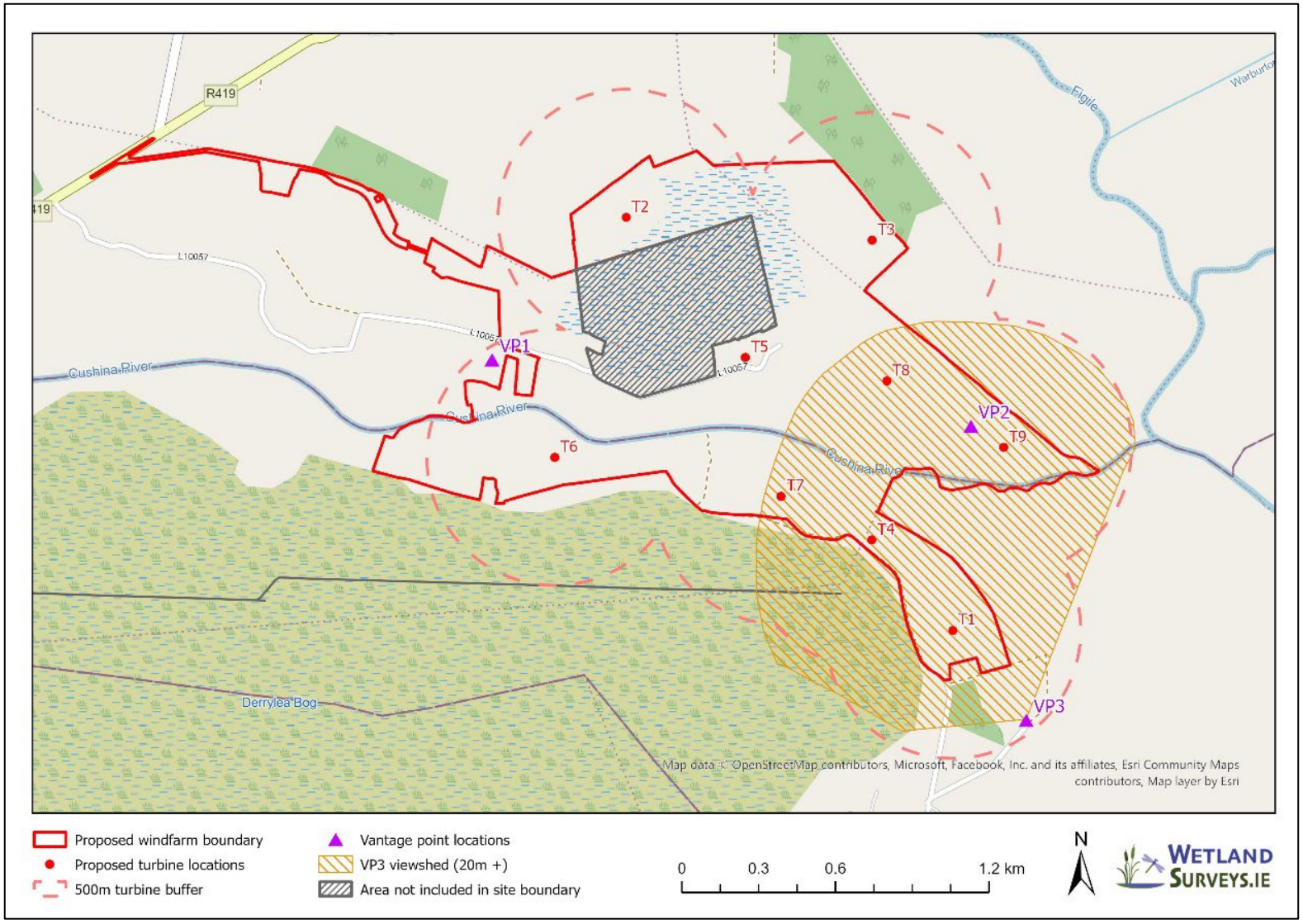



**Figure 10-4: Viewshed from VP3 (20m height).**

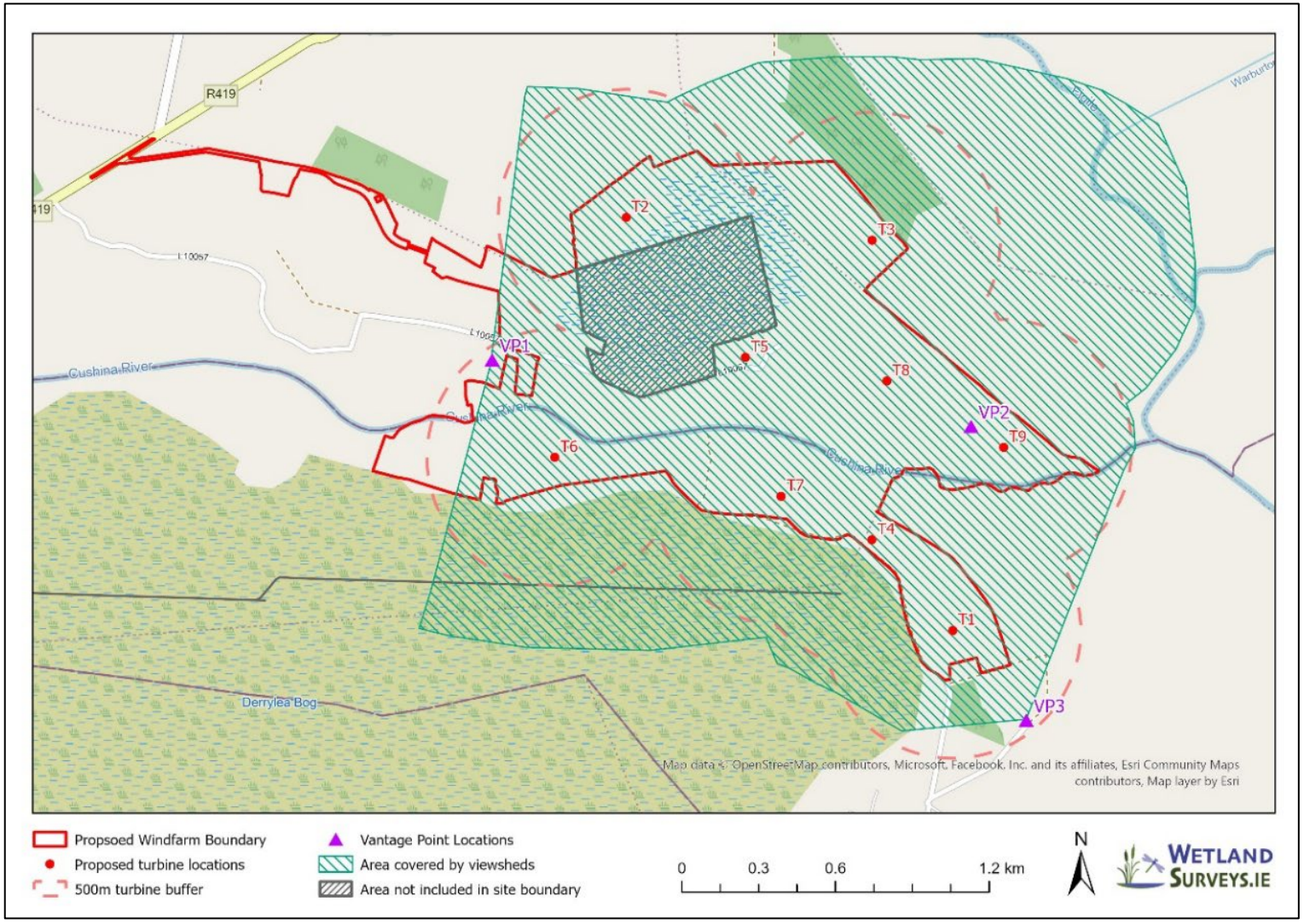



**Figure 10-5: Overall coverage of study area by three VP viewsheds (20m height).**

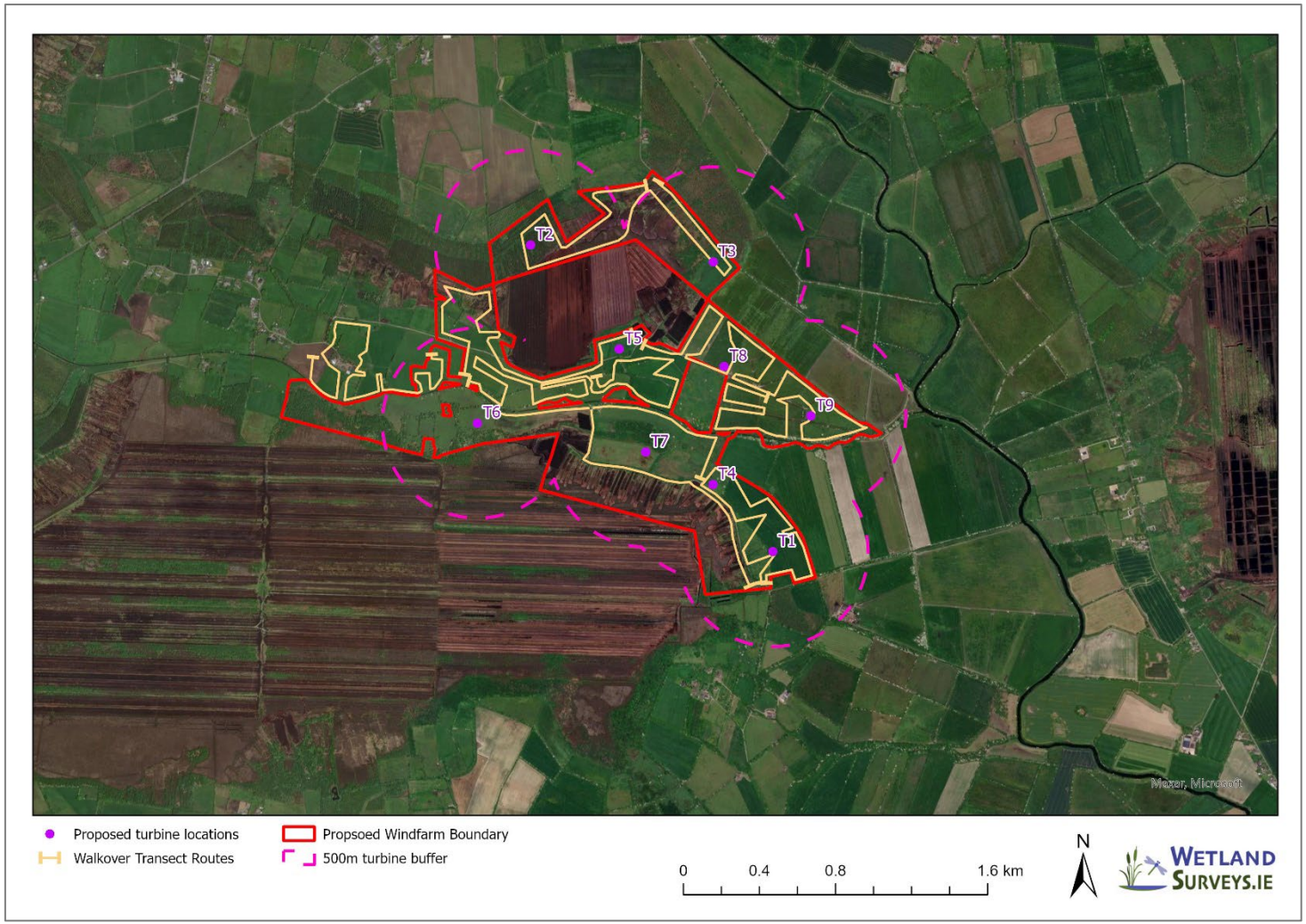



**Figure 10-6: Walkover transect routes at the proposed Derrynadarragh Wind Farm site in Winter 2021 – 2022 and Summer 2022.**

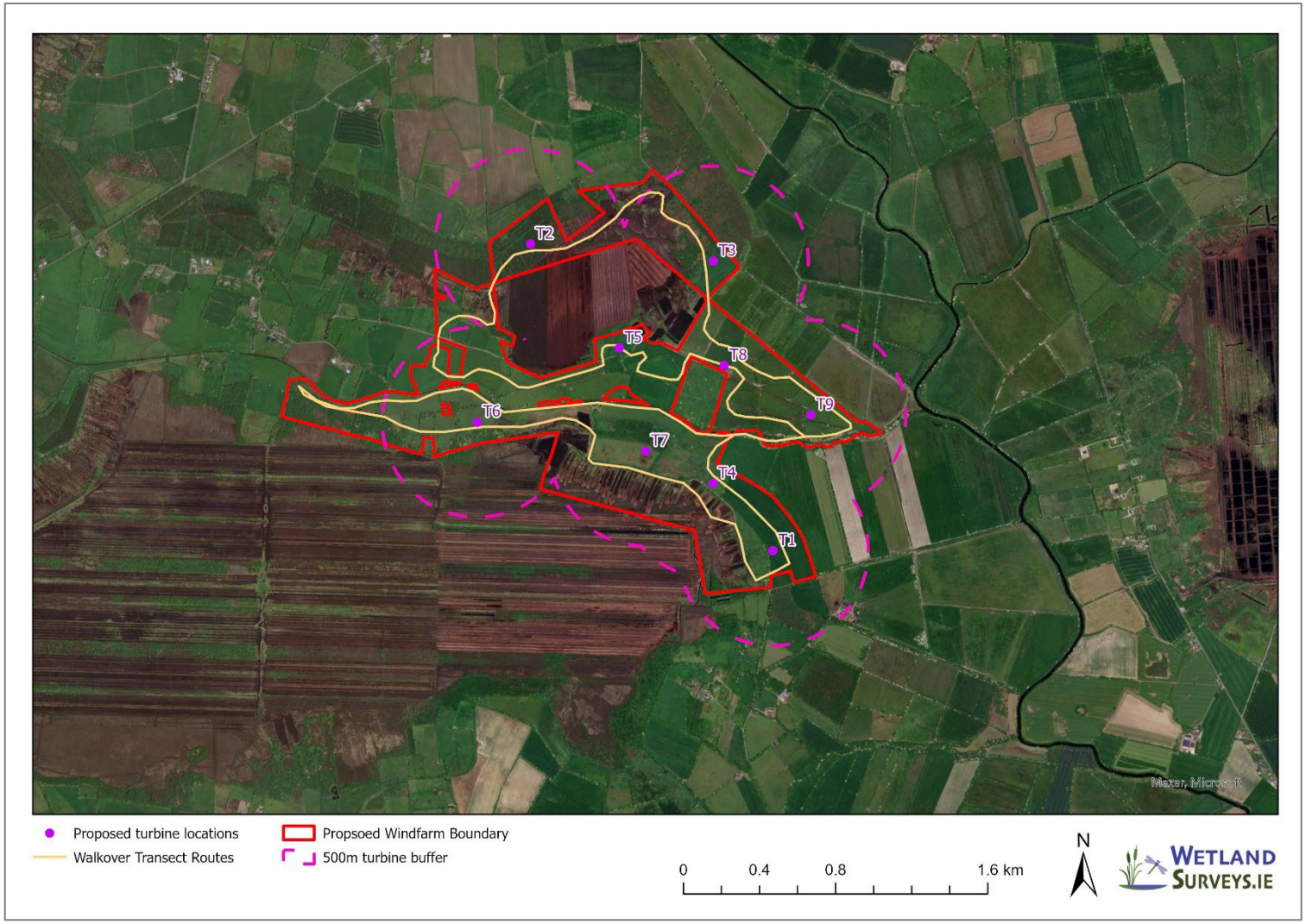



**Figure 10-7: Walkover transect routes at the proposed Derrynadarragh Wind Farm site in Winter 2022 – 2023 and Summer 2023.**

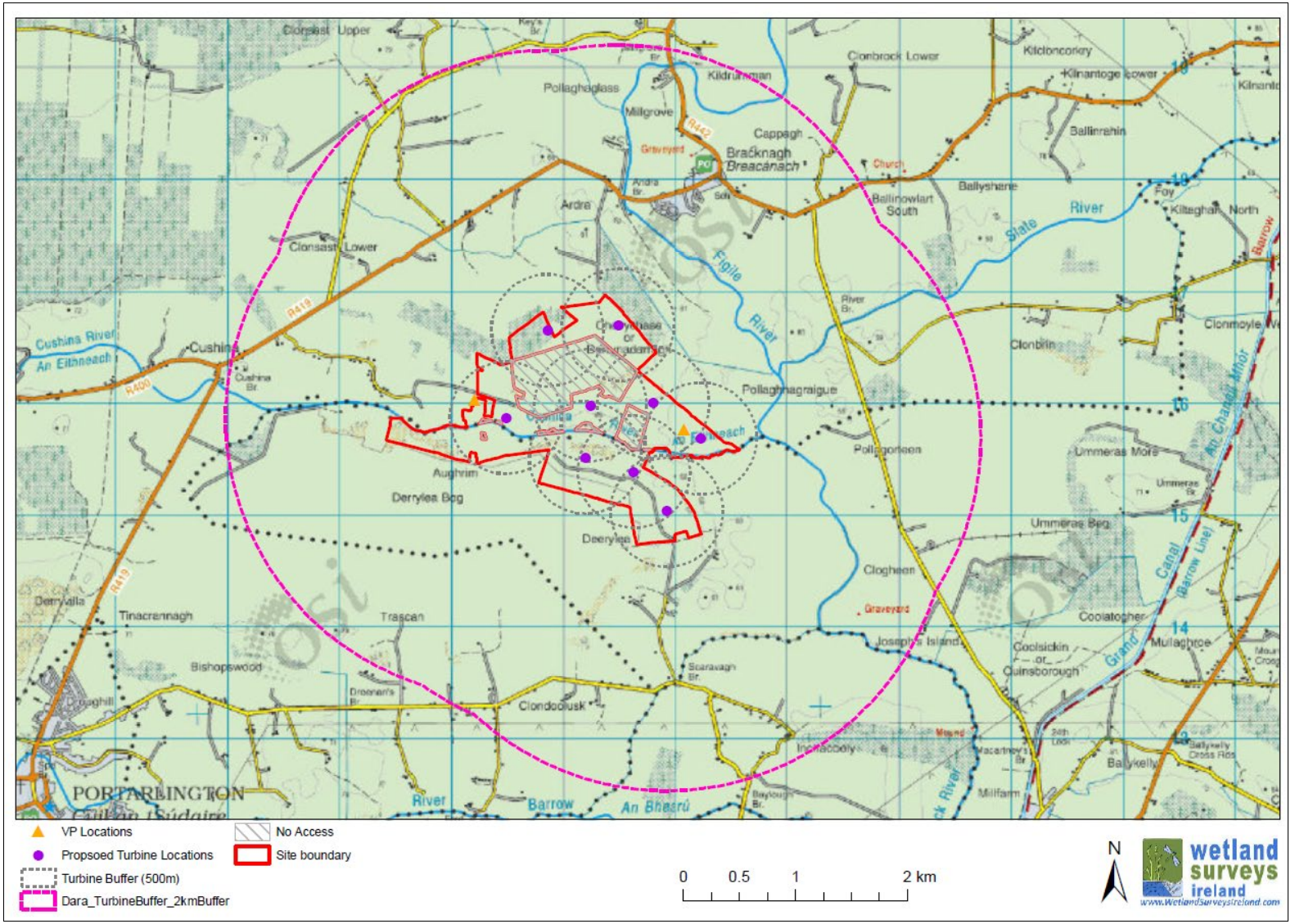



**Figure 10-8: Study area showing 2km buffer around Wind Farm Site that was subject to breeding raptor surveys and breeding wader surveys.**

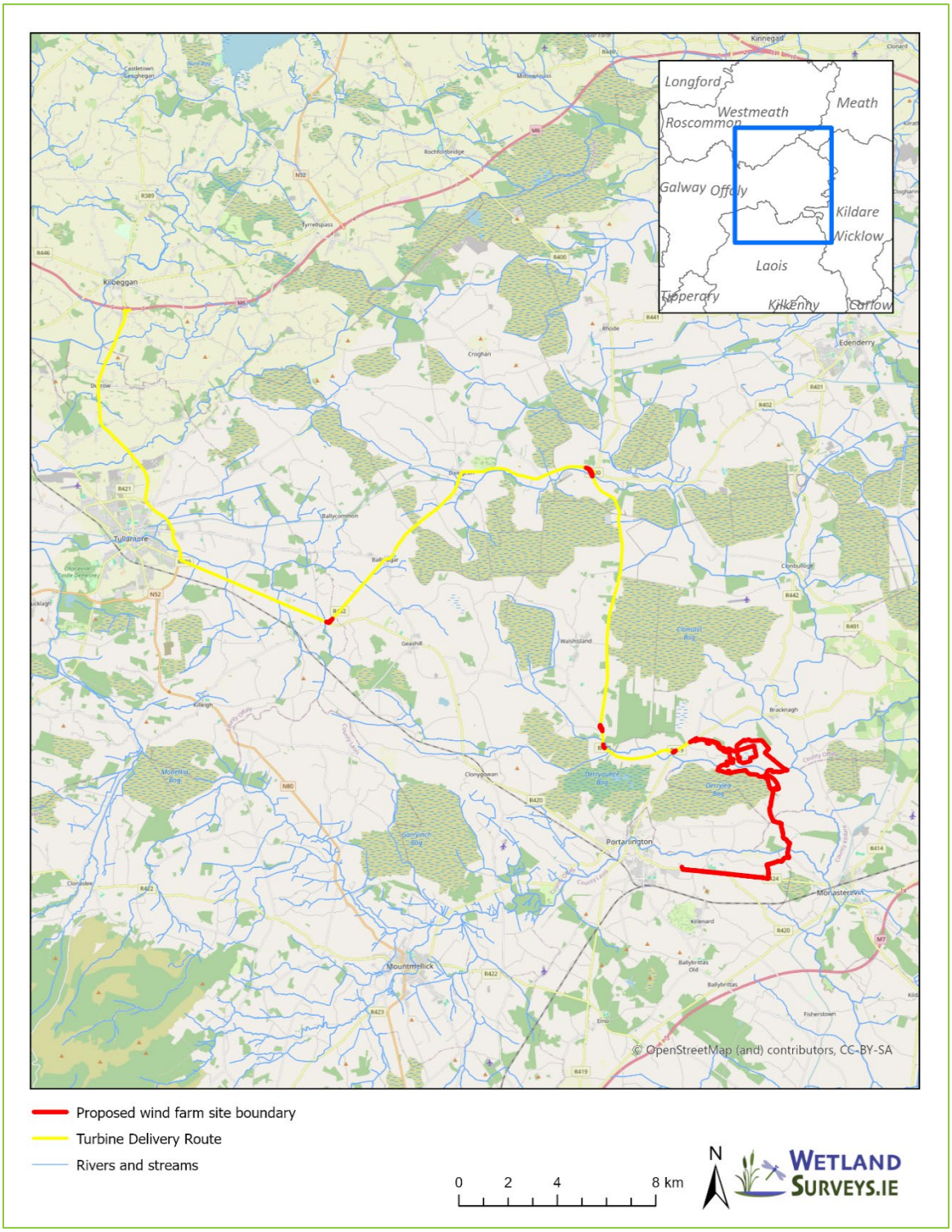



**Figure 10-9: Map showing the Turbine Delivery Route and Underground Grid Connection (to south of main Wind Farm Site).**

### 10.2.5 Evaluation and Impact Assessment Methodology

The ecological evaluation and impact assessment approach used in this report is based on "Guidelines on the information to be contained in Environmental Impact Assessment Reports" (EPA, 2022) and "Guidelines for Ecological Impact Assessment in the UK and Ireland" (CIEEM, 2018) (henceforth referred to as the CIEEM guidelines).

For the purposes of this assessment, in accordance with CIEEM guidelines, a 'significant effect' is an effect that either supports or undermines conservation objectives for VORs. Conservation objectives may be specific (e.g. for a designated site) or broad (e.g. national/local nature conservation policy). Effects can be considered significant at a wide range of scales from local to international. For example, a significant effect on a regionally important population of a species is likely to be of regional significance.

Wind farm development is known to potentially give rise to three impacts to birds:

- **Habitat loss.** Direct habitat effects are changes that are directly attributable to a defined action, e.g. the physical loss of habitat occupied by a bird species during the construction process. Indirect ecological effects are attributable to an action, but which affect ecological resources through effects on an intermediary ecosystem, process or receptor, e.g. the creation of roads which cause hydrological changes, which, in the absence of mitigation, could lead to the drying out of wetland habitats used by important bird species. The resultant habitat alteration may represent a loss of habitat to dependant bird species.
- **Displacement due to disturbance.** Disturbance effects have been assessed with reference to the relevant literature (e.g. Ruddock and Whitfield 2007, Drewitt and Langston, 2006; Hötker et al., 2006; Pearce-Higgins et al., 2009), and the literature has also been used to recommend appropriate disturbance-free buffer zones considered likely to be required to help prevent nest failure due to disturbance during construction and operation.
- **Collision of birds with turbine structures.** The standard Band Collision Risk Model (CRM) (Band et al. 2007, update 2024) was used to estimate collision risk based on recorded target species activity levels and flight behaviour, proposed turbine numbers and specifications, and the relevant species biometrics and flight characteristics. Modelling collision risk under the Band CRM is a two-stage process. Stage 1 estimates the number of birds that fly through the rotor swept area. Stage 2 predicts the proportion of these birds that have the potential to be hit by a rotor blade. Combining both stages produces an estimate of collision mortality in the absence of any avoidance action/behaviour by birds. Avoidance rates are then applied to generate predicted rates of collision mortality. Further details of the CRM methodology are provided in Technical Appendix 10-5.

Information on bird usage of the site gathered primarily by extensive onsite field surveys is used as the basis to predict the effects of the proposed wind farm development on birds during each phase of the development taking account of the characteristics of the Proposed Development.

#### *10.2.5.1 Site Evaluation*

To standardise the assessment of ecological value, this report follows the geographical framework advocated by CIEEM (2018). A suitable approach proposed by the NRA (2009) has been adopted in this assessment. This framework categorises sites based on their designated status and inherent ecological importance at international, national, regional, and local scales.

The categories used in this assessment are:

- **International Importance:** Sites designated as part of the Natura 2000 network (Special Areas of Conservation or Special Protection Areas) or which support habitats/species populations of international significance.
- **National Importance:** Sites designated as Natural Heritage Areas or deemed to be important for the conservation of species / habitats at the national level.
- **County Importance:** May include non-statutory sites identified by the Local Authority or support habitats or species that are rare or declining at the county scale. In relation to birds, these sites may support populations that are rare or declining at the county scale.
- **Local Importance (Higher Value):** This category captures sites that are valuable within a more immediate local area but do not meet county or national criteria. In relation to birds, these sites may be used for breeding by common but declining birds.
- **Local Importance (Lower Value):** Sites supporting common, widespread habitats and species whose ecological significance is confined to the immediate local context.

This tiered approach ensures a consistent and transparent evaluation of potential impacts on nature conservation receptors.

#### *10.2.5.2 Evaluation Of Ornithological Receptors and Impact Assessment*

The methodology for assessing the sensitivity of bird species to wind farm development, along with the subsequent assessment of effect magnitude and significance, follows Percival (2003). The criteria for each stage of the assessment is set out in Table 10-3, Table 10-4, and Table 10-5 below.

While the assessment of effects are in the first instance identified following Percival (2003) as it is adapted specifically for use on effects on birds, the effects are also described according the EPA (2022) terminology and criteria as set out in Table 10-7 to standardise approach with other disciplines.

## Table 10-3: Evaluation of Sensitivity for Birds (Percival 2003)

| Sensitivity | Criteria |
|---|---|
| **Very High** | Species that form the cited interest of SPA's and other statutorily protected nature conservation areas. Cited means mentioned in the citation text for the site as a species for which the site is designated. |
| **High** | Species that contribute to the integrity of an SPA but which are not cited as a species for which the site is designated.<br>Ecologically sensitive species including the following: divers, common scoter, hen harrier, golden eagle, red necked phalarope, roseate tern and chough.<br>Species present in nationally important numbers (>1% Irish population |
| **Medium** | Species on Annex 1 of the EU Birds Directive.<br>Species present in regionally important numbers (>1% regional (county) population).<br>Other species on BirdWatch Ireland's red list of Birds of Conservation Concern |
| **Low** | Any other species of conservation interest, including species on BirdWatch Ireland's amber list of Birds of Conservation Concern not covered above. |

## Table 10-4: Determination of Magnitude of Effects (Percival 2003)

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

**Table 10-5: Significance matrix: combining magnitude and sensitivity to assess significance (Percival 2003)**

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

**Table 10-6: EPA Criteria and means of describing different effects (EPA 2022)**

| **Quality or type of effect** | |
|---|---|
| Positive Effects | A change which improves the quality of the environment (for example, by increasing species diversity, or improving the reproductive capacity of an ecosystem, or by removing nuisances or improving amenities). |
| Neutral Effects | No effects or effects that are imperceptible, within normal bounds of variation or within the margin of forecasting error. |
| Negative / Adverse Effects | A change which reduces the quality of the environment (for example, lessening species diversity or diminishing the<br>reproductive capacity of an ecosystem, or damaging health or property or by causing nuisance). |
| **Describing the Significance of Effects** | |
| Imperceptible | An effect capable of measurement but without significant consequences. |
| Not Significant | An effect which causes noticeable changes in the character of the environment but without significant consequences. |
| Slight Effects | An effect which causes noticeable changes in the character of the environment without affecting its sensitivities. |
| Moderate Effects | An effect that alters the character of the environment in a manner that is consistent with existing and emerging baseline trends. |
| Significant Effects | An effect which, by its character, magnitude, duration or intensity, alters a sensitive aspect of the environment. |
| Very Significant | An effect which, by its character, magnitude, duration or intensity, significantly alters most of a sensitive aspect of the environment. |
| Profound Effects | An effect which obliterates sensitive characteristics. |
| **The Extent and Context of Effects** | |
| Extent | Describe the size of the area, the number of sites and the proportion of a population affected by an effect. |
| Context | Describe whether the extent, duration or frequency will conform or contrast with established (baseline) conditions (is it the biggest, longest effect ever?) |
| **Probability / Likelihood of Effects** | |
| Likely Effects | The effects that can reasonably be expected to occur because of the planned project if all mitigation measures are properly implemented. |
| Unlikely Effects | The effects that can reasonably be expected not to occur because of the planned project if |

| | |
|---|---|
| | all mitigation measures are properly implemented. |
| **Duration and Frequency of Effect** | |
| Momentary | Effects lasting from seconds to minutes. |
| Brief | Effects lasting less than a day. |
| Temporary | Effects lasting less than a year |
| Short term | Effects lasting 1 to 7 years. |
| Medium term | Effects lasting 7 to 15 years. |
| Long term | Effects lasting 15 to 60 years. |
| Permanent | Effects lasting over 60 years. |
| Reversible | Effects that can be undone, for example through remediation or restoration |
| Frequency | How often the effect will occur (once, rarely, occasionally, frequently, or constantly, hourly, daily, weekly, monthly, annually). |

#### *10.2.5.3 Potential Cumulative Effects*

Cumulative effects result from effects arising from two or more developments and/or from different elements of the same project. The approach to assessing cumulative effects follows methods outlined by SNH (2018) which considers the additive model of effects.

Cumulative effects have been assessed for all species for which detailed assessment has been undertaken in this EIA Report for which potential negative effects are likely. The potential for cumulative effects with other wind farms due to disturbance and collision mortality has been assessed. The cumulative assessment is based on consideration of residual effects, i.e. assuming that proposed mitigation measures for other wind farm projects are implemented.

With regard to the spatial extent of the cumulative assessment, current SNH (2018) guidance indicates that the default approach should be to assess cumulative effects at the Natural Heritage Zone (NHZ) scale, unless there is a reasonable alternative. As there are no NHZs in Ireland, the approach used is based on a 20km search distance recommended by IWEA (2012).

The significance of potential cumulative effects has been determined using the same method adopted in the assessment of effects for the Proposed Development considered on its own. Cumulative effects are therefore considered significant if they undermine conservation objectives for important ornithological receptors. Cumulative effects can be considered significant at a wide range of scales from local to international. For example, a significant cumulative effect on a regional population of a species is likely to be of regional significance.

#### *10.2.5.4 Survey Limitations*

The information provided in this EIAR chapter accurately and comprehensively describes the baseline environment against which effects were assessed. The specialist studies, analysis and reporting have been undertaken in accordance with the appropriate guidelines.

No significant limitations were encountered. However, there was a minor limitation in the use of only two VPs for the first winter season. A third VP (VP3) was introduced in April 2022 to ensure adequate coverage of the southern part of the site following feedback from surveyors once an early draft of the proposed layout was available. The area of the wind farm and 500m turbine buffers covered by VP3 largely overlaps with the viewsheds of VP 1 and VP2 particularly at the Potential Collision Height which is greater than 25m and therefore this limitation is not deemed significant.

The site is lowing with hedgerow and trees common features along field boundaries in some parts of the site presented a difficulty in viewing lower parts of the site in places. However, this did not obstruct views at Potential Collision Height (25m to 185m). presented difficulties of viewing lower part of the site that obstructed from view. The extensive coverage by walkover surveys regularly ensured that all lower parts of the site were adequately surveyed to determine the baseline ornithological interest of the entire site.

## 10.3 Baseline Conditions

A desktop review was conducted to determine the likely bird interest of the site and the surrounding landscape based on known ecological sites and bird species distribution. The desktop review included a review of sites designated for nature conservation, non-designated bird sites, and a review of bird atlas records as held by the National Biodiversity Data Centre. In addition, extensive site specific records from surveys undertaken at the site between 2017 and 2019 were reviewed and informed the determination of Target Species and Valued Ornithological Receptors.

### 10.3.1 Designated Sites

Statutory designated sites designated for their ornithological interest (i.e. SPAs, NHAs and pNHAs) are shown in Figure 10-10. A brief description of each site designated in full or in part for its ornithological interest, within 15 km of the site, is provided in Table 10-7 (other designated sites are considered in **Chapter 9: Biodiversity (Flora and Fauna)**.

The review of Special Protection Areas (SPAs) in proximity to the proposed Wind Farm site revealed that there are no SPAs within 15km of the proposed Wind Farm site (Figure 10-10).

NatureScot guidance (SNH, 2016) recommends that the core foraging range should be used when determining whether there is potential connectivity between a Special Conservation Interest (SCI) of an SPA. The determination of potential connectivity between the proposed Wind Farm site and SPAs considered the habitats that occur at the Proposed Wind Farm Site and their suitability in terms of the ecological requirements of different species. As the closest SPA to the proposed Wind Farm site is 19.6km away and the SCI species (Hen Harrier) has a maximum of 10km foraging range in the breeding season (SNH, 2016), it is determined that there is no connectivity between the proposed Wind Farm and the SPA. However, as hen harrier disperse from their upland breeding sites to lowland areas during winter there is a possibility for birds associated with SPAs interacting with the Wind Farm Site during winter. Other SPAs are sufficiently removed that they lie outside of the core foraging ranges of their Special Conservation Interests (SCIs).

There are no sites designated as Wetlands of International Importance under the Ramsar Convention within 15km of the proposed Wind Farm site. The closest Ramsar site to the proposed Wind Farm site is Pollardstown Fen (RAMSAR Site 474, NPWS Site Code 000396), which is located approximately 16km to the east of the proposed Wind Farm site.

The Important Bird and Biodiversity Areas (IBAs) Programme which is overseen by Birdlife international has identified areas throughout the world that can be considered of greatest importance to bird populations. There are no IBA sites within 15km of the proposed Wind Farm site, and the closest IBA is Wicklow Mountains, which is located over 40km to the east.

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 potential for effects on Natura 2000 sites in the surroundings. This assessment concludes that the Proposed Development will not adversely affect the integrity and conservation status of the network of Natura 2000 sites.

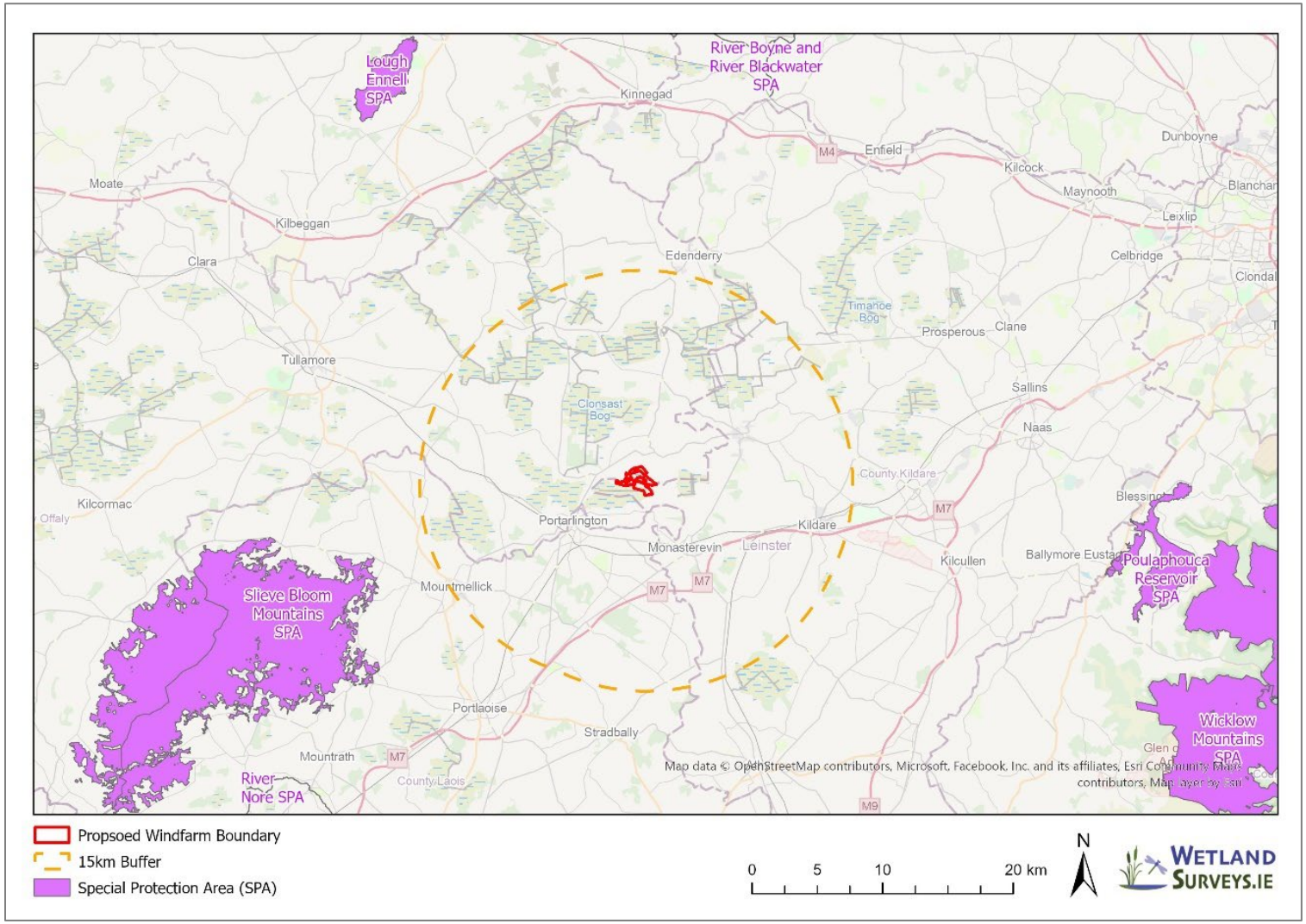



**Figure 10-10: Location of Special Protection Areas in relation to the proposed Derrynadarragh Wind Farm site.**

**Table 10-7: Designated sites within 15km of the study area (Source: www.npws.ie 2025)**

| Site Name | Site Code | Site Description | Distance and direction from Proposed Wind Farm Site | Determination of connectivity and Likely Zone of Impact |
|---|---|---|---|---|
| **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. | Whooper Swans are a wintering species in Ireland and their core foraging range from night roosts during the winter is, according to NatureScot (SNH, 2016), less than 5km.<br><br>This pNHA is therefore NOT considered to be connected to or within the Likely Zone of Impact of the Proposed Development and no further assessment is required. |

### 10.3.1 Non-designated sites

Other known sites of bird interest in the surroundings include those sites that are surveyed as part of the Irish Wetland Bird Survey (IWeBS). Many IWeBS sites do not occur within designated areas and therefore are not afforded formal protection, those IWeBS sites occurring within 5km of the proposed wind farm are presented in Table 10-8 below.

**Table 10-8: List of IWeBS Sites within 5km of the Proposed Wind Farm Site.**

| IWEBS Site | Subsite | Location relevant to Wind Farm Site | Site details[1] |
|---|---|---|---|
| River Barrow (Monasterevin-Portarlington)<br><br>[IWEBS Site Code OS 301] | Derrylea North of Monasterevin<br><br>[Sub-site Code: OS 310]<br><br>Grid Ref. N6120013800 | 1.5km southeast | Mix of arable and lowland pasture on the floodplain of the River Figile.<br>Peak counts [1995/96]: Whooper swan (100), Mute Swan (4), Lapwing (130) |
| | Derrylea/Inchacooly<br><br>[Sub-site Code: OS 310]<br><br>Grid Ref. N6120013500 | 1.7km southeast | Mix of arable and lowland pasture on the floodplain of the River Figile. |

[1] *Data were supplied by the Irish Wetland Bird Survey (I-WeBS), a scheme coordinated by BirdWatch Ireland under contract to the National Parks and Wildlife Service of the Department of Housing, Local Government and Heritage*

| IWEBS Site | Subsite | Location relevant to Wind Farm Site | Site details[1] |
|---|---|---|---|
| | | | Peak counts [1999/98]: Whooper swan (89), Mute Swan (2), Greylag Goose (resident) (2) |
| | River Barrow (Monasterevin-Portarlington)<br><br>Grid Ref. N6100013000 | 2km southeast | Mix of arable and lowland pasture on the floodplain of the River Figile.<br>Peak counts [1995/96]: Whooper swan (60), Mute Swan (25) |
| | Quinsborough<br><br>[Sub-site Code: OS 399]<br><br>Grid Ref. N6240013000 | 3km south-east | Mix of arable and lowland pasture on the floodplain of the River Figile.<br>Peak counts [2009/10]: Curlew (47) |

### 10.3.2 BirdWatch Ireland Bird Sensitivity Tool

The wind energy development site falls entirely within a 'low sensitivity' zone as defined by the Bird Sensitivity Mapping Tool (McGuiness et al., 2015). This tool, developed by BirdWatch Ireland, provides a spatially explicit assessment of potential sensitivity of protected birds to wind energy projects, based on a review of species-specific behavioural, ecological, and distributional criteria.

### 10.3.3 Local bird species records

Bird records held by the NBDC for the 10km grid square (N51) within which the proposed Wind Farm site occurs were reviewed and are presented in Table 10-9 In addition, records from the adjacent grid square (N62) are also included due to its proximity to the wind farm location. These records are a helpful guide but should not be considered as a comprehensive list of bird species occurring in the area as it is possible that some species are under recorded.

**Table 10-9: Bird species recorded within NBDC 10km grid square (N51) within which the proposed wind farm occurs.**

| Species name | Grid Square | Date of last record | Title of dataset | Conservation status |
|---|---|---|---|---|
| Barn Owl | N51, N61 | 29/02/1984 | The First Atlas of Wintering Birds in Britain and Ireland: 1981/82-1983/84. | BoCCI 4 Red List |
| Blackbird | N51, N61 | 08/05/2024 | Birds of Ireland | BoCCI 4 Green List |
| Blackcap | N51, N61 | 19/04/2019 | Birds of Ireland | BoCCI 4 Green List |
| Black-headed Gull | N51, N61 | 31/12/2011 | Bird Atlas 2007 - 2011 | BoCCI 4 Amber List |
| Blue Tit | N51, N61 | 08/05/2024 | Birds of Ireland | BoCCI 4 Green List |
| Brambling | N61 | 06/12/2021 | Birds of Ireland | BoCCI 4 Amber List |
| Bullfinch | N51, N61 | 27/12/2020 | Birds of Ireland | BoCCI 4 Green List |
| Buzzard | N51, N61 | 26/08/2024 | Birds of Ireland | BoCCI 4 Green List |
| Chaffinch | N51, N61 | 08/05/2024 | Birds of Ireland | BoCCI 4 Green List |
| Chiffchaff | N51, N61 | 31/12/2011 | Bird Atlas 2007 - 2011 | BoCCI 4 Green List |
| Coal Tit | N51, N61 | 31/12/2011 | Bird Atlas 2007 - 2011 | BoCCI 4 Green List |
| Collared Dove | N51, N61 | 31/12/2011 | Bird Atlas 2007 - 2011 | BoCCI 4 Green List |
| Common Gull | N61 | 29/02/1984 | The First Atlas of Wintering Birds in Britain and Ireland: 1981/82-1983/84. | BoCCI 4 Amber List |
| Common Sandpiper | N51 | 31/07/1972 | The First Atlas of Breeding Birds in Britain and Ireland: 1968-1972. | BoCCI 4 Amber List |
| Coot | N51 | 31/12/2011 | Bird Atlas 2007 - 2011 | BoCCI 4 Green List |
| Cormorant | N51, N61 | 02/03/2022 | Birds of Ireland | BoCCI 4 Amber List |
| Corn Bunting | N61 | 31/07/1991 | The Second Atlas of Breeding Birds in Britain and Ireland: 1988-1991 | Extinct |
| Corncrake | N51, N61 | 31/07/1972 | The First Atlas of Breeding Birds in Britain and Ireland: 1968-1972. | BoCCI 4 Red List, Annex I EU Birds Directive |
| Crossbill | N51 | 07/07/2021 | Birds of Ireland | BoCCI 4 Green List |
| Cuckoo | N51, N61 | 04/05/2022 | Birds of Ireland | BoCCI 4 Green List |
| Curlew | N51, N61 | 31/12/2001 | Irish Wetland Birds Survey (I-WeBS) 1994-2001. | BoCCI 4 Red List |
| Dipper | N51, N61 | 28/02/2014 | Birds of Ireland | BoCCI 4 Green List |
| Dunlin | N61 | 29/02/1984 | The First Atlas of Wintering Birds in Britain and Ireland: 1981/82-1983/84. | BoCCI 4 Red List |
| Dunnock | N51, N61 | 31/12/2011 | Bird Atlas 2007 - 2011 | BoCCI 4 Green List |

| Species name | Grid Square | Date of last record | Title of dataset | Conservation status |
|---|---|---|---|---|
| Fieldfare | N51, N61 | 31/12/2011 | Bird Atlas 2007 - 2011 | BoCCI 4 Green List |
| Goldcrest | N51, N61 | 31/12/2011 | Bird Atlas 2007 - 2011 | BoCCI 4 Amber List |
| Golden Plover | N51, N61 | 17/12/2019 | Birds of Ireland | BoCCI 4 Red List; Annex I EU Birds Directive |
| Goldfinch | N51, N61 | 27/12/2020 | Birds of Ireland | BoCCI 4 Green List |
| Grasshopper Warbler | N51, N61 | 24/04/2023 | Birds of Ireland | BoCCI 4 Green List |
| Great Spotted Woodpecker | N51, N61 | 27/01/2023 | Birds of Ireland | BoCCI 4 Green List |
| Great Tit | N51, N61 | 31/12/2011 | Bird Atlas 2007 - 2011 | BoCCI 4 Green List |
| Green Sandpiper | N61 | 21/01/2021 | Birds of Ireland | BoCCI 4 Green List |
| Greenfinch | N51, N61 | 31/12/2011 | Bird Atlas 2007 - 2011 | BoCCI 4 Amber List |
| Grey Heron | N51, N61 | 08/05/2024 | Birds of Ireland | BoCCI 4 Green List |
| Grey Partridge | N51 | 31/07/1991 | The Second Atlas of Breeding Birds in Britain and Ireland: 1988-1991 | BoCCI 4 Red List |
| Grey Wagtail | N51, N61 | 23/09/2022 | Birds of Ireland | BoCCI 4 Red List |
| Greylag Goose | N61 | 10/10/2021 | Birds of Ireland | BoCCI 4 Amber List |
| Hen Harrier | N51, N61 | 29/02/1984 | The First Atlas of Wintering Birds in Britain and Ireland: 1981/82-1983/84. | BoCCI 4 Amber List, Annex I EU Birds Directive |
| Herring Gull | N61 | 29/11/2022 | Birds of Ireland | BoCCI 4 Amber List |
| Hooded Crow | N51, N61 | 19/04/2019 | Birds of Ireland | BoCCI 4 Green List |
| House Martin | N51, N61 | 31/12/2011 | Bird Atlas 2007 - 2011 | BoCCI 4 Amber List |
| House Sparrow | N51, N61 | 08/05/2024 | Birds of Ireland | BoCCI 4 Amber List |
| Jack Snipe | N51 | 31/12/2001 | Irish Wetland Birds Survey (I-WeBS) 1994-2001. | BoCCI 4 Green List |
| Jackdaw | N51, N61 | 08/05/2024 | Birds of Ireland | BoCCI 4 Green List |
| Jay | N51, N61 | 08/08/2020 | Birds of Ireland | BoCCI 4 Green List |
| Kestrel | N51, N61 | 21/03/2022 | Birds of Ireland | BoCCI 4 Red List |
| Kingfisher | N51, N61 | 31/08/2023 | Birds of Ireland | BoCCI 4 Amber List; Annex I EU Birds Directive |
| Lapwing | N51, N61 | 31/12/2011 | Bird Atlas 2007 - 2011 | BoCCI 4 Red List |
| Lesser Black-backed Gull | N61 | 29/11/2022 | Birds of Ireland | BoCCI 4 Amber List |
| Lesser Redpoll | N51, N61 | 31/12/2011 | Bird Atlas 2007 - 2011 | BoCCI 4 Green List |

| Species name | Grid Square | Date of last record | Title of dataset | Conservation status |
|---|---|---|---|---|
| Linnet | N51, N61 | 27/12/2020 | Birds of Ireland | BoCCI 4 Amber List |
| Little Egret | N51, N61 | 02/03/2022 | Birds of Ireland | BoCCI 4 Green List |
| Little Grebe | N51, N61 | 07/07/2021 | Birds of Ireland | BoCCI 4 Green List |
| Long-eared Owl | N51, N61 | 31/12/2011 | Bird Atlas 2007 - 2011 | BoCCI 4 Green List |
| Long-tailed Tit | N51, N61 | 15/09/2016 | Birds of Ireland | BoCCI 4 Green List |
| Magpie | N51, N61 | 31/12/2011 | Bird Atlas 2007 - 2011 | BoCCI 4 Green List |
| Mallard | N51, N61 | 31/12/2011 | Bird Atlas 2007 - 2011 | BoCCI 4 Amber List |
| Meadow Pipit | N51, N61 | 31/12/2011 | Bird Atlas 2007 - 2011 | BoCCI 4 Red List |
| Merlin | N51, N61 | 31/12/2011 | Bird Atlas 2007 - 2011 | BoCCI 4 Amber List; Annex I EU Birds Directive |
| Mistle Thrush | N51, N61 | 19/04/2019 | Birds of Ireland | BoCCI 4 Green List |
| Moorhen | N51, N61 | 07/07/2021 | Birds of Ireland | BoCCI 4 Green List |
| Mute Swan | N51, N61 | 07/07/2021 | Birds of Ireland | BoCCI 4 Amber List |
| Peregrine | N51, N61 | 22/06/2017 | Birds of Ireland | Annex I EU Birds Directive |
| Pheasant | N51, N61 | 19/04/2019 | Birds of Ireland | BoCCI 4 Green List |
| Pied Wagtail | N51, N61 | 31/12/2011 | Bird Atlas 2007 - 2011 | BoCCI 4 Green List |
| Purple Sandpiper | N51 | 31/12/2001 | Irish Wetland Birds Survey (I-WeBS) 1994-2001. | BoCCI 4 Red List |
| Raven | N51, N61 | 31/07/1991 | The Second Atlas of Breeding Birds in Britain and Ireland: 1988-1991 | BoCCI 4 Green List |
| Red Grouse | N51 | 29/02/1984 | The First Atlas of Wintering Birds in Britain and Ireland: 1981/82-1983/84. | BoCCI 4 Red List |
| Redshank | N51 | 31/12/2001 | Irish Wetland Birds Survey (I-WeBS) 1994-2001. | BoCCI 4 Red List |
| Redwing | N51, N61 | 31/12/2011 | Bird Atlas 2007 - 2011 | BoCCI 4 Red List |
| Reed Bunting | N51, N61 | 31/12/2011 | Bird Atlas 2007 - 2011 | BoCCI 4 Green List |
| Robin | N51, N61 | 08/05/2024 | Birds of Ireland | BoCCI 4 Green List |
| Rock Dove | N51, N61 | 31/12/2011 | Bird Atlas 2007 - 2011 | BoCCI 4 Green List |
| Rook | N51, N61 | 08/05/2024 | Birds of Ireland | BoCCI 4 Green List |
| Ruddy Shelduck | N51 | 31/12/1892 | Rare birds of Ireland | BoCCI 4 Green List |

| Species name | Grid Square | Date of last record | Title of dataset | Conservation status |
|---|---|---|---|---|
| Sand Martin | N51, N61 | 31/12/2011 | Bird Atlas 2007 - 2011 | BoCCI 4 Amber List |
| Sedge Warbler | N51, N61 | 08/05/2024 | Birds of Ireland | BoCCI 4 Green List |
| Short-eared Owl | N61 | 13/03/2021 | Birds of Ireland | BoCCI 4 Amber List; Annex I EU Birds Directive |
| Siskin | N51, N61 | 31/12/2011 | Bird Atlas 2007 - 2011 | BoCCI 4 Green List |
| Skylark | N51, N61 | 31/12/2011 | Bird Atlas 2007 - 2011 | BoCCI 4 Amber List |
| Snipe | N51, N61 | 02/03/2022 | Birds of Ireland | BoCCI 4 Red List |
| Song Thrush | N51, N61 | 31/12/2011 | Bird Atlas 2007 - 2011 | BoCCI 4 Green List |
| Sparrowhawk | N51, N61 | 02/03/2022 | Birds of Ireland | BoCCI 4 Green List |
| Spotted Crake | N51 | 31/12/1834 | Rare birds of Ireland | BoCCI 4 Amber List; Annex I EU Birds Directive |
| Spotted Flycatcher | N51, N61 | 31/12/2011 | Bird Atlas 2007 - 2011 | BoCCI 4 Amber List |
| Starling | N51, N61 | 08/05/2024 | Birds of Ireland | BoCCI 4 Amber List |
| Stock Dove | N51, N61 | 31/07/1972 | The First Atlas of Breeding Birds in Britain and Ireland: 1968-1972. | BoCCI 4 Red List |
| Stonechat | N51, N61 | 02/03/2022 | Birds of Ireland | BoCCI 4 Green List |
| Swallow | N51, N61 | 08/05/2024 | Birds of Ireland | BoCCI 4 Amber List |
| Swift | N51, N61 | 26/05/2024 | Swifts of Ireland | BoCCI 4 Red List |
| Teal | N51, N61 | 31/12/2011 | Bird Atlas 2007 - 2011 | BoCCI 4 Amber List |
| Tree Sparrow | N61 | 17/07/2024 | Birds of Ireland | BoCCI 4 Amber List |
| Treecreeper | N51, N61 | 31/12/2011 | Bird Atlas 2007 - 2011 | BoCCI 4 Green List |
| Tufted Duck | N51 | 31/12/2011 | Bird Atlas 2007 - 2011 | BoCCI 4 Red List |
| Tundra Swan | N51 | 29/02/1984 | The First Atlas of Wintering Birds in Britain and Ireland: 1981/82-1983/84. | BoCCI 4 Green List |
| Tundra Swan | N61 | 29/02/1984 | The First Atlas of Wintering Birds in Britain and Ireland: 1981/82-1983/84. | na |
| Water Rail | N51 | 07/07/2021 | Birds of Ireland | BoCCI 4 Green List |
| Wheatear | N61 | 20/04/2021 | Birds of Ireland | BoCCI 4 Amber List |
| Whinchat | N51, N61 | 31/07/1991 | The Second Atlas of Breeding Birds in Britain and Ireland: 1988-1991 | BoCCI 4 Red List |
| Whitethroat | N51, N61 | 07/07/2021 | Birds of Ireland | BoCCI 4 Green List |

| Species name | Grid Square | Date of last record | Title of dataset | Conservation status |
|---|---|---|---|---|
| Whooper Swan | N51, N61 | 21/12/2019 | Birds of Ireland | BoCCI 4 Amber List; Annex I EU Birds Directive |
| Willow Warbler | N51, N61 | 31/03/2022 | Birds of Ireland | BoCCI 4 Amber List |
| Woodcock | N51, N61 | 31/12/2011 | Bird Atlas 2007 - 2011 | BoCCI 4 Red List |
| Woodpigeon | N51, N61 | 31/12/2011 | Bird Atlas 2007 - 2011 | BoCCI 4 Green List |
| Wren | N51, N61 | 08/05/2024 | Birds of Ireland | BoCCI 4 Green List |
| Yellowhammer | N51, N61 | 05/08/2019 | Birds of Ireland | BoCCI 4 Red List |

#### *10.3.3.1 Supplementary data*

As described in Section10.2.4.9 above, previous surveys were undertaken at the Wind Farm Site for a period of 24 months, from April 2017 to March 2019. These surveys provide a comprehensive site-specific dataset of bird records through two complete breeding and winter seasons. A summary of the observations made during this survey relevant to target species follows:

**Black-headed Gull**

Black-headed gull were observed on two occasions (a single bird and a flock of 40 individuals) between April 2017 and March 2019. Both observations were of commuting birds in proximity to the Wind Farm Site.

**Buzzard**

Buzzard were on 334 occasions between April 2017 and March 2019. Majority of observations were of single individuals, with up to three birds recorded on a few occasions. Birds were recorded commuting, hunting and soaring within and surrounding the site. The species was recorded throughout both the breeding and non-breeding seasons. A single pair likely to have bred in proximity to the site during the survey period (2017-2019).

**Cormorant**

Cormorant were observed flying over the site on two occasions.

**Curlew**

No observations of Curlew were made within the site throughout the survey period (April 2017- March 2019). Curlew were heard calling on two occasions during the breeding wader survey undertaken off-site to the east during Apr and May 2018, suggesting possible breeding nearby.

**Kestrel**

Kestrel were recorded on 60 occasions. All observations were of single birds, partaking in hunting or commuting. The species was recorded during both breeding and non-breeding seasons.

**Snipe**

A single Snipe was recorded across the survey period. Snipe were flushed from grassland area during off-site breeding wader surveys to the east of the site.

**Lapwing**

Lapwing were observed flying over the site on eight occasions. All observations were of flocks flying through the area during winter. Flock size ranged from 32 to 250 birds. Lapwing were also recorded during waterbird counts to the east of the site, foraging on improved grassland and stubble ground with a peak count of 60 birds during December 2017. Breeding bird surveys off-site to the east recorded a probable breeding pair during both breeding seasons amongst grassland habitat.

**Sparrowhawk**

Sparrowhawk were recorded on 25 occasions. Most observations were of single birds, partaking in hunting or commuting. The species was recorded during both the breeding and non-breeding seasons.

**Golden Plover**

Golden Plover were observed on fourteen occasions across the winter non-breeding season. Most observations were of birds flying in flocks. Maximum flock size recorded was ca 1,500 individuals circling to the east of site during February 2018.

**Grey Heron**

Grey Heron were observed on 19 occasions across the survey period. Most observations were of single birds flying in proximity to the Cushina River.

**Lesser back-backed Gull**

Lesser Black-baked Gull were observed on nine occasions, flying in small flocks of up to fourteen individuals.

**Mallard**

Mallard were observed on ten occasions, usually in small groups of up to 10 individuals. All observations were of flying birds in proximity to the Cushina River.

**Merlin**

Merlin were observed on four occasions. All observations were of single birds hunting within the site during the non-breeding winter season

**Mute Swans**

Mute Swan were observed on three occasions. All observations were of single birds flying through the site. Mute Swan were also recorded in low numbers during waterbird counts off-site to the east, foraging on improved grassland.

**Peregrine**

Peregrine were observed on three occasions. All observations were of single birds hunting within the site during the non-breeding winter season. Birds were recorded commuting and hunting.

**Whooper Swan**

Whooper Swan were observed on six occasions. All observations were of flocks ranging in size from 4 to 32 individuals flying through / nearby the site. The species were not recorded foraging or roosting within the site. Whooper Swan were recorded off-site during waterbird counts to the south-east of the site foraging on stubble and improved grasslands. Peak Flock size was 90 individuals was recorded during December 2017.

**Woodcock**

Woodcock were observed amongst conifer planation and cutover bog during targeted nocturnal surveys through the breeding season 2017 and 2018. Birds were recorded flying and partaking in Roding behaviour. Estimated that a single pair breed amongst suitable habitat within the site.

### 10.3.4 Field Survey Results

A comprehensive list of all bird species recorded during field surveys is provided in Appendix 7-1. Target bird species recorded within the zone of influence of the Wind Farm Site during the field surveys of the site undertaken from April 2021 to March 2023 are listed in Table 10-10 below. The conservation significance and an indication of the survey type(s) during which the species were observed is also presented.

The following sections describe the observations of each target species under the survey headings. Summary survey data for each survey type are presented in Appendix 7-3. The full dataset of species observations for each survey method and associated maps are presented in Appendix 7-4.

**Table 10-10: List of target species recorded during field surveys.**

| Species | Survey Method | Conservation significance |
|---|---|---|
| Buzzard (*Buteo buteo*) | Breeding Walkover, Winter Walkover, Breeding Raptor, Vantage Point Survey | BoCCI Green List |
| Curlew (*Numenius arquata*) | Breeding Walkover, Vantage Point Survey, Breeding Wader Survey | BoCCI Red List |
| Golden Plover (*Pluvialis apricaria*) | Breeding Walkover, Winter Walkover, Vantage Point Survey | BoCCI Red List; Annex I EU Birds Directive |
| Grey Heron (*Ardea cinerea*) | Breeding Walkover, Winter Walkover | BoCCI Green List |
| Grey Wagtail (*Motacilla cinerea*) | Breeding Walkover, Winter Walkover | BoCCI Red List |
| Hen Harrier (*Circus cyaneus*) | Vantage Point Survey | Annex I EU Birds Directive (BoCCI Amber List) |
| Kestrel (*Falco tinnunculus*) | Breeding Walkover, Winter Walkover, Breeding Raptor, Vantage Point Survey | BoCCI Red List |
| Kingfisher (*Alcedo atthis*) | Winter Walkover | Annex I EU Birds Directive (BoCCI Amber List) |
| Lapwing (*Vanellus vanellus*) | Breeding Walkover, Vantage Point Survey | BoCCI Red List |
| Mallard (*Anas platyrhynchos*) | Breeding Walkover, Winter Walkover, Vantage Point Survey | BoCCI Amber List |
| Meadow Pipit (*Anthus pratensis*) | Breeding Walkover, Winter Walkover | BoCCI Red List |

| Species | Survey Method | Conservation significance |
|---|---|---|
| Merlin (*Falco columbarius*) | Vantage Point Survey | Annex I EU Birds Directive (BoCCI Amber List) |
| Peregrine Falcon (*Falco peregrinus*) | Vantage Point Survey | Annex I EU Birds Directive (BoCCI Green List) |
| Redwing (*Turdus iliacus*) | Winter Walkover | BoCCI Red List |
| Snipe (*Gallinago gallinago*) | Breeding Walkover, Winter Walkover, Vantage Point Survey | BoCCI Red List |
| Sparrowhawk (*Accipiter nisus*) | Breeding Walkover, Winter Walkover, Breeding Raptor, Vantage Point Survey | BoCCI Green List |
| Swift (*Apus apus*) | Breeding Walkover | BoCCI Red List |
| Whooper Swan (*Cygnus cygnus*) | Vantage Point Survey | Annex I EU Birds Directive (BoCCI Amber List) |
| Woodcock (*Scolopax rusticola*) | Winter Walkover, Nocturnal Woodcock, Vantage Point Survey | BoCCI Red List |
| Yellowhammer (*Emberiza citrinella*) | Breeding Walkover, Winter Walkover | BoCCI Red List |

#### *10.3.4.1 Buzzard*

*Vantage Point Survey*

Buzzard (*Buteo buteo*), a Green Listed raptor species (Gilbert *et al*. 2021) was recorded on 139 occasions over the two-year survey period and were present throughout the year. It was the most frequently recorded bird species, accounting for just over half of the flightlines recorded over the entire two-year period.

Typically, flightline records related to a single bird, with a maximum of three birds recorded for any one observation. Buzzard flightlines were recorded throughout the proposed Wind Farm site and were not concentrated in any one particular area. Buzzard were typically recorded to be commuting or foraging/hunting / soaring. Numerous observations indicating breeding close by the site, during both breeding seasons (2022 and 2023) were recorded, with the nest most likely occurring in the nearby forestry, within 500m of T01.

*Winter Walkover*

Buzzard were observed on nine occasions. A single individual was recorded on each observation and the activity included soaring, travelling, hunting and perching. Records are evenly spread throughout the winter seasons.

*Breeding Walkover*

Buzzard were observed on nine occasions. Observations were all of one or two individuals and the activity included soaring, travelling, hunting and perching. The birds were observed in various locations throughout the site. Tow observations of related to a juvenile bird.

*Breeding Raptor*

Based on the outcome of observations across the two years it is concluded that a pair have nested and successfully fledged a juvenile in both seasons. The nest site has been identified as being approximately 500m from T01 in an area of conifer woodland.

#### *10.3.4.2 Curlew*

*Vantage Point Survey*

Curlew (Numenius arquata) were recorded on two occasions during the survey period, both during the breeding 2022 season (April and May 2022). Each flightline recorded an individual bird. Both flightlines were recorded in the central part of the proposed Wind Farm site. Curlew were not recorded from the site or surroundings during either winter season.

*Breeding Walkover*

A possible pair of curlew were heard to the east of the site from potential breeding grounds in June 2023. No other records of curlew during the walkover surveys.

*Breeding Wader Survey*

During the 2022 survey of potential breeding habitat three individuals were observed in flight in the latter half of May while an individual adult female was observed foraging at the end of May. No observations were made during the final visit in early June 2022.

During the 2025 survey an adult male and adult female Curlew were observed foraging within suitable breeding habitat on 20 April 2025. Remote acoustic monitoring was deployed at the site following the April visit. Calls noted each day until the 7th May, when the last call was recorded. Pair presumed to have failed breeding and dispersed site after this date. No Curlew were observed during the final site visit in mid-June.

#### *10.3.4.3 Golden Plover*

*Vantage Point Survey*

Golden Plover (*Pluvialis apricaria*), a Red Listed species (Gilbert *et al.* 2021) also listed on Annex I of the EU Birds Directive, were recorded on 34 occasions over the survey period. All observations were from the winter period (September to April). All observations related to flocks, with flock size ranging from 4 individuals to an estimate of 4,000 birds in a single flock observed during October 2022. In all, an estimated 15,358 bird flights were recorded. The range of flock sizes is as follows:

- Fifteen observations related to flocks of between 4 and 100 birds.
- Fourteen observations related to flocks of between 100 and five hundred birds.
- Five observations related to flocks of more than 1,000 birds

The larger flocks were recorded during the Autumn period in both years with October 2022 accounting for 12,900 bird flights (84% of all flights), while November 2023 accounted for 1,000 bird flights (7% of all flights) meaning that only 9% of bird flights occurred outside of these two months. Golden Plover were not observed utilising the habitats within the site for feeding or roosting. They were generally concentrated in lands to the east and southeast of the Wind Farm Site in proximity to the River Figile. An off-site observation of ca 8,000 birds was made on 25th October 2022 from this area where birds were seen circling and dropping (assumed foraging) throughout much of the day.

Based on the occurrence of the large numbers of birds during the migration period it is likely that the birds may on occasion use the lands nearby the Wind Farm Site as a staging area. The regularly observed circling flight behaviour is typical. Based on observed flight times and behaviour it is likely that the birds roost in proximity to the Derryounce lakes 4km WSW of site.

*Winter Walkover*

Four observations of Golden Plover were made during winter walkover surveys. All of these records were of birds flying over the site. Two records were of flocks estimated to include 1,500 birds and 200 birds respectively. Both observations were made on the 31st of October 2022 and are likely to be the same flock as recorded during VP watches in late October 2022.

*Breeding Walkover*

A single observation of Golden Plover was made during the breeding walkover surveys from September 2023. It comprised a flock of 20 individuals flying over the site. The autumn migration period for Golden Plover is typically September to November, and this record therefore relates to wintering birds.

#### *10.3.4.4 Grey Heron*

There were no records of Grey Heron during Vantage Point Surveys.

*Winter Walkover*

Two observations of a single individual each time. One was flushed (February 2022) from the Cushina River that passes through the Wind Farm Site. The other observation (March 2022) was of an individual foraging within improved grassland.

*Breeding Walkover*

Two observations of a single individual each time. One was flushed from the Cushina River while the other was of an individual flying through the site. No evidence of breeding within the site.

#### *10.3.4.5 Grey Wagtail*

There were no records of Grey Wagtail during Vantage Point Surveys.

*Winter Walkover*

Two observations of a single individual on a single visit occurring in proximity to the Cushina River within the site.

*Breeding Walkover*

Single observation of a male carrying food during April 2022 at the Cushina River. Likely breeding within the site.

#### *10.3.4.6 Hen Harrier*

*Vantage Point Survey*

A total of five Hen Harrier (Circus cyaneus) observations were recorded during the survey period. Flightlines were recorded in Winter 2021/2022 (November 2021), Summer 2022 (June and July 2022), and Winter 2022/2023 (February 2023). Each flightline recorded a single individual. Hen Harrier flightlines were concentrated in the east of the proposed Wind Farm site, often adjacent to areas of cutover peatland. Flightlines were recorded in the vicinity of proposed turbines T01, T03, and T08. The two winter records indicate that the site is visited on occasion by wintering birds. A single observation (7 Feb 2023)of a bird dropping into vegetation around dusk suggested a possible roost. However, based on no further observations it is concluded that the site is not regularly used as a winter roost. Anecdotal records suggest the presence of a roost ca 3.5km from the site.

Hen Harrier were not recorded during the winter walkover, breeding walkover, or breeding raptor surveys.

#### *10.3.4.7 Kestrel*

*Vantage Point Survey*

Thirty-five Kestrel (Falco tinnunculus) flightlines were recorded within the study area during the survey period. Flightlines were recorded year-round but were more commonly recorded during the winter periods. Each flightline recorded an individual bird, most often noted to be hunting. Flightlines were distributed throughout the proposed Wind Farm site but were most concentrated in the central area (in proximity to proposed turbines T03, T05, T07, and T08).

*Breeding Walkover*

Kestrel were observed on five occasions during breeding walkover surveys, all were individual sightings of hunting birds during the 2022 survey season.

*Winter Walkover*

Kestrel were observed on seven occasions during winter walkover surveys, all were individual sightings of hunting birds recorded during both winter seasons.

*Breeding Raptor*

Kestrel observed on one occasion during the breeding raptor survey. No nest site was identified within the study area.

#### *10.3.4.8 Kingfisher*

There were no records of Kingfisher during Vantage Point Surveys.

*Winter Walkover*

A single observation of Kingfisher was observed along the Cushina River in the central part of the site during December 2021. No other observations throughout the survey period.

No observations of Kingfisher during the breeding walkover surveys.

#### *10.3.4.9 Lapwing*

*Vantage Point Survey*

Lapwing (*Vanellus vanellus*) were recorded from VPs on six occasions over the two-year survey period. One single observation was made early in the breeding season (April 2022), while the remaining 5 observations were in the non-breeding season. Other observations were of birds noted to be travelling and were typically in small flocks of 8-30 birds, however on one occasion (November 2021) 150 birds were recorded. Lapwing flightlines were distributed through the proposed Wind Farm site.

There were no observations of Lapwing during winter walkover surveys.

*Breeding Walkover*

A single pair of Lapwing and chick were observed during May 2023 in the northeast of the Wind Farm Site within 500m of T3. This observations confirmed successful breeding attempt.

#### *10.3.4.10 Mallard*

*Vantage Point Survey*

A single observation of two mallard flying through the site during November 2022.

*Winter Walkover*

Four observations of mallard were made during winter walkover surveys, two in each winter season. The observations were of two or three individuals, and most were flushed in proximity to the Cushina River.

*Breeding Walkover*

Eight observations of mallard were made during breeding walkover surveys in 2023. Most records were in proximity to the Cushina River. A pair with four juveniles were observed in June 2023.

#### *10.3.4.11 Meadow Pipit*

Meadow Pipit were not recorded during the Vantage Point Surveys.

*Winter Walkover*

There were 34 observations made during the winter walkover surveys across both winter seasons. Most observations were of foraging birds. Two observations relate to displaying birds during March 2023.

*Breeding Walkover*

There were 42 observations of Meadow Pipit were made during the breeding season walkover surveys. Number of birds during each observation varied from one to twelve and many were deemed to be of family parties. Activities included foraging, displaying, and flying. Breeding behaviour was observed on numerous occasions including carrying food, adult with fledging, and display flights.

#### *10.3.4.12 Merlin*

Vantage Point Survey

Merlin was recorded on two occasions during the survey period, once in December 2021 and once in March 2022. A single bird was recorded on each occasion. Both flightlines occurred in a very similar area, in the centre of the southern part of the proposed Wind Farm site between T04 and T07.

Merlin were not observed during the winter walkover, breeding walkover, or breeding raptor surveys.

#### *10.3.4.13 Peregrine*

*Vantage Point Survey*

Two Peregrine (*Falco peregrinus*) flightlines were recorded during the winter 2021/2022 season, one in November 2021 and the other in March 2022. Both flightlines recorded an individual bird flying within the proposed Wind Farm site boundary (eastern part of the Proposed Wind Farm Site) in proximity to T08 and T09.

Merlin were not observed during the winter walkover, breeding walkover, or breeding raptor surveys.

#### *10.3.4.14 Redwing*

This winter visitor was not recorded during Vantage Point Surveys.

*Winter Walkover*

There were 33 observations of redwing during the Winter Walkover Surveys, all records are from the 2022 – 2023 winter season and were of foraging or flying individuals. Observations were all of multiple birds ranging in group size from two to 25. While the species was also observed in the 22021-2022 season, it was not identified as a target species and therefore not recorded by surveyors (only added to the BoCCI red list in 2021 (Gilbert *et al.* 2021).

#### *10.3.4.15 Snipe*

*Vantage Point Survey*

Snipe were recorded from VPs on 14 occasions during the survey period. The majority of records were during the winter season activity was recorded as flying. Most flightlines related to individual birds. A group of 11 birds were observed in October 2023. Snipe flightlines were distributed throughout the central part of the proposed Wind Farm site.

*Winter Walkover*

Fourteen observations were made during the winter walkover surveys across both seasons. Most birds were flushed by surveyors and were recorded amongst both peatland (bog) and grassland habitat. Records included individual birds and small groups up to fine birds.

*Breeding Walkover*

Three observations were made during the breeding walkover surveys during 2023 season. All birds were flushed by surveyors and were observed amongst both peatland (bog) and grassland habitat. All records were of individual birds.

*Breeding Wader Survey*

Two Snipe were recorded drumming during targeted Curlew surveys to the east of the Wind Farm Site during summer 2025, suggesting possible breeding Snipe in the area.

### *10.3.4.16 Sparrowhawk*

*Vantage Point Survey*

A total of 35 Sparrowhawk flightlines were observed during the survey period. Sparrowhawk flightlines were recorded year-round but were most frequently recorded in the winter 2022/2023 season (18 flightlines). Each flightline recorded an individual bird, often travelling or hunting. Sparrowhawk flightlines were recorded throughout the proposed Wind Farm site and were not concentrated in any one area. Most flights were recorded below turbine rotor height.

*Winter Walkover*

Six observations of Sparrowhawk were made during winter walkover surveys. All were of individual birds either flying or hunting.

*Breeding Walkover*

A single observation of Sparrowhawk was made during breeding walkover surveys, of an adult Male hunting over an area of scrub in September 2023.

*Breeding Raptor*

An adult male Sparrowhawk was observed carrying prey into forestry. Nest with chick likely within conifer plantation.

### *10.3.4.17 Swift*

Swift were not recorded during Vantage Point Watches.

*Breeding Walkover*

This summer visitor was observed on eight occasions during the summer 2022-23 season. Observations ranged from one to four individuals. They were observed in flight foraging over the site on each occasion.

While the species was also observed in the 22021-2022 season, it was not identified as a target species and therefore not recorded by surveyors (only added to the BoCCI red list in 2021 (Gilbert *et al.* 2021). No breeding habitat was identified within the Wind Farm Site.

#### *10.3.4.18 Whooper Swan*

*Vantage Point Survey*

Three Whooper Swan flightlines (*Cygnus cygnus*), an Annex I listed species, were recorded over the two-year survey period. One flightline (4 birds) was recorded in November 2021, one flightline (7 birds) in December 2022, and one flightline (8 birds) in March 2023. All Whooper Swan flightlines were recorded across the northern part of the site and two of them were within rotor height. Whooper Swans were not observed foraging or roosting within the site. A flock of Whooper Swans are known to occasionally forage in farmland areas adjacent the River Figile to the southeast of the site (River Barrow (Monasterevin-Portarlington) IWEBS Site Code OS 301).

Whooper Swan were not observed during winter or breeding walkover surveys.

#### *10.3.4.19 Woodcock*

*Vantage Point Survey*

Two Woodcock flightlines were recorded during the survey period, one in Winter 2021 – 2022 (October 2021) and the second in Winter 2022 – 2023 (December 2022). An individual bird was recorded on each occasion. The two flightlines were recorded in the western part of the proposed Wind Farm site.

*Winter Walkover*

A single observation of an individual Woodcock was made in October 2021.

*Nocturnal Woodcock*

A targeted woodcock survey was undertaken amongst suitable habitat to the north of the Wind Farm Site during June 2025. During this survey a single roding male with a female participating in flight to display. This record confirms the likely presence of a breeding pair occurring in the area, in line with previous surveys undertaken in the area in 2017 and 2018.

#### *10.3.4.20 Yellowhammer*

Yellowhammer were not recorded during Vantage Point Watches.

*Winter Walkover*

There were twelve observations of Yellowhammer during winter walkover surveys. They were recorded either perching or foraging amongst hedgerow habitat. Numbers varied from single birds to nine individuals.

*Breeding Walkover*

There were 39 observations of Yellowhammer during breeding walkover surveys. They were recorded either perching or foraging mostly amongst hedgerow habitat. Numbers varied from single birds to nine individuals with a number of likely breeding pairs and family groups observed.

## 10.4 Evaluation of Ornithological Receptors

Applying the criteria outlined in the Sensitivity of Receptors section (Section 10.2.5.1), an evaluation of the importance of the relevant study areas for target species recorded during the baseline surveys is given in Table 10-11. The target species with a value of 'local' or above are taken forward as Valued Ornithological Receptors for detailed assessment. The outcome of the evaluation and the final determination of Valued Ornithological Receptors is presented in

To determine the regional importance of the site for wintering waterbirds, we used Irish Wetland Bird Survey (IWeBS) data from Birdwatch Ireland. The average peak counts from the five most recent winter seasons (2015/16 to 2020/21) were summed to estimate the population within each county.

As the Proposed Wind Farm Site is located near the boundaries of Counties Offaly, Kildare, and Laois, the combined population estimate for these three counties was divided by three to derive a local population figure. It is important to note that this method likely results in a significant underestimate for two reasons: first, IWeBS site coverage is limited and does not encompass all potential habitats; second, the key species of concern—Lapwing, Golden Plover, and Whooper Swan—frequently forage on agricultural land across the wider landscape, areas not fully captured by wetland-focused surveys.

Where reliable survey data is not available at the county level then the national populations is divided by 26 to give an estimate of a county population, the appropriateness of this approach in relation to each species is discussed considering known national distribution and range. If one is to assume relatively even distribution across the country this would equate to an area within ca 30km of the Wind Farm Site.

Note that, in line with CIEEM (2018) VORs are defined broadly, to those species present on the site which are afforded a higher level of protection, or are species which are recognised, due to their behaviour, as being more likely to be subject to effects from wind farms. For instance, SNH (2017) recognise that passerines are not generally considered to be effected by wind farms.

**Table 10-11: Evaluation of target species populations within the Study Area.**

| Target Species | Species Information, Status & Baseline | Justification for Evaluation | Value |
|---|---|---|---|
| **Buzzard (*Buteo buteo*)** | • BOCCI 4: Green List<br>• ROI: National population has increased rapidly<br>• Baseline surveys:<br>Likely 1 breeding pair within site. Total of 139 observations of buzzard over the 2-year survey period. Maximum of three birds recorded for any one flightline. | The site is deemed to be of local importance (higher value) on the basis that the species is regularly occurring and confirmed breeding within the study area. | Local importance (higher value) |
| **Curlew (breeding** | • BOCCI 4: Red List<br>• ROI breeding population: 105 pairs (Colhoun 2022)<br>• Baseline surveys:<br>The Wind Farm Site itself is rarely used by Curlew having been recorded on one occasion. However, there is a breeding site within 2km of the site and attempted breeding has been recorded here in recent years. | A breeding pair has attempted to breed within the Study Area (within 2km of the Wind Farm Site). The breeding site occurs ca 1km of proposed turbines.<br>This is approximately representative of 1% of the national population. The species has undergone rapid decline in recent decades.<br>The study area is of national importance to breeding Curlew. | National Importance |
| **Golden Plover (winter)** | • Annex I<br>• BOCCI 4: Red List<br>• ROI wintering population: 80,707 (Burke *et al*., 2018).<br>• IWeBS based County Estimate 3,888 birds<br>• Baseline surveys: | The non-breeding population of Golden Plover is of county importance based on the regular occurrence of more than 38 birds during winter (not using the site itself but flying over it and circling in the area). | County Importance |

| Target Species | Species Information, Status & Baseline | Justification for Evaluation | Value |
|---|---|---|---|
| | Golden Plover were present regularly from September to April but were only ever recorded in flight (transiting or circling). The absence of any observed roosting or foraging behaviour within the study area indicates it is not a core habitat feature for this species. Numbers flying in the area were highly variable, with large flocks of 1,000 to 4,000 birds occurring occasionally. Vantage Point (VP) surveys on 44 days during this period recorded numbers exceeding 800 birds (the 1% national population threshold) on three days, two of which were consecutive. Furthermore, numbers exceeded 38 birds (1% of the county population) on 17 days. On this basis, the site is deemed to be of county importance due to the regular occurrence of flocks exceeding the county population threshold circling and flying in the area. These birds are likely to be using suitable agricultural lands and extensive peatlands in the surrounding area for foraging and roosting. The most notable foraging site in proximity to the study area are the agricultural lands in proximity to the Figile River to the east. | | |
| **Grey Heron** | • BoCCI 4: Green List<br>• Baseline surveys<br>• Baseline surveys:<br>• No records during Vantage Point Surveys. Two observations during walkover surveys along the Cushina River. | Site is deemed to be no greater than Local Importance (lower value) for this common and widespread species. | |
| **Gery Wagtail** | • BOCCI 4: Red List<br>• Only two records for the species during the study period during walkover surveys. Possible that the site is used by a breeding pair. | Sit is deemed to be no greater than Local Importance (lower value) for the species. | Local importance (lower value) |

| Target Species | Species Information, Status & Baseline | Justification for Evaluation | Value |
|---|---|---|---|
| **Hen Harrier** | • Annex I<br>• BOCCI 4: Amber List<br>• ROI wintering / breeding population: NPWS Article 12 reporting (2012-2018), is 311-345 wintering birds. NPWS (2015) estimates the breeding population is 108-157 pairs.<br>• Baseline surveys:<br>Five observations across the survey period all of a single bird. Occasionally used by hen harrier for hunting and commuting during winter. Two records of single birds passing through the site during Summer 2022. No indication of breeding nearby. | Low level of usage of the Site by this species. No known breeding population nearby (nearest known breeding population is in the Sliabh Blooms SPA approximately 19km from the Study Area). One possible, very infrequently used winter roost within the Study Area. Due to observations of birds flying northwards through site at dusk and anecdotal evidence, it is likely that birds are roosting north of the Site outside of the study area. Given the infrequency of observations over the two-year survey period and taking a precautionary approach, it is considered that the Study Area is of Local Importance (higher Value) for wintering Hen Harrier. Site deemed to be of no Ecological Importance to breeding Hen Harrier. | Local Importance (higher Value<br>(winter season) |
| **Kestrel** | • BOCCI 4: Red List (qualifying criteria: breeding population decline over the short period)<br>• ROI breeding population: approx. 13,500 birds (NPWS Article 12 reporting 2012-2018)<br>• Baseline surveys:<br>35 VP flightlines, all of single birds. Most commonly in winter. No displaying or evidence of potential breeding noted. Hunting and travelling only behaviours observed. During walkovers 12 observations of single birds, hunting across all seasons. One observation of an adult male hunting during breeding raptor surveys. No evidence of breeding in study area. | This species is not listed as threatened in Ireland for the wintering population. There is no evidence of a breeding pair being resident within or close to the Study Area. The Study Area is used regularly for hunting by Kestrel.<br>Taking the precautionary approach, the site is assessed as being of Local Importance (higher value) due to it's regular use for hunting by resident Kestrel. | Local Importance (higher value) |
| **Kingfisher** | • Annex I EU Birds Directive<br>• BoCCI 4: Amber List<br>• ROI Population: 368-1000 (Article 12 reporting 2008-2012)<br>• A single observation of Kingfisher during the survey period in winter along the Cushina River. | The site is deemed to be of Local Importance (lower value) to Kingfisher. This is based on a single record of the species during the surveys and an absence of any evidence of breeding. | Local Importance (lower value) |

| Target Species | Species Information, Status & Baseline | Justification for Evaluation | Value |
|---|---|---|---|
| **Lapwing** (breeding and winter) | • BOCCI 4: Red List<br>• ROI wintering population: 69,823 (Burke et al. 2018)<br>• IWeBS based County Estimate 1,480 birds<br>• ROI breeding population: 520 pairs (Article 12 reporting 2013-2018)<br>• Baseline surveys:<br>Observed on 6 occasions during VPs, 5 of which were during the non-breeding season and 1 in the breeding season (April 2022). Small flocks during winter (8 - 30 birds). One large flock observed (Nov. 2021) of 150 birds. Single pair confirmed breeding in summer 2023 within the study area in area of cutover bog. | The wintering population of Lapwing within the study area (based on a max. of 150 birds). This is well the threshold for national importance (698 birds). Based on review of IWeBS data in the three surrounding counties, the estimated regional / county population of wintering Lapwing is 1,480 birds, meaning a threshold for county importance would be 14 birds.<br><br>Given that low numbers of birds were generally travelling through the site and recorded irregularly with a peak count of 150 birds, the area is assessed as being at most county importance. The area is assessed as being of County Importance for wintering Lapwing.<br><br>Based on one breeding pair being observed within the Study Area, the estimated population of the Study Area is 1 pair, which represents 0.05% of the national breeding population. This is below the threshold of 1% for national importance. Assuming a county population of 20 pairs (crude estimate dividing national population by 26), this would be above the county threshold. Based on this and the sharp declines in the breeding population of the species, the Study Area is assessed to be of County importance for breeding Lapwing. | County Importance |

| Target Species | Species Information, Status & Baseline | Justification for Evaluation | Value |
|---|---|---|---|
| **Mallard** | • BoCCI Amber List<br>• ROI Population: Common and widespread.<br>• Baseline surveys:<br>A single observation of a two mallard was made during Vantage Point Surveys. Small numbers of Mallard were recorded during walkover surveys with a peak count of six birds. A single pair were confirmed breeding in within the study area. | Site is deemed to be no greater than Local Importance (lower value) for this common and widespread species. | Local Importance (lower value) |
| **Meadow Pipit** | • BoCCI Amber List<br>• ROI Population: Common and widespread.<br>• Baseline surveys:<br>This resident species was recorded throughout the survey period and was confirmed breeding during each summer. | Site is deemed to be no greater than Local Importance (lower value) for this common and widespread species. | Local Importance (lower value) |
| **Merlin** | • Annex I<br>• BOCCI 4: Amber List<br>• ROI population estimated between 400-800 birds (NPWS Article 12 reporting 2008-2012)<br>• Baseline surveys:<br>Two observations of 1 individual bird on both occasions) during non-breeding season. No observations during walkover or targeted breeding raptor surveys. | Based on the infrequency of observations of Merlin within the Study Area and the lack of breeding season observations, the Study Area is assessed as being of less than Local Importance. | Less than Local Importance |
| **Peregrine** | • Annex I<br>• BOCCI 4: Green List<br>• ROI breeding population: 425 pairs (NPWS Article 12 reporting)<br>• Baseline surveys:<br>Two flightlines, both of single birds in winter during Vantage Point Surveys. No observations during walkover or targeted breeding raptor surveys. | There were no observations of Peregrine falcons within the Study Area in the summer breeding season and only 2 no. observations during winter. There is no suitable breeding habitat within the Study Area. The Study Area is assessed as being less than local importance for this species. | Less than Local Importance |

| Target Species | Species Information, Status & Baseline | Justification for Evaluation | Value |
|---|---|---|---|
| **Redwing** | • BoCCI 4 Red List<br>• ROI Population: Common and widespread during winter<br>• Baseline surveys:<br>Observed regularly during winter walkover surveys. | Site is deemed to be no greater than Local Importance (lower value) for this widespread winter passerine species. | Local Importance (lower value) |
| **Snipe** | • BOCCI 4: Red List<br>• ROI breeding population: 4,275 (NPWS Article 12 reporting)<br>• Baseline surveys:<br>Snipe were recorded on 14 occasions during the VP watches. The majority of records were during the Winter 2021 – 2022 season. Three observations of birds during summer walkover surveys (2023). No confirmed breeding within the Wind Farm Site. A potential breeding pair was recorded during targeted curlew surveys during 2025 within 2km of the Wind Farm Site. | The site is used by low numbers of Snipe throughout the year. Assuming an individual breeding pair within the study area, the site is deemed to be of Local importance (higher value) for breeding Snipe. | Local Importance (higher value) |
| **Sparrowhawk** | • BOCCI 4: Green List<br>• ROI Population: 9100-14830 (NPWS Article 12 reporting)<br>• Baseline surveys:<br>37 flightlines recorded in all four seasons. All records of individual birds, predominantly travelling or hunting. Two observations in April 2022 indicating breeding in forestry in north of the Study Area. Seven observations of individual birds hunting or travelling through the area during walkovers. Targeted breeding raptor survey one observation in July 2023 of an adult male carrying passerine prey into forestry – likely nest with chick in forestry approx. 1.2km from the Site boundary. | The Study Area is likely to support 1 - 2 breeding pairs of this widespread breeding raptor. The Study Area is assessed as being of Local Importance (higher value) for this resident / regularly occurring species. | Local Importance (higher value) |
| **Swift** | • BoCCI Red List<br>• ROI Population: common and widespread<br>• Baseline surveys:<br>Low numbers recorded flying and foraging within the site during summer walkover surveys. | Site is deemed to be no greater than Local Importance (lower value) for this widespread summer passerine species. | Local Importance (lower value) |

| Target Species | Species Information, Status & Baseline | Justification for Evaluation | Value |
|---|---|---|---|
| **Whooper Swan (winter)** | • Annex I<br>• BOCCI 4: Amber List (qualifying criteria: internationally important wintering population in Ireland)<br>• ROI wintering population: 14,467 (Burke *et al*., 2021)<br>• IWeBS based County Estimate 291 birds<br>• Baseline surveys:<br>Rarely recorded flying through the site (three records of between 4 and 8 individuals) over the survey period. The site does not lie within a regularly used flight path. The birds were not recorded foraging or roosting within the site. Previous surveys and local consultation – flood plain of River Figile to southeast of site hosts a flock of up to 90 foraging birds (winter 2017/2018) (approx. 1.3km from Site boundary i.e. within wider Study Area). | The population observed feeding in nearby fields outside of the Site represents approx. 0.6% of the national population.<br><br>The study area is considered to be of county importance for wintering Whooper Swan. | County Importance |
| **Woodcock** | • BOCCI 4: Red List<br>• ROI breeding population: 27,434 males (O'Neill, 2024)<br>• Baseline surveys:<br>Rarely recorded during VP and walkover surveys (total of three observations. Targeted surveys undertaken at the site indicates 1-2 breeding pairs. | The Woodcock population within the Study Area represents approx. 0.004% of the national population falling well below the 274 threshold for national importance. An estimate of the county population is ca 1055 males. The breeding population of Woodcock in the Study Area is considered to be Local Importance (higher value) | Regional/County |
| **Yellowhammer** | • BoCCI Red List<br>• ROI Population: common and widespread<br>• Regular observations during winter and summer walkover surveys. Confirmed breeding within the site. | Site is deemed to be no greater than Local Importance (lower value) for this widespread passerine species. | Local Importance (lower value) |

**Table 10-12: Identification of Valued Ornithological Receptors**

| Target Species | Evaluation | VOR determination | Determined as VOR |
|---|---|---|---|
| **Buzzard** | Local importance (higher value) (all seasons) | Considering the use of the site by Buzzard the following potential effects require consideration:<br>• Effects of habitat loss<br>• Displacement effects<br>• Collision risk | Yes |
| **Curlew (breeding)** | National Importance (breeding season) | Considering the use of the site by Curlew (no foraging or roosting observations in wind farm) the following potential effects require consideration:<br>• Displacement effects<br>• Collision risk | Yes |
| **Golden Plover (wintering)** | National Importance (winter season) | Considering the use of the site by Golden Plover (no foraging or roosting observations in wind farm) the following potential effects require consideration:<br>• Displacement effects<br>• Collision risk | Yes |
| **Grey Heron** | Less than Local Importance (all seasons) | Rarely recorded using the site. Not recorded during VP surveys. There is no potential for any significant effects. | No |
| **Gery Wagtail** | Local importance (lower value) | SNH guidance suggests wind farms do not significantly impact passerine species, largely because their populations are so large. | No |
| **Hen Harrier** | Local Importance (higher Value) (winter season) | Hen Harrier were rarely recorded within the site and were not fond to roost within the area. The following potential effects require consideration:<br>• Collision risk | Yes |
| **Kestrel** | Local Importance (higher value) (all seasons) | Considering the use of the site by Kestrel the following potential effects require consideration:<br>• Effects of habitat loss<br>• Displacement effects<br>• Collision risk | Yes |
| **Kingfisher** | Local Importance (lower value) | Rarely recorded using the site. Not recorded during VP surveys. There is no potential for any significant effects. | No |

| Target Species | Evaluation | VOR determination | Determined as VOR |
|---|---|---|---|
| **Lapwing** | County Importance (breeding) | Considering the use of the site by Lapwing the following potential effects require consideration:<br>• Effects of habitat loss<br>• Displacement effects<br>• Collision risk | Yes |
| | County Importance (wintering) | Considering the use of the site by Lapwing the following potential effects require consideration:<br>• Collision risk | Yes |
| **Mallard** | Local Importance (lower value) | Rarely recorded using the site. Not recorded during VP surveys. There is no potential for any significant effects. | No |
| **Meadow Pipit** | Local Importance (lower value) | As per SNH guidance, it is generally considered that passerine species are not significantly impacted by wind farms primarily due to their large populations. | No |
| **Merlin** | Less than Local Importance | Rarely recorded using the site. Not recorded during VP surveys. There is no potential for any significant effects. | No |
| **Peregrine** | Less than Local Importance | Rarely recorded using the site. Not recorded during VP surveys. There is no potential for any significant effects. | No |
| **Redwing** | Local Importance (lower value) | SNH guidance suggests wind farms do not significantly impact passerine species, largely because their populations are so large. | No |
| **Snipe** | Local Importance (higher value) | Considering the use of the site by Snipe the following potential effects require consideration:<br>• Effects of habitat loss<br>• Displacement effects<br>• Collision risk | Yes |
| **Sparrowhawk** | Local Importance (higher value) | Considering the use of the site by Sparrowhawk the following potential effects require consideration:<br>• Effects of habitat loss<br>• Displacement effects<br>• Collision risk | Yes |
| **Swift** | Local Importance (lower value) | SNH guidance suggests wind farms do not significantly impact passerine species, largely because their populations are so large. | No |

| Target Species | Evaluation | VOR determination | Determined as VOR |
|---|---|---|---|
| **Whooper Swan** | County Importance | Considering the use of the site by Whooper Swan the following potential effects require consideration:<br>• Collision risk | Yes |
| **Woodcock** | Regional/County | Considering the use of the site by Woodcock the following potential effects require consideration:<br>• Effects of habitat loss<br>• Displacement effects<br>• Collision risk | Yes |
| **Yellowhammer** | Local Importance (lower value) | SNH guidance suggests wind farms do not significantly impact passerine species, largely because their populations are so large. | No |

### 10.4.1 Sensitivity of Valued Ornithological Receptors

In all, eleven bird species have been identified as VORs as set out in Table 10-12 above. Following the criteria set out by Percival (2003), the sensitivity of each VOR is presented in Table 10-13 below.

**Table 10-13: Sensitivity of VPROs to wind farm development (as per Percival 2003)**

| Target Species | Matched criteria | Sensitivity |
|---|---|---|
| **Buzzard** | | Low |
| **Curlew** | BoCCI 4 Red List | Medium |
| **Golden Plover** | Annex I EU Birds Directive<br>BoCCI 4 Red List | Medium |
| **Hen Harrier** | Ecologically sensitive species | **High** |
| **Kestrel** | BoCCI 4 Red List | Medium |
| **Lapwing** | BoCCI 4 Red List | Medium |
| **Snipe** | BoCCI 4 Red List | Medium |
| **Sparrowhawk** | | Low |
| **Whooper Swan** | Annex I EU Birds Directive | Medium |
| **Woodcock** | BoCCI Red List | Medium |

## 10.5 Assessment of Potential effects

### 10.5.1 The 'Do-Nothing' Effect

In the absence of the Proposed Development, it is expected that the current land use (a mix of intensive agriculture and peat mining) of the site will continue. In this scenario the value of the Proposed Wind Farm Site for birds would be expected to remain similar to the current situation, subject to ongoing changes in the population of some species across the wider landscape.

### 10.5.1 Key Elements of the project that Could Give rise to Significant Effects

Construction Phase

Potential impacts arise from two main sources:

(1) Habitat Loss: The construction of infrastructure will result in the permanent direct loss of habitat within the development footprint, removing areas previously used for foraging, breeding, or roosting.

(2) Disturbance: Operation of machinery and elevated levels of human activity may cause temporary disturbance to key species, potentially disrupting essential behaviours

Operational Phase

Long-term impacts during operation include:

(1) Collision Risk: The presence of rotating turbine blades presents a potential collision risk to birds throughout the project's lifespan.

(2) Disturbance & Displacement: The presence of turbines may cause displacement or barrier effects on sensitive species from adjacent habitats. Maintenance activities involving routine and remedial maintenance will necessitate periodic site access, resulting in recurring but short-term disturbance.

Decommissioning Phase

Impacts during decommissioning are anticipated to be similar in type to those during construction but significantly reduced in magnitude, duration, and spatial extent. The scale of works and associated habitat alteration will be contingent on the chosen decommissioning strategy, particularly regarding whether foundations and other sub-surface infrastructure are removed or left in situ. The latter scenario would greatly reduce the need for extensive ground excavation and its associated impacts.

### 10.5.2 Outcome of Collision Risk Model

A detailed description of the application of the Collision Risk Assessment undertaken is presented in Appendix 10-5. A summary output of estimated collisions per species is presented in Table 10-14. The outputs of the collision risk assessment are discussed in relation to the assessment of collision effects on each VOR species in the below.

**Table 10-14: Expected number of collisions per year (assuming avoidance behaviour) for bird species at the proposed Derrynadarragh Wind Farm.**

| Species | Projected number of rotor transits per year | Collision Risk (single transit risk) | | | Annual Collision Rate | | | Estimated collisions over a 30-year period |
|---|---|---|---|---|---|---|---|---|
| | | Flapping | Gliding | Average | Without avoidance | Avoidance rate | With avoidance | |
| Buzzard | 281 | 6.87 | 6.8 | 6.84 | 16 | 98 | 0.3 | 9 |
| Curlew | 22 | 5.53 | 5.47 | 5.5 | 1.03 | 98 | 0.021 | 0.63 |
| Golden Plover (Sep - Apr) | 566,588 | 4.96 | N/A | N/A | 23878 | 98.6 | 47.8 | 1,434 |
| Hen Harrier | 2 | 7.85 | 7.8 | 7.83 | 0.14 | 99 | 0.001 | 0.03 |
| Kestrel | 57 | 6.37 | 6.32 | 6.35 | 3 | 95 | 0.2 | 6 |
| Lapwing | 267 | 5.28 | N/A | N/A | 12 | 98 | 0.2 | 6 |
| Mallard | 1 | 5.26 | N/a | N/A | 0.06 | 98 | 0.001 | 0.03 |
| Merlin | 0 | 0 | 0 | 0 | 0.02 | 98 | 0.0003 | 0.0009 |
| Peregrine | 1 | 6.21 | 6.14 | 6.18 | 0.06 | 98 | 0.001 | 0.03 |
| Snipe | 26 | 4.3 | 4.27 | 4.29 | 0.93 | 98 | 0.019 | 0.57 |
| Sparrowhawk | 1 | 5.8 | 5.76 | 5.78 | 0.06 | 98 | 0.001 | 0.03 |
| Whooper Swan (Oct - Mar) | 14 | 8.82 | n/a | N/A | 1.07 | 99.5 | 0.005 | 0.15 |
| Woodcock | 0 | 4.62 | 4.57 | 4.6 | 0.02 | 98 | 0.0003 | 0.0009 |

### 10.5.3 Effects on Valued Ornithological Receptors

The potential effects on each VOR is assessed in the following sections. Potential effects of both the construction and operational phase of the development are included. The VORs are presented in order of sensitivity as set out in Table 10-13 above.

#### 10.5.3.1.1 Buzzard (*Buteo buteo*)

| | | |
|---|---|---|
| Habitat loss<br><br>Buzzard were confirmed as nesting within the Wind Farm Site, within 500m of a turbine. The known breeding habitat will not be impacted by direct habitat loss and other areas of suitable habitat (mature trees and treelines) will largely be retained. Direct loss of foraging habitat relative to its availability onsite, will be minimal. The land lost to the development footprint is small relative to the total area within the Wind Farm Site (< 5% of the site). Substantial areas of undisturbed suitable foraging habitat will remain throughout much the wind fam site. The loss of foraging habitat for this low sensitive species is deemed to be very low magnitude impact giving rise to a very low significance effect. | Very low effect significance | Long term imperceptible negative effect. |
| Disturbance<br><br>Buzzard were frequently observed throughout the survey periods and a confirmed breeding pair occur on site. The disturbance associated with construction works could lead to displacement of a breeding pair and temporary reduction in foraging activity within the site. Disturbance during construction phase is considered a medium magnitude impact of very low significance effect. | Very low effect significance | Short term, not significant effect. |
| **Operational phase** | | |
| Displacement / Barrier effects<br><br>Buzzard have been reported to show avoidance of wind turbines to 500m (Pearse Higgins et al. 2009). The wind farm development may lead to the displacement of breeding Buzzard from parts of the site. There is likely to be reduced Buzzard activity within the site. However, there is an abundance of suitable habitat in the wider area outside of Wind Farm Site. This medium magnitude impact will lead to a very low significance effect. | Very low effect significance | Long term slight negative effect |

| | | |
|---|---|---|
| Collision<br><br>The species was recorded flying with the potential collision risk zone during VP surveys. A "normal" collision risk analysis has been undertaken and full details are provided in Appendix 10-5. The collision risk has been calculated at a rate 0.3 collisions per year, which suggests nine collisions over the lifetime of the project. The predicted impact magnitude on this low sensitivity species over the lifetime of the project is considered low.<br><br>Low sensitivity, low magnitude impact = very low effect significance | Low effect significance | Long term slight negative effect |

#### 10.5.3.1.2 Curlew (*breeding*)

| **Potential effects during wind farm construction and operation** | **Significance (Percival 2003)** | **Significance (EPA 2022)** |
|---|---|---|
| **Construction phase** | | |
| Habitat Loss<br><br>Survey data indicates minimal use of the Wind Farm Site by curlews. Despite the confirmed presence of breeding Curlew in the wider study area (within 2km of the Proposed Wind Farm Site), there were no records of foraging or roosting within the site boundaries, and flights through the area were rare (only two occurrences in two years). Consequently, the direct loss of habitat from the development footprint is not expected to result in any significant adverse effects on the species. | No significant effect | No significant effect |

| **Potential effects during wind farm construction and operation** | **Significance (Percival 2003)** | **Significance (EPA 2022)** |
|---|---|---|
| Disturbance<br><br>The Curlew is a red-listed species of high conservation concern, highly vulnerable to disturbance during construction. Literature indicates that wind farm development can cause a decline in breeding Curlew density, with populations failing to recover post-construction, leading to a recommended sensitivity zone of 800m (Pearce-Higgins et al., 2012; McGuinness et al., 2015).<br><br>A breeding territory was confirmed east of the site in both 2022 and 2025. The nest was located 1.1-1.3km from the nearest turbines, a distance sufficiently removed that significant effects would not be expected. However, suitable breeding habitat and the birds' potential home range may extend to within 800m of the turbines.<br><br>Therefore, while the known nest is safely distant, disturbance impacts during construction cannot be ruled out should a nest be established amongst suitable habitat closer to the development. Under a worst-case scenario where a nest is established within 800m, unmitigated construction activity could cause disturbance and lead to breeding failure. For this medium sensitivity species, this would constitute a medium magnitude impact, resulting in an effect significance of low. | Low effect significance | No significant effect |
| **Operational phase** | | |
| Displacement / Barrier effects<br><br>Survey data indicates minimal use of the Wind Farm Site by curlews. Despite the confirmed presence of breeding Curlew in the wider study area (within 2km of the Proposed Wind Farm Site), there were no records of foraging or roosting within the site boundaries, and flights through the area were rare (only two occurrences in two years). Studies by Whitfield et al. (2010) and Pearse Higgins et al. (2012) found no evidence of displacement of Curlew from operational wind farms. Based on surveys undertaken of the proposed wind farm study area, the breeding territory is greater than 800m from the nearest proposed wind turbine. It is therefore concluded that operational phase displacement of breeding Curlew is not expected. Furthermore, Curlew were very rarely recorded flying through the Wind Farm Site and therefore barrier effects are not expected. | No significant effects | No significant effects |

| Potential effects during wind farm construction and operation | Significance (Percival 2003) | Significance (EPA 2022) |
|---|---|---|
| Collision<br><br>The species was rarely observed flying within the potential collision risk zone. A 'normal' collision risk model (Appendix 10-5) estimates a collision rate of 0.021 per year, equating to fewer than one collision (0.63) over the project's lifetime. Despite the species' high sensitivity, the impact is of negligible magnitude, resulting in an overall effect significance of very low. | Very low effect significance | Long term slight negative effect |

#### 10.5.3.1.3 Golden Plover

| Potential effects during wind farm construction and operation | Significance (Percival 2003) | Significance (EPA 2022) |
|---|---|---|
| **Construction phase** | | |
| Habitat loss<br><br>Surveys have confirmed that the habitats within the site are not utilised by Golden Plover with no observations of Golden Plover foraging or roosting within the Wind Farm Site. Most Golden Plover records related to bird circling around or flying over the site. Birds were observed foraging in agricultural lands beyond the study aera, in particularly in grasslands to the east of the site adjacent to the River Figile.<br><br>The project will not give rise to the loss of habitat used by foraging Golden Plover.<br><br>Significant effects on Golden Plover due to direct habitat loss are not foreseen. | No significant effects | No significant effects |

| **Potential effects during wind farm construction and operation** | **Significance (Percival 2003)** | **Significance (EPA 2022)** |
|---|---|---|
| Disturbance<br><br>Research indicates that this species is susceptible to disturbance impacts during the construction works (Pearce-Higgins et al., 2012). This species was not recorded utilising habitats within the site boundary for roosting or foraging. Areas of suitable roosting and foraging habitat for the species do occur in the wider landscape. Observations during the bird surveys suggest that agricultural lands along the River Figile are used regularly by flocks of foraging birds. Construction works may result in temporary displacement of birds from these foraging areas in the surroundings. There are extensive alternative habitats in the surroundings that this temporary displacement would not lead to any significant effects. | No significant effects | No significant effects |
| **Operational phase** | | |
| Displacement / Barrier effects<br><br>The main foraging site in the Study Area is located at least 800m from the nearest turbines. The species was not recorded foraging or roosting within the Wind Farm Site or in proximity to proposed wind turbines. displacement of non-breeding birds from roosting or foraging habitat is therefore not foreseen.<br><br>There is no evidence to suggest the site lies within a regularly used flight path or migration route for this species and therefore barrier effects are not foreseen. | No significant effects | No significant effects |

| | | |
|---|---|---|
| **Collision**<br><br>Golden Plover were regularly observed flying within the potential collision risk zone over the winter season. A 'normal' collision risk model (Appendix 10-5) estimates a collision rate of 47.8 per year (equates to 1434 over collisions the project's lifetime). The national population for the wintering golden plover is estimated at 80,707. An estimate of the county population based on an average of the three surrounding counties IWeBS counts is estimated to be 3,888 birds (likely under estimate considering survey coverage and common occurrence of Golden Plover outside of wetland sites). The annual baseline mortality rate of Golden Plover is reported known to be 27%. A loss of 47.8 birds would increase the mortality rate by 4.55%. The species is medium sensitivity due to its importance at the county level.<br><br>The relatively high predicted collision rate was due to the occasional occurrence of large flocks within the site. During the survey period, most of the large flocks (4 of the 5 flocks with >1,000 individuals) were recorded during late October 2022 (over four consecutive days 24th to 27th of October). This is likely to represent large numbers of birds on passage in the area over these few days which commonly occurs at either end of the winter season during migration periods. These four days comprised the full watch period for October 2022.<br><br>By running the CRM on a monthly basis it is apparent that October accounts for the vast majority (99.46%) of estimated annual collisions relates to these observations in October 2022, the annual collision rate for the other 11 months combined amounts to just 0.17 collision. There were no observations of Golden Plover in October 2021, although it seems the same Autumn migration pulse may have occurred in November that year when 1,000 birds were recorded on 9th November 2021. On the basis that all sampling in October 2022 occurred on the four days when large flocks were present is likely to have caused a significant over-estimation in the CRM, as the model would have assumed that this density of birds were present for the entirety of the month.<br><br>During supplementary surveys undertaken in 2017-2019, a similar pattern was noted, except that the larger flocks of Golden Plover (>1000 individuals) were recorded towards the end of February (spring migration) rather than October or November, when no larger flocks were recorded.<br><br>It is clear that the high collision risk is related to the occasional occurrence of large flocks flying in proximity to the site, particularly at times when birds are on the move.<br><br>In the absence of mitigation, the impact magnitude is deemed to be medium based on the potential increased mortality, leading to an overall low effect significance. | Low significance effect | Long term moderate effect |

### *10.5.3.2 Hen Harrier (wintering)*

| **Potential effects during wind farm construction and operation** | **Significance (Percival 2003)** | **Significance (EPA 2022)** |
|---|---|---|
| **Construction phase** | | |
| Habitat Loss<br><br>Surveys recorded low-intensity use of the site by hen harrier, with a total of five observations.<br><br>No evidence of breeding during the various surveys at the site. The nearest known breeding site is ca 19km to the south-west of the study area. This is well outside of the maximum foraging range of the species and therefore it is concluded that any loss of habitat within the site will not impact on breeding hen harrier.<br><br>Five individual sightings of non-breeding birds suggests the site is not a core component of any individual's home range, the presence of hunting activity and a single likely roosting observation confirms that the habitat provides some functional value. Potential foraging habitat (bog, scrub and wet grassland) that will be lost equates to 2.7ha, which is a small fraction (ca6%) of the 42.8ha total potential foraging habitat at the site. The loss of this habitat will is deemed to be of negligible magnitude on a high sensitive species leading to a low effect significance. | Low significance effect | Long-term slight negative effect |
| Disturbance<br><br>Hen Harriers are known to be sensitive to human-induced disturbance, with potential effects documented up to 500 metres from construction activity (Pearce-Higgins et al. 2009).<br><br>No disturbance to breeding Hen Harriers is anticipated, as no breeding population is present within the project's zone of influence. For non-breeding (wintering or dispersing) individuals, construction may cause temporary displacement from the immediate site. However, given the extensive availability of alternative foraging habitat in the surrounding area and the low suitability of the project site itself for this species, the magnitude of this impact is predicted to be negligible. Consequently, the significance of the potential disturbance effect is considered low. | Low significance effect | Long-term slight negative effect |

| **Potential effects during wind farm construction and operation** | **Significance (Percival 2003)** | **Significance (EPA 2022)** |
|---|---|---|
| **Operational phase** | | |
| Displacement / Barrier effects<br><br>Given the significant distance from any known breeding sites, the potential for displacement effects on breeding Hen Harrier does not arise.<br><br>For non-breeding individuals, while literature (e.g., Pearce-Higgins et al., 2009) indicates displacement can occur within 500m of turbines, site use by foraging and commuting Hen Harriers was infrequent. Specifically, they were observed within 500m of proposed turbine locations on only five occasions throughout the two-year survey period. Consequently, due to the exceptionally low rate of site utilisation, no significant displacement or barrier effects on Hen Harrier are anticipated. | Low significance effect | Short term slight negative effect |
| Collision<br><br>The species was rarely observed flying within the potential collision risk zone. A 'normal' collision risk model (Appendix 10-5) estimates a collision rate of 0.001 per year, equating to fewer than one collision (0.3) over the project's lifetime. Despite the species' high sensitivity, the impact is of negligible magnitude, resulting in an overall effect significance of very low. | Very low significance effect | Long-term imperceptible negative effect |

#### 10.5.3.2.1 Kestrel

| Potential effects during wind farm construction and operation | Significance (Percival 2003) | Significance (EPA 2022) |
|---|---|---|
| **Construction phase** | | |
| Habitat loss<br><br>While Kestrel were regularly observed foraging in the area they not observed breeding and no confirmed nests were identified. There will therefore be no loss of breeding habitat due to the wind farm development.<br><br>Direct loss of foraging habitat relative to its availability onsite, will be minimal. The land lost to the development footprint is small relative to the total area within the Wind Farm Site (< 5% of the site). Substantial areas of undisturbed suitable foraging habitat will remain throughout much the wind fam site. The loss of foraging habitat for this medium sensitive species is deemed to be low magnitude impact causing a low significant effect. | Low significant effect | Long term slight significant effect |
| Disturbance<br><br>As outlined above, no breeding was identified within or close by the site. There is no potential for disturbance to breeding birds. Hunting and foraging birds may be temporarily displaced during construction phase. It is considered that there is abundant suitable habitat in the vicinity for Kestrels to continue hunting and foraging in adjacent areas during the construction phase.<br><br>Significant effects are not foreseen | Very low effect significance | Short term not significant effect |
| **Operational phase** | | |

| | | |
|---|---|---|
| Displacement / Barrier effects<br><br>Research indicates that Kestrel generally demonstrate low rates of avoidance behaviour toward operational wind turbines. Kestrel have been observed maintaining foraging activities in close proximity to turbine infrastructure. Significant adverse effects on the Kestrel population is not anticipated, as extensive areas of suitable habitat will persist within the wider landscape. | No significant effects | No significant effects |
| Collision<br><br>Kestrel recorded flying within the potential collision risk zone during VP surveys. A "normal" collision risk analysis has been undertaken and full details are provided in Appendix 10-5. The collision risk has been calculated at a rate 0.2 collisions per year, which suggests six collisions over the lifetime of the project. The predicted impact magnitude of this collision risk over the lifetime of the project is therefore low.<br><br>Medium sensitivity species, low magnitude impact = low effect significance. | Low significant effect | Long term slight negative effect |

#### 10.5.3.2.2 Lapwing

| **Potential effects during wind farm construction and operation** | **Significance (Percival 2003)** | **Significance (EPA 2022)** |
|---|---|---|
| **Construction phase** | | |

| | | |
|---|---|---|
| Habitat loss<br><br>Wintering Lapwing were not observed using habitats within the site for foraging or roosting. The loss of habitat therefore will not lead to any significant effects on wintering lapwing.<br><br>A single breeding territory was identified during surveys undertaken during May 2023, the observation of a pair with chick in an area of cutover bog (dominated by bare peat) confirmed successful breeding. The construction of the wind farm will cause the loss of 1.03ha of cutover bog in this part of the site, estimated to be 1.03ha out of approximately 20.6ha of cutover bog that occurs within the site. The loss of this extent of habitat is minor considering the extent of the habitat within and surrounding the site. This impact may, assuming worst case, lead to the loss of a breeding territory within the site constituting a long term low magnitude impact on this medium sensitive species and lead to a low significance effect on the population within the site. | Low effect significance | Long term slight negative effect |
| Disturbance<br><br>Construction works are likely to give rise to local disturbance of breeding Lapwing which have been confirmed breeding during one season on cutover bog in the northern part of the site. The short term effect of the disturbance could lead to breeding failure and temporary displacement in proximity to works. The effect would be short term as the availability of habitat within the site will persist post-development to be used by breeding lapwing. The impact would be medium in magnitude and lead to a low effect significance. | Low effect significance | Short term slight negative effect |
| **Operational phase** | | |

| | | |
|---|---|---|
| Displacement / Barrier effects<br><br>No effects on wintering Lapwing. (wintering)<br><br>Several studies of wind energy infrastructure and its impact on bird populations have found no discernible impact on populations of breeding Lapwings, either through displacement or avoidance (Pearce-Higgins et al. 2009; Pearce-Higgins et al. 2012). The presence of the wind farm is not expected to deter lapwing from breeding in proximity to the Wind Farm Site. Some studies (Pearce-Higgins et al. (2012), Langston et al. (2003)) found that Lapwing nesting occurred slightly closer to turbines possibly as a result of the creation of preferred areas of shorter vegetation. Overall the impact would be medium in magnitude and lead to a low effect significance. (breeding only)<br><br>There is no evidence to suggest the site lies within a regularly used flight path or migration route for this species and therefore barrier effects are not foreseen. | No significant effects<br><br>Low effect significance | No significant effects<br><br>Long term slight negative effect |
| Collision<br><br>(wintering)<br><br>Lapwing flights within the collision risk zone were confined to the winter season. A 'normal' collision risk model (Appendix 10-5) predicts an average of 0.2 collisions per year, equating to an estimated 6 collisions over the project's lifetime. With a county population of 1,480 birds, this impact is considered low in magnitude for this species of medium sensitivity. Consequently, the overall significance of the effect is rated as low.<br><br>Medium sensitivity species, low magnitude impact = low effect significance.<br><br><u>(breeding)</u><br><br>The species was not observed flying at rotor height and therefore no collisions are predicted within the CRM is applied. Based on survey results there is no collision risk foreseen. | Low effect significance<br><br>No significant effects | Long term slight negative effect<br><br>No significant effects |

#### 10.5.3.2.3 Snipe

| Potential effects during wind farm construction and operation | Significance (Percival 2003) | Significance (EPA 2022) |
|---|---|---|
| **Construction phase** | | |
| Habitat loss<br><br>Direct loss of foraging habitat relative to its availability onsite, will be minimal. The land lost to the development footprint is small relative to the total area within the Wind Farm Site (< 5% of the site). Substantial areas of undisturbed suitable foraging habitat will remain throughout much the wind fam site. The loss of foraging habitat for this medium sensitive species is deemed to be very low magnitude impact causing no significant effect. | Very low effect significance | Not significant effect |
| Disturbance<br><br>Snipe were not confirmed nesting in proximity to the site. A likely breeding site was observed ca 1.3km east of the site. Snipe primarily use the site for foraging. It is possible that they will experience some disturbance and displacement effects during the construction phase. However, it is considered that there is ample, suitable foraging habitat in the surrounding area and also that the distance of 1.3km to the nesting site ensures that any displacement will be limited to foraging. | Very low effect significance | Temporary imperceptible effect |
| **Operational phase** | | |
| Displacement / Barrier effects<br><br>Breeding Snipe were not observed breeding within the Wind Farm Site. The nearest nest site identified is sufficiently removed that displacement of breeding birds is not expected. Significant adverse effects on foraging Snipe are not anticipated, as extensive areas of suitable habitat exists within the wider landscape and they are also likely to continue to use extensive parts of the Wind Farm Site for foraging. | Low effect significance | Long term slight effect |

| Potential effects during wind farm construction and operation | Significance (Percival 2003) | Significance (EPA 2022) |
|---|---|---|
| Collision<br><br>The species was recorded flying with the potential collision risk zone during VP surveys. A "normal" collision risk analysis has been undertaken and full details are provided in Appendix 10-5. The collision risk has 0.0003 collisions per year, and only 0.0009 collision over the lifetime of the project. The predicted collision risk over the lifetime of the project is therefore not significant. | Very low effect significance | Long-term Imperceptible Negative Effect |

#### 10.5.3.2.4 Sparrowhawk

| Potential effects during wind farm construction and operation | Significance (Percival 2003) | Significance (EPA 2022) |
|---|---|---|
| **Construction phase** | | |
| Habitat loss<br><br>Direct loss of foraging habitat relative to its availability onsite, will be minimal. The land lost to the development footprint is small relative to the total area within the Wind Farm Site (< 5% of the site). Substantial areas of undisturbed suitable foraging habitat will remain throughout much the wind fam site. The loss of foraging habitat for this low sensitive species is deemed to be very low magnitude impact causing a low significant effect. | Very low effect significance | Not significant effect |

| **Potential effects during wind farm construction and operation** | **Significance (Percival 2003)** | **Significance (EPA 2022)** |
|---|---|---|
| Disturbance<br><br>Sparrowhawk were assessed to be nesting within 1.2km of the Site and use the site for hunting and travelling. It is possible that they will experience some disturbance and displacement effects during the construction phase. However, it is considered that there is ample, suitable foraging habitat in the surrounding area and also that the distance of 1.2km to the nesting site ensures that any displacement will be limited to foraging/hunting. Considering also that this is a Green-Listed species in Ireland and a very widespread species, it is assessed that the construction phase is likely to result in short-term effects which are not significant. | Negligible effect significance | Imperceptible effect |
| **Operational phase** | | |
| Displacement / Barrier effects<br><br>Breeding Sparrowhawk are absent from the Wind Farm Site. The nearest nest site identified is sufficiently removed that displacement of breeding birds is not expected. Significant adverse effects on foraging Sparrowhawk are not anticipated, as extensive areas of suitable habitat exists within the wider landscape and they are also likely to continue to use parts of the Wind Farm Site for foraging. | Low effect significance | Long term slight effect |
| Collision<br><br>The species was recorded flying with the potential collision risk zone during VP surveys. A “normal” collision risk analysis has been undertaken and full details are provided in Appendix 10-5. The collision risk has 0.001 collisions per year, and only 0.3 collision over the lifetime of the project. The predicted collision risk over the lifetime of the project is therefore insignificant.<br><br>Low sensitivity, negligible magnitude impact = <u>very low effect significance</u> | Very low effect significance | Long-term Imperceptible Negative Effect |

#### 10.5.3.2.5 Whooper Swan

| Potential effects during wind farm construction and operation | Significance (Percival 2003) | Significance (EPA 2022) |
|---|---|---|
| **Construction phase** | | |
| Habitat loss<br><br>Surveys have confirmed that the habitats within the site are not utilised by Whooper Swans with no observations of them foraging or roosting within the Wind Farm Site. The project will not give rise to the loss of habitat used by foraging Whooper Swans.<br><br>Significant effects on Whooper Swans due to direct habitat loss are not foreseen. | No significant effects | No significant effects |
| Disturbance<br><br>Low numbers pass through the site but relatively large numbers (up to 90 observed) use the nearby Figile River floodplains for feeding approximately 1.1km from the nearest proposed turbine, though small numbers (5 individuals) were observed within 400m of proposed turbine locations in 2017. McGuinness *et al.* (2015) suggest that 600m around wind turbines is the Zone of Sensitivity for Whooper Swans, while Goodship and Furness (2022) determine the buffer zone to be 200m-600m. The foraging area that was observed to be used by the Whooper Swans is an area along the Figile and Slate Rivers from 400m – 1,300m to the nearest turbine.<br><br>Construction phase disturbance may cause temporary displacement of Whooper Swans from foraging lands to the east of the Wind Farm Site. There are extensive areas of alternative foraging habitat in the surroundings beyond the zone of influence of the development. This temporary displacement would therefore be an negligible magnitude and would lead to an effect of very low significance. | Very low effect significance | Short term not significant effect |
| **Operational phase** | | |

| Potential effects during wind farm construction and operation | Significance (Percival 2003) | Significance (EPA 2022) |
|---|---|---|
| Displacement / Barrier effects<br><br>The potential for wind turbines to create a barrier or displacement effect on Whooper Swans would arise where a regularly used established flight path crosses a site. In the case of the Proposed Wind Farm Site, Whooper Swan were only recorded flying through the area of the wind farm on three occasions with a maximum flock size of eight birds It is therefore clear that Whooper Swan do not regularly cross the site and therefore displacement or barrier effects are not foreseen. The foraging habitat at the River Figile that is occasionally used by flocks of Whooper Swans is sufficiently removed from the proposed wind farm that displacement effects on the site are not predicted. No significant effects are foreseen. | No significant effects | No significant effects |
| Collision<br><br>Whooper Swan flights were rarely observed within the rotor height during winter. A 'normal' collision risk model (Appendix 10-5) predicts 0.005 collisions per year, equating to an estimated 0.15 collisions over the project's lifetime. With a local population of 90 birds, this negligible impact results in an overall very low significance effect for this species of medium sensitivity.<br><br>Medium sensitivity species, negligible magnitude impact = very low effect significance. | Very low effect significance | Long-term Imperceptible Negative Effect |

#### 10.5.3.2.6 Woodcock

| Potential effects during wind farm construction and operation | Significance (Percival 2003) | Significance (EPA 2022) |
|---|---|---|
| **Construction phase** | | |

| | | |
|---|---|---|
| Habitat loss<br><br>Habitat used by breeding Woodcock includes the scrub and woodland habitats in the northern part of the site. Parts of this habitat will be lost during the construction of the wind farm and thus is likely to have a local effect on the use of the area by Woodcock. The habitats in question are extensive in proximity to the Wind Farm Site and surrounding landscape, such as surrounding the bogs at Derrylea to the South and Ummeras to the East. There will also be extensive areas of the habitat surviving in the area post-development. The unmitigated impact would in a worst case scenario lead to the loss of a breeding territory within the site constituting a long term low magnitude impact on this medium sensitive species and lead to a low significance effect on the population within the site. | Low effect significance | Long term slight negative effect |
| Disturbance<br><br>Construction works are likely to give rise to local disturbance of breeding Woodcock which have been confirmed breeding in the northern part of the site. The short term effect of the disturbance could lead to breeding failure and temporary displacement in proximity to works. The effect would be short term as the availability of habitat within the site will persist post-development to be used by breeding woodcock. The impact would be medium in magnitude and lead to a low effect significance. | Low effect significance | Short term slight negative effect |
| **Operational phase** | | |
| Displacement / Barrier effects<br><br>The minor loss of breeding habitat for woodcock will cause a minor reduction in available habitat. However, a significant area of similar habitat will remain within the site and is common in the wider area. This potential long term displacement associated with the loss of habitat will be minor, the birch dominated habitat is likely to expand in certain parts of the site throughout the lifetime of the development. | Low effect significance | Long term slight negative effect |
| Collision<br><br>Woodcock were rarely observed flying at rotor height. The collision risk model (Appendix 10-5) predicts an immeasurably low rate of 0.0003 collisions per year, or approximately 0.009 over the project's lifetime. This will have a negligible impact on the local population, resulting in an overall very low significance effect for this species of medium sensitivity. | Very low effect significance | Long-term Imperceptible Negative Effect |

### 10.5.1 Potential Effects Associated with Turbine Delivery Route

A map showing the turbines delivery route is presented in Figure 109 above. Very minor works are required within roadside habitats at five locations along the turbine delivery route as described in Chapter 2. Multidisciplinary ecological surveys were undertaken in these areas to assess their potential to support sensitive species. The majority of habitats along the turbine delivery route are of low ecological value (i.e. existing roads/tracks, agricultural land) and do not have the potential to support species of conservation interest in the area. On a precautionary basis, it is assumed that some temporary displacement of common bird species may occur during construction works. However, given the extent of suitable habitat in the wider area; significant displacement effects are not predicted. The minor works associated with the turbine delivery route do not have the potential to result in any significant habitat loss or displacement of any Valued Ornithological Receptor species.

### 10.5.2 Potential Effects Associated with Grid Connection

A map showing the grid connection route is presented in Figure 10-9 above. The grid connection will involve excavations largely confined to within the road corridor along its length. Windscreen multidisciplinary ecological surveys were undertaken along the route of the grid connection. The habitats along the grid connection route are of low ecological value (paved roadway and roadside verges) and are unlikely to support VOR species. The excavation works associated with the installation of the underground cable will not give rise to any significant effects on VOR species.

On a precautionary basis, it is assumed that some temporary displacement of common bird species may occur during construction works. However, given the extent of suitable habitat in the wider area; significant displacement effects are not predicted. The minor works associated with the grid connection do not have the potential to result in any significant habitat loss or displacement of any Valued Ornithological Receptor species.

### 10.5.3 Decommissioning Phase Effects

Effects on Value Ornithological Receptors due to disturbance and displacement during decommissioning are expected to be comparable to those described in relation to the conservation phase above. The same and similar in magnitude and significance can be expected to occur. No direct habitat loss effects will arise during the decommissioning phase.

## 10.6 Mitigation

In accordance with CIEEM guidelines, a sequential process has been adopted to avoid, mitigate and, if necessary, compensate for ornithological effects. This is referred to as the 'mitigation hierarchy'. Note that the term 'compensation' as used here does not refer to compensation for adverse effects on the integrity of European sites. Furthermore, no compensation measures are considered necessary in respect of ornithology for this project.

The differences between avoidance, mitigation, compensation and enhancement are defined here as follows:

- avoidance is used where an effect such as disturbance or displacement has been avoided through changes in scheme design;
- mitigation is used to refer to measures to reduce or remedy a specific negative effect in situ, e.g. timing restrictions during construction to avoid key periods for certain species;
- compensation describes measures taken to offset residual effects, i.e. where mitigation in situ is not possible, e.g. creation of new habitats to compensate for habitats lost or effectively lost due to displacement; and
- enhancement is the provision of new benefits for biodiversity that are additional to those provided as part of mitigation or compensation measures, although they can be complementary.

### 10.6.1 Mitigation By Avoidance

A process of 'mitigation by avoidance', as informed by constraints assessment and consultation, was undertaken by the EIAR team during the design of the wind farm layout and selection of grid connection (refer to **Chapter 3 - Site Selection and Alternatives for** further detail) with the objective of avoiding / minimising the potential for significant effects on ornithology. The Site layout and drainage infrastructure has been designed such that it is sympathetic to the existing ornithological interest of the site and aims to maintain the existing ornithological status of the Site. The project design has taken account of the sensitivity of terrestrial habitats by minimising land-take as much as possible and avoidance of higher value semi-natural habitat where possible with no infrastructure placed within 800m of the identified probable curlew breeding territory. The grid connection route was selected to utilise built infrastructure for the majority of its length (i.e. cables to be laid within public roads). Cables will be laid underground to avoid effects on roadside hedgerows and disturbance to nesting birds.

### 10.6.2 Construction Phase Mitigation

**Appointment of Ecological Clerk of Works**

- An Ecological Clerk of Works (ECoW) will be appointed to provide ongoing ecological advice and monitoring throughout the construction phase. The key responsibilities of the ECoW will include:
- Reviewing and Monitoring Mitigation: Overseeing the implementation of all ecological mitigation measures outlined in this document and other relevant plans.
- Pre-Construction Survey: Overseeing a pre-construction bird surveys to establish a baseline and ensure breeding birds are not adversely affected.
- Personnel Awareness: Informing and advising on-site personnel on the specific ornithological and ecological sensitivities present within the site.
- Oversight and Advice: Providing continuous oversight of ecological issues during the construction period, offering immediate advice on ornithological and other ecological matters as they arise.
- Legal Compliance Guidance: Providing guidance to the principal contractor and sub-contractors to ensure all works remain compliant with relevant wildlife legislation, including the protection of scheduled species and their habitats.

**Avoidance of impacts on nesting birds and sensitive species**

1. **Timing of Works:** Clearance of uncultivated vegetation (trees, hedgerows) will be strictly scheduled outside the main bird breeding season (March to August inclusive).

2. **Pre-Construction Surveys:** If works must occur during the breeding season, a pre-commencement bird nest survey will be conducted by a qualified ecologist immediately before the work starts (no more than 24-48 hours prior) to confirm the area is clear of active nests.

3. **Buffer Zones:** Where applicable, works will be prohibited within established disturbance-free buffer zones around the nests of sensitive species (e.g., breeding waders) for the duration of their nesting period.

   Based on survey data and the relevant literature (e.g. Goodship and Furness, 2022; McGuinness *et al.*, 2019) the following disturbance-free buffer zones will be applied to minimise potential disturbance during construction. It should be noted that these distances represent a guide only and these may vary according to topography and other factors at each nest site. Six VORs were confirmed within the study are during pre-planning surveys. These are listed below with the recommended disturbance-free buffer zones.

   - Buzzard 200m
   - Curlew 800m
   - Lapwing 350m
   - Snipe 300m
   - Sparrowhawk 200m
   - Woodcock 300m

4. **Ongoing Monitoring:** The Ecological Clerk of Works (ECoW) will monitor for any nesting activity that commences after the initial survey and will instruct the contractor to cease work and implement further buffers if necessary.

#### *10.6.2.1 Operational Phase Mitigation*

**Mitigating Collision Risk To Sensitive Species**

The Collision Risk Assessment undertaken for the project identified Golden Plover as being at most risk of collision. This was mainly related to large flocks that occasionally fly within and around the site. These large flocks tend to occur most regularly during the early (arrival) and late (departure) winter season coinciding with the main migration periods.

To effectively mitigate this risk, an adaptive management strategy is proposed to be agreed with the Local Authority and NPWS. This strategy is based on monitoring for the presence of large flocks and this would then trigger curtailment of turbines, which ensures turbine operation is modified only when high-risk conditions are present.. To implement this strategy the following is proposed:

<u>Baseline monitoring</u>

Prior to and during the first two years of operation, dedicated monitoring will be undertaken to improve understanding of Golden Plover (to also include Lapwing and Whooper Swan as secondary species) occurrence at the site. Monitoring of the following parameters will be necessary: flock size and distribution, temporal patterns, and flight height analysis.

Develop Monitoring and curtailment protocol

An experienced ornithologist will conduct regular monitoring surveys during high -risk periods. Once certain criteria are met (threshold number of birds within defined distance of turbines) then a message is sent the wind farm controller to shut down specific turbines.

The mitigation strategy will incorporate the following:

- Review effectiveness annually
- Protocol is adapted as more data becomes available.
- Reporting to local authority on monitoring and curtailment events etc.

#### *10.6.2.2 Decommissioning Phase Mitigation*

Mitigation approach during decommissioning will replicate that done during construction so as to minimise any risk of disturbance to breeding birds due to site activities and works associated with decommissioning which will be of a similar nature to construction.

### 10.6.1 Monitoring

Construction Phase

A precautionary approach will be adopted, with construction works scheduled outside the bird nesting season (1 March to 31 August inclusive). Pre-commencement walkover surveys, conducted by a suitably qualified ornithologist, will be undertaken within a 500m radius of all work areas to identify nests or roosts of conservation concern. If works must extend into the breeding season, surveys will be repeated to confirm the absence of breeding birds. Should an active nest or roost of high conservation concern be identified, a species-specific buffer zone (as per Goodship & Furness, 2022, McGuinness *et al.*, 2019) will be established. No works will occur within this buffer until monitoring confirms the site is no longer in use.

Operational Phase

A detailed Bird Monitoring Programme will be implemented to monitor collision, displacement, and habituation effects. Following best practice guidelines (SNH, 2009), surveys will be conducted in Years 1, 2, 3, 5, 10, and 15 and will include:

- Monthly vantage point surveys of flight activity.
- Breeding bird surveys using an Adapted Brown & Shepard method.
- Targeted carcass searches using trained dogs, incorporating detection and scavenger rate trials to ensure data robustness.

Reports at the end of each monitoring year will be submitted to the Planning Authority and will inform any required adaptive mitigation.

Decommissioning Phase

The decommissioning process will mirror the monitoring approach of the construction phase. Pre-commencement surveys will be conducted outside the nesting season, with repeated surveys required if works extend into subsequent seasons. Identified active nests or roosts will trigger the same species-specific buffer zones and work prohibitions as during construction.

## 10.7 Residual Effects

Considering the significance of potential effects and incorporating the proposed mitigation and best practice measures, no significant residual impacts on Ornithological Receptors are anticipated in relation to direct habitat loss, displacement, or collision risk

A summary of residual effects relevant to each VOR that was subject to detailed assessment is presented in Table 10-15. As per Percival 2003 criteria, no residual effects of significance greater than Low were identified. As per EPA 2022 criteria, no residual effect significance of greater than Slight was identified.

**Table 10-15: Summary of each VOR in relation to potential effects, mitigation, and residual effects.**

| VOR | Potential Effect | Mitigation | Residual effect (Percival 2003) | Residual effect (EPA 2022 |
|---|---|---|---|---|
| **Buzzard** | | | | |
| Construction - Habitat Loss | Very low effect significance | Design avoidance | Very low effect significance | Long term imperceptible negative effect. |
| Construction - Disturbance | Very low effect significance | ECoW / Nest Protection / Timing | Very low effect significance | Short term, not significant effect. |
| Operational – Displacement | Very low effect significance | n/a | Very low effect significance | Long term slight negative effect |
| Operational - Collision | Very low effect significance | n/a | Very low effect significance | Long term slight negative effect |
| **Curlew (breeding)** | | | | |
| Construction - Habitat Loss | No significant effects | n/a | No significant effects | No significant effects |
| Construction - Disturbance | Low effect significance | ECoW / Nest Protection / Timing | Very low effect significance | No significant effect |
| Operational – Displacement | No significant effects | n/a | No significant effects | No significant effect |
| Operational - Collision | Very low effect significance | n/a | Very low effect significance | Long term slight negative effect |

| VOR | Potential Effect | Mitigation | Residual effect (Percival 2003) | Residual effect (EPA 2022 |
|---|---|---|---|---|
| **Golden Plover (wintering)** | | | | |
| Construction - Habitat Loss | No significant effects | n/a | No significant effects | No significant effects |
| Construction - Disturbance | No significant effects | n/a | No significant effects | No significant effects |
| Operational – Displacement | No significant effects | n/a | No significant effects | No significant effects |
| Operational - Collision | Low effect significance | Monitoring & Curtailment | Low effect significance | Long term slight effect |
| **Hen Harrier** | | | | |
| Construction - Habitat Loss | Low effect significance | Design avoidance | Low effect significance | Long-term slight negative effect |
| Construction - Disturbance | Low effect significance | ECoW / Nest Protection / Timing | Low effect significance | Long-term slight negative effect |
| Operational – Displacement | Low significance effect | n/a | Low significance effect | Short term slight negative effect |
| Operational - Collision | Very low effect significance | n/a | Very low effect significance | Long-term imperceptible negative effect |
| **Kestrel** | | | | |
| Construction - Habitat Loss | Low effect significance | Design avoidance | Low significance effect | Long term slight significant effect |
| Construction - Disturbance | Very low effect significance | ECoW / Nest Protection / Timing | Very low effect significance | Short term not significant effect |
| Operational – Displacement | No significant effects | n/a | No significant effects | No significant effects |
| Operational - Collision | Low effect significance | n/a | Low effect significance | Long term slight negative effect |

| VOR | Potential Effect | Mitigation | Residual effect (Percival 2003) | Residual effect (EPA 2022 |
|---|---|---|---|---|
| **Lapwing (winter)** | | | | |
| Construction - Habitat Loss | Low effect significance | Design avoidance | No significant effects | No significant effects |
| Construction - Disturbance | Low effect significance | ECoW / Nest Protection / Timing | No significant effects | |
| Operational – Displacement | No significant effects | n/a | No significant effects | No significant effects |
| Operational - Collision | Low effect significance | Monitoring & Curtailment | Very low effect significance | Long term slight negative effect |
| **Lapwing (breeding)** | | | | |
| Construction - Habitat Loss | Low effect significance | Design avoidance | Low effect significance | Long term slight negative effect |
| Construction - Disturbance | Low effect significance | ECoW / Nest Protection / Timing | Very low effect significance | Short term slight negative effect |
| Operational – Displacement | Low effect significance | n/a | Low effect significance | Long term slight negative effect |
| Operational - Collision | No significant effects | n/a | No significant effects | No significant effects |
| **Snipe** | | | | |
| Construction - Habitat Loss | Very low effect significance | n/a | Very low effect significance | Not significant effect |
| Construction - Disturbance | Very low effect significance | ECoW / Nest Protection / Timing | Very low effect significance | Temporary imperceptible effect |
| Operational – Displacement | Low effect significance | n/a | Low effect significance | Long term slight effect |
| Operational - Collision | Very low effect significance | n/a | Very low effect significance | Long-term Imperceptible Negative Effect |

| VOR | Potential Effect | Mitigation | Residual effect (Percival 2003) | Residual effect (EPA 2022 |
|---|---|---|---|---|
| **Sparrowhawk** | | | | |
| Construction - Habitat Loss | Very low effect significance | Design avoidance | Very low effect significance | Not significant effect |
| Construction - Disturbance | Negligible effect significance | ECoW / Nest Protection / Timing | Negligible effect significance | Not significant effect |
| Operational – Displacement | Low effect significance | n/a | Low effect significance | Imperceptible effect |
| Operational - Collision | Very low effect significance | n/a | Very low effect significance | Long term slight effect |
| **Whooper Swan** | | | | |
| Construction - Habitat Loss | No significant effects | n/a | No significant effects | No significant effects |
| Construction - Disturbance | Very low effect significance | n/a | Very low effect significance | Short term not significant effect |
| Operational – Displacement | No significant effects | n/a | No significant effects | No significant effects |
| Operational - Collision | Very low effect significance | Monitoring & Curtailment | Very low effect significance | Long-term Imperceptible Negative Effect |
| **Woodcock** | | | | |
| Construction - Habitat Loss | Low effect significance | Design avoidance | Low effect significance | Long term slight negative effect |
| Construction - Disturbance | Low effect significance | ECoW / Nest Protection / Timing | Very low effect significance | Short term Imperceptible Negative Effect |
| Operational – Displacement | Low effect significance | n/a | Low effect significance | Long term slight negative effect |
| Operational - Collision | Very low effect significance | n/a | Very low effect significance | Long-term Imperceptible Negative Effect |

## 10.8 Cumulative Impacts

Other wind farm projects which could potentially interact with the proposed development and result in significant cumulative effects on birds are considered below. The various wind farm sites occur within 20km of the Proposed Wind Farm Site and include windfarms at various stages in the project cycle:

| Wind Farm | No Turbines | Distance removed from proposed wind farm site | Project Development Status | Identification of cumulative effects of significance |
|---|---|---|---|---|
| Cushina | 9 | 3km | In planning | No |
| The details of the project are not currently available and therefore very limited assessment is possible. The site is located north-west of the Proposed Wind Farm Site, to the north of Derryounce Lakes. Site appears to be located within farmland habitat with degraded bog in proximity and conifer plantations close by. Bird surveys at the Project Wind Farm Site did not identify any flight paths of birds suggesting any direct bird connectivity with this area. Further details on flight paths are available in Appendix 10.4. Considering the predicted impacts of the Proposed Wind Farm Site and our knowledge of the avifauna in the area no potential cumulative effects of significance are identified. | | | | |
| Moanvane | 12 | 6km | Operational | No |
| This site is located in area 6km west of the Proposed Wind Farm Site, in an area dominated by Conifer plantation and degraded and cutover raised bog. Farmland occurs in the surroundings. Bird surveys at the Project Site did not identify any flight paths of birds suggesting any direct bird connectivity with Moanvane (Refer to Appendix 10.4)<br><br>The potential for additive Golden Plover fatalities due to collision risk has been considered. However, based on the post-mitigation effects predicted for the Proposed Wind Farm Site, it is concluded that cumulative effects of significance are not foreseen, furthermore the Moanvane assessment on birds concluded that '*the project would have an imperceptible residual impact on golden plover at a county and all-Ireland level. Habituation to the site is likely to also reduce the proposed risk.*'<br><br>Considering the predicted impacts of the current project and those identified as part of pre-planning reports on Moanvane, no potential cumulative effects of significance are identified. | | | | |
| Mount Lucas | 28 | 10km | Operational | No |
| This is a large operational wind farm site located 10km north-west of the Proposed Wind Farm Site. The windfarm is located within an extensive area of cutaway bog with regenerating wetland and scrub habitats present.<br><br>Bird surveys at the Proposed Wind Farm Site did not identify any flight paths of birds suggesting any direct bird connectivity with Mount Lucas (Refer to Appendix 10.4). The potential for additive Golden Plover fatalities due to collisions risk has been considered, based on the post-mitigation effects predicted for the Proposed Wind Farm Site, it is concluded that cumulative effects of significance are not foreseen. | | | | |

| Wind Farm | No Turbines | Distance removed from proposed wind farm site | Project Development Status | Identification of cumulative effects of significance |
|---|---|---|---|---|
| Considering the predicted impacts of the Proposed Wind Farm Site and those identified as part of planning reports on Mount Lucas, no potential for cumulative effects of significance in relation to birds are identified. | | | | |
| Ballydermot | 48 | 7km | In planning | No |
| The details of the project are not currently available and therefore very limited assessment possible. The site is located north-east of the Proposed Wind Farm Site within an expansive area of previously exploited Bord na Móna cutaway bog, with significant regeneration of scrub. Bird surveys at the Proposed Wind Farm Site did not identify any flight paths of birds suggesting any direct bird connectivity with this area (Refer to Appendix 10.4). Considering the predicted impacts of the Proposed Wind Farm Site and our knowledge of the avifauna in the area no potential cumulative effects of significance are identified. | | | | |
| Cushaling | 8 | 8km | Operational | No |
| Cushaling wind farm was granted planning subject to conditions in 2020.<br><br>Bird surveys at the Proposed Wind Farm Site did not identify any flight paths of birds suggesting any direct bird connectivity with this area (Refer to Appendix 10.4). However, considering the proximity and connectivity provided by the Figile River which runs closeby both sites the potential for connectivity between Cushaling and the farmland used by wintering birds to the east of the Proposed Wind Farm Site.<br><br>The potential for additive Golden Plover fatalities due to collision risk has been considered in this assessment. Collision was identified as a potential effect in the Cushaling site. Adaptive mitigation is built into the project to enact curtailment should the risk of collision arose during the operational phase. Based on the residual (post-mitigation) effects predicted for the Proposed Wind Farm Site and for Cloncreen it is concluded that cumulative effects of significance on birds are not foreseen. | | | | |
| Cloncreen | 21 | 9km | Operational | No |
| This is a large operational wind farm site located 9km north of the Proposed Wind Farm Site. The windfarm is located within an extensive area of Bord na Móna cutaway bog with regenerating wetland and scrub habitats present. Based on the residual impact.<br><br>Bird surveys at the Proposed Wind Farm Site did not identify any flight paths of birds suggesting any direct bird connectivity with Cloncreen (Refer to Appendix 10.4). The potential for additive Golden Plover fatalities due to collisions risk has been considered. Based on the post-mitigation effects predicted for the Proposed Wind Farm Site and the low collision risk identified for Cloncreen, it is concluded that cumulative effects of significance are not foreseen. | | | | |

| Wind Farm | No Turbines | Distance removed from proposed wind farm site | Project Development Status | Identification of cumulative effects of significance |
|---|---|---|---|---|
| Considering the predicted impacts of the current project and those identified as part of planning reports on Cloncreen, no potential for cumulative effects of significance in relation to birds are identified. | | | | |
| Cloncarrow | 4 | 12km | In planning | No |
| The details of the project are not currently available and therefore very limited assessment possible. Cloncarrow is located north-east of the Proposed Wind Farm Site, adjacent to and to the north of Mount Lucas Wind Farm. Site appears to be located in an area of exploited Bord na Móna cutaway. Bird surveys at the Proposed Wind Farm Site did not identify any flight paths of birds suggesting any direct bird connectivity with this area (Refer to Appendix 10.4). Considering the predicted impacts of the Proposed Wind Farm Site and our knowledge of the avifauna in the area no potential cumulative effects of significance are identified. | | | | |
| Dernacart | 8 | 13km | Consented | No |
| An eight turbines wind farm located ca 13km to the south-west of the Proposed Wind farm Site. The project received planning permission in 2024.<br><br>Bird surveys at the Proposed Wind Farm Site did not identify any flight paths of birds suggesting any direct bird connectivity with this area (Refer to Appendix 10.4). Considering the predicted impacts of the Proposed Wind Farm Site and those identified as part of planning reports on Dernacart, no potential for cumulative effects of significance in relation to birds are identified. | | | | |
| Yellow River | 29 | 19km | Operational | No |
| A 29 turbine turbines site three turbines located 19km from Proposed Wind Farm Site. The Yellow River wind farm is located on mostly agricultural fields (improved grassland, with some remnant raised bogs and cutover present in the surrounding landscape. The site is fully operational. Considering the distance removed and absence of any identifiable corridor it is highly unlikely that there is any significant connectivity between the Proposed Wind Farm Site and the Yellow River Wind Farm. Golden Plover and Whooper Swans were considered as ecological receptors at the planning stage. Significant effects on either species were not identified. Based on the residual (post-mitigation) effects predicted for the Proposed Wind Farm Site and for Yellow River Wind Farm it is concluded that cumulative effects of significance on birds are not foreseen. | | | | |

## 10.9 Conclusion

An assessment of effects on ornithology has been carried out for the proposed development, based on a desk-based review and detailed surveys conducted between 2017 and 2025. The consideration of residual effects (post-mitigation) leads to the conclusion that the Proposed Wind Farm Development will not result in any significant negative effects on the Ornithological Receptors. Therefore, provided the Proposed Development is constructed, operated, and decommissioned in accordance with the submitted design, proposed mitigation measures, and relevant best practice, no significant individual or cumulative effects on ornithology are anticipated.

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# Appendix 4

# Aquatic Baseline Report

# DERRYNADARRAGH WIND FARM
# AQUATIC ECOLOGY




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# 1. INTRODUCTION

This report addresses the potential impact of the proposed Derrynadarragh Wind Farm (also referred to in this report as the 'Site') project on the receiving aquatic environment. The Site is located south of Edenderry, Co. Kildare and Northeast of Portarlington. Co. Laois. This document provides an assessment of the impact of the proposed development on aquatic habitats, aquatic ecological communities, and individual aquatic species. The aims of the aquatic ecology assessment are:

- To carry out a desktop study in order to determine the surface water features affected by the proposed development and surrounding area and
- To carry out a baseline fisheries and aquatic ecological survey of the identified aquatic areas.

Field survey work to inform the current assessment included kick/sweep sampling and visual assessments as well as electrical fishing surveying during September 2021 and September 2024.

The CIEEM (2019) advice note on the lifespan of ecological reports and surveys states that for reports more than three years only that "*the report is unlikely to still be valid and most, if not all, of the surveys are likely to need to be updated*". This advice is also in line with the NRA (2009) guidance for ecology surveys, which gives a three-year expiry date. The aquatic ecology surveys for this project were therefore all updated during September 2024 to a level of detail that will ensure that the assessment remains valid during the planning application period. The 2021 data is used as a reference point and for comparison purposes, rather than a basis for decision-making.

Figure 1 gives the location of the proposed Derrynadarragh Wind Farm. Figure 2 shows an aerial view of the Site. Figure 3 shows the Site with respect to the River Barrow and River Nore SAC and watercourses in the Barrow catchment. This report was prepared by Ecofact Environmental Consultants Ltd.

## 1.1 Statement of Authority

The report was prepared by Senior Ecologist Dr. Will O'Connor. 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 were also completed by Dr. Will O'Connor with the assistance of junior staff.

# 2. METHODOLOGY

## 2.1 Desk study

A desktop study was undertaken to collate the existing available information on the aquatic ecology of the study area. The Study Area included the Site and all waterbodies/watercourses adjacent to the Site. The desktop study involved accessing the National Biodiversity Data Centre (NBDC) (www.biodiversityireland.ie) and the databases available for any records of sensitive aquatic ecology receptors. The National Parks and Wildlife Service (www.npws.ie) website and online maps were accessed in relation to designated areas, qualifying interests and site synopses on relevant Special Areas of Conservation with regard to aquatic ecology. Similarly, any relevant information on the website of Inland Fisheries Ireland (www.fisheriesireland.ie) was reviewed.

The Environmental Protection Agency (www.gis.epa.ie/EPAMaps/) websites including Catchments.ie (www.catchments.ie) and publications relating to the Water Framework Directive (WFD) were accessed to identify watercourses in the Study Area, in relation to water quality status and also water quality pressures in the study area. The Environmental Sensitivity Mapping (ESM) tool was also used to gather data on aquatic biodiversity, flora and fauna in the study area.

Aerial imagery was accessed online in order to gain a better understanding of the study area and its surrounding habitats. All documents reviewed are included in the bibliography section of the current report.

## 2.2 Field survey

### *2.2.1 Introduction*

All watercourses / water bodies which could be affected directly (i.e. within the site) or indirectly (i.e. drain areas close to the site) were considered as part of the current appraisal. Aquatic habitat surveys were completed on all watercourses draining the Proposed Wind Farm Site and a total of 6 sites were selected for detailed assessment. The purpose of these sites is to provide baseline information and can also be used for monitoring during the construction of the Proposed Wind Farm. The locations of the sites are given in Table 1 and shown in Figure 1.

**Table 1** Location of the aquatic ecology sites assessed for the Proposed Derrynadarragh Wind Farm Site.

| Site No. | Catchment | Sub-catchment | Watercourse Name | Watercourse Order | Segment Code | EPA Code |
|---|---|---|---|---|---|---|
| 1 | Barrow 14 | Barrow_SC_040 | River Barrow | 5th | 14_1611 | 14B01 |
| 2 | Barrow 14 | Barrow_SC_040 | River Figile | 4th | 14_1766 | 14F01 |
| 3 | Barrow 14 | Barrow_SC_040 | River Cushina | 3rd | 14_276 | 14C04 |
| 4 | Barrow 14 | Barrow_SC_040 | River Cushina | 3rd | 14_276 | 14C04 |
| 5 | Barrow 14 | Barrow_SC_040 | River Cushina | 3rd | 14_275 | 14C04 |
| 6 | Barrow 14 | Figile_SC_020 | River Figile | 4th | 14_10514 | 14F01 |

. The surveys completed at each site were at a level required to make an evaluation of biological water quality, fisheries value, aquatic habitat value, and presence of rare/protected/notable aquatic species at each site. The surveys were conducted in accordance with relevant best practice guidelines, as outlined in the following sections. All watercourses on the site were again viewed during the walkover

surveys. Of the sites chosen, two were within the Site, two were upstream and 2 were downstream of the Site. One of the upstream sites (Site 5) is also along the proposed Turbine Delivery Route (TDR).

### 2.2.2 Habitat Surveys

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).

### 2.2.3 General Fish Surveys

Electrical fishing surveys were undertaken at the six sites during September 2021 and September 2024. The surveys were completed under authorisation from the Department of Environment, Climate and Communications under Section 14 of the Fisheries (Consolidation) Act (1959).

Sites were surveyed following the methodology outlined in the CFB (2008) guidance, and with reference to Matson *et al* (2018). A portable electrical fishing unit (Smith Root-LR 24backpack) was used to carry out the survey. The sites were fished continuously for 5 minutes each. Captured fish were collected into a container of river water using dip nets. The fish were released alive and spread evenly over the sampling area. No mortalities were recorded. Strict biosecurity measures were followed during all fieldwork (IFI, 2010).

### 2.2.4 Juvenile Lamprey Surveys

Juvenile Lamprey surveys followed the methodology for ammocoete surveys given in the manual *'Monitoring the River, Brook and Sea Lamprey, Lampetra fluviatilis, L. planeri* and *Petromyzon marinus'* by Harvey & Cowx (2003). Electrical fishing for juvenile lampreys was carried out at three 1m$^2$ habitat patches where available. A total of 3 x 1 m$^2$ enclosures were fished at each site where suitable habitat was present and where conditions allowed. Lamprey identification followed '*Identifying Lamprey. A Field Key for Sea, River and Brook Lamprey'* by Gardiner R (2003). Sites were surveyed during September 2021 and September 2024

### 2.2.5 Biological water quality

A biological water quality rating was assigned at each site with regard to the methodology given in Toner *et al*., (2005). This was a rapid assessment and estimated water quality ratings were assigned for each of the 6 aquatic survey sites.

The presence / absence of any rare or notable macroinvertebrate species was also assessed during the survey. This was based on the kick /sweep sampling results and visual observations at each site.

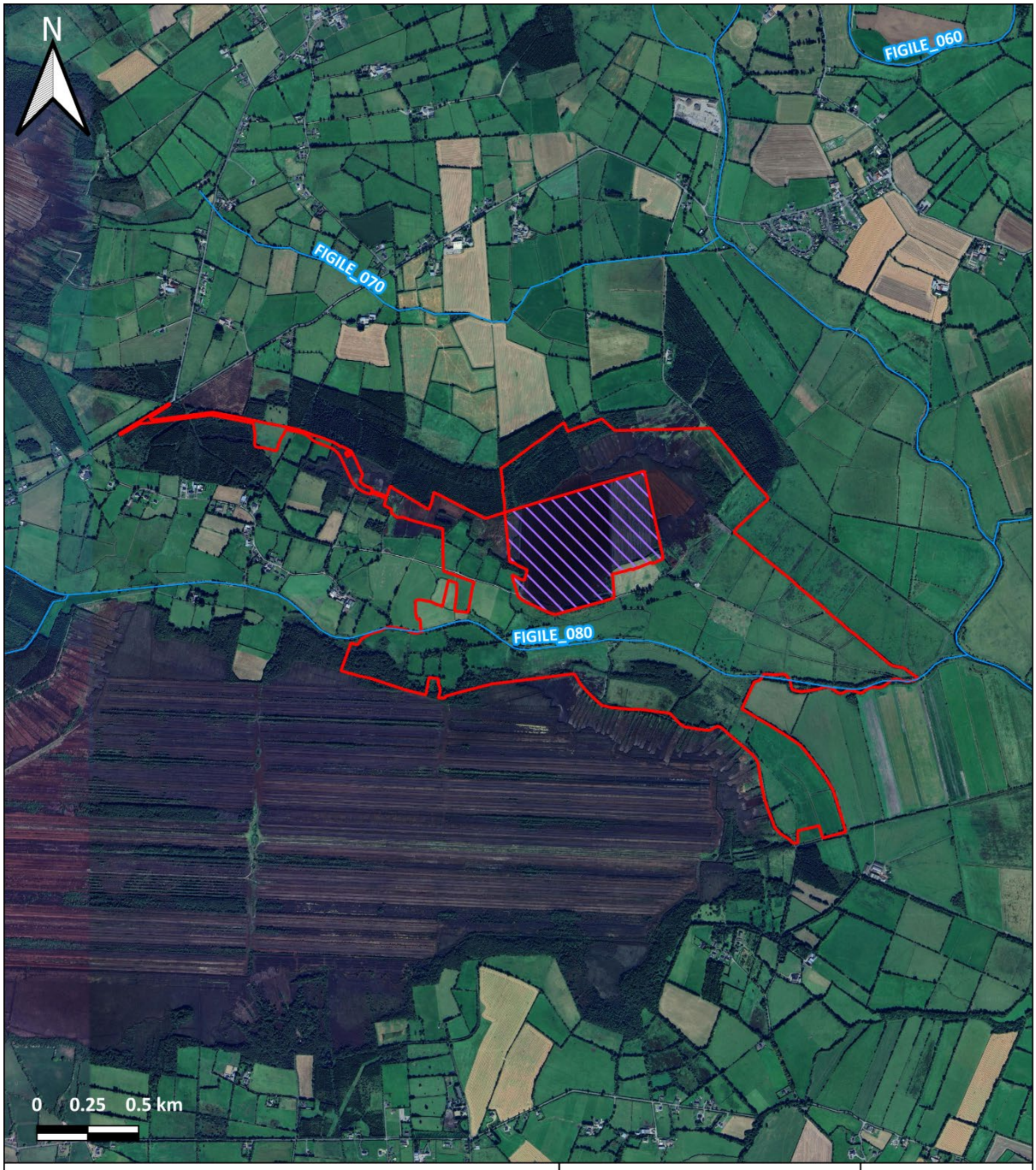



**Figure 1** Location of the proposed Derrynadarragh Wind Farm site.




**Figure 2** The location of the 6 aquatic ecology survey sites.

# 3. RECEIVING ENVIRONMENT

## 3.1 Desk study

### *3.1.1 Introduction*

The proposed Derrynadarragh wind farm is located within the River Figile sub catchment, which is part of the Barrow catchment. The River Barrow is the 2nd longest river in Ireland, the Barrow catchment drains a total area of 3,025km$^2$.

The River Figile (EPA code: 14F01) is the largest sub-catchment of the River Barrow. It is a lowland drained catchment where land use is predominantly pastures and peat bogs, with some forest tracts scattered throughout too. The main tributaries of the Figile are the Cushina, Slate and Daingean Rivers. There are three survey sites (Sites 1, 2 and 6) located on the River Figile.

The Figile confluence with the Barrow is located at the Laois – Kildare County border, just north of Monasterevin. The 4th order Figile River flows in a southerly direction into the main channel of the River Barrow from the north side and to the west of the Grand Canal Barrow Line. Upstream of the Barrow the Figile is joined by a 1st order tributary, the Ummera_Beg, from the east before the 3rd order Cushina River flows in from the west to the north of Derrylea Bog. Just over 600rm upstream of the Cushina confluence, the 3rd order Slate River joins the watercourse from the east side. The Proposed Wind Farm is located directly west of this confluence.

Further upstream at Bracknagh, two small tributaries flow into the channel from the west, the Bracknagh River and the Clonshannon 14 River. Just downstream of Clonbulloge the 3rd order Ballygarrett 14 flows in from the east. The Daingean River confluence is located at the upstream side of the village of Clonbulloge. A number of 1st order streams drain into the Figile River as the channel turns to a west-east orientation upstream of Edenderry Power Station. The 3rd order Ballyleakin also flows in from the north. Several more 1st and 2nd order tributaries connect to the Figile in its upper reaches; including the Lullymore_East, Abbeylough and Parsontown Rivers just downstream of the source of the Figile at Dunfierth Bog North County Kildare.

The Proposed Wind Farm Site is located on the River Cushina c. 280rm upstream from the River Figile. Sites 3, 4 and 5 are also located on the River Cushina. This river rises c. 17.6rkm upstream from the Proposed Wind Farm Site. From where the river rises it flows east until it meets the River Figile. The only major tributary is the 3rd order Enaghan Stream (EPA code: 14E02).

### *3.1.2 Designated sites*

Part of the River Barrow catchment is included in the River Barrow and River Nore Special Area of Conservation (SAC) (Site code: 002162). The boundary of the SAC is located approximately 6rkm downstream of the Proposed Derrynadarragh Wind Farm site. This is the only Natura 2000 river system potentially affected by the proposed development. The River Barrow and River Nore SAC comprise of the freshwater element of the River Barrow downstream of the Slieve Bloom Mountains to the tidal areas as far as Credaun Head in Waterford.

The River Barrow and River Nore SAC is selected for the Annex I aquatic habitat Water courses of plain to montane levels with the *Ranunculion fluitantis* and *Callitricho-Batrachion* vegetation [3260]. The site is also listed for the following aquatic Annex II species; *Margaritifera margaritifera (*Freshwater Pearl Mussel) [1029], *Austropotamobius pallipes* (White-clawed Crayfish) [1092], Petromyzon marinus (Sea

Lamprey) [1095], *Lampetra planeri* (Brook Lamprey) [1096], Lampetra fluviatilis (River Lamprey) [1099], *Alosa fallax fallax* (Twaite Shad) [1103], and *Salmo salar* (Salmon) [1106].

### *3.1.3 Water Quality*

The Environmental Protection Agency (EPA) carry out biological monitoring on a number of sites on the watercourses within the study area.

There is an EPA monitoring station on the River Figile at survey Site 6. This monitoring station (EPA station code: 14F01 0500) was rated Q4 in 2020 equivalent to WFD status "Good". A further 6rkm upstream there is another EPA monitoring station (EPA station code: 14F01 0400). This station was rated Q3 in 2023 equivalent to WFD status "Poor". There is another monitoring station located at Clonbulloge village c. 3rkm upstream. This site was rated Q3 in 2024.

The closest EPA monitoring station downstream is located on the River Barrow at Monasterevin. This site (EPA station code: 14B01 1000) was rated Q3-4 in 2023 equivalent to WFD status "Moderate".

There is an EPA monitoring station on the River Cushina (EPA station code: 14C04 0100). This site is located c. 1.8 rkm upstream of the Proposed Wind Farm Site. The site was rated Q3-4 in 2023. There is another EPA monitoring station (EPA station code: 14E02 0300) located c. 3.4rkm upstream. This site was rated Q4 in 2023 equivalent to WFD status "Good".

The Water Framework Directive sets out objectives to be met by river waterbodies in Ireland before 2027. Waterbodies are then assessed for their potential risk of not meeting these objectives set out by WFD and therefore are assigned a Risk rating. Waterbodies that are "At Risk" can then be prioritised for the implementation of measures. The River Figile directly downstream of the site is considered "Under Review". The River Cushina at the Wind Farm site is also "Under Review". These are located in the same sub-catchment. This sub-catchment (sub-catchment: Figile_080) is under pressure from channelisation and wastewater discharge. Directly upstream of Site 6 the River Figile is considered "Not at Risk". Upstream of the Figile_080 sub-catchment the Cushina_30 sub-catchment is "Not at Risk". Further upstream the River Cushina at "At Risk".

### *3.1.4 Previous Aquatic Ecology Records*

The River Barrow supports a range of fish species including Atlantic salmon (*Salmo salar*), Brown Trout (*Salmo trutta*), Twaite Shad (*Alosa fallax*), Dace (*Leuciscus leuciscus*), Bream (*Abramis brama*), Perch (*Perca fluviatilis*), Rudd (*Scardinius erythrophthalmus*), Roach (*Rutilus rutilus*), Tench (*Tinca tinca*), and Pike (*Esox lucius*). The Barrow is known to support the only sizeable spawning population of Twaite Shad (*Alosa fallax*) in Ireland – however, this species does not occur in the study area as migration of Shad (*Alosa fallax*) in the river is blocked by the weir at St. Mullins (King, 2006). In general, the tributaries of the River Barrow tend to have limited habitat for juvenile Lamprey (*Lampetra sp.*) (King, 2006). Compared to other catchments in Ireland, such as the Slaney and Munster Blackwater and the Moy, the Barrow has limited ammocoete (*Lampetra* spp.) populations (King, 2006).

The River Barrow has a relatively good run of salmon which spawn downstream of the weirs on the main channel and also run into the tributaries. Most of the tributaries have been subjected to arterial drainage schemes and water quality is a significant pressure in the catchment. According to Inland Fisheries Ireland (IFI), the River Barrow catchment contains 5.75% of the accessible juvenile salmon habitat in Ireland, comprising 6.49 million $m^2$ of suitable juvenile salmon habitat. As gradient has a strong influence on habitat suitability for salmonids, especially at the early life stages, the main channel

of the River Barrow is regarded as a marginal habitat with respect to salmon production. To accommodate navigation, as well as providing hydropower to a number of industrial units, the River Barrow was regulated by a number of major weirs, creating a series of zero to very low gradient reaches between each weir.

IFI carried out an electrofishing survey of the entire River Barrow Catchment as part of the National Research Survey Programme in 2015 and again in 2020. Both surveys included sites located on the River Figile and the River Cushina catchments. There were four sites located on the River Figile. Of these, three were located just in a 2km stretch downstream of Daingean. These were located on the Philipstown River. This is over 30km upstream from where the River Figile flows into the river Cushina. Cumulatively at these sites in 2015, Stone loach, Pike, Nine-spiked stickle back and Three-spined stickleback were recorded. The River Figile site was located at Ticknevin and is over 20 rkm upstream from where the River Cushina flows in the River Figile. This site was only surveyed in 2020. There was a total of three species recorded. These were Brown trout (0.0101 fish/$m^2$), Stone loach (0.018 fish/$m^2$) and Three-spined stickleback (0.083 fish/$m^2$). There were two age classes of brown trout recorded. The minimum density recorded for 0+ fish was 0.046 fish/$m^2$ and for 1+ and older it was 0.055 fish/$m^2$ (Gordon 2021).

The survey site on the River Cushina was located upstream of the Proposed Wind Farm Site at Survey Site 5. At this site there were three species recorded. These were 1+ and older Brown trout (0.009 fish/$m^2$), Gudgeon (0.009 fish/$m^2$) and Stone loach (0.03 fish/$m^2$). Overall, the fish ecological status for the River Cushina and the Phillipstown river sites was Poor. The status for the River Figile site was Moderate (Gordon 2021).

The Barrow also supports populations of the protected, White-clawed Crayfish (*Austropotamobius pallipes*). The River Barrow and River Nore SAC was a stronghold for White-clawed crayfish (Demers *et al.,* 2005). This species is threatened on a global scale and Ireland holds one of the world's largest populations of the species. Crayfish plague, caused by the alien fungus *Aphanomyces astaci* is present in the River Barrow.

In 2017 large Crayfish mortality events occurred in the catchment between Graignamanagh in Kilkenny and upstream as far as Carlow. DNA tests from 4 different locations along this stretch confirmed the presence of Crayfish plague. According to catchments.ie, the highly infectious disease had spread through the main Barrow channel and was now widespread in the river. It had been recorded as far upstream in the main channel as Monasterevin in 2018. In May 2019 Crayfish Plague was found to be present within the Figile sub-catchment, its presence was confirmed on the River Slate at Rathangan (NPWS, 2019). Previous Ecofact surveys have shown that the Figile River has previously been considered important for this species (Ecofact 2014). Significant numbers were recorded at Cushaling Bridge in 2014. It is likely that the Figile River population has since been impacted by Crayfish Plague.

There are records of Freshwater Pearl Mussel (*Margaritifera margaritifera*) populations in the Barrow catchment. Pieces of empty *Margaritifera* shells have been recorded previously in the River Barrow (McMillan and Zeissler, 1990), however, no living specimens of the critically endangered species have been found outside of the River Nore since 1993. The Barrow Freshwater Pearl Mussel populations occur in the Aughavaud, Ballymurphy and Mountain sub-catchments. The Figile River was surveyed by Moorkens in 1991 (Moorkens *et al.* 1992) and the species was not present.




**Figure 3** Natura 2000 Sites within 15km of proposed Derrynadarragh Wind Farm.

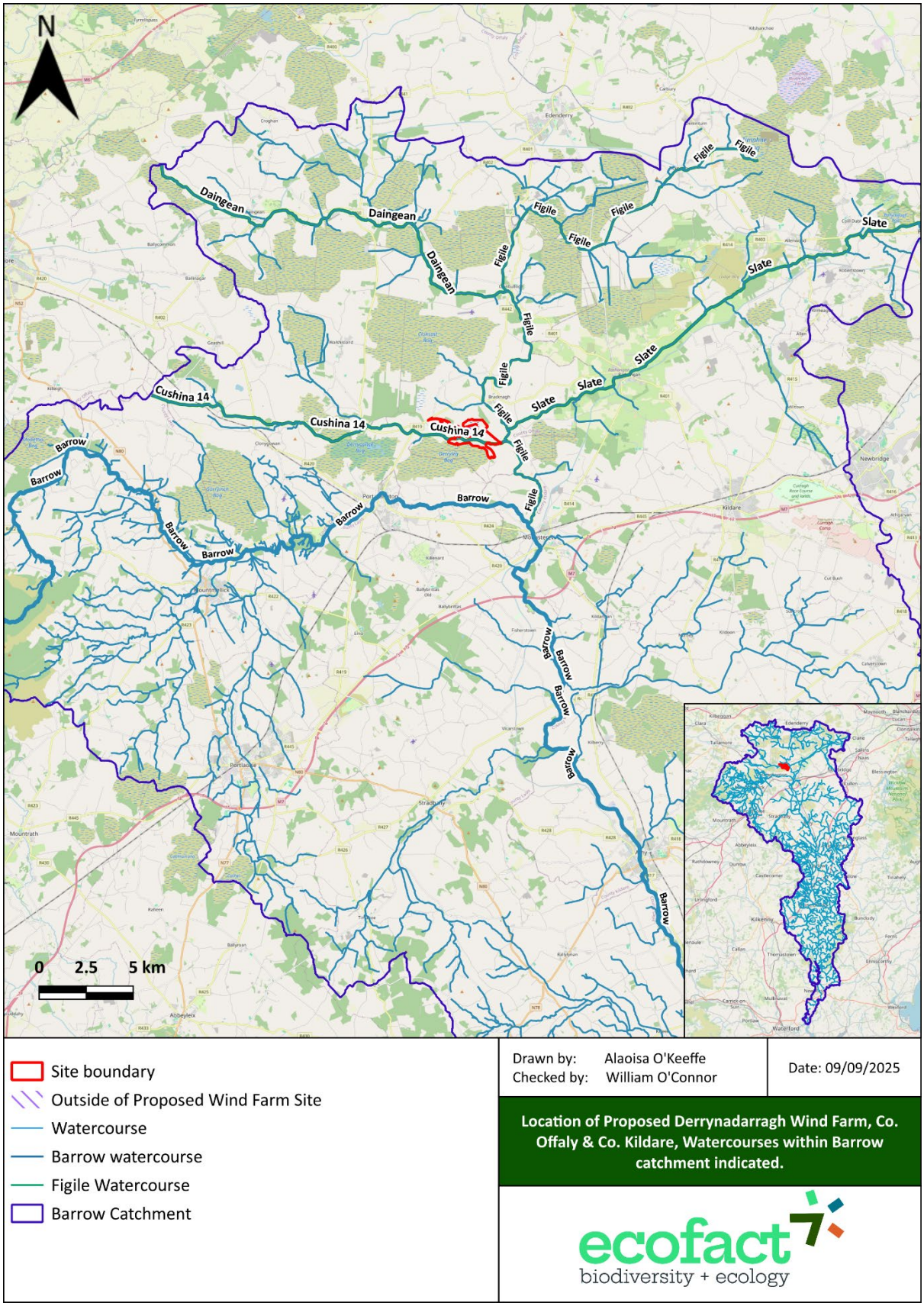



**Figure 4** Location of the proposed Derrynadarragh Wind Farm in relation to the River Barrow catchment.

**Table 3** Summary of the potential occurrence of aquatic qualifying interests of the River Barrow and River Nore SAC within the Figile sub-catchment.

| | Natura Code | Qualifying Interests | Occurrence |
|---|---|---|---|
| Habitats | 3260 | Water courses of plain to montane levels with the *Ranunculion fluitantis* and *Callitricho-Batrachion* vegetation | The main area of this habitat for which the SAC is designated is located in the Kings tributary of the River Nore. It is noted that the full distribution of this habitat in the SAC is not currently known (NPWS, 2011). However, this habitat occurs in areas of good water quality, the water quality in the Figile sub-catchment is not sufficient to support this habitat type and so it does not occur in these rivers. |
| Species | 1095 | Sea lamprey (*Petromyzon marinus*) | Range in the Barrow catchment is limited to the lower reaches due to barriers to migration – therefore is not present in these rivers of the Figile sub-catchment in the Upper Barrow catchment. |
| | 1096 | Brook lamprey (*Lampetra planeri*) | Widely distributed in the River Barrow and recorded in the River Figile at Cushaling in 2014 (Ecofact, 2015). |
| | 1099 | River lamprey (*Lampetra fluviatilis)* | The range of this species is mainly limited to downstream areas due to barriers to upstream migration and so is unlikely to be present in these rivers of the Figile sub-catchment in the Upper Barrow catchment. |
| | 1102 | Allis shad (*Alosa fallax*) | Impassable barrier at St. Mullins weir prevents this species from accessing these rivers of the Figile sub-catchment in the Upper Barrow catchment (NPWS, 2013). This species therefore would not occur in the Figile sub-catchment located in the Upper Barrow catchment. |
| | 1106 | Atlantic salmon (*Salmo salar)* | This species has not been recorded on the main River Figile in previous Ecofact surveys (Ecofact, 2015; Ecofact, 2020) but is likely to occur here as it is known to be present in the Figile sub-catchment. |
| | 1103 | Twaite shad (*Alosa alosa*) | Impassable barrier at St. Mullins weir prevents this species from accessing these rivers of the Figile sub-catchment in the Upper Barrow catchment (NPWS, 2013). This species therefore would not occur in the Figile sub-catchment located in the Upper Barrow catchment. |
| | 1092 * | White-clawed crayfish (*Austropotamobius pallipes*) | The Figile River has previously been considered important for this species (Ecofact 2014). Significant numbers were recorded at Cushaling Bridge in 2014. It is likely however that the Figile River population has since been impacted by Crayfish Plague as the invasive species was confirmed to be present in the River Slate in 2019. |
| | 1029 | Freshwater pearl mussel (*Margaritifera margaritifera*) | Freshwater pearl mussel populations recorded from the River Barrow sub-basin are restricted to three tributaries of the Barrow in Co. Carlow: the Aughavaud, Ballymurphy and Mountain Rivers.<br><br>The Figile River was surveyed by Moorkens in 1991 (Moorkens *et al.* 1992) and the species was not present. This species is not present in this watercourse. |

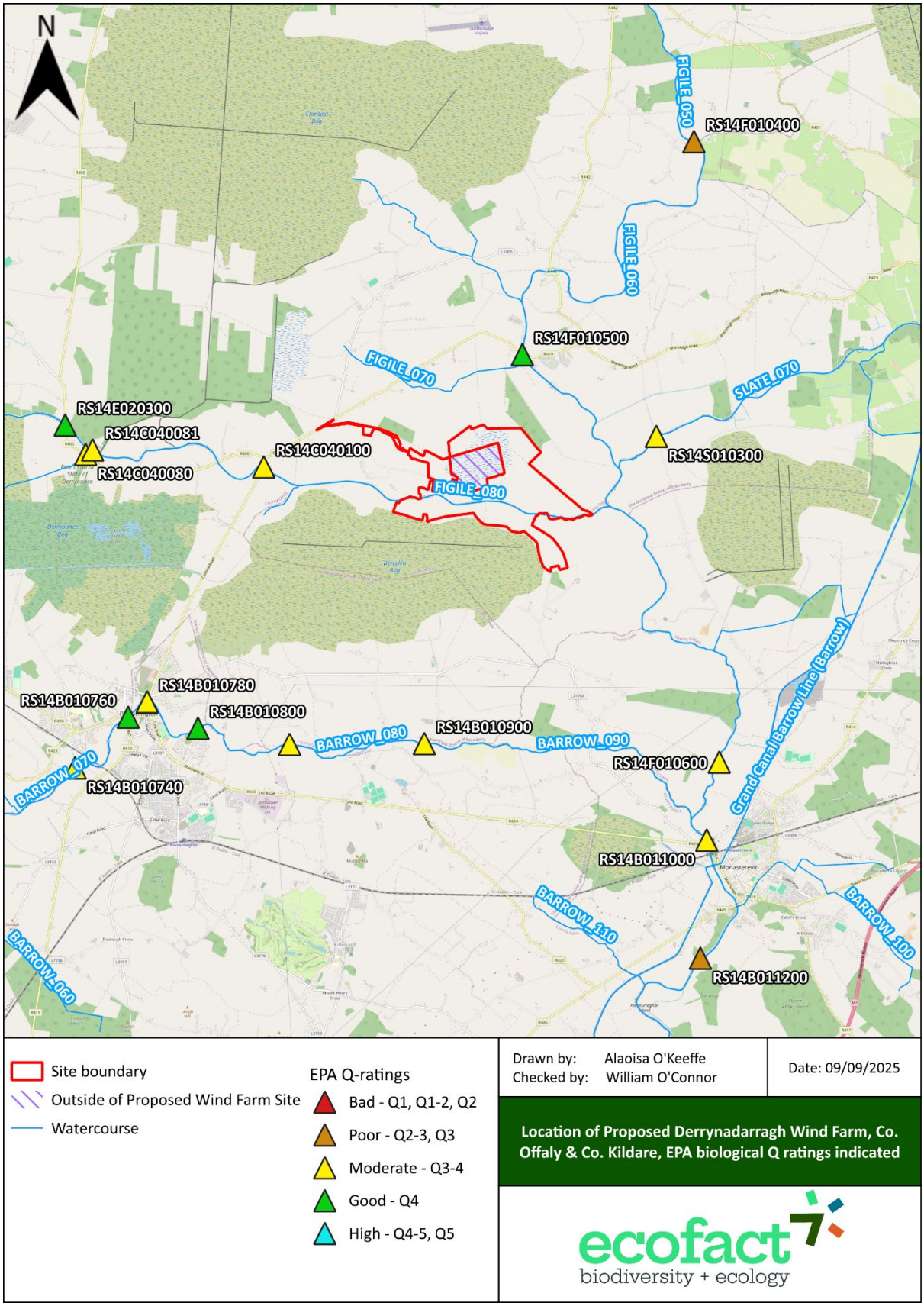



**Figure 5** EPA Monitoring Stations in Relation to proposed Derrynadarragh Wind Farm.

## 3.5 Baseline Aquatic Ecology Surveys 2021-2024

### *3.5.1 Site 1*

Site 1 is located on the 5th order River Barrow (EPA segment code: 14_1611). This site is located c. 390rm downstream of the River Figile confluence with the River Barrow and c. 5.5 km downstream from the Proposed Wind Farm Site boundary. This site is located within the River Barrow and River Nore SAC.

The river here was wide with a wetted width of c. 30m. The water depth at the site was also relatively high with a mean depth of 70cm and a maximum depth of over 1m. Habitat present was predominantly glide (80%), no riffle habitat and 10% pool habitat. The substrate at the site was dominated by fine material. Silt/mud increased towards the riverbanks. The gradient here was low and siltation was moderate. The channel has been drained and channelised. Filamentous algae were recorded here.

The fish community at this site was dominated by coarse fish. The most abundant species were Minnow, Dace, and Roach. Small numbers of Brown trout and lampreys were recorded at this site.

Salmon were not recorded in either the 2021 or 2024 survey. Salmon are present in this stretch but the nursery habitat here is suboptimal. Adult salmon pass through to spawn in areas upstream and only very low densities of parr would be expected, and these were not picked up in the surveys. White-clawed crayfish were present at the site until recently, but the population here has been impacted by crayfish plague. Crayfish were not recorded during the 2021 and 2024 surveys, but it is hoped the population will recover again in the future.

The site was assigned a Q-value of Q3-4 equivalent to WFD status “Moderate”. The EPA assigned the site a rating of Q3-4 also in 2023. The dominant fish are coarse fish species and moderate siltation along with filamentous algae were present.

### *3.5.2 Site 2*

Site 2 is located on the 4th order River Figile (EPA segment code: 14_10483). This site is located c. 600rm downstream of the Proposed Wind Farm Site.

The river here had a wetted width of 12m. The water depth at the site was on average 50cm. The riverbank here was 3m high. The level of instream vegetation at the site was c. 30%. Habitat present was predominantly glide (80%) with no riffle and 10% pool habitat. The substrate was predominantly sand/fine (50%) with lower levels of cobble (30%) and rock (20%). The gradient here was low and siltation was moderate. The channel has been drained and channelised.

The fish community recorded was again dominated by coarse fish species. The most abundant species was Minnow. Three-spined stickleback were recorded in small numbers. Small numbers of Brook lamprey were also present. Salmonids were recorded during the 2021 survey but not in the 2024 survey. This does not mean they were absent, but they are present in very low numbers in suboptimal habitat here and were not detected during the September 2024 survey. The river levels were slightly lower during the 2021 survey, and this may have affected sampling efficiency.

White-clawed crayfish were not recorded in either survey. White-clawed crayfish were present at the site until recently, but the population here has been impacted by crayfish plague (see Section 3.1.4 above).

The site was assigned a Q-value of Q3 equivalent to WFD status “Poor”. This rating is driven by the suboptimal habitat at the site. The dominant fish are coarse fish species and moderate siltation along with filamentous algae were present.

### *3.5.3 Site 3*

Site 3 is located on the 3rd order River Cushina (EPA segment code: 14_276) c. 50m downstream of the Proposed Wind Farm Site boundary. This site is located c. 250rm upstream of the river Cushina and River Figile confluence.

The river here is c. 8m wide. There is a mean depth of c. 30cm with a maximum of c. 50cm. The proportion of instream vegetation present was 35%. The dominant habitat here was glide. The substrate was predominantly cobble with lower levels of sand/fine and rock. The gradient here was low and siltation was moderate. Filamentous algae were present. The channel has been drained and channelised. The fish community here was again dominated by coarse fish. There were overall small numbers of salmonids and lampreys present. White-clawed crayfish were not recorded.

The site was assigned a Q-value of Q3 equivalent to WFD status “Poor”. This rating is driven by the suboptimal habitat at the site. The dominant fish are coarse fish species and moderate siltation along with filamentous algae were present.

### *3.5.4 Site 4*

Site 4 is located within the Proposed Wind Farm Site. This site is on the 3rd order River Cushina (EPA segment code: 14_276). This was located c. 1.7rkm upstream from survey Site 3.

The river at the site here is c.5m wide. The mean depth was c. 40 cm with a maximum depth of c. 70cm. The habitat here was 100% glide. The substrate was 100% sand/fine. The gradient here was low and siltation was moderate. Filamentous algae were present. The channel has been drained and channelised.

Minnow, Roach, Three-spined Stickleback, and Stone Loach were recorded at this site. This is very suboptimal habitat for salmonids and none were recorded in either survey. However, both salmon and trout are present in more suitable habitats on this waterbody. There were ongoing river works at this site when it was visited in September 2021. It is regularly dredged, and this further degrades the habitats present. Low densities of lampreys may be present, but they were not recorded. Juvenile lampreys are very vulnerable to river maintenance works.

The site was assigned a Q-value of Q3 equivalent to WFD status “Poor”. This rating is driven by the suboptimal habitat at the site. The dominant fish are coarse fish species and moderate siltation along with filamentous algae were present.

### *3.5.5 Site 5*

Site 5 is located on the 3rd order River Cushina (EPA segment code: 14_275). This site is located c. 1.8rkm upstream of the Proposed Wind Farm Site boundary. The site is located where the River Cushina crosses the R419 road.

The wetted width of the channel was c. 5m. The mean depth was c. 35cm with a maximum of c. 70cm. The coverage of instream vegetation present was c. 50%. The dominant habitat here was glide (70%)

followed by pool (20%) and riffle (10%). The substrate was predominantly sand/fine (40%), with equal proportions of rock (30%) and cobble (30%). The gradient here was low and siltation was moderate. Filamentous algae were present. The channel has been drained and channelised. There were ongoing river works at this site when it was visited in September 2021.

The fish community at this site is again dominated by coarse fish species. Gudgeon were recorded here in the 2024 survey but were not detected in the previous survey. Minnow and Dace were the most common species. Salmon, Brown Trout, Brook lamprey were recorded. However, the habitats here are very suboptimal for salmonids and lampreys.

The site was assigned a Q-value of Q3-4 equivalent to WFD status “Moderate”. The dominant fish are coarse fish species and moderate siltation along with filamentous algae were present.

### *3.5.6 Site 6*

Site 6 is located on the River Figile (EPA segment code: 14_10514). This site is located where the river crossed the regional R419 road. This site is located c. 3.5rkm upstream from Site 2.

The wetted width of this site was c.10m with a maximum depth of 80cm. The coverage of instream vegetation was 40%. The dominant habitat here was glide (90%) followed by riffle (10%). The substrate was predominantly sand/fine (40%), with equal proportions of rock (30%) and cobble (30%). The gradient here was low and siltation was moderate. Filamentous algae were present. The channel has been drained and channelised. River works were ongoing downstream of the site when it was surveyed in 2021.

The most abundant species were Minnow and Three-spined stickleback. Eel, Salmon, Brown Trout, Dace, Stone Loach and Pike were also recorded. Small numbers of salmonids and lampreys were present. The habitats here are very suboptimal for these species.

The site was assigned a Q-value of Q3-4 equivalent to WFD status “Moderate”. The dominant fish are coarse fish species and moderate siltation along with filamentous algae were present.

**Table 4** Summary of the results of the aquatic ecology surveys completed for the proposed Derrynadarragh Wind Farm development.

| Site No. | Watercourse name | Biological Water quality | Aquatic habitat | Fish population | Rare / notable species | Overall evaluation |
|---|---|---|---|---|---|---|
| 1 | River Barrow | Q3-4 | Drained and channelised. Gravel substrate with muddy sides. | Fish community dominated by coarse fish. Small numbers of salmonids and lampreys also present. | Brook Lamprey Brown Trout White-clawed crayfish were present until recently. Salmon likely to be present. | Moderate status channel dominated by coarse fish species. |
| 2 | River Figile | Q3 | Drained and channelised. Substrate dominated by silt/mud. | Fish community dominated by coarse fish. Small numbers of salmonids and lampreys also present. | Brook Lamprey, Brown Trout, Salmon. White-clawed crayfish were present until recently | Moderate status channel dominated by coarse fish species, but salmonids and lampreys present in low numbers. |
| 3 | River Cushina | Q3 | Drained and channelised. Substrate dominated by silt/mud. | Fish community dominated by coarse fish. Small numbers of salmonids and lampreys also present. | Brook Lamprey, Brown Trout, Salmon. | Moderate status channel dominated by coarse fish species, but salmonids and lampreys present in low numbers. |
| 4 | River Cushina | Q3 | Drained and channelised. Substrate dominated by silt/mud. Ongoing river works. | Minnows and Three spined sticklebacks recorded in the survey. However, some salmonids and lampreys likely to be present and occur upstream. | None | Moderate status channel. Modified and ongoing river works. |
| 5 | River Cushina | Q3-4 | Drained and channelised. Ongoing river works. | Fish community dominated by coarse fish. Small numbers of salmonids and lampreys also present. | Brook Lamprey, Brown Trout, Salmon. | Moderate status channel dominated by coarse fish species, but salmonids and lampreys present in low numbers. |
| 6 | River Figile | Q3-4 | Drained and channelised. Ongoing river works. | Fish community dominated by coarse fish. Small numbers of salmonids and lampreys also present. | Brook Lamprey, Brown Trout, Salmon. | Moderate status channel dominated by coarse fish species, but salmonids and lampreys present in low numbers. |

# 5. CONCLUSION

The overall assessment of the aquatic habitats within and adjacent to the site have been assessed to be of moderate quality, with Q-Values of 3 and 3-4 recorded. The fish community is generally dominated by coarse fish with small numbers of salmonids and lampreys also present in some of the survey sites. The river channels, at least at the points surveyed, have been, and continue to be, modified through dredging and channelisation.

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## PLATES



**Plate 1** The River Barrow downstream of the River Figile confluence (Site 1) during September 2024.



**Plate 2** The River Cushina at Site 3, September 2024.



**Plate 3** The River Cushina at Site 4, September 2024.



**Plate 4** The River Cushina at Site 5, September 2024.



**Plate 5** Eutrophication at Site 6 on the River Figile, September 2024.



**Plate 6** Drainage maintenance works on the River Cushina between Sites 4 and 5 (September 2021).



**Plate 7** Electrical fishing survey at Site 6 on the River Figile, September 2024.




**Plate 8** Brown trout (top), Dace (centre) and Roach from Site 1 The fish community at this site was dominated by coarse fish species. However, juvenile trout and salmon were also present.

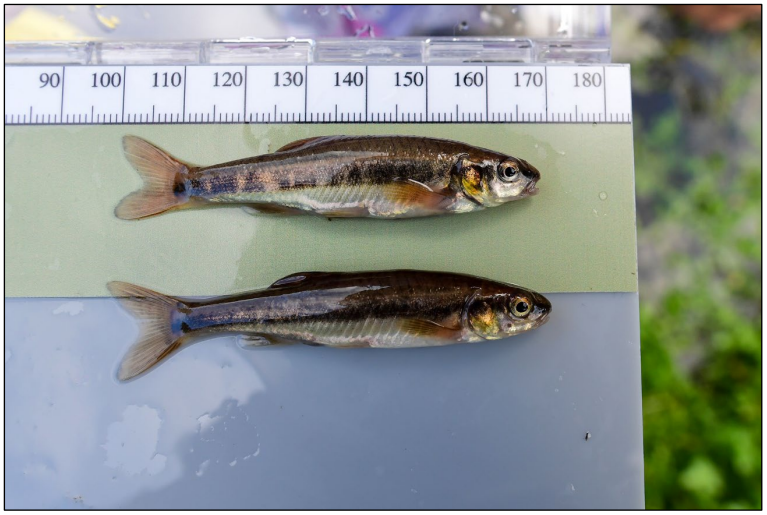



**Plate 9** Minnows from the River Cushina at Site 3.



**Plate 10** Juvenile Pike from the Site 6 on the River Figile, September 2024.



**Plate 11** Stone Loach from the River Cushina at Site 5, September 2024.




**Plate 12** Juvenile salmon (two age classes) from the River Cushina, at Site 5.




**Plate 13** Pike (top), Dace (centre), and Gudgeon from Site 6 on the River Figile.




**Plate 14** Juvenile Brook lampreys from at Site 6 on the River Figile.



**Plate 15** Juvenile Brook lampreys from at Site 6 on the River Figile, September 2024.

# APPENDIX 1 RESULTSI (2021-2024 SURVEYS)

**Table A.1.1** General characteristics of the 6 survey sites.

| Site | Watercourse Name | Wetted width (m) | Mean Depth (cm) | Max Depth (cm) | Instream vegetation (%) | Bank Height (m) |
|---|---|---|---|---|---|---|
| 1 | River Barrow | 30 | 80 | 100+ | 20 | 3 |
| 2 | River Figile | 12 | 50 | 100+ | 30 | 3 |
| 3 | River Cushina | 8 | 40 | 80 | 35 | 1 |
| 4 | River Cushina | 5 | 40 | 70 | 90 | 2 |
| 5 | River Cushina | 4 | 35 | 60 | 50 | 2 |
| 6 | River Figile | 8 | 35 | 80 | 40 | 2 |

**Table A.1.2** Flow and substrate characteristics of the 6 survey sites.

| Site | Watercourse Name | Habitat | Riffle (%) | Glide (%) | Pool (%) | Rock (%) | Cobble (%) | Sand/Fine (%) |
|---|---|---|---|---|---|---|---|---|
| 1 | River Barrow | FW2 | 0 | 80 | 20 | 10 | 20 | 70 |
| 2 | River Figile | FW2 | 0 | 80 | 20 | 20 | 30 | 50 |
| 3 | River Cushina | FW2 | 10 | 70 | 20 | 20 | 60 | 20 |
| 4 | River Cushina | FW2 | 0 | 100 | 0 | 0 | 0 | 100 |
| 5 | River Cushina | FW2 | 10 | 80 | 10 | 30 | 30 | 40 |
| 6 | River Figile | FW2 | 10 | 90 | 0 | 40 | 40 | 20 |

**Table A.1.3** Results of the River Corridor Survey (RHS) Assessments at the 6 survey sites.

| Site | EPA Code | Drained (Y/N) | Habitat | Gradient (Low/Med/High) | Siltation (Heavy/Moderate/Normal/Free) | Filamentous algae (Y/N) | Eroding Banks (Y/N) |
|---|---|---|---|---|---|---|---|
| 1 | 14B01 | Y | FW2 | L | M | Y | N |
| 2 | 14F01 | Y | FW2 | L | M | Y | N |
| 3 | 14C04 | Y | FW2 | L | M | Y | N |
| 4 | 14C04 | Y | FW2 | L | M | Y | N |
| 5 | 14C04 | Y | FW2 | L | M | Y | N |
| 6 | 14F01 | Y | FW2 | L | M | Y | N |

**Table A.1.4** Results of the aquatic ecology habitat assessments at the 6 survey sites.

| Site | Watercourse Name | Salmonid Nursery(Y/N) | Salmonid Fishery (Y/N) | Coarse Nursery (Y/N) | Coarse Fishery (Y/N) | Salmon (P/A) | Trout (P/A) | Coarse Fish (P/A) | Eel (P/A) | Lamprey Habitat (P/A) | Lamprey (Y/N) | Crayfish (P/A) | FWPM (P/A) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | River Barrow | N | N | Y | Y | A | P | P | A | P | Y | A* | A |
| 2 | River Figile | N | N | Y | N | P | P | P | A | P | Y | A* | A |
| 3 | River Cushina | N | N | Y | N | A | P | P | A | P | Y | A | A |
| 4 | River Cushina | N | N | Y | N | A | A | P | A | P | A | A | A |
| 5 | River Cushina | Y | N | Y | N | P | P | P | A | P | Y | A | A |
| 6 | River Figile | Y | N | Y | N | P | P | P | P | P | Y | A* | A |

Y = Yes, N= No, P = Present, A = Absent, L = not recorded but likely to occur in the waterbody

**A.1.5** Biological water quality and WFD status at the 6 aquatic survey sites (2024 results).

| Site | Watercourse Name | EPA Code | EPA Q Value | Ecofact Q Value | WFD Status | WFD Waterbody Status |
|---|---|---|---|---|---|---|
| 1 | River Barrow | 14B01 | Q4 | Q3-4 | Moderate | Good |
| 2 | River Figile | 14F01 | - | Q3 | Poor | - |
| 3 | River Cushina | 14C04 | - | Q3 | Poor | - |
| 4 | River Cushina | 14C04 | - | Q3 | Poor | - |
| 5 | River Cushina | 14C04 | Q4 | Q3-4 | Moderate | Good |
| 6 | River Figile | 14F01 | Q3-4 | Q3-4 | Moderate | Moderate |

**Table A.1.6** Native species abundance recorded at the 6 survey sites (summary of 2021-2024 results).

| Site | Watercourse Name | Salmon | Brown Trout | Eel | Brook Lamprey | Three-spined stickleback |
|---|---|---|---|---|---|---|
| 1 | River Barrow | | * | | * | |
| 2 | River Figile | * | * | | ** | |
| 3 | River Cushina | | * | | ** | |
| 4 | River Cushina | | | | | |
| 5 | River Cushina | * | * | | * | |
| 6 | River Figile | ** | * | ** | * | |

*Present, **Small Numbers, ***Common, ****Numerous

**Table A.1.7** Non-native species abundance recorded at the 6 survey sites (summary of 2021-2024 results).

| Site | Watercourse Name | Minnow | Stone Loach | Dace | Roach | Pike | Perch | Gudgeon |
|---|---|---|---|---|---|---|---|---|
| 1 | River Barrow | *** | * | *** | *** | * | * | |
| 2 | River Figile | **** | * | * | * | * | | |
| 3 | River Cushina | ** | | | | | | |
| 4 | River Cushina | * | | | | | | |
| 5 | River Cushina | ** | *** | ** | | * | | |
| 6 | River Figile | *** | * | ** | | * | | ** |

*Present, **Small Numbers, ***Common, ****Numerous

**Table A.1.8** Results of the 10-minute electrical fishing surveys at the 6 survey sites (CPUE fish/min). Results for native species the September 2024 survey.

| Site | Watercourse Name | Salmon | Brown Trout | Eel | Three-spined stickleback |
|---|---|---|---|---|---|
| 1 | River Barrow | 0.00 | 0.00 | 0.10 | 0.20 |
| 2 | River Figile | 0.00 | 0.00 | 0.00 | 0.00 |
| 3 | River Cushina | 0.00 | 0.00 | 0.00 | 0.60 |
| 4 | River Cushina | 0.00 | 0.00 | 0.00 | 0.50 |
| 5 | River Cushina | 0.60 | 0.40 | 0.00 | 0.50 |
| 6 | River Figile | 0.20 | 0.40 | 0.20 | 0.20 |

**Table A.1.9** Results of the 10-minute electrical fishing surveys at the 6 survey sites (CPUE fish/min). Results for non-native species the September 2024 survey.

| Site | Watercourse Name | Stone Loach | Dace | Roach | Pike | Perch | Gudgeon |
|---|---|---|---|---|---|---|---|
| 1 | River Barrow | 0.00 | 0.60 | 0.20 | 0.00 | 0.00 | 0.00 |
| 2 | River Figile | 0.00 | 1.00 | 0.20 | 0.10 | 0.00 | 0.00 |
| 3 | River Cushina | 0.00 | 0.00 | 1.30 | 0.00 | 0.00 | 0.00 |
| 4 | River Cushina | 0.00 | 0.00 | 1.20 | 0.00 | 0.00 | 0.00 |
| 5 | River Cushina | 0.20 | 0.60 | 0.00 | 0.10 | 0.00 | 0.00 |
| 6 | River Figile | 0.10 | 0.80 | 1.00 | 0.20 | 0.10 | 0.40 |

**Table A.1.10** Results of the 3-minute lamprey surveys at the 6 survey sites (CPUE fish/min). Results for the September 2024 survey.

| Site | Watercourse Name | Potential lamprey nursery habitat present (Y/N) | Potential lamprey Spawning habitat present (Y/N) | CPUE |
|---|---|---|---|---|
| 1 | River Barrow | Y | N | 1.67 |
| 2 | River Figile | Y | N | 0.00 |
| 3 | River Cushina | Y | N | 1.33 |
| 4 | River Cushina | Y | N | 0.00 |
| 5 | River Cushina | Y | Y | 3.00 |
| 6 | River Figile | Y | Y | 2.67 |

**Table A.1.11** Results of the 5-minute electrical fishing surveys at the 6 survey sites (CPUE fish/min). Results for the September 2021 survey.

| Site | Watercourse Name | Salmon | Brown Trout | Eel | Minnow | Three-spined stickleback | Stone Loach | Dace | Roach | Pike | Perch |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | River Barrow | 0.00 | 0.20 | 0.00 | 0.00 | 3.00 | 1.00 | 0.20 | 1.20 | 2.00 | 0.20 |
| 2 | River Figile | 0.40 | 0.40 | 0.00 | 0.00 | 4.00 | 2.00 | 0.20 | 0.20 | 0.20 | 0.40 |
| 3 | River Cushina | 0.00 | 0.20 | 0.00 | 0.00 | 3.00 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 4 | River Cushina | 0.00 | 0.00 | 0.00 | 0.00 | 1.00 | 0.20 | 0.00 | 0.00 | 0.00 | 0.00 |
| 5 | River Cushina | 0.60 | 1.00 | 0.00 | 0.00 | 4.00 | 0.80 | 0.40 | 0.80 | 0.00 | 0.20 |
| 6 | River Figile | 0.80 | 0.60 | 0.80 | 0.80 | 3.00 | 2.80 | 0.20 | 0.60 | 0.00 | 0.20 |

*Present, **Small Numbers, ***Common, ****Numerous

**Table A.1.12** Results of the 3-minute lamprey surveys at the 6 survey sites (CPUE fish/min). Results for the September 2021 survey.

| Site | Watercourse Name | Potential lamprey habitat present (Y/N) | Brook Lamprey | CPUE |
|---|---|---|---|---|
| 1 | River Barrow | Y | 3 | 1.00 |
| 2 | River Figile | Y | 5 | 1.67 |
| 3 | River Cushina | Y | 8 | 2.67 |
| 4 | River Cushina | Y | 0 | 0.00 |
| 5 | River Cushina | Y | 6 | 2.00 |
| 6 | River Figile | Y | 3 | 1.00 |

# Appendix 5

# EIAR Chapter 9 - Biodiversity

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 'Wind Farm' is referred to, this relates to all wind farm infrastructure as detailed in Chapter 2.
- 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 wind turbine specifications with a hub height of 105 m and a rotor diameter of 162 m with a tip height of 187 m.

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.

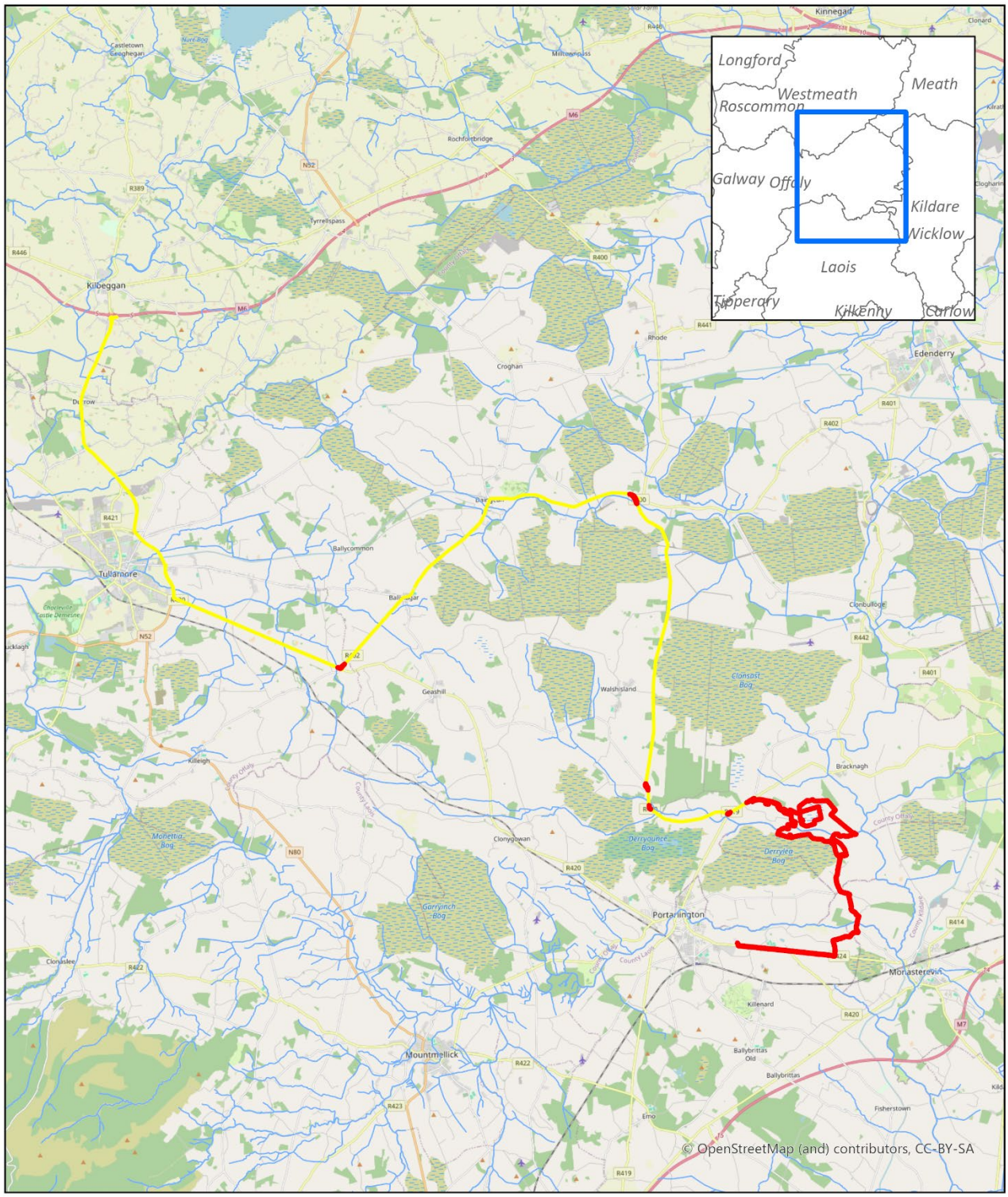



**Figure 9-1:** Map illustrating the location of the Proposed Site, underground grid connection route (GCR) and turbine delivery route (TDR).

## 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.<br><br>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.<br><br>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.<br><br>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.<br><br>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:<br>• To detail the mitigation measures that might be needed for bats and post construction monitoring<br>• Peatland Habitats – address potential air quality impacts during construction<br>• Ensure appropriate surveys completed and mitigation included e.g. pine marten, red squirrel, badger, otter. | Addressed in Sections:<br>• 9.14<br>• 9.13.1.2<br>• 9.5.2.2<br>• 9.5.2.3 and<br>• 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;<br><br>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; Derrylea Road; L71764; 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 5 no. crossing points comprising 4 no. watercourse crossings and one dry stone arch bridge crossing at a disused canal. There will be 4 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.<br><br>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.<br><br>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.<br><br>**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.<br><br>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.<br><br>**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*.<br><br>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.<br><br>**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.<br><br>**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.<br><br>**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.<br><br>**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.<br><br>This NHA is not linked hydrologically to the Site and no source-pathway-receptor route for indirect effects was identified.<br><br>**This NHA is not considered to be within the Zone of Likely Impact and no further assessment is required.** |

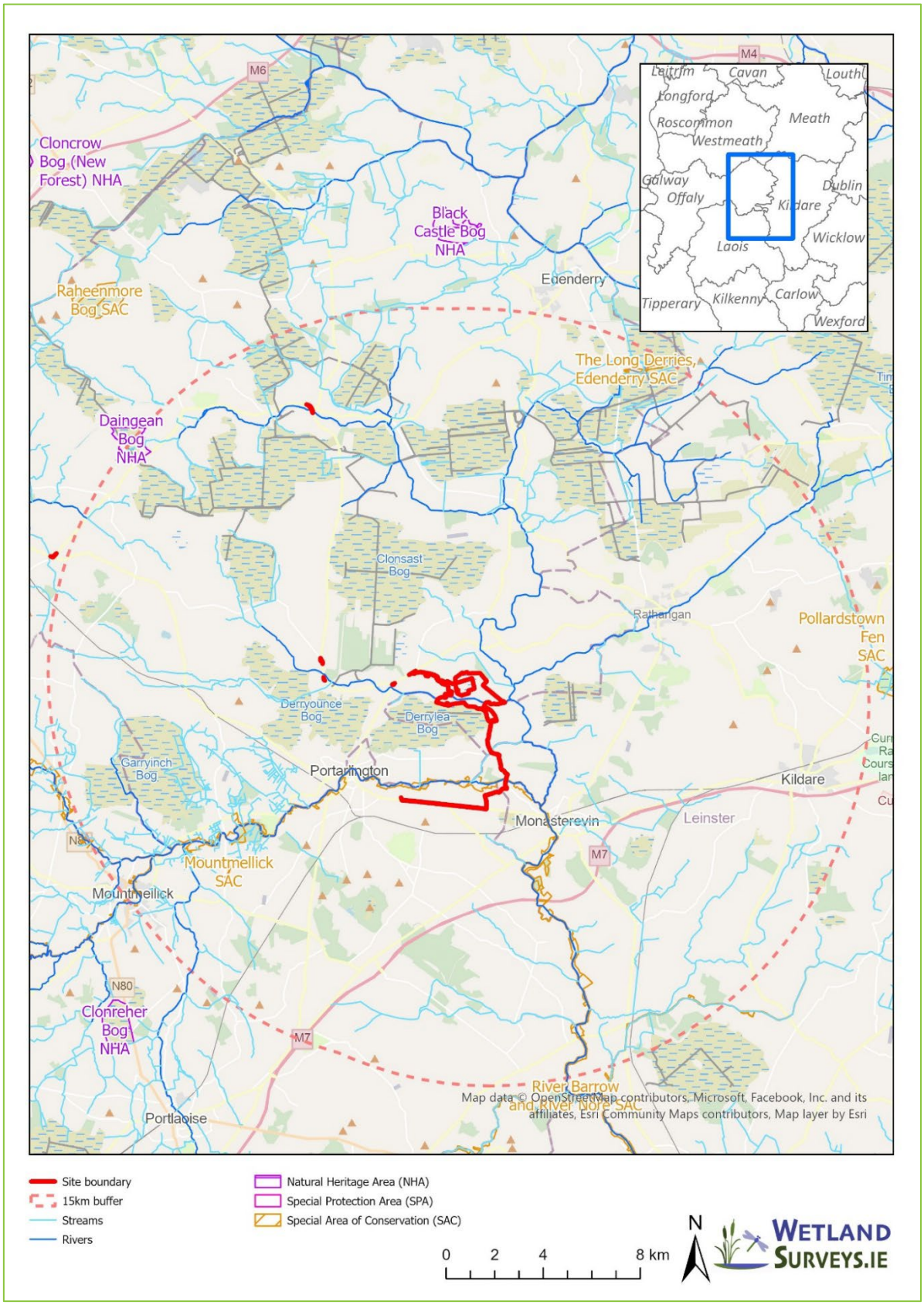



**Figure 9-2: Map of Designated Sites for conservation within 15km of the Proposed Wind Farm at Derrynadarragh**

## 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.<br>Exposed gravel (ED1).<br><br>Hedgerow (WL1) Hawthorn, Alder and Ash. | Local Importance (Lower Value)<br><br>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).<br>Buildings and artificial surfaces (BL3)<br>Treeline (WL2). Copper Beech, New Zealand Flax, Poplar, Hawthorn, Birch. | Local Importance (Lower Value)<br><br>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.<br>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)<br><br>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.<br>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.<br>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.<br>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).<br><br>Treeline (WL2) of Willow, Hawthorn and Sycamore.<br>Drainage Ditch (FW4) dry at time of survey with Horsetail. | BC1: Local Importance (Lower Value)<br><br>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.<br>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.**

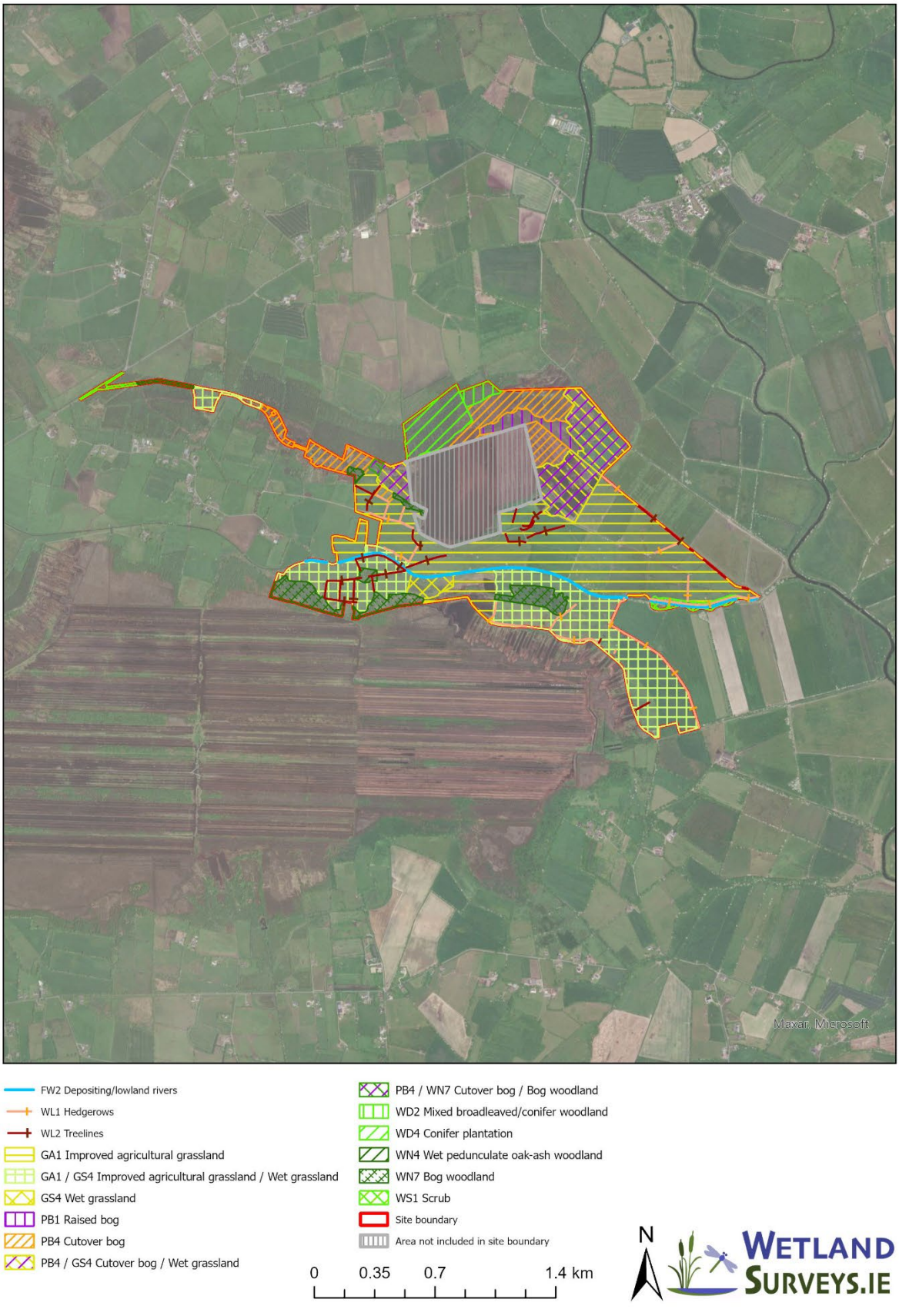



**Figure 9-11: Habitat map of the Proposed Development Site at Derrynadarragh.**

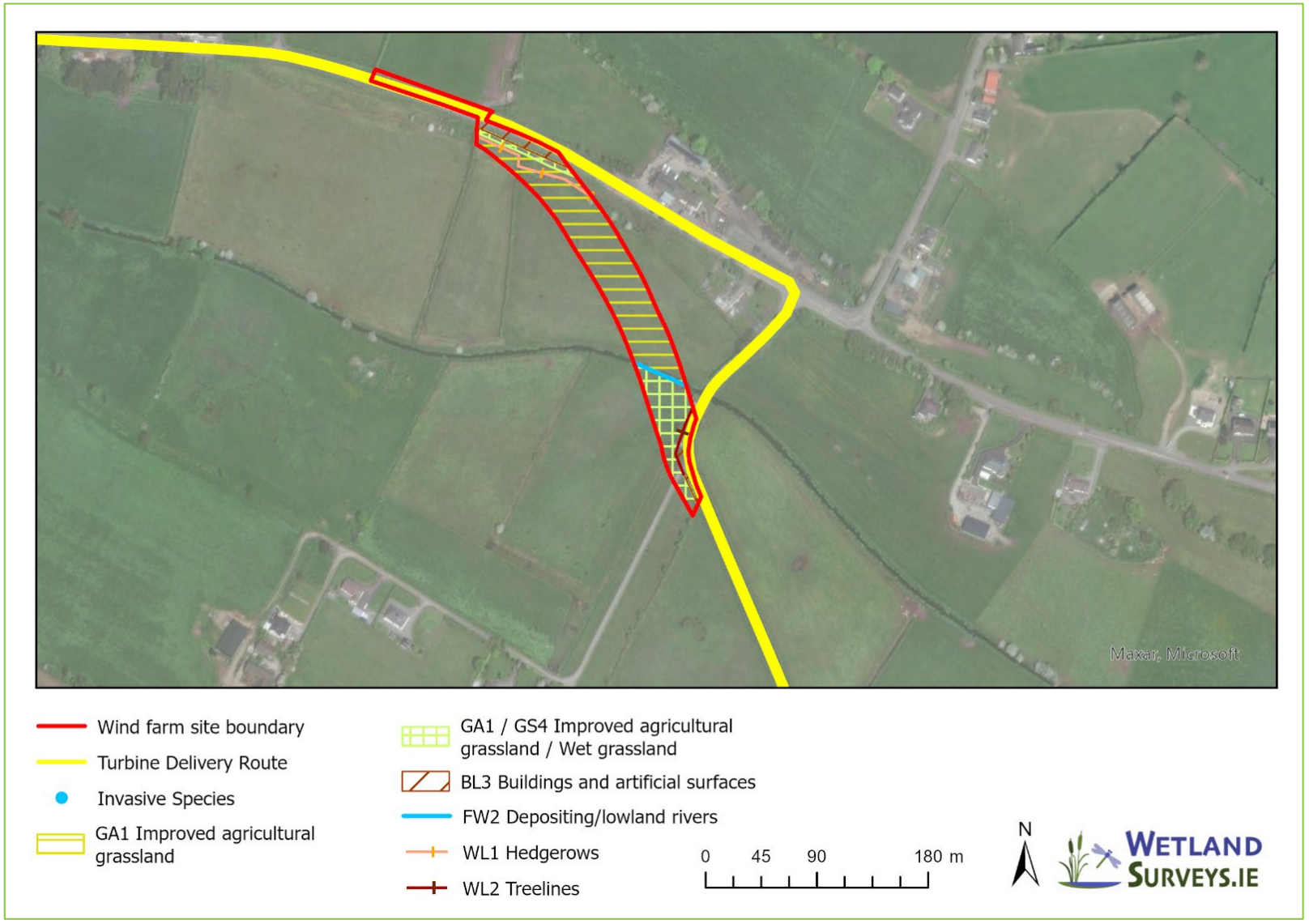



**Figure 9-12: Habitat map of TDR Node 29/30 at proposed bridge crossing of the Philipstown River**

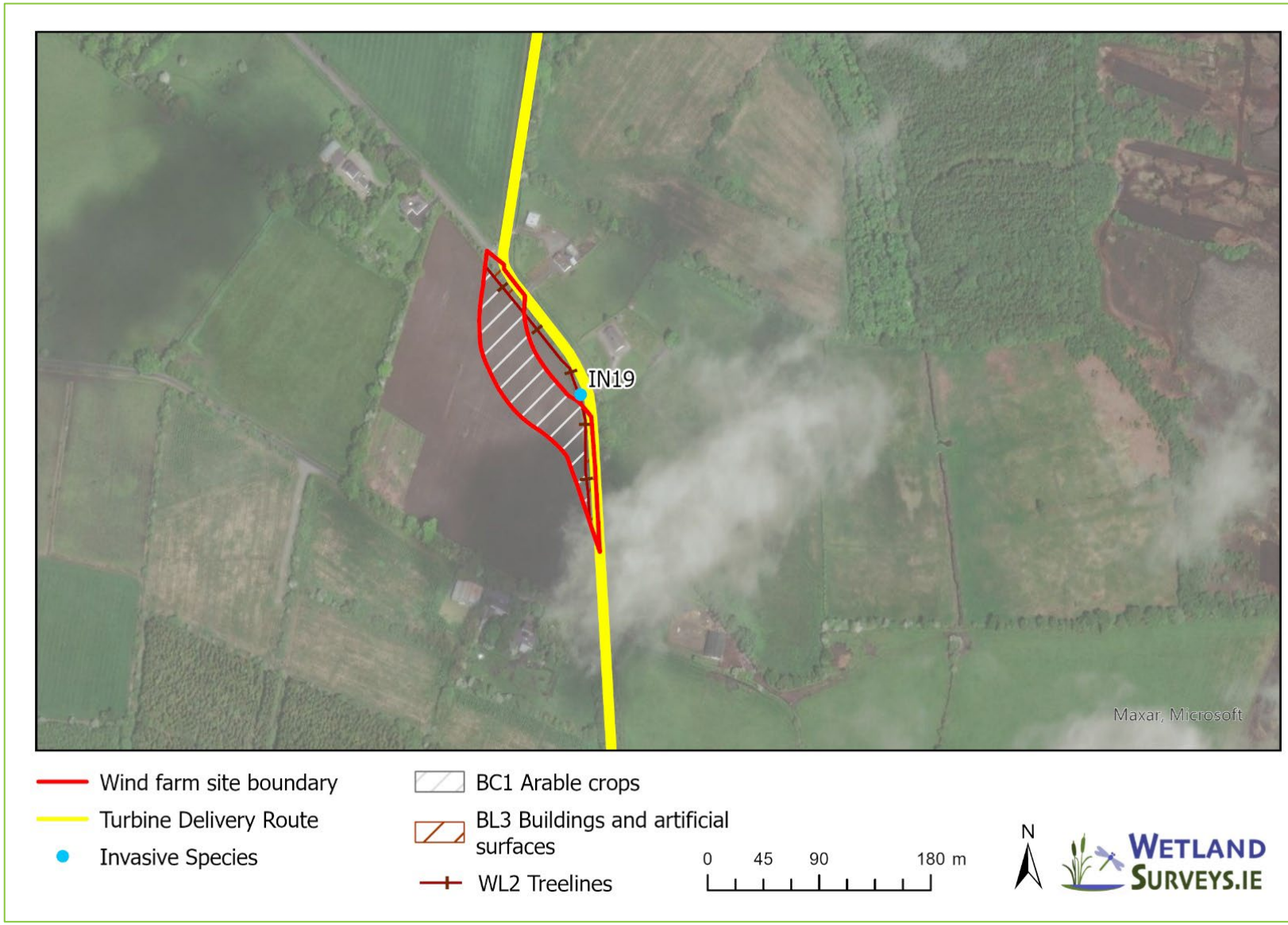



**Figure 9-13: Habitat map at TDR Node 35/36 where new section of road is proposed.**

### 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.

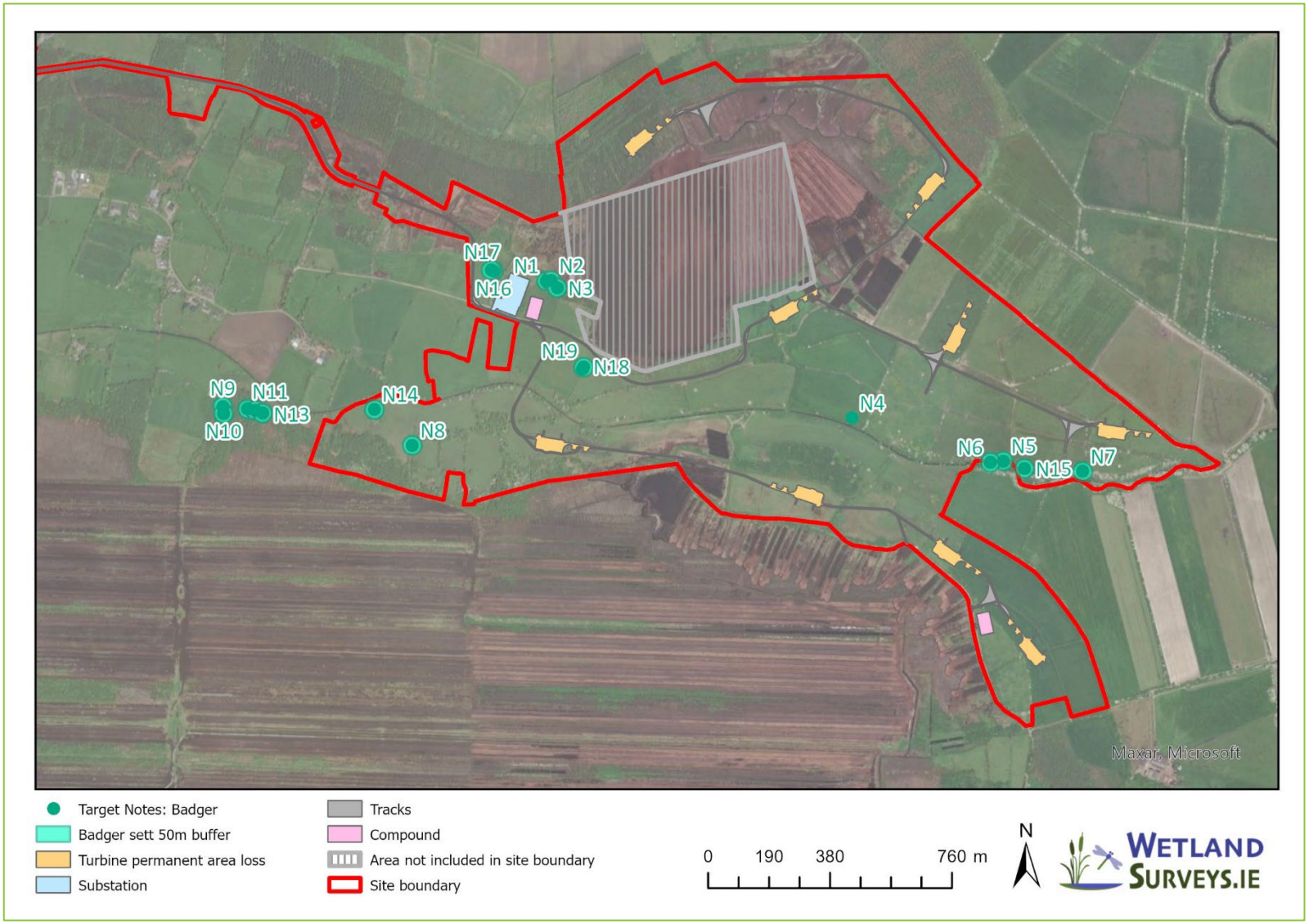



**Figure 9-14: Map showing locations of observations of evidence of Badgers. cf. Table 9-11**

**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.

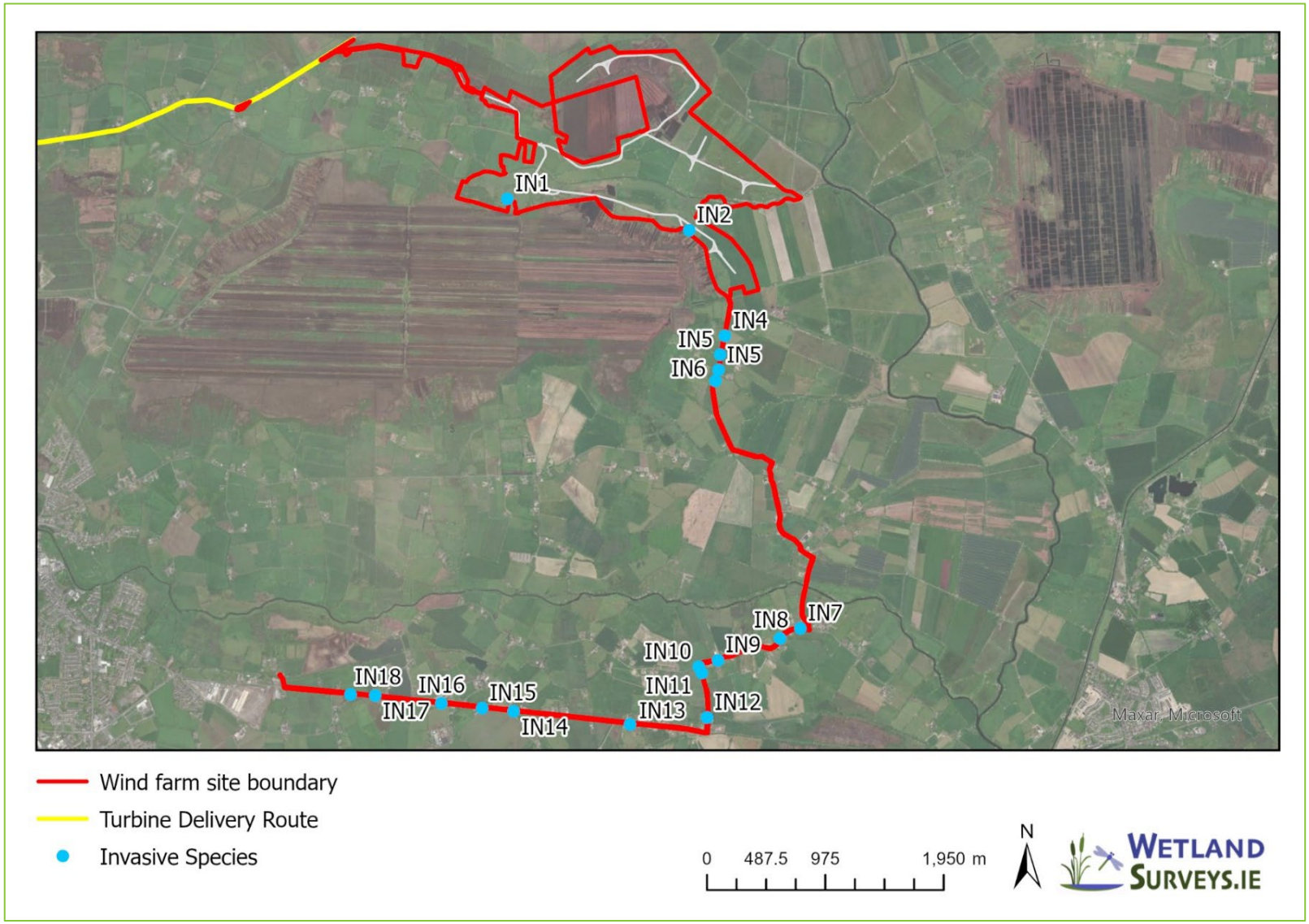



**Figure 9-16: Map of location of invasive species within Site and along GCR**

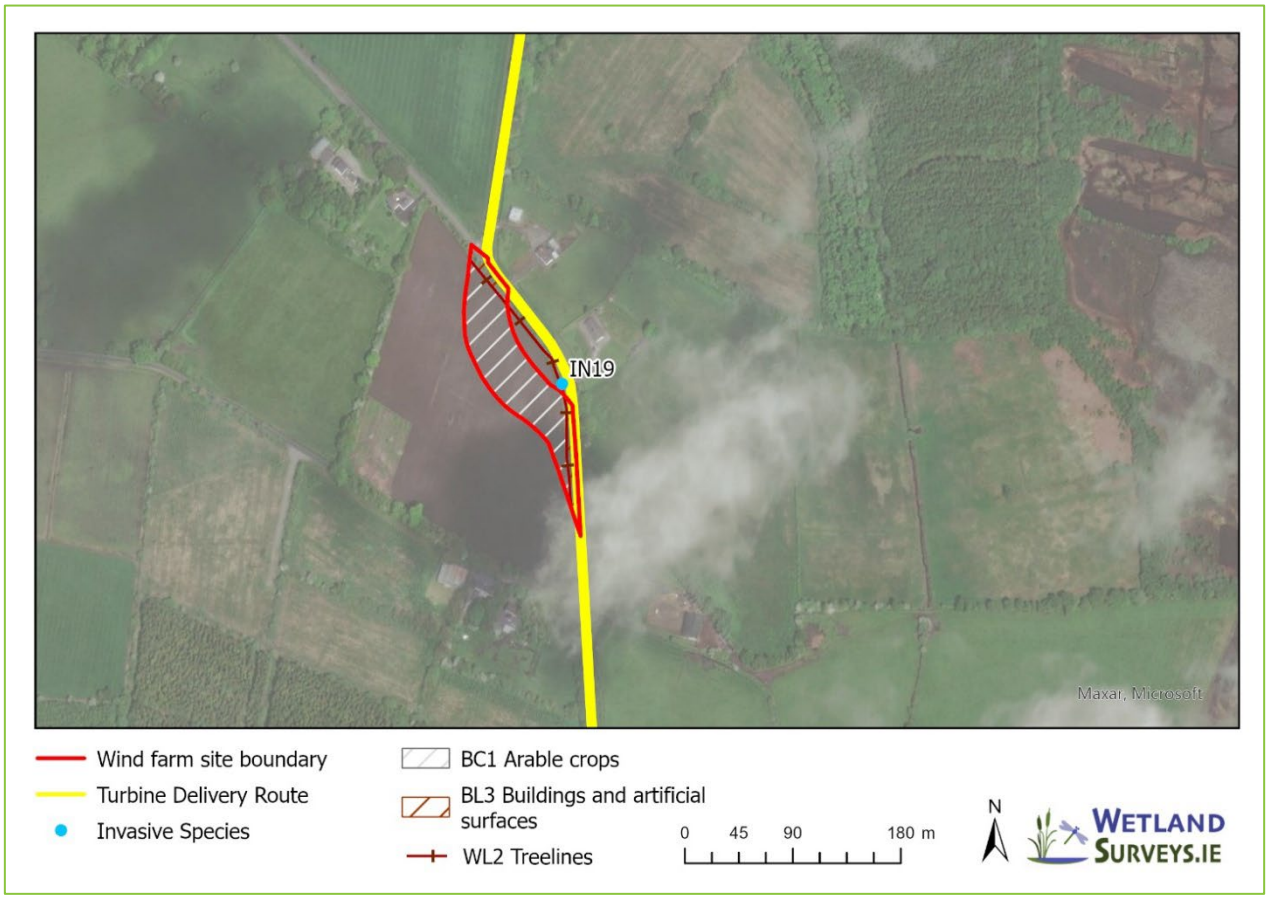



**Figure 9-17: Map showing location of invasive species in relation to proposed TDR accommodation works at Node 35/36.**

**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**<br><br>The following Nationally designated sites have connectivity to the Proposed Development and have been identified as being within the likely Zone of Impact:<br><br>o The Grand Canal pNHA (002104)<br><br>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**<br><br>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.<br><br>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)**<br><br>**Wet Grassland (GS4)**<br><br>**Improved Agricultural Grassland/Dry Calcareous Grassland mosaic (GA1/GS1)**<br><br>**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)**<br><br>**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)***<br><br>***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)***<br><br>***Halictus (Seladonia) tumulorum***<br><br>***Gooden's Nomad Bee (Nomada goodeniana)***<br><br>***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

- Construction of 1 no. permanent onsite 110kV TSO electrical substation and associated compound including:
  - Welfare facilities;
  - TSO control building
  - Electrical infrastructure;
  - Parking;
  - Wastewater holding tank;
  - 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 5 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; Derrylea Road; L71764; 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.

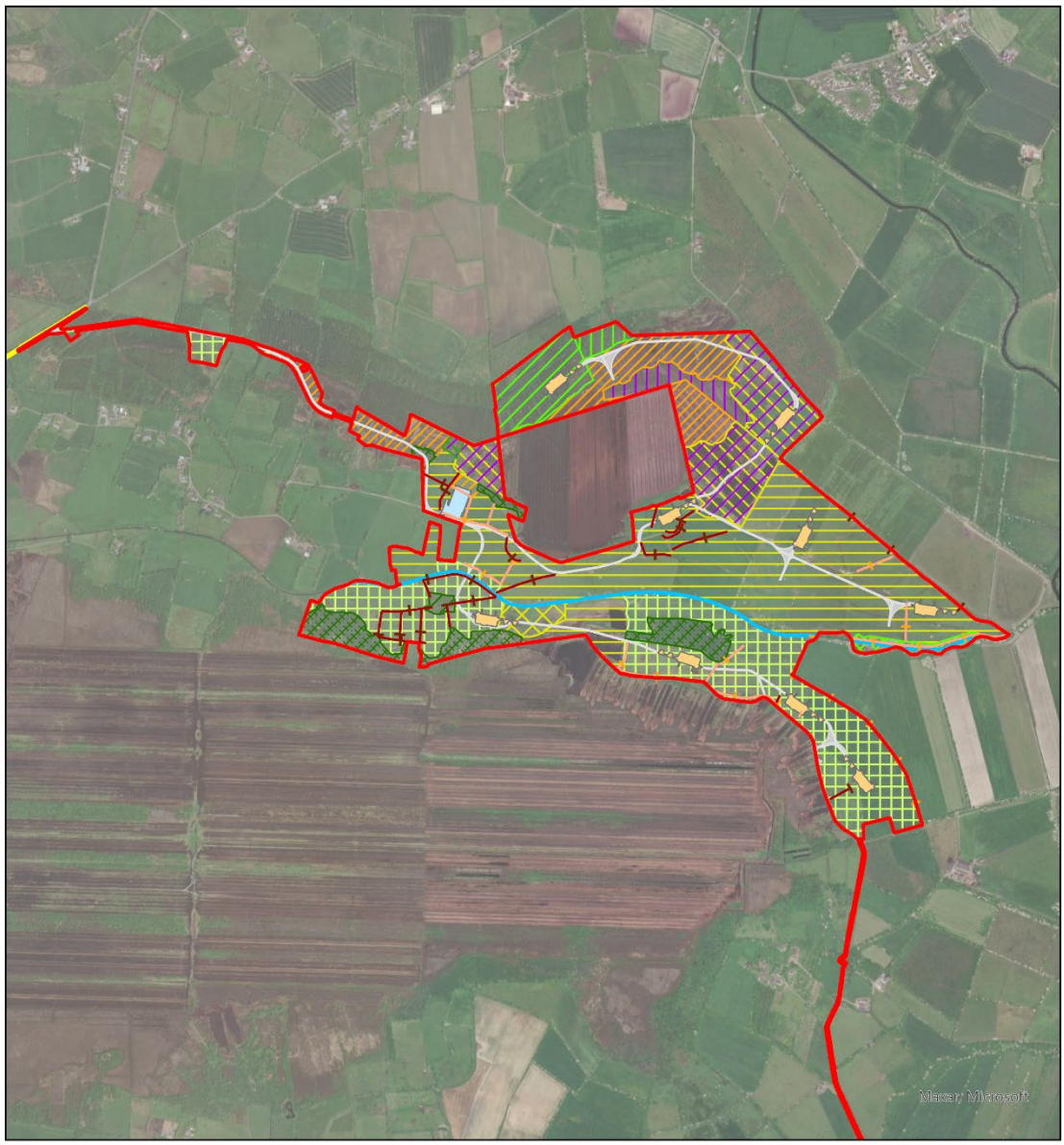



**Figure 9-18: Map showing habitats of Site with main infrastructure of the Proposed Development**

### 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.<br><br>Indirect air pollution effects were assessed to not to be significant. | ***Short-term adverse, likely significant effects.***<br><br>***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.<br><br>Indirect air pollution effects were assessed to not to be significant. | ***Short-term adverse, likely significant effects.***<br><br>***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.<br><br>Indirect air pollution effects were assessed to not to be significant. | ***No direct likely significant effects.***<br><br>***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.<br><br>Indirect air pollution effects were assessed to not to be significant. | ***No direct likely significant effects.***<br><br>***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.<br><br>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.***<br><br>***Indirect effects short-term local adverse, likely not significant.*** | No |
| **Hedgerows (WL1)**<br><br>**Treelines (WL2)** | Direct habitat loss (approx. 887m WL1 and 524m WL2).<br><br>Disturbance and habitat fragmentation will occur.<br><br>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.***<br><br>Direct disturbance will result in ***short-term adverse, likely insignificant effects***<br><br>Habitat fragmentation will result in ***long-term adverse, likely moderate effects.***<br><br>***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.<br><br>Indirect air pollution effects were assessed to not to be significant. | Habitat loss, fragmentation and disturbance will have ***long-term adverse, likely slight effects.***<br><br>***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.<br><br>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.***<br><br>***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.<br><br>Disturbance from artificial lighting. Will largely avoid bats due to working hours being predominantly during daylight hours during active bat season.<br><br>Indirect air pollution effects were assessed to not to be significant. | Habitat loss will result in ***long-term localised adverse, likely moderate effects***<br><br>Artificial lighting will result in ***localised, short-term adverse, likely slight effects***<br><br>***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)*<br><br>Common Whorl Snail *(Vertigo pygmaea)*** | Risk of accidental release of pollutants at HDD site if not properly managed.<br><br>Indirect air pollution effects were assessed to not to be significant. | Construction works will have ***short-term local adverse, likely significant effects.***<br><br>***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).<br><br>Indirect air pollution effects were assessed to not to be significant. | Loss of habitgat will have a ***local adverse, long-term, imperceptible effect***<br><br>***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)**<br><br>**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)***<br><br>**Common Whorl Snail *(Vertigo pygmaea)*** | No effects foreseen during operational phase. | ***No likely significant effects.*** | no |
| **Large Red Tailed Bumble Bee (*Bombus (Melanobombus) lapidarius*),**<br>***Halictus (Seladonia) tumulorum*,**<br>**Gooden's Nomad Bee (*Nomada goodeniana*),**<br>***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 8) 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 8) 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 7), 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 10) 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 D of the CEMP (Appendix 2.1, Volume 3). 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.

Accidental spillage from leaking or damaged fuel lines

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 C of the CEMP (Appendix 2.1, Volume 3).

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 C of the CEMP (the CEMP is presented in Appendix 2.1, Volume 3). 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.**<br><br>**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.*<br>• *Presence of competent EnCoW/ECoW.*<br>• *Water Quality monitoring*<br>• *HDD Drilling Methodology and management.*<br>• *Riparian Enhancement (BEMP)*<br>• *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.*<br>• *Presence of competent EnCoW/ECoW.*<br>• *Water Quality monitoring*<br>• *HDD Drilling Methodology and management.*<br>• *Riparian Enhancement (BEMP)*<br>• *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.<br>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)**<br>**Treelines (WL2)** | Direct habitat loss (approx. 887m WL1 and 524m WL2). | ***Long-term adverse, likely slight effect.*** | None necessary.<br>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.<br>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.<br>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.<br>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.<br><br>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.<br>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<br>• Blade Feathering<br>• 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.

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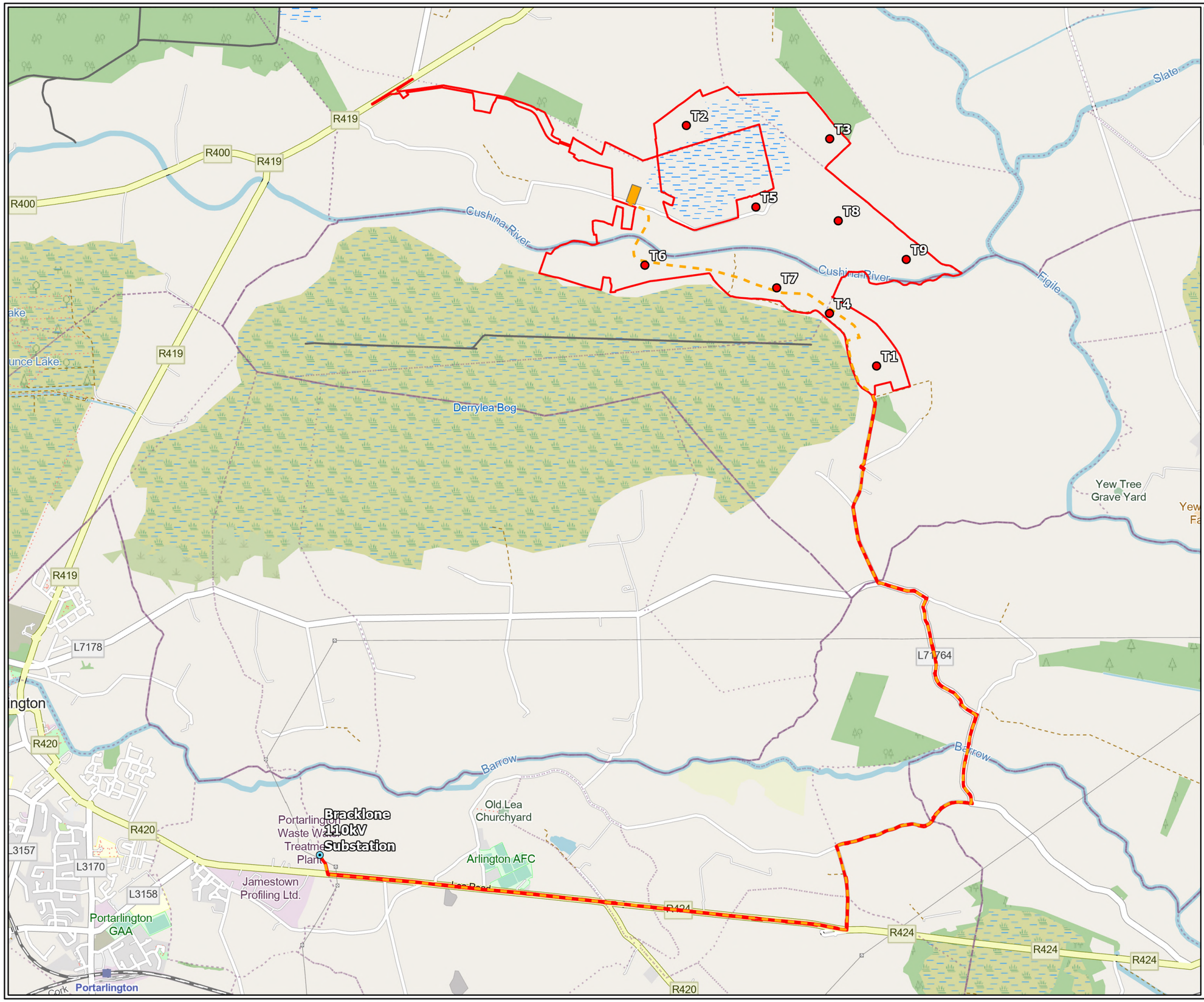
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# Appendix 6

# Site Layout Maps

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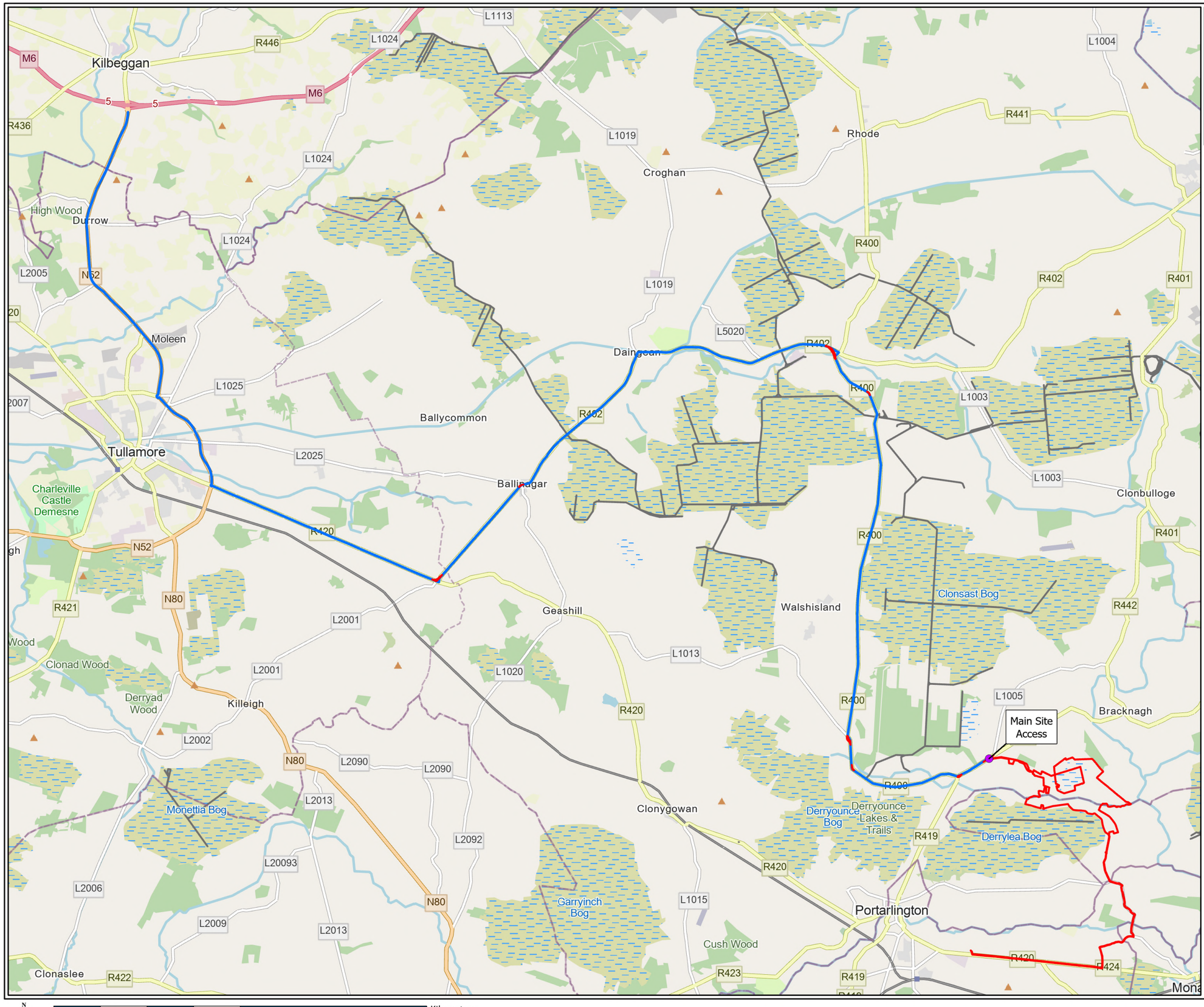
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- Substation
- External Grid Cable
- Bracklone 110kV Substation
- Turbine Locations

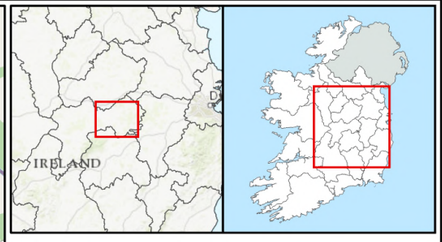
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**Legend**

- Site Boundary
- Turbine Delivery Route
- Site Entrance

| | | | |
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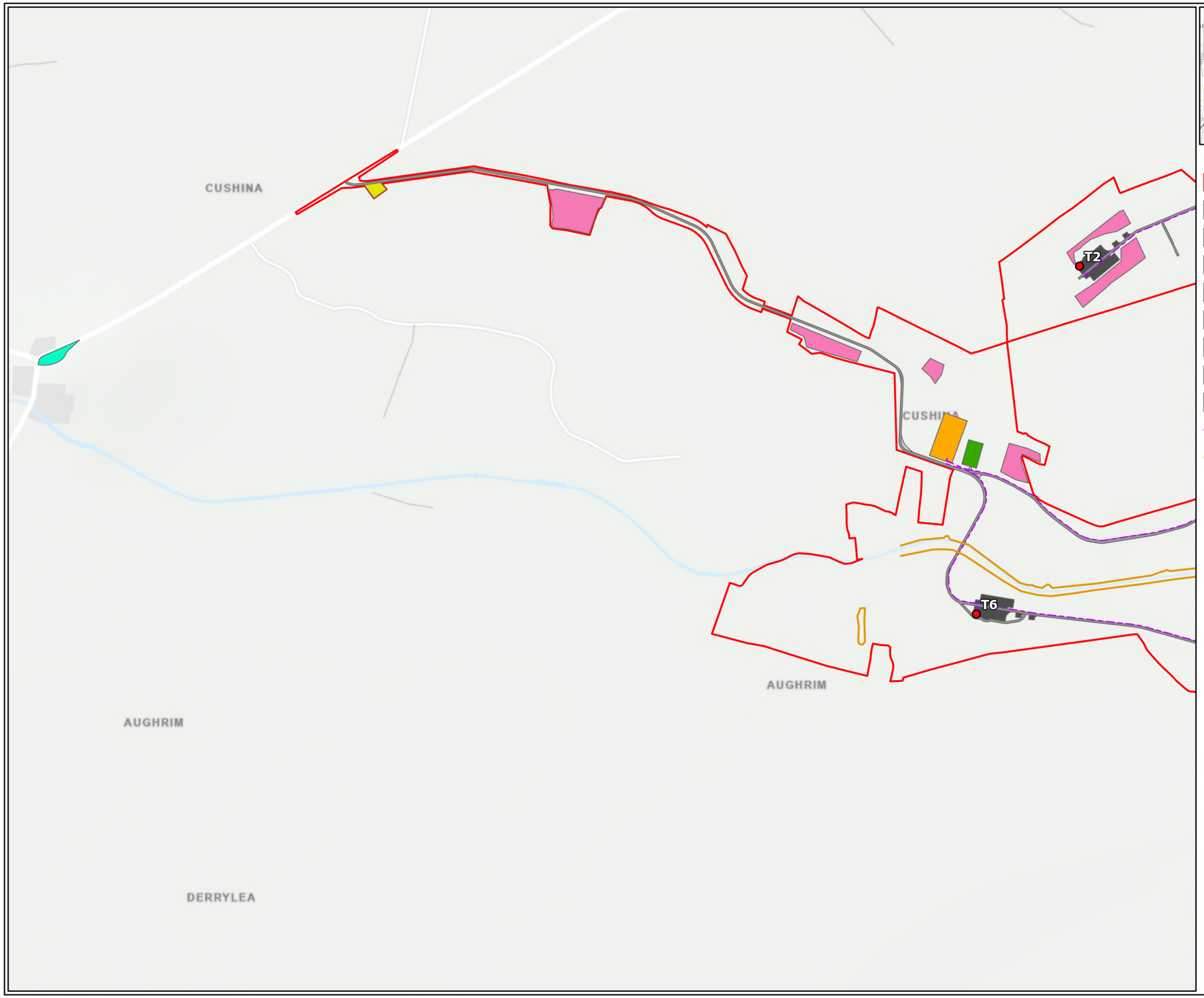
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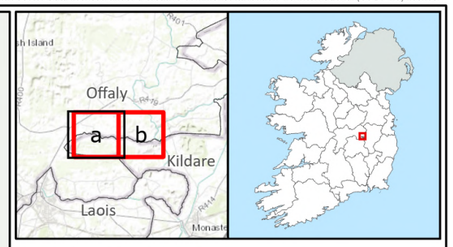
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**Legend**

- Site Boundary
- Substation
- TDR Areas
- Hardstandings
- Peat Storage Area
- Temporary Access Track
- Access Track
- Temporary Laydown Area
- Construction Compound
- Internal Grid Cable
- Fence Habitat
- Turbine Locations

| | | | |
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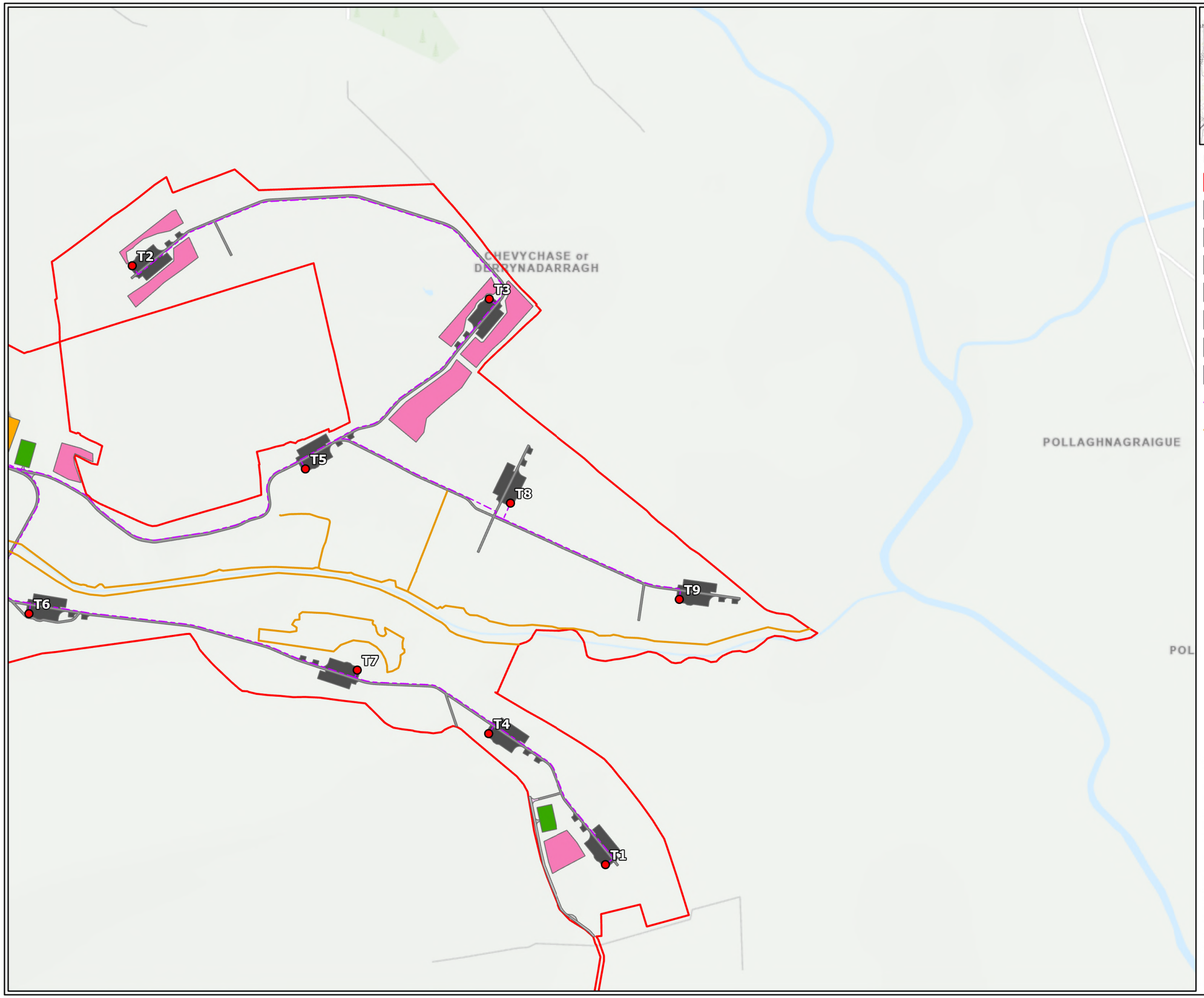
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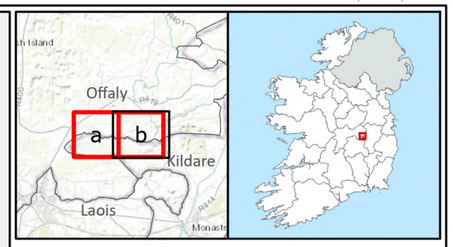
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**Legend**

- Site Boundary
- Substation
- Hardstandings
- Peat Storage Area
- Temporary Access Track
- Access Track
- Road Amenity
- Construction Compound
- Internal Grid Cable
- Fence Habitat
- Turbine Locations

| | | | |
|---|---|---|---|
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# Appendix 7

# Construction Environmental management Plan (CEMP)

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

## Construction and Environmental Management Plan (CEMP)

**Prepared for:**

**Dara Energy Ltd.**

Dara Energy Limited

**Date:** **September 2025**

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# CONSTRUCTION AND ENVIRONMENTAL MANAGEMENT PLAN (CEMP)

## REVISION CONTROL TABLE, CLIENT, KEYWORDS AND ABSTRACT

**User is responsible for Checking the Revision Status of This Document**

| Rev. No. | Description of Changes | Prepared by: | Checked by: | Approved by: | Date: |
|---|---|---|---|---|---|
| 0 | Draft | AH/KB | JH | JH | 16/09/2025 |

**Client:** Dara Energy Limited

**Keywords:** Mitigation, Compliance, Monitoring, Pollution Prevention, Surface Water Management, Waste Handling, Noise Control, Dust Suppression, Ecology.

**Abstract:** This document is a Construction and Environmental Management Plan (CEMP) for the construction of Derrynadarragh Wind Farm.

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# 1. INTRODUCTION

## 1.1 General Introduction and Purpose

This document is the Construction and Environmental Management Plan (CEMP) for the Proposed Development and has been prepared by Fehily Timoney and Company (FT) on behalf of Dara Energy Ltd.

The CEMP will be a key construction contract document, and the appointed contractor will be obliged to implement it in full. It will be updated by the Contractor prior to construction to take account of any relevant conditions attached to the planning permission and will be implemented for the duration of the construction phase of the Proposed Development. The CEMP also includes measures for the operational and decommissioning phase of the Proposed Development. Decommissioning of the Proposed Development is intended to take place following its 35-year operational life. General guidance for the decommissioning of the Proposed Development is contained in Section 4.3.1 of this CEMP.

The CEMP will be a live document and will be subject to ongoing review through regular environmental auditing and site inspections. The measures in the CEMP will be implemented in full and further measures may be added as may be identified from the auditing and site inspections.

This CEMP sets out the key construction and environmental management issues associated with the construction of the Proposed Development, to ensure that the environment is protected and impacts on the environment are minimised.

The CEMP should be read in conjunction with the EIAR and NIS. In the case of any ambiguity or contradiction between this CEMP and the EIAR, the EIAR shall take precedence.

The document is divided into six sections:

**Section 1:** *Introduction* provides an overview of the existing site and the Proposed Development.

**Section 2:** *Existing Site Environmental Conditions* provides details of the main existing geotechnical, hydrological, ecological and archaeological conditions onsite. These conditions will be considered by the contractor in the construction, operation and decommissioning of this Proposed Development.

**Section 3:** *Overview of Construction Works,* this section provides an overview of the construction works proposed, including drainage and sediment controls to be installed.

**Section 4:** *Environmental Management Plan (EMP*), this section outlines the main requirements of the EMP and outlines operational controls for the protection of the environment including soil management, habitat and species, site drainage control, archaeology, construction traffic, site reinstatement and decommissioning, waste management.

**Section 5:** *Safety & Health Management Plan*, this section defines the work practices, procedures and management responsibilities relating to the management of safety and health during the design, construction and operation of the Proposed Development.

**Section 6:** *Emergency Response Plan* contains predetermined requirements and procedures to ensure the safety, health and welfare of everybody involved in the project and to protect the environment during the construction phase of the Proposed Development.

## 1.2 Statement of Authority

This CEMP was completed by Fehily Timoney and Company. The CEMP was drafted by Aoife Hurd and checked by Jim Hughes.

Aoife Hurd is a Senior Civil Engineer at Fehily Timoney and Company working in the Energy and Planning Department. She holds a First-Class Honours Bachelor's Degree and Master's Degree in Civil, Structural and Environmental Engineering from Trinity College Dublin. She is a member of Engineers Ireland (EI) and has experience working on residential, infrastructure and renewable energy projects at all stages from concept to construction. Aoife provides technical and engineering support to the EIAR teams for a variety of commercial scale renewable energy projects.

Aoife has experience in the preparation of Traffic and Transportation assessments, Air and Climate assessments, as well as other technical chapters associated with EIARs and environmental reports for renewable energy projects ranging from wind farms, solar farms, grid connections, battery energy storage systems and ancillary grid infrastructure projects. She also has experience in the design of renewable energy developments.

Jim Hughes holds a BA in Public Administration from the University of Limerick, an MSc in Town Planning from Queen's University Belfast and a HDip in Environmental Impact Assessment from University College Dublin. Jim has led and managed large infrastructure projects in Ireland in the planning, environmental assessment and permitting disciplines including many wind farm developments.

## 1.3 The Proposed Development

The key components of the Proposed Development include: The wind farm site, the grid connection, and the turbine delivery route.

A detailed description of the Proposed Development is contained in Chapter 2 of the EIAR. A detailed description of the proposed construction works is outlined in Section 3 of this CEMP.

An overview of the Proposed Development is shown in planning drawings submitted with the application and in EIA Figures included in Volume IV of the EIAR documentation.

### 1.3.1 The Site

A 10-year planning permission and 35-year operational life from the date of commissioning of the Proposed Wind Farm is being sought.

The proposed development involves the construction of 9 no. wind turbines, each with a blade tip height of 186m, a hub height of 105m, and a rotor diameter of 162m. The project includes the installation of permanent turbine foundations, crane pads, and associated drainage, as well as the construction and upgrading of internal access tracks and existing tracks and associated drainage infrastructure. One main site entrance (off Regional Road R419) will be created, and an existing site entrance to the south will be upgraded.

Infrastructure works encompass extensive drainage and sediment control systems, including interceptor drains, cross drains, sediment ponds, and swales, as well as the installation of new watercourse crossings, including single-span bridge, open bottomed culvert and piped culvert within the Site. Removal and replacement of existing culverted watercourse and drain crossings along the cable route will also be required. A permanent 110 kV on-site electrical substation and compound will be constructed, with underground cabling linking turbines to the substation. Additional works include earthworks, peat and spoil management, and the installation of medium voltage electrical and communication cabling underground from the proposed turbines to the proposed on-site substation and Bracklone Substation. Accommodation works along the Proposed Turbine Delivery Route will also be implemented.

Refer to Chapter 2 of the EIAR for a detailed description of the proposed development.

### 1.3.2 Turbine Delivery Route

The Turbine Delivery Route will exit the M6 at junction 5 and continue southbound on the N52 southbound for 8.6km, then taking the second exit on the Ardan Roundabout and continuing on the N52 southbound for 2.9km which includes taking the second exit at Cappancur Roundabout to stay on the N52. At the Cloncollog Roundabout, take the first exit onto the R420 and continue south-east bound on the R420 for 6.6km. Then turn northbound onto the R402 and continue northbound on the R402 for 8.3km including going through the village of Ballinagar. In the village of Daingean, turn onto the R402 Edenderry and continue on the R402 eastbound for 5.6km. Then turn southbound on to the R400 and continue on the R400 southbound for 14.8km. Finally turn northbound on the R419 and continue northbound for 1km before arriving at the Site Entrance.

The TDR will be confined to the public road corridor except for locations where accommodation works will be required to facilitate the delivery of abnormal loads. The works to facilitate the delivery of turbine components to the Site are detailed in Chapter 2 of the EIAR. Please also refer to the Pell Frischmann Route Survey Review (RSR) in Appendix 14.1 and the Dara Energy Ltd. Amended Turbine Delivery Route Assessment Report in Appendix 14.2, EIAR Volume III.

A Traffic Management Plan is included in Appendix 14.3, Volume III of the EIAR. The objective of which is to always maintain the strategic capacity of the national routes, cognisant of the National Development Plan, 2021 – 2030, and to maintain all roads to a robust and safe standard for users. The Developer will adopt and further develop the Traffic Management Plan for agreement with the local Planning Authorities (Kildare County Council, Offaly County Council and Laois County Council) in advance of construction.

### 1.3.3 Grid Connection

It is proposed to connect the development to the national grid via underground cable to the existing Bracklone 110kV substation. Grid connection works joining the onsite 110kV substation to the existing 110kV Bracklone Substation. The grid connection will require 11.4km of underground 110kV electrical cabling. Works for the grid connection will involve trenching, laying of ducting, installing joint bays and watercourse crossing, pulling cables and the back filling of trenches and reinstatement works. The route which will run through 9.1km of existing public road, 0.3km in existing tracks and 2km in new access tracks on the wind farm site.

Connection works from the onsite substation to Bracklone substation will involve the installation of ducting, joint bays and ancillary infrastructure and the subsequent running of cables along the existing road network. This will require delivery of plant and construction materials, followed by excavation, laying of cables and subsequent reinstatement of trenches and road surfaces. Details of proposed grid connection infrastructure are provided in planning application drawings.

It is expected that full road closures will be put in place to facilitate cabling works in combination with lane closures, partial road closures and stop/go systems. This will enable the works to be completed as quickly and as safely as possible, with minimal disruption time for residents of the area. These works will be undertaken on a rolling basis with short sections closed for short periods before moving onto the next section. This is described in more detail in Chapter 14 - Traffic and Transportation.

In advance of the construction phase cable detection tools, a ground penetrating radar and slit trenches will be used, as appropriate, to verify the exact locations of existing services. The final locations of the proposed cable routes in the public roads and in the verge along the public road will be within the area indicated and assessed in this EIAR and will minimise conflicts with other services.

# 2. EXISTING ENVIRONMENT

## 2.1 Existing Environment Descriptions

### 2.1.1 The Site

The Site comprises approximately 208 hectares of land, and is contained within the townlands of Cushina, Clonsast Lower, and Chevychase or Derrynadarragh in County Offaly, and Aughrin 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 Site is in a sparsely populated rural context. The settlement patterns in the area consists of one-off rural housing fronting onto the road network in a linear rural settlement pattern. The Site is located within the lowland topography with predominantly flatlands and is located on the Derrylea Bog which is connected to Clonsast Bog to the north and Derryounce Bog to the west.

The Corrine Land Cover database for Ireland (based on interpretation of satellite imagery and national vector mapping data) identifies Quaternary deposits present at the site mostly comprise cut over raised peat. There are sections in the north and west of the site that are underlain by till derived from limestones, while the eastern section of the site is underlain by lake marl. The site is predominantly underlain by the Lucan Formation (dark limestone and shale) with a section in the north of the site underlain by the Ballyadams Formation (crinoidal wackestones/packstone limestone).

The main hydrology features within and adjacent to the proposed wind farmlands are the Figile River located immediately to the east of the proposed site. The Cushina River located within the southern section of the proposed site joins the Figile River approximately 1.2km to the east of the site. The Figile River then joins the Barrow River approximately 4.5km south-east of the site. This provides a connection to the River Barrow_090 lying to the south of the site.

According to the National Indictive Fluvial Mapping (NIFM) and Catchment Flood Risk Assessment, there are past flooding events extent associated with the Barrow County Kildare Drainage. Portions of the application site are contained within the flood extents of the River Cushina.

There are 2 no. European sites designated for nature conservation occur within a 5km radius of the potential wind farm site, the River Barrow and River Nore Special Areas of Conservation (SAC) (Site code: 002162), and the Grand Canal Proposed Natural Heritage Area (pNHA) (Site code: 002104).

The proposed wind farm site has designation for a number of habitats that are of ecological importance including treelines to the west of the site, woodland to the south-west and lowland rivers within the Cushina River. The proposed wind farm site also has designation for a number of fauna on site which include records of hare, a moderate-high value of Irish bat species, otter associated with the Cushina River and a number of identified badger sets within the site. The proposed site also has a number of river catchments located within the proposed site including the River Barrow Watercourse, River Figile Watercourse and the River Cushina Watercourse which are all dominated by coarse fish species.

# 3. OVERVIEW OF CONSTRUCTION WORKS

## 3.1 Construction Period

The construction of the Proposed Development in its entirety is expected to take 24 months.

## 3.2 Overview of Construction Sequence

The construction of a wind farm project is a major infrastructural project. The construction of this Project will involve many inter-related, inter-dependent and overlapping elements of a complex nature.

The following section outlines the construction methodology for the Project. Upon mobilisation for the construction of the development, peat excavation (where required), upgrading of existing site tracks, felling and the provision of new site tracks will precede all other activities. Construction stage drainage infrastructure will be constructed in parallel with the site clearance and track construction, elements of which will be adopted into and will accord with the Site's operational drainage as set out in the Planning Drawings. This will be followed by the construction of the turbine foundations and the provision of the hardstanding areas. In parallel with these works the on-site electrical works; sub-station and internal cable network will be constructed. The proposed grid connection works are anticipated to commence during month 16 in parallel of the proposed on-site wind farm works.

The proposed construction programme is presented in Table 3-1 below:

## Table 3-1: Construction Programme

| | Month | | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Activity** | **1** | **2** | **3** | **4** | **5** | **6** | **7** | **8** | **9** | **10** | **11** | **12** | **13** | **14** | **15** | **16** | **17** | **18** | **19** | **20** | **21** | **22** | **23** | **24** |
| Mobilisation and site setup | | | | | | | | | | | | | | | | | | | | | | | | |
| Site clearance and felling | | | | | | | | | | | | | | | | | | | | | | | | |
| Internal access tracks | | | | | | | | | | | | | | | | | | | | | | | | |
| Turbine hard standings | | | | | | | | | | | | | | | | | | | | | | | | |
| Turbine foundations | | | | | | | | | | | | | | | | | | | | | | | | |
| TDR accommodation works | | | | | | | | | | | | | | | | | | | | | | | | |
| Turbine Installation | | | | | | | | | | | | | | | | | | | | | | | | |
| Onsite substation | | | | | | | | | | | | | | | | | | | | | | | | |
| Grid connection works | | | | | | | | | | | | | | | | | | | | | | | | |
| Private electrical network and commissioning | | | | | | | | | | | | | | | | | | | | | | | | |
| Landscaping, reinstatement, demobilisation | | | | | | | | | | | | | | | | | | | | | | | | |

## 3.3 Overview of Construction Methodology

Method statements are presented below for the key elements of the construction process. The contractor for the main construction works will, following appointment, take ownership, expand upon and generally develop these method statements appropriately for the construction stage, in accordance with this CEMP.

The proposed construction methodology is summarised under the following headings:

- Site Entrances;
- Temporary Site Compounds;
- Felling;
- Concrete Washout and Wheel Washing;
- New Site Access Tracks;
- Upgrade of Existing Internal Access Tracks;
- Drainage and Watercourse Crossings;
- Crane Hardstands;
- Turbine Foundations;
- Substation Compound;
- Electrical Works;
- Internal Wind Farm Cable Works;
- Turbine Installation;
- TDR Accommodation Works.

The construction methodology of the GC works is contained in Appendix A of this CEMP. Any temporary reinstatement of road excavations associated with the GC will be as follows, with permanent reinstatement as per TII / Local Authority Requirements:

- Hot works permit to be issued for the area of works for the area to be reinstated.
- A grader (if required), Roller and mini-patch planer will be delivered to site by low-loader. A 2 - in - 1 Tar - and Chipper or patch sprayer will be driven to site.
- A mini patch planer will be attached to a skid steer and will plane a fresh cut line along the verge of the trench.
- The trench fill material will be graded to shape the trench to match the existing camber of the carriageway and compacted using a drum roller.
- The Tar - and - Chipper will make first pass of one metre wide.
- Once the bitumen emulsion and chips have been dispensed from the 2- in 1 Tar and chipper and the drivers cab is clear of the area, the roller will follow and compact the chips into the emulsion.
- If the 2 - in - 1 - Tar - and - Chipper is not being used, a towable emulsion sprayer will be used. This involves the towable sprayer being towed by a pickup truck, and an operative spraying the trench area by means of a lance from the unit.
- The emulsion is heated up to 70°C.The operator will wear protective overalls, heat resistant gloves and eye protection.

- The emulsion is sprayed out to cover the existing trench fill where a follow up crew will spread surface dressing chips over the sprayed area at a safe distance of 5m from the lance.
- Compaction will then take place by a drum roller.
- Both the 2 - in - 1 - Tar - and - Chipper and towable sprayer will have internal diesel burners, with no exposed naked flame.
- Delay set macadam may also be used, 75mm of delay set macadam shall be placed within the trench at the end of each working day, by means of skid steer and trench reinstatement bucket and compacted.



**Figure 3-1: Towable Sprayer for Temporary Reinstatement**

### 3.3.1 Site Entrances

The Proposed Wind Farm will include a new site entrance along the R419 Regional Road to serve as construction and operation access to the proposed wind farm and onsite 110kV substation, an additional access from L-70481 will be used for construction on the south of the river Cushina, prior to completion of the bridge crossing.

The new site access has been selected with consideration for safety of public road users, construction staff and to ensure that it can be constructed to comply with the requirements of Offaly County Council, Kildare County Council, and TII design requirements for direct accesses.

During the construction phase, standard HGVs shall use the existing southern access, located within Co. Kildare, if transporting materials prior to on-site bridge being constructed. Otherwise, all construction traffic shall use the main northern access, located in Co. Offaly.

The onsite 110kV electrical substation will be accessed from the existing site entrance to the south.

All HGV traffic travelling to the site shall only be permitted to use approved transport routes and site access points as identified in the Traffic Management Plan (TMP) contained in Appendix 14.3, Volume III of the EIAR.

### 3.3.2 Temporary Site Compounds

During the construction phase, it will be necessary to provide temporary facilities for construction personnel. There will be 2 no. temporary compounds which will include temporary self-contained welfare facilities (e.g. ecopod type) and offices. The location of the temporary site compounds is shown in the Planning Drawings accompanying the application. Wheel wash facilities will be provided within the site near the site entrance point.

The temporary site compounds will be established by removing topsoil down to a firm substrate, laying down geotextile material and then constructing a working surface of stone sourced from within the Site, and surrounded by security fencing. The topsoil will be removed and stored in accordance with the Peat and Spoil Management Plan contained within Appendix B of this CEMP.

Temporary facilities will be removed, and the lands reinstated on completion of the construction phase.

Facilities to be provided in the temporary site compounds will include the following:

- site offices, of Portacabin type construction
- Portaloos
- bottled water for potable supply
- a water tanker to supply water used for other purposes
- canteen facilities
- material/non-fuel storage areas
- employee parking
- specially constructed bunded fuel / oil storage to ensure that fuel spillages are fully contained (such bunds shall be roofed to exclude rainwater)
- contractor lock-up facility
- diesel generator (within bunded area)
- waste management areas

### 3.3.3 Felling and Site Clearance

Permanent felling of approximately 0.28 ha of forestry is required at the main entrance to the Site. It should be noted that the clear-felling of trees in the State requires a felling licence. The Forest Service of the Department of Agriculture, Food & the Marine is Ireland's national forest authority and is responsible for all forest licensing which is governed by the Forestry Act 2014 as amended and the Forestry Regulations 2017 (S.I. No. 191 of 2017). A felling licence will include the provision of relevant replant lands (afforestation area) to be planted in consideration for the proposed tree felling on the Site. The associated afforestation of alternative lands equivalent in area to those lands being permanently clear-felled is also subject to licensing ('afforestation licensing').

The area of trees to be felled will be minimised to only that required to accommodate the Proposed Development.

The contractor will not commence tree removal on site until both felling and afforestation licences are in place.

Tree felling, trimming and site clearance will not be carried out during the bird breeding season which commences on March 1st and finishes on August 31st. All site clearance / enabling works will be preceded by survey and inspection by an Ecological Clerk of Works for the presence of any species or habitats protected by Law in accordance with the TII's "Ecological Surveying Techniques for Protected Flora and Fauna during the Planning of National Road Schemes". The following confirmatory surveys, as specified within the Biodiversity chapter, will be undertaken by the Ecological Clerk of Works (who will be suitably qualified and competent to undertake such surveys) in accordance with the methodologies set out in the EIAR, prior to the commencement of Construction, in order for the Contractor to ensure the most relevant mitigation measures are included in the Design and Construction:

a) An otter survey 200m upstream and downstream of the footprint of all watercourse crossings to identify holt / couch locations and need for mammal passage/mitigation;
b) A bat survey of trees to be felled in accordance with the NRA Guidelines for the Treatment of Bats Prior To the Construction of National Road Schemes (a visual inspection of the tree during daylight hours followed by a nighttime detector survey);
c) A badger survey within 150m of all works areas;
d) A common frog surveys along all drain crossings (and spawn survey) during the breeding season of common frog (approximately January – midsummer). Spawn translocation may be required under licence where active breeding drains are within the development footprint during the construction phase.
e) An invasive plant species survey of all watercourses and lands within the footprint of the Works.

If any such species or habitats are found, as a result of such survey and inspection, the Contractor will undertake the following:

- Record and report the ecological data in accordance with the requirements of the National Biodiversity Data Centre (NBDC);
- If mitigation measures for such species or habitats have not been identified in the EIAR for that area of the Site, the Contractor will, consult with the National Parks and Wildlife Services and the Inland Fisheries Ireland as appropriate to determine and implement appropriate mitigation for the species / habitat.

### 3.3.4 Concrete Washout Area and Wheel Washing

Detailed measures to control concrete runoff during the Construction stage of the Proposed Development are included in Chapter 12 - Flooding, Hydrology & Water Quality of the EIAR and will be implemented as part of the Works. A summary is provided hereunder.

All concrete will be delivered to site via ready-mix trucks from a local supplier.

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 a minimum of 50m. The residual liquids and solids will be disposed of off-site at an appropriate licenced waste facility, as shown in Table 4-2 of this CEMP.

Wheel wash facilities will be located near the site entrance to reduce construction traffic fouling public roads. Each wheel wash will come with an additional water tank which will be filled regularly. These units will be self-contained and will filter the waste for ease of disposal. Silt will be removed from each unit and from site by a licensed contractor.

### 3.3.5 New Site Access Tracks

The Proposed Wind Farm will include the construction of 9.36 km of new internal access tracks and the upgrading of 0.55km of existing tracks and associated drainage infrastructure. The proposed internal site track layout will permit access for vehicles during the construction phase, for maintenance during the operational phase and for vehicles to decommission the turbines at the end of the life of the Proposed Development. The internal road layout has taken into account the following key factors:

- Buildability having regard to existing ground conditions and land drainage;
- Minimise watercourse crossings;
- Sustainability by avoiding habitats of higher value and making use of existing tracks and roads;
- Optimising cut/fill balance.

All access tracks will be approximately 4.5-5 m wide along straight sections and wider at bends as required. The tracks will be finished with a well graded aggregate. The drainage system will be installed adjacent to the internal access tracks.

Internal wind farm access tracks shall be a constructed by a combination of founded and floating methods as required. There is approximately 2.1km of floated access track within the site which has been determined by geotechnical walkovers and detailed site investigations.

#### Floating Method

Floating roads are constructed without excavating the existing ground. They will consist of a layer of combined geotextile and geogrid laid directly on the existing surface. Layers of stone will then be placed on top with additional geogrid reinforcement as required. A layer of compacted Cl 804 material will be placed on top to provide a suitable running surface. It is anticipated that the stone required for the construction of the internal access roads will be sourced from quarries in the vicinity.

Typically, the track formation will consist of a minimum 500 mm hardcore on geo-textile membrane. The likely construction methodology for newly constructed tracks will be as follows:

- The formation will be prepared to receive the geotextile membrane.
- Stone will be placed and compacted in layers to minimum 500 mm depth.
- A drainage ditch will be formed, within excavated width, along sides of the track.
- Surplus excavated material will be placed along the side of sections of the tracks and dressed to blend in with surrounding landscaping and partially obscure sight of the track.

Where the underlying peat has insufficient bearing capacity or due to topographic restrictions an excavate and replace type access road may be more suitable, although this is not anticipated at the location of the floated roads.

#### Founded Method

This method will consist of either one or two layers of stone depending on the load bearing capacity of the base layer. Where the underlying layer is mineral subsoil, two layers of stone are used; a stone capping layer and running layer. Construction details are outlined in the planning drawings.

In areas where the load bearing layer is rock, the capping layer is omitted, and the running layer is installed directly onto the rock surface. Drainage runs and associated settlement ponds will be installed.

Track construction details will be implemented as follows:

- Establish alignment of the new site tracks from the construction drawings and mark out the centrelines with ranging rods or timber posts.
- The access tracks will be of single-track design with an overall width of 5m. There will be some local widening on the bends as shown on the design drawings, junctions and around Turbine Foundations for the safe passage of large vehicles. All bends have been designed to suit the requirements of the delivery vehicles.
- All machinery shall work within the consented areas as identified on planning and contract drawings.
- All access for construction vehicles within the site will follow the proposed internal access tracks as shown in planning drawings.
- Topsoil/subsoil will be stripped back to required levels. Excavated material will be placed along the side of sections of the tracks and dressed to blend in with surrounding landscaping and partially obscure sight of the track.
- The soil will be excavated down to a suitable formation layer of either firm subsoil or rock.
- The formation will be prepared to receive the geotextile membrane.
- Well-graded granular fill will be spread and compacted in layers to provide a homogeneous running surface. The thickness of layers and amount of compaction required will be decided by the Site Manager based on the characteristics of the material and the compaction plant to be used.
- Batters will have a slope of between 1:1 and 1:5 (depending on depth and type of material) and will be left as cut to re-vegetate naturally with local species.

### 3.3.6 Upgrade of Existing Internal Access Tracks

There is 0.55km of existing track upgrades and associated drainage infrastructure required. Existing track upgrades shall follow the same outline methodology as for new access tracks.

Existing drainage infrastructure will be maintained and upgraded where necessary and to the same standard as the proposed drainage infrastructure in accordance with the drainage design and Surface Water Management Plan (within the Appendix C of this CEMP). Any new drainage systems required will be installed adjacent to the internal access tracks.

### 3.3.7 Drainage and Watercourse Crossings

A Surface Water Management plan has been prepared which can be found in Appendix C of this CEMP. It contains methodology for drainage, water quality management and silt control. The measures contained within the plan will be applied by the Contractor.

Within the Site there are 41 drain crossings and 26 watercourse crossings, which are shown in Table 3-1 of the SWMP in Appendix C.

It is proposed to install 1 no. clear span bridge crossing where the internal wind farm access track crosses the Cushina River. Refer to Drawing no. P22-145-0300-0001for details. It is also proposed to install a new watercourse crossing along the TDR comprising a 1 no. single span bridge crossing at Daingean River/Philipstown Bridge to avoid the R400 / R402 junction.

In addition to the above clear span bridge crossings, the design includes, 14 no. open-bottomed box culvert crossings and 28 no. piped culverts.

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 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.

*Clear Span Bridge Details and Construction Methodology*

The abutments for the bridge will be founded on reinforced concrete pad footings. An excavator will be used to reach the subgrade on which the concrete pads will be founded. The excavations will be set back 2.5m from the banks of the river. Based on site investigations the approach embankments to the bridge structure can be founded directly on existing stratum.

Dewatering of the excavations as per the Surface Water Management Plan will likely be required through sump pump or alternative means until completion of the footings. A layer of Class 6N2 fill will be laid as a regulating layer on top of the subgrade. A 75mm thick blinding concrete will be placed over the full extent of the rectangular foundation to produce a clean flat surface for the wet structural foundation concrete. The reinforcement cage for the pad footing will be fixed and tied with bars protruding vertically for subsequent concrete pours. Formwork will be placed around the perimeter of the footing ensuring sufficient concrete cover to the reinforcement. Approximately 18m3 of concrete will be required for each abutment bank seat pad and will be delivered to site by ready mix trucks. The concrete will be placed in the formwork using a hopper or concrete pump and vibratory poker used to remove air bubbles.

Once the pad footing has achieved sufficient strength, the reinforcement for the abutment upstands will be cut, tied and fixed into position. A vertical formwork will be placed around the perimeter of the abutment wall. Each abutment upstand will require approximately 13m3 of concrete which will be placed using a hopper or concrete pump. A vibratory poker will be used to remove any air pockets. Once the formwork has been removed and the concrete has cured, a waterproofing membrane will be applied to the concrete. At the top of the upstands, seatings for the precast deck beams will be prepared at the correct levels.

The bridge deck will be set above the 1% AEP flood height (100-year event) and will be made up of precast concrete beams with a clear span of c.15m. The beams will be precast off site and delivered to site on a flatbed truck. A crane will be used to lift the beams into position onto the seatings formed on top of the abutment upstands. Side forms for the edge parapet beams will be secured and reinforcement for the deck slab and parapet edge beams will be cut, tied and fixed into position with bars protruding vertically from the edge beams for subsequent concrete pours for the concrete parapets. The bridge deck slab and edge beams will be concreted to the finished level. Once the deck slab has reached sufficient strength the abutment walls will be backfilled with a granular fill to access track formation level.

The bridge deck parapets will be constructed from reinforced concrete. Reinforcement for the parapets will be fixed to lap with the starter bars from the edge beams. Vertical formwork will be erected and secured in place. An in-situ pour will be carried out to cast the parapets to the design height and vibratory poker used. Once the parapets have reached sufficient strength the formwork will be stripped. The deck surfacing is to be formed using an ST1 concrete mix. This will be placed on top of the deck slab with a minimum thickness of 100 mm and with a crossfall from the centre of the deck to the parapet to allow water to drain.

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 crossing will be scheduled to align with fisheries seasonal restrictions and will not be undertaken during a period of flooding.

Vehicular access to the crossing location shall be available from both sides of the watercourse.

The access track on the approach to the watercourse will be completed to a formation level which is suitable for the passing of plant and equipment required for the installation of the watercourse crossing.

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.

All earthworks adjacent to the crossing locations will be carried out to prevent soil entering the watercourse and will be in accordance with the Soil Management Plan.

Further details on hydrology and drainage are contained in Chapter 12 - Hydrology and Water Quality, the Surface Water Management Plan (SWMP) which is contained in Appendix C and on accompanying planning application drawings.

*Bottomless Culvert and Piped Culvert Construction Methodology*

Culverts will be made of precast units which will be sized specific to the hydraulic capacity required relative to the characteristics of the watercourse to be crossed. The crossing angle for the culverts will be set out in relation to access track alignment and the existing watercourse channel. The project engineer will determine the required gradient of the culvert. Standard details for piped and bottomless culverts are provided in the Planning Drawings.

The access track on the approach to the channel will be completed to a formation level which is suitable for the passing of plant and equipment required for the installation of the culvert crossings.

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'. The watercourse flow will be diverted by over pumping or by fluming the flow as appropriate to facilitate construction of the culvert in dry conditions. The installation of the culvert will take place in low flow conditions. Mitigation for the protection of sensitive biological receptors when fluming / over pumping are presented in Chapter 9 – Biodiversity.

For piped culvert, the bed of the watercourse will be taken down to the desired levels to create a suitable platform for laying the culvert. The pipe culvert will be lifted into place with excavator with a lifting mechanism / crane and will have an invert level 500 mm below the existing watercourse bed level. The embedded section will be allowed to fill naturally.

For bottomless box culvert, the base will be excavated to rock or competent ground with a mechanical excavator with the foundation formed in-situ using a semi-dry concrete lean mix foundation and concrete panels. The base will be excavated along the stream bank with no instream works required. The bottom plate of the culvert will be bolted to the foundation on both sides of the watercourse. The top section of the culvert will be bolted together and lifted into position and bolted to the two bottom sections. Once the culvert is in position stone backfill will be placed and compacted against the culvert up to the required level above the foundations. A concrete beam will then be shuttered, fixed and poured along the two shoulders of the culvert. When the concrete beams are cured the filling and compaction of the access track will be completed.

*Minor Stream / Drain Crossing Construction Methodology*

All minor streams or drains within the Site (not identified as Rivers by the EPA in their reporting under the Water Framework Directive) which are crossed by the wind farm infrastructure will be collected by interceptor drains and carried under the access track by cross drains. Further details on the locations of such cross drains are provided in the Surface Water Management Plan in Appendix C and on accompanying planning application drawings.

The cross drains will be an appropriately sized pipe buried in the sub-base of the access track at the necessary invert level to ensure ponding or pooling doesn't occur above or below the cross drain and water can continue to flow as necessary.

For a minor stream/drain crossing the following will be employed:

- The access track construction will finish at least 10m from the nearside bank of the minor stream/drain.
- All environmental mitigation measures, described in detail in Chapter 12 - Hydrology and Water Quality and Chapter 9 - Biodiversity, will be implemented locally in advance of the works, in accordance with the measures outlined in the Surface Water Management Plan (SWMP) in the CEMP in Appendix C.
- The pipe is laid in one lift or in sections using a lifting mechanism attached to an excavator.
- Rock armour headwalls will be constructed where necessary to protect pipe ends and the base of slope embankments on either side of the track.

Instream works will only take place during the period July to September (as required by IFI for instream works).

Operation of machinery in-stream will be kept to an absolute minimum. All construction machinery operating in-stream will be mechanically sound to avoid leaks of oils, hydraulic fluid, etc. Machinery will be checked prior to commencement of in-stream works.

Before contact with water is made, any equipment or machinery that will be used in the water, including Personal Protective Equipment (e.g. footwear, gloves), will undergo the Clean-Check-Dry biosecurity protocol: https://www.fisheriesireland.ie/Biosecurity/biosecurity.html. This will similarly be carried out upon completion of the work or moving the equipment or machinery from the water.

### 3.3.8 Turbine Hardstands

All crane pads and associated splays have been designed taking account of the loadings provided by the turbine manufacturer. They will consist of a compacted stone structure in accordance with the detailed engineering designs and employer's requirements.

All crane pads will be formed from a suitably stiff layer of subsoil or rock. The finished crane pad surface will provide a minimum bearing capacity of 260kN/m².

Crane pad and associated splay formation will consist of either 1 or 2 layers of suitable fill material depending on the properties of the underlying load bearing layer. Where the underlying layer is soft soil, 2 layers of suitable fill formation will be used and the stone capping layer. In areas where the load bearing layer is rock, the capping layer will be omitted, and the running layer will be installed directly onto the rock surface.

A turbine hardstanding area consists of a main crane pad hardstanding of 80 m x 33.5 m (2,700 $m^2$) with a number of additional smaller hardstandings that act as ancillary crane pads and set down and assembly areas, located as shown on the accompanying planning drawings. This area will accommodate a main crane and an assist crane during the assembly of the turbine, as well as during occasional maintenance periods during operation. It will also facilitate parking for operation and maintenance staff. The crane pads will have a maximum cross and longitudinal fall tolerance of 2%. The crane hardstands will be constructed using a typical excavation method.

The excavation method can be summarised as follows:

*Excavation Method:*

All environmental mitigation measures will be implemented locally in advance of the works, in accordance with the measures outlined in the environmental management plan in Section 4 of this CEMP.

- Establish alignment of the hardstands from the construction drawings and mark out the corners with ranging rods or timber posts.
- Drainage runs and associated settlement ponds will be installed.
- Topsoil and subsoil stockpiles will be formed, and the side compacted to prevent silt run off during heavy rain or airborne dust during dry periods.
- Batters will have a slope of between 1:1 and 1:5 (depending on depth and type of material) and will be left as cut to re-vegetate naturally with local species.

### 3.3.9 Turbine Foundations

Following detailed site investigations, it has been determined that the wind turbine foundations at Derrynadarragh will be standard shallow reinforced concrete foundations. The turbine foundation bases are circular in shape and will be 25 m in diameter and 3.5 m in depth.

Turbine foundations will be designed to Eurocode Standards. Foundation loads will be provided by the wind turbine supplier, and factors of safety will be applied to these in accordance with European design standards:

- EN 1992-1-1: Eurocode 2: Design of concrete structures.
- BS EN 61400-1:2005: Wind Turbines Design Requirements.

The wind turbine foundations will be constructed using standard reinforced concrete construction techniques. A section of reinforced concrete foundation called a plinth shall protrude above ground to which the turbine tower will be bolted as per the turbine manufacturer's guidelines which will be incorporated in the civil foundation design.

The turbine foundations will be constructed as follows:

*Standard Excavated Reinforced Concrete Base:*

f) The extent of the excavation will be marked out and will include an allowance for trimming the sides of the excavation to provide a safe working area and slope batter.

g) No material will be removed from site and storage areas will be stripped of vegetation prior to stockpiling placement in line with best working practises.

h) Around the perimeter of the foundation formation a shallow drain will be formed to catch ground water entering the excavation. The drain will direct the water to a sump if required where it will be pumped out to a settlement pond away from the excavation.

i) A layer of concrete blinding will be laid approximately 75mm thick directly on top of the newly exposed formation, tamped and finished with a screed board to leave a flat level surface. If required, geogrid and soil replacement will be laid according to the foundation design, followed by placement of the concrete blinding layer.

j) If soil replacement is required, the aggregate used will be tested and approved by the project geotechnical engineer.

k) High tensile steel reinforcement will be fixed in accordance with the designer's drawings & schedules. The foundation anchorage system will be installed, levelled and secured to the blinding using steel box section stools.

l) Ductwork will be installed as required, and formwork erected around the steel cage and propped from the backside as required.

m) The foundation anchorage system will be checked both for level and line prior to the concrete being installed in the base.

n) Concrete will be placed using a concrete pump and compacted using vibrating pokers to the levels and profile indicated on the construction drawings.

o) Upon completion of the concreting works the foundation base will be covered from the elements that could cause hydration cracking and/or delay setting in any way.

p) Steel shutters will be used to pour the upper plinth section.

q) The foundation will be backfilled with a cohesive material, where possible using the material arising during the excavation and landscaped using the top-soil set-aside during the excavation. The suitability of backfill material will be approved by the project geotechnical engineer.

r) A gravel footpath will be formed from the access track to the turbine door and around the turbine for maintenance.

### 3.3.10 Substation Compound

The footprint of the proposed on-site (TSO) 110kV substation compound measures approximately 5,250m$^2$ in area and will include 1 no. control building (18m x 25m and 7.4m high) and the electrical substation components necessary to consolidate the electrical energy generated by each wind turbine and export that electricity from the on-site 110kV substation to the national grid.

The building's main function is to provide housing for switchgear, control equipment and monitoring equipment necessary for the proper functioning of the substation and wind farm. The building will be constructed by the following methodology:

- The area of the control buildings and compound will be marked out using ranging rods or wooden posts and the vegetable soil stripped and removed to the nearby storage area for later use in landscaping. No material will be removed from site and storage areas will be stripped of vegetation prior to stockpiling in line with best working practises.
- Drainage runs and associated settlement ponds will be installed.
- The dimensions of the Building and Compound area will be set to meet the requirements of EirGrid and the necessary equipment to safely and efficiently operate the wind farm.
- The foundations will be excavated down to the level indicated by the designer and concreted.
- The blockwork walls will be built up from the footings to DPC level and the floor slab constructed, having first located any ducts or trenches required by the follow on mechanical and electrical contractors.

- The blockwork will then be raised to wall plate level and the gables & internal partition walls formed. Scaffold will be erected around the outside of the building for this operation.
- The concrete roof slabs will be lifted into position using an adequately sized mobile crane.
- The wooden roof trusses will then be lifted into position using a telescopic load all or mobile crane depending on site conditions. The roof trusses will then be felted, battened, tiled and sealed against the weather.

The remainder of the substation compound will be brought up to the agreed formation and approved stone imported and graded to the correct level as per the detail design.

Equipment plinths will be marked out, excavated and constructed using in-situ reinforced concrete or pre-cast concrete. Provision will be made in each plinth for earth connection.

Following the construction of the equipment plinths an earth mat will be installed throughout the compound. This will be connected to each plinth and the buildings as per the electrical earth protection design.

### 3.3.11 Electrical Works

#### *3.3.11.1 Substation Fit Out and Switchgear Installation*

The substation will have a domestic electrical system including lights, sockets, fire alarm and intruder alarm. The high voltage switchgear for the wind farm will be installed through the following method.

- The switchboard units will be delivered to site on a truck and unloaded using a forklift, front end loader or HIAB crane.
- Suitable task specific RAMS and lifting plans will be in place prior to the commencement of all works.
- The switchgear will be unloaded on to a concrete plinth directly outside the substation building.
- The units will be moved inside the substation building using a hand driven forklift and positioned over the internal trench supports, prepared previously.
- The switchgear will then be secured as per manufacturer's instructions, typically by bolting directly to steel support bars over the trench.
- The building is fitted out with small light and power and ancillary wind farm control equipment such as SCADA computer, remote telemetry units, metering etc.
- All equipment and fittings are then connected, wired tested and commissioned in accordance with the Electrical Contractor's commissioning plan.

#### *3.3.11.2 Transformers*

- The turbine transformers will be placed directly onto the turbine foundation upon delivery to site, prior to the installation of the turbine towers.
- The transformers will be of the sealed type and will be inspected for any damage prior to offloading. It is proposed that the units will be installed using a small mobile all-terrain crane and will be tested, commissioned and energised by suitably trained and authorised persons.
- The accessible sections of the transformer will be protected within an enclosure which will be locked at all times and displaying appropriate warning signs.
- Transformers and ancillary plinth-mounted equipment required in the substation compound will be delivered to site and unloaded directly in place by HIAB crane or similar.
- Suitable task specific RAMS and lifting plans will be in place prior to the commencement of all works.

### 3.3.12 Internal Wind Farm Cabling Works

The specification for cable trenches is based on cable voltage, location and existing land use. If, subject to confirmatory surveys, the land is not as expected, the route may need to be varied within the parameters set out and assessed in the EIAR.

With a trefoil formation, the internal cable trench width will be 600 mm, and with a flat formation, the trench width will be 1200 mm. The depth of cover to the ducts carrying the cables will be 900 mm to the top of the upper ducts. The depth of trench for the cables will be 1200 mm. The diameter of the ducting will be selected to suit the range of cross-sectional areas of electrical cables and is likely to fall between 100 mm and 200 mm diameter.

Internal cable trench section types associated with on-site electrical cabling are presented in the accompanying planning application drawing P22-145-0500-0004.

The following describes the construction methodology for cable installation works inside the Site. Some cables will be buried directly, and some will be ducted. Direct buried cables will be used in non-load bearing areas and ducts will be used in load bearing areas.

For direct buried cables, the following outline methodology will be implemented:

- All environmental mitigation measures will be implemented locally in advance of the works, in accordance with environmental management plan outlined in Section 4 of this CEMP.
- The line of the cable trench will run beside the site access tracks until it exits to the public road.
- The ground will be excavated using a mechanical digger. The top layer of soil will be removed and placed to one side. It will be used for landscaping the top of the backfilled cable trench following the laying of the cables. The remaining subsoil, excavated to the required depth, will be placed separately and used as backfill for the trench.
- Safe ladder access/egress to trenches will be provided into the trench.
- The cables will be laid directly onto a bed of suitable material, free from sharp stones and debris*.
- A suitable material will be placed over the top of the cables to protect them during backfilling*.
- Warning tape and plates will be installed by hand in accordance with the trench design and ESBN specifications and the engineer's design.
- On completion, the ground will be reinstated, and marker posts will be positioned at agreed centres to the side of the trench highlighting the presence of cables below.
- Trenches will vary in width depending on the number of cables in the circuit. Where there is more than one set of cables they will be separated as per cable manufacturers and ESB/ EirGrid requirements.

Where ducting is required within the Site (i.e., for areas where cables will be laid under access tracks or other loaded surfaces), suitable ducting will be required to protect the cables. In this scenario, tasks marked by an asterisk (*) in the above methodology will be replaced by the following steps:

- Ducts will be placed into the trench manually, having been delivered to roadside embankment/verge by tractor and pipe trailer and then offloaded by hand.
- Approved bedding material will be used to surround the ducts. It will be delivered straight from a concrete truck or by skid steer along the route.
- Approved fill material will be compacted above and below the power cable ducting as per the engineer's design.
- Exposed duct ends will be capped.

- A 12mm Draw rope will be blown through the ducting at later date.
- Small jointing pits will be located along the route of the trench which will be left open until jointing takes place. A protective handrail/ barrier will be placed around each pit for health and safety reasons.
- Once the cables are joined and sealed the jointing container will be removed and the cables at the joint-bay locations will be back-filled in the same manner as the rest of the cable trench.
- The cables will connect the turbines to the substation. Ducts will be cast into each turbine foundation to provide access for the cables Likewise, at the substation, ducts will be cast through the building foundation to provide access for the cables.
- There are no existing buried services expected within the site however the appointed contractor will be responsible for carrying out pre-construction confirmation surveys ahead of construction.
- Prior to commencement of the works, up to date records of services such as watermains, sewers, gas mains and other power cables will be obtained from the relevant service providers. Cable detection tools, ground penetrating radar and slit trenches will be used, as appropriate, to find the exact locations of existing services. The final locations of the cable trenches will be selected to minimise conflicts with other services.
- Trenches where ducts are laid will be back filled every evening. During excavation works signage will be erected at each location warning of the dangers.

### 3.3.13 Turbine Installation

Each wind turbine will have an associated turbine hardstand area and temporary laydown area adjacent to the foundation to accommodate the delivery and temporary storage of the turbine components prior to their erection and to support the cranes during erection.

Once the turbine components arrive on site they will be placed on the hardstand and lay down areas prior to assembly. The towers will be delivered in sections, and each blade will be delivered in a separate load within the convoys. Once there is a suitable weather window the turbine will be assembled.

It is anticipated that the turbine installation works will take place over the course of 7 months. This is based on a total of 7 no. loads per turbine to deliver blades, tower sections and nacelles, with each convoy consisting of components for two turbines at a time.

### 3.3.14 Fencing and Site Security

Temporary Heras fencing will be erected surrounding the construction compounds. Access will be gated to prevent unauthorised access. CCTV will be in operation.

The on-site 110kV substation compound will include steel palisade fencing (2.6m high as required by ESB), and internal fences will also segregate different areas within the main substation. Fence details are shown on the accompanying planning application drawings.

## 3.4 Construction Working Hours

The hours of construction activity will be limited to avoid unsociable hours where possible as per Section 8.5 (d) of the code of practice for BS 5228: Part 1: 1997. Construction operations will generally be restricted to between 07:00 hours and 19:00 hours Monday to Saturday. It should be noted that it may be necessary to commence turbine base concrete pours earlier due to time constraints incurred by the concrete curing process. Work on Sundays or public holidays will only be conducted in exceptional circumstances or in an emergency. Additional emergency works may also be required outside of normal working hours as quoted above.

# 4. ENVIRONMENTAL MANAGEMENT PLAN

## 4.1 Introduction

This Environmental Management Plan (EMP) defines the work practices, environmental management procedures and management responsibilities relating to the construction of the Proposed Development. This plan should be read in conjunction with the EIAR.

This EMP describes how the Contractor for the main construction works will implement a site Environmental Management System (EMS) on this project to meet the specified contractual, regulatory and statutory requirements and identified mitigation measures. This plan will be further developed and expanded following the grant of planning permission and appointment of the Contractor for the main construction works (in accordance with the parameters and measures set out in this EMP). Please note that some items in this plan can only be finalised with appropriate input from the Contractor who will carry out the main construction works and once the planning conditions are known. It is the Contractor's responsibility to implement an effective EMS to ensure that environmental requirements for the construction of this Proposed Development are met.

All site personnel will be required to be familiar with the EMP's requirements as related to their role on site. The plan describes the project organisation, sets out the environmental procedures that will be adopted on site and outlines the key performance indicators for the site.

- The EMP is a controlled document and will be reviewed and revised as necessary (to comply with planning conditions or other local authority requirements).
- A copy of the EMP will be located on the site H&S notice board.
- All employees, suppliers and contractors whose work activities cause/could cause impacts on the environment will be made aware of and understand the EMP and its contents.

This section includes the mitigation measures which will be implemented by the contractor and client during the construction, operation and decommissioning of the Proposed Development as per the EIAR and NIS.

## 4.2 Project Obligations

In the construction of the Proposed Development there are a number of environmental management obligations on the developer and the contractor. As well as statutory obligations, there are several specific obligations set out in the EIAR and NIS. This CEMP will be updated by the main contractor following appointment and will only be revised as set out above. The contractor and all of its sub-contractors will be fully aware of and in compliance with these environmental obligations.

### 4.2.1 EIAR/NIS Obligations

The EIAR and NIS identified mitigation measures that will be put in place to mitigate the potential environmental impacts arising from construction of the Proposed Development. Measures identified in the EIAR and NIS are detailed in this CEMP and listed in the Schedule of Commitments which accompany the EIAR. It should be noted that this Schedule of Commitments also includes operational phase and decommissioning phase commitments which are not relevant to the construction phase. The CEMP will be read in conjunction with the EIAR and NIS. In the case of any ambiguity or contradiction between this CEMP and the EIAR and NIS, the EIAR and NIS shall take precedence.

### 4.2.2 Planning Permission Obligations

All planning conditions attached to the Proposed Development's planning permission will be adhered to. All pre-commencement planning conditions will be discharged fully by the project owner prior to commencement of construction.

### 4.2.3 Other Obligations

The Developer and/or Contractor for the main construction works will liaise directly with relevant Bodies in relation to securing any necessary permits to allow the works to take place including for example (non-exhaustive list):

- Commencement notice;
- Special Permits in relation to oversized vehicles on public roads;
- Temporary Road Closures (if required);
- Road Opening Licence;
- Building control approval;
- Trade effluent discharge licence / Tankered wastewater agreement;
- Section 50 consent for the construction of bridges or culverts on any drain or watercourse;
- Abstraction licence – registration with EPA;
- Licence, permit or certificate of registration required by the waste producer, haulier and waste facility;
- Tree Felling Licence;
- Licence from national Monuments Service;
- Protected Species licence (noting that the need for same has not been identified at planning stage);

The Developer will also liaise closely with the local residents, especially homeowners and landowners along the local access routes in relation to works and all reasonable steps will be taken to minimise the impact of the development on such persons. A TMP is included in Appendix 14.3, Volume III of the EIAR.

## 4.3 Environmental Management Plan

This section outlines the EMP associated with the Proposed Development. Table 4-1 below describes the Management Plans that have been prepared as part of the EIAR and CEMP that are included in the Appendices to this CEMP (given their size they are not included in this section). The Management Plans should be read in conjunction with the EIAR. The contents of the management plans will be updated for the construction phase in line with any planning conditions that may apply.

**Table 4-1: Management Plans**

| Management Plan | Location | Description |
|---|---|---|
| Traffic Management Plan | Appendix 14.3, Volume III of the EIAR. | The traffic management plan outlines the procedures to be implemented during the construction stage for traffic management at the Proposed Development.<br><br>In the traffic management plan the proposed haul routes to the site, used for engineering material, equipment deliveries and the turbine delivery route (TDR) (to be used for the delivery of oversized components required for the construction of the turbines) are assessed.<br><br>Prior to works commencing, the traffic management plan will be revised as necessary by the appointed contractor in consultation with the local authority. |
| Peat and Spoil Management Plan | Appendix B of this CEMP. | The purpose of this is to provide a peat and spoil management plan for the construction phase of the Proposed Development. The intention of the report is to describe how peat and spoil which will be excavated from infrastructure locations such as turbine bases and roads and will be handled and placed/reinstated on site in an appropriate manner.<br><br>The peat and spoil management plan contains drainage guidelines for construction works and for management of peat on site. It should be noted that the control of water quality and drainage measures for site is outlined in detail in Chapter 12 of the Environmental Impact Assessment Report (EIAR). |
| Surface Water Management Plan | Appendix C of this CEMP. | The Surface Water Management Plan contains methodology for drainage, water quality management and silt control. The measures contained within the plan will be applied when working near water. |

### 4.3.1 Decommissioning Plan

The decommissioning phase works will be completed to approved standards, which include specified materials, standards, specifications and codes of practice (at the time decommissioning takes place).

An experienced main contractor will be appointed to undertake the of the decommissioning of the wind farm development. The main contractor will comply with the Construction and Environmental Management Plan (CEMP) prepared for the construction phase and the Operation and Environmental Management Plan (OEMP) implemented during operation and any revisions made to those documents throughout the phases in which they were adopted. The contractor will produce a detailed and site-specific Decommissioning Plan prior to commencement of decommissioning.

The key site targets are as follows;

- Ensure decommissioning works and activities are completed in accordance with mitigation and best practice approach presented in the accompanying Environmental Impact Assessment Report (EIAR) and associated planning documentation;
- Ensure decommissioning works and activities have minimal impact/disturbance to local landowners and the local community;
- Ensure decommissioning works and activities have minimal impact on the natural environment;
- Adopt a sustainable approach to decommissioning;
- Provide adequate environmental training and awareness for all project personnel.

The key site objectives are as follows;

- Using recycled materials if possible, e.g. soil and overburden material for backfilling and reinstatement;
- Ensure sustainable sources for materials supply where possible;
- Avoidance of any pollution incident or near miss as a result of working around or close to existing watercourses and having emergency measures in place;
- Avoidance of vandalism;
- Keeping all watercourses free from obstruction and debris;
- Correct implementation of the sustainable drainage system (SuDS) drainage design principles;
- Keep impact of decommissioning works to a minimum on the local environment, watercourses, and wildlife;
- Correct fuel storage and refuelling procedures to be followed;
- Good waste management and house-keeping to be implemented;
- Air and noise pollution prevention to be implemented;
- Monitoring of the works and any adverse effects that it may have on the environment.
- Decommissioning methods will be altered where it is found there is the potential to have an adverse effect on the environment;

An overview of the anticipated decommissioning methodologies is provided below.

### *Wind Turbines*

Prior to any works being undertaken on wind turbines, they will be disconnected from the grid by the site operator in conjunction with ESB Networks and EirGrid. The dismantling and removal of wind turbines of this scale is a specialist operation which will be undertaken by the turbine supplier that completed the installation where possible. Turbine dismantling will be undertaken in reverse order to methodology employed during their construction. A number of large-scale cranes will be brought back to site utilising the existing hard stand areas. The dismantling of turbines will be bound by the same safety considerations as was the case during construction in terms of weather conditions where works will not be undertaken during adverse weather conditions and in particular not during high winds.

The turbines will most likely be removed from site in a similar manner to how they were transported to the site originally in extended articulated trucks. The destination of the turbines post decommissioning is unclear at this time as a re-use option may be sourced if early decommissioning occurs. Therefore, the removal of turbines from site is considered in terms of all turbine components being removed intact and as they transported to site.

The transport of disassembled turbines from the site will be undertaken in accordance with a Decommissioning Transport Management Plan which will be issued to and agreed with the competent authority at that time as part of a permit application for the delivery of abnormal loads using the local roads under the Road Traffic (Special Permits for Particular Vehicles) Regulations 2007. The Transport Management Plan will provide for all necessary safety measures, including a convoy and Garda escort as required, off-peak turning/reversing movements and any necessary safety controls.

The accommodation works along the TDR will not be required for the decommissioning phase as turbine components can be dismantled on site and removed using standard HGVs.

### *Turbine Foundations*

On the dismantling of turbines, it is not intended to remove the concrete foundation from the ground. The foundation pedestals will be covered over and allowed to re-vegetate naturally. Leaving the turbine foundations in situ is considered a more environmentally sensible option as to remove the reinforced concrete associated with each turbine would result in environmental nuisances such as noise and vibration and dust.

Therefore, the turbine foundations will be backfilled and covered with soil material which will comprise the usable soil or overburden material on the site after construction. The soil will be spread and graded over the foundation using a tracked excavator and revegetation allowed to occur naturally.

It is proposed that all the internal site access tracks and turbine hard standings will be left in place. These will continue to be used for agriculture. Turbine foundation pedestals and hard standings will be covered over with topsoil previously stripped and used for landscaping purposes during the construction stage and left to revegetate naturally.

### *Underground Cabling*

The electrical and fibre optic cabling that connects each turbine will be removed from the cable ducting. The cabling will be pulled from the cable duct using a mechanical winch which will extract the cable and re-roll it on to a cable drum. This will be undertaken at each of the joint bays/pull pits along the cable. The access track will be excavated using a mechanical excavator at each cable pulling pit location and will be fully re-instated once the cables are removed. The cable ducting will be left in-situ as it is considered the most environmentally prudent option, avoiding unnecessary excavation and soil disturbance for an underground element that is not visible.

Grid connection infrastructure including the on-site substation and ancillary electrical equipment will form part of the national grid and will be left in situ.

It is expected that the decommissioning phase will take no longer than 6 months to complete.

### 4.3.2 Dust Management Plan

This Dust Management Plan (DMP) outlines the sources of dust during the works, identifies measures to minimise dust during the works and the complaints procedure for dust.

Construction stage mitigation measures to minimise dust and emissions will be implemented as follows:

- Construction vehicles and machinery will be serviced and in good working order;
- Receptors which receive dusting and soiling on the haul routes, entering the site; and dwellings directly adjacent to the grid connection route that experience dust soiling, where appropriate, and with the agreement of the landowner, will have the facades of their dwelling cleaned if required should soiling have taken place;
- Ensure all vehicles switch off engines when stationary – no idling vehicles; and
- 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.

#### *4.3.2.1 Dust Generation and Control*

The principal sources of potential air emissions during the construction of the Project will be from the Site, GC and TDR; from dust arising from earthworks, tree felling activities, trench excavation along cable routes, construction of the new access tracks, the temporary storage of excavated materials, the construction of the proposed substation, the movement of construction vehicles, loading and unloading of aggregates/materials and the movement of material around the site.

The following dust control measures will be put in place during construction and decommissioning works:

- The internal access roads will be constructed prior to the commencement of other major construction activities. These roads will be finished with high quality graded aggregate;
- A water bowser will be available to spray work areas and haul roads, especially during periods of excavations works coinciding with dry periods of weather, in order to suppress dust migration from the site;
- All loads which could cause a dust nuisance will be covered to minimise the potential for fugitive emissions during transport;
- Re-vegetate earthworks and exposed areas/soil stockpiles to stabilise surfaces as soon as practicable;
- 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.

*Complaints Procedure*

At the main site entrance, the contact details for the site will be available so that local residents are encouraged to contact the Contractor in the event of an off-site dust impact.

The contractor on site will need to be immediately informed of the incident so that fugitive dust complaints can be substantiated.

In all instances, a complaint will be logged by the environmental manager and each complaint will be assigned a discrete complaint number in the Environmental Log.

The environmental manager will maintain the complaints register and any complaints received will be investigated and the dust suppression methods employed will be reviewed. Suitable remedial action will be undertaken as necessary.

### 4.3.3 Noise and Vibration Management

The predicted noise levels from on-site activity from the Proposed Development is below the noise limits in BS 5228-1:2009+A1:2014. Nonetheless, several mitigation measures will be employed to minimise any potential impacts from the Proposed Development.

The noise impact for construction works traffic will be mitigated by generally restricting movements along access routes to the standard working hours and exclude Sundays and public holidays, unless specifically agreed otherwise. For example, during turbine erection, an extension to the working day may be required but this would be necessary only on a relatively small number of occasions. The hours of construction activity will be as described in Section 3.4.

It will be ensured that vehicles on local roads do not wait outside residential properties with their engines idling during turbine deliveries. Local residents and the local authority will be consulted in advance of any activities likely to occur outside of normal working hours. The transport of large transport loads generates low levels of noise and vibration as trucks performing such tasks move at very low speeds. Construction activity is temporary and unlikely to generate noise issues at any receptor. Construction noise including ground vibration, and air overpressure impacts are predicted as insignificant.

Consultation with the local community is important in minimising the impacts and therefore construction will be undertaken in consultation with the local authority as well as the residents being informed of construction activities through the Community Liaison Officer.

The construction works on site will be carried out in accordance with the guidance set out in BS 5228:2009+A1:2014. Proper maintenance of plant will be employed to minimise the noise produced by any site operations.

The on-site construction and decommissioning noise levels will be below the relevant noise limit of 65 dB LAeq,1hr for operations exceeding one month, and therefore construction noise impacts are not considered to be significant. However, there is potential for temporary elevated noise levels due to the grid connection works. However, the impact of these works at any particular receptor will be for a short duration (i.e. less than 3 days). Where the works at elevated noise levels are required over an extended period at a given location, a temporary barrier or screen will be used to reduce noise levels below the noise limit where required. The noise impact will also be minimised by limiting the number of plant items operating simultaneously where reasonably practicable.

The operation of plant and machinery, including site vehicles, is a source of potential impact that will require mitigation at all locations within the site. Proposed measures, which are the same as those proposed for the construction phase, to control noise include:

- Diesel generators will be enclosed in sound proofed containers to minimise the potential for noise impacts.
- Plant and machinery with low inherent potential for generation of noise and/or vibration will be selected. All plant and equipment to be used on-site will be modern equipment and will comply with the S.I. No. 359/1996 - European Communities (Construction Plant and Equipment) (Permissible Noise Levels) (Amendment) Regulations.
- Regular maintenance of plant will be carried out in order to minimise noise emissions. Particular attention will be paid to the lubrication of bearings and the integrity of silencers.

- All vehicles and mechanical plant will be fitted with effective exhaust silencers and maintained in good working order for the duration of the works.
- Compressors will be of the "sound reduced" models fitted with properly lined and sealed acoustic covers which will be kept closed whenever the machines are in use and all ancillary pneumatic tools shall be fitted with suitable silencers.
- Machines, which are used intermittently, will be shut down during those periods when they are not in use.
- Training will be provided by the Site Manager to drivers to ensure smooth machinery operation/driving, and to minimise unnecessary noise generation.
- Local areas of the haul route will be condition monitored and maintained, if necessary.

### 4.3.4 Biodiversity / Flora and Fauna Management

*Objectives*

The primary objectives of biodiversity / flora and fauna management are as follows:

- Promote the conservation of habitats on site through the establishment of management and/or mitigation;
- Provide management and mitigation for aquatic habitats and water quality;
- Provide management and mitigation for avifauna;
- Provide management and mitigation for bats and terrestrial mammals;
- Monitor the usage of the Site by birds post construction;
- Monitor for any collision by birds at the Site post construction;
- Monitor for any collision by bats at the Site post construction.

For mitigation measures associated with the protection of terrestrial ecology please refer to Chapter 9.

For mitigation measures associated with the protection of aquatic ecology please refer to Chapter 9.

In addition to the above mitigation measures from the EIAR, the mitigation measures prescribed in the Natura Impact Statement (NIS) carried out for the Proposed Development will be implemented in full. For mitigation measures associated with the NIS please refer to Chapter 9, Volume II of the EIAR.

### 4.3.5 Archaeological Management Plan

*Mitigation Measures and Monitoring*

A suitably qualified archaeologist will be employed to oversee the construction phase of the Proposed Development and will advise on and establish appropriate Exclusion Zones around the external most elements of Heritage Assets. Exclusion zones shall be fenced off or demarcated for the duration of construction works in the vicinity of the monuments and will be agreed in advance with the National Monuments Service. No groundworks of any kind (including but not limited to advance geotechnical site investigations) and no machinery, storage of any materials or any other activity related to construction will be permitted within Exclusion Zones.

A systematic advance programme of archaeological field-walking surveys will be undertaken within all construction areas to confirm whether there are any surface traces of any potential unrecorded archaeological or architectural heritage sites exist within areas inaccessible due to the presence of thick tree cover. Archaeological monitoring of ground excavation works during the construction phase will then be carried out within all areas of the Site under licence by the National Monuments Service (NMS) of the Department of Housing, Local Government and Heritage. The Archaeologist will advise on the need for geophysical survey in advance of ground excavation. In the event that any archaeological sites are identified during monitoring, ground works will halt at the location and the archaeological remains will be recorded and cordoned off. The NMS will then be consulted to determine further appropriate mitigation measures, which may include preservation in situ by avoidance or preservation by record through systematic archaeological excavations licensed by the NMS.

### 4.3.6 Waste Management Plan

It will be the objective of the Developer in conjunction with appointed contractor to prevent, reduce, reuse and recover as much of the waste generated on site as practicable and to ensure the appropriate transport and disposal of residual waste off site. This is in line with the relevant National Waste Management Guidelines and the European Waste Management Hierarchy, as enshrined in the Waste Management Act 1996, as amended.

Any waste generated during the development construction phase will be collected, source separated and stored in dedicated receptacles at the temporary compound during construction pending removal to an appropriately licensed waste facility.

A Construction Waste Management Plan has been prepared for the Proposed Development in line with the "Best Practice Guidelines on the Preparation of Waste Management Plans for Construction and Demolition Projects" (2021) as published by the Department of the Environment, Community and Local Government.

The Waste Management Plan will be finalised in accordance with this plan following the appointment of the contractor for the main construction works. This plan should be read in conjunction with the EIAR. The Construction Waste Management Plan will comply with the Statutory requirements of the National Waste Management Plan for a Circular Economy.

*Assignment of Responsible Personnel*

It will be the responsibility of the contractor for the main construction works (when appointed) to nominate a suitable site representative such as a Project Manager, Site Manager or Site Engineer as Waste Manager who will have overall responsibility for the management of waste. The waste manager will have overall responsibility to instruct all site personnel including sub-contractors to comply with on-site requirements. They will ensure that at an operational level each crew foreman is assigned direct responsibility.

*Waste Generated*

It is envisaged that the following categories of waste will be generated during the construction of the Proposed Development:

- municipal solid waste (MSW) from the office and canteen;
- construction waste including concrete;
- waste oil/hydrocarbons;
- paper/cardboard;
- timber;
- steel.

A fully authorised waste management contractor will be appointed prior to construction works commencing. This contractor will provide appropriate receptacles for the collection of the various waste streams and will ensure the regular emptying/and or collection of these receptacles.

*Waste Minimisation/Reduction*

All efforts will be made by site management to minimise the creation of waste throughout the construction of the Proposed Development.

This will be done by:

- material ordering will be optimised to ensure only the necessary quantities of materials are delivered to site
- material storage areas will be of a suitable design and construction to adequately protect all sorted materials to ensure no unnecessary spoilage of materials occurs which would generate additional waste
- all plant will be serviced before arriving on site. This will reduce the risk of breakdown and the possible generation of waste oil/hydrocarbons on site
- all operators will be instructed in measures to cut back on the amount of wastage for trimming of materials etc. For example, cutting of plywood, built into the amount ordered
- educating foremen and others to cut/use materials such as ply wisely for shutters etc.
- prefabrication of design elements will be used where suitable to eliminate waste generation on site
- where materials such as concrete are being ordered, great care will be practiced in the calculation of quantities to reduce wastage.

*Waste Reuse*

When possible, materials shall be re used onsite for other suitable purposes e.g.

- re-use of shuttering etc. where it is safe to do so;
- re-use of rebar cut-offs where suitable;
- re-use of excavated soil for screening, berms etc.;
- re-use of excavated rock or stone – where possible will be used as suitable fill elsewhere on site for the new site tracks, the hardstanding areas and embankments where possible.

*Waste Recycling & Recovery*

In accordance with national waste policy, source separation of recyclable material will take place. Receptacles will be clearly labelled, signposted and stored in dedicated areas in the construction compound.

The following sourced segregated materials container will be made available on site in the construction compound:

- timber;
- ferrous metals;
- aluminium;
- dry mixed recyclables;
- packaging waste;
- food waste.

Typical waste quantities generated during construction of similar-sized developments are included hereunder with typical recovery / reuse that can be achieved.

| | | Reuse | | Recycle/Recovery | | Disposal | |
|---|---|---|---|---|---|---|---|
| Waste Type | Tonnes | % | Tonnes | % | Tonnes | % | Tonnes |
| Mixed C&D | 1200 | 10 | 120 | 80 | 960 | 10 | 120 |
| Timber/Wood | 1000 | 40 | 400 | 55 | 550 | 5 | 50 |
| Plasterboard | 360 | 30 | 108 | 60 | 216 | 10 | 36 |
| Metals | 300 | 85 | 255 | 10 | 30 | 5 | 15 |
| Concrete | 200 | 20 | 40 | 65 | 130 | 15 | 30 |
| Other | 540 | 20 | 108 | 60 | 324 | 20 | 108 |
| Total | 3600 | | 1031 | | 2210 | | 359 |

The materials will be transported off-site by a licensed contractor to a licensed recovery centre and these materials will be processed through various recovery operations. A list of nearby licensed waste management facilities is shown in Table 4-2.

**Table 4-2: Nearby Waste Management Facilities**

| Licensed Waste Facility Location | Type of Waste |
|---|---|
| J. Ryan Haulage Ltd.<br>Cushina, Portarlington,<br>Co. Offaly<br>(c. 3.4km from site) | Soil and stones |
| Pat Mangan,<br>Ballycon Mount Lucas<br>Daingean Co. Offaly<br>(c. 16.4km from site) | Soil and stones |
| Killeshal Precast Concrete Ltd,<br>Killeshal, Daingean,<br>Co. Offaly R35 YK85<br>(c. 24km from site) | Concrete, soil and stones, mixed construction and demolition waste |
| T/A Oxigen Environmental<br>Barnan, Daingean<br>Co. Offaly R35 EE64<br>(c. 26km from site) | Waste plastics (except packaging), waste from forestry, waste metal, paper and cardboard packaging, plastic packaging, wooden packaging, metallic packaging, composite packaging, mixed packaging, glass packaging, textile packaging, concrete, bricks, tiles and ceramics, mixture of concrete, bricks, tiles and ceramics, wood, glass, plastic, copper, bronze, brass, aluminum, lead, zinc, iron and steel, tin, mixed metals, cables, soil and stones, insulation materials, gypsum-based construction materials, mixed construction and demolition wastes, paper and cardboard, ferrous metal, non-ferrous metal, plastic and rubber, glass, wood containing dangerous substances, wood, textiles, minerals (for example sand, stones), combustible waste (refuse derived fuel) |
| Anthony Cocoman,<br>Shean Edenderry Co. Offaly<br>(c. 17km from site) | Concrete, soil and stones |
| Hinch Plant Hire Ltd,<br>Ballydownan Geashill<br>Co. Offaly<br>(c. 15.6km from site) | Soil and stones |
| John Mallen,<br>Ballycon Mount Lucas<br>Co. Offaly,<br>(c. 15.1km from site) | Concrete, soil and stones, dredging spoil |

*Waste Disposal*

Residual waste generated on-site will require disposal. This waste will be deposited in dedicated receptacles and collected by the licensed waste management contractor and transported to an appropriate facility. All waste movements will be recorded, which records will be held by the waste manager on-site.

*Contaminated Material*

Any contaminated soils will be handled, removed and disposed of in accordance with statutory requirements for the handling, transportation and disposal of waste. In particular, the following measures will be implemented:

- Contaminated material will be left in-situ and covered, where possible until such time as WAC (Waste Acceptance Criteria) testing is undertaken in accordance with recommended standards and in-line with the acceptance criteria at a suitably licenced landfill or treatment facility. This will determine firstly the nature of the contamination and secondly the materials classification i.e. inert, non-hazardous or hazardous,
- If the material is deemed to be contaminated, consultation will take place with the respective local authority and/or EPA on the most appropriate measures. Such materials will be excavated, transported by a contractor with a valid waste collection permit and recovered/disposed of at an appropriate facility.

*Waste Management Training*

Copies of the construction waste management plan will be made available to all relevant personnel on site. All site personnel and sub-contractors will be instructed about the objectives of the Waste Management Plan and informed of the responsibilities that fall upon them as a consequence of its provisions.

It will be the responsibility of the contractors appointed Waste Manager to ensure that all personnel are made aware of their responsibilities under the plan via a toolbox talk or otherwise.

## 4.4 Environmental Management Team - Structure and Responsibility

A preliminary organisation chart is included hereunder.

The Contractor's Project Manager will be responsible for the delivery of all elements of the Environmental Management Plan.

The Contractor's Project Manager will retain all responsibility for issuing, changing and monitoring the Environmental Management Plan throughout.

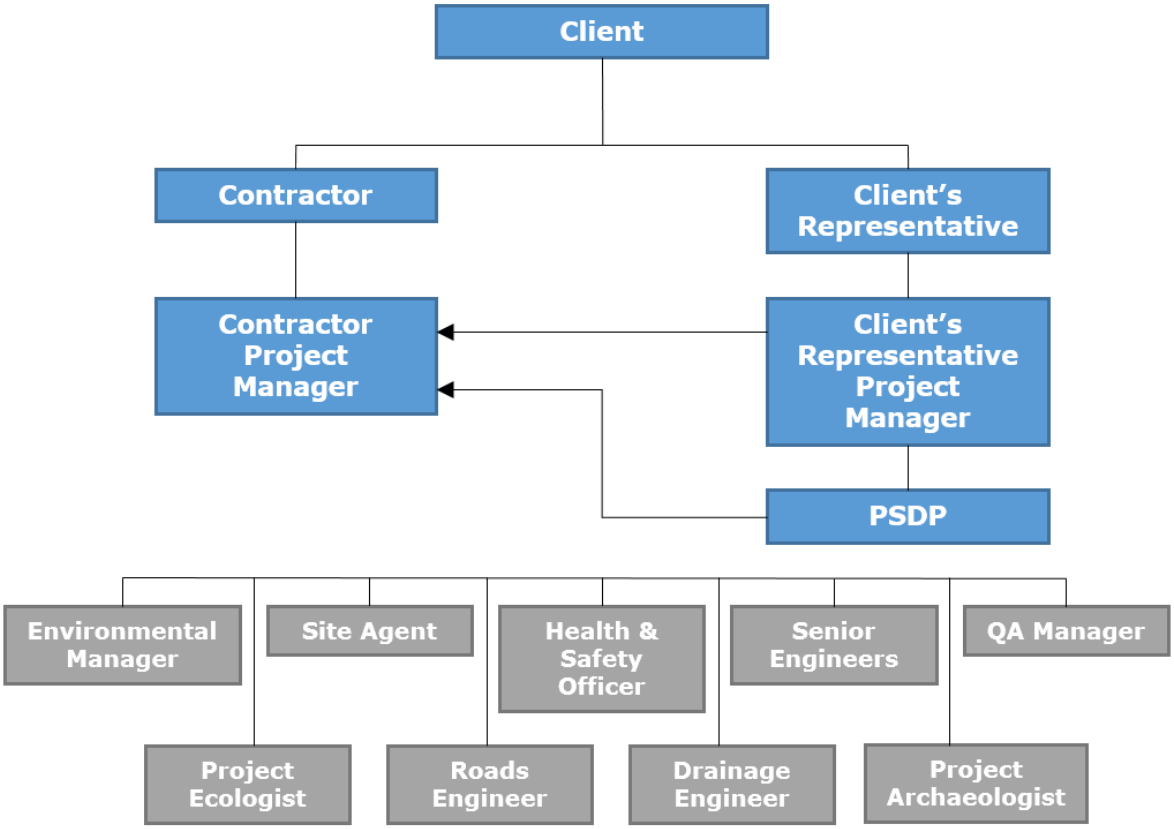



Figure 4-1: Project Management Team Organogram

## 4.5 Training, Awareness and Competence

All site personnel will receive environmental awareness information as part of their initial site briefing. The detail of the information will be tailored to the scope of their work on site.

The contractor for the main construction works will conduct the environmental awareness training at the same time as Health and Safety Training (often referred to as Site Inductions).

This will ensure that personnel are familiar with the environmental aspects and impacts associated with their activities, the procedures in place to control these impacts and the consequences of departure from these procedures.

The CEMP will be available in the main site compound during the construction of the Proposed Development. The environmental performance at the site is on the agenda of the monthly project management meetings for the Proposed Development.

Elements of the CEMP will be discussed at these meetings including objectives and targets, the effectiveness of environmental procedures etc. Two-way communication will be encouraged by inviting all personnel to offer their comments on environmental performance at the site.

## 4.6 Environmental Policy

*The contractor is responsible for preparing and maintaining an Environmental Policy for the site*. The policy will be appropriate to the Proposed Development, commit to continuous improvement and compliance with legal requirements and provide a framework for objectives and targets. This will be communicated to all site personnel and will be available on-site notice boards.

## 4.7 Register of Environmental Aspects

The contractor is responsible for preparing and maintaining a Register of Environmental Aspects pertaining to the site. This register will identify the environmental aspects associated with activities onsite and determine which aspects have or can have a significant impact on the environment. This will be adopted from the mitigations set out in Chapter 9 of the EIAR.

## 4.8 Register of Legislation

The contractor is responsible for preparing and maintaining a register of key environmental legislation pertaining to the site. This register will reference all current environmental legislation and will be inspected, reviewed and updated regularly to ensure compliance.

## 4.9 Objectives and Targets

Objectives and targets will be set to ensure that the Proposed Development can be constructed and operated in full accordance with the EIAR, planning conditions and legislative requirements, with minimal impact on the environment.

Environmental objectives are the broad goals that the contractor must set in order to improve environmental performance. Environmental targets are set performance measurements (key performance indicators or KPI's) that must be met in order to realise a given objective.

## 4.10 Non-Conformance, Corrective and Preventative Action

Non-Conformance Notices will be issued where there is a situation where limits associated with activities on the Proposed Development are exceeded, or there is an internal/external complaint associated with environmental performance.

Non-Conformance is the situation where essential components of the EMS are absent or dysfunctional, or where there is insufficient control of the activities and processes to the extent that the functionality of the EMS is compromised, in terms of the policy, objectives and management programmes. A Non-Conformance register will be controlled by the contractor.

The EMS and all its components will be required to conform to the EMP. In the event of non-conformance with any of the above, the following must be undertaken:

- Assess cause of the non-compliance;
- Develop a plan for correction of the non-compliance;
- Determine preventive measures and ensure they are effective;
- Verify the effectiveness of the correction of the non-compliance;

- Ensure that any procedures affected by the corrective action taken are revised accordingly.

Responsibility will be designated for the investigation, correction, mitigation and prevention of non-conformance.

## 4.11 EMS Documentation

The Contractor is required to keep the following documentation in relation to the environmental management of the construction of the Proposed Development (as a minimum):

- Construction Environmental Management Plan;
- Register of Environmental Impacts;
- Register of Planning Conditions;
- Monitoring Records;
- Minutes of Meetings;
- Training Records;
- Audit and Review Records.

All these documents and records will be available for inspection in the site office. The documentation will be kept up to date and will be reviewed on a regular basis with revisions controlled in accordance with the site quality plan.

## 4.12 Control of Documents

The Contractor will establish, implement and maintain a procedure to control CEMP documents and records so they are clearly identifiable, organised, current, easily located and revised when necessary.

# 5. SAFETY & HEALTH MANAGEMENT PLAN

## 5.1 Introduction

This Safety and Health Management Plan (SHMP) defines the work practices, procedures and management responsibilities relating to the management of health and safety during the design, construction and operation of the Proposed Development and will be read in conjunction with the Preliminary Safety & Health Plan prepared for the Proposed Development by the Project Supervisor for the Design Process. The Safety and Health Management Plan for the construction stage will be finalised in accordance with this plan following the appointment of the contractor for the main construction works.

This SHMP describes how the contractor for the main construction works will implement a site safety management system (SMS) on this project to meet the specified contractual, regulatory and statutory requirements, environmental impact assessment report and natura impact statement mitigation measures and planning conditions The contractor will be required to implement an effective safety management system and will be required to appoint a health and safety officer to ensure that the developer's safety requirements for the construction of this Proposed Development are met.

All site personnel will be required to be familiar with the requirements of the safety management plan as related to their role on site. The plan describes the project organisation and sets out the health and safety procedures that will be adopted on site.

- The Safety and Health Plan is a controlled document and will be reviewed and revised as necessary.
- A copy of the Safety and Health Plan will be located on/near the site H&S notice board.
- All employees, suppliers and contractors whose work activities cause/could cause impacts on the environment will be made aware of the SHMP and its contents.

## 5.2 Project Obligations

The construction of the Proposed Development will impose numerous safety management obligations on the developer, designer and contractor. As well as statutory obligations, there are several specific obligations set out in the EIAR for the Proposed Development. These obligations are set out below. The contractor for the main construction works and all its sub-contractors are to ensure that they are fully aware of and in compliance with these safety obligations.

### 5.2.1 Planning Permission Obligations

Planning permission obligations will be fully outlined in this CEMP once it is updated if planning permission is granted.

### 5.2.2 Statutory Obligations

The Safety, Health and Welfare at Work Act 2005 (as amended) and the Safety, Health and Welfare at Work (Construction) Regulations 2013 (as amended) place a responsibility on the Developer as the "Client", the Designer, the Project Supervisors and the Contractor.

The Client will:

- Appoint a competent and adequately resourced Project Supervisor for the Design Phase (PSDP);
- Appoint a competent and adequately resourced Supervisor for the Construction Stage (PSCS);
- Be satisfied that each designer and contractor appointed has adequate training, knowledge, experience and resources for the work to be performed;
- Co-operate with the project supervisor and supply necessary information;
- Keep and make available the safety file for the completed structure;
- Provide a copy of the safety and health plan prepared by the PSDP to every person tendering for the project;
- Notify the Authority of the appointment of the PSDP.

Designers must:

- Identify any hazards that their design may present during construction and subsequent maintenance;
- Eliminate the hazards or reduce the risk;
- Communicate necessary control measures, design assumptions or remaining risks to the PSDP so they can be dealt with in the safety and health plan;
- Co-operate with other designers and the PSDP or PSCP;
- Take account of any existing safety and health plan or safety file
- Comply with directions issued by the PSDP or PSCS.

The PSDP must:

- Identify hazards arising from the design or from the technical, organisational, planning or time related aspects of the Proposed Development;
- Where possible, eliminate the hazards or reduce the risks;
- Communicate necessary control measure, design assumptions or remaining risks to the PSCS so they can be dealt with in the safety and health plan;
- Ensure that the work of designers is coordinated to ensure safety;
- Organise co-operation between designers;
- Prepare a written safety and health plan for the Proposed Development and deliver it to the client prior to tender;
- Prepare a safety file for the completed structure and give it to the client.

The PSCS must:

- Co-ordinate the identification of hazards, the elimination of the hazards or the reduction of risks during construction;
- Develop the Safety and Health Plan initially prepared by the PSDP before construction commences;
- Co-ordinate the implementation of the construction regulations by contractors;
- Organise cooperation between contractors and the provision of information;
- Co-ordinate the reporting of accidents to the Authority;
- Notify the Authority before construction commences;
- Provide information to the site safety representative;

- Co-ordinate the checking of safe working procedures;
- Co-ordinate measures to restrict entry on to the site;
- Co-ordinate the provision and maintenance of welfare facilities;
- Co-ordinate arrangements to ensure that craft, general construction workers and security workers have a Safety Awareness card, e.g. Safe Pass and a Construction Skills card where required;
- Co-ordinate the appointment of a site safety representative where there are more than 20 persons on site;
- Appoint a safety adviser where there are more than 100 on site;
- Provide all necessary safety file information to the PSDP;
- Monitor the compliance of contractors and others and take corrective action where necessary;
- Notify the Authority and the client of non-compliance with any written directions issued.

The Contractor must:

- Co-operate with the PSCS;
- Promptly provide the PSCS with information required for the safety file;
- Comply with directions of the project supervisors;
- Report accidents to the Authority and to the PSCS where an employee cannot perform their normal work for more than 3 days;
- Comply with site rules and the safety and health plan and ensure that your employees comply;
- Identify hazards, eliminate the hazards or reduce risks during construction;
- Facilitate the site safety representative;
- Ensure that relevant workers have a safety awareness card and a construction skills card where required;
- Provide workers with site specific induction;
- Appoint a safety officer where there are more than 20 on site or 30 employed;
- Consult workers with site specific induction;
- Monitor compliance and take corrective action.

Consequently, at all stages of construction of the Proposed Development there are statutory requirements for the management of safety, health and welfare of all involved in or affected by the development. This CEMP and specifically the Safety and Health Management Plan address key construction management issues associated with the construction of the Proposed Development. This plan will be developed further at the construction stage, on the appointment of the Contractor for the main construction works.

### 5.2.3 The Preliminary Safety and Health Plan

In accordance with the requirements of the Safety, Health & Welfare at Work (Construction) Regulations 2013 (as amended) a Preliminary Safety & Health Plan will be required as part of the design process. This plan will be further developed by the PSCS on appointment and maintained as a live document during construction and commissioning of the Proposed Development.

The safety and health plan will include the following information:

- a general description of the Proposed Development;
- details of other work activities taking place on site;
- works involving particular risks;

- the timescale for the construction phase and the basis on which the time frame was established;
- conclusions drawn by designers and the PSDP having taken into account the General Principles of Prevention and any relevant Safety and Health Plan or Safety File;
- the location of electricity water and sewage connections so as to facilitate early establishment of welfare facilities.

In accordance with the PSDP's procedures the Preliminary Safety & Health Plan for the Proposed Development will include the following sections and subsections to ensure the PSCS is aware of the health and safety issues at tender stage and enable them to price accordingly:

Preamble:

1 General Project Information:
- 1.1 Title;
- 1.2 Description of the Proposed Development;
- 1.3 Employer;
- 1.4 Designers / Other Consultants;
- 1.5 Project Supervisor Design Process;
- 1.6 Drawings, Specifications and Other Documents;
- 1.7 Intended Contract Commencement Date;
- 1.8 Intended Contract Completion Date;
- 1.9 Basis for Contract Duration;
- 1.10 Restrictions on Working Hours;
- 1.11 Notification of Project;
- 1.12 Termination of the PSCS Appointment.

2 The Existing Environment:
- 2.1 Site Location;
- 2.2 Relevant Adjoining Land Uses;
- 2.3 Site Restrictions;
- 2.4 Restrictions on Access;
- 2.5 Hazardous Area Classification;
- 2.6 Existing Services;
- 2.7 Ground Conditions;
- 2.8 Existing Hazards;
- 2.9 Liaison with Statutory Bodies.

3 Other Work Activities:
- 3.1 Other Contracts Which May Affect Work;
- 3.2 Occupation of Site;
- 3.3 Building Activities;
- 3.4 Other Work Activities;
- 3.5 Emergency Procedures in Place on Site.

4 Particular and Residual Risks:
- 4.1 Works Which Put Persons at Work at risk;

4.2 Work Which Puts Persons at Risk from Chemical or Biological Substances;
4.3 Work with Ionising Radiation;
4.4 Work near High Voltage Power Lines;
4.5 Work Exposing Persons at Work to the Risk of Drowning;
4.6 Work on Wells, Underground Earthworks and Tunnels;
4.7 Work Carried Out by Divers at Work Having a System of Air Supply;
4.8 Work Carried Out by Divers at Work Having a System of Air Supply;
4.8 Work Carried Out in a Caisson with a Compressed Air Atmosphere;
4.10 Work Involving the Assembly or Dismantling of Heavy Prefabricated Components;
4.11 Work Involving Hazardous Material;
4.12 Residual Risks.

5 Additional Information:
5.1 Existing Documents;
5.2 Site Possession;
5.3 Site Rules;
5.4 Site Specific Safety Objectives;
5.5 Phasing of Works;
5.6 Permits / Authorisation Required;
5.7 Maintenance;
5.8 Continuing Liaison;
5.9 Specific Recommendations.

6 Information Required for Safety File:
6.1 Information Required for Safety File from PSCS.

### 5.2.4 The Management of Health and Safety during the Construction Phase

The selection criteria for the Contractor for the works will be based on the ability to construct the works in a manner that will not endanger the safety, health and welfare of any parties and competence to fulfil the role of PSCS.

The contract will be awarded on the basis of assessment of the candidates against relevant health and safety criteria including experience of similar projects, knowledge of the construction processes involved and training of their management and staff who will be involved in carrying out the works.

### 5.2.5 The Construction Stage Safety and Health Plan

In accordance with the requirements of the Safety, Health & Welfare at Work (Construction) Regulations 2013 (as amended) the preliminary Safety & Health Plan prepared by the PSDP will be further developed by the PSCS before the commencement of the construction work and updated on a regular basis during the construction phase of the project.

The document will include the following sections and subsections to ensure the management of health and safety during the construction phase of the project:

1. Description of Project:

- project description and programme details;
- details of client, PSDP and PSCS, designers;
- main contractor and other consultants;
- extent and location of existing records and plans;
- arrangements for communicating with Contractors, PSDP and others as appropriate.

2. Communication and Management of the Work:

- management structure and responsibilities;
- safety and health goals for the construction phase and arrangements for monitoring and review of safety and health performance.
- arrangements for:
- regular liaison between parties on site;
- consultation with the workforce;
- the exchange of design information between the Client, Designers, Project Supervisor for the Design Process, Project Supervisor Construction Stage and Contractors on site;
- handling design changes during the construction phase;
- the selection and control of contractors;
- the exchange of safety and health information between contractors;
- security, site induction, and on-site training;
- welfare facilities and first aid;
- the production and approval of risk assessments and method statements;
- the reporting and investigation of accidents and other incidents (including near misses);
- site rules;
- fire and emergency procedures.

3. Arrangements for Controlling Significant Site Risks:

- safety risks:
- services, including temporary electrical installations;
- preventing falls;
- work with or near fragile materials;
- control of lifting operations;
- dealing with services (water, electricity and gas);
- the maintenance of plant and equipment;
- poor ground conditions;
- traffic routes and segregation of vehicles and pedestrians;
- storage of hazardous materials;
- dealing with existing unstable structures;
- accommodating adjacent land use;
- other significant safety risks.

- Health risks:
- removal of asbestos;
- dealing with contaminated land;
- manual handling;
- use of hazardous substances;
- reducing noise and vibration;
- other significant health risks.

The construction stage safety and health plan will be maintained on site by the PSCS and will be communicated to all relevant parties on an ongoing basis through inductions, site safety meetings and toolbox talks etc. as required.

# 6. EMERGENCY RESPONSE PLAN

## 6.1 Introduction

This chapter of the CEMP presents an Emergency Response Plan (ERP) for the proposed project. The Emergency Response Plan shall be finalised in accordance with this plan following the appointment of the contractor for the main construction works and following detailed design development.

This ERP contains predetermined guidelines and procedures to ensure the safety, health and welfare of everybody involved in the Proposed Development and to protect the environment during the construction phase of the Proposed Development. This outlines the immediate response to an emergency situation and will be developed by the main construction works contractor and PSCS as part of their construction stage Safety and Health Plan.

An emergency is any disruptive or harmful event that endangers people, environment, property or assets. Emergencies can be small, as in a fire contained by employees using firefighting equipment or large, as in damage resulting from a storm.

In the context of the Proposed Development, examples of Emergency Response Plan emergency events are:

- medical emergency;
- explosion;
- overheated equipment;
- chemical and fuel spill;
- fire;
- loss of power;
- vehicle incidents;
- land slippage.

Example sources of emergency or disaster events are:

- unstable/inappropriate stockpiles on site;
- faulty or incorrect use of equipment;
- falls from height;
- storm/adverse weather;
- power failure;
- fuel spill;
- road failure;
- serious vehicle collisions or overturning.

The emergency response plan deals with the immediate physical effects of a disaster and outlines the initial response.

## 6.2 Emergency Response Liaison

The contractor/PSCS will designate an individual to serve as the Emergency Response Liaison for this Proposed Development. The emergency response liaison will coordinate the emergency response for the duration of any emergency at or nearby the Site.

The local authority, An Garda Síochána and the HSE Ambulance Co-ordinator will be provided with the construction programme and the onsite contact information from the Emergency Response Liaison prior to construction.

The Emergency Response Liaison will be immediately reachable at all times during Proposed Development construction. The Liaison will coordinate with the above agencies to establish emergency procedures for access to and within the site in the event of an emergency.

## 6.3 Reporting Emergencies

In the event of fire, storm, flood, serious injury or other emergency, contact:

**ALL ON SITE EMERGENCIES DIAL 999**

## 6.4 Designated Responder

A map depicting turbine tower locations with the emergency meeting point will be furnished to the local authority, Fire Department and HSE ambulance co-ordinators.

Upon arrival on the scene, the senior EMS Officer will set up the incident command structure. The Emergency Response Liaison and all contractor's personnel will cooperate with directions of the incident commander and assist as directed.

The nearest emergency services, ambulance and Accident & Emergency (A&E) facilities are:

| Service: | Contact Details: | |
|---|---|---|
| Accident & Emergency (A&E) | Midland Regional Hospital Portlaoise | (057) 869 6035 |
| Ambulance Service | Dial 112 or 999 | |
| Fire Services | Dial 112 or 999 | |
| Garda Station | Newbridge Garda Station | (045) 431 212 |
| District HQ: | Kildare Garda Station | +353 45 527737 |
| Divisional HQ: | Naas Garda Station | +353 45 884311 |

Each member of the contractor's site team who are First-Aid and Cardiopulmonary Resuscitation (CPR) trained personnel will be identifiable with a hard hat sticker indicating their training.

## 6.5 Emergency Alarm

The emergency alarm will be raised on site as soon as an emergency situation is detected, the alarm will be identified (contractor to check those that apply):

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | Air Horn | | Radio | | Voice | | Hand Signals | | Siren |

## 6.6 Emergency Reporting

In the event of an emergency the nearest supervisor with radio equipment/mobile phone will be notified. The degree of emergency will be reported to the Emergency Response Liaison who will contact the Emergency Services and request the appropriate emergency service.

## 6.7 Medical Protocol

In the event of a major medical emergency, the emergency centre (999) will be notified, and an ambulance and emergency medical team will respond to the scene. All major medical cases require professional (ambulance) transportation. In the event of a minor medical case, the affected employee can be transported via company vehicle in the escort of a foreman or site engineer (with first aid training).

## 6.8 Emergency Response

Upon notification, the Emergency Response Liaison will respond to the emergency scene and manage emergency operations:

**1. Assess hazards and make the area safe** – If you cannot enter the area without risking your safety, don't do it, call the Emergency Services immediately and wait for them. If you think you can safely enter the area, look around the emergency scene for anything that can be dangerous or hazardous to you, the casualty, or anyone else at the scene. Bystanders can help with making the area safe. First aid kits will be available on site. Operators that have been first aid/CPR/AED trained will be listed on site and easily identifiable by a hard hat sticker.

**2. Take charge of the situation** – if you are the first-aid provider on the scene act fast. If someone is already in charge, briefly introduce yourself and see if that person needs any help. If there is any chance the casualty could have a head or spinal injury, tell them not to move.

**3. Get Consent** – always identify yourself as a first-aid provider and offer to help. Always ask for consent before touching a conscious adult casualty. Remember to protect yourself first by wearing gloves and eye protection.

**4. Assess Responsiveness** – is the casualty conscious or unconscious? Note their response while you are asking them for their consent. If they respond, continue with the primary survey, and if they don't respond, be aware that an unconscious casualty is or has the potential of being a breathing emergency.

**5. Call out for help** – this will attract bystanders. Help is always useful in an emergency situation. Someone can be called over to phone for medical help. Others can bring blankets if needed, get water, etc. a bystander can help with any of the following:

- Make the area safe.
- Find all the casualties.
- Find the first aid kit, or any useful medical supplies.
- Control the crowd.
- Call for medical help.
- Help give first aid, under your direction.
- Gather and protect the casualty's belongings.
- Take notes, gather information, be a witness.
- Reassure the casualty's relatives.
- Lead the ambulance attendants to the scene of the emergency.
- Notify Emergency Services as soon as you can. Either send a bystander or call yourself.

In the event of a major medical emergency the Emergency Response Liaison, as the person-in-charge of the emergency scene, will dispatch someone to the site access point nearest the emergency scene to direct and lead arriving outside responders to the emergency scene. The designated meeting point will be agreed prior to the commencement of construction. Emergency personnel will be met at this meeting point communicated by management during the 999 call. The emergency personnel escort will use the hazard lights on their vehicle, so they are easily identified.

## 6.9 Escape and Evacuation Procedure

Dependent upon the degree of the emergency and if safe to do so, employees will evacuate to the designated assembly area where the designated wardens shall account for all employees and determine if anyone still remains within the emergency scene.

Should a wild land fire or peat slippage occur, and the designated assembly area is compromised other locations will be designated as secondary assembly areas.

Wind turbines shall be fitted with fire suppression systems and will have emergency escape procedures in place for staff in the event of fire in a wind turbine.

## 6.10 Turbine Tower rescue Procedure

In the event personnel are trapped or injured in an elevated turbine tower position the following protocol will be initiated:

1. The Emergency protocol will be initiated.
2. Emergency Response Liaison will be notified.
3. Tower Rescue Team will be activated and respond to the scene.
4. Outside medical and Rescue Teams will be notified and respond to the scene.

**Tower Rescue Procedure:**

1. Upon learning of an emergency, the on-scene foreman shall assess the emergency and ascertain its degree, location and the extent of any injuries.
2. Upon confirming that an emergency exists the on-scene foreman notifies the Emergency Response Liaison and the project Office.
3. Upon notification of the emergency the Emergency Response Liaison shall notify senior project supervision and the local emergency centre (999) of the emergency.
4. The Emergency Response Liaison shall inform the dispatcher of the location, tower number, the degree of the emergency and the extent of injuries.

## 6.11 Prevention of Illness/Injury Due to Weather/Elements

1. All employees will have access to shelter and heat in the event of inclement weather.
2. Employees will have access to at least a litre of water at all times.
3. High wind warnings and weather forecast will be discussed every morning with the crews. Weather conditions and forecast will be monitored regularly by management.
4. No Employee will work alone. A buddy system will be used so employees can contact a supervisor in case of an emergency.

## 6.12 Environmental Emergency Procedure - Pollution Control

An emergency preparedness and response procedure is required to prevent environmental pollution incidents. Emergency Silt Control and Spillage Response Procedures are included in Section 4.7 of the Surface Water Management Plan which is included in Appendix C of this CEMP.

Suitable spill kits and absorbent material for dealing with oil spills will be maintained on site and will be provided in all construction vehicles. In the event of pollution or potential risk of pollution the Local Authority will be informed immediately.

In the case of water pollution in addition to the Local Authority, Inland Fisheries Ireland will also be informed immediately.

## 6.13 Emergency Response Plan - Haul Routes

Emergency Response Procedure relating to transportation of plant, equipment and materials to site will be developed by the main contractor during the construction phase of the Proposed Development.

## 6.14 Emergency Response Plan - Fire

A site evacuation/fire drill procedure will be in place for carrying out the immediate evacuation of all site personnel in the event of an emergency with might include fire on site or within adjacent lands. The following steps will be taken:

- Notification of the emergency situation. Provision of a siren to notify all personnel of an emergency situation.
- An assembly point will be designated in the construction compound area and will be marked with a sign. All site personnel will assemble at this point.
- A roll call will be carried out by the Site Security Officer to account for all personnel on site.
- The Site Security Officer will inform the Site Supervisor/Construction Manager when all personnel have been accounted for. The Site Supervisor/Construction Manager will decide the next course of action, which be determined by the situation that exists at that time and will advise all personnel accordingly.
- All personnel will be made aware of the evacuation procedure during site induction. The Fire Services Acts of 1981 and 2003 require the holding of fire safety evacuation drills at specified intervals and the keeping of records of such drills.

Fire Safety awareness will be provided as part of general safety induction to the Site. Specific fire training provided to all relevant fire wardens/ officers /representatives. Fire officers will ensure that used or partially used Fire Extinguishers are immediately refilled or replaced.

Smoking will be restricted on site to designated areas within the construction compounds only.

Stockpiling of cleared vegetation / brash will not take place during periods of high fire risk.

Machinery will be parked in a manner that allows them to be moved in an emergency and will be parked a reasonable distance apart from each other to avoid the risk of a fire spreading to adjacent machines.

Areas must be left safe from the threat of fire following hot works. Hot work will only be undertaken by competent and trained personnel under a permit to work system and a fire risk assessment carried will be out for all hot works.

## 6.15 Emergency Events - Wind Turbine Damage/Failures

Each wind turbine, incorporating the tower, blades, gearbox and ancillary equipment in the tower and nacelle is a machine under the European Machinery Directive [2006/42/EC]. The duties of designers and manufacturers of machinery are set out in the Machinery Directive, which has been transposed into national law by the 2008 European Communities (Machinery) Regulations [S.I.No.407/2008] (as amended). All wind turbines will be CE marked, which is in effect, a mark of assurance that the wind turbine complies with the essential health and safety requirements (EHSRs) of EU supply law. In all cases, the manufacturer or the manufacturer's authorised representative will compile information in a technical file confirming how the machine complies with these requirements. The commissioning of turbines and ancillaries will only be carried out by competent, trained and qualified personnel. The system of work for commissioning must be planned, organised, maintained and revised to ensure safety of personnel.

Potential emergency events associated with wind turbines include:

- Blade loss;
- Fire;
- Wind turbine toppling (due to foundation or tower failure);
- Wind turbine rotational failure in extreme wind conditions (due to control system or rotor break failure).

The primary mitigation against an emergency catastrophic event that may endanger the health and safety of the public is implemented at design stage through adequate siting of wind turbines which provide sufficient set back distances from occupied buildings and other infrastructure to avoid the risk of impact in the event of wind turbine collapse.

Peat slippage contingency measures have been included in Section 6.16 below in the unlikely event of landslide scenario.

## 6.16 Land Slippage Contingency Measures

### 6.16.1 Excessive Movement

Where there is excessive movement or continuing peat movement recorded at a monitoring location or identified at any location within the site but no apparent signs of distress to the peat (e.g. cracking, surface rippling) then the following shall be carried out.

1. All activities (if any) shall cease within the affected area.
2. Increased monitoring at the location shall be carried out. The area will be monitored, as appropriate, until such time as movements have ceased.
3. Re-commencement of activities shall only start following a cessation of movement and a review by an experienced geotechnical engineer.

### 6.16.2 Onset of Peat Slide

In the unlikely event where there is the onset or actual detachment of peat (e.g. cracking, surface rippling) then the following will be carried out.

1. On alert of a peat slide incident, all activities (if any) in the area will cease and all available resources will be diverted to assist in the required mitigation procedures.
2. Action will be taken to prevent a peat slide reaching any watercourse. This will take the form of the construction of check barrages on land. Due to the terrain and the inability to predict locations it may not be possible to implement any on-land prevention measures, in this case a watercourse check barrage will be implemented.
3. All relevant authorities will be notified if a peat slide event occurs on site.

4. For localised peat slides that do not represent a risk to a watercourse and have essentially come to rest the area will be stabilised initially by rock infill, if required. The failed area and surrounding area will then be assessed by an experienced geotechnical engineer and stabilisation procedures implemented. The area will be monitored, as appropriate, until such time as movements have ceased.

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# APPENDIX A

## Grid Connection Construction Methodology

Derrynadarragh Wind Farm

# CEMP Appendix B –Grid Connection Construction Methodology

**DERRYNADARRAGH WIND FARM**

Dara Energy Limited

# CEMP Appendix B – Grid Connection Construction Methodology DERRYNADARRAGH WIND FARM

**Abstract:** Inis Onshore Wind and Danu Energy compiled this Construction Methodology for grid connection works joining the new Transmission System Operator (TSO) 110KV Substation to the existing 110KV GIS Bracklone Substation for the proposed development. The purpose of this document is to outline and explain the construction techniques and methodologies which will be implemented during the construction of grid connection works. The grid connection will consist entirely of underground cabling (UGC) with the majority of the UGC to be installed within the public road network and some elements in the Site tracks.

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# 1. INTRODUCTION

## 1.1 Purpose

The purpose of this document is to outline and explain the construction techniques and methodologies which will be implemented during the construction of grid connection works. The grid connection will consist entirely of underground cabling (UGC) with the majority of the UGC to be installed within the public road network and some elements in the Site tracks. This document should be read in conjunction with CEMP and EIAR Chapter 2 Project description.

## 1.2 Proposed Grid Connection

The Proposed Grid Connection will comprise 11.4km of underground 110kV electrical cabling which will pass through the townlands of Cushina in County Offaly; Derrylea, and Inchacooly in County Kildare, and Coolnaferagh, Ullard or Controversyland, Clonanny, Lea, Loughmansland Glebe, and Bracklone in County Laois. The Proposed Grid Connection has been 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).




**Figure 1.1 – Grid Connection Route**

## 1.3 Grid Connection Works

Works for the grid connection will involve trenching, laying of ducting, installing 15 no. joint bays and 4 Horizontal Directional Drills, pulling cables and the back filling of trenches and reinstatement works. The route which will run through 9.1 Km of existing public road, 0.3km in existing tracks and 2km in new access tracks on the wind farm site.

# 2. TRENCHING AND CABLE INSTALLATION METHODOLOGY

## 2.1 TRENCHING AND CABLE INSTALLATION METHODOLOGY

### 2.1.1 Preparation of Method Statement

The Contractor and their appointed Site Manager will develop a targeted Method Statement detailing the construction approach. This will include all relevant mitigation and control measures outlined and in accordance with environmental management plan outlined in Section 4 of the CEMP.

### 2.1.2 Service Identification

Prior to commencing construction, all existing underground services along the underground cable (UGC) route will be identified and marked on site.

### 2.1.3 Traffic Management

Traffic management measures will be implemented in accordance with Chapter 14 of the EIAR. A comprehensive Traffic Management Plan will be prepared and agreed upon with Kildare and Laois County Councils.

### 2.1.4 Trench Dimensions

Trenches will be excavated approximately 600mm in width and 1315mm in depth, both within public roads and site roads see drawings [EirGrid Typ 160 duct trench]. Some sections of public road have been identified where peat is present under the road structure. The depth to base of peat varies and can be up to 2m deep below road surface. Along these local sections of road, it will be necessary to excavate wider and deeper, down to base of peat, and place leanmix or engineering fill to support the grid route trench. Refer to drawing DANU-DAR D002.1

### 2.1.5 Peat Removal

A Ground Penetrating Radar GPR survey was conducted by APEX Geophysics Limited along the public road sections of the route see Appendix 11.4 Cable route Geophysical Investigation Report. The survey identified the presence and depth of peat beneath the road surface. While peat depths under public roads are generally modest, certain locations will require over-excavation to remove underlying peat. In localized sections, particularly along the existing bog road within the site, trench depths may reach up to 2 metres. The anticipated volume of peat to be excavated from trenching works within public roads is approximately [2,800m$^3$] (unbulked). Where peat is encountered along the grid route, it will be removed to ensure the trench is founded on a stable and suitable sub-grade.

### 2.1.6 Peat Storage and Management

Excavated peat will be stored in designated peat deposition areas on site, in accordance with the Peat Management Plan Appendix 11.3.

### 2.1.7 Trenching next to mature trees

A 360m section of the grid route will be trenched along public road L-70481 (figure 2), which is lined with mature trees on both sides (figure 2). To protect tree roots, trenching will follow Section 6.5.5 of the Purple Book 2015 Guidelines for Managing Openings in Public Road. A qualified arborist will oversee and advise on all works in this area. Detailed methodology for this work is included in Appendix 2.1 D Arboricultural Derrylea road Report.

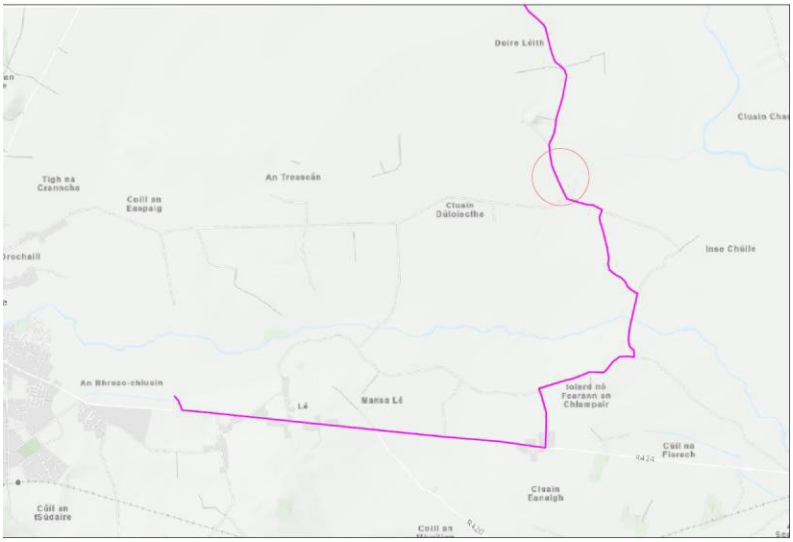



**Figure 2.1 – Location of Mature Trees L-70481**

### 2.1.8 Duct Installation

HDPE cable ducts will be placed into the prepared trench, inspected, and backfilled in accordance with drawing P22-145-0500-0004.

### 2.1.9 Material Stockpiling

Excavated suitable material will be temporarily stockpiled on site for reuse during reinstatement. Stockpiles will:

- Be limited to a maximum height of 2m Be located at least 50m from any surface water features.
- Be approved by the Site Manager and Project Environmental Clerk of Works (ECoW).

### 2.1.10 Backfilling and Surplus Material

Where suitable, excavated material will be reused for backfilling. Any surplus will be transported to designated on-site deposition areas.

### 2.1.11 Sod Management

Earthen (sod) banks will be carefully excavated, with surface sods stored separately and preserved for reinstatement.

### 2.1.12 Dewatering

If required, trenches will be dewatered using a sump installed at the lowest point. Any extracted water will be treated via silt bags before being discharged to vegetation or surface water drainage features, in line with Chapter 12 of the EIAR and Appendix 2.1 C Surface Water Management Plan.

### 2.1.13 Grass Reinstatement

Grass will be reinstated either by reseeding or by replacing stored grass turves, depending on site conditions.

### 2.1.14 Sequential Excavation

No more than 100m of trench will be open at any one time. The next section will only be excavated once reinstatement of the previous section is substantially complete.

### 2.1.15 Work Rate and Schedule

On average, excavation, installation, and reinstatement of a 100m section will be completed within one working day.

### 2.1.16 Roadway Reinstatement

Where trenching occurs in roadways, temporary reinstatement may be applied to facilitate larger-scale permanent reinstatement. Permanent road reinstatement details will be confirmed with the relevant county councils prior to construction. Various roads along the route may require full lane or full width road pavement reinstatement. Some sections of public road have been identified where peat is present under the road structure, and it will be necessary to reconstruct the upper section of the road in order to incorporate geogrid layers to strengthen the road structure.

### 2.1.17 Working Hours

Works will be carried out during standard hours:
Monday to Friday: 07:00–19:00
Saturday: 07:00–13:00
No works on Sundays or Bank Holidays, except in emergencies or exceptional circumstances.

### 2.1.18 Cable Pulling and Jointing

Following duct installation, Cables as per drawing P22-145-0500-0004 and EirGrid Typ 160 duct trench will be pulled through the Ducts. Cable pulling will take approximately one day between each joint bay.
Cable jointing will take approximately one week per joint bay location.

### 2.1.19 Equipment:

- 1 Excavator Operator
- 2-3 General Operatives
- 1 no. tracked excavator (only rubber tracked machines will be allowed on public roads)
- 1 no. dumper or tractor and trailer.

### 2.1.20 Materials:

- Ready-mix Concrete (delivered to site)
- Trench backfilling material (excavated material and aggregates) to relevant specifications
- 160mm diameter HDPE ducting
- 125mm diameter HDPE ducting
- 63mm diameter HDPE duct
- Temporary Surface Reinstatement Materials
- Geogrid and pavement reinforcement materials
- Permanent road surface reinstatement materials.

# 3. JOINT BAYS AND CHAMBERS

## 3.1 Joint Bays and Associated Chambers Methodology

### 3.1.1 Joint Bay Installation

Joint bays will be installed in accordance with the project design specifications. Each bay will consist of a pre-cast concrete structure measuring 2.5m (W) x 6m (L) x 2.05m (D), positioned below the finished ground level. see drawing DANU-DAR-SK001 - Joint Bay drawing for details.

### 3.1.2 Communication Chambers

At each joint bay location, communication chambers will be installed to facilitate data links between Derrynadarragh Wind Farm and the Bracklone 110kV Substation. These chambers will be located adjacent to the joint bays.

### 3.1.3 Earth Sheath Link Chambers

Earth sheath links are used for earthing and bonding cable sheaths in underground power cables. These are installed in a flat formation to minimise circulating currents and induced voltages. Earth sheath link chambers will be positioned near joint bays and will also be constructed from pre-cast concrete with surface-level access covers.

### 3.1.4 Marker Posts

On non-roadway **routes, marker posts** will be installed to indicate the duct route and joint bay locations. These posts will feature:

- A corrosion-resistant aluminium triangular danger sign (750mm base)
- A centred lightning symbol on a fluorescent yellow engineering-grade background
- Installation in concrete foundations Marker posts will also be placed where cable burial depth is below standard due to road conditions.

### 3.1.5 Drawings and Documentation

Detailed drawings of joint bays, communication chambers, and their locations are included in the planning documentations:

# 4. HORIZONTAL DIRECTIONAL DRILLING

## 4.1 Horizontal Directional Drilling (HDD) Methodology

### 4.1.1 Site Preparation

A designated work area of approximately 40m² will be securely fenced on both sides of the crossing to ensure safety and containment.

### 4.1.2 Equipment Setup

The drilling rig and fluid handling units will be positioned on one side of the crossing. These units will be placed on double-bunded 0.5mm PVC bunds to contain any potential fluid spills and manage stormwater runoff.

### 4.1.3 Excavation of Entry and Exit Pits

Entry and exit pits, each measuring 1m x 1m x 2m, will be excavated using an excavator. Excavated material will be temporarily stored within the work area and either reused for reinstatement or disposed of at a licensed facility.

### 4.1.4 Installation of Steel Boxes

Steel containment boxes (1m x 1m x 2m) will be placed in each pit to collect drilling fluid returns from the borehole.

### 4.1.5 Drilling Initiation

A surveyor will set up the drill bit, after which the driller will advance the drill string into the ground, steering the bore path beneath the watercourse.

### 4.1.6 Monitoring and Control

A surveyor will continuously monitor the drilling process to ensure that modelled stress levels and collapse pressures are not exceeded.

### 4.1.7 Cuttings Removal

Drilled cuttings will be flushed back to the steel box in the entry pit using drilling fluid.

### 4.1.8 Back Reaming

Upon completion of the pilot hole, a hole-opener or back reamer will be installed in the exit pit to pull a drill pipe back through the borehole to the entry side.

### 4.1.9 Duct Installation

After all boreholes are completed, a towing assembly will be set up to pull the ducting through the bore.

### 4.1.10 Fluid Disposal

Steel boxes will be removed, and all drilling fluid will be disposed of at a licensed facility.

### 4.1.11 Duct Verification

Installed ducts will be cleaned, tested, and surveyed to confirm their location and integrity.

### 4.1.12 Site Reinstatement

Entry and exit pits will be reinstated in accordance with specifications provided by ESBN, EirGrid, and Laois and Kildare County Councils.

### 4.1.13 Transition Coupler Installation

Transition couplers will be installed on both sides of the crossing to connect the HDD ducts to the standard ducts, as per ESBN and EirGrid requirements.

# 5. WATER CROSSINGS

## 5.1 Water crossings

Six water crossings have been identified along the grid route. For detailed locations, refer to Chapter 2 – Project Description of the EIAR.

The crossings include:

- 5 Horizontal Directional Drills (HDD) – including one beneath the Barrow River bridge and River (see Figure 5.1) See Drawings DAR-D001 Series Drawings for Water crossing Sections details.
- 1 crossing over the new wind farm bridge on site see drawing P22-145-0300-0001.



**Figure 5.1 – River Barrow Bridge**

## 5.2 Traffic Management Plan

The Contractor will develop a comprehensive Traffic Management Plan (TMP) to support road opening applications. This plan will be prepared in consultation with Laois and Kildare County Councils and will incorporate all relevant measures outlined in the Environmental Impact Assessment Report (EIAR).

### 5.2.1 Traffic Flow Management

Along the R420 and R424 where road widths permit, a 'Stop/Go' traffic management system will be implemented, maintaining a minimum 2.5m wide carriageway to allow traffic to pass safely.

Along the local roads L71764, L-7050, L-7051, L7176, L7176, L70481 where a 'Stop/Go' traffic management system is not feasible, a road closure will be required, with diversions where possible and local access accommodated.

### 5.2.2 Road Cleanliness and Safety

The public road will be regularly inspected and kept free of mud and debris.

Road sweeping will be carried out as needed to ensure construction traffic does not negatively impact road conditions.

### 5.2.3 Emergency Access

In the event of an emergency, steel plates (kept on site) can be placed over open trenches to temporarily restore traffic flow.

### 5.2.4 Local Access

Access for local residents will be maintained throughout the works, although traffic flow may be temporarily reduced during active construction.

# Appendix 8

# Surface Water Management Plan (SWMP)

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

## Surface Water Management Plan

**Dara Energy Limited**

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# Surface Water Management Plan

**REVISION CONTROL TABLE, CLIENT, KEYWORDS AND ABSTRACT**

**User is responsible for Checking the Revision Status of This Document**

| Rev. No. | Description of Changes | Prepared by: | Checked by: | Approved by: | Date: |
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| 1 | Final | AH/KB | PD | TC | 17/09/2025 |

**Client:** Dara Energy Limited

**Keywords:** Surface Water Management Plan, SWMP, Wind Farm, EIAR, Construction.

**Abstract:** This document is a Surface Water Management Plan (SWMP) for the construction of Derrynadarragh Wind Farm. The document sets out the measures that shall be implemented during the construction stage of the Proposed Development to ensure the protection of the existing hydrological environment in accordance with mitigation measures set out in the Derrynadarragh Wind Farm Environmental Impact Assessment Report (EIAR).

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# 1. INTRODUCTION

This document is a Surface Water Management Plan (SWMP) for the construction of Derrynadarragh Wind Farm. The document sets out the measures that shall be implemented during the construction stage of the Proposed Development to ensure the protection of the existing hydrological environment in accordance with mitigation measures set out in the Derrynadarragh Wind Farm Environmental Impact Assessment Report (EIAR).

This SWMP shall be read in conjunction with the EIAR and planning application drawings and in particular the following documents:

- EIAR Chapter 2 - Description of the Development [EIAR Volume II];
- EIAR Chapter 11 - Soils, Geology and Hydrogeology [EIAR Volume II];
- EIAR Chapter 12 - Flooding, Hydrology & Water Quality [EIAR Volume II];
- Site Specific Flood Risk Assessment (SSFRA) [EIAR Volume III, Appendix 12.1];
- Construction and Environmental Management Plan [EIAR Volume III, Appendix 2.1];
- Aquatic Ecology Assessment Report [EIAR Volume III, Appendix 9.2];
- Biodiversity Enhancement Management Plan (BEMP) [EIAR Volume III, Appendix 2.2];
- Peat and Spoil Management Plan [EIAR Volume III, Appendix 11.3];
- The preliminary drainage design presented in 0100 and 0500-Series planning application drawings.

The SWMP for the construction stage of the Proposed Development shall be finalised in accordance with this plan following the appointment of the contractor for the works.

## 1.1 Statement of Authority

This SWMP was completed by Fehily Timoney and Company where it was drafted by Aoife Hurd and reviewed and by Pablo Delgado.

Aoife Hurd is a Senior Civil Engineer at Fehily Timoney and Company working in the Energy and Planning Department. She holds a First-Class Honours Bachelor's Degree and First-Class Honours with Distinction Master's Degree in Civil, Structural and Environmental Engineering from Trinity College Dublin. She is a member of Engineers Ireland (EI) and has experience working on residential, infrastructure and renewable energy projects at all stages from concept to construction. Aoife provides technical and engineering support to the EIAR teams for a variety of commercial scale renewable energy projects.

Aoife has experience in the preparation of Traffic and Transportation assessments, Air and Climate assessments, as well as other technical chapters associated with EIARs and environmental reports for renewable energy projects ranging from wind farms, solar farms, grid connections, battery energy storage systems and ancillary grid infrastructure projects. She also has experience in the design of renewable energy developments.

Pablo is a Principal Engineer and Drainage Lead at Fehily Timoney and a Chartered Member of Engineers Ireland. He has extensive experience in planning, design, and construction of hydraulic engineering projects, collaborating effectively with clients and contractors. Specialising in hydraulic infrastructure, he works closely with all stakeholders to deliver practical and efficient designs while addressing issues throughout project delivery.

He has strong expertise in hydraulic design, including developing best-practice guidelines, drainage design, standards, and specialist software tools. Pablo has delivered drainage designs in Design & Build and Public-Private Partnership environments, with experience across the UK, Ireland, and Spain. He holds a Bachelor's degree in Civil Engineering, a Master's degree, and Postgraduate Diplomas in Civil and Environmental Engineering from the University of Zaragoza and the Polytechnic University of Valencia, Spain, focusing on hydraulic design of civil and environmental infrastructure.

Throughout his career, Pablo has provided technical design and advisory services across all project stages in both urban and rural settings. His major projects include Dunkettle Interchange, N4 Collooney to Castlebaldwin, N22 Baile Bhuirne to Macroom, HS2, A737 Dalry Bypass, and Leanamore Wind Farm. He has also served as a Third-Party Checker on projects such as Adare Bypass and the N5 Ballaghaderreen to Scramoge. Additionally, he has delivered preliminary and detailed designs for renewable energy developments, including flood risk assessments, modelling, hydrological and hydraulic analyses, and environmental impact assessment chapters.

## 1.2 Existing Environment

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, temporary construction compounds, drainage infrastructure, 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 Proposed Development assessed in this EIAR 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').

For a detailed description of the Proposed Development please refer to Chapter 2, Volume II of the EIAR.

A detailed description of the existing hydrological environment and existing drainage is contained in Chapter 12 of the EIAR.

The proposed wind farm site is located within the Barrow Catchment (ID 14) and the Barrow_SC_040 sub-catchment as defined by the Water Framework Directive (WFD). The waterbody in this sub-catchment that is crossing the proposed site is known as FIGILE_080 (EPA Name: Cushina 14).

In addition, the wind farm is located within two sub-basins:

- FIGILE_070- IE_SE_14F010510.
- FIGILE_080- IE_SE_14F010600.

The main hydrology feature within the wind farm site is the Cushina River (FIGILE_080). A large area of the surface runoff drains into this river within FIGILE_080 sub-basin. The Cushina River runs in an easterly direction, and it is a tributary of the Figile River (FIGILE_080). The remaining of the site drains into FIGILE_070 sub-basin or directly into Figile River. There are no lakes or reservoirs within the wind farm site study area.

Existing access tracks and lands are generally drained by adjacent drainage ditches and swales. These drainage features will be retained and upgraded where necessary to the same standard as the proposed drainage design. Where existing tracks are widened, existing drainage will be realigned or replaced. The replacement sections of drain shall have a similar gradient and width as existing channels to ensure the flow rate and capacity of the existing channel is retained and adequate for the contributing area.

## 2. DRAINAGE OF THE PROPOSED WIND FARM

The proposed surface water drainage system utilises sustainable drainage devices and methods where appropriate, incorporating the main components of Sustainable Drainage Systems (SuDS). A fundamental principle of the drainage design is that clean water flowing in the upstream catchment, including overland flow and flow in existing drains, is allowed to bypass the works areas without being contaminated by silt from the works. This will be achieved by intercepting the clean water and conveying it to the downstream side of the works areas either by piping it or diverting it by means of new drains.

The proposed layout of the drainage system is provided in 0100 and 0500-Series planning application drawings.

The drainage strategy within internal areas of the Site will incorporate the following main components of Sustainable Drainage Systems (SuDS):

- Interceptor Drains
- Cross Drains
- Diffusers
- Swales
- Settlement Ponds

On the upslope side of new sections of access track and hardstanding areas, overland flows will be intercepted in channels. The flow will then be discharged diffusely over vegetated areas. The roadside drains will therefore only carry the site access track runoff. This will ensure that there will be no mixing of 'clean' and 'dirty' water as shown in Figure 2-1, and will avoid a large concentration of flows. Thus, erosion risks will be reduced and the quantity of water requiring treatment will be minimised.

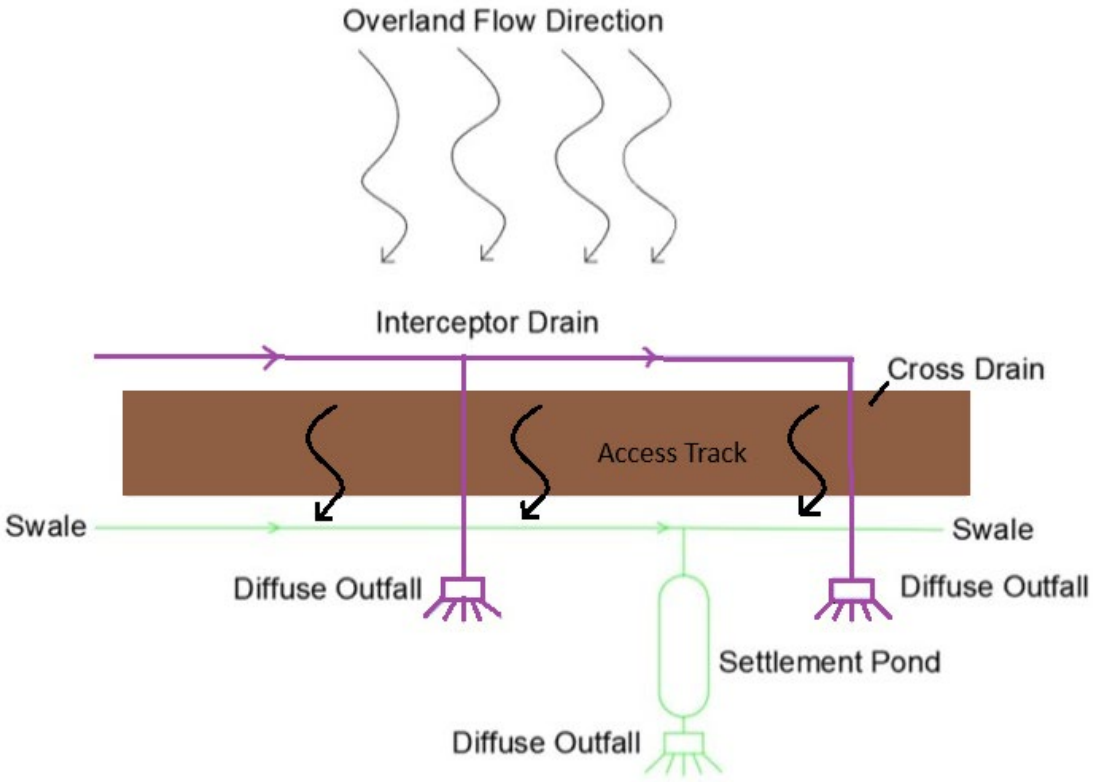



**Figure 2-1: Drainage Design Principles**

The drainage system outlined below provides for a multi-stage treatment train of the discharges from the development, as recommended in The SuDS Manual (C753), 2015:

- Grassed swales removing some of the sediment borne contaminants,
- Settlement ponds providing retention and treatment of discharges,
- Diffuse outflow from settlement ponds providing for further retention and settlement of suspended solids by reducing the velocities of flows and increasing the flow path of discharges,
- Continuation of flows by natural flow paths over vegetated areas before entering the watercourse, providing further retention and treatment of discharges.

**Interceptor Drains**

Interceptor drains will be installed ahead of the main earthworks activities to minimise the effects of collected water on the stripped/exposed soils once earthworks commence. These drainage ditches will be installed on the upgradient boundary of the areas affected by the access track earthworks operations and installed ahead of the main track construction operations commencing.

They will generally follow the natural flow of the ground. The interceptor drains will intercept any storm water surface runoff and collect it to the existing low points in the ground, allowing the clean water flows to be transferred independently through the works without mixing with the construction drainage. Collected runoff will be discharged through the roads via cross drains.

It will then be directed to areas where it can be redistributed over the ground. The overland flow will then discharge diffusely on the downslope side over vegetated areas within the site boundary.

**Cross Drains**

Cross drains will be implemented prior to the initiation of primary earthworks activities to mitigate the impact of accumulated water on exposed soils resulting from earthworks commencement. These drainage channels will be positioned at the elevated boundaries of regions influenced by the earthworks operations associated with site infrastructure, and they will be installed in advance of the primary earthworks construction activities.

These channels will typically conform to the natural topographical contours. The cross drains will intercept surface runoff and direct it towards pre-existing low points in the terrain, enabling the unadulterated flow of uncontaminated water through the Proposed Development area without mingling with construction-related drainage.

The cross drains should be installed in such a way that the invert levels are slightly lower than the corresponding levels on the inlet and outlet sides, to allow a natural bed to form. Cross drains should not be installed with a "hanging" outlet (i.e. significantly higher than the corresponding ground level), as this will cause erosion of the ground through the forced action of the water flows and would not provide a suitable path for small mammals to use in periods of drier conditions.

The location of cross drains associated with the Proposed Development can be found in the associated 0100 and 0500-Series planning application drawings**.**

**Diffuser in Gravel and Stones**

A gravel and stone-lined diffuser, also known as a gravel or stone-lined diffuser, is a hydraulic structure commonly utilized in interceptor drains. Its primary purpose is to effectively manage water flow and prevent erosion in areas with loose or erodible soils, such as gravel beds or riverbanks.

The structure consists of a layer of gravel of a minimum of 40 mm diameter or stones that disperses the flowing water's energy, safeguarding the surrounding environment from erosion impacts. By distributing water across a larger area, slowing down its velocity, and facilitating water infiltration, the diffuser ensures energy dissipation and sediment trapping. This eco-friendly solution supports ecological coexistence and sustainable water management practices. Regular maintenance is essential to sustain its effectiveness in controlling water flow and preventing soil erosion.

**Swales**

The surface water drainage is designed to capture surface water run-off from the roads and other hardstanding areas in swales and discharge into settlement ponds specifically constructed for managing surface water runoff generated from the proposed wind farm infrastructure and earthworks. After passing through the settlement pond, surface run-off will be permitted to spread across the adjacent lands.

This treated water will ultimately percolate to groundwater or travel over ground and be assimilated into the existing drainage network. There will be no direct discharges from the proposed wind farm to any existing natural watercourse.

The internal access tracks will be constructed using unbound aggregate materials such that they will permit some degree of infiltration and reduce the volume of runoff generated.

Swales along access tracks will be installed in parallel of the main construction phase. Swales will provide additional storage of storm water where located along gradient. Given the steep longitudinal gradients on some sections of access track, regular check dams will be employed within the trackside swale on these sections to reduce the flow velocity and provide settlement opportunity. Check dams will be constructed from course gravel/ crushed rock.

The swales will be 0.3 m in depth with a bottom width of 0.5 m and side slopes of 1 in 3. A grassed swale is shown on Figure 2-2. The swales will be constructed in accordance with CIRIA C698 Site Handbook for the Construction of SUDS (CIRIA, 2007).

All drainage elements will be designed with a freeboard of 300 mm to provide additional hydraulic capacity to accommodate heavy rainfall event



**Figure 2-2: Grassed Swale along Access Track**

**Check Dams**

At slopes greater than 2%, check dams will be required in the swales and interceptor drains to slow down the velocities of flows and prevent erosion occurring, as shown in Figure 2-3. These check dams will be in stone of minimum size 40 mm and will be laid at a spacing of between 10 and 30 m dependent on the slope.

All check dams, etc will be checked at least once weekly via a walkover survey during the full period of construction. All excess silts will be removed and placed in borrow pit reinstatement or embankments. Where check dams have become fully blocked with silt, they will be replaced.

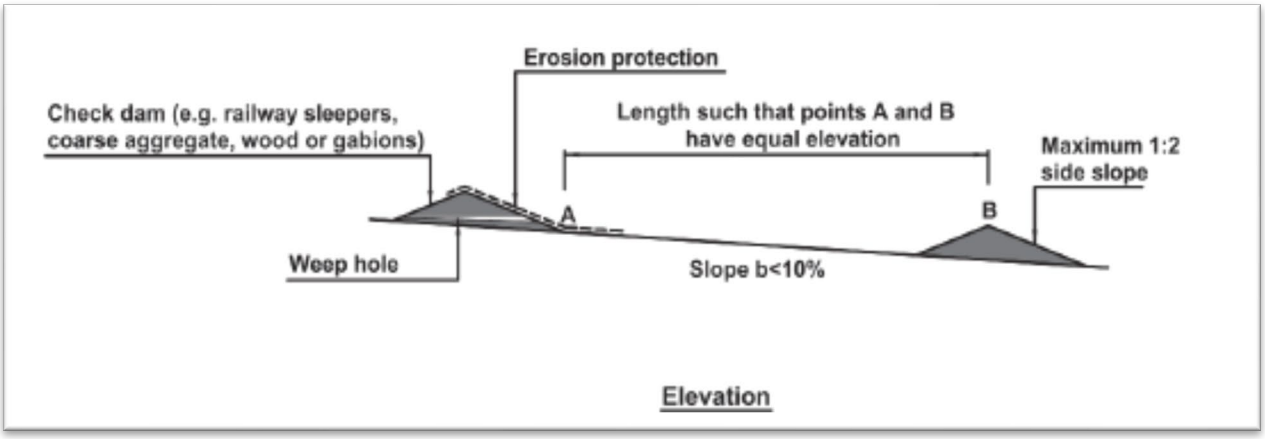



Figure 2-3: Check Dam Detail

**Settlement Ponds**

Settlement ponds will be put in place across the Site (refer to 0100 Series planning drawings for layout and 0501 Series planning drawings for details). Settlement ponds will have a diffuse stone filled outflow which will encourage the diffuse spread of flows overland and back into natural drains down slope of the settlement ponds. Drainage stone will be placed at the inlet to the ponds to filter the flows before they enter the ponds.

After passing through the settlement ponds, the concentration of suspended solids in the surface water run-off due to the excavations will be reduced.

The following shall apply to construction of settlement ponds at the Site:

- Pond depths generally to be excavated to less than 1.5m;
- Side slopes to be shallow, nominally at a 1 in 3 side slope (maximum); and
- Material excavated from the settlement pond should be compacted around the edge of the pond.

The settlement ponds will be designed with a freeboard of 300 mm to provide additional hydraulic capacity to accommodate heavy rainfall event.

The settlement pond design is based on primary settling out of suspended solids from aqueous suspension. The theory behind the design of the settlement ponds is the application of Stoke's Law. 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 (greater than or equal to 0.02 mm) to settle prior to allowing the water to outfall to the receiving environment. Flow rates for storm events will be maintained at or below greenfield run-off rates.

For the preliminary design Stokes' law is used in combination with the Rational Method. The inflow to stilling pond is calculated using Modified Rational Method:

$$Q = 2.78 \times c \times I \times A \text{ (l/s)}$$

C = coefficient runoff, for infrastructure the value of 0.84 is used as per DN-DNG-03066 (TII, 2015).
I = intensity (mm/h) for 1 in 10 years storm event, duration 1h, as per CIRIA C698 Site Handbook for the Construction of SUDS (CIRIA, 2007).
A = contributing area (ha).

According to the CIRIA 648 a pond volume is defined by inflow and retention time:

$$V = Q \times t$$

Settlement ponds will be installed concurrently with the formation of the road and will be fenced off for safety. Machine access will be required at settlement ponds to remove accumulated sediment.

Further sediment pond control measures include:

- Settlement pond maintenance and/or cleaning will not take place during periods of extended heavy rain; this will be carried out under low or zero flow conditions so as not to contaminate the clean effluent from the pond. The water level would first be lowered to a minimum level by pumping through a settlement tank without disturbing the settled sediment. Then excavator can remove sediment;
- Settlement ponds will be monitored closely over the construction timeframe to ensure that they are operating effectively.

In the event of an emergency, the settlement ponds will provide a temporary holding area for any accidental spills on site as it will be possible to block off the outflow from these ponds for a limited period. Erosion control and retention facilities, including settlement ponds will be regularly maintained during the construction phase.

The drainage system will remain operational and will be utilised for the decommissioning phase to treat any surface water from exposed areas as a result of decommissioning at the site. During the decommissioning of the turbine base, hardstanding areas and access tracks shall remain in place and be covered with local soil/topsoil to minimise disturbance to soils.

Swale draining to settlement pond is shown on Figure 2-4.

The locations of temporary settlement pond will be adjacent to earthworks, as close as possible to the source of sediment while maintaining a minimum 50 m buffer distance from existing watercourses. The settlement pond will also provide containment capacity 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 (refer to Appendix 2.1 of 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.

The contractor, during the construction phase, will be responsible to provide the temporary settlement ponds, including the design, maintenance and operation. After the completion of the construction phase the contractor will be responsible to the decommission and the reinstatement of these settlement ponds.



Figure 2-4: Swale draining to Settlement Pond

### Drainage of Temporary Site Compounds

Temporary settlement ponds will be put in place downstream of the location of the temporary site construction compounds to ensure water retention and settling of the particles. To improve water quality control the flow from the compound areas will be treated with Full Retention Petrol Interceptor before reaching the settlement ponds.

The settlement ponds will have a diffuse stone filled outflow which will encourage the diffuse spread of flows overland and back into natural drains down slope of the settlement ponds. Drainage stone will be placed at the inlet to the ponds to filter the flows before they enter the ponds.

The locations of settlement ponds will be adjacent to earthworks, as close as possible to the source of sediment while maintaining a minimum 10m buffer distance from existing watercourses. The settlement pond will also provide containment capacity 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 (refer to Appendix 2.1 of 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.

# 3. WATERCOURSE CROSSINGS

All crossings will be designed in accordance with National Roads Authority guidance 'Guidelines for the Crossing of Watercourses During the Construction of National Road Schemes' and Inland Fisheries guidance 'Guidelines on protection of Fisheries During Construction Works in and Adjacent to Waters' (2016) , with clear span bridges being the preferable type of water crossing, with box culverts and piped culverts used where a bridge would not be feasible. The crossing structures will be installed with a minimum 300mm freeboard elevation for 1% AEP MRFS flows (annual exceedance probability, medium range future scenario).

Table 3-1 below details all drain and watercourse crossings associated with the Proposed Development.

For further details on drain and watercourse crossings please refer to Chapter 12, Volume II of the EIAR. The proposed drainage layout which includes the location of crossings can be found on 0100 and 0500-Series planning application drawings. For further information on construction methodologies, please refer to Chapter 2, located in Volume II and the CEMP located in Appendix 2.1 of Volume III.

## Table 3-1: Drain and Watercourse Crossings

| Feature ID | Element of Project | X (ITM) | Y (ITM) | WFD Waterbody (Yes/No) | Existing Culvert/ Structure | Proposed Crossing Method |
|---|---|---|---|---|---|---|
| WCC-WF1 | Wind Farm | 659082 | 716063 | No | No | Pipe Culvert |
| WCC-WF2 | Wind Farm | 659031 | 715998 | No | No | Pipe Culvert |
| WCC-WF3 | Wind Farm | 659513 | 716003 | No | Yes | Box Culvert |
| WCC-WF4 | Wind Farm | 659862 | 715831 | No | No | Pipe Culvert |
| WCC-WF5 | Wind Farm | 660099 | 715739 | No | No | Box Culvert |
| WCC-WF6 | Wind Farm | 659533 | 716372 | No | No | Box Culvert |
| WCC-WF7 | Wind Farm | 659129 | 716789 | No | No | Pipe Culvert |
| WCC-WF8 | Wind Farm | 659294 | 716786 | No | No | Box Culvert |
| WCC-WF9 | Wind Farm | 658817 | 716702 | No | No | Pipe Culvert |
| WCC-WF10 | Wind Farm | 658347 | 715857 | Yes | No | Bridge |
| WCC-WF11 | Wind Farm | 658504 | 716006 | No | No | Pipe Culvert |
| WCC-WF12 | Wind Farm | 658237 | 716098 | No | No | Pipe Culvert |
| WCC-WF13 | Wind Farm | 658183 | 716296 | No | No | Box Culvert |
| WCC-WF14 | Wind Farm | 658088 | 716388 | No | No | Box Culvert |
| WCC-WF15 | Wind Farm | 657968 | 716432 | No | No | Pipe Culvert |
| WCC-WF16 | Wind Farm | 658001 | 716418 | No | No | Pipe Culvert |
| WCC-WF17 | Wind Farm | 657885 | 716466 | No | No | Box Culvert |
| WCC-WF18 | Wind Farm | 657749 | 716523 | No | No | Pipe Culvert |
| WCC-WF19 | Wind Farm | 657807 | 716496 | No | No | Pipe Culvert |
| WCC-WF20 | Wind Farm | 657621 | 716718 | No | No | Box Culvert |
| WCC-WF21 | Wind Farm | 657438 | 716792 | No | No | Pipe Culvert |
| WCC-WF22 | Wind Farm | 656792 | 716839 | No | No | Pipe Culvert |
| WCC-WF23 | Wind Farm | 658985 | 715592 | No | Yes | Pipe Culvert |
| WCC-WF24 | Wind Farm | 658813 | 715638 | No | No | Pipe Culvert |
| WCC-WF25 | Wind Farm | 659330 | 715481 | No | No | Box Culvert |
| WCC-WF26 | Wind Farm | 658725 | 715865 | No | No | Pipe Culvert |
| WCC-WF27 | Wind Farm | 656919 | 716853 | No | No | Pipe Culvert |
| WCC-WF28 | Wind Farm | 656944 | 716857 | No | No | Pipe Culvert |
| WCC-WF29 | Wind Farm | 657033 | 716864 | No | No | Pipe Culvert |
| WCC-WF30 | Wind Farm | 657269 | 716819 | No | No | Pipe Culvert |
| WCC-WF31 | Wind Farm | 658180 | 716261 | No | No | Box Culvert |
| WCC-WF32 | Wind Farm | 659337 | 716089 | No | No | Box Culvert |

| Feature ID | Element of Project | X (ITM) | Y (ITM) | WFD Waterbody (Yes/No) | Existing Culvert/ Structure | Proposed Crossing Method |
|---|---|---|---|---|---|---|
| WCC-WF33 | Wind Farm | 659634 | 716590 | No | No | Pipe Culvert |
| WCC-WF34 | Wind Farm | 659359 | 716765 | No | No | Box Culvert |
| WCC-WF35 | Wind Farm | 659036 | 716783 | No | No | Pipe Culvert |
| WCC-WF36 | Wind Farm | 659719 | 715314 | No | No | Pipe Culvert |
| WCC-GCR1 | GCR | 659966 | 713535 | No | Yes | HDD |
| WCC-GCR2 | GCR | 660546 | 712416 | Yes | Yes | HDD |
| WCC-GCR3 | GCR | 660321 | 711962 | No | Yes | Crossing Over |
| WCC-GCR4 | GCR | 659745 | 711434 | No | Yes | HDD |
| WCC-GCR5 | GCR | 658244 | 711382 | No | Yes | HDD |
| WCC-TDR5 | TDR | 652594 | 727645 | Yes | Yes | Bridge |

## 3.1 Wind Farm

Within the Site there are 36 no. drain crossings and 1 no. watercourse crossing, as identified in Table 3-1. There is one WFD River watercourse crossing point proposed on the Cushina River (FIGILE_080) which is a tributary of the River Barrow (reference WCC-WF10 of Table 3-1). It is proposed to construct a single span bridge at this location where the internal wind farm access track crosses the Cushina River.

A cross section of the proposed new single-span bridge is included within the Planning Drawings. The soffit level of the bridge will provide a minimum freeboard of 300mm to allow a fluvial flood level of 1 in 100 years (+20%). The crossing shall also be sized to convey the flow from 1 in 100-year (+20%) flood event unobstructed.

The supports for the proposed clear span bridge crossing at this location shall be set back 5 m from the riverbank.

Other drain crossings within the wind farm site comprise bottomless box culverts and pipe culverts where the proposed wind farm access track crosses minor streams and land drains. Details of these are shown in Table 3-1. For more information and illustrations of proposed single span bridge crossings, box culverts and piped culverts, see Chapter 12, located in Volume II of the EIAR.



Figure 3-1: WFD River watercourse crossing point at FIGILE_080 River

## 3.2 Grid Connection

The onsite substation (contained within the Proposed Wind Farm area) will be connected to the grid via high voltage (110kV) and communication underground cabling to the existing 110KV GIS Bracklone Substation.

There will be 5 no. crossing points comprising 4 no. watercourse crossings and one dry stone arch bridge crossing at a disused canal. There will be 4 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 (reference WCC-GCR2 of Table 3-1).

Construction methodologies can be found in Chapter 2 - Description of the Proposed Development and the CEMP in Appendix 2.1 of Volume III. HDD will be employed on the GCR crossing point 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 public road and stream bed so as not to conflict with the road drainage and 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.



**Figure 3-2: Existing bridge on BARROW_090 River**

## 3.3 Turbine Delivery Route

The Turbine Delivery Route (TDR) will utilise existing public highways, which cross a number of existing WFD watercourses. In addition, a new single span bridge will be constructed along the TDR to cross the Philipstown River, constructed adjacent to the existing Philipstown Bridge.

Further details on the watercourse crossing Construction methodologies are provided in Chapter 2 - Description of Proposed Development and the CEMP in Appendix 2.1 of Volume III.

Bottomless box culverts shall be of pre-cast concrete construction and sized to accommodate the 1 in 100-year (+20%) flood flow and will include a minimum freeboard of 300mm.

Piped culverts will be sized to accommodate the 1 in 100-year flood flow (plus a 20% allowance for climate change) and will be minimum 450mm in diameter.

With suitably sized piped culvert and box culvert crossings, and a suitably designed bridge, there will be no impact on flows within watercourses and the risk of flooding will not be increased as a result of the Proposed Development.



**Figure 3-3: Existing Philipstown Bridge Watercourse Crossing at TDR Node No. 29/30**

All in-stream works will be carried out under dry works conditions i.e. the works area will be isolated from the river/stream/drain flow by means of temporarily over pumping or fluming the flow. The diversion of flow by over pumping / fluming will be into the same waterbody i.e. flows will not be diverted from one watercourse to another. The flume pipe and / or the pumps will be sized appropriate to watercourse flow and will have capacity to accommodate storm flows. Fluming is the preferred option for fishery water courses and must be such that fish passage is maintained. Where over pumping is proposed, measures (such as screening) will be taken to ensure that fish do not become entrained in the pump. Additionally, measures will be taken to reduce the sedimentation caused by pumping e.g. creating a gravel-lined sump.

To create a dry works area, an upstream barrier will be installed using aquadam or sandbags (which will be double bagged and tied). Straw bales will not be permitted. Flows will either be over pumped or flumed downstream of the works area. A downstream barrier will then be installed and the works area dewatered. Direct dewatering into the watercourse will not be permitted as it will increase the risk of sedimentation. Instead dewatering will be via filter bag, sediment tank, filter mats or natural vegetation adjacent to the watercourse. Discharging construction water (trade effluent) directly to surface waters is a licensed activity. No extracted or pumped or treated construction water from the isolated construction area will be discharged directly to a drain or watercourse (This is in accordance with Local Government (Water Pollution) Act, 1977 as amended).

Any water courses requiring a dry works area will require a fish salvage exercise which must firstly be Authorised under Section 14 of the Fisheries (Consolidation) Act 1959. Fish salvage by electrofishing will not be carried out where water temperature exceeds 20ºC. Fish salvage operations can only be conducted by qualified ecologists under said license. A detailed method statement will be required as part of the license application. The work will have regard to the following general guidelines for electrical fishing include Beaumount et al., (2002) “Guidelines for Electric Fishing Best Practice” and Scottish Fisheries Coordination Centre (2007) “Electrofishing team leader training manual” and Central Fisheries Board (2008) Methods for the Water Framework Directive Electric Fishing in wadable reaches”.

No in-stream works will be carried out in any WFD mapped watercourse or associated riparian area during the salmonid spawning season (which is October to May inclusive).

# 4. SURFACE WATER MANAGEMENT AND WATER QUALITY MONITORING

## 4.1 Daily Preparation During the Implementation of the Surface Water Management Plan

The Drainage Engineer appointed by the contractor shall conduct regular meetings with the Construction Management Team to discuss the phasing of construction and drainage as the work progresses. The focus of these meetings will be on establishing an operational drainage system in advance of the progression of the works.

Particular regard will be taken of daily weather conditions and long-range forecasts. The Drainage Engineer will have the authority to suspend the works if weather conditions are deemed too extreme for the effective protection of receiving watercourses. Mitigation measures to protect receiving watercourses will be put in place as directed by the Drainage Engineer in response to extreme forecasts.

The surface water management system will be visually inspected on a daily basis during construction works by the SHEQ Officer (or equivalent appointed person) to ensure that it is working optimally. The frequency of inspection will be increased at settlement ponds adjacent to areas where earthworks are being carried out and at the borrow pits during excavations. Where issues arise, construction works will be stopped immediately, and the source of the issue will be investigated. Records of all maintenance and monitoring activities associated with the surface water network will be retained by the Contractor on-site, including results of any discharge testing requirements.

The Contractor will implement temporary control measures such as silt fences, silt bags, temporary settlement tanks, as required.

The works programme for the initial construction stage of the Proposed Development will take account of weather forecasts and predicted rainfall in particular. Large excavations and movements of subsoil or vegetation stripping will be suspended or scaled back if heavy rain is forecast. The extent to which works will be scaled back or suspended will relate directly to the amount of rainfall forecast.

## 4.2 Personnel Qualifications and Key Contacts

Subject to planning consent and following the appointment of the Contractor for the works and Ecological Clerk of Works (ECoW), the SWMP for the construction stage of the Proposed Development shall be finalised in accordance with this plan.

All those carrying out work on site must have a FÁS/Solas Safe Pass Card. All works must be supervised by a competent supervisor. Workers must be adequately trained in the tasks they are required to carry out. The key contact names and contact details shall be supplied to all personnel entering the site. All site staff shall be informed of the emergency procedures for the site.

## 4.3 Mitigation Measures for Pollution Control to Protect Water Quality

Additional infrastructure and measures used to protect water quality are described in the following sub-sections.

### Silt Traps and Silt Fences

Silt traps will be provided in swales which will consist of geotextile staked across the swale at regular intervals. The geotextile will be weighed down on the upstream side with clean filter stone to provide further filtration and stability to the silt trap, as shown in Figure 4-1 and Figure 4-2. Silt traps will be decommissioned after the end of the construction phase and will be replaced by check dams.

Silt fencing will be kept on site and erected as required during construction to provide further protection to prevent the ingress of silt into the existing land drains, streams and watercourses. Silt fences will be constructed using a permeable filter fabric (e.g. Hy Tex Terrastop Premium silt fence or similar) and not a mesh (see 0501 Series Planning Drawings for details). The base of the silt fence will be bedded at least 15-30 cm and posts set a maximum of 2m intervals. Once installed the silt fence will be inspected daily during the proposed works, weekly on completion of the works for at least one month, but particularly after heavy rains and periodically thereafter. The silt fencing will be kept in place until the natural vegetation has been re-established.



**Figure 4-1: Silt trap across grassed swale**

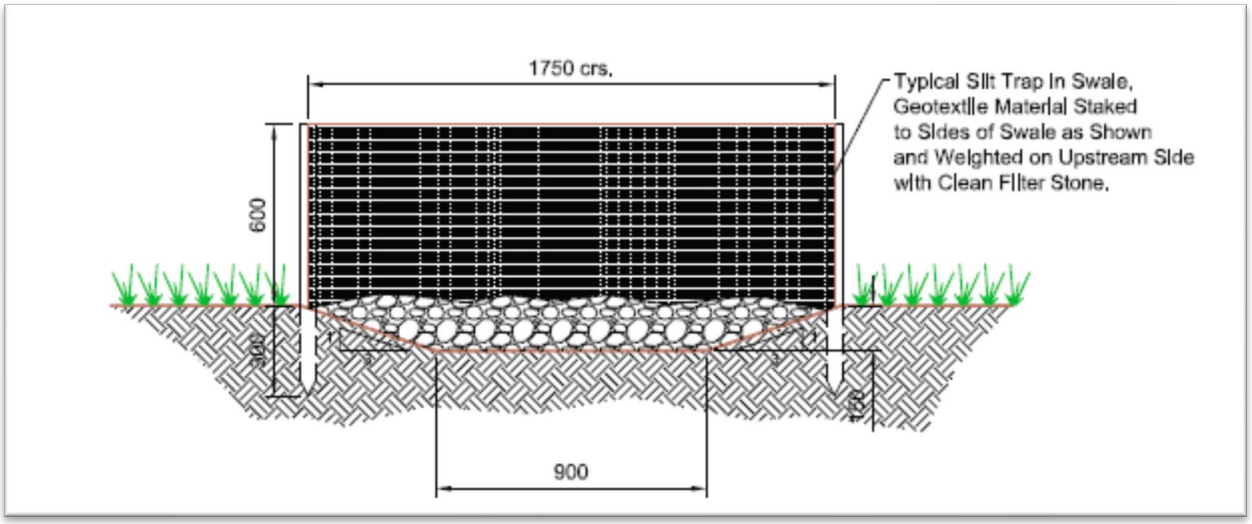



**Figure 4-2: Trap Details**



**Figure 4-3: Silt Fence**

**Drainage of Temporary Site Compounds**

The site compounds will be set back a minimum of 50 m from existing watercourses. Drains around the hard-standing areas of the site compounds will be in the form of shallow grassed swales to minimise the disturbance to sub-soils.

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 a minimum of 50 m.

Any diesel or fuel oils stored at the temporary site compounds will be bunded. The bund capacity will be sufficient to contain 110% of the tank's maximum capacity. Where there is more than one tank within the bund, the capacity will be sufficient to accommodate 110% of the largest tank's maximum capacity or 25% of the total maximum capacities of all tanks, whichever is the greater. Design and installation of fuel tanks will be in accordance with best practice guidelines BPGCS005 (Oil Storage Guidelines).

Portaloos and / or containerised toilets and welfare units with storage tanks will be used to provide toilet facilities for site personnel during construction. The sanitary waste will be removed from site by a licensed waste disposal contractor.

All Portaloo units located on site during the construction phase will be operated and maintained in accordance with the manufacturer's instructions and will be serviced under contract with the supplier. All such units will be removed off-site following completion of the construction phase. Potable water will be brought onsite in bottles.

Temporary petrol and oil interceptors will be installed at the site compounds and at all locations dedicated for plant repairs/storage of fuel/temporary generator installation. Surface water run-off from the compound will be directed through a Class 1 Full Retention Oil Interceptor before discharge to the surface water drainage system for the site. This surface water drains flows to a settlement pond before final discharge over land. A trained and dedicated environmental and fuel spill emergency response team will be set up on site before commencement of construction on-site.

**Drainage of Substation Compound**

The permitted on-site substation will be drained using shallow swales, with a suitably designed settlement pond. The settlement pond will remain in place following the construction period. At the upslope side of the sub-station overland flows will be intercepted in channels and discharged diffusely over vegetated areas.

In the operational stage, the substation drainage will consist of an underground surface water pipe system. This system will include a number of surface water manholes, rainwater pipes for the compound building roof, Class 1 Full Retention Oil Separator, an oil sensitive bund dewatering system, attenuation tank, ACO drains and filter drains. The system will discharge overland limited to the greenfield runoff.

In accordance with SuDs best practice, it is proposed to include rainwater harvesting tanks within the surface water system which will comprise of a filter, an underground tank and a pump. The system allows rainwater to run down the roof and into the guttering and downpipes in the normal way before passing through the filter, which removes any leaves and debris. Rainwater is then stored in the underground tank for reuse. Potable water will be brought onsite in bottles.

A foul system is proposed within the station to cater for the wastewater generated in the welfare facilities of the control building. The foul system will consist of an underground pipe network, foul manholes and a 10,000L full retention foul effluent storage tank. The tank will have an associated high-level alarm which will be connected to the control building.

A foul holding tank to be maintained and emptied bi-annually is the most preferable means of treating and disposing of foul waste from the site. The licensed contractor charged to empty and dispose of the waste will be the holder of a valid waste collection permit. It is not proposed to treat wastewater onsite.

**Drainage of Turbine Bases and Hardstanding**

The excavations for turbines will be pumped into the site drainage system (including settlement ponds), which will be constructed at site clearance stage, in advance of excavations for the turbine bases.

As discussed above, the new turbine hard-standing areas will be drained via shallow swales with suitably designed settlement ponds. The settlement ponds for the turbine bases and hardstanding will remain in place following the construction period.

If cross-drains are required to convey the drainage across the hardstanding area, the diameters will be suitably designed in advance.

**Drainage of Cable Trenches**

Cables running throughout the wind farm site will be installed in trenches adjacent to site access tracks, where possible. Cable trenches will be excavated using a mechanical excavator and the excavated materials placed in small bunds adjacent to the trenches for back filling, as shown in Figure 4-4.

The seed bank is to be retained for placing back as the top layer of backfill to the trench, to aid successful restoration of vegetation in disturbed areas.

Cable trenches will be excavated during dry periods where possible, in short sections and left open for minimal periods, to avoid acting as a conduit for surface water flows.



Figure 4-4: Backfill over Cable Trench

**Procedure for Dewatering of Excavations**

Standing water, which could arise in excavations, has the potential to contain an increased concentration of suspended solids as a result of the disturbance to soils. Water in the excavations will be pumped into the 'dirty water' drainage system which will be constructed at site clearance stage, in advance of and excavation works. Where dewatering is required in areas away from the Site drainage system, dewatering will be to adjacent lands contained within the Planning Boundary which are down topography of the works area and will be via filter bags (appropriate sized relative to pump rate) onto natural vegetation set back a minimum of 50m from any drain or watercourse. There will be no direct discharge to the existing drainage or river network.

**Drainage of Stockpiled Material and Embankments**

During the construction period, the excavated material will be used to reinstate the turbine bases or will be placed within the Spoil Management Area. All excavations shall be constructed and backfilled as quickly as possible. Excavation will stop during or immediately after heavy rainfall.

Excavation will precede the turbine base construction, cable trench and access track construction. Soil will be excavated and replaced with granular fill where required. Excavation will be carried out from access tracks where possible in order to reduce the compaction of topsoil. The silt fences will be inspected weekly and after rainfall events by Environmental Clerk of Works (ECoW).

During the construction period, spoil heaps from the excavations for the turbine bases will be stored and permanently kept during the Proposed Development. The following are the details of the permanent spoil heap drainage process:

- Collection: A system of open channel drain and catchment basins is installed on the spoil heap to collect and channel water to a central location.
- Treatment: The water collected from the spoil heap may contain pollutants and require treatment before being released back into the environment. The treatment process depends on the type of pollutants present and may include physical, chemical or biological methods.

- Reuse or discharge: The treated water can either be reused for other purposes or safely released back into the environment.
- Maintenance: The permanent spoil heap drainage system requires regular maintenance and inspection to ensure that it continues to function effectively and prevent any environmental harm.

Overall, permanent spoil heap drainage helps to maintain the stability of the spoil heap, prevent water-related environmental problems, and reduce the risk of accidents. It is a crucial aspect of responsible mining and environmental management.

**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.

Any plant operating within 50 m of a drain or watercourse will require special consideration of the transport of concrete from the point of discharge from the mixer to final discharge into the delivery pipe (tremie). Care will be exercised when slewing concrete skips or mobile concrete pumps over or near surface waters. Placing of concrete in or near watercourses will be carried out only under the supervision of the Ecological Clerk of Works (ECoW).

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.

A small volume of water generated from washing of concrete truck chutes will be directed into a semi-permanent lined impermeable containment area, as shown in Figure 4-5, or into a designated concrete wash unit. The containment lagoon will be lined with a 1 mm LLDPE impermeable liner and equipped with a sump to collect wash water. Excavated material from this area will be retained on site for reinstatement following construction.

During construction, wash water and any solids collected in the sump will be removed periodically to a licensed waste facility, with daily emptying available if required. After construction, the liner, remaining wash water, and any accumulated solids will be removed and disposed of appropriately, and the sump will be reinstated.

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 watercourses.



**Figure 4-5: Lined Settlement Lagoon for Concrete Washout Facility**

**General Pollution Control Measures**

Refuelling of plant during construction will be carried out at the temporary compounds, which will be located a minimum of 50 m from any watercourse. The station will be fully equipped for a spill response and a specially trained and dedicated environmental and emergency spill response team will be appointed before commencement on site. In addition to the above, onsite re-fuelling of machinery will be carried out 50 m from watercourses using a mobile double skinned fuel bowser.

The fuel bowser, a double axel custom-built refuelling trailer will be re-filled off site or at the designated refuelling area and will be towed by a 4x4 jeep to designated re-fuelling areas near to where machinery is located but at distances of greater than 50 m from watercourses.

Drip trays and spill kits will be kept available on site, to ensure that any spills from vehicles are contained and removed off site.

Any diesel, fuel or hydraulic oils stored at the temporary site compounds will be bunded. The bund capacity will be sufficient to contain 110 % of the tank's maximum capacity.

Vehicles entering the site shall be in good working order, free from leakage of fuel or hydraulic fluid.

A wheel wash will be provided at the site entrance draining to a silt trap to avoid any silt laden run-off flowing on to the public road and entering roadside drains.

Portaloos and/or containerised toilets and welfare units will be used to provide toilet facilities for site personnel during construction. Sanitary waste will be removed from site via a licenced waste disposal contractor.

***Emergency Response Procedure in the Case of Leaks or Silt Breakout***

All personnel working on site will be trained in pollution incident control response. An emergency response procedure is contained in the following sections ("Accidental Spillage from Leaking or Damaged Fuel Lines" and "Accidental Break Out of Silt from Settlement Ponds") and which will ensure that appropriate information will be available on site outlining the spillage response procedure and a contingency plan to contain silt.

A regular review of forecasts of heavy rainfall is required and a contingency plan will be prepared before and after such events.

In the event of a risk of pollution to a drain or watercourses due to an accidental spill, suitably sized pumps will be on hand to over pump the flow from upstream with the of isolating the flow away from the area of spill. Oil booms will be placed downstream of the spill as necessary.

Procedures for particular accidental spillages, from leaking or damaged fuel lines or a break-out of silt are outlined below.




**Figure 4-6: Typical Mobile Fuel Boswer**

**Accidental spillage from leaking or damaged fuel lines**

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.

Typically, the following procedures will be followed in the event of an incident:

- Works will stop immediately where safe to do so,
- The SHEQ Officer (or equivalent appointed person) will be contacted,

- The size of the incident will be assessed and determined if it can be controlled by site staff or if emergency services are required to attend,
- The appropriate enforcing authority will be contacted,
- The SHEQ Officer (or equivalent appointed person) will investigate after the incident,
- The findings will be sent to the appropriate authority; and
- An action plan will be prepared to set out any modifications to working practices required to prevent a recurrence.

**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 potential 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.

## 4.4 Maintenance of Site Drainage Systems

The proposed drainage system has been designed in accordance with the current standards and guidelines to minimise the maintenance requirement for the proposed site, however excessive debris in the system could still result in loss of performance.

The drainage system for the development shall be maintained regularly to keep it operating effectively. The maintenance shall include the following:

- Inspection and maintenance of swales,
- Inspecting cross-drains for any blockages,
- Inspecting settlement ponds and outfalls,
- Inspecting the stream crossings and piped crossings for obstructions,
- Inspecting the progress of the re-establishment of vegetation,
- Implementing appropriate remedial measures as required after the above inspections.

Regular maintenance shall be provided to the site drainage system to ensure optimal operation to accommodate heavy rainfall events. All the drainage elements will be designed with a freeboard of 300 mm to provide additional hydraulic capacity to accommodate heavy rainfall event.

Biannual inspections will take place in spring and autumn where there is additional risk of blockage from debris associated with fallen leaves.

The proposed drainage system includes SuDS drainage ditches and settlement ponds. The key maintenance requirement for the ditches and associated headwalls and pipework will be the maintenance of vegetation and mowing of grass within and on the banks/verges and the removal of accumulated sediments and collection of litter and debris.

During the inspections the general operation, and structural condition of the headwalls and any erosion of banks or scour control features should be identified and rehabilitated as required.

Vegetation within and on the banks of the drainage ditches and settlement ponds should be trimmed twice a year, preferably in April and October to a height of 100mm to establish a dense sward and provide long grass margins.

All access tracks will be constructed from aggregate which will allow a portion of rainfall to infiltrate and, therefore, reduce surface water runoff. Adjacent swales will also intercept and retain surface water runoff allowing this to disperse naturally via infiltration and evapotranspiration. Where swales are installed on sloped ground, check dam structures will be used within the channels to provide attenuation, allowing a portion of the flows to disperse naturally.

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.

Watercourse crossings will be designed and suitably sized to accommodate peak, or storm discharge rates so as not to cause risk of impeding flows during extreme storm events and causing flooding upstream of the crossing. All drain and watercourse crossings will be designed in accordance with the requirements of Regulation 50 of the European Communities (Assessment and Management of Flood Risks) Regulations 2010 SI 122 of 2010. The channel width will be maintained, and the crossings will be designed so as not to cause an impediment to the passage of woody debris or sediment transport. Appropriate freeboard will be provided to OPW requirements.

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. There will, therefore, be no increase in the risk of flooding.

The surface water management system at the Site will ensure that there will be no increase in the risk of fluvial or surface water flooding downstream as a result of the windfarm development.

After the heavy rainfall and winds, it is necessary to assess the conditions of the site drainage system to evaluate that it is operating according to the design requirements. Maintenance is required to re-establish the regular status of the drainage system. If the event was too heavy and the drainage system is damaged, it is necessary to re-build the damaged drainage elements, according to the design requirements.

## 4.5 Water Quality Monitoring Plan

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 establish 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 (FIGILE_080) at locations approximately 10m downstream of the proposed watercourse crossing within the Proposed Wind Farm. Water quality sampling will be undertaken in accordance with BS EN ISO 5667 - Water Quality Sampling. The samples will be checked in situ for:

I. pH;
II. Temperature;
III. Turbidity;
IV. Conductivity; and
V. 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 established using the River Hydromorphology Assessment Technique (RHAT)[1]. 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.

[1] https://www.riverhabitatsurvey.org/RHSfiles/RHSToolboxHelp/RiverHabitatSurveyToolbox.html?RHAT.html

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 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, Midlands & 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 carried out within a timely manner.

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# Appendix 9

# Published NPWS SAC Site Synopses

# APPENDIX 9

**Published NPWS Site Descriptions for Designated Sites Relevant to Stage 2 Appropriate Assessment**

**Site Name: River Barrow and River Nore SAC**

**Site Code: 002162**

**Version date: 03.04.2024**

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. Major towns along the edge of the site include Mountmellick, Portarlington, Monasterevin, Stradbally, Athy, Carlow, Leighlinbridge, Graiguenamanagh, New Ross, Inistioge, Thomastown, Callan, Bennettsbridge, Kilkenny and Durrow. The larger of the many tributaries include the Lerr, Fushoge, Mountain, Aughavaud, Owenass, Boherbaun and Stradbally Rivers of the Barrow, and the Delour, Dinin, Erkina, Owveg, Munster, Arrigle and King's Rivers on the Nore.
Both rivers rise in the Old Red Sandstone of the Slieve Bloom Mountains before passing through a band of Carboniferous shales and sandstones. The Nore, for a large part of its course, traverses limestone plains and then Old Red Sandstone for a short stretch below Thomastown. Before joining the Barrow it runs over intrusive rocks poor in silica. The upper reaches of the Barrow also run through limestone. The middle reaches and many of the eastern tributaries, sourced in the Blackstairs Mountains, run through Leinster Granite. The southern end, like the Nore runs over intrusive rocks poor in silica. Waterford Harbour is a deep valley excavated by glacial floodwaters when the sea level was lower than today. The coast shelves quite rapidly along much of the shore.

The site is a Special Area of Conservation (SAC) selected for the following habitats and/or species listed on Annex I / II of the E.U. Habitats Directive (* = priority; numbers in brackets are Natura 2000 codes):

[1130] Estuaries
[1140] Tidal Mudflats and Sandflats
[1170] Reefs
[1310] *Salicornia* Mud
[1330] Atlantic Salt Meadows
[1410] Mediterranean Salt Meadows
[3260] Floating River Vegetation [4030] Dry Heath
[6430] Hydrophilous Tall Herb Communities
[7220] Petrifying Springs*
[91A0] Old Oak Woodlands
[91E0] Alluvial Forests*
[1016] Desmoulin's Whorl Snail (*Vertigo moulinsiana*)
[1029] Freshwater Pearl Mussel (*Margaritifera margaritifera*)
[1092] White-clawed Crayfish (*Austropotamobius pallipes*)
[1095] Sea Lamprey (*Petromyzon marinus*)

[1096] Brook Lamprey (*Lampetra planeri*)
[1099] River Lamprey (*Lampetra fluviatilis*)
[1103] Twaite Shad (*Alosa fallax*)
[1106] Atlantic Salmon (*Salmo salar*)
[1355] Otter (*Lutra lutra*)
[1421] Killarney Fern (*Trichomanes speciosum*)

Good examples of alluvial forest (a priority habitat on Annex I of the E.U. Habitats Directive) are seen at Rathsnagadan, Murphy's of the River, in Abbeyleix estate and along other shorter stretches of both the tidal and freshwater elements of the site. Typical species seen include Almond Willow (*Salix triandra*), White Willow (*S. alba*), Rusty Willow (*S. cinerea* subsp. *oleifolia*), Crack Willow (*S. fragilis*) and Osier (*S. viminalis*), along with Iris (*Iris pseudacorus*), Hemlock Water-dropwort (*Oenanthe crocata*), Wild Angelica (*Angelica sylvestris*), Thin-spiked Wood-sedge (*Carex strigosa*), Pendulous Sedge (*C. pendula*), Meadowsweet (*Filipendula ulmaria*), Common Valerian (*Valeriana officinalis*) and the Red Data Book species Nettle-leaved Bellflower (*Campanula trachelium*).

A good example of petrifying springs with tufa formations occurs at Dysart Wood along the Nore. This is a rare habitat in Ireland and one listed with priority status on Annex I of the E.U. Habitats Directive. These hard water springs are characterised by lime encrustations, often associated with small waterfalls. A rich bryophyte flora is typical of the habitat and two diagnostic species, *Palustriella commutata* and *Eucladium verticillatum*, have been recorded.

The best examples of old oak woodlands are seen in the ancient Park Hill woodland in the estate at Abbeyleix; at Kyleadohir, on the Delour, Forest Wood House, Kylecorragh and Brownstown Woods on the Nore; and at Cloghristic Wood, Drummond Wood and Borris Demesne on the Barrow, though other patches occur throughout the site. Abbeyleix Woods is a large tract of mixed deciduous woodland which is one of the only remaining true ancient woodlands in Ireland. Historical records show that Park Hill has been continuously wooded since the 16th century and has the most complete written record of any woodland in the country. It supports a variety of woodland habitats and an exceptional diversity of species including 22 native trees, 44 bryophytes and 92 lichens. It also contains eight indicator species of ancient woodlands. Park Hill is also the site of two rare plants, Nettle-leaved Bellflower and the moss *Leucodon sciuroides*. The rare Myxomycete fungus, *Licea minima* has been recorded from woodland at Abbeyleix.

Oak woodland covers parts of the valley side south of Woodstock and is well developed at Brownsford where the Nore takes several sharp bends. The steep valley side is covered by oak (*Quercus* spp.), Holly (*Ilex aquifolium*), Hazel (*Corylus avellana*) and Downy Birch (*Betula pubescens*), with some Beech (*Fagus sylvatica*) and Ash (*Fraxinus excelsior*). All the trees are regenerating through a cover of Bramble (*Rubus fruticosus* agg.), Foxglove (*Digitalis purpurea*), Great Wood-rush (*Luzula sylvatica*) and Broad Buckler-fern (*Dryopteris dilatata*).

On the steeply sloping banks of the River Nore, about 5 km west of New Ross, in Co. Kilkenny, Kylecorragh Woods form a prominent feature in the landscape. This is an excellent example of relatively undisturbed, relict oak woodland with a very good tree canopy. The wood is quite

damp and there is a rich and varied ground flora. At Brownstown, a small, mature oak dominated woodland occurs on a steep slope.

There is younger woodland to the north and east of it. Regeneration throughout is evident. The understorey is similar to the woods at Brownsford. The ground flora of this woodland is developed on acidic, brown earth type soil and comprises a thick carpet of Bilberry (*Vaccinium myrtillus*), Heather (*Calluna vulgaris*), Hard Fern (*Blechnum spicant*), Common Cow-wheat (*Melampyrum pratense*) and Bracken (*Pteridium aquilinum*).

Borris Demesne contains a very good example of a semi-natural broadleaved woodland in very good condition. There is quite a high degree of natural re- generation of oak and Ash through the woodland. At the northern end of the estate oak species predominate. Drummond Wood, also on the Barrow, consists of three blocks of deciduous woods situated on steep slopes above the river. The deciduous trees are mostly oak species. The woods have a well-established understorey of Holly, and the herb layer is varied, with Bramble abundant. The whitebeam *Sorbus devoniensis* has also been recorded here.

Eutrophic tall herb vegetation occurs in association with the various areas of alluvial forest and elsewhere where the floodplain of the river is intact. Characteristic species of the habitat include Meadowsweet, Purple Loosestrife (*Lythrum salicaria*), Marsh Ragwort (*Senecio aquaticus*), Ground Ivy (*Glechoma hederacea*) and Hedge Bindweed (*Calystegia sepium*). Indian Balsam (*Impatiens glandulifera*), an introduced and invasive species, is abundant in places.

Floating river vegetation is well represented in the Barrow and in the many tributaries of the site. In the Barrow the species found include water-starworts (*Callitriche* spp.), Canadian Pondweed (*Elodea canadensis*), Bulbous Rush (*Juncus bulbosus*), water-milfoils (*Myriophyllum* spp.), the pondweed *Potamogeton* x *nitens,* Broad-leaved Pondweed (*P. natans*), Fennel Pondweed (*P. pectinatus*), Perfoliated Pondweed (*P. perfoliatus*) and crowfoots (*Ranunculus* spp.). The water quality of the Barrow has improved since the vegetation survey was carried out (EPA, 1996).

Dry heath at the site occurs in pockets along the steep valley sides of the rivers especially in the Barrow Valley and along the Barrow tributaries where they occur in the foothills of the Blackstairs Mountains. The dry heath vegetation along the slopes of the river bank consists of Bracken and Gorse (*Ulex europaeus*) with patches of acidic grassland vegetation. Additional typical species include Heath Bedstraw (*Galium saxatile*), Foxglove, Common Sorrel (*Rumex acetosa*) and Creeping Bent (*Agrostis stolonifera*). On the steep slopes above New Ross the Red Data Book species Greater Broomrape (*Orobanche rapum-genistae*) has been recorded. Where rocky outcrops are shown on the maps Bilberry and Great Wood-rush are present. At Ballyhack a small area of dry heath is interspersed with patches of lowland dry grassland. These support a number of clover species, including the legally protected Clustered Clover (*Trifolium glomeratum*) - a species known from only one other site in Ireland. This grassland community is especially well developed on the west side of the mud-capped walls by the road. On the east of the cliffs a group of rock-dwelling species occur, i.e. English Stonecrop (*Sedum anglicum*), Sheep's-bit (*Jasione montana*) and Wild Madder (*Rubia peregrina*). These rocks also support good lichen and moss assemblages with *Ramalina subfarinacea* and *Hedwigia ciliata*.

Dry heath at the site generally grades into wet woodland or wet swamp vegetation lower down the slopes on the river bank. Close to the Blackstairs Mountains, in the foothills associated with the Aughnabrisky, Aughavaud and Mountain Rivers there are small patches of wet heath dominated by Purple Moor-grass (*Molinia caerulea*) with Heather, Tormentil (*Potentilla erecta*), Carnation Sedge (*Carex panicea*) and Bell Heather (*Erica cinerea*).

Salt meadows occur at the southern section of the site in old meadows where the embankment has been breached, along the tidal stretches of in-flowing rivers below Stokestown House, in a narrow band on the channel side of Common Reed (*Phragmites australis*) beds and in narrow fragmented strips along the open shoreline. In the larger areas of salt meadow, notably at Carrickcloney, Ballinlaw Ferry and Rochestown on the west bank; Fisherstown, Alderton and Great Island to Dunbrody on the east bank, the Atlantic and Mediterranean sub types are generally intermixed. At the upper edge of the salt meadow in the narrow ecotonal areas bordering the grasslands where there is significant percolation of salt water, the legally protected species Borrer's Saltmarsh-grass (*Puccinellia fasciculata*) and Meadow Barley (*Hordeum secalinum*) are found. The very rare and also legally protected Divided Sedge (*Carex divisa*) is also found. Sea Rush (*Juncus maritimus*) is also present. Other plants recorded and associated with salt meadows include Sea Aster (*Aster tripolium*), Thrift (*Armeria maritima*), Sea Couch (*Elymus pycnanthus*), Spear-leaved Orache (*Atriplex prostrata*), Lesser Sea-spurrey (*Spergularia marina*), Sea Arrowgrass (*Triglochin maritima*) and Sea Plantain (*Plantago maritima*).

Glassworts (*Salicornia* spp.) and other annuals colonising mud and sand are found in the creeks of the saltmarshes and at the seaward edges of them. The habitat also occurs in small amounts on some stretches of the shore free of stones.

The estuary and the other E.U. Habitats Directive Annex I habitats within it form a large component of the site. Extensive areas of intertidal flats, comprised of substrates ranging from fine, silty mud to coarse sand with pebbles/stones are present. Good quality intertidal sand and mudflats have developed on a linear shelf on the western side of Waterford Harbour, extending for over 6 km from north to south between Passage East and Creadaun Head, and in places are over 1 km wide. The sediments are mostly firm sands, though grade into muddy sands towards the upper shore. They have a typical macro-invertebrate fauna, characterised by polychaetes and bivalves. Common species include *Arenicola marina*, *Nephtys hombergii*, *Scoloplos armiger*, *Lanice conchilega* and *Cerastoderma edule*. An extensive area of honey-comb worm biogenic reef occurs adjacent to Duncannon, Co. Wexford on the eastern shore of the estuary. It is formed by the polychaete worm *Sabellaria alveolata*. This intertidal *Sabellaria alveolata* reef is formed as a sheet of interlocking tubes over a considerable area of exposed bedrock. This polychaete species constructs tubes, composed of aggregated sand grains, in tightly packed masses with a distinctive honeycomb-like appearance. These can be up to 25cm proud of the substrate and form hummocks, sheets or more massive formations. A range of species are reported from these reefs including: *Enteromorpha* sp.; *Ulva* sp.; *Fucus vesiculosus*; *Fucus serratus*; *Polysiphonia* sp.; *Chondrus crispus*; *Palmaria palmate*; *Coralinus officialis*; *Nemertea* sp.; *Actinia equine*; *Patella vulgate*; *Littorina littorea*; *Littorina obtusata* and *Mytilus edulis*.

The western shore of the harbour is generally stony and backed by low cliffs of glacial drift. At Woodstown there is a sandy beach, now much influenced by recreation pressure and erosion. Behind it a lagoonal marsh has been impounded which runs westwards from Gaultiere Lodge along the course of a slow stream. An extensive reedbed occurs here. At the edges is a tall fen dominated by sedges (*Carex* spp.), Meadowsweet, willowherbs (*Epilobium* spp.) and rushes (*Juncus* spp.). Wet woodland also occurs.

The dunes which fringe the strand at Duncannon are dominated by Marram (*Ammophila arenaria*) towards the sea. Other species present include Wild Clary/Sage (*Salvia verbenaca*), a rare Red Data Book species. The rocks around Duncannon ford have a rich flora of seaweeds typical of a moderately exposed shore and the cliffs themselves support a number of coastal species on ledges, including Thrift, Rock Samphire (*Crithmum maritimum*) and Buck's-horn Plantain (*Plantago coronopus*).

Other habitats which occur throughout the site include wet grassland, marsh, reedswamp, improved grassland, arable land, quarries, coniferous plantations, deciduous woodland, scrub and ponds.

Seventeen Red Data Book plant species have been recorded within the site, most in the recent past. These are Killarney Fern (*Trichomanes speciosum*), Divided Sedge, Clustered Clover, Basil Thyme (*Acinos arvensis*), Red Hemp-nettle (*Galeopsis angustifolia*), Borrer's Saltmarsh-grass, Meadow Barley, Opposite-leaved Pondweed (*Groenlandia densa*), Meadow Saffron/Autumn Crocus (*Colchicum autumnale*), Wild Clary/Sage, Nettle-leaved Bellflower, Saw-wort (*Serratula tinctoria*), Bird Cherry (*Prunus padus*), Blue Fleabane (*Erigeron acer*), Fly Orchid (*Ophrys insectifera*), Ivy Broomrape (*Orobanche hederae*) and Greater Broomrape. Of these, the first nine are protected under the Flora (Protection) Order, 2015. Divided Sedge was thought to be extinct but has been found in a few locations in the site since 1990. In addition plants which do not have a very wide distribution in the country are found in the site including Thin-spiked Wood-sedge, Field Garlic (*Allium oleraceum*) and Summer Snowflake. Six rare lichens, indicators of ancient woodland, are found including *Lobaria laetevirens* and *L. pulmonaria*. The rare moss *Leucodon sciuroides* also occurs.

The site is very important for the presence of a number of E.U. Habitats Directive Annex II animal species including Freshwater Pearl Mussel (*Margaritifera margaritifera*), White-clawed Crayfish, Salmon, Twaite Shad, three lamprey species – Sea Lamprey, Brook Lamprey and River Lamprey, the tiny whorl snail *Vertigo moulinsiana* and Otter. This is one of only a handful of spawning grounds in the country for Twaite Shad. The freshwater stretches of the River Nore main channel is a designated salmonid river. The Barrow/Nore is mainly a grilse fishery though spring salmon fishing is good in the vicinity of Thomastown and Inistioge on the Nore. The upper stretches of the Barrow and Nore, particularly the Owenass River, are very important for spawning.

The site supports many other important animal species. Those which are listed in the Irish Red Data Book include Daubenton's Bat, Badger, Irish Hare and Common Frog. The rare Red Data Book fish species Smelt (*Osmerus eperlanus*) occurs in estuarine stretches of the site. In addition to the Freshwater Pearl Mussel, the site also supports two other freshwater mussel species, *Anodonta anatina* and *A. cygnea*.

Three rare invertebrates have been recorded in alluvial woodland at Murphy's of the River. These are: *Neoascia obliqua* (Order Diptera: Syrphidae), *Tetanocera freyi* (Order Diptera: Sciomyzidae) and *Dictya umbrarum* (Order Diptera: Sciomyzidae). The rare invertebrate, *Mitostoma chrysomelas* (Order Arachnida), occurs in the old oak woodland at Abbeyleix and only two other sites in the country. Two flies (Order Diptera) *Chrysogaster virescens* and *Hybomitra muhlfeldi* also occur at this woodland.

The site is of ornithological importance for a number of E.U. Birds Directive Annex I species, including Greenland White-fronted Goose, Whooper Swan, Bewick's Swan, Bar-tailed Godwit, Peregrine and Kingfisher. Nationally important numbers of Golden Plover and Bar-tailed Godwit are found during the winter. Wintering flocks of migratory birds are seen in Shanahoe Marsh and the Curragh and Goul Marsh, both in Co. Laois, and also along the Barrow Estuary in Waterford Harbour. There is also an extensive autumnal roosting site in the reedbeds of the Barrow Estuary used by Swallows before they leave the country. The old oak woodland at Abbeyleix has a typical bird fauna including Jay, Long-eared Owl and Raven. The reedbed at Woodstown supports populations of typical waterbirds including Mallard, Snipe, Sedge Warbler and Water Rail.

Land use at the site consists mainly of agricultural activities – mostly intensive in nature and principally grazing and silage production. Slurry is spread over much of the area. Arable crops are also grown. The spreading of slurry and fertiliser poses a threat to the water quality of the salmonid river and to the populations of E.U. Habitats Directive Annex II animal species within the site. Many of the woodlands along the rivers belong to old estates and support many non-native species. Little active woodland management occurs. Fishing is a main tourist attraction along stretches of the main rivers and their tributaries and there are a number of Angler Associations, some with a number of beats. Fishing stands and styles have been erected in places. Both commercial and leisure fishing takes place on the rivers. There is net fishing in the estuary and a mussel bed also. Other recreational activities such as boating, golfing and walking, particularly along the Barrow towpath, are also popular. There is a golf course on the banks of the Nore at Mount Juliet and GAA pitches on the banks at Inistioge and Thomastown. There are active and disused sand and gravel pits throughout the site. Several industrial developments, which discharge into the river, border the site. New Ross is an important shipping port. Shipping to and from Waterford and Belview ports also passes through the estuary.

The main threats to the site and current damaging activities include high inputs of nutrients into the river system from agricultural run-off and several sewage plants, over-grazing within the woodland areas, and invasion by non-native species, for example Cherry Laurel (Prunus laurocerasus) and Rhododendron (Rhododendron ponticum). The water quality of the site remains vulnerable. Good quality water is necessary to maintain the populations of the Annex II animal species listed above. Good quality is dependent on controlling fertilisation of the grasslands, particularly along the Nore. It also requires that sewage be properly treated before discharge.

Drainage activities in the catchment can lead to flash floods which can damage the many Annex II species present. Capital and maintenance dredging within the lower reaches of the system pose a threat to migrating fish species such as lamprey and shad. Land reclamation

also poses a threat to the salt meadows and the populations of legally protected species therein.

Overall, the site is of considerable conservation significance for the occurrence of good examples of habitats and of populations of plant and animal species that are listed on Annexes I and II of the E.U. Habitats Directive. Furthermore it is of high conservation value for the populations of bird species that use it. The occurrence of several Red Data Book plant species including three rare plants in the salt meadows add further interest to this site.

# Appendix 10

# Peat and Spoil Management Plan

FEHILY TIMONEY

DESIGNING AND DELIVERING
A SUSTAINABLE FUTURE

# PEAT & SPOIL MANAGEMENT PLAN

## DERRYNADARRAGH WIND FARM

**Prepared for:**
**Dara Energy Limited**

Dara Energy Limited

**Date:** **August 2025**

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# PEAT AND SPOIL MANAGEMENT PLAN
# DERRYNADARRAGH WIND FARM

**REVISION CONTROL TABLE, CLIENT, KEYWORDS AND ABSTRACT**
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**Client:** Dara Energy Ltd.

**Keywords:** Peat, Spoil, Management, Excavation,

**Abstract:** Fehily Timoney and Company (FT) were engaged by Dara Energy Ltd to compile a Peat and Spoil Management Plan (PSMP) for the proposed Derrynadarragh Wind Farm. The purpose of this report is to provide a Peat and Spoil Management Plan for the construction phase of the wind farm and associated grid connection. The report describes how peat and spoil which will be excavated from infrastructure locations such as turbine bases and roads and will be handled and placed/reinstated onsite. The report also provides construction details for the types of roads which will be put in place at the Site and proposed peat and spoil management areas which will be developed at the Site.

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# 1. INTRODUCTION

## 1.1 Fehily Timoney and Company

Fehily Timoney and Company (FT) is an Irish engineering, environmental science and planning consultancy with offices in Cork, Dublin and Carlow. The practice was established in 1990 and currently has c.100 members of staff, including engineers, scientists, planners and technical support staff. We deliver projects in Ireland and internationally in our core competency areas of Waste Management, Environment and Energy, Civils Infrastructure, Planning and GIS and Data Management.

This Report was written by Emily Archer (FT Senior Project Geotechnical Engineer, MSc Applied Environmental Geoscience) and Ian Higgins (FT Principal Geotechnical Engineer, MSc in Geotechnical Engineering). Emily is a Senior Project Engineer with Fehily Timoney and has 6 years' experience in geotechnical engineering. Ian is a Technical Director with Fehily Timoney and has 25 years' experience in geotechnical engineering.

## 1.2 Project Description

Fehily Timoney and Company (FT) were engaged by Dara Energy Ltd. in November 2022 to compile a Peat and Spoil Management Plan for the Proposed Project.

A detailed description of the project assessed within the main EIAR is provided in Chapter 2 and is comprised of three main 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 Development includes 9 no. wind turbines with a total height of 187 m with an underground cable connecting the 9 no. turbine wind farm development to the on-site substation, internal access tracks, hard standings, internal electrical and communications cabling, temporary construction compound, drainage infrastructure and all associated works related to the construction of the proposed wind farm.

## 1.3 Purpose

The purpose of this report is to provide a peat and spoil management plan with particular reference to peat stability for the construction phase of the Proposed Project. Such peat and spoil management measures have been successfully implemented on numerous wind farms over the past 15 years.

This peat and spoil management plan also includes a monitoring programme which will be implemented during the construction phase of the Proposed Project and a contingency plan should peat instability/failure occur at the Site.

As for all construction projects, a detailed engineering construction design will be carried out by the appointed construction stage designer prior to any construction work commencing on site. This will take account of the consented project details and any conditions imposed by that consent. This will include a detailed peat stability assessment to account for any changes in the environment which may have occurred in the time leading up to the commencement of construction and a peat and spoil management plan to allow for the most appropriate geotechnical and environmental led solutions to be developed for the management of peat and spoil.

As work is carried out on site the contents of the peat and spoil management plan and peat stability monitoring programme will be implemented in full and updated (if required to comply with any planning conditions or requirements of the planning authority) in the Construction & Environmental Management Plan (CEMP) for the construction phase.

This peat and spoil management plan contains some drainage guidelines for construction works and for management of peat on site. It should be noted that the control of water quality and drainage measures for the Proposed Wind Farm site is outlined in detail in Chapter 4: Description of the Proposed Project, and Chapter 9: Water, of the Environmental Impact Assessment Report (EIAR).

## 1.4 Peat Instability Definition

Peat instability in this report is defined as a mass movement of a body of peat that would have a significant adverse impact on the surrounding environment. Peat instability excludes localised movement of peat that would occur below a floating access road, creep movement or localised erosion type events.

Adherence to the peat and spoil management plan will reasonably minimise the potential for all such peat movements. However, it is noted that due to the soft ground nature of the peat terrain identified at the Proposed Wind Farm site it is not possible to completely avoid localised peat movement.

## 1.5 Site Investigation

As part of the design process for the Proposed Project, intrusive site investigations were undertaken across the Site, to provide detail and clarity on the nature and extent of sublayers and bedrock as a means of characterising the Proposed Wind Farm site. This assisted in providing additional information on the most suitable location for turbines and associated infrastructure.

Geotechnical ground investigations (i.e. trial pitting) were undertaken in April 2025, under the supervision of Fehily Timoney & Company (FT). The combined geological and hydrological dataset collected from the geotechnical ground investigations and from ground truthing site walkovers completed by FT, have been used in the preparation of the EIAR Chapters.

The objectives of the intrusive site investigations included mapping the subsoil lithology for all proposed turbines and other identified locations and assessing the underlying bedrock. This data was used to inform the final layout of the Site.

In summary, a total of 12 no. trial pits, supervised by FT, were carried out at proposed turbine locations and at other identified locations to investigate the underlying mineral soil lithology and subsoil/bedrock interface.

The complete geotechnical ground investigations were carried out in accordance with IS EN 1997-2 and BS5930:2015+A1:2020 Code of Practice for Ground Investigations with precedence given to IS EN 1997-2 where applicable.

As part of the assessment of potential peat failure at the Proposed Development site, FT carried out a site reconnaissance in conjunction with a desk study review. This comprised walkover inspections of the Site, with recording of salient geomorphological features which included peat depth assessments across the Site and a preliminary assessment of peat strength at the Site.

The peat depth data was recorded by FT during May and September 2023 and an additional peat probing survey was carried out in January 2025.

## 1.6 Relevant Guidance

The relevant guidance used and referred to throughout this report includes;

- Good Practice during Windfarm Construction (Scottish Renewables, SNH, SEPA & Forestry Commission Scotland, 5th Edition 2024);
- Guidance on Developments on Peatland: Site Surveys (Scottish Government, Scottish Natural Heritage and SEPA, 2017;
- Munro, R, 2004. Dealing with bearing capacity problems on low volume roads constructed on peat. Roadex II Northern Periphery;
- Scottish Natural Heritage/Forestry Commission Scotland, 2010. Floating Roads on Peat;
- Scottish Natural Heritage, 2015. Constructed Tracks in the Scottish Uplands. Scottish Natural Heritage.

# 2. CONSTRUCTION ACTIVITIES COVERED BY PEAT AND SPOIL MANAGEMENT PLAN

## 2.1 Construction Activities

For the construction phase of the Proposed Project the activities that will generate peat and spoil are as follows:

(1) Upgrade of existing access tracks (excavate and replace) including temporary widening of local road to facilitate deliver of turbine components

(2) Construction of new excavated roads through peat

(3) Construction of floating roads over peat (will not generate peat and spoil but the methodology for construction is included for completeness)

(4) Excavation and placement of arisings

(5) Excavations in peat for turbine bases, hardstands and other infrastructure foundations

(6) Excavations in peat for underground cables

Peat and spoil management of the above construction activities are covered individually in this report.

## 2.2 Road Construction Types

To provide access within the Proposed Wind Farm site and to connect the wind turbines and associated infrastructure, and to facilitate the Proposed Grid Connection existing tracks will need to be upgraded and new access roads will need to be constructed. The road construction design has taken the following key factors into account:

(1) Buildability considerations

(2) Maximising use of existing infrastructure

(3) Minimising excavation arisings

(4) Serviceability requirements for construction and wind turbine delivery and maintenance vehicles

(5) Requirement to minimise disruption to peat hydrology

Whilst the above key factors are used to determine the proposed road design, the actual construction technique employed for a particular length of road will be determined by the prevailing ground conditions encountered during confirmatory investigations along that length of road.

The proposed road construction techniques to be considered are given in Table 2-1.

It should be noted that this report does not include a detailed design for the access roads associated with the Proposed Wind Farm and Proposed Grid Connection underground cabling route. This report includes the most suitable type of road construction envisaged for each section of access road based on the ground/site conditions recorded during the site walkovers and intrusive site investigation works. Where floating roads are proposed in this report, a proposed methodology is presented however a detailed design will be carried out prior to construction commencing on site. These measures are based on available guidance, including 'Constructed Tracks in the Scottish Uplands (Scottish Natural Heritage, 2nd Edition , 2015), Floating Roads on Peat (Scottish

Natural Heritage/Forestry Commission Scotland, 2010) and 'Dealing with Bearing Capacity Problems on Low Volume Roads Constructed on Peat (ROADEX II, 2004).

**Table 2.1: General Road Construction Techniques**

| Construction Method | Site Conditions | | | Approximate Length of Road (km) | Comment |
|---|---|---|---|---|---|
| | Construction Type | Peat Depth (m) | Slope Inclination (degs) | | |
| Upgrade of existing access roads | Type A | - | Varies | 0.55 | Upgrade existing excavated access roads to the required width and finished with a layer of selected granular fill – Drawing P22-145-INFO-0010 |
| Construction of new excavated roads | Type B | Proposed where less than 1.5m | Varies | 7.26 | New access road construction technique envisaged for various locations on site – Drawing P22-145-INFO-0011 |
| Construction of new floating roads over peat | Type C | >1.5 | <3 | 2.1 | New access road construction technique envisaged for various locations on site – Drawing P22-145-INFO-0012 |

Further details on access road construction types A to C are given in Sections 3, 4 and 5 of this report.

# 3. UPGRADE OF EXISTING ACCESS ROADS – TYPE A

A small portion of access roads requiring upgrade are present across the Site and have been in operation for a significant number of years. The existing access roads were constructed using both floating and excavate and replace construction techniques. Based on the site walkover carried out by FT the existing access roads were noted as being in relatively good condition. Upgrade works will involve both widening and resurfacing of the existing access road. The proposed locations for upgrade of the existing access roads on site are shown in Drawing P22-145-INFO-0022 and details are shown in Drawing P22-145-INFO-0010.

## 3.1 Upgrading Existing Access Tracks Construction Methodology

This methodology includes procedures that will be included in the construction methodology to minimise any adverse impact on peat stability. The methodology is not intended to cover all aspects of construction such as drainage and environmental considerations, which are described and assessed within the main EIAR.

(1) Access road construction will be to the line and level requirements as per design.

(2) For upgrading of existing excavated access roads (Type A) the following guidelines will be implemented in full:

  (a) Excavation of the widened section of access road will take place to a competent stratum beneath the peat (as agreed with the designer) and backfilled with suitable granular fill.

  (b) Benching of the excavation may be required between the existing section of access road and the widened section of access road where the depth of excavation required exceeds 500mm.

  (c) The surface of the existing access road will be overlaid with up to 500mm of selected granular fill.

  (d) Access roads will be finished with a layer of capping across the full width of the track.

  (e) A layer of geogrid/geotextile may be required at the surface of the existing access road and at the base of the widened section of access road (to be confirmed by the designer).

  (f) For excavations in peat, side slopes will be not greater than 1 (v): 3 (h). This slope inclination will be reviewed during construction. Where areas of weaker peat are encountered then slacker slopes will be required to ensure stability.

(3) The finished road width will have a running width of 5m, with wider sections on bends and corners.

(4) On side long sloping ground any road widening works required will be done on the upslope side of the existing access road, where possible.

(5) At transitions between new floating and existing excavated roads a length of about 10 to 20m will have all peat excavated and replaced with suitable fill. The surface of this fill will be graded to accommodate wind turbine construction and delivery traffic.

# 4. CONSTRUCTION OF NEW EXCAVATED ROADS THROUGH PEAT – TYPE B

The excavation of peat and spoil and founding of access roads on competent stratum below the base of peat for new access roads will be carried out at various locations within the Site. The proposed locations for new excavated access roads within the Site are shown in drawing P22-145-INFO-0022 and details are shown in drawing P22-145-INFO-0011.

Excavate and replace type access roads are the conventional method for construction of access roads on peatland sites and the preferred construction technique in shallow peat provided sufficient placement/reinstatement capacity is available on site for the excavated peat.

## 4.1 Excavated Road Construction Methodology

This methodology includes procedures that will be included in the construction to minimise any adverse impact on peat stability. The methodology is not intended to cover all aspects of construction such as drainage and environmental considerations, which are assessed within the main EIAR.

(1) Prior to commencing the construction of the excavated roads movement monitoring posts will be installed in areas where the peat depth is greater than 2.0m.

(2) Interceptor drains will be installed upslope of the access road alignment to divert any surface water away from the construction area.

(3) Excavation of roads will be to the line and level given in the design requirements. Excavation will take place to a competent stratum beneath the peat.

(4) Road construction will be carried out in sections of up to 50m lengths i.e., no more than 50m of access road will be excavated without replacement with stone fill.

(5) Excavation of materials with respect to control of peat stability:

  (a) Where Acrotelm (the upper 0.3 to 0.4m of the peat layer) is required for landscaping, it will be stripped and temporarily stockpiled for re-use as required. Acrotelm stripping will be undertaken prior to main excavations.

  (b) Where possible, the acrotelm will be placed with the vegetation part of the sod facing the right way up to encourage growth of plants and vegetation.

  (c) All catotelm peat (peat below about 0.3 to 0.4m depth) will be transported immediately on excavation, where possible, to the designated peat and spoil management areas.

(6) Once excavated, non-catotelm peat will be temporarily stored in localised areas adjacent to excavations for roads and hardstands before being placed into the permanent Peat and Spoil Management areas. All temporary peat and spoil management areas will be upslope of founded roads/hardstands and will be inspected by the Project Geotechnical Engineer before material is stored in the area.

(7) Excavation side slopes in peat will be not greater than 1 (v): 3 (h). This slope inclination will be reviewed during construction. Where areas of weaker peat are encountered then slacker slopes will be required. Battering of the side slopes of the excavations will be carried out as the excavation progresses.

(8) End-tipping of stone onto the road during the construction/upgrading of the access road will be carefully monitored to ensure that excessive impact loading, which may adversely affect the adjacent peat, is limited.

(9) The excavated access road will be constructed with an average depth of 750mm of selected granular fill. Granular fill will be placed and compacted in layers in accordance with the TII Specification for Road Works.

(10) Access roads will be finished with a layer of capping across the full width of the road.

(11) A layer of geogrid/geotextile may be required at the surface of the competent stratum where cohesive material is present to prevent mixing of the underlying material with the granular fill.

(12) At transitions between floating and excavated roads a length of road of about 10m will have all peat excavated and replaced with suitable fill. The surface of this fill will be graded so that the road surface transitions smoothly from floating to excavated road.

(13) Where slopes of greater than 5 degrees are encountered along with relatively deep peat (i.e., greater than 2m) and where it is proposed to construct the access road perpendicular to the slope contours it is best practice to start construction at the bottom of the slope and work towards the top, where possible. This method avoids any unnecessary loading to the adjacent peat and greatly reduces any risk of peat instability.

(14) The construction and upgrading of access roads in areas of deep peat (greater than 2m) will be inspected on a routine basis (by the Site manager/Ecological Clerk of Works/Project Geotechnical Engineer) during the works, particularly before/following trafficking by heavy vehicular loads.

# 5. CONSTRUCTION OF NEW FLOATED ROADS OVER PEAT – TYPE C

The use of new floated access tracks will be limited on site to areas of flatter terrain, i.e., less than a 3 degree slope. The proposed locations for floating roads across the Site are shown in drawing P22-145-INFO-0022 and details shown in drawing P22-145-INFO-0012. Floating roads are not proposed on areas of sidelong ground.

A confirmatory stability analysis will be carried out by the designer where it is proposed to install floating access roads over the peat prior to any construction work commencing on site.

Floating roads minimise impact on the peat, particularly peat hydrology. As there is no excavation required no peat arisings are generated. However, where the underlying peat has insufficient bearing capacity or due to topographic restrictions an excavate and replace type access road may be more suitable (see Section 6), although this is not anticipated at the location of the proposed floated roads.

## 5.1 Floating Road Construction Methodology

This methodology includes procedures that will be included in the construction to minimise any adverse impact on peat stability. The methodology is not intended to cover all aspects of construction such as drainage and environmental considerations, which are assessed within the main EIAR.

Note: Details of geogrid arrangement will be provided by the specialist geogrid provider/designer.

(1) Prior to commencing floating road construction movement monitoring posts will be installed in areas where the peat depth is greater than 2m.

(2) Base geogrid will be laid directly onto the existing peat surface along the line of the road in accordance with geogrid provider's requirements.

(3) Construction of road will be in accordance with appropriate design from the designer.

(4) The make-up of the new floated access road is up to 1,000mm of selected granular fill with 2 no. layers of geogrid with possibly the inclusion of a geotextile separator (drawing P22-145-INFO-0012).

(5) Granular fill will be placed and compacted in layers in accordance with the TII Specification for Road Works.

(6) Following the detailed design of the floated access roads it may be deemed necessary to include pressure berms either side of the access road in some of the deeper peat areas. The inclusion of a 2 to 5m wide pressure berm (typically 0.5m in height) either side of the access road will reduce the likelihood of potential bearing failures beneath the access road.

(7) The finished road width will be a minimum of 5m, with wider sections on bends and corners.

(8) Stone delivered to the floating road construction will be end-tipped onto the constructed floating road. Direct tipping of stone onto the peat will be avoided.

(9) To avoid excessive impact loading on the peat due to concentrated end-tipping all stone delivered to the floating road will be tipped over at least a 10m length of constructed floating road.

(10) Where it is not possible to end-tip over a 10m length of constructed floating road then dumpers delivering stone to the floating road will carry a reduced stone load (not greater than half full) until such time as end-tipping can be carried out over a 10m length of constructed floating road.

(11) Following end-tipping suitable machinery will be employed to spread and place the tipped stone over the base geogrid along the line of the road.

(12) A final surface layer will be placed over the full width of the floating road, as per design requirements, to provide a road profile and graded to accommodate wind turbine construction and delivery traffic.

## 6. GENERAL CONSTRUCTION GUIDELINES FOR ACCESS ROADS

The following general construction guidelines will be implemented for the access roads on site.

(1) Where an open ditch is present alongside an existing/proposed floating access track, the ditch will need to be filled prior to upgrading/constructing the access track. The ditch will be filled with suitable drainage stone. As applicable, a perforated pipe will be laid into a ditch prior to filling so as to maintain water flow within the ditch.

(2) Where existing drainage crosses the road then it will be necessary to ensure that this drainage is not affected by settlement of the upgraded access road. Cross drains comprising flexible perforated pipes within a permeable stone fill surround will be used to maintain the existing drainage.

(3) No excavations (e.g., drainage, peat cuttings) will be carried out within 5m distance of a completed floated access road edge, or at a distance determined following site inspection. The presence of excavations can destabilise the road. Temporary excavations will be excavated in short lengths and backfilled as soon as practicable.

(4) Floating roads will not be constructed on areas of sidelong ground.

(5) No stockpiling of materials will take place on or adjacent to floated access roads so as to avoid bearing failure of the underlying peat.

(6) End-tipping of stone onto the road during the construction/upgrading of the access road will be carefully monitored to ensure that excessive impact loading, which may adversely affect the underlying peat, is limited.

(7) Due to the nature of floating road construction, it will be necessary to monitor the settlement/movement of the road. Survey points will be located along the road at 10m intervals in areas of deep peat (greater than 2m). These survey points will be surveyed on a weekly basis, and more frequently when construction activities are ongoing in the area.

(8) The construction and upgrading of access roads in areas of deep peat (greater than 2m) will be inspected on a routine basis during the works, particularly before/following trafficking by heavy vehicular loads.

(9) In the event of excessive vertical displacement of the road during/following construction then mitigation measures will be required to ensure the stability of the road. This will include:

  (a) Introduction of pressure berms either side of the road (that are 2 to 5m wide by 0.5m deep stone layer).

  (b) Where peat is relatively shallow then excavate peat and replace with suitable fill.

  (c) Slowing the rate of construction.

(10) Settlement of a floated access road is expected and will likely be in the order of several 100mm in the deeper peat areas; as such it will be necessary to re-level the road at convenient intervals during the works. The magnitude and extent of settlement is likely to be greater in areas of deeper peat with the rate of settlement reducing over time. Prior to completion of the works, the road will be re-levelled using crushed stone.

# 7. EXCAVATION AND STORAGE OF PEAT AND SPOIL

## 7.1 Excavation and Storage of Arisings Methodology

This methodology includes procedures that will be included in the construction to minimise any adverse impact on peat stability. The methodology is not intended to cover all aspects of construction such as drainage and environmental considerations, which are assessed in within the main EIAR.

(1) Excavated peat and spoil will be transported immediately to one of the designated peat and spoil management areas, unless it is the acrotelm as this will be temporarily stockpiled and re-used for landscaping purposes.

(2) Further details on the placement of excavated material to designated peat and spoil management areas close to turbines are given in Section 7.4.

(3) Some of the peat, in particular the acrotelm (upper layer of the peat), excavated during construction will be temporarily stored locally and used for landscaping purposes.

## 7.2 Summary of Peat and Spoil Volumes on the Proposed Wind Farm site

A summary of the excavated peat and spoil volumes calculated for the Site is given in Table 7-1.

**Table 7.1: Summary of Excavated Peat and Spoil Volumes on Site**

| Infrastructure Element [1] | Proposed Dimensions | Peat Volume ($m^3$) [2] | Spoil (non-peat) Volume ($m^3$) [2] | Comment |
|---|---|---|---|---|
| 9 no. Turbines and Hardstands | 27m diameter excavation footprint (25m wide base with 1m of working space around the perimeter of the base) for turbine foundation with 80 x 33.5m hardstand area. | 30,449 | 18,921 | Hardstanding area and foundation footprint |
| Access Roads | Assumed 5m running surface with 6m wide development footprint. | 13,776 | 9,184 | |
| Substation | Hardstanding area of 140 x 85m. | 2,881 | 2881 | |
| Temporary Construction Compounds (x2) | Footprint of 70 x 40m for both | 4313 | 5176 | |
| GCR | Provided by client | 3450 | | |
| | | | | |
| | **Total =** | **54,869** | **36,162** | **Total peat and spoil = 91,031m3** |

Note 1 – A bulking factor of 15 and 10% has been applied to the excavated peat and non-peat soils respectively. This allows for expected increase in volume upon excavation and to allow for a variation in ground conditions across the Site.
Note 2 – Soil volumes given in this table are indicative and for information purposes only, and subject to detailed estimates

## 7.3 Summary of Peat and Spoil Management Areas on the Proposed Wind Farm site

A summary of the potential peat and spoil management areas at the Site is given in Table 7-2.

**Table 7.2: Summary of Peat and Spoil Management Areas on the Proposed Wind Farm site**

| Location (1) | Peat and Spoil Volume ($m^3$) | Comment |
|---|---|---|
| Peat placement within proposed peat and spoil management areas | 92,830 | Up to 1.25m in height across specific areas shown in Drawing P22-145-INFO-0022. See Section 7.5 of the report and Drawings P22-145-INFO-0015 to P22-145-INFO-0021 for further details. |
| Landscaping (2) | 13,500 | 1,500$m^3$ assessed at 9 no. turbine locations |
| | | |
| **Total =** | **106,330$m^3$** | |

Note (1) The location of the proposed peat/spoil storage areas at the Proposed Wind Farm site are shown on Drawing P22-145-INFO-0022.

Note (2) Some of the acrotelm (upper layer of the peat) excavated during construction will be used for landscaping purposes.

## 7.4 Summary of Management and Reuse of Excavated Peat and Spoil

The Proposed Project will be developed in phases, to allow for the development and backfill of the peat and spoil storage areas. An outline of the proposed Phasing is provided below:

(1) Peat and spoil excavated from turbines will be transported to the adjacent peat and spoil storage areas, peat will be used to create pressure berms on both sides of the floating roads or used for landscaping around the hardstands.

(2) Shallow Peat/Topsoil removed will be temporarily stockpiled locally and used to cover the peat/spoil storage areas, as well as any landscaping areas.

(3) Spoil excavated from the substation platform will either be landscaped around the platform or transported to the peat and spoil storage areas.

(4) A small volume (c. 350$m^3$ per base) of spoil will be reused at each turbine base as ballast backfill.

## 7.5 Designated Peat and Spoil Management Areas

The following commitments for the placement of peat within peat and spoil management areas will be implemented during construction. These areas have been selected based on a combination of the depth of peat, the recorded peat strength in the area and the slope angle.

(1) Excavated peat will be placed/spread across the 7 no. areas within the Proposed Wind Farm site. These locations are shown in Drawing P22-145-INFO-0022.

(2) The peat placed within the peat and spoil management areas shown on Drawing P22-145-INFO-0022 will be restricted to a maximum height of 1.25m. Weak/liquified peat will be stored in the centre of the peat management areas with firmer/drier peat placed around the outside.

(3) The placement of excavated peat will be avoided without first establishing the adequacy of the ground to support the load. The placement of peat and spoil within the peat and spoil management areas will require the use of long reach excavators, low ground pressure machinery and possibly bog mats in particular for drainage works.

(4) It will be ensured that the surface of the placed peat will be shaped to allow efficient run-off of surface water. Shaping of the surface of the peat will be carried out as placement of peat within the peat and spoil management area progresses. This will reduce the likelihood of debris run-off and reduce the risk of instability of the placed peat.

(5) Finished/shaped side slopes in the placed peat will be not greater than 1 (v): 4 (h). This slope inclination will be reviewed during construction, as appropriate.

(6) Where available, the acrotelm will be placed on the finished surface with the vegetation part of the sod facing the right way up to encourage growth of plants and vegetation at the surface of the placed peat and spoil within the peat and spoil management areas.

(7) Movement monitoring instrumentation will be placed around the areas where peat has been placed. The locations where monitoring is required will be identified by the Project Geotechnical Engineer on site.

(8) Supervision by the Project Geotechnical Engineer will be carried out for the works.

(9) An interceptor drain will be installed upslope of the designated peat and spoil management areas to divert any surface water away from these areas. This will help ensure stability of the placed peat and reduce the likelihood of debris run-off.

(10) All of the above mentioned general guidelines and requirements will be undertaken by the Contractor during construction.

## 7.6 Summary of Stone Volume Requirements

Table 7.3 below summarises the stone volume requirement for the Proposed Project, excluding the final blinding layer, all of which will come from an external source.

**Table 7.3: Summary of Stone Volume Requirements**

| Infrastructure Element (1) | Typical Dimensions | Stone Volume (m3) (2) | Comment |
|---|---|---|---|
| 9 no. Turbines and Hardstands | 27m diameter excavation footprint (25m wide base with 1m of working space around the perimeter of the base) for turbine foundation with 80 x 33.5m hardstand area. | 28,826 | Hardstanding area and foundation footprint. Allowance included for mini-crane pads and blade finger hardstands associated with the main hardstand, plus allowance for side slopes in areas of fill. |
| Access Roads | Assumed 5m running surface with 6m wide development footprint. | 52,305 | Allowance includes for widening on bends, at junctions, laybys, and tie-ins to hardstands. |
| Substation | Hardstanding area of 140 x 85m. | 9,185 | |
| Temporary Construction Compounds (x2) | Footprint of 70 x 40m for both | 5500 | - |
| GCR | Provided by client | 9,400 | |
| | | | |
| | **Total =** | **105,216** | |

Note 1 – A contingency factor of 25% stone volumes to allow for a variation in ground conditions across the Site.
Note 2 – Stone volumes given in this table are indicative and for information purposes only, and subject to detailed estimates.

# 8. EXCAVATIONS IN PEAT FOR TURBINE BASES, HARDSTANDINGS AND INFRASTRUCTURE FOUNDATIONS

The turbine bases will be founded on competent founding strata which will require excavation through peat and soft overburden. Some turbine foundations may require a piled solution following confirmatory ground investigations by the Contractor.

Similarly, crane hardstandings, construction compound, substation platforms and met mast foundations are to be founded on competent mineral soil and/or rock which will require excavation through peat and spoil.

## 8.1 Methodology

This methodology includes procedures that will be included in the construction to minimise any adverse impact on peat stability. The methodology is not intended to cover all aspects of construction such as drainage and environmental considerations, which are assessed within the main EIAR.

(1) With respect to placement of arisings from excavations the commitments given in Section 7 will be followed.

(2) All excavations within peat will be adequately supported or peat slopes are to be battered to a safe slope inclination typically of 1 (v): 3 (h). This slope inclination will be reviewed during construction, as appropriate. Where areas of weaker peat are encountered then slacker slopes will be provided.

(3) Excavations will be kept reasonably free from water at all times. Water will be prevented from being impounded within excavations by either using drainage channels cut into the excavation face or by pumping.

(4) Where water is channelled or pumped from an excavation then this water is to be fed into an established watercourse or drainage ditch following suitable treatment, as described within the main EIAR.

# 9. EXCAVATIONS FOR UNDERGROUND CABLES

A connection between the Site and the national electricity grid will be necessary to export electricity. The Proposed Grid Connection construction methodology, including proposals for water crossings on the underground cabling routes is described in within the main EIAR.

It is proposed to excavate the trenches for the underground cable at a uniform level within the footprint of the access roads. The Proposed Grid Connection will encounter localised areas of shallow peat (<0.5m) and till derived from limestones, as per GSI mapping (gsi.ie) and walkover surveys, and will be constructed on solid ground to EirGrid specifications.

## 9.1 Methodology

This methodology includes procedures that will be included in the construction to minimise any adverse impact on peat stability. The methodology is not intended to cover all aspects of construction such as drainage and environmental considerations, which are assessed within the main EIAR.

(1) With respect to placement of arisings from excavations the guidelines given in Section 7 will be followed.

(2) All excavations within peat will be adequately supported or peat slopes will be battered to a safe slope inclination typically of 1 (v): 3 (h). This slope inclination will be reviewed during construction, as appropriate. Where areas of weaker peat are encountered then slacker slopes will be required.

(3) Similarly, all excavations within non-peat overburden for the cable trench are to be adequately supported or battered to a safe slope inclination typically of 1 (v): 1.5 or 2 (h). This slope inclination will be reviewed during construction, as appropriate.

(4) Excavations will be kept reasonably free from water at all times.

(5) Any overburden excavated from the cable trench will be transported to the peat/spoil storage areas for storage. Any pavement materials containing tar will be transported to an authorised waste facility.

## 10. GENERAL MEASURES FOR GOOD CONSTRUCTION PRACTICE

To minimise the risk of construction activity causing potential peat instability the Construction Method Statements (CMS) for the Proposed Project will also implement (as a minimum), the general measures below together with the specific measures above.

(1) Uncontrolled concentrated water discharge onto peat slopes identified as being unsuitable for such discharge will be avoided. All water discharged from excavations during work will be piped over areas specifically assessed as being unsuitable and hence directly into suitable drainage lines.

(2) All excavations will be suitably supported to prevent collapse and development of tension cracks.

(3) Avoidance of placing fill and excavations in the vicinity of steeper peat slopes, that is at the crest or toe of the slope.

(4) Installation and regular monitoring of geotechnical instrumentation during construction in areas of possible poor ground, such as deeper peat deposits (see Section 11).

(5) Site reporting procedures will be implemented to ensure that working practices are suitable for the encountered ground conditions. Ground conditions will be assessed by a suitably experienced geotechnical engineer.

(6) Regular briefing of all site staff (e.g., toolbox talks) to provide feedback on construction and ground performance and to promote reporting of any observed change in ground conditions.

(7) Routine inspection of the Proposed Wind Farm site and Proposed Grid Connection by the Contractor and Project Geotechnical Engineer will be undertaken and will include an assessment of ground stability conditions (e.g., cracking, excessive floating road settlement, disrupted surface, closed-up drains) and drainage conditions (e.g., blocked drains, absence of water in previously flowing drains, springs, etc).

# 11. INSTRUMENTATION

## 11.1 Movement Monitoring Posts

To monitor possible peat movements, it is proposed to install sighting posts upslope and downslope of the access roads at staggered intervals at locations where the peat depth is greater than 2m. Additional monitoring locations will be provided at infrastructure locations with deeper peat deposits and at peat and spoil management areas. Details of sighting posts are given below.

(1) A line of sighting posts will comprise:

(a) A line of wooden stakes (proposed to be 1 to 1.5m long) placed vertically into the peat to form a straight line.

(b) The sighting line will comprise 6 no. posts at 5m centres that is a line some 25m long.

(c) A string line will be attached to the first and last posts and all intervening posts will be adjusted so they are just touching the string line.

(2) Lines of sighting posts will be placed across the existing slope about 5m away from the area to be worked. It is recommended that the posts are located along the road at 5m intervals in areas of deep peat (say greater than 2.0m). Where there are relatively steeper slopes or softer ground a sighting line will be placed down the slope, or at any location where monitoring is deemed useful by the Project Geotechnical Engineer.

(3) Each line of sighting posts will be uniquely referenced with each post in the line given a reference. The post reference will be marked on each post (e.g., reference 1-1, 1-2, 1-3, 1-4, 1-5, 1-6 for posts in line 1).

(4) The sighting lines will be monitored at the beginning of each working day, and during the day were considered appropriate (e.g., when working activity is concentrated at a specific location).

(5) Monitoring of the posts will comprise sighting along the line and recording any relative movement of posts from the string line.

(6) Where increased movements are recorded the frequency of monitoring will be increased.

(7) A monitoring record will be kept of the date, time and relative movement of each post, if any. This record will be updated and stored as a spreadsheet.

# 12. CONTINGENCY MEASURES

## 12.1 Excessive Movement

Where there is excessive movement or continuing peat movement recorded at a monitoring location or identified at any location within the Proposed Wind Farm site but no apparent signs of distress to the peat (e.g., cracking, surface rippling) then the following will be carried out.

(1) All activities (if any) will cease within the affected area.

(2) Increased monitoring at the location will be carried out. The area will be monitored, as appropriate, until such time as movements have ceased.

(3) Re-commencement of activities will only start following a cessation of movement and agreement with all parties (Contractor/Engineer/Designer).

## 12.2 Onset of Peat Slide

In the unlikely event where there is the onset or actual detachment of peat (e.g., cracking, surface rippling) then the following will be carried out.

(1) On alert of a peat slide incident, all activities (if any) in the area will cease and all available resources will be diverted to assist in the required mitigation procedures.

(2) Action will be taken to prevent a peat slide reaching any watercourse. This will take the form of the construction of check barrages on land. Due to the terrain and the inability to predict locations it may not be possible to implement any on-land prevention measures, in this case a watercourse check barrage will be implemented.

(3) All relevant authorities will be notified if a peat slide event occurs on site.

(4) For localised peat slides that do not represent a risk to a watercourse and have essentially come to rest the area will be stabilised initially by rock infill, if required. The failed area and surrounding area will then be assessed by the engineering staff and stabilisation procedures implemented. The area will be monitored, as appropriate, until such time as movements have ceased.

## 12.3 Check Barrages

Whilst it is not anticipated from the analysis undertaken that a peat slide will occur on site, as a contingency a check barrage procedure is included below.

The check barrage procedure deals with preventing a peat slide from moving downstream within a watercourse.

The most effective method of preventing excessive peat slide debris from travelling downstream in a watercourse is the use of a check barrage. A check barrage comprises the placement of rock fill across a watercourse. The check barrage is a highly permeable construction that will allow the passage of water but will prevent peat debris from passing through. Rock fill will comprise well-graded coarse rock pieces from about 300mm up to 1000mm.

The rock fill for the check barrage will be sourced from local quarries.

The size of the barrage will vary depending on the scale of the peat debris to be contained and the geometry of the watercourse at the barrage location. In general, due to the low speed of a peat slide there is generally little impact force and most of the lateral load is due to fluid pressure on the upslope face of the barrage.

The check barrage will fill the entire channel width of the watercourse up to a height of 3 to 4m with a crest width of at least 2m and side slopes of about 45 degrees depending on the geometry of the barrage location.

The check barrage procedure is as follows:

(1) Access to the check barrage location will be along the existing access roads on the Proposed Wind Farm site and/or along public roads, where possible. When it is necessary to form the barrage then rock fill will be placed across the watercourse to effectively block the passage of peat debris.

(2) Operatives employed to carry out the construction of the check barrage will be inducted by means of a briefing by on-site supervisors as to the proposed location of the check barrage.

(3) The check barrage provides containment for peat debris in the highly unlikely event of a major peat slide. Further remedial measures, should they be required, will be assessed by the Contractor and the Project Geotechnical Engineer and carried out as soon as physically possible when the location and extent of the failure is established.

(4) Where a barrage was constructed as a precaution and no peat debris reached the watercourse then the barrage will be removed as soon as any measures to prevent further peat sliding is agreed with all parties (Contractor/Engineer/Designer).

## 13. REFERENCES

Munro, R, 2004. Dealing with bearing capacity problems on low volume roads constructed on peat. Roadex II Northern Periphery.

Scottish Natural Heritage/Forestry Commission Scotland, 2010. Floating Roads on Peat.

Scottish Natural Heritage, 2015. Constructed Tracks in the Scottish Uplands. Scottish Natural Heritage.

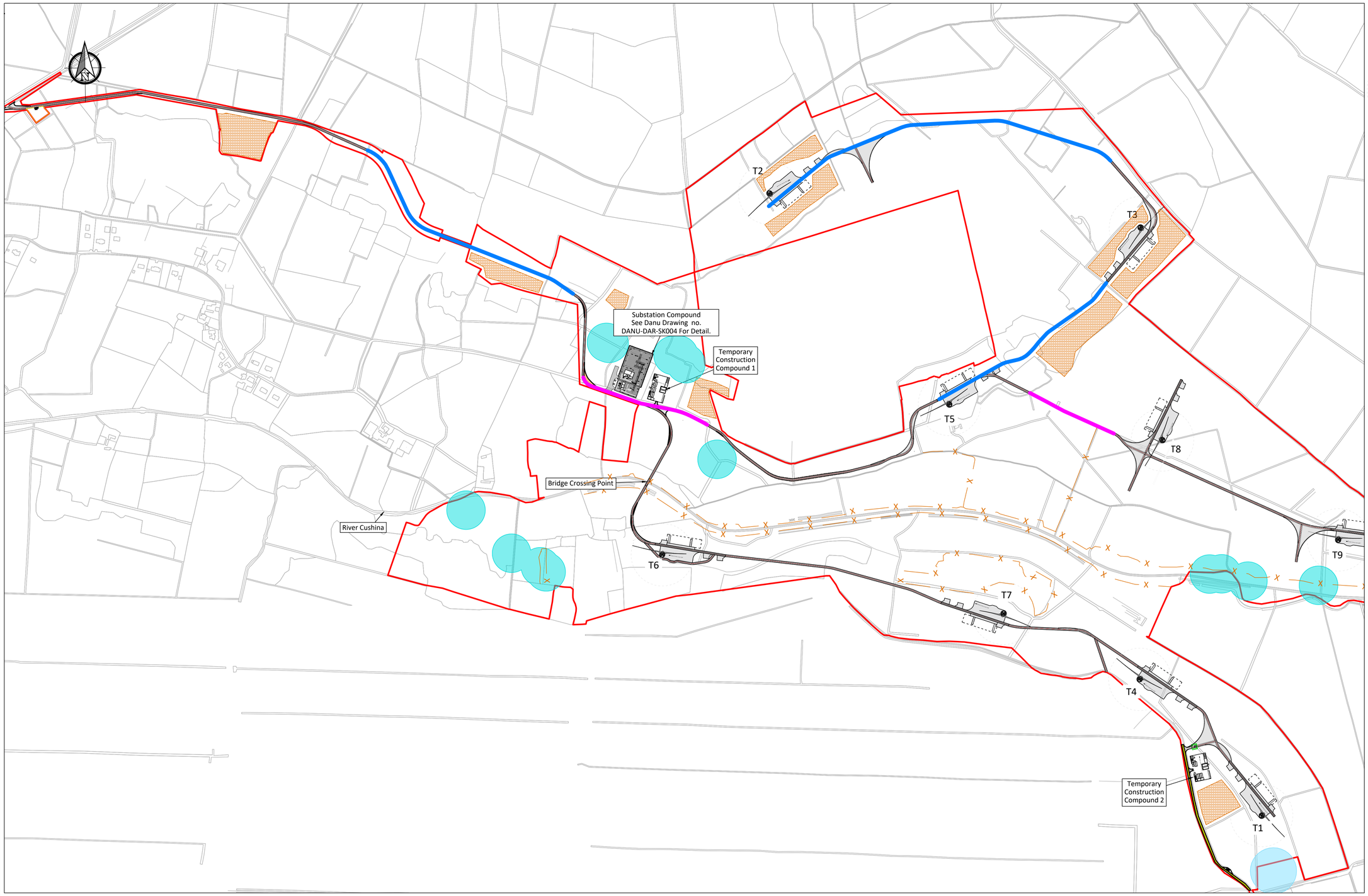
Good Practice during Windfarm Construction (Scottish Renewables, SNH, SEPA & Forestry Commission Scotland, 5th Edition 20249).

Guidance on Developments on Peatland: Site Surveys (Scottish Government, Scottish Natural Heritage and SEPA, 2017.

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# DRAWINGS




## LEGEND:

- Planning Site Boundary
- Turbine
- Proposed Site Access Road
- Temporary Widenings
- Existing Road to be upgraded
- 64.00 Existing Ground Contour
- Proposed Peat Storage Areas
- Proposed Habitat Fence

## ROAD TYPE LEGEND:

- New Floated Access Road
- Upgrade of Existing Access Track

# PLAN

**Scale 1:5000**

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| Rev. | Description | App By | Date |
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| A | ISSUE FOR PLANNING | JH | 23.04.25 |
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**PROJECT**
DERRYNADARRAGH WIND FARM

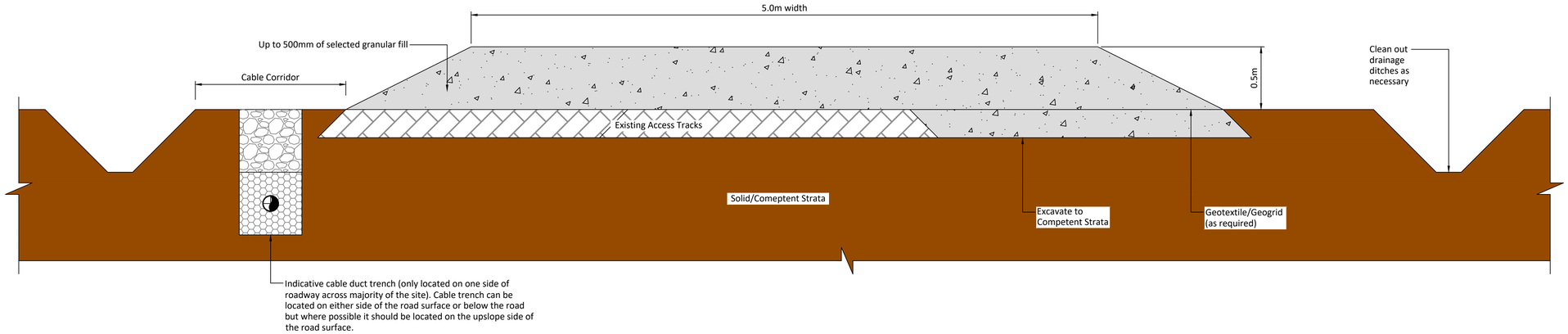
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Dara Energy Limited

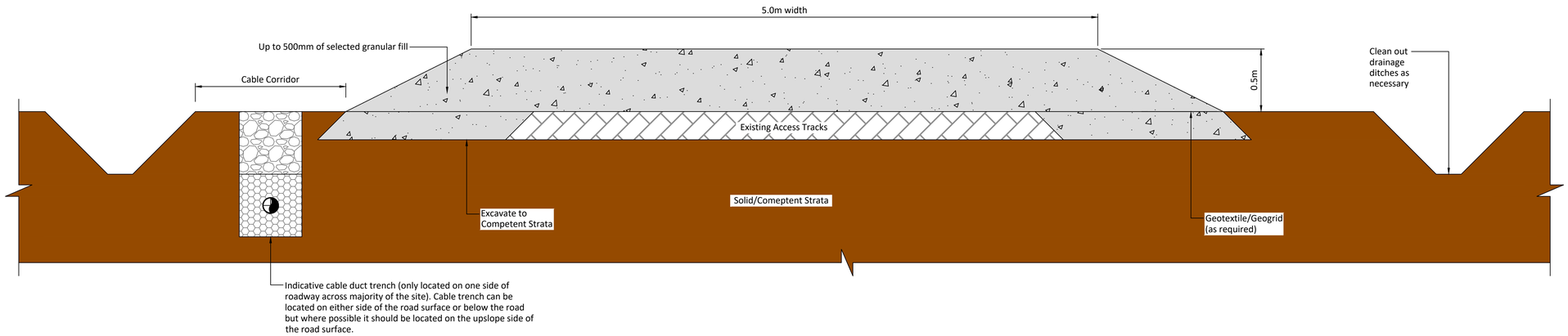
**SHEET**
PEAT AND SPOIL MANAGEMENT AREAS
ROAD CONSTRUCTION TYPES PLAN

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| Date 23.04.25 | Project number P22-145 | Scale (@ A1-) 1:5000 |
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10 September 2025




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| A | ISSUE FOR PLANNING | JH | 25.08.25 |
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**PROJECT**
**DERRYNADARRAGH WIND FARM**

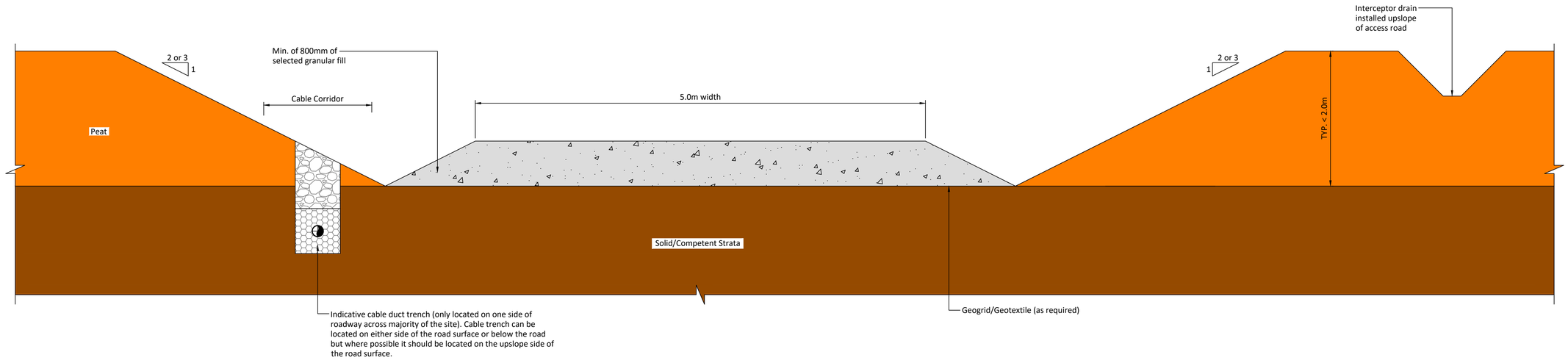
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**SHEET**
**PEAT & SPOIL MANAGEMENT AREAS- TYPE A - UPGRADE OF EXISTING EXCAVATED ACCESS ROAD**

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| Date 25.08.25 | Project number P22-145 | Scale (@ A1-) 1:0 | |
| Drawn by CS | Drawing Number P22-145-INFO-0010 | | Rev A |
| Checked by EA | | | |

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PROJECT
**DERRYNADARRAGH WIND FARM**

CLIENT
Dara Energy Limited

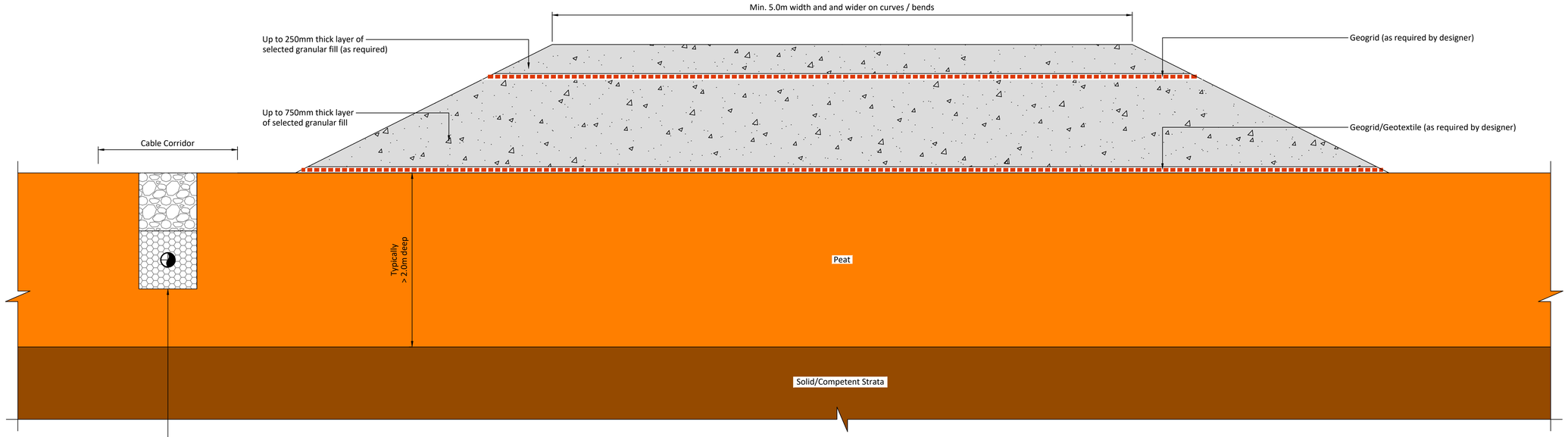
SHEET
**PEAT & SPOIL MANAGEMENT AREAS- TYPE B - NEW EXCAVATE AND REPLACE ACCESS ROAD**

| | | | |
|---|---|---|---|
| Date 25.08.25 | Project number P22-145 | Scale (@ A1- ) 1:0 | |
| Drawn by CS | Drawing Number P22-145-INFO-0011 | | Rev A |
| Checked by EA | | | |

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10 September 2025

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PROJECT
**DERRYNADARRAGH WIND FARM**

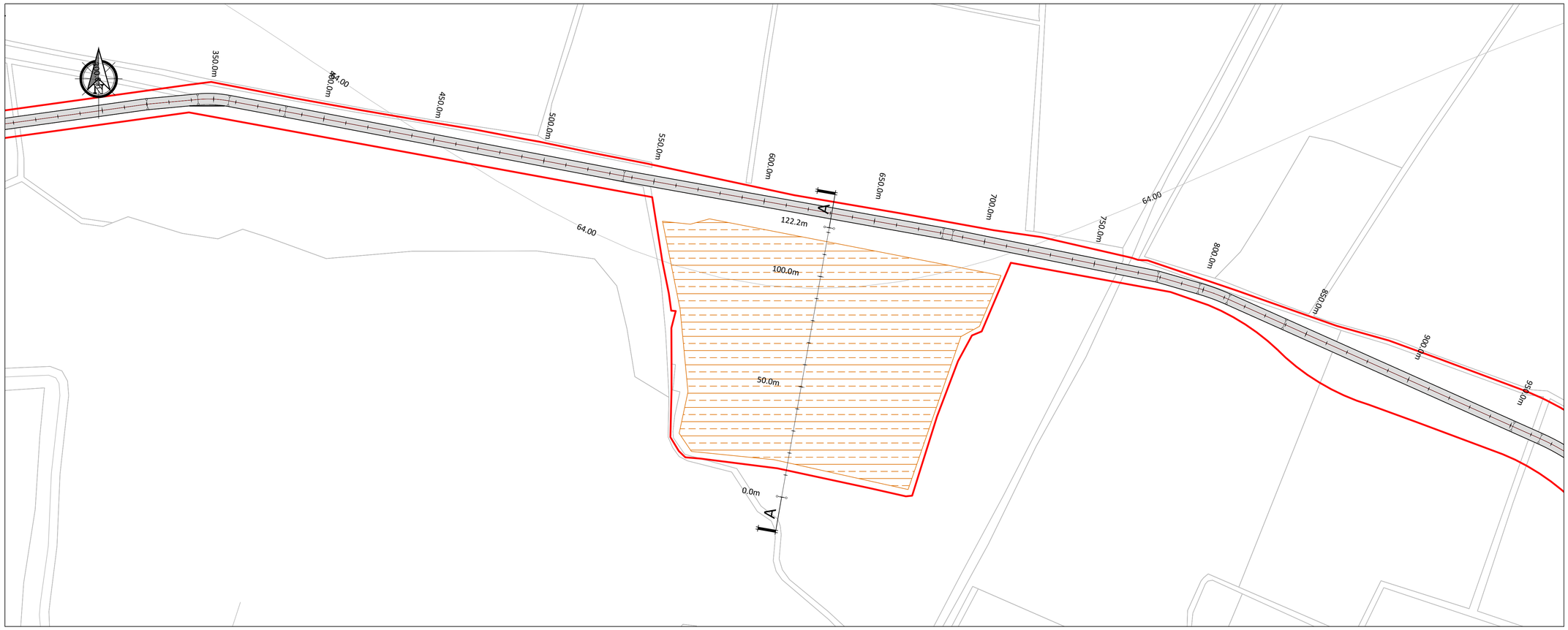
CLIENT
Dara Energy Limited

SHEET
**PEAT & SPOIL MANAGEMENT AREAS- TYPE C - NEW FLOATED ACCESS TRACK**

| | | | |
|---|---|---|---|
| Date 25.08.25 | Project number P22-145 | Scale (@ A1- ) 1:0 | |
| Drawn by CS | Drawing Number P22-145-INFO-0012 | | Rev A |
| Checked by EA | | | |

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10 September 2025




## PLAN

**Scale 1:1000**

LEGEND:

- Planning Site Boundary
- Turbine
- Proposed Site Access Road
- Temporary Widenings
- Existing Road to be upgraded
- 64.00 Existing Ground Contour
- Proposed Peat Storage Areas
- x x Proposed Habitat Fence

### Construction Notes Peat Deposition Areas:

(1) An interceptor drain will also be installed upslope of the peat deposition areas.

(2) A silting pond will be required at the lower side of the peat deposition areas.

(3) It is important that the surface of the stored peat be shaped to allow efficient run-off of water from the stored spoil.

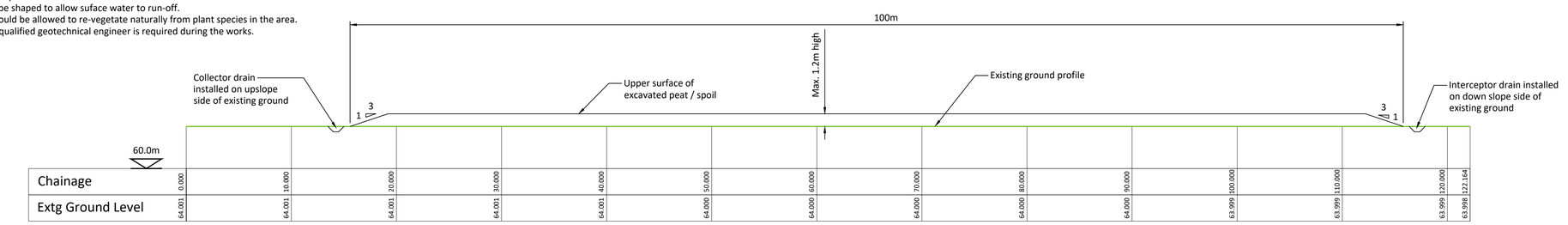
(4) Supervision by a geotechnical engineer or appropriately competent person is recommended for the construction of the peat deposition area.

(5) All the above-mentioned general guidelines and requirements will be implemented during construction.

(6) Further guidelines on the construction of the peat storage area are included within Section 5.4 of the Peat & Spoil Management Plan.

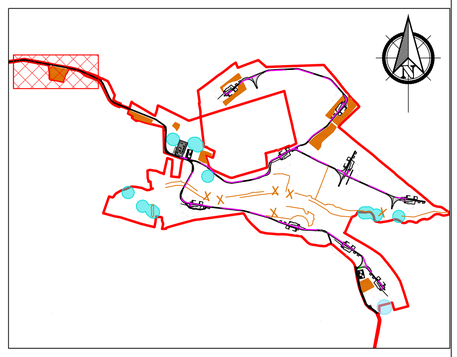
Construction Notes:

1) Spoil heap may consist of peat and overburden from local excavations.
2) Stored material should be shaped to allow suface water to run-off.
3) Placed / spread spoil should be allowed to re-vegetate naturally from plant species in the area.
4) Supervision by suitably qualified geotechnical engineer is required during the works.




## SECTION A-A

**Scale 1:250**



## KEY PLAN

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PROJECT: DERRYNADARRAGH WIND FARM

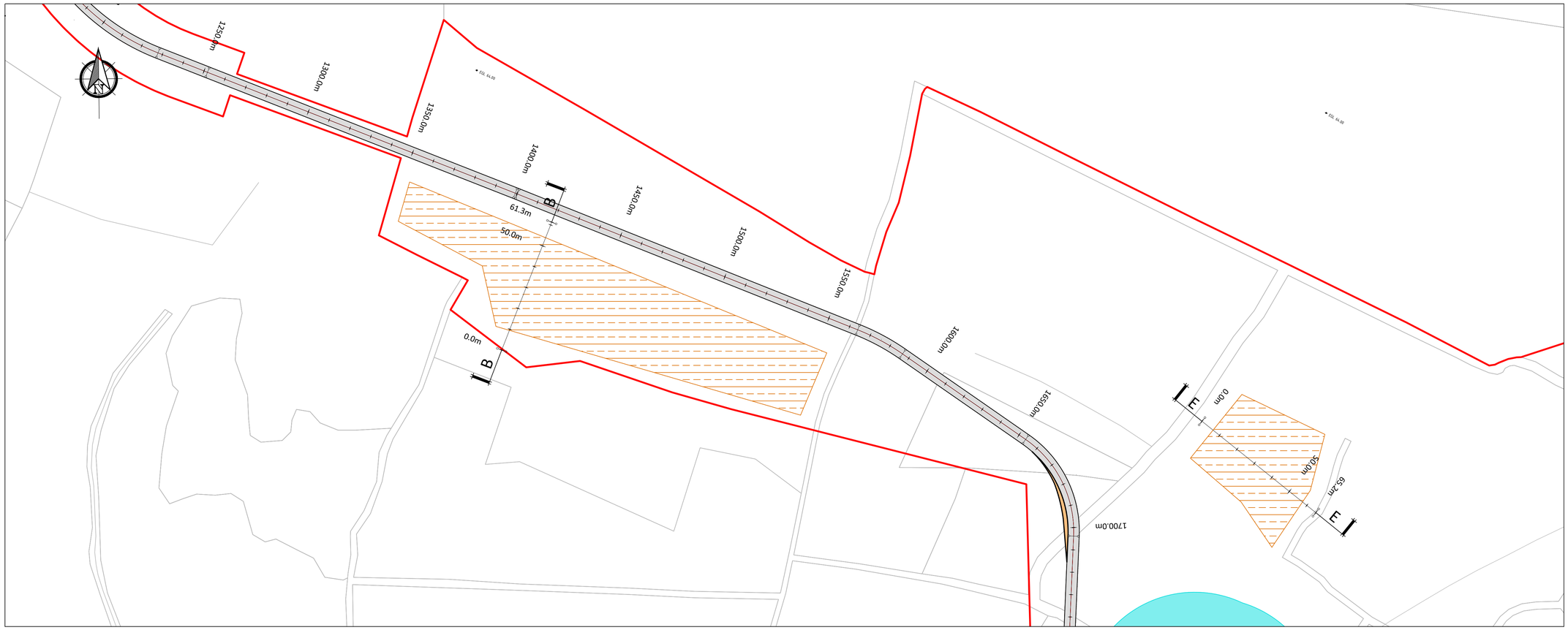
CLIENT: Dara Energy Limited

SHEET: PEAT AND SPOIL MANAGEMENT AREAS PLAN AND SECTION (SHEET 1 OF 7)

| | | | |
|---|---|---|---|
| Date 09.09.25 | Project number P22-145 | Scale (@ A1- ) 1:1000 | |
| Drawn by CS | Drawing Number P22-145-INFO-0015 | | Rev A |
| Checked by EA | | | |

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9 September 2025




## PLAN

**Scale 1:1000**

LEGEND:

- Planning Site Boundary
- Turbine
- Proposed Site Access Road
- Temporary Widenings
- Existing Road to be upgraded
- 64.00 Existing Ground Contour
- Proposed Peat Storage Areas
- Proposed Habitat Fence

## Construction Notes Peat Deposition Areas:

(1) An interceptor drain will also be installed upslope of the peat deposition areas.

(2) A silting pond will be required at the lower side of the peat deposition areas.

(3) It is important that the surface of the stored peat be shaped to allow efficient run-off of water from the stored spoil.

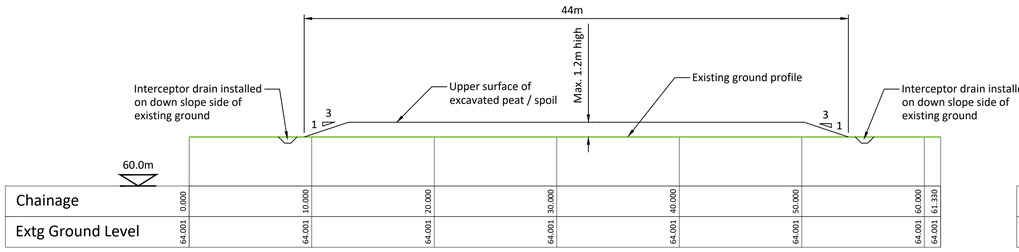
(4) Supervision by a geotechnical engineer or appropriately competent person is recommended for the construction of the peat deposition area.

(5) All the above-mentioned general guidelines and requirements will be implemented during construction.

(6) Further guidelines on the construction of the peat storage area are included within Section 5.4 of the Peat & Spoil Management Plan.

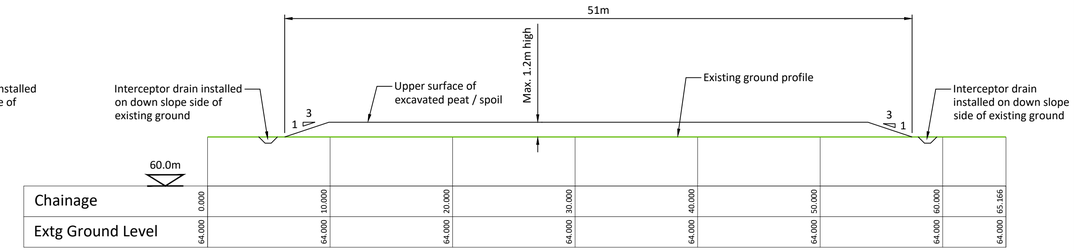
Construction Notes:

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4) Supervision by suitably qualified geotechnical engineer is required during the works.



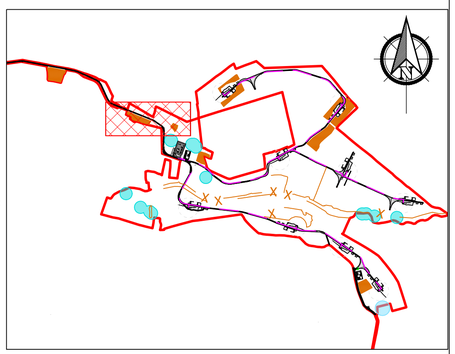

## SECTION B-B

**Scale 1:250**




## SECTION E-E

**Scale 1:250**



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PROJECT: DERRYNADARRAGH WIND FARM

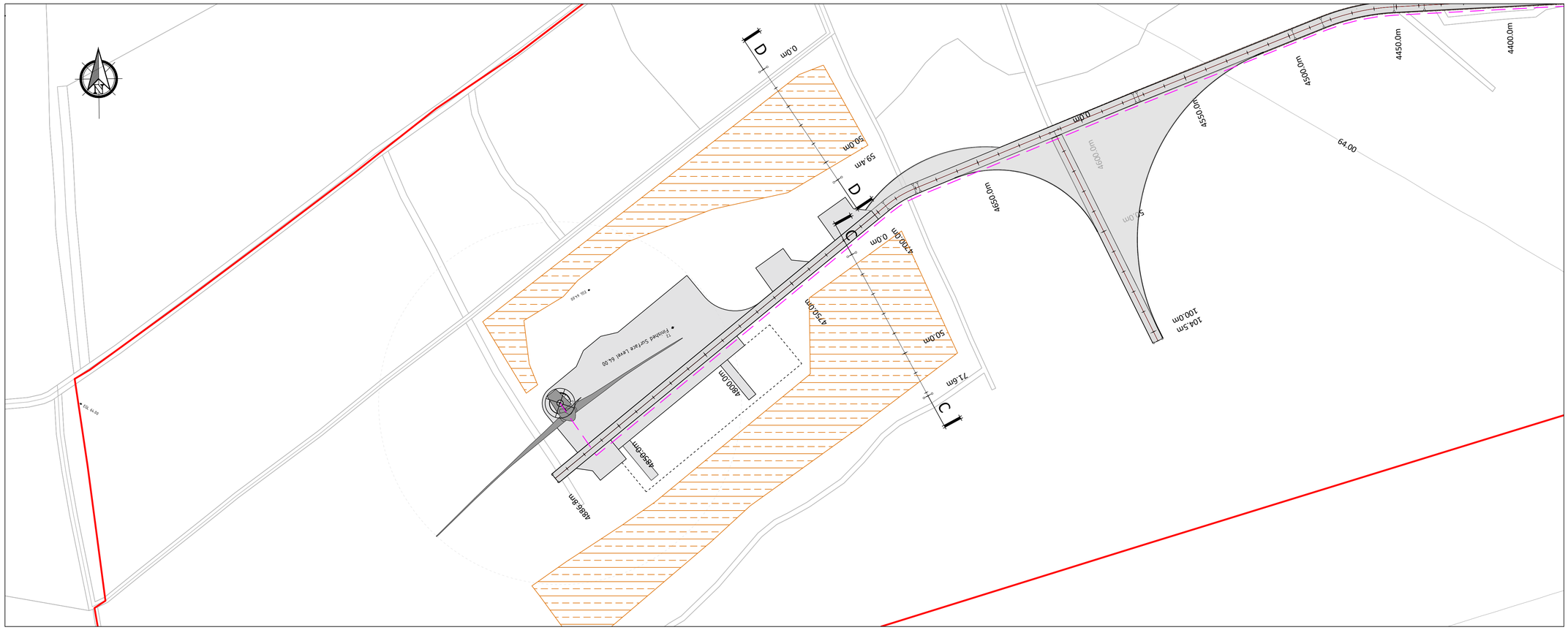
CLIENT: Dara Energy Limited

SHEET: PEAT AND SPOIL MANAGEMENT AREAS PLAN AND SECTION (SHEET 2 OF 7)

| | | | |
|---|---|---|---|
| Date 09.09.25 | Project number P22-145 | Scale (@ A1- ) 1:1000 | |
| Drawn by CS | Drawing Number P22-145-INFO-0016 | | Rev A |
| Checked by EA | | | |

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9 September 2025




## PLAN

**Scale 1:1000**

LEGEND:

- Planning Site Boundary
- Turbine
- Proposed Site Access Road
- Temporary Widenings
- Existing Road to be upgraded
- 64.00 Existing Ground Contour
- Proposed Peat Storage Areas
- x x Proposed Habitat Fence

## Construction Notes Peat Deposition Areas:

(1) An interceptor drain will also be installed upslope of the peat deposition areas.

(2) A silting pond will be required at the lower side of the peat deposition areas.

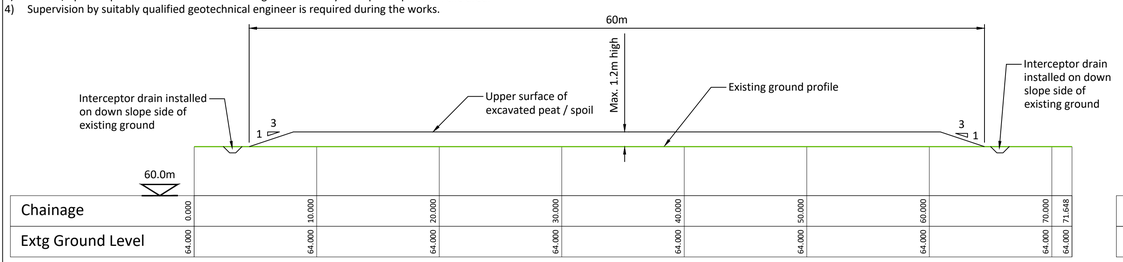
(3) It is important that the surface of the stored peat be shaped to allow efficient run-off of water from the stored spoil.

(4) Supervision by a geotechnical engineer or appropriately competent person is recommended for the construction of the peat deposition area.

(5) All the above-mentioned general guidelines and requirements will be implemented during construction.

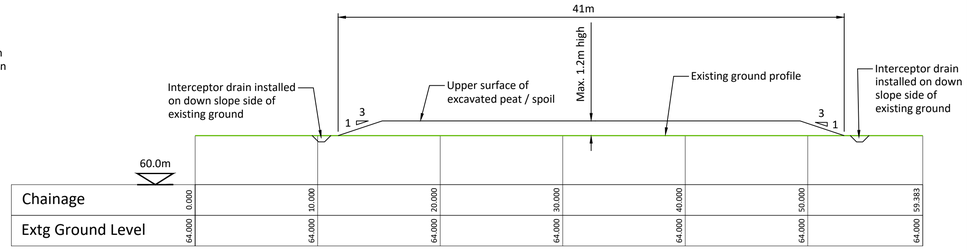
(6) Further guidelines on the construction of the peat storage area are included within Section 5.4 of the Peat & Spoil Management Plan.

1) Spoil heap may consist of peat and overburden from local excavations.
2) Stored material should be shaped to allow suface water to run-off.
3) Placed / spread spoil should be allowed to re-vegetate naturally from plant species in the area.
4) Supervision by suitably qualified geotechnical engineer is required during the works.



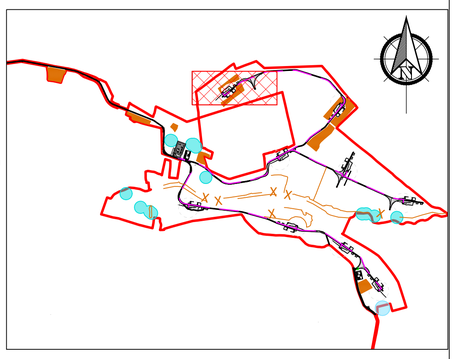

## SECTION C-C

**Scale 1:250**




## SECTION D-D

**Scale 1:250**



## KEY PLAN

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PROJECT: DERRYNADARRAGH WIND FARM

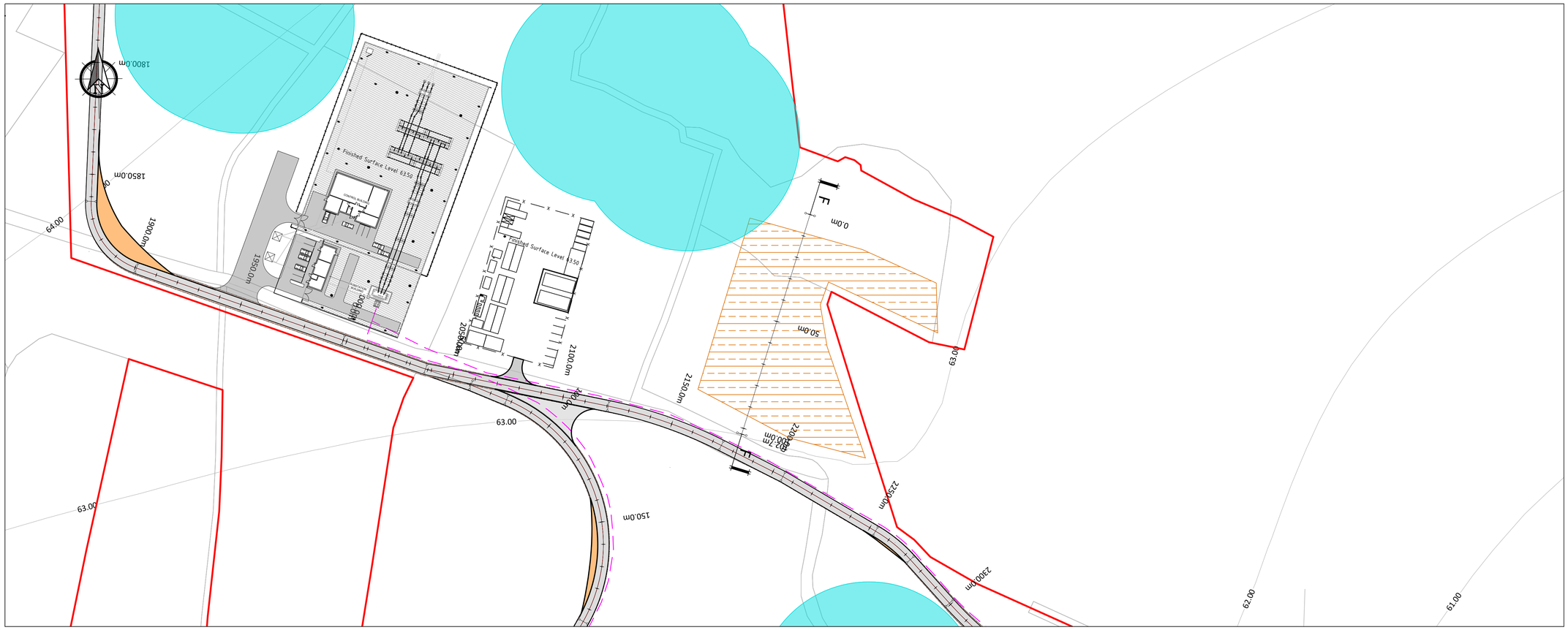
CLIENT: Dara Energy Limited

SHEET: PEAT AND SPOIL MANAGEMENT AREAS PLAN AND SECTION (SHEET 3 OF 7)

| | | | |
|---|---|---|---|
| Date: 09.09.25 | Project number: P22-145 | Scale (@ A1- ): 1:1000 | |
| Drawn by: CS | Drawing Number: P22-145-INFO-0017 | | Rev: A |
| Checked by: EA | | | |

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## PLAN

**Scale 1:1000**

LEGEND:

- Planning Site Boundary
- Turbine
- Proposed Site Access Road
- Temporary Widenings
- Existing Road to be upgraded
- 64.00 Existing Ground Contour
- Proposed Peat Storage Areas
- x x Proposed Habitat Fence

## Construction Notes Peat Deposition Areas:

(1) An interceptor drain will also be installed upslope of the peat deposition areas.

(2) A silting pond will be required at the lower side of the peat deposition areas.

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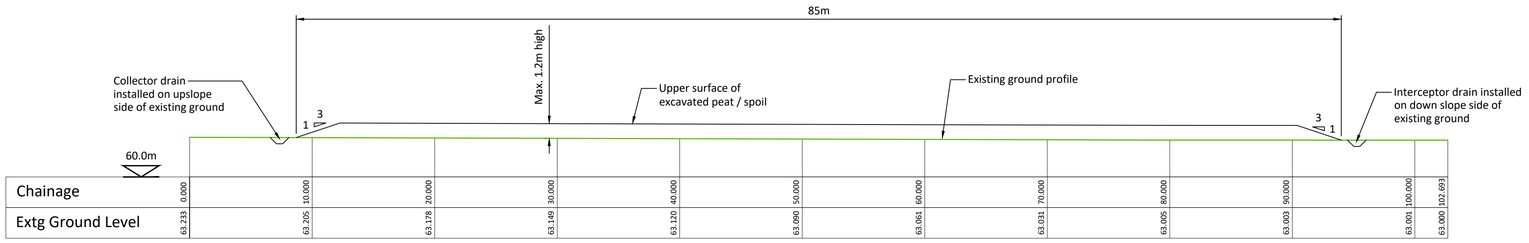
(4) Supervision by a geotechnical engineer or appropriately competent person is recommended for the construction of the peat deposition area.

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(6) Further guidelines on the construction of the peat storage area are included within Section 5.4 of the Peat & Spoil Management Plan.

Construction Notes:

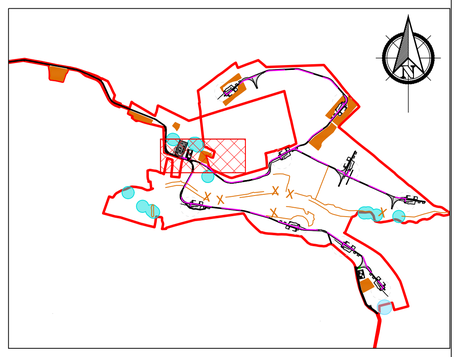
1) Spoil heap may consist of peat and overburden from local excavations.
2) Stored material should be shaped to allow suface water to run-off.
3) Placed / spread spoil should be allowed to re-vegetate naturally from plant species in the area.
4) Supervision by suitably qualified geotechnical engineer is required during the works.




| Chainage | 0.000 | 10.000 | 20.000 | 30.000 | 40.000 | 50.000 | 60.000 | 70.000 | 80.000 | 90.000 | 100.000 | 102.693 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Extg Ground Level | 63.233 | 63.205 | 63.178 | 63.149 | 63.120 | 63.090 | 63.061 | 63.031 | 63.005 | 63.003 | 63.001 | 63.000 |

## SECTION F-F

**Scale 1:250**



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PROJECT: DERRYNADARRAGH WIND FARM

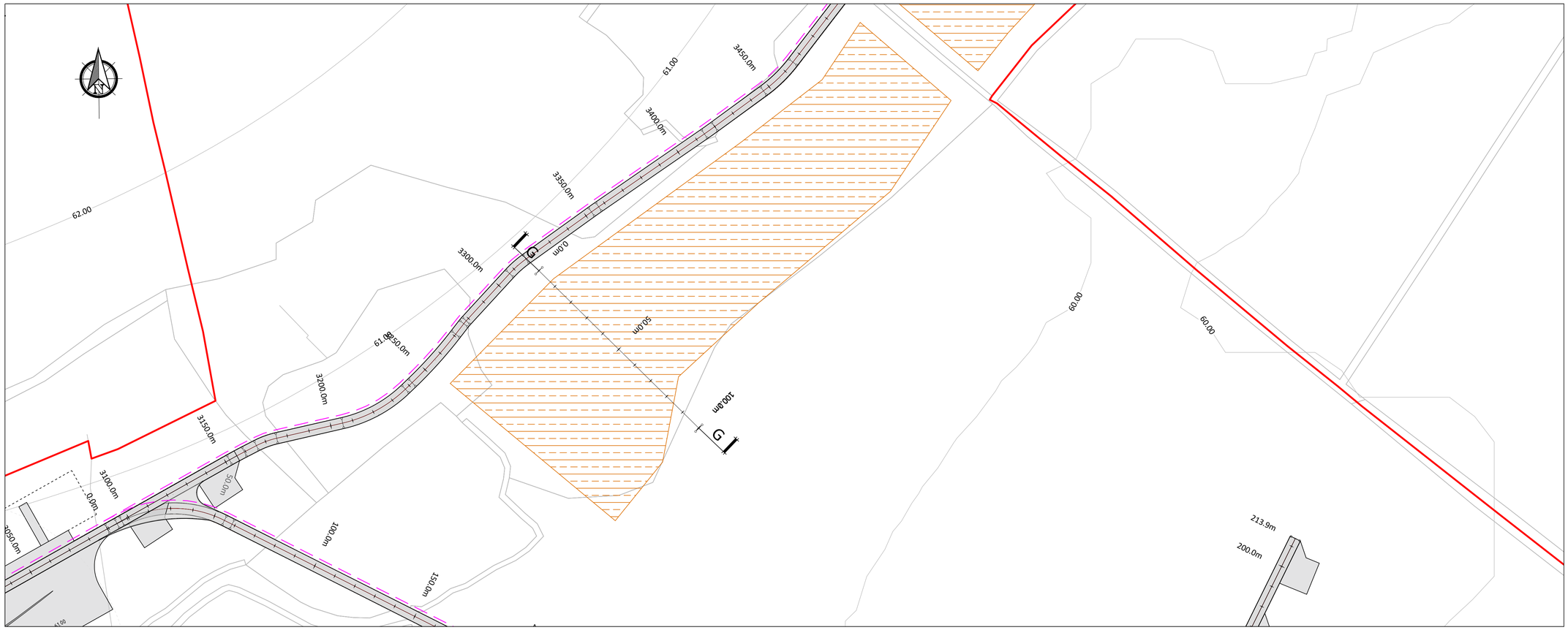
CLIENT: Dara Energy Limited

SHEET: PEAT AND SPOIL MANAGEMENT AREAS PLAN AND SECTION (SHEET 4 OF 7)

| | | | |
|---|---|---|---|
| Date 09.09.25 | Project number P22-145 | Scale (@ A1- ) 1:1000 | |
| Drawn by CS | Drawing Number P22-145-INFO-0018 | | Rev A |
| Checked by EA | | | |

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## PLAN

**Scale 1:1000**

LEGEND:

- Planning Site Boundary
- Turbine
- Proposed Site Access Road
- Temporary Widenings
- Existing Road to be upgraded
- 64.00 Existing Ground Contour
- Proposed Peat Storage Areas
- Proposed Habitat Fence

## Construction Notes Peat Deposition Areas:

(1) An interceptor drain will also be installed upslope of the peat deposition areas.

(2) A silting pond will be required at the lower side of the peat deposition areas.

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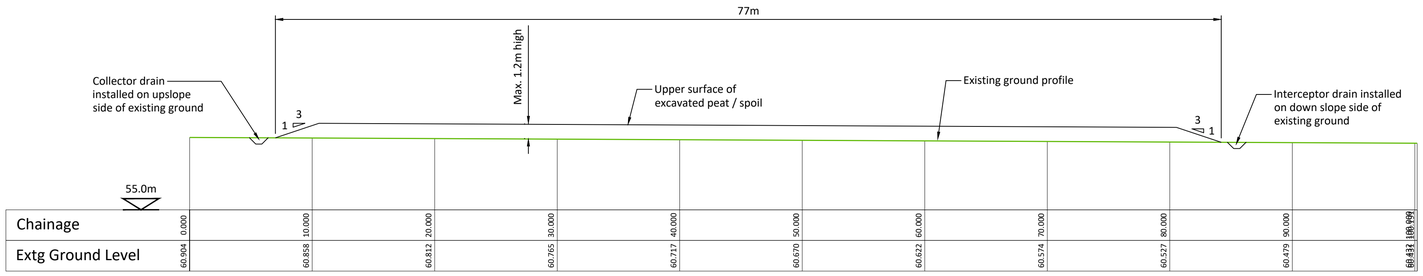
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(6) Further guidelines on the construction of the peat storage area are included within Section 5.4 of the Peat & Spoil Management Plan.

Construction Notes:

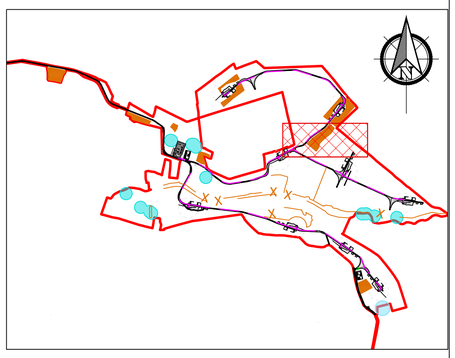
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| Chainage | 0.000 | 10.000 | 20.000 | 30.000 | 40.000 | 50.000 | 60.000 | 70.000 | 80.000 | 90.000 | 100.000 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Extg Ground Level | 60.904 | 60.858 | 60.812 | 60.765 | 60.717 | 60.670 | 60.622 | 60.574 | 60.527 | 60.479 | 60.431 |

## SECTION G-G

**Scale 1:250**



## KEY PLAN

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PROJECT: DERRYNADARRAGH WIND FARM

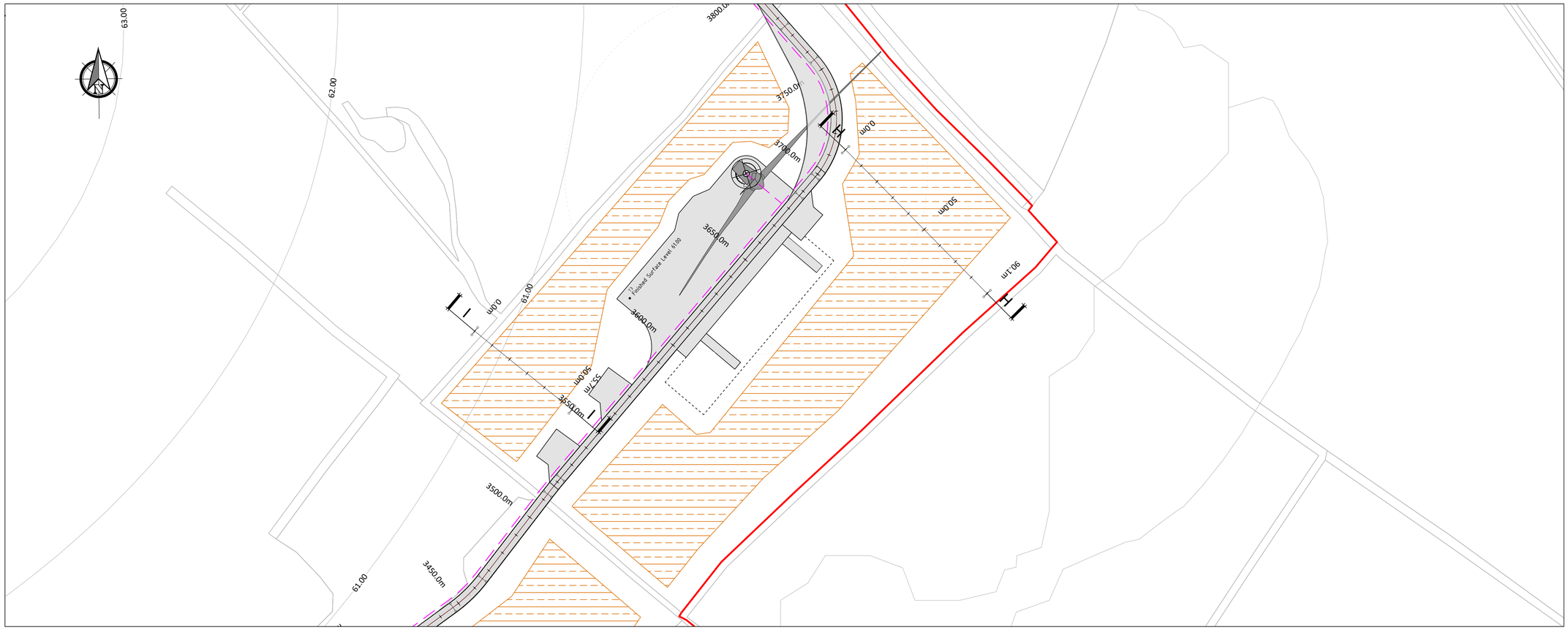
CLIENT: Dara Energy Limited

SHEET: PEAT AND SPOIL MANAGEMENT AREAS PLAN AND SECTION (SHEET 5 OF 7)

| | | | |
|---|---|---|---|
| Date: 09.09.25 | Project number: P22-145 | Scale (@ A1- ): 1:1000 | |
| Drawn by: CS | Drawing Number: P22-145-INFO-0019 | | Rev: A |
| Checked by: EA | | | |

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## PLAN

**Scale 1:1000**

LEGEND:

- Planning Site Boundary
- Turbine
- Proposed Site Access Road
- Temporary Widenings
- Existing Road to be upgraded
- 64.00 Existing Ground Contour
- Proposed Peat Storage Areas
- x x Proposed Habitat Fence

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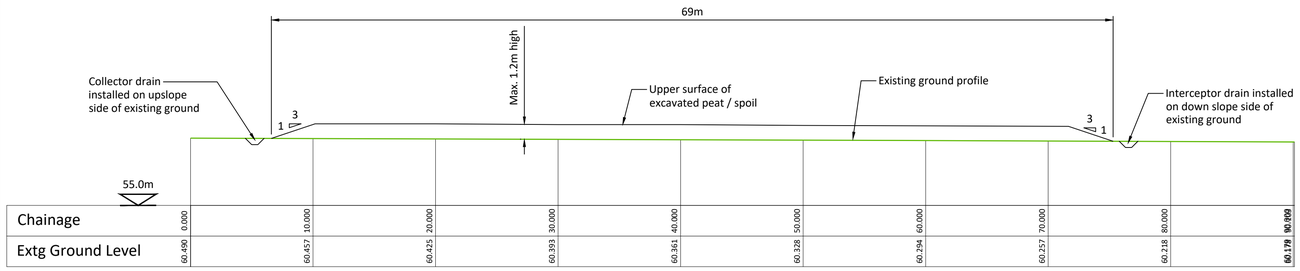
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Construction Notes:

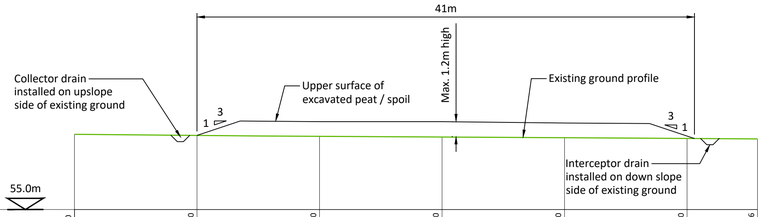
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2) Stored material should be shaped to allow suface water to run-off.
3) Placed / spread spoil should be allowed to re-vegetate naturally from plant species in the area.
4) Supervision by suitably qualified geotechnical engineer is required during the works.




| Chainage | 0.000 | 10.000 | 20.000 | 30.000 | 40.000 | 50.000 | 60.000 | 70.000 | 80.000 | 90.809 |
|---|---|---|---|---|---|---|---|---|---|---|
| Extg Ground Level | 60.490 | 60.457 | 60.425 | 60.393 | 60.361 | 60.328 | 60.294 | 60.257 | 60.218 | 60.178 |

## SECTION H-H

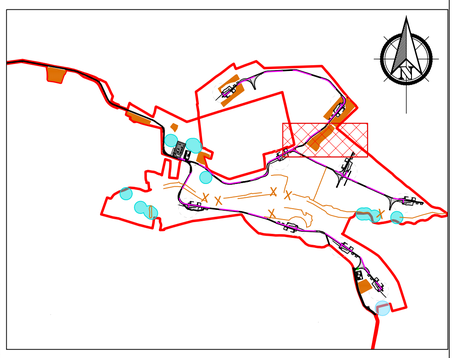
**Scale 1:250**




| Chainage | 0.000 | 10.000 | 20.000 | 30.000 | 40.000 | 50.000 | 55.746 |
|---|---|---|---|---|---|---|---|
| Extg Ground Level | 61.140 | 61.048 | 60.972 | 60.915 | 60.858 | 60.800 | 60.765 |

## SECTION I-I

**Scale 1:250**



## KEY PLAN

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| Rev. | Description | App By | Date |
|---|---|---|---|
| A | ISSUE FOR PLANNING | JH | 09.09.25 |
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PROJECT: **DERRYNADARRAGH WIND FARM**

CLIENT: Dara Energy Limited

SHEET: **PEAT AND SPOIL MANAGEMENT AREAS PLAN AND SECTION (SHEET 6 OF 7)**

| | | | |
|---|---|---|---|
| Date: 09.09.25 | Project number: P22-145 | Scale (@ A1-): 1:1000 | |
| Drawn by: CS | Drawing Number: P22-145-INFO-0020 | | Rev: A |
| Checked by: EA | | | |

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9 September 2025

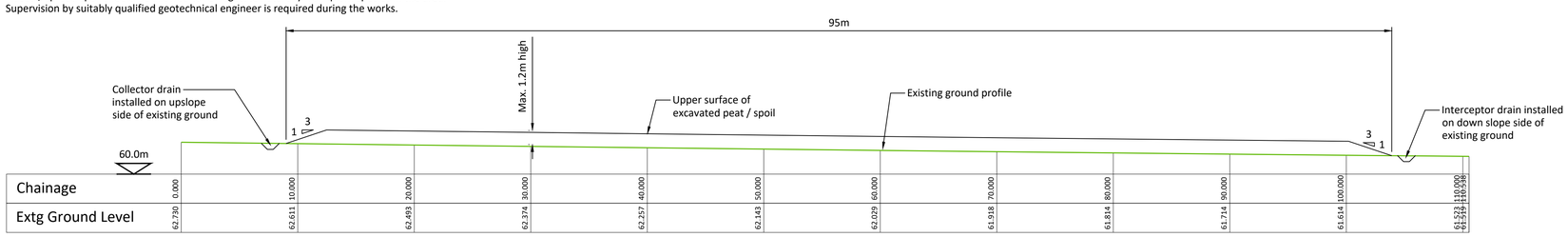



## PLAN

**Scale 1:1000**

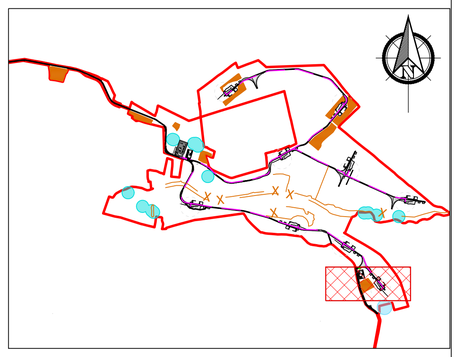
Construction Notes:

1) Spoil heap may consist of peat and overburden from local excavations.
2) Stored material should be shaped to allow suface water to run-off.
3) Placed / spread spoil should be allowed to re-vegetate naturally from plant species in the area.
4) Supervision by suitably qualified geotechnical engineer is required during the works.




## SECTION J-J

**Scale 1:250**



## KEY PLAN

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PROJECT: **DERRYNADARRAGH WIND FARM**

CLIENT: Dara Energy Limited

SHEET: **PEAT AND SPOIL MANAGEMENT AREAS PLAN AND SECTION (SHEET 7 OF 7)**

| | | |
|---|---|---|
| Date: 09.09.25 | Project number: P22-145 | Scale (@ A1- ): 1:1000 |
| Drawn by: CS | Drawing Number: P22-145-INFO-0021 | Rev: A |
| Checked by: EA | | |

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9 September 2025

# Appendix 11

# EIAR Chapter 12 - Hydrology

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DESIGNING AND DELIVERING
A SUSTAINABLE FUTURE

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

## Volume 2 – Main EIAR

## Chapter 12 – Hydrology and Water Quality

**Prepared for:**

**Dara Energy Limited**

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# 12. HYDROLOGY AND WATER QUALITY

## 12.1 Introduction

This chapter of the Environmental Impact Assessment Report (EIAR) examines the likely effects of the Proposed Development on Hydrology and Water Quality. The chapter includes a description of the existing environment in respect of hydrology and water quality and considers the likely significant effects arising from the Proposed Development during construction, operation and decommissioning.

This chapter of the EIAR is supported by Figures in Volume IV, Planning Drawings accompanying the planning application and the following Appendix documents provided in Volume III:

- Appendix 2.1: Construction Environmental Management Plan (CEMP)
- Appendix 2.2: Biodiversity Enhancement Management Plan (BEMP)
- Appendix 2.3: Turbine Delivery Route Assessment

Common terms and acronyms used throughout this EIAR can be found in Chapter 1 - Introduction.

The Proposed Development assessed in this EIAR 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 Site Location of the Proposed Development is shown in Figure 2.1. The general layouts of the Proposed Wind Farm, Proposed Grid Connection, and Turbine Delivery Route are presented in Figures 2.3 to 2.5.

### 12.1.1 Study Area

The Study Area for hydrology and water quality comprises catchments, sub-catchments and sub-basins within which the Proposed Development is located, along with their associated waterbodies (refer to Figure 12.1, Volume IV). The delineation of the catchments and their waterbodies is defined by the latest "Cycle 3" Water Framework Directive (WFD) (Directive 2000/60/EC of the European Parliament and of the Council of 23 October 2000 establishing a framework for Community action in the field of water policy) reporting and can be viewed via https://www.catchments.ie/ and https://gis.epa.ie/EPAMaps/Water. The characteristics and associated hydrological features of the catchments within which the Site, GC and TDR are located are addressed within this Chapter and are listed in Table 0-1 .

**Table 12-1: WFD delineated waterbodies at the Site**

| Catchment | Sub-catchment | Sub-Basin |
|---|---|---|
| The Barrow Catchment (Hydrometric Area 14) | Barrow_SC_040 | FIGILE_070 |
| | | FIGILE_080 |

The Site is contained wholly within the one sub-catchment, the Barrow_SC_040. The Site covers two sub-basins, the FIGILE_070 and the FIGILE_080. This is considered the main study area; however, the GC and the TDR cross several other waterbodies which are also considered as an extension of the study area.

As well as the Barrow Catchment (Hydrometric Area 14), the TDR also extends into the Lower Shannon (Hydrometric Area 25A). Within the Lower Shannon Catchment, the TDR crosses the Tullamore_SC_010, the Silver[Tullamore]_SC_010 and the Brosna_SC_020 sub-catchments.

The GC extends into the Barrow_SC_050 and the Barrow_SC_020 sub-catchments.

Groundwater and hydrogeology are addressed in Chapter 11 - Soils, Geology and Hydrogeology.

## 12.2 Statement of Authority

This chapter has been prepared by Mr. Brian Cronin and reviewed by Mr. Pablo Delgado of Fehily Timoney and Company.

Brian Cronin is a Senior Environmental Scientist with a BSc in Environmental Science from University College Cork and an MSc in Environmental Engineering from Trinity College Dublin. He is member of the Institution of Engineers of Ireland (MIEI). Brian has 10 years of postgraduate experience, with four years working in contaminated land and remediation consulting; and more recently, three years working in Environmental Impact Assessment. He has experience working on various renewable energy projects preparing chapters of the EIAR for wind farms, specialising in various disciplines including hydrology and water quality.

Pablo Delgado, a Chartered Civil Engineer, has accumulated more than 8 years of professional experience in the hydraulic engineering domain. His specific area of expertise lies in the planning, design, and construction of hydraulic infrastructure projects, where he closely collaborates with Clients and Contractors. Pablo's primary focus centres around producing practical and efficient designs while proactively addressing any challenges that may arise throughout the project's execution. He possesses extensive knowledge in hydraulic design, enabling him to develop industry-leading guidelines and exhibit a high level of proficiency in drainage design, standards, and tools. Additionally, Pablo has a successful track record of delivering drainage designs within diverse project environments such as Design and Build (D&B) and Public-Private Partnership (PPP), including contributions to hydrologic and hydraulic chapters for Environmental Impact Assessments (EIA). His project portfolio encompasses engagements in the United Kingdom, Ireland, and Spain.

## 12.3 Methodology

The following sources of information were considered in this assessment:

- The design layout of the proposed project.
- Published literature as described in Section 1.2.1 and 1.2.2 below.
- A desk-based assessment of the surface water hydrology in the catchments relevant to the wind farm, including an assessment of the watercourses which will be intercepted by the layout of the wind farm and those which will receive surface water run-off from the proposed wind farm development.
- A field assessment of the existing hydrological environment, to both verify desk-based assessment and record all significant hydrological features was undertaken.

### 12.3.1 Relevant Legislation and Guidance

#### *12.3.1.1 Policy and Legislation*

The following policies and legislation have been considered in the development of this chapter to identify relevant objectives relating the surface water.

- EU Water Framework Directive (2000/60/EC);
- River Basin Management Plan for Ireland 2022-2027;
- The Planning System and Flood Risk Management, Guidelines for Planning Authorities, Nov 2009;
- Offaly County Development Plan 2021-2027;
- Kildare County Development Plan 2023-2029;
- Laois County Development Plan 2021–2027.

Directive 2000/60/EC (WFD - Water Framework Directive) of the European Parliament and Council established a framework for community action in the field of water policy. The WFD requires EU member states to aim to reach good chemical and ecological status for surface and ground waters; with good ecological status for surface waters and good quantitative status for groundwaters. The WFD established a strategic framework for managing the water environment and requires a River Basin Management Plan (RBMP) to be developed every six years. River Basin Management Plan 2018-2021[1] has been prepared by Department of Housing, Planning and Local Government which sets out the actions that Ireland will take to improve water quality and achieve 'good' ecological status in waterbodies (rivers, lakes, estuaries and coastal waters) by 2027.

The Third Cycle River Basin Management Plan 2022-2027 was published in September 2024. The Plan outlines the intended rollout of guidelines for planning authorities on the relationship between physical planning and river basin management planning.

The WFD has been transposed into Irish law.

[1] Department of Housing, Local Government and Heritage, River Basin Management Plan for Ireland, 2017. Available online here: gov.ie - River Basin Management Plan 2018 - 2021 (www.gov.ie) Accessed March 2023.

***County Development Plans***

The County Development plans for Laois, Offaly and Kildare have been reviewed and these plans have informed the preparation of this EIAR chapter.

*Offaly County Development Plan 2021-2027*

Cognisance was taken of particular guidance on hydrology from the policies and objectives of the Offaly County Development Plan 2021-2027 (the CDP). The CDP lays down specific policies in relation to surface water run-off and flooding as follows:

- **WSP-01: Efficient and Sustainable Use of Water Resources:** It is Council policy to ensure the efficient and sustainable use and development of water resources and water services infrastructure in order to manage and conserve water resources in a manner that supports a healthy society, economic development requirements, a cleaner environment and climate change mitigation.

- **WSP-07: Protection of Natura 2000 Network:** It is Council policy to ensure the delivery and phasing of services in the county is subject to the required appraisal, planning and environmental assessment processes and shall avoid adverse impacts on the integrity of the Natura 2000 network. (This indirectly relates to water quality as many Natura 2000 sites are water-dependent or sensitive to water pollution).

- **WSP-08: Groundwater Quality Assessment for Subsurface Exploration:** It is Council policy to ensure any proposal for geothermal or other energy subsurface exploration is accompanied by an assessment that addresses the potential impacts on groundwater quality.

- **WSP-11: Water Conservation and Demand Management:** It is Council policy to promote the conservation and sustainable use of water in existing and new development within the county and to encourage demand management measures among all water users including rainwater harvesting and grey water recycling.

- **WSP-14: Elimination of Untreated Discharges:** It is Council policy to co-operate and support Irish Water to eliminate untreated discharges from settlements in the short-term, while planning strategically for long-term growth in tandem with Project Ireland 2040 and in increasing compliance with the requirements of the Urban Waste Water Treatment Directive.

In addition, the Development Management Standards chapter (Chapter 13) of the CDP promotes the inclusion of sustainable urban drainage systems (SuDS) in developments, which helps manage surface water runoff and can contribute to water quality.

*Kildare County Development Plan 2023-2029*

As the site boundary extends into County Kildare, the CDP for Kildare was also reviewed (Kildare County Development Plan 2023-2029). The Kildare CDP sets out objectives relating to hydrology and water quality as follows:

- **IN O57 (Assess Applications):** Assess applications for developments, having regard to the impact on the quality of surface waters and any targets and measures set out in the River Basin Management Plan and any subsequent local or regional plans.
- **IN O58 (Site-Specific Assessments):** Require development proposals which may have an impact on water quality to undertake site-specific assessments to determine localized pressures and demonstrate suitable mitigation measures to protect water quality.

- **GO 15 (Groundwater Abstractions):** Ensure that groundwater abstractions that form part of planning applications do not negatively impact on the hydrology of any sensitive areas, particularly European Sites.
- **GO 24 (Water/Wastewater Services):** Liaise with Irish Water to provide adequate water and wastewater services to meet the development needs of each settlement within the Plan period.

**River Basin Management Plan:** The plan is informed by and aligns with the latest River Basin Management Plan (the Water Action Plan), with inspections to be carried out by Kildare County Council (KCC) in relation to water quality targets.

**Protection of European Sites:** Avoid encroachment on European Sites and implement buffer zones where feasible to protect their hydrological integrity.

**Water Quality Monitoring:** Continue to monitor water quality at selected locations in co-operation with relevant agencies.

The Kildare County Development plan puts a strong emphasis on SuDS, similar to what was noted when reviewing the CDP for County Offaly.

*Laois County Development Plan 2021-2027*

The Laois County Development Plan 2021-2027 includes the following objectives relevant to the preparation of this chapter:

- **CS 03**: In the assessment of development proposals, to take account of transport corridors, environmental carrying capacity, availability and/or capacity to provide waste water and water supply services, potential to conflict with Water Framework Directive objectives, potential to impact on the integrity of European sites and Annexed Habitats and species, features of biodiversity value including ecological networks, impact on landscape and visual characteristics, education and other socioeconomic objectives.

- **NRE 3**: Ensure the provision, where feasible, of electricity cables been located underground, especially in the urban environment, and generally within areas of public open space. Where undergrounding of cables is being pursued, proposals should demonstrate that environmental impacts including the following are minimised:
    - Habitat loss as a result of removal of field boundaries and hedgerows (right of way preparation) followed by topsoil stripping (to ensure machinery does not destroy soil structure and drainage properties);
    - Short to medium term impacts on the landscape where, for example, hedgerows are encountered;
    - Impacts on underground archaeology;
    - Impacts on soil structure and drainage; and
    - Impacts on surface waters as a result of sedimentation

- **NRPO 9:** Encourage and facilitate the development of green infrastructure that recognises the synergies that can be achieved with regard to the following:
    - Provision of open space amenities;
    - Sustainable management of water;
    - Protection and management of biodiversity;
    - Protection of cultural heritage;
    - Protection of protected landscape sensitivities

- **SWD 7:** Ensure that all storm water generated in a new development is disposed of on-site or is attenuatedandtreatedpriortodischargetoanapprovedstormwatersystem
- **SWD 8:** Promote storm water retention facilities for new developments and to incorporate design solutions that provide for collection and recycling of surface water in accordance with Sustainable Urban Drainage Systems as recommended in the Planning System and Flood Risk Management: Guidelines for Planning Authorities(DoEHLG,2009) and Laois County Council's Roads and Drainage Standards, or as amended.

#### *12.3.1.2 Relevant Guidance*

The following guidance have been considered in the development of this chapter to identify relevant objectives relating the surface water.

- Guidelines on the information to be contained in Environmental Impact Assessment Reports, Environmental Protection Agency (EPA), May 2022;
- The Planning System and Flood Risk Management - Guidelines for Planning Authorities - Department of Environment, Heritage and Local Government (DoEHLG) and the Office of Public Works (OPW), November 2009
- Environmental good practice on site guide (fourth edition) (C741) - Construction Industry Research and Information Association (CIRIA), January 2015.
- Best Practice Guide BPGCS005 Oil Storage Guidelines (Enterprise Ireland)
- Guidelines for the Crossing of Watercourses During the Construction of National Road Schemes (National Roads Authority, 2005)
- Guidelines on Planning for Watercourses in the Urban Environment (Inland Fisheries Ireland, 2020)
- Guidelines on protection of fisheries during construction works in and adjacent to waters' to allow cable construction (Inland Fisheries Ireland, 2016)
- Good Practice During Wind Farm Construction (Scottish Natural Heritage 2019)
- The SuDS Manual (C753) - Construction Industry Research and Information Association (CIRIA), 2015
- Control of water pollution from linear construction projects (C648) – Construction Industry Research and Information Association (CIRIA), 2006;
- Control of water pollution from construction sites. Guidance for Consultants and Contractors (C532) - Construction Industry Research and Information Association (CIRIA), December 2001
- UK Guidance for Pollution Prevention (GPP):
- GPP2: Above ground oil storage tanks (Natural Resources Wales (NRW), Northern Ireland Environment Agency (NIEA), the Scottish Environment Protection Agency (SEPA), Energy Institute, Oil Care Campaign, June 2021)
- GPP4: Treatment and disposal of wastewater where there is no connection to the public foul sewer (NRW, NIEA, SEPA, November 2017)
- GPP5: Works and maintenance in or near water (NRW, NIEA, SEPA, January 2017)
- GPP8: Safe storage and disposal of used oil (NRW, NIEA, SEPA, July 2017)
- GPP21: Pollution Incident Response Plans (NRW, NIEA, SEPA, July 2017)
- GPP22: Dealing with Spills (NRW, NIEA, SEPA, October 2018)
- GPP26: Safe storage of Drums and intermediate Bulk Containers (IBCs), (NRW, NIEA, SEPA, February 2019)
- GE-INT-01203- Introduction to the NRA Design Manual for Roads and Bridges (Transport Infrastructure Ireland, December 2013)
- Coillte (2013): Forest Operations & Water Protection Guidelines.
- Planning Regulatory Guidelines on EIA 2018
- https://www.opr.ie/wp-content/uploads/2019/08/2018-Environmental-Impact-Assessment-1.pdf

### 12.3.2 Desk Study

The desk-based study assessed the surface water hydrology and water quality in the catchments relevant to the Project, including an assessment of the watercourses that will be crossed (through culvert or bridge) by the road infrastructure and those that will receive surface water runoff from the layout of the Site, GC and TDR. The desk study involved an examination of the hydrological aspects and water quality aspects using the following sources of information (last accessed July 2025):

- Ordnance Survey Ireland mapping.
- Science and Stories about Integrated Catchment Management (https://www.catchments.ie/).
- OPW Indicative Flood Maps (https://www.floodinfo.ie/map/floodplans/).
- Geological Survey of Ireland (www.gsi.ie).
- History of flooding and status of drainage in the vicinity of the Proposed Development (available at http://www.floodinfo.ie/map/floodmaps/).
- Environmental Protection Agency river flow data (http://www.epa.ie/hydronet).
- Met Eireann Meteorological Database (available at https://www.met.ie).

### 12.3.3 Field Assessment

The field assessment of the existing hydrological environment within the Site, GCR and TDR, was undertaken to both verify desk-based assessment, record all significant hydrological features and assess the proposed crossing points along water features. A site walkover survey was conducted in April 2023 to establish the drainage pattern and to record existing hydrology features; a collection of the site visit photos can be found in Appendix 7 of the Flood Risk Assessment, which itself is presented as Appendix 12.1 (Volume III of the EIAR). The site of the proposed wind farm has a generally flat slope, with a flood plain that starts widening on both sides approximately 470m east of a proposed bridge crossing, following the downstream direction of the Cushina River. This is the main river within the site which flows in an easterly direction and is a tributary of the Figile River.

The Turbine Delivery Route (TDR) intersects the Philipstown River and its flood plain and a bridge is also proposed here. This river flows in an easterly direction, and the surrounding area generally follows a flat slope.

### 12.3.4 Evaluation Criteria

The significance of likely effects has been assessed in accordance with the Environmental Protection Agency (2022) Guidelines through comparison of the character of the predicted effect to the sensitivity of the receiving environment, as per Image 0-1.

Categories for defining the sensitivity of the receiving environment are set out in Table 0-2.

The sensitivity of a hydrological receptor is based on its vulnerability to be impacted/altered by the development, i.e. the ability of the receptor to absorb development without perceptible change.

**Table 12-2: Criteria for Determining Receptor Sensitivity**

| Sensitivity | Criteria | Typical Examples | |
|---|---|---|---|
| | | Surface Water | Hydro-ecological receptors |
| **High** | Receptor has a high quality and rarity on a local scale and limited potential for substitution. Receptor is generally vulnerable to impacts that may arise from the project and recoverability is slow and/or costly. | Surface water providing a regionally important drinking water resource.<br>Surface water with high WFD status objective / Blue Dot catchments.<br>Waterbodies identified as nutrient sensitive areas / waterbodies under WFD RBMP Cycle 3. | Protected under EU or Irish habitat legislation (e.g., Special Area of Conservation (SAC) or Natural Heritage Area (NHA)).<br>Designated Salmonid / Cyprinid Waters.<br>Nationally and internationally designated sites where hydrology/hydrogeology is a key factor in designation (e.g. SAC / NHA/ Special Protection Areas (SPA) sites)/ freshwater pearl mussel designated waterbodies and their associated catchments. |
| **Medium** | Receptor has a medium quality and rarity, local scale and limited potential for substitution/replacement or receptor with a low quality and rarity, regional or national scale and limited potential for substitution. Receptor is somewhat vulnerable to impacts that may arise from the project and/or has moderate to high recoverability. | Watercourses with designate features such as Environmental or ecological significance, Cultural or historical value, recreational purposes and Water supply or drinking water sources. Large lakes with an extension of 50ha or more and non-potable reservoirs. | Statutory designated sites where hydrology/hydrogeology is a key factor in designation (e.g. National Nature Reserves (NNR), Local Nature Reserves (LNR)). |
| **Low** | Receptor with a low quality and rarity, local scale and limited potential for substitution. Receptor is not generally vulnerable to impacts that may arise from the project and/or has high recoverability. | Watercourse with no designated features.<br>Non-sensitive water resources (non WFD classified e.g. small lakes, ponds, land drain).<br>Man-made feature not in hydraulic continuity (e.g. canal). | |
| **Negligible** | Attribute has a very low environmental importance and/or rarity on local scale.<br>Receptor is of negligible value, not vulnerable to impacts that may arise from the project and/or has high recoverability. | Man-made feature with no ecological importance (e.g. farm land drainage ditches). | |
| Note | Professional judgement based on the baseline condition of the receptor should be used to determine a receptor's sensitivity. | | |

#### *12.3.4.1 Evaluation Criteria in the Context of the Proposed Development*

The surface hydrological environment of the Proposed Development and its downstream catchments are considered to be of medium sensitivity given that the surface waters draining the site have no particular ecological or environmental designation, but the site is hydrologically connected with the River Barrow and River Nore SAC, which is approximately 6 km downstream from the site boundary. The Qualifying Interests for the SACs include ten protected species and twelve protected habitats. Many of the QI species are particularly sensitive to agricultural and chemical pressures which a wind farm development would not be likely to increase. However, amongst the QI species are freshwater pearl mussel which are particularly sensitive to siltation, which is a likely impact from wind farm development if the appropriate mitigation measures are not implemented. Information on the likely impacts on Biodiversity in the SAC can be found in Chapter 9 Biodiversity.

The scale of effect is determined in relation to the sensitivity of the receptor and the potential magnitude of change from baseline conditions, Image 0-1, presents how comparison of the magnitude of the predicted impact to the sensitivity of the receiving environment can determine the significance of the impact. Sensitivity of the receiving environment can be 'high', 'medium', 'low' or 'negligible'. Description of impact is defined by its character, magnitude, duration, probability and consequences (pre-mitigation). The magnitude of impact can be 'high', 'medium', 'low' or 'negligible'.

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

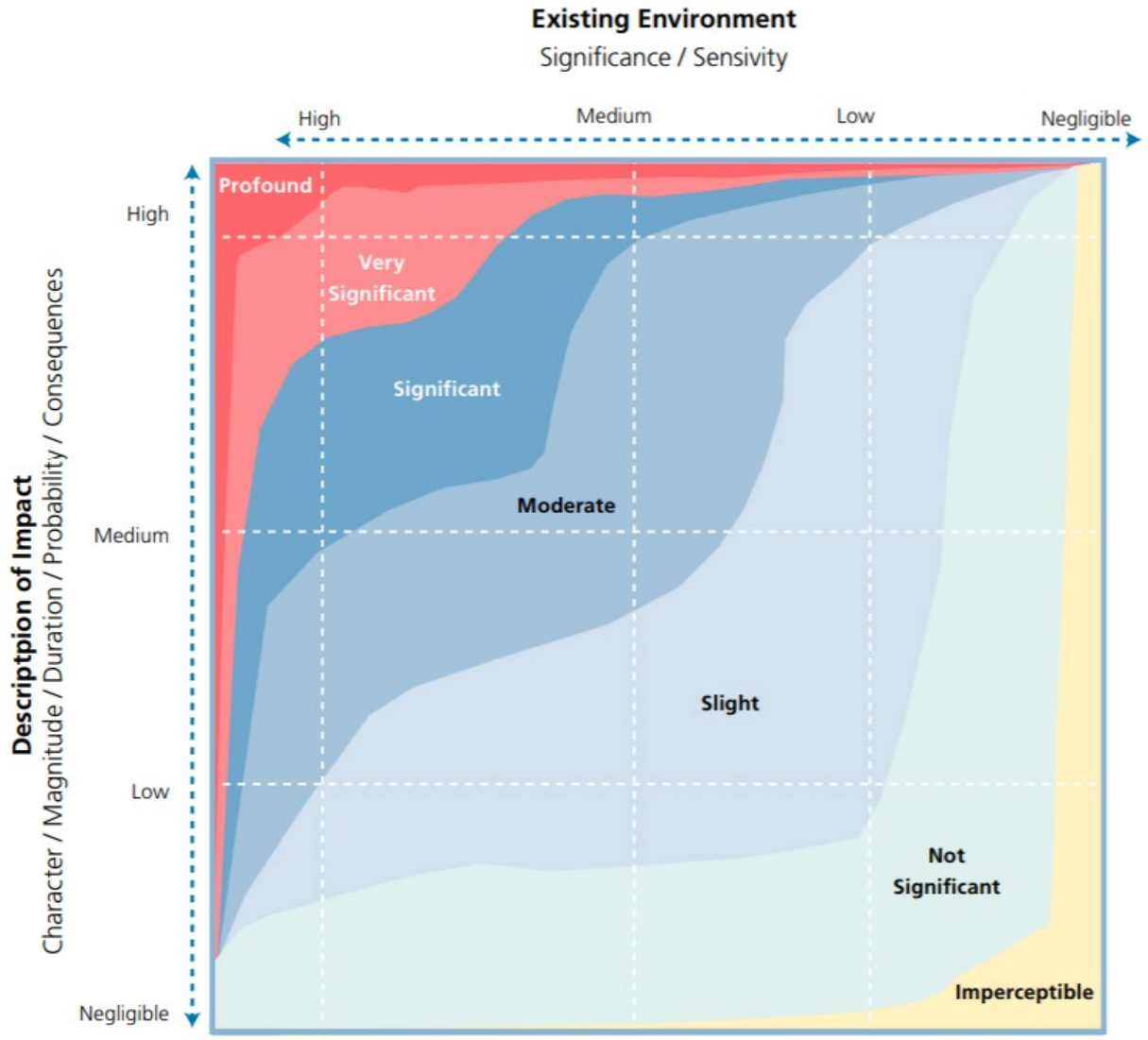



**Figure 12-1: Classifications of the Significance of Impacts**

### 12.3.5 Assessment of Cumulative Impacts

The assessment of cumulative effects on the water environment considers the combined potential effects of other developments (existing, approved but not yet built or operational, or proposed), with the potential to affect the water environment, within the same catchment(s) as the Proposed Project, as discussed further in Section 1.6.5.

### 12.3.6 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 - EIA Scoping and Consultation. Of the consultees contacted, only Inland Fisheries Ireland provided a response which is relevant to the subject of this chapter.

#### *12.3.6.1 Inland Fisheries Ireland*

Inland Fisheries Ireland responded to the Scoping Report on 9th January 2025. Their response outlined the following:

- Previous site visits undertaken by the IFI to the section of the Cushina within the development site has highlighted significant over-deepening which has resulted in the removal of all/most gravels from this section of channel and over-widening of the Cushina river which has resulted in a highly degraded hydromorphology.
- Human intervention will be necessary to facilitate the recovery of the fisheries habitat here, and it was a request of the IFI that the proposed development include habitat restoration of the section of the Cushina River flowing through the site.
- Any crossing points of the Cushina River should be clear span structure and the design and construction method statement for same be agreed with the IFI.
- Previous visits by the IFI have identified excellent riparian/terrestrial habitat along sections of the Cushina River. It is requested that in choosing a location for the new river crossing that a location which will limit the necessity to remove any such habitat be chosen.
- The IFI's knowledge of the site is that the subsoils throughout are composed of heavy/fine clay which is prone to erosion and likely to result in the generation of significant suspended solids. The construction of significant roadways and excavations for turbines and associated hardstands through these fine clays have potential to generate significant quantities of suspended solids, with the Cushina or Figile River being the ultimate receptor for this material if adequate steps are not put in place to address this.
- A potential impact of projects such as that proposed is the discharge of silt-laden waters to fisheries streams. Silt can clog salmonid spawning beds, and juvenile salmonids are particularly sensitive to siltation of gill structures. Similarly plant and macro-invertebrate communities can literally be blanketed over, and this can lead to loss or degradation of valuable habitat.
- The IFI requested that systems be put in place to ensure that there shall be no discharge of suspended solids or other deleterious matter to watercourses during any phase of works at this site.
- The design and sizing of the surface water drainage system must ensure that no suspended solids enter the surface water network flowing to the Cushina/Figile, even during periods of prolonged heavy rainfall.
- IFI request that the focus of any works methodology be measures which eliminate/reduce the generation of suspended solids.
- All surface waters from the site and access roads should be channelled through adequately sized petrol/oil interceptors prior and be subject to attenuation prior to discharge to surface waters.
- If silt settlement ponds are proposed for this facility. It is important that they are oversized to cope with all eventualities.
- The activities proposed for this site are likely to result in significant lorry traffic to and from the site, with potential for the generation of significant suspended solids pollution in the associated road run-off. It is imperative that the potential for suspended solids pollution from road run-off associated with vehicles entering and leaving this site is fully addressed.

Further information on the scoping and consultation can be found in Chapter 5 of this EIAR, and its associated appendices.

## 12.4 Existing Environment

### 12.4.1 General Description of the Catchments

#### *12.4.1.1 The Site*

Within The proposed wind farm site is located within the Barrow Catchment (ID 14) and the Barrow_SC_040 sub-catchment as defined by the WFD*. The waterbody in this sub-catchment that is crossing the proposed site is known as FIGILE_080 (EPA Name: Cushina 14).*

In addition, the wind farm is located within two sub-basins:

- *FIGILE_070- IE_SE_14F010510.*
- FIGILE_080- IE_SE_14F010600.

The elevation range of the overall wind farm site varies between approximately 66 m OD and 59 m OD, and it generally has a flat topography. Turbines will be installed in the range between approximately 64 m OD and 60 m OD.

The main hydrology feature within the wind farm site is the Cushina River (FIGILE_080). A large area of the surface runoff drains into this river within the FIGILE_080 sub-basin. The Cushina River runs in an easterly direction, and is a tributary of the Figile River (FIGILE_080). The remainder of the site drains into FIGILE_070 sub-basin or directly into the Figile River. In addition, there are no lakes or reservoirs within the wind farm site study area.

During the Scoping and Consultation process, Inland Fisheries Ireland pointed out that the Cushina River has a "highly degraded hydromorphology".

Rainfall data from Met Éireann was analysed and recorded at Casement Station, which is c.46 km northeast of the Site and associated infrastructure.

The 30-year annual average rainfall at Casement weather station, recorded from 1991 to 2020, was calculated to be 783.5 mm. The average rainfall at the proposed wind farm site may vary due to its geographical location.

The Standard Average annual Rainfall (SAAR) of the site from the FSU Portal is approximately 827 mm, which gives a more conservative output and it will be used for the Hydraulic Analysis in Section 7.1.

Following further research into the Rainfall data from Met Éireann, Table 3-1 below shows the average annual rainfall recorded from the closest weather station with more available data which is in Lullymore, Co. Kildare. This station is approximately 15 km north-east of the subject site and associated infrastructure.

**Table 12-3: Rainfall Data - Lullymore Nature Centre Station**

| Total rainfall in millimetres for Lullymore Nature Centre Station | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Year | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 | 2022 | 2023 | 2024 | Average |
| Rainfall | 839 | 976 | 818 | 848 | 1025 | 868 | 877 | 747 | 986 | 1008 | 845 | 834 | 1038 | 785 | 892 |

This station is closer to the Site than Casement weather station, but it is still 15 km away and at a different elevation, therefore the Standard Average Annual Rainfall (SAAR) from the FSU Portal was chosen.

The M5-60 at development location is 16.5 mm according to the Met Éireann rainfall data. This is the predicted rainfall depth in a sixty-minute storm that will occur with a frequency of once every five years.

#### *12.4.1.2 Turbine Delivery Route*

The watercourse crossing of the Turbine Delivery Route is located within the Barrow Catchment (ID 14) and the Figile_SC_020 sub-catchment as defined by the WFD. *The waterbody in this sub-catchment that is affected by the TDR is named as Daingean_030 (also known as Philipstown and referred to throughout this chapter as the Philipstown River). This watercourse runs in an easterly direction, and it is a tributary of the Figile River.*

This watercourse crossing is located approximately 5 km east of Daingean town and is bordered by the R402 to the north, where the TDR branches off, and the R400 to the east.

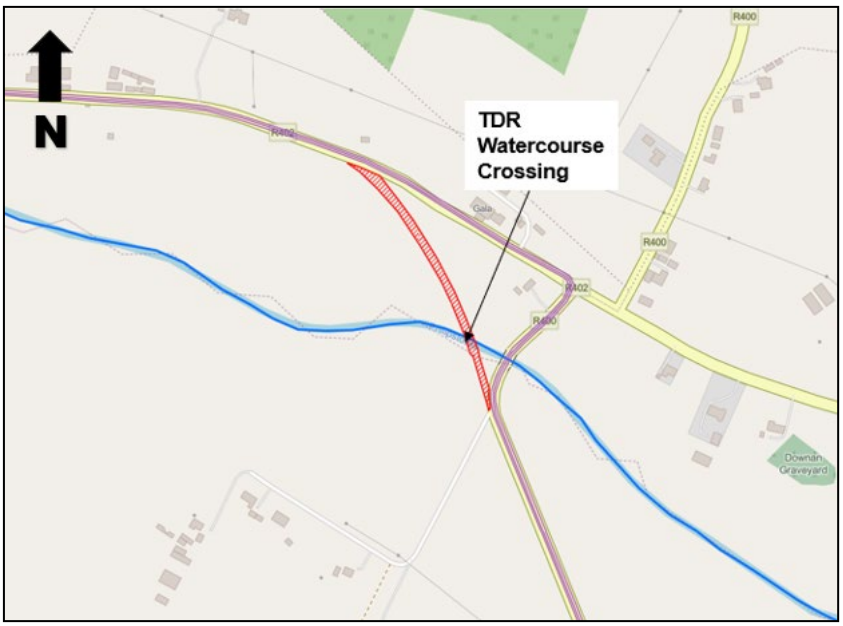



**Figure 12-2: TDR Watercourse Crossing**

Rainfall data from Met Éireann was also analysed, including records from the Lullymore Nature Centre Station, located approximately 18 km east of the watercourse crossing. However, due to the distance and difference in elevation, the Standard Average Annual Rainfall (SAAR) value from the FSU Portal was used instead.

### 12.4.2 Flooding

The National Catchment Flood Risk Management (CFRAM) Programme has examined the flood risk, and possible mitigation measures to address flooding, in 300 communities throughout the country at potentially significant flood risk. These communities were identified through the Preliminary Flood Risk assessment (PFRA), which was a national screening assessment of flood risk. The communities recognized as being at a significant flood risk are called Areas for Further Assessment (AFA). For the AFAs a detailed hydraulic modelling has been carried out to produce indicative flood maps (CFRAM Maps).

The subject site and the TDR watercourse crossing are within an AFA and therefore, flooding maps have been produced as part of the CFRAM mapping.

Local Authority is charged with the responsibility of maintaining Drainage Districts. According to the OPW database, the Cushina, Figile and Philipstown Rivers as well as a number of local drains in the area form part of the Drainage Districts.

The CFRAM Programme extends to the subject site and the TDR watercourse crossing showing that both locations are vulnerable to fluvial flooding. Figure 0-2 below shows the flood extents for the 1% annual exceedance event-Current Scenario.

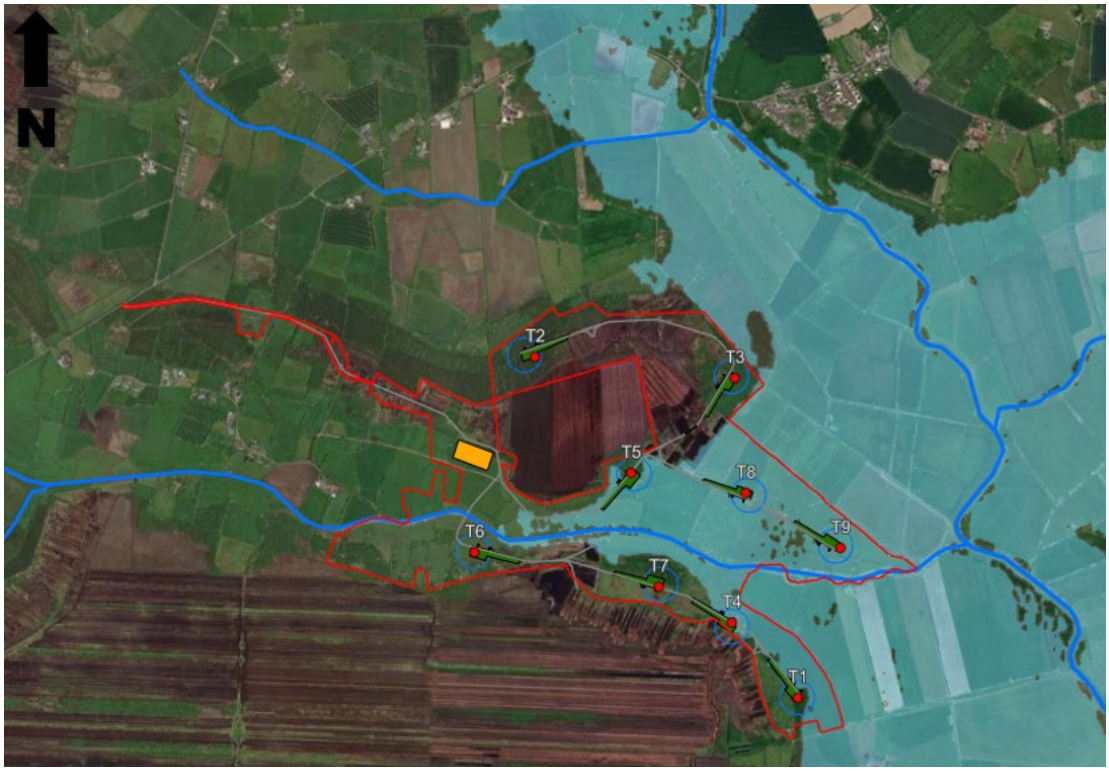



**Figure 12-3: CFRAM Flood Map - Medium Probability-Proposed Wind Farm Location (Map from www.floodmaps.ie)**




**Figure 12-4: CFRAM Flood Map -Medium Probability-TDR Watercourse Crossing (Map from www.floodmaps.ie)**

### *12.4.2.1 Pluvial Flooding*

The Winter 2015/2016 Surface Water Flooding map shows fluvial (rivers) and pluvial (rain) floods, excluding urban areas, during the winter 2015/2016 flood event. Figure 0-4 below shows that there was pluvial flooding in combination with fluvial within the site boundary, probably due to the overland flow in these low lying and flat areas.

Pluvial flood risk should be considered, and the proposed development should not increase the flood risk elsewhere due to the construction of new access tracks, hardstanding areas, and the proposed discharge points.




Figure 12-5: GSI Winter 2015/2016 Surface Water Flooding-Proposed Wind Farm Location (Map from www.floodmaps.ie)

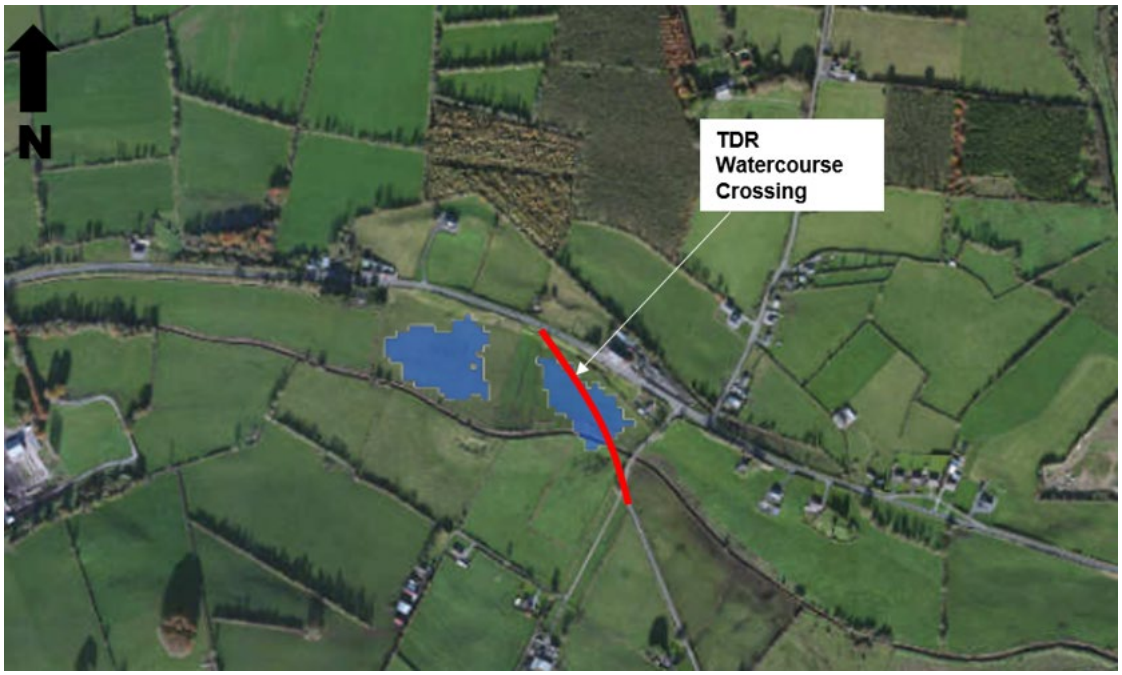



Figure 12-6: GSI Winter 2015/2016 Surface Water Flooding-TDR Watercourse Crossing

### *12.4.2.2 Historical Flooding*

The national flood hazard mapping (www.floodmaps.ie ), indicates that there are historical or past flooding events within the proposed site boundary. This past flood event has been mapped defining the extend of the flood along the Cushina River. There are also some single and recurring flood events in the area but are outside of the proposed site boundary.

The past flood event that has been mapped as shown in Figure 0-6 below appears to extend only within County Kildare. However, the floodplain also extends towards County Offaly on the north side of the Cushina River. Therefore, this map is considered only as part of the information gathered and a more detailed assessment will be required.




**Figure 12-7: Past Flood Event-Proposed Wind Farm Location (Map taken from www.floodmaps.ie)**

Figure 12-8 below shows a recurring flood event to the west of the TDR Watercourse Crossing, approximately less than 1 km away, which appears to be associated with the Philipstown River.

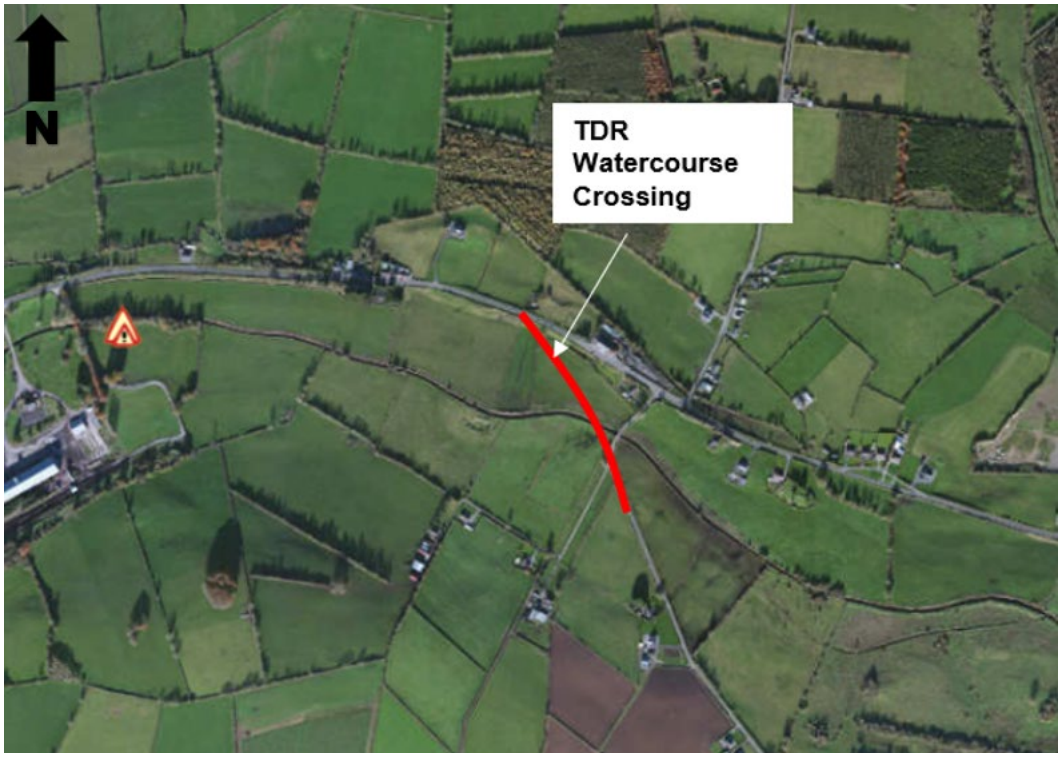



**Figure 12-8: Past Flood Event-TDR Watercourse Crossing (Map taken from www.floodmaps.ie)**

There are areas defined as 'benefiting lands' within the subject site and the TDR watercourse crossing. Benefiting lands were lands that were drained as part of the Drainage District to improve land for agriculture and to mitigate flooding.




**Figure 12-9: Drainage Districts, Benefitting Lands and Channels-Proposed Wind Farm (Map from www.floodmaps.ie)**

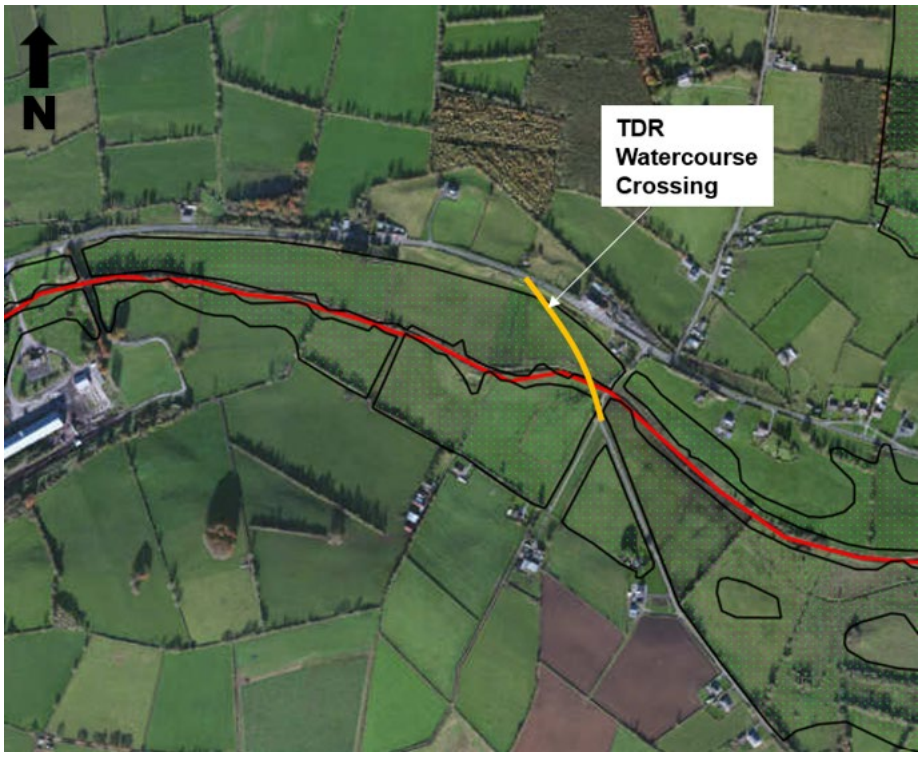



**Figure 12-10: Drainage Districts, Benefitting Lands and Channels - TDR Watercourse Crossing (Map from www.floodmaps.ie)**

### 1.1.1 Surface Water Quality

A review of the data available online revealed that little data is available within the study area as defined in Section 1.1.1. As such, data was also reviewed for the CUSHINA_030 waterbody, as due to its proximity to the site it was considered representative of water quality in the locality. Therefore, surface WFD water quality status (2016-2021) and river waterbody risk for the CUSHINA_030 waterbody, the FIGILE_070 and the FIGILE_080 waterbodies are provided in Table 0-4. The Biological Quality Rating for stations in these waterbodies are presented in Table 0-5.

The WFD ecological status is assigned as ‘good’ for all three waterbodies. The status for the CUSHINA_030 is based on monitoring data and assigns an assessment of ‘Good’. All of the Biological Status conditions are classed as 'Good', and the Supporting Chemistry Conditions have been assigned an overall 'Pass'. Within the Supporting Chemistry Conditions, it is noted that Nitrate status is 'Moderate', while all other conditions are classed as 'High', 'Good' or 'Pass'. There are no monitoring results for the FIGILE_070 or the FIGILE_080, the status for each of these has been assigned by modelling the likely status.

The WFD risk projection for the CUSHINA_030 is assigned as 'not at risk', and no risk status has been assigned to either the FIGILE_070 or the FIGILE_080, their current status is recorded as ‘Review’ and the pressures driving this risk are 'River urban run-off pressures'.

**Table 12-4: WFD River Status and River Waterbody Risk**

| Watercourse | Waterbody | River Status | Reason for River Status | Waterbody Risk | Reason for Waterbody Risk |
|---|---|---|---|---|---|
| Cushina | CUSHINA_030 | Good | Ecological Status | Not at risk | N/A |
| Figile | FIGILE_070 | Good | Ecological Status | Review | N/A |
| Cushina, Figile | FIGILE_080 | Good | Ecological Status | Review | N/A |

**Table 12-5: EPA Biological Water Quality Rating**

| Sub-Basin | Station ID | Station Location | 1979 | 1980 | 1985 | 1986 | 1989 | 1993 | 1997 | 2000 | 2003 | 2006 | 2009 | 2011 | 2015 | 2017 | 2020 | 2023 | 2024 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Cushina_030 | RS14C040080 | Cushina – Br E of Moanvane House | | | | | 3-4 | 3-4 | 3 | 4-5 | 4 | 3-4 | | 4 | 4 | 4 | 4-5 | 3-4 | |
| Cushina_030 | RS14C040081 | Br d/s Enaghan Confluence | | | | | | | | | | | | | | | | | 3-4 |
| Cushina_030 | RS14C040100 | Cushina Bridge | | 4 | 4 | | 4-5 | 4-5 | 3-4 | 4 | 4 | 4 | 3-4 | 4 | 4 | 4 | 4 | 3-4 | |
| Figile_080 | RS14F010600 | Figile – 1km u/s Barrow R Confluence | 5 | | | 4 | 4 | 4 | | | | 3-4 | | | | | | | |

### 12.4.3 Water Dependent Protected Areas

The EPA in 2018, to inform the WFD River Basin Management Plan Cycle-3, identified Special Areas of Conservation and Special Protection Areas that have protected water dependent habitats or species. While the Site is not located within any of these protected areas, the waterbody sub-catchment in which the Site is located overlap with such protected areas as follows:

- River Barrow and River Nore SAC - approximately 6 km downstream of the eastern site boundary. The Qualifying Interests (QIs) of the SAC include freshwater pearl mussel and white clawed crayfish, as well as a number of fish species and other EU Habitats Directive Annex II species (more information on this can be found in Chapter 9 - Biodiversity). Of particular note in terms of hydrology and water quality, is the sensitivity of freshwater pearl mussel to siltation. Mitigation measures are provided in Section 1.8 which minimise the potential siltation to occur as a result of the proposed development.

Further information is provided on protected sites in the Chapter 9 - Biodiversity.

### 12.4.4 Existing Site Drainage

The main hydrology feature within the wind farm site is the Cushina River (FIGILE_080), with a large area of the surface runoff draining into this river within the FIGILE_080 sub-basin. The Cushina River runs in an easternly direction, and it is a tributary of the Figile River (FIGILE_080). The remainder of the site drains into the FIGILE_070 sub-basin or directly into the Figile River. There are no lakes or reservoirs within the wind farm site study area.

Existing access tracks and lands are generally drained by adjacent drainage ditches and swales. These drainage features will be retained and upgraded where necessary to the same standard as the proposed drainage design. Where existing tracks are widened, existing drainage will be realigned or replaced. The replacement sections of drain shall have a similar gradient and width as existing channels to ensure the flow rate and capacity of the existing channel is retained and adequate for the contributing area.

## 12.5 Flood Risk Identification and Assessment

### 12.5.1 Methodology

National Planning Policy

The Planning System and Flood Risk Management Guidelines for Planning Authorities (PSFRM Guidelines) was published in 2009 by the Office for Public Works (OPW). These outline the core objectives for the management of flood risk, including those for new planning applications. Flood risk is defined as a combination of two components:

- The likelihood/probability of flooding; and
- The consequences of flooding.

The PSFRM Guidelines divide geographical areas into three flood zones based on the probability of flooding:

- Zone A (High Risk): a probability of greater than 1 in 100 (1% Annual Exceedance Probability) for river flooding or 1 in 200 (0.5% AEP) for coastal flooding;
- Zone B (Moderate Risk): a probability of between 1 in 1000 and 1 in 120 (0.1% - 1.0% AEP) for river flooding and 1 in 1200 and 1 in 200 (0.1% - 0.5% AEP) for coastal flooding; and
- Zone C (Low Risk): a probability of less than 1 in 1000 (0.1% AEP) for both river and coastal flooding.

The PSFRM Guidelines are based on a 'sequential' approach to ensure that new development is directed towards land at a low risk of flooding. If a Proposed Development lies within a higher risk area, appropriate justification is required and measures for mitigating the flood risk are to be identified via the Justification Test.

The consequences of flooding depend on the hazards caused by flooding (e.g. depth of water, speed of flow, rate of onset and water quality) and the vulnerability of the receptor. Table 3.1 of the Guidelines, reproduced as Table 0-6 below, outlines the three vulnerability classifications and examples of the types of development included.

**Table 12-6: Vulnerability Class and Development Types**

| Vulnerability Class | Example Land Use and Types of Development |
|---|---|
| Highly Vulnerable Development (including Essential Infrastructure) | • Garda, ambulance and fire stations and command centres required to be operational during flooding;<br>• Hospitals;<br>• Dwellings, student halls of residence, hostels, residential institutions (care homes, children's homes and social services homes), dwellings designed/constructed/adapted for the elderly or people with impaired mobility;<br>• Caravans and mobile home parks;<br>• Essential infrastructure including primary transport and utilities distribution, electricity generating power stations and sub-stations, water and sewage treatment, and potential significant sources of pollution in the event of flooding. |
| Less Vulnerable Development | • Buildings used for retail, leisure, warehousing, commercial, industrial and non-residential institutions<br>• Land and buildings used for holiday or short-let caravans and camping (subject to specific warning and evacuation plans)<br>• Land and buildings used for agriculture and forestry<br>• Waste treatment (except landfill and hazardous waste)<br>• Mineral working and processing<br>• Local transport infrastructure |
| Water-Compatible Development | • Flood control infrastructure<br>• Docks, marinas and wharves<br>• Water-based recreation and tourism<br>• Amenity open space, outdoor sports and recreation and essential facilities |

Table 3.2 of the Guidelines, reproduced in Table 0-7 below, states what types of development would be appropriate within each Flood Zone and those that would be required to meet the criteria of the Justification Test.

**Table 12-7: Appropriate Development within Flood Zones**

| Vulnerability | Flood Zone A | Flood Zone B | Flood Zone C |
|---|---|---|---|
| Highly Vulnerable development (Including Essential Infrastructure) | Justification Test | Justification Test | Appropriate |
| Less Vulnerable Development | Justification Test | Appropriate | Appropriate |
| Water-Compatible Development | Appropriate | Appropriate | Appropriate |

The OPW published the Flood Risk Management Climate Change Sectoral Adoption Plan for Flood Risk Management in 2015 (updated in 2022) and provides information on the potential changes in flood hazard as a result of climate change. The Plan outlines two potential future scenarios:

- Mid-Range Future Scenario (MRFS) -typical or near to the general average of future climate projections; and
- High-End Future Scenario (HEFS) - a more extreme future based on the upper end of the range of projections of future climatic conditions.

Table 5-1 of the Plan (reproduced as Table 0-8 below) shows the changes to flood-related parameters under both scenarios.

**Table 12-8: Allowances Flood Parameters for Mid-Range and High-End Future Scenarios**

| Vulnerability | Mid-Range Future Scenario | High-End Future Scenario |
|---|---|---|
| Extreme Rainfall Depths | +20% | +30% |
| Peak Flood Flows | +20% | +30% |
| Mean Sea Level Rise | +500mm | +1200 |

A series of flood maps were produced in 2015 as part of the National Catchment based Flood Risk Assessment and Management (CFRAM) program. The mapping shows the extent of fluvial and coastal flooding in the present-day scenario, and the Mid-Range and High-End future scenarios.

A further series of flood maps were produced in 2019 as part of the National Indicative Fluvial Mapping (NIFM) project. The mapping extends to areas not covered by the 2015 CFRAM program and includes the present-day scenario, and the Mid-Range and High-End future scenarios.

***Local Planning Policy***

The Strategic Flood Risk Assessment for Offaly County Development Plan 2021-2027 (SFRA) (CAAS Ltd, 2021) provides a broad assessment of all types of flood risk to inform strategic land-use planning decisions within County Offaly. The SFRA contains flood mapping, a Flood Risk Management Plan, and advice on zoning and land use proposals within settlements. A similar SFRA was prepared for the Kildare County Development Plan 2023-2029 (SFRA), prepared by RPS Group Ltd (2023).

### 12.5.2 Flood Risk Identification and Assessment

A Site-Specific Flood Risk Assessment (SSFRA) has been prepared for the Proposed Development and is presented as Appendix 12.1. 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.

The areas particularly affected include turbines T1, T4, T5, T8, and T9, along with their associated access tracks, as well as other areas where localised impacts on access roads were identified. A proposed bridge crossing the River Cushina is necessary to access the turbines located on the southern side of the site and to facilitate the grid connection route.

As the proposed development is considered a 'Less Vulnerable Development' under the Planning Guidelines (with the exception of the substation and the joint bays of the grid connection), and some infrastructure lies within Flood Zone A, it was determined that a Justification Test is required in accordance with the Guidelines.

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 potential impacts, 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.

## 12.6 Description of the Proposed Project - Hydrology and Drainage

### 12.6.1 Drainage Design

Surface water drainage features will be installed as part of the construction phase and retained where required such that they can be used during the decommissioning phase, ensuring that there would be no increase in the risk of surface water flooding to off-site areas during any phase of the Project. Further details of proposed site drainage is included in the Surface Water Management Plan, which forms Appendix D of the CEMP (Appendix 2.1 of Volume III of this EIAR) and in the 1:500 series layout planning drawings (P22-145-0100-0006 to P22-145-0100-0059).

The drainage strategy within internal areas of the Site will incorporate three main components of Sustainable Drainage Systems (SuDS):

- Interceptor drains;
- Swales; and
- Settlement Ponds

A conceptual plan of the proposed drainage regime is included as Figure 12-11 below.

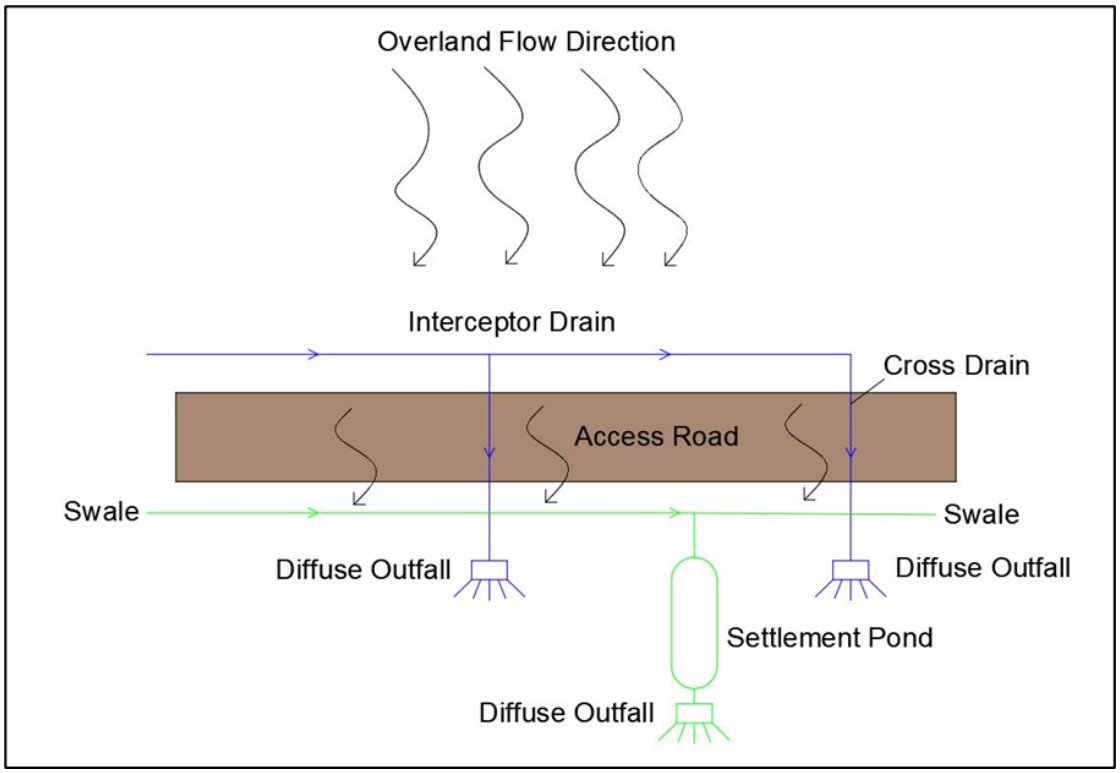



**Figure 12-11: Drainage Design Principles**

### *Existing Undeveloped Areas*

Interceptor drains will be constructed upslope of areas of hardstanding and new sections of access track. These will intercept overland flows from areas of undeveloped land, preventing mixing with runoff from access tracks and hard surfaces. These channels will direct flows around areas of hardstanding and across access tracks via cross drains at appropriate intervals. Flows will then be discharged diffusely across vegetated areas to minimise erosion and encourage evapotranspiration and infiltration to ground. Interceptor drains will be installed as part of the construction phase, in advance of earthworks, road and hardstand construction.

Where interceptor drains have a gradient of greater than 2%, crushed rock 'check dam' structures will be installed at appropriate intervals to reduce the velocity of the flows and prevent erosion.

### *Existing Tracks*

Existing access tracks are generally drained by adjacent drainage ditches and swales. These drainage features will be retained and upgraded to the same standard as the proposed drainage design. Where existing tracks are widened, existing drainage will be realigned or replaced. The replacement sections of drain will have a similar gradient and width as existing channels to ensure the flow rate and capacity of the existing channel is retained and adequate for the contributing area.

All track widening will be undertaken using clean, uncrushable aggregate to allow for some dispersal of surface water runoff via infiltration and, therefore, reduce the rate of surface water runoff generated.

### *New Site Access Tracks and Hard Surfaces*

The proposed internal access tracks will also be constructed using unbound aggregate materials which will allow a portion of surface water runoff to disperse via infiltration.

Vegetated swales will be installed adjacent to new access tracks and areas of hardstanding. These swales will be 0.5 m in depth with 1 in 1 side slopes. Swales will be installed downslope of access tracks and hardstanding areas where coincident with the topography and will provide some attenuation for the surface water runoff during storm events.

Geotextile silt traps will be installed across the swales during the construction phase to prevent the ingress of silt and will remain in place until the vegetation has been established (refer to the Surface Water Management Plan for further details).

Where swales are constructed on slopes of greater than 2%, check dams will be installed at appropriate intervals to reduce flow velocities (refer to the Surface Water Management Plan for further details). By reducing flow rates, the check dams can also provide upstream storage within the swale allowing some dispersal via infiltration close to source rather than conveying all flows to a single larger downstream drainage feature, in accordance with the principles of SuDS.

Settlement ponds will be installed as construction progresses and will be designed in accordance with the principles of CIRIA C648 (Control of water pollution from linear construction projects) and Stoke's law approach to ensure retention of the runoff and settlement of the particles to prevent sediment pollution to the receiving waterbodies. Ponds will be less than 1.5m deep with 1 in 3 side slopes. Runoff from access tracks and hardstands to the proposed swale networks will be discharged to these ponds and will be temporarily retained to allow for the settlement of sediment and suspended solids. During the construction phase, standing water from excavations will be pumped to settlement ponds and there will be no direct discharge to the existing drainage network prior to settlement.

Settlement ponds will not discharge directly to watercourses. Settled water will be discharged diffusely via an outfall to disperse via overland flow or into natural drainage features as per the existing regime. Discharge will be restricted to a rate at or below the existing greenfield runoff rate during storm events, and the ponds will be sized to accommodate flows for all storm events up to and including the 1 in 100 year event.

The settlement ponds will also contain surface water runoff in the event of a spill or leak, and the outflow can be closed off to retain any potential pollutants within the settlement ponds prior to any necessary treatment. Regular inspection and maintenance will be carried out to ensure the proper functioning of the settlement ponds and check dams (and timely identification of potential corrective maintenance needs). Ciria C753 SuDS manual will be adhered to, which provides guidance on the routine maintenance and inspections requirements for settlement ponds and check dams.

### *Drainage of Temporary Site Compounds*

The proposed construction compounds will be drained in a similar manner as the access tracks and hardstands, with surface water runoff from undeveloped areas intercepted and dispersed naturally, and surface water runoff from areas of hardstanding intercepted by swales and conveyed to settlement ponds. Surface water runoff from the compound area will be directed through a Class 1 Full Retention Separator Oil Interceptor (sized relative to area served) before discharge to the surface water drainage network.

There will be no discharge of foul flows from welfare units, with water retained in holding tanks and removed from site by a contractor.

### *Drainage of Substation*

The substation will be drained via an underground piped surface water drainage network. The network will also utilise linear drainage channels and filter drains.

The network will discharge overland via a Class 1 Full Retention Oil Separator at a restricted greenfield rate. Attenuation for flows exceeding this rate will be provided within an underground tank.

In accordance with SuDS best practice, a rainwater harvesting tank will be included. Rainwater will be filtered and stored within the underground tank for reuse.

There will also be no discharge of foul flows from welfare units within the substation, with water stored in tanks and removed from site by a contractor.

### 12.6.2 Watercourse Crossings

Regulation 50 of the European Communities (Assessment and Management of Flood Risks) Regulations 2010 SI 122 of 2010 requires that: "No Person, including a body corporate, will construct any new bridge or alter, reconstruct, or restore any existing bridge over any watercourse without the Consent of the Commissioners or otherwise than in accordance with plans previously approved of by the Commissioners."

The word "bridge" as defined in said Regulations includes a culvert or other like structure. The word "watercourse" as defined in said Regulations includes rivers, streams, and other natural watercourses, and also canals, drains, and other artificial watercourses.

The OPW is responsible for the implementation of the regulations and consent to construct any bridge will be sought from the OPW via their application process.

All watercourse crossings required for the Proposed Development will be subject to the requirements of Regulation 50. Prior to the commencement of any works on watercourse crossings, the developer will apply to the OPW for a consent under Regulation 50 for the watercourse crossing works as described in more detail in section 1.5.2.1 below and will abide by the consents given.

Details on the location and sizing of each watercourse crossing can be found in the Surface Water Management Plan (SWMP) in Appendix D of the CEMP (Appendix 2.1).

#### *12.6.2.1 Watercourse Crossings - Site Access Tracks*

There will be 49 drain crossings and one watercourse crossing within the wind farm site. It is proposed to construct one single-span bridge to cross the Cushina River between T6 and the on-site substation. The proposed crossing design will be is in line with consultation feedback and in accordance with Inland Fisheries Ireland (IFI) 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 planning drawing P22-145-0300-0001 and the location of the crossing is shown on planning drawing P22-145-0100-0001.

The soffit level of the bridge will provide a minimum freeboard of 300mm to allow a fluvial flood level of 1-in-100 years (+20%). The crossing will also be sized to convey the flow from 1 in 100 year (+20%) flood event unobstructed.

Construction methodologies for the single-span bridge and piped culverts are provided in Chapter 2 – Description of the Proposed Development; with further technical details regarding location and sizing of the bridge provided in the SWMP, presented as Appendix D of the CEMP (Appendix 2.1).

With a suitably designed bridge, there will be no impact on flows within watercourses and the risk of flooding will not be increased as a result of the proposed bridge.

For a minor watercourse/drain crossing using a piped culvert, the following shall be employed:

1. The access track construction will finish at least 10m from the nearside bank of the minor watercourse/drain.
2. All environmental mitigation measures will be implemented locally in advance of the works, in accordance with the measures outlined in the Surface Water Management Plan (SWMP) in Appendix D of the CEMP (Appendix 2.1).
3. Pipe culvert installation will only take place during dry periods.
4. The pipe is laid in one lift or in sections using a crane.
5. Suitable bedding material in the form of clean round gravel between 10-100mm diameter, shall be laid in the base of the pipe in accordance with the recommendations set out in Guidelines on Protection of Fisheries During Construction Works in and Adjacent to Watercourses from Inland Fisheries Ireland.
6. Rock armour headwalls will be constructed where necessary to protect pipe ends and the base of slope embankments on either side of the track.

Further details on hydrology and drainage are contained in the Surface Water Management Plan (SWMP) which is contained in Appendix D of the CEMP (Appendix 2.1) and on accompanying planning application drawings.

#### *12.6.2.2 Watercourse Crossings – Turbine Delivery Route*

The turbine delivery route will utilise a number of existing watercourse crossings. In addition, a new single span bridge will be constructed along the TDR to cross the Philipstown River, constructed adjacent to the existing Philipstown Bridge.

#### *12.6.2.3 Watercourse Crossings – Grid Connection Route*

There will be five crossing points comprising four watercourse crossings and one dry stone arch bridge crossing at a disused canal. There will be four Horizontal Directional Drilling (HDD) and one flat formation crossing within the road above an existing culvert.

HDD is a method of drilling under obstacles such as bridges, railways, water courses, etc. in order to install cable ducts under the obstacle. This method is employed where installing the ducts using standard installation methods is not possible.

A competent specialist HDD contractor will be appointed for the proposed works. The HDD Contractor will conduct the drilling works in a safe and controlled manner with due regard for site constraints including environmental issues. The Contractor will be required to ensure that their proposed works do not adversely affect, existing services / utilities, groundwater / aquifers. The drilling methodology is as follows:

- An entry and exit pit will be established on both sides of the river crossing.
- 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 timing of grid connection cable laying will be carried out during metrologically dry seasons/periods and HDD on the stream crossing will not be carried out during the salmonid spawning season.
- The depth of the bore will be at least 3m below the level of the riverbed so as not to conflict with watercourse hydrology;
- Inert, biodegradable drilling fluid will be used;

- There will be no refuelling within 50m of the watercourse.
- The drilling rig and fluid handling units will be located on one side of the river and will be stored on double bunded 0.5mm PVC bunds which will contain any fluid spills and storm water run-off.
- Entry and exit pits (1m x 1m x 2m) will be excavated using an excavator. The excavated material will be temporarily stored within the works area and used as a byproduct or disposed of to a licensed facility.
- A 1m x 1m x 2m steel box will be placed in each pit. This box will contain any drilling fluid returns from the borehole.
- The HDD pilot bore will be undertaken using a wireline guidance system. Assembly will be set up by the drilling team and steering engineer. The steering system will provide real time directional information to the surveyor at the driller's console and will be used to navigate the bores.
- 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, viscosity and weight), and the accurate measurement of mud returns and pH. A closed-loop drilling fluid mixing and circulation system with recycling capability will be utilised.
- Fluid return lines used in HDD process will be tested for leaks prior to use to check their reliability.
- The pilot bore will be drilled to the pre-determined profile and alignment under the watercourse crossing.
- The steering engineer and drill team will monitor the drilling works to ensure that modelled stresses and pressures are not exceeded.
- The drilled cuttings will be flushed back by drilling fluid to the entry and exist pits and re-cycled for re-use. The nature of the cuttings will be monitored to understand the ground conditions as the drilling progresses.
- Once the first pilot hole has been completed a hole-opener or back reamer will be fitted in the exit side which will then be pulled back to the entry side as part of the pre-reaming/hole opening process to enlarge the hole to the correct size.
- When the pre-reaming/hole opening/hole cleaning has been completed, a reamer of slightly smaller diameter than the final cut will be installed on the drill string to which the ducts will be attached for installation. The steel boxes will be removed, with the drilling fluid disposed of to a licensed facility.
- The ducts will be cleaned and proven, and their installed location surveyed.

**Table 12-9: Watercourse crossings on grid connection route**

| Crossings | | | | |
|---|---|---|---|---|
| **No.** | **Easting** | **Northing** | **Description** | **Type** |
| 1 | 659966 | 713535 | Culvert 1 | HDD |
| 2 | 660546 | 712416 | Bridge Over River Barrow | HDD |
| 3 | 660321 | 711962 | Culvert 2 | Crossing Over |
| 4 | 659745 | 711434 | Culvert 3 | HDD |
| 5 | 658244 | 711382 | Old Canal Bridge | HDD |

#### *12.6.2.4 River Crossing - TDR*

The TDR crosses several watercourses from the Port of Entry (POE) in Galway to the site entrance. Of particular note, the TDR will require the construction of a new bridge crossing, adjacent to the existing Philipstown River bridge. The new bridge will be a clear span bridge and will be constructed in accordance with IFI (2016) ' Guidelines on protection of fisheries during construction works in and adjacent to waters'. More details can be found in the TDR report, presented as Appendix 2.3.

## 12.7 Assessment of Effects on Hydrology and Water Quality

### 12.7.1 Do-Nothing Scenario

The likely evolution of the baseline environment in the absence of the Proposed Development is considered. Land use within the Site will likely remain as per the current scenario for the foreseeable future, i.e. agriculture, with smaller pockets of commercial forestry also present along the periphery, and much of the land scarred from historic peat extraction. A slight increase in commercial forestry may occur in the wider catchment area in line with national policy (Ireland Forestry Strategy 2023- 2030).

Residential property density in the area is low with ribbon development and one-off housing dominating. As such, surface water drainage will continue as it is occurring currently, with pressures on the river waterbodies continuing with regard to agriculture and domestic wastewater as detailed in Table 0-4.

The existing agricultural, turbary and forestry operations are likely to continue into the future. The creation of in-ditch wetlands proposed as part of the BEMP will not proceed and as such, the existing drainage ditches onsite will continue to be intensively managed through regular maintenance, with some ditches carrying significant loads of peat sediment. Discharge of this sediment-laden water will continue into the River Cushina, which is likely contributing to the Poor water quality of the River Cushina. Potential Effects During Construction

Potential construction phase effects, in the absence of mitigation, of the Proposed Development on Hydrology and Water Quality are set out hereunder.

#### *12.7.1.1 Potential Effects on Surface Water WFD Status/Water Quality*

WFD Ecological Status for inland surface waterbodies is determined based on biological quality elements and supporting physico-chemical and hydromorphological quality elements.

Effects on WFD biological quality elements are addressed in Chapter 9 - Biodiversity. The potential for significant effects on hydromorphology and physico-chemical conditions is discussed hereunder.

##### 12.7.1.1.1 Potential for Effects on Hydrology / Hydromorphology (Including Flood Risk)

Hydromorphology is the physical and hydrological condition of surface water bodies which comprises the habitats and natural processes that support and maintain healthy aquatic ecosystems. Potential significant effects to hydromorphology can be caused by changes in the physical habitat or flow conditions of a waterbody.

#### 12.7.1.1.2 Potential for Effects on Water Quality / Physico-chemical Conditions

The European Communities Environmental Objectives (Surface Waters) Regulations 2009 -25) prescribe physico-chemical conditions for surface waters which are necessary to maintain / achieve Good or High Status. These relate to water temperature, oxygen conditions, pH, and nutrient conditions. Notably the Regulations are mute on the sedimentation conditions required to support biology. As such, reference is made to the European Communities (Quality of Salmonid Waters) Regulations, 1988 which required an average concentration of <25mg/l of suspended solids (measured monthly over a period of 12 months) in order to support salmonid fish species. The Surface Water Regulations also prescribe environmental quality standards for priority substances and priority hazardous substances and requires the progressive reduction / phasing out these substances in waterbody catchments.

Construction phase activities will require earthworks and use of materials that have potential to negatively impact the physico-chemical conditions for surface waters.

***Release of Construction or Cementitious Materials***

To facilitate the Proposed Development, the incorporation of concrete structures is necessary at turbine foundations and the substation foundation. Additionally, concrete will be required as blinding for culvert and joint bay installations and also as part of the bridge crossing structure on the wind farm site, and the bridge crossing structure being provided for the TDR.

The use of cementitious materials like concrete, cement, or lean mix can lead to changes in soil and water pH, as well as increased concentrations of sulphates and other constituents found in concrete, which can further impact water quality. Concrete and other cement-based products are highly alkaline and corrosive and can have significant negative impacts on water quality. They can generate very fine, highly alkaline silt (pH 11.5) that can alter water chemistry. A pH range of between 6-9 is set in the Surface Waters Regulations (for hard water) as the standard required to support Good / High WFD Status. Inland Fisheries Ireland (2016) 'Guidelines on Protection of Fisheries During Construction Works in and Adjacent to Waters' prescribe that artificial variations in waters must not be in excess of ±0.5 of a pH units.

All of the wind turbine foundations are located a minimum of 50 m away from any all watercourses and as such it is unlikely that surface water runoff from these installations would enter watercourses. Where land drains are traversed by the development infrastructure these will be intercepted by clean water interceptor drains and carried as needed by cross drains. This drainage separation of clean water channels from dirty water sources will be in place in advance of the works and as such it is unlikely that concrete runoff would enter the clean surface water drainage. The footings of the new bridge crossings are setback 2.5m landward from the riverbank to retain riverbank integrity. Given the proximity of the bridge to the river, it is likely that pre-mitigation concrete runoff could enter the waterbody.

Other foundation works, i.e. for joint bays and the substation foundation, are not located within 50m of any watercourse. Given setback, it is unlikely that surface water runoff from these installations would enter watercourses.

New culvert crossings will be required in land drains. Pre-mitigation, release of concrete to the aquatic environment is likely.

During the construction phase of the Development, the utilization of plant, equipment and vehicles for excavation, material transport, and construction activities introduces the potential for hydrocarbon spillages and leaks which might enter the aquatic environment, especially during regular refuelling procedures. If hydrocarbons are accidentally introduced into the environment, they are expected to be intercepted by the drainage and surface water networks that will be constructed as part of the Proposed Development in accordance with the surface water management plan. However, areas of particular risk of water pollution are where works will be carried out in stream or on the riverbank i.e. for culvert and bridge construction.

**Pre-mitigation, the likely effects on water quality (from accidental release of pollutants, cement material, and hydrocarbons) at the site are considered negative, direct/indirect, short term, moderate.**

***Release of Suspended Solids***

The construction phase of the Proposed Development will invariably involve earthworks including: removal of vegetation cover, construction of roads, forestry felling etc. to facilitate the installation of wind farm infrastructure, temporary stockpiling of subsoils (including peat) and bedrock, construction and removal of temporary works e.g. construction compounds, TDR accommodation works and HDD temporary access roads.

Throughout the excavation, storage, and reuse of materials in the Proposed Development, suspended solids could be carried by surface water runoff and into the surface water networks. This likelihood is particularly high during sustained rainfall events. Water dewatered from excavations for foundations and roads can become contaminated whereby soil or water from areas of potential contamination is drawn down. If not properly controlled, such contaminated water can enter the aquatic environment. If the rate of dewatering is not effectively managed, the drainage and attenuation features designed to handle the water could become overwhelmed by a sudden influx of water containing high concentrations of suspended solids and potentially resulting in runoff into nearby surface waters.

The development will inevitably bring about alterations in the drainage patterns at the site. If not effectively managed, these alterations have the potential to create new pathways for runoff, potentially causing erosion of soils and construction materials, as well as the entrainment of solids in the runoff process.

Extensive peat probing for the Proposed Development has been carried out, with approximately 275 locations tested, and a peat stability assessment prepared for the Site (see Appendix 11.2). The findings show that the Site has an acceptable margin of safety and is suitable for the proposed wind farm project. Slope inclinations at the main infrastructure locations have an average slope of 2 degrees. The relatively flat topography/nature of the terrain on site reflects the low risk of peat failure. The purpose of the stability analysis was to determine the stability i.e. Factor of Safety (FoS), of the peat slopes. The FoS provides a direct measure of the degree of stability of a peat slope. A FoS of less than 1.0 indicates that a slope is unstable; a FoS of greater than 1.0 indicates a stable slope. An acceptable FoS for slopes is generally taken as a minimum of 1.3. The stability analysis for this project, which analysed the turbine locations, access roads and substation, resulted in FoS above the minimum acceptable value of 1.3 and hence the site has a satisfactory margin of safety. As such, peat slippage, and the associated release of peat sediment into watercourses at the Site, is unlikely.

**Potential effects on water quality from peat slippage or sediment runoff are deemed unlikely.**

***Horizontal Directional Drilling (HDD)***

HDD will be employed at four locations to cross watercourses, as described in Section 1.5.2.3.

The operation will be carried out by an experienced HDD specialist and is expected to take place in a single day per crossing location.

The process will involve setting up a small, tracked drilling rig on one side of the surface water feature. A pilot hole will be bored as per the agreed alignment and will be tracked and controlled using a transmitter in the drill head. By tracking the depth, position and pitch of the drill head the operator can accurately steer the line of the drilling operation. The drilling operation will be lubricated using a fluid (typically a mixture of water and additives like bentonite or polymers, designed to facilitate drilling, stabilize boreholes, and remove cuttings). When the pilot hole has been drilled to the correct profile, its diameter is increased, if necessary, to match the external diameter if the cable duct. The flexible plastic ducting is then pulled through the pre-drilled hole and sealed at each end until required for cable installation.

If not properly managed, there is potential for frac-out to occur during the HDD drilling process. A frac out occurs when the pressure of the drilling fluid in a borehole exceeds the strength of the surrounding soil, causing the soil to fracture and the fluid to escape to the surface.

**Pre-mitigation, the likely effects on water quality (from accidental release of pollutants, HDD drilling fluids, cement material, and hydrocarbons) at the site are considered negative, direct/indirect, short term, moderate.**

#### *12.7.1.2 Potential Effects on Surface Water Dependent Designated Sites*

None of the elements of the Proposed Development are located within the boundaries of any Nationally or European designated sites.

The drains and watercourses within the Site flow to the Cushina and Figile rivers. Downstream extents of the Figile are part of the River Barrow and River Nore SAC. Any negative change to the existing WFD status of the waterbody supporting this SAC or any activity that might impede the achievement of the objective WFD status for such waterbody could have an effect on the attributes (structure and function) required to support the water dependent habitats and species of the designated site. However, having regard to Section 1.6.2.1.2, it is determined that, with the exception of in-stream and riparian works, significant effects on water quality are unlikely.

**Pre-mitigation, the likely effects on the water dependent designated site (River Barrow and River Nore SAC) due to potential effects on water quality are considered negative, indirect, short term and significant.**

### 12.7.2 Potential Effects During Operation and Maintenance

#### *12.7.2.1 Potential for Effects on Hydrology / Hydromorphology (Including Flood Risk)*

***Alteration of Runoff Rates***

The Proposed Development will require the excavation and removal of vegetation cover and soil, and replacement with less permeable surfaces with a resulting potential to contribute to the increase in rate and volume of rainfall runoff from the Site.

Any alteration in the existing drainage regime / hydrology of the Site can impact on the volume of surface water which drains to the local streams and watercourses or to the rate at which such drainage occurs. This in turn can have an effect on hydromorphology through, for example, an increase in erosion and sediment transport, increase flow velocity, alteration of flood regime.

The increase in impermeable area caused by the wind farm footprint can directly influence the volume and velocity of runoff. As the footprint expands, there is a larger proportion of lower permeability surfaces compared to natural or vegetated areas. This alteration can disrupt the natural hydrological cycle, reducing the amount of water that can infiltrate the soil and increasing the amount of runoff generated.

Due to the landscape in the area of the proposed development, characterised by relatively flat lands which is heavily channelised by peat drainage networks, run-off from the site is essentially captured across three catchment areas. For the purposes of run-off assessment, these have been named "Catchment 1", "Catchment 2" and "Catchment 3" as shown in Figure 12-12 below.

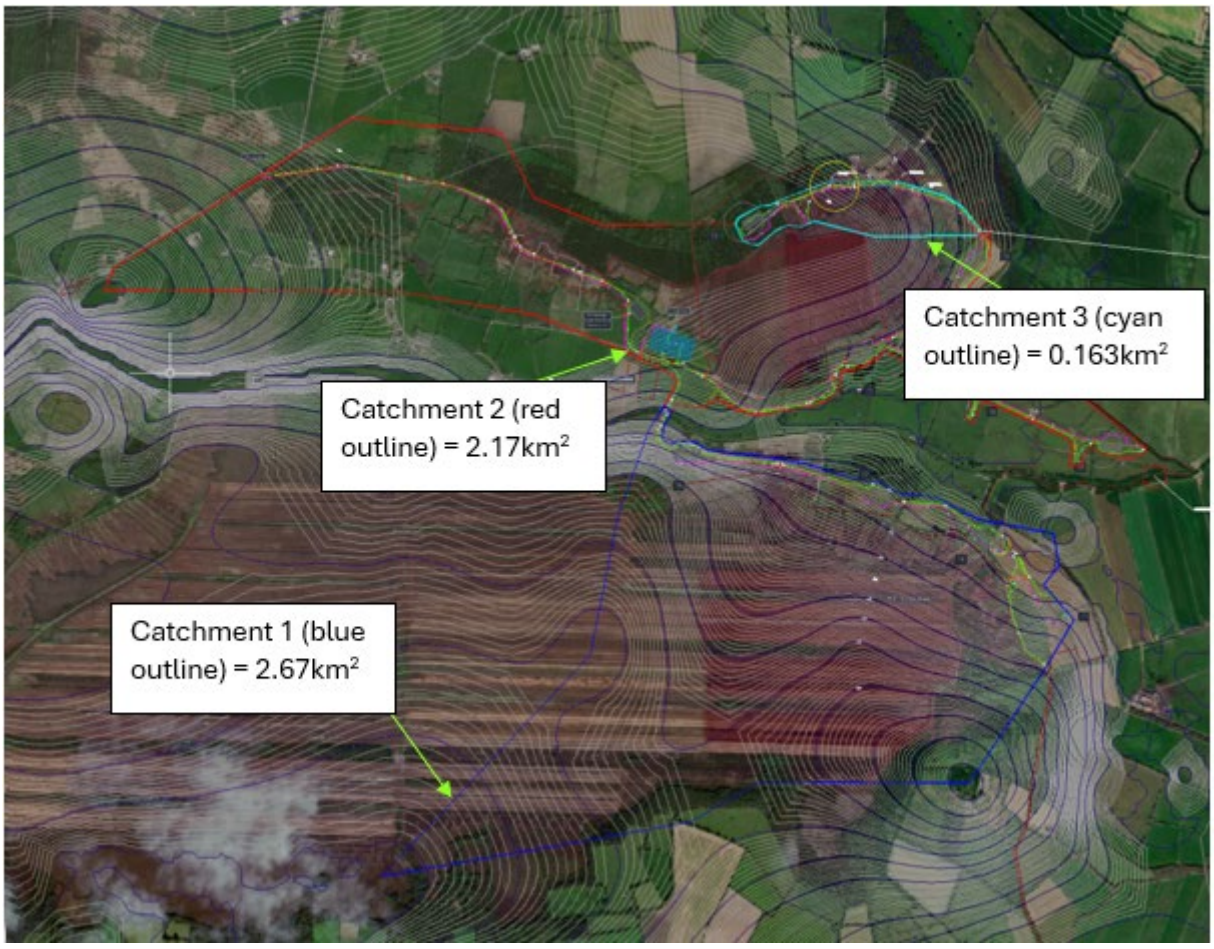



**Figure 12-12: Run-off catchment areas**

In accordance with *Drainage of Runoff from Natural Catchments (including Amendment no. 1 dated June 2015)* published by Transport Infrastructure Ireland (TII, 2015); the runoff from each of these catchment areas is calculated by either the ADAS method (for catchment areas less than 0.4 $km^2$) or the IH124 method (for catchment areas greater than 0.4 $km^2$). Accordingly, as Catchments 1 and 2 are greater than 0.4 $km^2$, the runoff for these areas has been calculated using the IH124 method. Whereas the runoff for Catchment 3 has been calculated using the ADAS method.

The runoff from the new lower permeability surfaces of the proposed development is then calculated using the modified rational method, and added to the flow of the natural catchment, to compare the existing runoff with the runoff post development.

The runoff calculations have been completed for a 1-in-100 year rainfall event. The results are presented as Table 12-10.

**Table 12-10: Impermeable footprint increase ratio**

| | Catchment 1 | Catchment 2 | Catchment 3 |
|---|---|---|---|
| Catchment area (km2) | 2.668 | 2.168 | 0.163 |
| Development footprint within the catchment area (km2) | 0.037 | 0.067 | 0.015 |
| Runoff for 1-in-100 year rainfall event (m3/s) using IH124 or ADAS method (for catchment area minus development footprint) | 4.542 | 3.718 | 0.419 |
| Run-off from new surfaces (m3/s) using rational method | 0.428 | 0.593 | 0.043 |
| Increase in run-off due to proposed development (m3/s) | 0.37 | 0.488 | 0.0009 |
| Percentage increase relative to catchment area | 8% | 13% | 0.2% |

At the scale being examined, where catchment areas have been delineated over small areas, the percentage increase in run-off is not significant. It is important to note that the percentage increase in runoff would be much smaller when comparing to the run-off within the wider sub-basin, sub-catchment or WFD catchment, equating to fractions of a percentage point on such a scale. In addition, the SuDS drainage design for the proposed development, while designed for the purposes of maintaining water quality, has additional benefits in attenuating flows such that the actual run-off from the proposed development would be less than those calculated in Table 0-10. As such, it is considered that the values presented in Table 0-10 represents a conservative approach which likely overestimates the increase in runoff due to the proposed development.

***Potential Effect on Flood Risk***

Infrastructure development can increase the risk of flooding. A flood risk assessment was prepared as supported by a detailed hydraulic model of the catchment informed by detailed Digital Terrain Model (DTM). The model has determined that the Proposed Development will not increase flood risk elsewhere within the catchment.

According to the Flood Risk Assessment (presented as Appendix 12.1), some wind farm infrastructure, such as certain access tracks and turbines, are located within Flood Zones A and B. To minimise any impact on existing flood levels, the access tracks and hardstanding areas within these zones will be constructed at ground level. For turbines located within or very close to flood zones—such as T1, T4, T5, T8, and T9—the plinths to which the towers will be bolted will be raised above the design flood levels with a minimum clearance of 500 mm. This will guarantee that the critical electrical and mechanical components housed in the base of the turbine tower will be protected. For more information see Appendix 12.1.

***Structures On/Over Water***

There will be 49 drain crossings and one watercourse crossing within the wind farm site. The watercourse crossing will comprise a clear span bridge to cross the Cushina River between T6 and the on-site substation. There is also a requirement for a new clear span bridge along the TDR, to be installed adjacent to the existing bridge over the Philipstown River. The bridge structures will be a clear span type structure with a minimum abutment setback from the riverbanks of 2.5m. All culverts and bridge crossings have been sized to convey flows for a 1-in-100 year flood event plus a 20% allowance for climate change, such that the crossings will have no likely significant effects on catchment hydrology.

**The Proposed Development will have a direct, long-term and not significant effect on alteration of surface water flow and flood extents.**

#### *12.7.2.2 Potential for Effects on Water Quality / Physico-chemical Conditions*

During the operational phase, accidental pollution from spills and leaks of fuel, oil and chemicals from vehicles and maintenance works may occur. Additionally, transformer oil will be used in cooling the transformers associated with the sub-station which creates potential for oil spills during any oil replacement activity or leaks during the operational phase, although the likelihood of this is low. Additionally, permanent drains and settlement ponds will be installed and maintained across the Site as shown on the 1:500 series layout planning drawings (P22-145-0100-0006 to P22-145-0100-0059). These will act to attenuate any accidental spills such that they can be controlled and managed in a timely manner.

**The significance of the effect of the release of the hydrocarbons into the receiving waters is Slight due to the low likelihood and low quantities involved.**

### 12.7.3 Potential Effects During Decommissioning

As described in Chapter 2, wind turbines will be deconstructed by unbolting the components and disassembling using cranes. The hardstanding and foundation pedestals of the turbines will be covered over (with soil that was stripped during construction) and allowed to re-vegetate. This is less disruptive to the environment than removing the hardstanding and foundations.

Infrastructure that will be left in-situ following decommissioning includes: internal site access tracks, the on-site substation and ancillary electrical equipment.

In the event of decommissioning of the Wind Farm site, similar activities to the construction phase are carried out. Potential impacts would be similar to the construction phase but to a lesser degree.

#### *12.7.3.1 Potential for Effects on Hydrology / Hydromorphology (Including Flood Risk)*

The removal of permanent infrastructure and covering with soil could result in a very slight increase in surface water runoff until such time as vegetation has established. However, the settlement ponds on site will be maintained and operated during decommissioning, which will act to control the flow.

**The Proposed Development will have a direct, temporary not significant effect on alteration of surface water flow and flood extents during decommissioning.**

#### *12.7.3.2 Potential for Effects on Water Quality / Physico-chemical Conditions*

As the hard standing infrastructure will remain in place the sediment disturbance is not significant during the disassembly. Potential impacts are similar to the construction phase but less significant as there is no invasive works breaking ground and it is mainly associated with the dis-assembly of the above ground components of the turbines. The potential receptors are the same as the construction phase. No concrete works are required, and roads will be left in situ with only hardstandings being covered over with soil. All hardstandings are located greater than 50m from any watercourse and as such the potential for direct runoff is limited. The settlement ponds on site will be maintained and operated during decommissioning, which will act to control site runoff.

**The Proposed Development will have a direct, temporary not significant effect on water quality during decommissioning**

### 12.7.4 Potential Cumulative Effects

Cumulative effects of the proposed project with other developments in the region are presented here in relation to potential significant effects on hydrology and water quality.

Cumulative projects are existing and known developments in the planning system, the subject of an application, appeal or judicial review. It is accepted best practice that developments within the same catchment and at the construction stage need to be taken into consideration when assessing the potential for cumulative effects. According to Entec's 2008 report "it is conceivable that two or more wind farms (or indeed other developments) in the catchment of a water receptor could result in combined runoff impacts to water quality, which then exceed Environmental Quality Standard thresholds. It is generally the case that in such circumstances any such effect is only likely to have the potential to be significant during the construction period. Once operational, any effects are likely to be restricted to high rainfall events when the level of dilution of impact is proportionately increased by higher flow levels that can be anticipated under these circumstances. Despite this theoretical potential impact, it is possible to control construction effects by good management techniques and therefore in practice significant effects, either individually or cumulatively, will rarely occur. Where such impacts occur, other regulation provides additional controls. Due to the existing regulation over water environment there are absolute controls on the manner in which developments are constructed and operated in respect of the water environment which result in any potential effect being designed out. In this way it is unlikely that any cumulative effect would be significant."[2]

Therefore, only other developments that lie in the same catchment(s) as the Proposed Development that have the potential to have their construction stage overlap with the Proposed Development's construction stage are considered.

Relevant projects, that are likely to have an impact on the Hydrology and Water Quality, in proximity to the Site and GCR are listed in Table 12-11.

[2] Entec UK Limited (2008) Review of Guidance on the Assessment of Cumulative Impacts of Onshore Windfarms: Phase 1 Report

**Table 12-11: Wind Energy Developments within 20 km of the Proposed Wind Farm Site**

| Development (Application No.) | Number of turbines | Distance from the Site (km) | Water regions | Status |
|---|---|---|---|---|
| Cloncreen Wind Farm | 21 | 10.6km to the north of the site | Same catchment as the proposed development, separate sub-catchment | Operational since 2022. |
| Mount Lucas Wind Farm | 28 | 11.1km to the north of the site | Same catchment as the proposed development, separate sub-catchment | Operational since 2015. |
| Cushaling Wind Farm | 9 | 12km to the north-east of the site | Same catchment as the proposed development, separate sub-catchment | Permitted since 2020 & construction started in 2022. |
| Dernacart Wind Farm | 8 | c.15km west of the site | Same catchment as the proposed development, separate sub-catchment | High Court Ruled in favour of this development in June 2025.<br><br>An Bord Pleanala (now An Coimisiun Pleanala) approved the development in January 2024 (Appeal Case Ref: 310312) |
| Moanvane Wind Farm | 12 | 18.6km to the west of the site | Same catchment, same sub-catchment, separate sub-basin | Permitted since 2018 & construction started in 2022. |
| Yellow River Wind Farm | 29 | c.19km to the north of the site | Separate catchment | Permitted since 2022 & construction began in 2022, with an expected completion date in 2025. |
| Cushina Wind Farm | 11 | c.4.3km northwest of the site | Same catchment, same sub-catchment, separate sub-basin | Pre-Application stage |
| Clonarrow Wind Farm | 4 | c.12km to the north of the site | Same catchment as the proposed development, separate sub-catchment | Currently in Planning and awaiting decision (Planning Ref: 2560189) |

| Development (Application No.) | Number of turbines | Distance from the Site (km) | Water regions | Status |
|---|---|---|---|---|
| Ballydermott Wind Farm | 47 | c.7.7km to the south east of the site | Separate catchment | Pre-Application Stage |

The proposed large-scale developments summarised in Table 0-11 have been considered. If construction/ maintenance works for these projects overlap or run concurrently with the development of the Site, there may be a cumulative impact on hydrology and water quality.

Wind Farms

Apart from Yellow River wind farm, all other wind farm developments within 20 km of the site share the same catchment as the Proposed Development. This is not surprising, as the Barrow catchment is a particularly large catchment, covering an area of over 3,000 $km^2$. At such a scale, wind farm developments within the same catchment are unlikely to act cumulatively with the Proposed Development unless there is a closer hydrological connection, for example if the projects share the same sub-catchment, or closer still by sharing the same sub-basin.

In the case of the Proposed Development, both the Moanvane Wind Farm and the Cushina Wind Farm share the same sub-catchment. Due to the distance from site, the Moanvane Wind Farm is unlikely to act cumulatively with the Proposed Development. However, the Cushina Wind Farm is located relatively close to the Proposed Development and would be likely to act cumulatively with the Proposed Development. Provided the Cushina project implements SuDS drainage design, sizes all watercourse and drain crossings appropriately, and does not have a construction phase that overlaps with the Proposed Development, there will not be any significant cumulative impacts arising.

Forestry and Turbary

Turbary turf cutting and forestry activities occur in the vicinity of the Proposed Development and within a shared waterbody catchment. These activities can result in sedimentation of the local drains and watercourses and may be impacting the water quality of the Cushina and Figile. While potential effects on water quality from peat slippage or sediment runoff form the Proposed Development are deemed unlikely, there is potential for accidental runoff from the Site to act cumulatively with forestry and turbary activities if not properly mitigated.

## 12.8 Risk of Major Accidents and Disasters

This section assesses the potential significant adverse effects of the proposed project on the hydrology and water quality 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 might have an effect on water quality or hydrology.

***Potential vulnerability to risks***

Flood Risk

The proposed bridge that crosses the Cushina River has been designed with a minimum freeboard of 300 mm between the 1% AEP +CC flood level and the bridge deck to reduce the likelihood of debris blockage and also allows for uncertainties in hydrological and hydraulic design calculations. Sufficient span has been designed to minimise the afflux.

The proposed bridge for the section of the TDR crossing the Philipstown River has been designed following the same principles as the other bridge; however, flood relief culverts have also been included, as the TDR crosses a floodplain in this area.

Some wind farm infrastructure, such as certain access tracks and turbines, is located within Flood Zones A and B. To minimise any impact on existing flood levels, the access tracks and hardstanding areas within these zones will be constructed at ground level. For turbines located within or very close to flood zones—such as T1, T4, T5, T8, and T9—the plinths to which the towers will be bolted will be raised above the design flood levels with a minimum clearance of 500 mm. This will guarantee that the critical electrical and mechanical components housed in the base of the turbine tower will be protected.

Other essential and critical elements of the proposed development such as the substation and the grid connection route joint bays will be placed outside of the flood zones.

More information on flood risk, and the mitigation measures being implemented for the proposed development are contained within the SSFRA, presented as Appendix 12.1.

***Potential to cause accidents and / or disasters***

Peat Stability

Extensive ground investigation for the Proposed Development has been carried out and a peat stability assessment prepared for the Site (see Appendix 11.2). The stability analysis determined that the Site has a satisfactory margin of safety. As such, peat slippage into local watercourses at the Site is unlikely. Additionally, contingency measures / emergency response measures are set out in the CEMP in Appendix 2.1 of the EIAR, which will deal with any peat destabilisation in the unlikely event that it were to occur .

Water Contamination

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). These will ensure that the risk of water contamination is low.

Flood Risk

A flood risk assessment was prepared as supported by a detailed hydraulic model of the catchment informed by detailed Digital Terrain Model (DTM) and surveyed watercourse cross sectional data from the catchment. The model has determined that the Proposed Development will not significantly increase flood risk elsewhere within the catchment.

## 12.9 Mitigation Measures

### 12.9.1 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 Chapter 3 - Site Selection and Alternatives for further detail) with the objective of avoiding / minimising the potential for significant effects on water quality and hydrology. The Site layout and drainage infrastructure has been designed such that it is sympathetic to the existing topography and aims to maintain the existing hydrological regime of the Site such that it does not create a changed hydrological response to precipitation. The design has been informed by a detailed flood risk assessment for the Site.

The infrastructure has been located such that it is set back as far as reasonably practicable from hydrological features, with an ethos of ensuring a minimum setback of 50 m between mapped surface waters and wind farm infrastructure, and a minimum setback of 10 m from non-mapped streams and drainage features with the exception of HDD locations and watercourse crossings. The County Development Plans for Kildare, Offaly and Laois require that a riparian buffer zone is maintained between the development works and the top of the riverbank. The design of the Proposed Development meets the objective of the Development Plans, noting that there are a number of watercourse crossings included in the Proposed Development.

A Surface Water Management Plan for the construction, operation and decommissioning stages of the Proposed Development is presented as Appendix D of the CEMP (Appendix 2.1). 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.

### *Attenuation and Flood Risk*

The Proposed Development will increase the impermeable area within the Site, however as per Table 0-10, this is not considered to cause a significant change in runoff rates. Notwithstanding, mitigation measures to address surface water runoff and drainage are proposed for this project as set out in Chapter 2, in the Surface Water Management Plan, and in the planning drawings which are primarily for the purposes of maintaining water quality but provide attenuation of flows in addition.

All access tracks will be constructed from aggregate which will allow a portion of rainfall to infiltrate and, therefore, reduce surface water runoff. Adjacent swales will also intercept and retain surface water runoff allowing this to disperse naturally via infiltration and evapotranspiration. Where swales are installed on sloped ground, check dam structures will be used within the channels to provide attenuation, allowing a portion of the flows to disperse naturally.

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.

Watercourse crossings will be designed and suitably sized to accommodate peak, or storm discharge rates so as not to cause risk of impeding flows during extreme storm events and causing flooding upstream of the crossing. All drain and watercourse crossings will be designed in accordance with the requirements of Regulation 50 of the European Communities (Assessment and Management of Flood Risks) Regulations 2010 SI 122 of 2010. The channel width will be maintained, and the crossings will be designed so as not to cause an impediment to the passage of woody debris or sediment transport. Appropriate freeboard will be provided to OPW requirements.

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.

The Flood Risk Assessment for the Proposed Development (Appendix 12.1) has identified that the Proposed Development will not result in a significant increase in flood risk to the locality. Additionally, the drainage design at the Site will ensure that there will be no increase in the risk of surface water runoff as a result of the windfarm development.

### 12.9.2 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 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 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 carried out within a timely manner.

### 12.9.3 Mitigation Measures for the Construction Stage

The mitigation measures prescribed are aimed at ensuring no deterioration in WFD status waterbodies within the catchments of the Project. Strict mitigation measures in relation to maintaining a high quality of surface water runoff from the Proposed Development will ensure that the status of surface waterbodies are not affected.

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)

Further environmental best practice measures to be used as key parts of the construction phase are outlined in more detail in the Construction Environmental Management Plan CEMP (Appendix 2.1, Volume III) and reproduced below for ease of reference.

### *Control of Accidental Spills and Leaks*

Regarding good practice associated with mitigating the risk of hydrocarbon release during construction, as stated in the SWMP, construction vehicles will be refuelled off-site, wherever possible. This will primarily be the case for road vehicles such as vans and trucks. Refuelling of mobile plant during construction will be carried out by mobile fuel tanks equipped with pressure relief valves, built-in vents, handles for easy transportation, pumps, hoses and meters to facilitate fuel transfer operations. Any additional fuel containers and for smaller equipment (such as generators, lights etc.) used on site will be positioned on appropriately sized plant nappy/bund and stored within additional secondary containment e.g. bund for static tanks or drip trays for smaller mobile containers. Taps/nozzles for fuels and storage containers for oils will be fitted with locks to ensure their use is controlled. Only designated trained and competent operatives will be authorised to refuel plant on site.

All tank and drum storage areas will, as a minimum, be bunded, either locally or remotely, to a volume not less than the greater of the following:

- 110% of the capacity of the largest tank or drum within the bunded area; or
- 25% of the aggregate volume of all other substance which could be stored within the bunded area.

The purpose of this requirement is to ensure that any potential leaks, spills, or other releases from tanks or drums are effectively contained within the bunded area, preventing any environmental contamination or harm. The bunded area acts as a secondary containment system, providing an additional layer of protection against accidental releases and facilitating proper clean-up and mitigation measures.

All plant and equipment will be in good working order, checked regularly and maintained when necessary and a maintenance log maintained.

Fuels, lubricants and hydraulic fluids will be carefully handled to avoid spillage, properly secured and provided with appropriate type of spill containment kits in case of incident.

All spill-kits will be inspected on a weekly basis by the EnCoW to ensure they are maintained as fit for purpose.

Welfare / hygiene facilities will be located within the construction compounds only.

All water from vehicle wheel washes will be removed from site and disposed of by a licensed waste carrier.

### *Control of Concrete Runoff*

Precast concrete will be used wherever possible for the structural elements of watercourse crossings (single span / piped crossings) as well as cable joint bays. However, ready mix and lean mix concrete will be required during the construction phase for piled turbine foundations, as blinding works for joint bay pits, culverts and cross drains, for concrete pads for bottomless culvert and clear span bridge foundations. On-site batching will not be permitted. Concrete will instead be transported to the Site by concrete truck.

The risk of concrete runoff from turbine foundation works areas will be minimal given that all turbine foundations are located a minimum of 50m from any watercourse. The potential effects associated with wet concrete being introduced below ground level in the form of piled foundations is dealt with in Chapter 11. Additionally, the formwork and site preparation works will contain the concrete in an enclosed, excavated area. For drain crossings requiring concrete works, these works will be carried out under dry works conditions, as discussed further below in relation to 'Works in or Adjacent to Waters'.

The acquisition, transport and use of concrete will be planned fully in advance of commencing works such that volumes are minimised, the route to and through the Site is predetermined so as to aim to avoid drains and watercourses and wash down areas are appropriately located. Additionally, all concrete works will be supervised at all times by the Developer's appointed Environmental / Ecological Clerk of Works.

No surplus concrete will be stored or deposited anywhere on site. Such material will be returned to the source location or disposed of off-site appropriately.

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 a minimum of 50m. This requirement will be communicated to all on-site personnel and to each concrete truck driver prior to entering into the works area. Washout areas / mortar bins will be sized such that they can withstand an unexpected heavy rainfall event without overtopping and they will be covered when not in use.

Concrete washing will be contained and managed. Waste concrete slurry, washings and supernatant will be allowed to settle/dry and will be taken to a licensed waste facility for disposal.

Any shuttering / formwork installed to contain the concrete during pouring will be installed to a high standard with minimal potential for leaks. Additional measures will be taken to ensure this, for example the use of plastic sheeting, foams or other sealing products at joints.

Pouring of concrete into standing water within excavations will not be undertaken. Excavations will be prepared before pouring of concrete by pumping standing water out of excavations to the treatment train and buffered surface water discharge systems in place. Where the isolated working area requires constant dewatering to maintain a dry works area, pumps will be turned off during the concrete pour and remain off until it can be ensured that the discharge will not result in a change in pH of +/-0.5 units for any nearby watercourse or drain. Alternatively, any dewatering from these areas during the concrete pour will be taken off site for disposal at a licensed waste facility for disposal. Once concrete has cured the pH of any water required to be dewatered will be checked and none of that water allowed to enter the environment unless it is back to within the normal baseline range of the local network.

Concrete works will be scheduled during dry weather conditions to reduce the elevated risk of runoff and will avoid foreseen sustained rainfall (any event longer than 4-hour duration) and/or any foreseen intense rainfall event (>3mm/hour) and will not proceed during any yellow (or worse) rainfall warning issued by Met Éireann.

It will be ensured that suitably sized covers are available for freshly poured concrete to avoid wash off in the event of rain.

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 consult CIRIA C532 to consider the most appropriate measure.

Spill kits will be readily available at the location of concrete works and will be appropriate for the containment and control of concrete spills and/or runoff.

The Community Water Officer for the Midlands and East Region, National Parks and Wildlife Services and Inland Fisheries Ireland will be notified immediately of any concrete spills / runoff into a 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 C of the CEMP (Appendix 2.1).

No permanent stockpile will remain on the site during the construction or operational phase of the Proposed Development. Excavated material will be either reused as fill / landscaping material within the Site or will be stored temporarily as stockpiles (in accordance with waste legislation) adjacent to the area of excavation and subsequently removed from the site as a byproduct or in accordance with waste legislation. Stockpiles will be covered with plastic sheeting.

The on-site cabling and grid connection will require excavation of cable trenches. All spoil from trenches in public roadways will be removed from Site as it is excavated and transported to a licenced waste facility. Road surfacing materials will be stored in a skip for recycling. Spoil from trenches cut into natural ground will be treated in a similar manner to spoil arising from excavations at turbine locations i.e. the material will be re-used on site in cut-and-fill works or for landscaping.

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.

Silt fences will be established downslope along the perimeter of source areas of contaminated runoff. Silt fences will be installed close to source (as opposed to close to receptor). Silt fences will be constructed using a permeable filter fabric (e.g. Hy Tex Terrastop Premium silt fence or similar) and not a mesh or terram. The base of the silt fence will be bedded at least 15- 30 cm into the ground. Once installed the silt fence will be inspected regularly, daily during the proposed works, weekly on completion of the works for at least one month, but particularly after heavy rains and periodically thereafter. The integrity of the silt fencing will be checked daily by the EnCoW and after poor weather conditions (rain or wind) and any failures rectified immediately. Any build-up of sediment along the fence will be removed as deemed necessary by the EnCoW and in accordance with manufacturers requirements. The silt fencing will be left in place until the works are completed (which includes removal of any temporary ground treatment). Silt fences will not be removed during heavy rainfall. The silt fence will not be pulled from the ground but cutaway at ground level and posts removed. A record of when it was installed, inspected and removed will be maintained by the EnCoW.

### *Works in or Adjacent to Waters*

In-stream works will be required at new culvert new bridge 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.

All in-stream works will be carried out under dry works conditions i.e. the works area will be isolated from the river/stream/drain flow by means of temporarily overpumping (in the case of the culverts) or fluming the flow (in the case of the clear-span bridge). The measures employed at the sheet piled floated road through Cloonbar Bog may be a combination of fluming and overpumping. Further construction details are presented in the Surface Water Management Plan.

The diversion of flow by overpumping / fluming will be into the same waterbody i.e. flows will not be diverted from one watercourse to another. The flume pipe and / or the pumps will be sized appropriate to watercourse flow and will have capacity to accommodate storm flows. Fluming is the preferred option for fishery watercourses and must be such that fish passage is maintained. Where overpumping is proposed, screening will be put in place to ensure that fish do not become entrained in the pump. Additionally, a gravel-lined sump will be provided to reduce sedimentation caused by pumping.

In order to create a dry works area, an upstream barrier will be installed using aquadam or sandbags (which will be double bagged and tied). Straw bales will not be permitted. Flows will either be overpumped or flumed downstream of the works area. A downstream barrier will then be installed and the works area dewatered. Direct dewatering into the watercourse will not be permitted as it will increase the risk of sedimentation. Instead dewatering will be via filter bag, sediment tank, filter mats or natural vegetation adjacent to the watercourse. Discharging of construction water (trade effluent) directly to surface waters will be subject to a water pollution licence. No extracted or pumped or treated construction water from the isolated construction area will be discharged directly to a drain or watercourse (This is in accordance with Local Government (Water Pollution) Act, 1977 as amended).

Any watercourses requiring a dry works area will require a fish salvage exercise which must firstly be authorised under Section 14 of the Fisheries (Consolidation) Act 1959. Fish salvage by electrofishing will not be carried out where water temperature exceeds 20ºC. Fish salvage operations can only be conducted by qualified ecologists under said licence. A detailed method statement will be required as part of the licence application. The work will have regard to the following general guidelines for electrical fishing include Beaumount et al., (2002) “Guidelines for Electric Fishing Best Practice” and Scottish Fisheries Coordination Centre (2007) “Electrofishing team leader training manual” and Central Fisheries Board (2008) Methods for the Water Framework Directive Electric Fishing in wadable reaches”.

No in-stream works will be carried out in any WFD mapped watercourse or associated riparian area during the salmonid spawning season (which is October to May inclusive).

If it is necessary to sling concrete in a skip/hopper for the works or to pump concrete into the works area, the pump and/or hopper/skip will be moved only within or above the isolated works area and will not be allowed to operate above the watercourse.

Provided the construction water within the isolation area is managed in accordance with the measures described above and in the Surface Water Management Plan, overpumping / fluming of the surface water features does not pose a significant risk to surface water quality downstream of the watercourse crossings.

The EnCoW / ECoW will monitor the pH, temperature, DO, turbidity and conductivity of the watercourse upstream and downstream of the isolated works area. The works will be immediately stopped and an investigation of cause carried out and mitigated in the event of the following:

- any change in pH +/-0.5 detected between upstream and downstream monitoring locations
- downstream turbidity exceed 28 NTU
- DO drops below 80% saturation

### *Horizontal Directional Drilling*

HDD will be employed at four locations along the grid connection route 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 will 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;
- 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.

## 12.9.4 Proposed Mitigation Measures for Operation and Maintenance Stage

The Surface Water Management Plan will ensure that there is no effect on water quality as a result of operation of the Proposed Development. The proposed drainage system will provide several stages of treatment to surface water runoff from constructed areas, which follows the concept of a multi-stage SuDS 'treatment train'.

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, the operational phase maintenance routine will involve the regular 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.

## 12.9.5 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. Silt protection procedures, similar to during construction (as described in Section 1.8.3) will be employed for decommissioning.

## 12.10 Residual Effects

### 12.10.1 Residual Effects during Construction Stage

Effects on hydrology and water quality will be mitigated with measures outlined in Section 1.8. This will ensure that the residual impacts of the construction stage are Not significant and there will be no perceivable impact on the Cushina River and the downstream Figile River, and Barrow SAC which is a highly sensitive receptor that is hydrologically connected to the Site. Furthermore, the Proposed Development will not result in the deterioration of the status of any waterbody under the WFD or jeopardise the achievement of waterbody objectives (good / high status) of any such waterbody.

### 12.10.2 Residual Effects during Operation and Maintenance Stage

The unmitigated potential effects during the operational phase of the site was not significant. Visual monitoring and water quality monitoring at appropriate intervals will be undertaken as precautionary measures to inform any required contingency mitigation measures during operation. The main risk to surface water is the release of hydrocarbons, such as fuel into surface waterbodies via runoff. The residual risk is Not Significant.

### 12.10.3 Residual Effects during Decommissioning Stage

The potential residual effects associated with decommissioning will be similar to those associated with construction but of reduced magnitude.

Turbine bases and hardstanding areas will be covered with soil to encourage vegetation growth and reduce run-off and sedimentation.

Mitigated with measures outlined in Section 1.8 will ensure that the residual impacts of the decommissioning stage are Not significant and there will be no perceivable effect on the Cushina and downstream water bodies.

## 12.11 Limitations or Technical Difficulties

No limitations or technical difficulties were encountered in the preparation of this chapter of the EIAR.

## 12.12 Conclusions

As a result of the design of the project and prevention and mitigation measures that will be adopted, there will be no significant adverse effect on the environment and on hydrology and water quality as a result of the proposed development on its own or in combination with other plans and projects.

As a result of the design of the project and the prevention and mitigation measures to be taken, the proposed development will not directly or indirectly alone or in combination with other projects , cause a deterioration in the status of any waters or impair the ability of any waters to meet the objectives of the Water Framework Directive or those set for them in the Water Action Plan 2024.

It will not cause or permit any direct or indirect discharge or entry of priority substances or priority hazardous substances or any toxic/dangerous substances to any waters. The proposed development will not adversely affect the integrity of any European or protected site or NHA, pNHA in view of its water related conservation objectives and will not impair the objectives for any protected site and will comply with all relevant standards and will comply with Priority Pathway Action Plans (PPAP) relating to invasive species and soils and spoil when appropriate. The spread of invasive species will be prevented by testing of imported material as detailed in Chapter 11 – Soils, Geology and Hydrogeology. The onsite wheelwash will prevent the spread of invasive species from site to other lands.

The design of the proposed Directive therefore complies with the objectives of the WFD.

The proposed development will also lead to an overall improvement in the status of waters by the provision of wetland drains in accordance with the measures detailed in the BEMP and ensuring better monitoring of waters by the project ecologist.

Note: this is an assessment of the project in the light of the Water Framework Directive.

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# Appendix 12

# EIAR Chapter 11 -Soils, Geology and Hydrogeology

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

## Volume 2 - Main EIAR

## Chapter 11 - Soils, Geology and Hydrogeology

**Prepared for:**

**Dara Energy Limited**

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# 11. SOILS, GEOLOGY AND HYDROGEOLOGY

## 11.1 Introduction

This chapter has been prepared to examine the likely effects of the proposed Derrynadarragh Wind Farm, associated grid connection and turbine delivery route on existing geological and hydrogeological conditions within the study area. The study area is defined as the 'Site', as well as a one-kilometre corridor along either side of the Grid Connection (both defined below). The primary focus of this chapter is on the Site which has the most potential to impact the underlying geological and hydrogeological receptors. The GCR is also to be assessed, however their interaction with geological and hydrogeological receptors can be considered far less impactful as the works are proposed along existing roads and will require only minor excavation / accommodation works. The likely effects of the Project are assessed, taking account of mitigation measures to reduce or eliminate any residual effects on Soils, Geology and Hydrogeology. The assessment also considers the cumulative effects of the project together with other plans and projects.

This chapter initially provides a description of the receiving environment of the site and the likely significant impacts of the development. When assessing the likely significant impacts, this assessment considers the significance of the environmental attributes, and the predicted scale, and duration of the likely effects.

A detailed description of the project assessed in this EIAR is provided in Chapter 2 and is comprised of three main 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 Development includes 9 no. wind turbines with a total height of 187 m with an underground cable connecting the 9 no. turbine wind farm development to the on-site substation, internal access tracks, hard standings, internal electrical and communications cabling, temporary construction compound and all associated works related to the construction of the proposed wind farm.

A detailed description of the project assessed in this EIAR is provided in Chapter 2.

## 11.2 Statement of Authority

This Chapter has been prepared by EurGeol Emily Archer PGeo of Fehily Timoney and Company.

Emily is a Chartered Senior Project Geotechnical Engineer with a BSc in Geology from University College Cork and an MSc in Applied Environmental Geoscience from University College Cork. She is a professional member of the Institute of Geologists of Ireland (PGeo) and the European Federation of Geologists (EurGeol). Emily has 7 years of post-graduate experience working in the fields of geoscience and ground engineering. She has experience working on renewable energy projects within the Irish market, preparing Soils, Geology and Hydrogeology EIAR chapters for wind farms sites.

Technical review of this chapter and supporting appendices has been completed by the following:

Tom Clayton MEng. (Distinction) Civil Engineering - a Chartered Engineer with 15 years of experience within the geotechnical sector with excellent skills in analytical design (including finite element analysis).Tom has expertise in transport geotechnics (for road, rail, underground rail schemes, active travel and greenway schemes), deep excavations and shafts (primarily in the Middle East and London) and Energy Geotechnics (both for solar and wind farms). Tom also specialises in earthwork stabilisation and has worked in asset management and design consultancy roles for both highways and rail projects.

Ian Higgins BSC. Engineering Geology, MSc. Geotechnical Engineering – a geotechnical engineer with 25 years' experience in the design and supervision of construction of bulk earthworks, soft ground engineering, geotechnical foundation design, geotechnical monitoring and reviewing, reinforced earth design and 3rd party checking of piling and ground improvement designs. Ian's experience also includes the design, supervision and interpretation of ground investigations, including desk studies, walkover surveys, hazard mapping of rock excavations and slopes. Ian has acted as reviewer for multiple wind energy EIARs.

## 11.3 Methodology

In summary the methodology adopted for this assessment includes:

- Review of appropriate guidance and legislation;
- Characterisation of the receiving environment;
- Review of the proposed project;
- Assessment of potential effects;
- Identification of mitigation measures;
- Assessment of cumulative impacts; and
- Assessment of residual impacts.

The assessment methodology and criteria are outlined in Section 11.3.4.

### 11.3.1 Relevant Guidance

The main EIA guidelines are listed in Chapter 1, other topic specific reference documents used in the preparation of this section include the following:

- NRA (2009), Guidelines on Procedures for Assessment and Treatment of Geology, Hydrology and Hydrogeology for National Road Schemes;
- IGI (2013), Guidelines for the Preparation of Soils, Geology and Hydrogeology Chapters of Environmental Impact Statements;
- Scottish Executive (2017) Peat Landslide Hazard and Risk Assessments: Best Practice Guide for Proposed Electricity Generation Developments, 2nd Edition;[1]
- EPA (2003), Towards Setting Guideline Values for the Protection of Groundwater in Ireland.
- EPA (2022), Guidelines on the Information to be Contained in Environmental Impact Assessment Reports;
- Irish Wind Energy Association (IWEA) (2012), Best Practice Guidelines for the Irish Wind Energy Industry.

[1] This guidance document represents the current standard used in Ireland for peatland sites.

### 11.3.2 Relevant Legislation

The general EIA legislation are listed in Chapter 1, all relevant Irish and EU legislation has been complied with in the preparation of this section.

### 11.3.3 Consultation

The scope for this assessment has been informed by consultation with statutory consultees, bodies with environmental responsibility and other interested parties as summarised in Chapter 5 – Scoping, Consultation and Key Issues. Responses from the consultees identified a range of observations which have been taken into consideration in the preparation of the respective chapters of this EIAR. Specific issues raised during the scoping process with respect to Soils, Geology and Hydrogeology are presented in Table 11-1:

**Table 11-1: Consultation Responses**

| Consultee | Response Date | Responses / Issues Raised |
|---|---|---|
| Geological Survey Ireland (GSI) | January 2025 | Consider all appropriate guidelines, and data sources. Use of GSI data or maps should be attributed correctly. |

### 11.3.4 Impact Appraisal Methodology

As outlined in Section 11.1, this chapter identifies the potential impacts of the construction, operation and decommissioning of the proposed Project on the existing Soils, Geology and Hydrogeology of the study area. The assessment also identifies appropriate mitigation measures to minimise any likely significant effects.

The following elements were examined to determine the potential impacts of the Project on the Soils, Geology and Hydrogeology within the study area:

- Characterisation of the soils, geology and hydrogeology of the study area;
- Evaluation of the potential impacts of the Project.

The baseline geological and hydrogeological conditions within the study area were determined following a desktop review of publicly available information. This review was undertaken in March 2023. In addition to the desktop assessment, a site reconnaissance and follow-on peat probing survey were undertaken in May 2023 and September 2024, respectively. The site reconnaissance and peat probing survey was undertaken by an FT Senior Project Geotechnical Engineer (Emily Archer BSc. MSc.) and an FT Senior Project Engineer (Alan Whelan BEng).

The resulting data from these surveys are discussed in Section 11.4.9 of this Chapter. An intrusive ground investigation comprising trial pits was undertaken by Ground Investigations Ireland Ltd. (GII) in April 2025. The results from these surveys are presented in Appendix 11-1. A summary of the intrusive ground investigation findings is presented in Sections 11.4.10 of this Chapter.

Following the assessment of the existing environment, the unmitigated impacts of the Project during the construction, operational and decommissioning phases on sensitive receptors identified were determined. As part of the cumulative impact assessment, large scale developments within 20km of the Site were assessed. The evaluation of the significance of the impacts was undertaken in accordance with the IGI guidance (2013).

Where likely significant impacts were identified, mitigation measures are proposed in respect of negative impacts and will be implemented to minimise adverse effects on the environment. The residual effects from the Project were then re-appraised considering the mitigation measures as outlined in Section 11.7. The residual effects from the Project are presented in Section 11.8 of this chapter.

### 11.3.5 Evaluation Criteria

During each phase (construction, operation and maintenance, and decommissioning) of the Project, several activities will take place on Site, some of which will have the potential to cause effects on the geological regime at the proposed Site and the associated Soils, Geology and Hydrogeology. These potential effects are discussed throughout this chapter. Mitigation measures where required are presented in Section 11.7.

#### *11.3.5.1 Assessment of Magnitude and Significance of Impact on Soils, Geology and Hydrogeology*

An impact rating has been developed for each of the phases of the Project based on the Institute for Geologists Ireland (IGI) "Guidance for the Preparation of Soils, Geology and Hydrogeology Chapters of Environmental Impact Statements". In line with the IGI Guidance, the receiving environment (Geological Features) was first identified.

Using the NRA rating criteria in Appendix C of the IGI Guidance, the importance of the geological and hydrogeological features are rated (Table 11-2 and Table 11-3) followed by an estimation of the magnitude of the impacts on geological and hydrogeological features (Table 11-4 and Table 11-5).

This determines the significance of the impact prior to application of mitigation measures as set out in Table 11-6.

**Table 11-2: Criteria for Rating Site Importance of Geological Features (NRA, 2009)**

| Magnitude | Criteria | Typical Example |
|---|---|---|
| Very High | Attribute has a high quality, significance or value on a regional or national scale. Degree or extent of soil contamination is significant on a national or regional scale. Volume of peat and/or soft organic soil underlying the site is significant on a national or regional scale. | • Geological feature on a regional or national scale (NHA);<br>• Large existing quarry or pit;<br>• Proven economically extractable mineral resource. |
| High | Attribute has a high quality, significance or value on a local scale. Degree or extent of soil contamination is significant on a local scale.<br>Volume of peat and/or soft organic soil underlying the site is significant on a local scale. | • Contaminated soil on site with previous heavy industrial usage;<br>• Large recent landfill site for mixed wastes;<br>• Geological feature of high value on a local scale (County Geological Site);<br>• Well drained and/or high fertility soils;<br>• Moderately sized existing quarry or pit;<br>• Marginally economic extractable mineral resource. |

| Magnitude | Criteria | Typical Example |
|---|---|---|
| Medium | Attribute has a medium quality, significance or value on a local scale.<br>Degree or extent of soil contamination is moderate on a local scale. Volume of peat and/or soft organic soil underlying the site is moderate on a local scale. | • Contaminated soil on site with previous light industrial usage;<br>• Small recent landfill site for mixed wastes;<br>• Moderately drained and/or moderate fertility soils;<br>• Small existing quarry or pit;<br>• Sub- economic extractable mineral resource. |
| Low | Attribute has a low quality, significance or value on a local scale. Degree or extent of soil contamination is minor on a local scale. Volume of peat and/or soft organic soil underlying the site is small on a local scale. | • Large historical and/or recent site for construction and demolition wastes;<br>• Small historical and/or recent landfill site for construction and demolition wastes;<br>• Poorly drained and/or low fertility soils;<br>• Uneconomic extractable mineral resource. |

**Table 11-3: Criteria for Rating Site Importance of Hydrogeological Features (NRA, 2009)**

| Importance | Criteria | Typical Example |
|---|---|---|
| Extremely High | Attribute has a high quality or value on an international scale. | Groundwater supports river, wetland or surface water body ecosystem protected by EU legislation e.g. SAC or SPA status |
| Very High | Attribute has a high quality or value on a regional or national scale. | Regionally Important Aquifer with multiple wellfields. Groundwater supports river, wetland or surface water body ecosystem protected by national legislation – e.g. NHA status.<br>Regionally important potable water source supplying >2500 homes Inner source protection area for regionally important water source. |
| High | Attribute has a high quality or value on a local scale. | Regionally Important Aquifer.<br>Groundwater provides large proportion of baseflow to local rivers.<br>Locally important potable water source supplying >1000 homes. Outer source protection area for regionally important water source. Inner source protection area for locally important water source. |
| Medium | Attribute has a medium quality or value on a local scale. | Locally Important Aquifer<br>Potable water source supplying >50 homes.<br>Outer source protection area for locally important water source. |
| Low | Attribute has a low quality or value on a local scale. | Poor Bedrock Aquifer.<br>Potable water source supplying <50 homes. |

**Table 11-4: Estimation of Magnitude of Impact on Geological Features (NRA, 2009)**

| Magnitude | Criteria | Typical Example |
|---|---|---|
| Large Adverse | Results in loss of attribute | • Loss of high proportion of future quarry or pit reserves<br>• Irreversible loss of high proportion of local high fertility soils<br>• Removal of entirety of geological heritage feature<br>• Requirement to excavate / remediate entire waste site<br>• Requirement to excavate and replace high proportion of peat, organic soils and/or soft mineral soils beneath alignment |
| Moderate Adverse | Results in impact on integrity of attribute or loss of part of attribute | • Loss of moderate proportion of future quarry or pit reserves<br>• Removal of part of geological heritage feature<br>• Irreversible loss of moderate proportion of local high fertility soils<br>• Requirement to excavate / remediate significant proportion of waste site<br>• Requirement to excavate and replace moderate proportion of peat, organic soils and/or soft mineral soils beneath alignment |
| Small Adverse | Results in minor impact on integrity of attribute or loss of small part of attribute | • Loss of small proportion of future quarry or pit reserves<br>• Removal of small part of geological heritage feature<br>• Irreversible loss of small proportion of local high fertility soils and/or<br>• high proportion of local low fertility soils<br>• Requirement to excavate / remediate small proportion of waste site<br>• Requirement to excavate and replace small proportion of peat, organic soils and/or soft mineral soils beneath alignment |
| Negligible | Results in an impact on attribute but of insufficient magnitude to affect either use or integrity | No measurable changes in attributes |
| Minor Beneficial | Results in minor improvement of attribute quality | Minor enhancement of geological heritage feature |
| Moderate Beneficial | Results in moderate improvement of attribute quality | Moderate enhancement of geological heritage feature |

| Magnitude | Criteria | Typical Example |
|---|---|---|
| Major Beneficial | Results in major improvement of attribute quality | Major enhancement of geological heritage feature |

**Table 11-5: Estimation of Magnitude of Impact on Hydrogeological Features (NRA, 2009)**

| Magnitude | Criteria | Typical Example |
|---|---|---|
| Large Adverse | Results in loss of attribute and /or quality and integrity of attribute | Removal of large proportion of aquifer.<br>Changes to aquifer or unsaturated zone resulting in extensive change to existing water supply springs and wells, river baseflow or ecosystems.<br>Potential high risk of pollution to groundwater from routine run-off. Calculated risk of serious pollution incident >2% annually. |
| Moderate Adverse | Results in impact on integrity of attribute or loss of part of attribute | Removal of moderate proportion of aquifer.<br>Changes to aquifer or unsaturated zone resulting in moderate change to existing water supply springs and wells, river baseflow or ecosystems.<br>Potential medium risk of pollution to groundwater from routine run-off.<br>Calculated risk of serious pollution incident >1% annually. |
| Small Adverse | Results in minor impact on integrity of attribute or loss of small part of attribute | Removal of small proportion of aquifer.<br>Changes to aquifer or unsaturated zone resulting in minor change to water supply springs and wells, river baseflow or ecosystems.<br>Potential low risk of pollution to groundwater from routine run-off. Calculated risk of serious pollution incident >0.5% annually. |
| Negligible | Results in an impact on attribute but of insufficient magnitude to affect either use or integrity | Calculated risk of serious pollution incident <0.5% annually. |

The matrix in Table 11-6 determines the significance of the impacts based on the importance and magnitude of the impacts as determined by Table 11-2 to Table 11-5 .

**Table 11-6: Ratings of Significance of Impacts for Geology/Hydrogeology (NRA, 2009)**

| Importance of Attribute | Magnitude of Impact | | | |
|---|---|---|---|---|
| | Negligible | Small Adverse | Moderate Adverse | Large Adverse |
| Very High | Imperceptible | Significant/Moderate | Profound/Significant | Profound |
| High | Imperceptible | Moderate/Slight | Significant/Moderate | Profound/Significant |
| Medium | Imperceptible | Slight | Moderate | Significant |
| Low | Imperceptible | Imperceptible | Slight | Slight/Moderate |

The determination of the significance of each impact for the Site and GCR are discussed in Section 9.6.

### 11.3.6 Desk Study

Prior to undertaking the site walkovers and intrusive site investigations, a desk study was undertaken to determine the baseline conditions within the study area to provide relevant background information. The desk top study involved an examination of the following sources of information:

- Geology of Offaly
- Kildare County Development Plans 2023-2029
- Offaly County Development Plan 2021 – 2027
- Laois County Development Plan 2021 - 2027
- Aerial imagery from Google, Bing and OSi (Geohive)
- Current and historical (6 inch and 25 inch) Ordnance Survey maps
- Mapping data of the area produced by the Geological Survey of Ireland (GSI)
    - *Quaternary subsoil geology*
    - *100k bedrock geology*
    - *Karst features*
    - *Geological heritage features*
    - *Aggregate potential*
    - *Landslide susceptibility*
    - *Catchment & Management Units*
    - *Groundwater Bodies Status and Risk*
    - *Drinking Water Protection Areas*
    - *Groundwater Resources (Aquifers)*
    - *Groundwater Wells and Springs*
    - *Groundwater Vulnerability*
- Teagasc soil and subsoil database
- Datasets from the EPA

### 11.3.7 Site Investigations and Field Assessments

A Site reconnaissance and follow-on peat probing survey were undertaken in January and May 2023 and an additional peat probing survey was carried out in January 2025. The site reconnaissance and peat probing survey was undertaken by an FT Senior Project Geotechnical Engineer (EurGeol Emily Archer PGeo, BSc., MSc.) and an FT Senior Project Engineer (Alan Whelan, BEng). The purpose of these surveys was to determine the baseline characteristics of the Site.

The assessment works undertaken comprised the following:

- Walkover inspections of the Site with recording of salient geomorphological features at proposed infrastructure locations.
- Peat depth probing and slope stability assessment at proposed infrastructure locations and where peat deposits were encountered.

The intrusive ground investigation was undertaken by Ground Investigations Ireland (GII) in April 2025. The investigation comprised:

- 12 no. trial pits
- Geotechnical and geo-environmental testing

The intrusive ground investigation works were supervised by FT's Senior Project Geotechnical Engineer, Julian Borlado and GII's Chartered Senior Engineering Geologist, James Cashen (BSc, EurGeol, PGeo).

GII's Factual Report, including exploratory hole logs, is included in Appendix 11-1.

## 11.4 Receiving Environment

### 11.4.1 General

The existing environment is described hereunder. This includes descriptions of the underlying quaternary and bedrock geology, areas of geological heritage, areas of economic interest with respect to geological resources, potential for soil contamination, aquifer classification, groundwater vulnerability and groundwater wells and springs. This section also includes a summary of site-specific information obtained during walkover surveys undertaken as part of the baseline assessment works. The following sections form the basis of a Conceptual Site Model (CSM), detailing the interactions between the different receiving geological and hydrogeological receptors.

### 11.4.2 Type of Geological/Hydrogeological Environment

Based on regional and site-specific information available the type of geological/hydrogeological environment as per Figure 2 of the IGI Guidelines is **Type D – Sensitive Geological / Hydrogeological Environments**.

### 11.4.3 Rating of Significance of Geological and Hydrogeological Attributes

Based on the TII (previously NRA) methodology (2009), criteria for rating site importance of geological features, the importance of the bedrock and soil features at this site is rated as 'Low Importance' due to local geological attribute has a low quality, significance or value on a local scale.

Based on the TII methodology (2009) the importance of the hydrogeological features at this site is rated as 'medium importance' based on the assessment that the attribute has a medium quality significance or value on a local scale. The aquifer is a locally important aquifer and is not widely used for public water supply or generally for potable use.

### 11.4.4 Quaternary Deposits

The GSI Quaternary mapping indicates the Site is predominantly underlain by a mantle of cut over raised peat (peat). The remaining areas of the Site are underlain by lake marl. In general, the Quaternary deposits across the Site can be categorised as being poorly drained.

The Quaternary geology of the proposed project and surrounding area is presented in Figure 11.1 in Appendix 4. Mapping shows the turbines and hardstands are underlain by the following Quaternary deposits:

- Cut over raised peat at turbines **2, 3, 4, 5, 6 and 7.**
- Lake marl at turbines **1, 8 and 9.**

### 11.4.5 Bedrock Geology

The GSI 1:100,000 scale bedrock mapping indicates the Site is entirely underlain by lower Carboniferous limestone. The Site is fully underlain by the Lucan Formation comprising dark grey-black, fine-grained limestone interbedded with shaly limestones and shales, known as 'calp'.

The Bedrock geology is presented in Figure 11.2 in Appendix 4

### 11.4.6 Hydrogeology

#### *11.4.6.1 Aquifer Classification*

Groundwater mapping (Figure 11.6 in Appendix 4) indicates that the entire Site is underlain by a Locally Important Aquifer – Moderately productive bedrock in local zones. The Site lies within the Cushina Groundwater Body (GWB) which is presented in Figure 11.4 in Appendix 4.

The description of the GWB's within the study area have been taken from the 'Summary of Initial Characterisation' reports for each defined GWB published by the GSI in accordance with the Groundwater Working Group Publication: Guidance Document GW2 (2003). The GWB Characterisation Reports are available from the GSI Public Data Viewer. Site specific data including depth to bedrock and subsoil type encountered during intrusive investigations have been used to supplement and validate the published information.

Table 11-7 presents a summary of the aquifer classification and characteristics underlying the study areas.

**Table 11-7: Summary of Aquifer Classification and Characteristics**

| Aquifer Name | Groundwater Body (GWB) | GSI Aquifer Classification | Transmissivity ($m^2$/day) | Well Yields | Location |
|---|---|---|---|---|---|
| Unnamed | Cushina | Locally Important Aquifer – bedrock which is moderately productive in local zones | 20-500 | Moderate | All of site |

#### *11.4.6.2 Groundwater Wells and Resource Protection Zones*

There are several wells recorded by the GSI within 500 m of the site. Based on GSI mapping, there is an accuracy of 100 to 1000 m for the well locations. The available details of these wells are summarised below in Table 11-8. There may also be additional wells in nearby houses that are not included in the GSI dataset. The groundwater wells are presented in Figure 11.6 in Appendix 4

**Table 11-8: Summary of Wells near the Site Area**

| Well ID | Grid Co-Ordinates (ING from GSI) | Well Type | Well Use | Total Depth (m) | Depth to Bedrock (m) | Yield ($m^3$/day) | Yield Class |
|---|---|---|---|---|---|---|---|
| 2321SEW021 | E: 257360<br>N: 217370 | Borehole | Domestic use only | 13.4 | 12.2 | 32.7 | Poor |
| 2321SEW022 | E: 257360<br>N: 217250 | Borehole | Public Supply | 28.6 | 3.2 | 3.9 | Poor |
| 2621SWW001 | E: 260650<br>N: 217150 | Borehole | Industrial | 54.9 | 8.2 | 163.5 | Good |
| 2321SEW016 | E: 259200<br>N: 213500 | Borehole | Domestic use only | 15.2 | 6.1 | 32.7 | Poor |

There are no Groundwater Protection Areas located within 10km of the site (Figure 11.5 in Appendix 4).

### 11.4.7 Karst Features

The GSI groundwater karst mapping (Figure 11.7 in Appendix 4) indicates there are no karst features identified within the site boundary and within 5km of the site. The closest karst features are 3 no. boreholes located approximately 8km south-west of the site.

### 11.4.8 Flood Risk

According to Flood Info interactive map viewer, there is a risk associated with fluvial flooding within the site, around the Cushina River. The CFRAMS flood extents extend through the east of the site for a “Medium” probability (1 in 100 year) event.

The nearest flood occurrence took place at Bracknagh, on the River Figile, approximately 1 km north east of the site. A flood risk assessment has been undertaken as part of this submission and is included in Appendix 12-1 of this EIAR.

### 11.4.9 Groundwater Vulnerability

Groundwater vulnerability, as defined by the GSI, is the term used to represent the intrinsic geological and hydrogeological characteristics that determine the ease of which groundwater could be contaminated by human activities. The vulnerability of an aquifer to contamination is influenced by the leaching characteristics of the topsoil, the permeability and thickness of the subsoil, the presence of an unsaturated zone, the type of aquifer, and the amount and form of recharge (the hydraulic process where water moved downward from surface water to groundwater).

Groundwater vulnerability is determined mainly according to the thickness and permeability of the subsoil that underlies the topsoil, as both properties strongly influence the travel times and attenuation process of contaminants that could be released into the subsurface from below the topsoil.

The groundwater vulnerability is variable across the site and ranges from 'Low' to 'Moderate' as classed by the GSI (Figure 11.3 in Appendix 4).

The groundwater vulnerability for the site area is presented in Table 11-9. This table outlines the standard ratings of vulnerability used by the GSI, with existing site conditions highlighted based on the findings of the site investigation.

**Table 11-9: Groundwater Vulnerability Rating Matrix**

| Vulnerability Rating | Hydrogeological Conditions | | |
|---|---|---|---|
| | Subsoil Permeability (Type) and Thickness | | |
| | High Permeability (sand/gravel) | Moderate Permeability (sandy soil) | Low Permeability (clayey subsoil, clay, peat) |
| Extreme (E) | 0 – 3.0 m | 0 – 3.0 m | 0 – 3.0 m |
| High (H) | > 3.0 m | 3.0 – 10.0m | 3.0 – 5.0 m |
| Moderate (M) | N/A | > 10.0 m | **5.0 – 10.0 m** |
| Low (L) | N/A | N/A | **> 10.0 m** |

Notes: 1. N/A = not applicable.
2. Precise permeability values cannot be given at present.

### 11.4.10 Geological Heritage

The GSI's online Geological Heritage database indicates there are no audited or unaudited Geological Heritage Sites (GHSs) within the Site or along the GC. The closest GHSs are located approximately 6km to the north of the site (Clonkeen Mushroom Rock – An isolated upstanding rock in a grass field).

The TDR crosses through the Kilcormac Esker, just south of Ballinagar, Co. Offaly and crosses the Ballyduff and Clonmacnoise Eskers along the N52.

The distribution of Geological Heritage Sites is shown on Figure 11.8 in Appendix 4.

### 11.4.11 Economic Geology

The GSI Online Minerals Database accessed via the Public Data Viewer shows no quarries (active or historic) within 5km of the Site. Two mineral occurrences of calcite occur approximately 6km south of the Site. The distribution of these sites are presented in Figure 11.9 in Appendix 4.

The GSI Aggregates database indicates that there is a very low to low potential for crushed rock aggregate across the Site (Figure 11.10 in Appendix 4). There is generally a low potential for granular aggregate but only in localised areas to the east and across the centre of the Site (Figure 11.11 in Appendix 4).

No bedrock outcrops are mapped by the GSI within the Site. Similarly, no bedrock outcrops were observed during the site surveys.

### 11.4.12 Walkover Survey Findings

A peat probe survey was undertaken during January and May 2023 and an additional peat probing survey was carried out in January 2025. The survey work was completed by FT Senior Project Geotechnical Engineer Emily Archer (EurGeol, PGeo, BSc, MSc) who has over 7 years' professional experience and FT Senior Project Engineer Alan Whelan (BEng) who has over 6 years' professional experience. Findings from the peat probe survey indicates that peat occurs across the majority of the site, however it is predominantly shallow. The minimum, maximum and mean peat depth recorded out of 354 peat probe locations were 0.1m, 4.2m and 1m respectively. Approximately 94% of peat depths recorded as part of the peat probe survey were less than 2m.

A summary of the peat probe depths at the key infrastructure locations is presented in Table 11-10.

**Table 11-10: Summary of site walkover findings at key infrastructure locations.**

| Infrastructure Element | Easting | Northing | Peat Depth (m) | Slope (°) Note 1 |
|---|---|---|---|---|
| T01 | 659937 | 714994 | 0.5 – 0.8 | 2 |
| T02 | 658662 | 716607 | 2 – 2.5 | 2 |
| T03 | 659623 | 716518 | 0.4 – 0.6 | 2 |
| T04 | 659622 | 715347 | 1 – 1.6 | 2 |
| T05 | 659128 | 716060 | 2.4 – 3.1 | 2 |
| T06 | 658384 | 715670 | 0.4 – 0.9 | 2 |
| T07 | 659268 | 715518 | 0.2 – 0.4 | 2 |
| T08 | 659680 | 715968 | 0.2 – 0.3 | 2 |
| T09 | 660136 | 715709 | 0.1 – 0.3 | 2 |
| Construction Compound | 658226 | 716272 | 0.8 – 1.2 | 3 |
| On-Site Substation | 658367 | 716134 | 0.2 – 0.5 | 2 |
| Note 1 – slope angles measured using a Suunto PM-5/360PC clinometer. | | | | |

Photographs taken during the site walkover survey are presented in Appendix 11-2.

### 11.4.13 Intrusive Ground Investigation Findings

The detailed findings and conclusions of the intrusive ground investigation is provided in Appendix 1 and generally confirm the anticipated geology described in the Desk Study.

Trial pits were excavated at the turbine, construction compound and substation locations. A summary of ground and groundwater conditions encountered during the intrusive ground investigation are presented in Table 11-11.

**Table 11-11: Summary of ground and groundwater conditions within the trial pits**

| Hole ID | Peat | | Soft to firm Clay / Silt | | Coarse-Grained Till | | Groundwater Strike (mbgl) | Infrastructure Element Tested |
|---|---|---|---|---|---|---|---|---|
| | From (mbgl) | To (mbgl) | From (mbgl) | To (mbgl) | From (mbgl) | To (mbgl) | | |
| TP01 | 0.00 | 0.70 | 0.70 | 4.10 | | | 1.40 and 3.00 | T01 |
| TP02 | 0.00 | 1.90 | 1.90 | 3.80 | | | 3.80 | T02 |
| TP03 | 0.00 | 0.90 | 0.90 | 4.30 | | | 4.20 | T03 |
| TP04 | 0.00 | 0.40 | 0.40 | 4.20 | | | 0.80 | T04 |
| TP05 | 0.00 | 1.00 | 1.00 | 4.30 | | | | T05 |
| TP06 | 0.00 | 0.50 | 0.50 | 4.20 | | | 3.30 | T06 |
| TP07 | 0.00 | 1.10 | 1.10 | 4.10 | | | | T07 |
| TP08 | | | 0.00 | 4.30 | | | 3.50 | T08 |
| TP09 | | | 0.00 | 4.20 | | | 1.50 | T09 |
| TP10 | 0.00 | 1.80 | 1.80 | 2.80 | 2.80 | 3.30 | 2.90 | Construction Compound |
| TP11 | 0.00 | 0.60 | 0.60 | 3.50 | | | | Substation |
| TP12 | 0.00 | 1.10 | 1.10 | 3.50 | | | 0.90 | Substation |

Key findings from the trial pitting are presented below:

- No bedrock was met during the excavation of the trial pits.
- A maximum peat depth of 1.90m bgl was encountered at turbine T02.
- The most dominant strata type recorded was fine-grained (cohesive) till, which was encountered in all 12 no. trial pits.
- Coarse-grained till was encountered in 1 no. trial pit (TP10).
- Groundwater strikes (typically described as seepages) were recorded in 9 no. trial pits at depths ranging from 0.80 to 4.20m bgl.

### 11.4.14 Existing Slope Stability

During the Site walkovers a series of hand-held probes were undertaken to determine the presence/depth of peat and/or soft soils within the Site.

A summary of the general topography and slopes at the Site are presented below.

#### *11.4.14.1 Slope Stability Assessment*

From a review of the GSI Landslide Susceptibility database, the Project and proposed infrastructure locations are within an area mapped as having a 'Low' landslide susceptibility. In addition, desktop review of available aerial photography and site reconnaissance findings did not identify evidence of slope instability and there are no historical records of landslide activity within 5km of the Site on the GSI database. A summary of the GSI landslide susceptibility with respect to the Project is provided in Figure 11.12 in Appendix 4.

Considering the above, it is therefore considered that the risk of landslide within the Site is negligible and insignificant .

#### *11.4.14.2 Peat Stability Assessment*

Following the Site walkover and given the presence of peat deposits within the Site, a review of the published checklist for peat landslide hazard and risk assessment was carried out. This was undertaken in accordance with the following best practice guidance: Scottish Executive – Peat Landslide Hazard and Risk Assessments (2017).

The potential for a landslide risk is defined in the Scottish Executive "Peat Landslide Hazard and Risk Assessments, Best Practice Guide for Proposed Electricity Generation Developments" (2017) as the following:

- *Peat is present at the development Site in excess of 0.5 m depth, and;*
- *There is evidence of current or historical landslide activity at the Site, or;*
- *Slopes > 2° are present on-Site, or;*
- *The works will impinge on the peat covered areas and cannot be relocated to avoid peat covered areas.*

A peat survey was carried out by an FT Senior Project Engineer (Emily Archer MSc.) during January and May 2023 and an additional peat probing survey was carried out in January 2025. Peat depths were taken using a handheld Van Walt peat probe at handheld turbine and associated infrastructure locations. The minimum, maximum and mean peat depth recorded out of 354 peat probe locations were 0.1m, 4.2m and 1m respectively. Approximately 94% of peat depths recorded as part of the peat probe survey were less than 2m.

As such and in accordance with the Scottish Executive Best Practice Guide for Proposed Electricity Generation Developments (2017), as the works will impinge on the peat covered areas and cannot be relocated to avoid peat covered areas, and peat depth are in excess of 0.5m bgl, a peat stability assessment was warranted.

A geotechnical assessment has been undertaken using findings from the site walkover surveys and intrusive ground investigations and is presented in Appendix 2 – Peat Stability and Geotechnical Assessment Report. The analyses returned Factor of Safety Results of >1.3 for all infrastructure elements assessed, indicating the risk of peat landslide is insignificant / negligible.

### 11.4.15 Soil Contamination

There are no known areas of soil contamination on the Site. No evidence of soil contamination was noted during Site walkovers or during the intrusive ground investigation. A review of existing aerial photography and historic ordnance mapping show no indication of potential contamination from historic land use. Mapping indicates that the Site is located within an area where no historic industrial land uses were observed.

## 11.5 Characteristics of the Proposed Project

The proposed project will involve the removal of topsoil, peat and overburden for the construction of turbine foundations, hardstands, substation, temporary construction compounds, cable route and access roads.

Aggregate for construction of these access roads and hardstands will be imported to the Site.

Estimated volumes of overburden (peat and spoil) and bedrock to be removed are shown in Table 11-12 and Table 11-13 respectively. Excavated soil will be placed in designated spoil deposition areas, be used for reinstatement and landscaping works around the Site, as well as being used to improve the access roads.

**Table 11-12: Estimated excavation volumes of Peat and Spoil**

| Infrastructure Element [(1)] | Proposed Dimensions | Peat Volume ($m^3$) [(2)] | Spoil (non-peat) Volume ($m^3$) [(2)] | Comment |
|---|---|---|---|---|
| 9 no. Turbines and Hardstands | 27m diameter excavation footprint (25m wide base with 1m of working space around the perimeter of the base) for turbine foundation with 80 x 33.5m hardstand area. | 30,449 | 18,921 | Hardstanding area and foundation footprint |
| Access Roads | Assumed 5m running surface with 6m wide development footprint. | 13,776 | 9,184 | |
| Substation | Hardstanding area of 140 x 85m. | 2,881 | 2881 | |
| Temporary Construction Compounds (x2) | Footprint of 70 x 40m for both | 4313 | 5176 | |
| GCR | The route will run through 9.1 km of existing public road, 0.3km in existing tracks and 2km in new access tracks on the wind farm site. | 3450 | | Details provided by client. The Peat depths along the road and tracks were determined following a Ground penetration radar survey of the route. |

| Infrastructure Element [1] | Proposed Dimensions | Peat Volume ($m^3$) [2] | Spoil (non-peat) Volume ($m^3$) [2] | Comment |
|---|---|---|---|---|
| | The trench will be 1.35m deep and 0.60m wide along with 15 joint bays of 6.5mx 2.5m wide. Peat will be extracted down to suitable bearing stratum. | | | |
| | | | | |
| | **Total =** | **54,869$m^3$** | **36,162$m^3$** | **Total peat and spoil = 91,031$m^3$** |

Note 1 – Abulking factor of 15 and 10% has been applied to the excavated peat and non-peat soils respectively. This allows for expected increase in volume upon excavation and to allow for a variation in ground conditions across the Site.
Note 2 – Soil volumes given in this table are indicative and for information purposes only, and subject to detailed estimates

**Table 11-13: Anticipated stone volumes necessary for construction**

| Infrastructure Element | Typical Dimensions | Stone Volume ($m3$) [1, 2] | Comment |
|---|---|---|---|
| 9 no. Turbines and Hardstands | 27m diameter excavation footprint (25m wide base with 1m of working space around the perimeter of the base) for turbine foundation with 80 x 33.5m hardstand area. | 28,826 | Hardstanding area and foundation footprint. Allowance included for mini-crane pads and blade finger hardstands associated with the main hardstand, plus allowance for side slopes in areas of fill. |
| Access Tracks | Assumed 5m running surface with 6m wide development footprint. | 52,305 | Allowance includes for widening on bends, at junctions, laybys, and tie-ins to hardstands. |
| Substation | Hardstanding area of 140 x 85m. | 9,185 | |
| Temporary Construction Compounds (x2) | Footprint of 70 x 40m for both | 5500 | - |
| GCR | Provided by client | | |
| | | | |
| | **Total =** | **95,816$m^3$** | |

Note 1 – Acontingency factor of 25% stone volumes is included to allow for a variation in ground conditions across the Site.
Note 2 – Stone volumes given in this table are indicative and for information purposes only, and subject to detailed estimates.

## 11.6 Likely Impacts

The likely impacts on the underlying soils, geology and hydrogeology at the Site are assessed in the following sections for the activities associated within each phase (Construction, Operation and Decommissioning) for the Project as described in Chapter 2.

The likely impacts are assessed in accordance with the evaluation criteria outlined in Section 11.3. The unmitigated likely impacts are summarised in Table 11-17 and Table 11-18. The proposed mitigation measures are then considered to reduce or eliminate likely negative significant impacts/effects.

The importance of the soils, geology and groundwater receptors are summarised in Table 11-14.

**Table 11-14: Receptor Importance**

| Receptors | Activity | Importance | Rational |
|---|---|---|---|
| Geological - Peat deposits/organic soils and glacial till deposits | Construction, Operational & Decommissioning Phases | Low | Site comprises poorly drained / low fertility soils. |
| Local quarries (crushed rock and granular aggregate) | Cumulative | Medium | Supply of imported stone to the Site from local quarries. Depleting off-site resources. |
| Hydrogeological - Locally Important Aquifer – Moderately productive bedrock in local zones, groundwater wells and springs, and surface water bodies. | All activities | High | Underlying bedrock is a Locally Important Aquifer. |

### 11.6.1 Do Nothing Impact

If the proposed Wind Farm were not constructed, it is likely that the current land uses will continue for the foreseeable future. The impact on the Soils, Geology and Hydrogeology would remain unaltered as a result.

### 11.6.2 Likely Future Receiving Environment

The environment will likely change, even without the construction of the proposed project. However, any such changes in the natural environment will be minor and will not alter the current classification of the site as a passive geological/hydrogeological environment, nor will it change on the current importance rating of the site in terms of geology (low) or hydrogeology (medium).

### 11.6.3 Construction Phase

The following on-Site activities have been identified as the sources of potential effects on the existing geological and hydrogeological conditions during the construction phase of the Project:

### *11.6.3.1 Site Clearance*

Topsoil and vegetation clearance will be undertaken at the turbine and all ancillary infrastructure locations across the Site. In addition to the permanent infrastructure, 2 no. temporary construction compounds are proposed within the Site as well as a lay-down area at the new site access on the R419 road. These will also require removal of vegetation and topsoil prior to construction.

Permanent felling of approximately 6.01 ha of conifer plantation forestry is required at T02 and along the new access track at the site entrance. The proposed areas to be felled are described further in Chapter 2, Description of the Project.

It should be noted that the clear-felling of trees in the State requires a felling licence. The Forest Service of the Department of Agriculture, Food & the Marine is Ireland's national forest authority and is responsible for all forest licensing which is governed by the Forestry Act 2014 as amended and the Forestry Regulations 2017 (S.I. No. 191 of 2017). A felling licence will include the provision of relevant replant lands (afforestation area) to be planted in lieu of the proposed tree felling on the site. The associated afforestation of alternative lands equivalent in area to those lands being permanently clear-felled is also subject to licensing ('afforestation licensing').

It should be noted that the forestry to be felled within the Site was originally planted as commercial crops and will be felled and replanted in the coming years should the project not proceed.

Proposed tree felling will involve the use of heavy felling machinery and exposure of underlying soils to surface water runoff, which could result in soil erosion. This also could lead to an increase in sediment and nutrient concentrations in the surface water run-off which may in turn impact groundwater in the Locally Important Aquifer beneath the Site.

The use of plant and machinery during tree felling works will require the storage and use of fuels and oils. Their storage and use present potential for spills and leaks which could contaminate underlying exposed soils and groundwater.

Further assessment of potential effects to surface water discharges from felling activities are discussed in Chapter 12 Hydrology and Water Quality of the EIAR.

The Magnitude of the effects from these works on the soils and geology receptors is considered to be '**Small Adverse**' in nature. The importance is considered to be '**Low**'. The rating of these potential effects, prior to mitigation, is considered to be of '**Imperceptible**' significance. The Impact Classification is negative, direct, long-term and will have likely minor effects.

The Magnitude of the impact from these works on groundwater receptors is considered to be '**Small Adverse**' in nature. The importance is considered to be '**Medium**'. The rating of these potential effects, prior to mitigation, is considered to be of '**Slight**' significance. The Impact Classification is negative, short-term, direct and will have likely minor effects.

### *11.6.3.2 Earthworks*

The Site will require construction phase earthworks associated with the excavation of turbine bases, removal of overburden deposits for the construction of turbine foundations, temporary site compounds, substation, turbine hard standings and internal access roads.

As such there is the potential for impact to Soils, Geology and Hydrogeology from the excavation and movement of existing superficial Peat deposits, Glacial Till deposits and bedrock during the construction phase of the Site.

The following earthworks excavations will be required:

- Excavation of Topsoil
- Excavation of Peat deposits
- Excavation of Glacial Till
- Construction of a 2.1km long floating road

The following filling and material deposition operations will be required:

- Deposition of surplus topsoil/peat and spoil in berms for reinstatement purposes around turbine bases hardstands, and along access roads. Material placed alongside access roads will generally not exceed 1m in height and will be shaped and sealed to prevent the ingress of water.
- Importation and filling of site won and imported General Fill and Engineering Aggregates.

Based on information derived from the preliminary site investigation and site reconnaissance and taking into consideration wind turbine manufacturer specifications, it is expected that wind turbine foundations shall be piled. A minimum of 3m of peat/spoil shall be removed to allow for construction of the piled turbine bases. The piles to be constructed will be large diameter reinforced concrete and will range in diameter from 600 to 1200mm. Between 14 and 16 piles will be used at each piled turbine foundation. For the piled foundations it will be necessary to embed the piles directly into the bedrock using rock sockets.

It is proposed that all on-site materials excavated shall be retained on Site and re-used where suitable as part of the construction phase to minimise the import materials requirements. The Project will comply with Priority Pathway Action Plans (PPAP) relating to invasive species, soils and spoil where appropriate. Relevant testing on imported material will be carried out as necessary to ensure all material used on site meets the relevant requirements.

Surplus Topsoil and Glacial Till recovered from excavations will be used for the reinstatement proposed around turbine bases, hardstands, landscaping, temporary construction compounds and peat deposition areas. All associated quantities have been calculated in Section 11.4 and no excavated material will leave the proposed Wind Farm site.

Direct effects to the existing geological regime associated with the construction phase of the Site are:

- Soil compaction may occur due to movement of construction traffic. This will occur particularly within areas of highly compressible soft deposits which are left in-situ during the construction phase. This could lead to an increase in surface water runoff due to reduced infiltration of rainfall and subsequently to an increase in erosion of overburden deposits left in-situ.
- The use of plant and machinery during construction will require the storage and use of fuels and oils. Their storage and use present potential for spills and leaks which could contaminate underlying exposed soils.
- The extraction of rock from off-site quarries will represent a reduction in the availability of an exhaustible resource. Imported crushed rock will be required for material such as Class 1 (general fill) 6F2 (capping), 6N1 (Fill to structures) and 6N2 (fill below structures).

The Magnitude of the impact from these works on the soils and geology receptors is considered to be '**Moderate Adverse**' in nature. The importance is considered to be '**Low**'. The rating of these potential effects, prior to mitigation, is considered to be of '**Slight**' significance. The Impact Classification is negative, permanent, direct and will have likely minor effects.

Direct effects to the existing hydrogeological regime associated with earthworks with respect to the construction phase of the Site are:

- Potential for groundwater pollution from the removal of overburden deposits. It is proposed to remove the overlying soft ground and Glacial Till deposits as outlined in the proposed design.
- The vulnerability of the aquifer to groundwater pollution particularly during construction stage will be increased as overburden is removed thus reducing the level of protection from potential pollution sources.
- Potential for silt infiltration to groundwater as a result of increased surface runoff and reduced protection of the aquifer. Soil erosion as a result of exposure of soils in open excavations and temporary storage of excavated materials represents a potential impact to the underlying groundwater aquifer.
- Reduction in groundwater levels from dewatering of excavations as required during the construction stage of foundations if high groundwater is encountered. Groundwater levels within the trial pits ranged from 0.80 to 4.20m bgl. It is anticipated that any drawdown of groundwater levels would be localised to the proposed areas of excavation. This impact is most likely during the excavation of the turbine and substation foundations. There are no groundwater supply wells recorded in the immediate vicinity of the Site. It is considered that other excavations associated with temporary construction compound and grid connection trenches will not extend into the underlying bedrock aquifers. Upon completion of the construction phase, it is considered that groundwater levels will revert to the pre-construction situation when there is no longer a requirement to control groundwater levels.

In relation to groundwater, it is worth noting that the overlying glacial till was typically recorded as fine grained and is therefore considered to have a relatively low permeability.

The Magnitude of the impact from these works on groundwater receptors is considered to be '**Small Adverse'** in nature. The importance is considered to be '**Medium**'. The rating of these potential effects, prior to mitigation (mitigation measures are described in Section 11.7), is considered to be of '**Slight**' significance. The Impact Classification is negative, short term, direct and will likely have minor effects.

#### *11.6.3.3 Slope Stability*

The Project and proposed infrastructure locations are generally located within areas predominantly mapped as having a 'Low' landslide susceptibility. Results from the site reconnaissance surveys show no evidence of recent or historic landslides. No failures within the underlying till deposits were recorded.

Due to the presence of deep peat on Site and in accordance with guidance in the Scottish Executive – Peat Landslide Hazard and Risk Assessments (2017), a peat stability analysis was undertaken as part of the Peat Stability and Geotechnical Assessment Report (Appendix 11-1). Results from this assessment show a low likelihood of instability within peat deposits across the Site.

Direct impacts to the existing environment associated with potential slope instability and failure include:

- Slope failures have the potential to impact the existing geological conditions from the removal and deposition of landslide/slope failure material and the exposure of underlying overburden deposits and bedrock to an increase in surface water runoff and subsequent increase in erosion. Slope failure also has the potential to have an impact on the safety of construction workers that could be in the vicinity of a landslide/slope failure event, existing infrastructure (roads, access tracks, turbines) and nearby residents / properties.
- The impact of a slope failure could potentially result in the influx of acidic and/or peat laden waters into downgradient surface water features resulting in a decrease in the receiving water's pH values. This may impact groundwater quality in the underlying Locally Important Aquifer and in any groundwater abstractions in the vicinity of a landslide event.

The Magnitude of the impact from these works on the soils and geology receptors is considered to be '**Moderate Adverse**' in nature. The importance is considered to be '**Low**'. The rating of these potential impacts, prior to mitigation, is considered to be of '**Slight**' significance. The Impact Classification is negative, short term, direct and will have unlikely effects.

The Magnitude of the impact from these works on groundwater receptors is considered to be '**Small Adverse**' in nature. The importance is considered to be '**Medium**'. The rating of these potential impacts, prior to mitigation, is considered to be of '**Slight**' significance. The Impact Classification is negative, short-term, direct and will have unlikely effects.

#### *11.6.3.4 Internal Access Roads and Hardstands*

There will be approximately 9,910m (approx. 2,100m of this to be floated) of new internal access tracks associated with the Site and approximately 550m of existing track upgrade.

All access tracks will be approximately 5m wide along straight sections and wider at bends and as required. The tracks will be finished with a well graded aggregate. The drainage system will be installed adjacent to the internal access tracks. Existing drainage infrastructure will be maintained and upgraded where necessary.

The following filling and material deposition operations will be required:

- Deposition of surplus topsoil, peat and Glacial Till deposits in berms for reinstatement purposes around, hardstands, temporary construction compound and substation compound.
- Importation and Filling of imported General Fill and Engineering Aggregates.

It is anticipated that the stone required for the construction of the internal access roads, hardstands, temporary construction compounds and the substation will be imported from quarries in the vicinity.

The likely off-site, source quarries for the supply of imported crushed rock aggregate during the construction phase of the Project is presented in Table 11-15.

**Table 11-15: Nearest Supplier of TII Series 600 Stone Products.**

| Quarry | Approx. Distance from Site (km) | Products |
|---|---|---|
| Kilsaran, Portlaoise | 25 (S) | Crushed Rock (TII Series 600 and 800 materials) |
| Kilsaran, The Curragh | 20 (E) | Crushed Rock (TII Series 600 and 800 materials) |

Typically, access track formation will consist of a minimum 500mm hardcore on a geotextile membrane. The likely construction methodology for newly constructed tracks will be as follows:

- The formation will be prepared to receive the geotextile membrane.
- Stone will be placed and compacted in layers to minimum 500mm depth.
- A drainage ditch will be formed, within the excavated width and along the sides of the track.
- Surplus excavated material will be placed along the side of sections of the tracks and dressed to blend in with surrounding landscaping and partially obscure sight of the track.

Direct impacts to the existing geological regime associated with the construction of proposed access tracks and hardstands are:

- Soil compaction may occur due to movement of construction traffic. This will occur particularly within areas of highly compressible soft deposits which are left in-situ during the construction phase. This could lead to an increase in surface water runoff due to reduced infiltration of rainfall and subsequently to an increase in erosion of overburden deposits left in-situ.
- The use of plant and machinery during construction will require the storage and use of fuels and oils. Their storage and use present potential for spills and leaks which could contaminate underlying exposed soils.
- During construction, imported engineering fill and excavated soils will be exposed in excavations and in temporary stockpiles. These soils will be subject to erosion by wind and rain which could deposit silt in streams with an indirect impact on surface water quality.

The Magnitude of the impact from these works on the soils and geology receptors is considered to be '**Moderate Adverse**' in nature. The importance is considered to be '**Low**'. The rating of these potential impacts, prior to mitigation, is considered to be of '**Slight**' significance. The Impact Classification is negative, permanent, direct and will have likely effects.

Direct impacts to the existing hydrogeological regime associated with the construction of proposed access tracks and hardstands are:

- Potential for groundwater pollution from the removal of overburden deposits. It is proposed to remove the overlying soft ground and Glacial Till deposits as outlined in the proposed design.
- The vulnerability of the aquifer to groundwater pollution particularly during construction stage will be increased as overburden is removed thus reducing the level of protection from potential pollution sources.

- Potential for silt infiltration to groundwater as a result of increased surface runoff and reduced protection of the aquifer. Soil erosion as a result of exposure of soils in open excavations and temporary storage of excavated materials represents a potential impact to the underlying groundwater aquifer.
- Potential for groundwater pollution from the use of cement-based compounds during the construction phase.

The Magnitude of the impact from these works on the groundwater receptors is considered to be '**Small Adverse**' in nature. The importance is considered to be '**Medium'**. The rating of these potential impacts, prior to mitigation, is considered to be of '**Slight**' significance. The Impact Classification is negative, short term, direct and will have likely effects.

#### *11.6.3.5 Internal Cabling and Grid Connection*

As outlined in Chapter 2 of this EIAR, electricity generated from wind turbines shall be collected at medium voltage by an internal circuit of buried cables which will follow on-site access tracks. This circuit shall be terminated at a proposed on-site substation.

Connection works will involve the installation of ducting, joint bays, drainage and ancillary infrastructure and the subsequent running of cables within existing agricultural fields to the proposed loop-in grid connection point. For cable trenches crossing public roads, the contractor shall excavate cable trenches and then lay high density polyethylene (HDPE) ducting in the trench in a surround of cement bound material (CBM). Back-filling and reinstatement in public roads will be to a specification to be agreed with the road authority.

A similar construction methodology will apply for cable trenches laid within the Site's access tracks. In this case the cable-ducts will generally be laid when the track is being constructed and will follow the edge of the Site access tracks. The trenches within these locations will generally be backfilled using the excavated material.

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) through the following townlands; Derrylea, Inchacooly, Ballyhast, and Loughmansland Glebe. The grid connection will require 11.4 km of underground 110kV electrical cabling and the route will pass through the townlands of Cushina in County Offaly; Derrylea, and Inchacooly in County Kildare, and Coolnaferagh, Ullard or Controversyland, Clonanny, Lea, Loughmansland Glebe, and Bracklone in County Laois. Works for the grid connection will involve trenching, laying of ducting, installing 15 no. joint bays and 5 no. watercourse crossing, pulling cables and the back filling of trenches and reinstatement works. The route which will run through 9.1 Km of existing public road, 0.3km in existing tracks and 2km in new access tracks on the wind farm site.

Direct impacts to the existing environment associated with the proposed internal cabling and grid connection works include:

- The proposed grid connection, associated excavations and ducting may present a preferential pathway for the movement of groundwater and/or contamination in the subsurface. However, the subsoil is predominantly Glacial Till which has a low to medium permeability.
- The excavations for the grid connection trenches and joint bays can have a direct impact on the exposed soils and rock in the form of increased erosion from surface water ingress.

- Where the material excavated from the proposed grid connection excavations is not suitable for reuse as backfill or deposition on Site, this material shall be used as a byproduct for reuse elsewhere if possible, and if not shall be disposed of at a facility licenced (subject to environmental testing and classification) to accept this waste type.

The Magnitude of the impact from these works on the soils and geology receptors is considered to be '**Small Adverse'** in nature. The importance is considered to be '**Low**'. The rating of these potential impacts, prior to mitigation, is considered to be of '**Imperceptible**' significance. The Impact Classification is negative, permanent, direct and will have likely effects.

The Magnitude of the impact from these works on the groundwater receptors is considered to be '**Small Adverse**' in nature. The importance is considered to be '**Medium**'. The rating of these potential impacts, prior to mitigation, is considered to be of '**Slight**' significance. The Impact Classification is negative, short term, direct and will have likely effects.

### 11.6.4 Operational Phase Impacts

The potential impacts on land, soils, geology & hydrogeology from the operation of the Project are outlined below.

#### *11.6.4.1 Potential Direct Effects*

Very few potential direct effects are envisaged during the operational phase of the Project. These are:

- Some construction traffic may be necessary for maintenance of turbines, hardstands and access tracks which could result in minor accidental leaks or spills of fuel/oil.

The Magnitude of the effect from these works on the soils and geology receptors is considered to be '**Small Adverse'** in nature. The importance is considered to be '**Low**'. The rating of these potential impacts, prior to mitigation, is considered to be of '**Imperceptible**' significance. The Impact Classification is negative, short-term, direct and has unlikely effects.

The Magnitude of the impact from these works on the groundwater receptors is considered to be '**Negligible**' in nature. The importance is considered to be '**Medium**'. The rating of these potential impacts, prior to mitigation, is considered to be of '**Imperceptible**' significance. The Impact Classification is negative, short-term, direct and has unlikely effects.

#### *11.6.4.2 Potential Indirect Impacts*

A small amount of granular material may be required to maintain access tracks during operation which will place intermittent minor demand on local quarries listed in Section 11.5.2.4.

The Magnitude of the impact from these works on the soils and geology receptors is considered to be '**Small Adverse'** in nature. The importance is considered to be '**Low'.** The rating of these potential impacts, prior to mitigation, is considered to be of '**Imperceptible**' significance. The Impact Classification is negative, short-term, direct and has unlikely effects.

The Magnitude of the impact from these works on the groundwater receptors is considered to be '**Negligible**' in nature. The importance is considered to be '**Medium**'. The rating of these potential impacts, prior to mitigation, is considered to be of '**Imperceptible**' significance. The Impact Classification is negative, short-term, direct and has unlikely effects.

### 11.6.5 Decommissioning Phase Impacts

The potential impacts associated with decommissioning will be similar to those associated with construction but of reduced magnitude.

During decommissioning, it may be possible to reverse or at least reduce some of the impacts caused during construction by rehabilitating construction areas such as turbine bases and hardstanding areas. This could be done by covering with topsoil to encourage vegetation growth and reduce run-off and sedimentation.

Other impacts such as possible soil compaction and contamination by fuel leaks will remain but will be of reduced magnitude. Nevertheless, as noted in the Scottish Natural Heritage guidance on restoration and decommissioning of onshore wind farms (SNH, 2013) reinstatement proposals for a wind farm are made approximately 3 to 5 years in advance, so within the lifespan of the wind farm, technological advances and preferred approaches to reinstatement are likely to change.

Some of the impacts associated with reinstatement of the Site (excavation of turbine bases, access tracks etc.) will be avoided by leaving these in place where possible. The Irish Wind Energy Association (IWEA) (11) states that when decommissioning a wind farm "*the concrete bases could be removed, but it may be better to leave them under the ground, as this causes less disturbanc*e". It is proposed to leave the access tracks in-situ at the decommissioning stage. IWEA also state that "*it may be best*" to leave site tracks in-situ depending on the size and geography of the development. In a case where access tracks can not be left in place they will be removed with the subsoil reinstated and topsoil replaced.

It is therefore '*best practice not to limit options too far in advance of actual decommissioning but to maintain informed flexibility until close to the end-of-life of the wind farm*'.

Ducts and cables will be left in the ground, therefore no potential impacts during decommissioning stage are likely to occur.

The Magnitude of the impact from these works on the soils and geology receptors is considered to be '**Small Adverse**' in nature. The importance is considered to be '**Low'**. The rating of these potential impacts, prior to mitigation, is considered to be of '**Imperceptible**' significance. The Impact Classification is negative, short-term, direct and has unlikely effects.

The Magnitude of the impact from these works on the groundwater receptors is considered to be **'Small Adverse'** in nature. The importance is considered to be '**Medium**'. The rating of these potential impacts, prior to mitigation, is considered to be of '**Slight**' significance. The Impact Classification is negative, short-term, direct and has unlikely effects.

### 11.6.6 Cumulative Impacts

As part of the assessment of cumulative impacts, planning searches were undertaken using the following online planning enquiry portals to search for large scale developments within 20km of the Site:

- Offaly County Council (OCC);
- Laois County Council (LCC);
- Kildare County Council (KCC); and
- An Bord Pleanála (ABP).

Relevant projects, that are likely to have an impact on the Land, Soils, Geology and Hydrogeology, in proximity to the Site and GCR are listed in Table 11-16.

**Table 11-16: Potential Cumulative Impact from other Developments.**

| Development (Application No.) | Distance from the Site (km) | Status | Interface |
|---|---|---|---|
| Trascan and Clondoolusk Solar Farm (ABP ref. 310367) | 10.0 | Granted | Groundwater, subsoils and bedrock. |
| Moanvane Wind Farm (ABP ref. 301619) | 14.0 | Granted | Groundwater, subsoils and bedrock. |
| Cushina Wind Farm (ABP ref. 319344-24 | 5.0 | Granted | Groundwater, subsoils and bedrock. |

The proposed large-scale developments summarised in Table 11-24 have been considered. If construction/ maintenance works for these projects overlap or run concurrently with the development of the Site there may be a supply issue with local quarries providing imported aggregate.

The magnitude of the impact from these works on the soils and geology receptors is considered to be '**Small Adverse**' in nature. The importance is considered to be '**Low**'. The rating of this potential cumulative impact is considered to be of '**Slight**' significance. The Impact Classification is negative, short-term, indirect and has unlikely effects.

There is the potential for groundwater pollution from run-off impacting on the groundwater receptor from the development sites. The Magnitude of the impact from these works on the groundwater receptors is considered to be '**Negligible**' in nature. The importance is considered to be '**Medium**'. The rating of this potential cumulative impact is considered to be of '**Imperceptible**' significance. The Impact Classification is negative, short-term, indirect and has unlikely effects.

### 1.1.1 Summary of Potential Impacts

A summary of unmitigated potential impacts on soils and geology attributes from the Site is provided in Table 11-17 with the potential impacts on hydrogeological attributes provided in Table 11-18.

**Table 11-17: Summary of Potential Unmitigated Impact Significance on Soils & Geology**

| Activity | Potential Impact | Receptor | Importance | Prior to Mitigation | |
|---|---|---|---|---|---|
| | | | | Magnitude | Significance |
| **Construction Phase** | | | | | |
| Site Clearance | Exposure of underlying overburden leading to increased erosion.<br>Felling machinery resulting soil compaction of soft deposits and an increase in surface water runoff resulting in increased erosion of exposed soils. | Peat deposits/organic soils, Glacial Till deposits and bedrock. | Low | Small Adverse | Imperceptible |
| Earthworks associated with the construction of the proposed turbines and associated infrastructure. | Removal of overburden material, open excavations and subsequent exposure underlying overburden and bedrock leading to increased erosion.<br>Construction traffic resulting in soil compaction and increase in surface water runoff resulting in increased erosion of exposed soils.<br>Importation of engineering fill and concrete. | Peat deposits/organic soils Glacial Till deposits and bedrock. | Low | Moderate Adverse | Slight |
| Earthworks associated with the construction of the proposed turbines and associated infrastructure. | Slope Failure. | Peat deposits/organic soils Glacial Till deposits and bedrock. Site Operatives. Existing Infrastructure and nearby residential areas. | Low | Moderate Adverse | Slight |

| Activity | Potential Impact | Receptor | Importance | Prior to Mitigation | |
|---|---|---|---|---|---|
| | | | | Magnitude | Significance |
| Construction of Turbine and Substation Foundations | Open excavations, increased runoff causing erosion of underlying overburden and bedrock.<br>Construction traffic resulting in soil compaction and increase in surface water runoff resulting in increased erosion of exposed soils.<br>Importation of engineering fill and concrete products | Peat deposits/organic soils Glacial Till deposits and bedrock. Local quarries. | Low | Moderate Adverse | Slight |
| Construction of Internal Site Access Roads, Hardstands and Temporary Compound | Open excavations, increased runoff causing erosion of underlying overburden and bedrock.<br>Construction traffic resulting in soil compaction and increase in surface water runoff resulting in increased erosion of exposed soils.<br>Importation of engineering fill | Peat deposits/organic soils Glacial Till deposits and bedrock. Local quarries | Low | Moderate Adverse | Slight |
| Construction of the Grid Connection and Internal Cabling | Removal of overburden material and exposure underlying Clay and Bedrock to erosion.<br>Construction traffic resulting in soil compaction and increase in surface water runoff resulting in increased erosion of exposed soils.<br>Importation of engineering fill and concrete products<br>Disposal of surplus excavated material to licenced facility | Peat deposits/organic soils Glacial Till deposits and bedrock. Local quarries.<br>Licensed waste facilities | Low | Small Adverse | Imperceptible |
| Accommodation works along TDR | Removal of overburden material and exposure of underlying superficial deposits and bedrock to erosion.<br>Construction traffic resulting soil compaction and increase in surface water runoff resulting in increased erosion of exposed soils.<br>Importation of engineering fill.<br>Disposal of surplus excavated material to licenced facility. | Peat deposits/organic soils Glacial Till deposits and bedrock. Local quarries.<br>Licenced waste facilities | Low | Small Adverse | Imperceptible |

| Activity | Potential Impact | Receptor | Importance | Prior to Mitigation | |
|---|---|---|---|---|---|
| | | | | Magnitude | Significance |
| **Operational Phase** | | | | | |
| Construction traffic for maintenance purposes. | Minor accidental leaks or spills of fuel/oil | Peat deposits/organic soils Glacial Till deposits and bedrock. | Low | Small Adverse | Imperceptible |
| Operation of substation | Spills, leaks of oils/battery fluids. | Peat deposits/organic soils Glacial Till deposits and bedrock. | Low | Small Adverse | Imperceptible |
| Maintenance of access tracks | Importation of engineering fill from local quarries | Local quarries | Low | Small Adverse | Imperceptible |
| **Decommissioning Phase** | | | | | |
| Removal of Turbines and Hardstands. | Construction traffic resulting soil compaction and increase in surface water runoff resulting in increased erosion of exposed soils. | Peat deposits/organic soils Glacial Till deposits and bedrock. | Low | Small Adverse | Imperceptible |
| **Cumulative Impacts** | | | | | |
| Large-scale developments within 20km of the Project Site occurring concurrently with construction of the Site. | Strain on supply and reduction of a finite aggregate resource. | Local quarries (crushed rock and granular aggregate) | Low | Small Adverse | Imperceptible |

**Table 11-18: Summary of Potential Unmitigated Impact Significance on Hydrogeology**

| Activity | Potential Impact | Receptor | Importance | Prior to Mitigation | |
|---|---|---|---|---|---|
| | | | | Magnitude | Significance |
| **Construction Phase** | | | | | |
| Felling Activities | Exposure of soils and bedrock to surface water runoff. An increase in sediment and nutrient concentrations within the surface water impacting the underlying aquifer. Spills, leaks of fuels and oils from forestry machinery which could contaminate the groundwater. | Locally Important Bedrock Aquifer<br>Groundwater Wells and Springs.<br>Surface water bodies. | Medium | Small Adverse | Moderate/Slight |
| Earthworks associated with the construction of the proposed turbines and associated infrastructure. | Potential for groundwater pollution from the removal of overburden deposits.<br>Potential for silt infiltration to groundwater as a result of increased surface runoff and reduced protection of the aquifer.<br>Potential for contamination to groundwater from spills/leakages during construction phase earthworks.<br>Reduction in groundwater levels from dewatering of excavation as required during the construction phase. | Locally Important Bedrock Aquifer<br>Groundwater Wells and Springs.<br>Surface water bodies. | Medium | Small Adverse | Moderate/Slight |
| Earthworks associated with the construction of the proposed turbines and associated infrastructure. | Slope Failure. | Locally Important Bedrock Aquifer<br>Groundwater Wells and Springs.<br>Surface water bodies. | Medium | Negligible | Imperceptible |

| Activity | Potential Impact | Receptor | Importance | Prior to Mitigation | |
|---|---|---|---|---|---|
| | | | | Magnitude | Significance |
| Construction of Turbine and Substation Foundations | Potential for groundwater pollution from the removal of overburden deposits.<br>Potential for silt infiltration to groundwater as a result of increased surface runoff and reduced protection of the aquifer.<br>Potential for contamination to groundwater from spills/leakages during construction phase earthworks.<br>Reduction in groundwater levels from dewatering of excavation as required during the construction phase. | Locally Important Bedrock Aquifer<br>Groundwater Wells and Springs.<br>Surface water bodies. | Medium | Small Adverse | Moderate/Slight |
| Construction of Internal Site Access Roads, Hardstands and Temporary Compound | Potential for groundwater pollution from the removal of overburden deposits.<br>Potential for silt infiltration to groundwater as a result of increased surface runoff and reduced protection of the aquifer.<br>Potential for contamination to groundwater from spills/leakages during construction phase earthworks.<br>Potential for ground water pollution from the use of cement-based compounds during the construction phase. | Locally Important Bedrock Aquifer<br>Groundwater Wells and Springs.<br>Surface water bodies. | Medium | Small Adverse | Moderate/Slight |
| Construction of the Grid Connection and Internal Cabling | Potential for ground water pollution from the removal of overburden deposits.<br>Potential for silt infiltration to groundwater as a result of increased surface runoff and reduced protection of the aquifer.<br>Potential for contamination to groundwater from spills/leakages during construction phase earthworks. | Locally Important Bedrock Aquifer<br>Groundwater Wells and Springs.<br>Surface water bodies. | Medium | Small Adverse | Moderate/Slight |

| Activity | Potential Impact | Receptor | Importance | Prior to Mitigation | |
|---|---|---|---|---|---|
| | | | | Magnitude | Significance |
| Accommodation works along TDR | Potential for ground water pollution from the removal of overburden deposits.<br>Potential for silt infiltration to groundwater as a result of increased surface runoff and reduced protection of the aquifer.<br>Potential for contamination to groundwater from spills/leakages during construction phase accommodation works. | Locally Important Bedrock Aquifer<br>Groundwater Wells and Springs.<br>Surface water bodies. | Medium | Negligible | Imperceptible |
| **Operational Phase** | | | | | |
| Construction traffic for maintenance purposes. | Minor accidental leaks or spills of fuel/oil | Locally Important Bedrock Aquifer<br>Groundwater Wells and Springs.<br>Surface water bodies. | Medium | Negligible | Imperceptible |
| Operation of substation | Spills, leaks of oils/battery fluids. | Locally Important Bedrock Aquifer<br>Groundwater Wells and Springs.<br>Surface water bodies. | Medium | Negligible | Imperceptible |

| Activity | Potential Impact | Receptor | Importance | Prior to Mitigation | |
|---|---|---|---|---|---|
| | | | | Magnitude | Significance |
| **Decommissioning Phase** | | | | | |
| Removal of Turbines and Hardstands. | Potential for groundwater pollution from the disturbance of overburden deposits<br>Potential for silt infiltration to groundwater as a result of increased surface runoff and reduced protection of the aquifer.<br>Potential for contamination to groundwater from spills/leakages during decommissioning phase earthworks. | Locally Important Bedrock Aquifer<br>Groundwater Wells and Springs.<br>Surface water bodies. | Medium | Small Adverse | Imperceptible |
| **Cumulative Impacts** | | | | | |
| Large-scale developments within 20km of the Project Site occurring concurrently with construction of the Site. | Potential for groundwater pollution from runoff. | Locally Important Bedrock Aquifer<br>Groundwater Wells and Springs.<br>Surface water bodies. | Medium | Small Adverse | Imperceptible |

## 11.7 Mitigation Measures

The following section outlines appropriate mitigation measures by design and best practice to avoid or reduce the potential impact of the Project. Further details are given in the CEMP which is contained in Appendix 2.1 of Volume III.

### 11.7.1 Mitigation by Design and Best Practice

With regard to the Project, detailed design and best practice has been implemented as follows:

In order to reduce the impacts on land, soils, geology, hydrogeology and slope stability, infrastructure has been primarily located within areas of thinner peat/soft ground and lower slope gradients. Extensive work has been undertaken at the preliminary design stage to apply risk avoidance by design which included:

- Peat probing, site walkover surveys intrusive and non-intrusive ground investigations to identify geotechnical constraints (e.g. peat deposits and evidence of historic landslip) likely to adversely affect the design of the Site.
- Relocation and micro-siting of turbines, hardstanding's and access roads based on the site assessments and geotechnical assessments in order to reduce, inter alia, ground risk associated with the Site.
- The works have been designed and checked by geotechnical and civil engineers, who are suitably qualified and experienced in excavation and earthworks design and construction methodologies. Details of experience and competence is included in Chapter 1.

The following will also be implemented:

- The Project has been designed in accordance with best practice methodologies to include (but not limited to) guidance documents from the EPA, IGI, Office of the Planning Regulator and the Scottish Executive.
- Any excavation and construction related works will be subject to a design risk assessment at detailed design stage to determine risk levels for the construction, operation and maintenance and decommissioning of the works. Identified impacts will be minimised by the application of principles of avoidance, prevention and protection. Information on residual impacts will be recorded.
- Given that the works comprise a significant proportion of excavation and earthworks, suitably qualified and experienced geotechnical personnel will be employed on Site to supervise the works.
- A detailed method statement compliant with best practice methodologies for each element of the works will be prepared by the Contractor prior to any element of the work being carried out. These method statements shall be reviewed and approved by a qualified geotechnical engineer.
- The Contract will require flexibility when scheduling the works such that earthworks are not undertaken during severe weather conditions. Where such weather is forecast, suitable measures will be taken to secure the works.

### 11.7.2 Construction Phase

The following sections outline appropriate mitigation measures to avoid or reduce the potential impact of the Project.

### *11.7.2.1 Construction Environmental Management Plan*

A Construction Environmental Management Plan (CEMP) has been prepared for the proposed project and is included in Volume III, Appendix 2.1. The CEMP defines the work practices, environmental management procedures and management responsibilities relating to the construction phase of the proposed project.

The CEMP sets out the key environmental management measures associated with the construction, operation and decommissioning of the Project, to ensure that during these phases of the development, the environment is protected, and any likely significant effects are minimized. The final CEMP will be developed further at the construction stage, on the appointment of the main Contractor to the project to address the requirements of any relevant planning conditions, including any additional mitigation measures that are conditioned and shall be submitted to the planning authority for review.

Reference to relevant sections of the CEMP with respect to the mitigation of potential effects to Soils, Geology and Hydrogeology from the proposed project are outlined below.

Site Clearance

As outlined in Section 11.5.2.1, potential effects to the existing environment from the proposed site clearance works have been identified. The works will lead to the exposure of underlying soils to surface water runoff, which could result in soil erosion. This also could lead to an increase in sediment and nutrient concentrations in the surface water run-off which may in turn impact groundwater in the Regionally Important Aquifer – Karstified (conduit) beneath the Site. It should be noted that the amount of vegetation clearance in relation to commercial forestry is small (6.01 ha) and its impact on the underlying soils, geology and hydrogeology receptors is considered to be negligible.

One of the primary mitigation measures to be employed at the construction phase of the development is the management of silt laden runoff. The potential impact from silt laden surface water runoff from increased erosion of exposed overburden deposits has been assessed, particularly at new and existing drainage locations and where vegetation clearance works are proposed and is included in Chapter 12 – Hydrology and Water Quality.

Details of the proposed Surface Water Management System and associated mitigation measures, which will be implemented during the construction phase, are summarised in Chapter 12 and are also outlined in the CEMP, which is contained in Appendix 2.1 of Volume III.

Best practices will be employed in the prevention of silt laden run-off from entering watercourses as discussed in Chapter 12. Best practice measures included in the design include sediment control in the form of swales, interceptor ditches and settlement ponds. Additional standard construction management will be employed where appropriate such as CIRIA C648 (Control of water pollution from linear construction projects), CIRIA C532 (Control of water pollution from construction sites) and CIRIA C753 (SuDS Manual).

The use of plant and machinery during worksite clearance works and throughout the construction will require the storage and use of fuels and oils, which will only be stored at the construction compound areas in designated bunded areas. Details of oil spill protection measures adjacent to sensitive receptors and emergency spill response procedures, which will be implemented during the construction phase, are outlined in the CEMP, which is contained in Appendix 2.1 of Volume III.

Storage tanks, used to store fuel for the various items of machinery, will be self-contained and double-walled.

Refuelling will be carried out using fuel trucks, which will bring fuel to the felling plant and equipment. Specific mitigation measures relating to the management of hydrocarbons are as follows:

- Any diesel, fuel or hydraulic oils stored on Site will be stored in bunded storage tanks – the bund area will have a volume of at least 110 % of the volume of such materials stored.
- Appropriately sized plant nappies will be used for all mobile equipment e.g. generators and pumps.
- Emergency drip trays and spill kits will be kept available on Site, to ensure that any spills from vehicles are contained and removed off Site. The emergency response procedure is provided in the CEMP.
- Only designated trained operators will be authorised to refuel plant on Site.
- Taps, nozzles and valves will be fitted with locking systems.

#### *11.7.2.2 Earthworks*

The Site will be constructed in a phased manner to reduce the potential effects of the Project on the Soils, Geology and Hydrogeology. Phased construction reduces the amount of open, exposed excavations at any one time. Given that the works comprises a significant proportion of excavation and earthworks, suitably qualified and experienced geotechnical personnel will be required on site to supervise the earthworks phase of construction.

Details of the proposed methodology and mitigation measures are summarised below and are also outlined in the CEMP in Appendix 2.1 of Volume III.

One of the primary mitigation measures employed at the preliminary design stage is the prevention of volumes of excavated overburden deposits to be exported off-site. All excavated overburden will be retained on-site.

This will include:

- Use of suitable Site won material as general fill in the construction of access tracks, hardstands and in reinstatement around turbine foundations.
- Surplus overburden will be re-used on Site in the form of landscaping and for reinstatement purposes or placed within the designated peat and spoil management areas.

Surplus overburden deposits excavated during the course of the works will be temporarily stored adjacent to the construction phase excavations prior to reuse.

Some temporary stockpiles (not exceeding 2m in height) of material will be necessary adjacent to the excavation areas prior to reinstatement, however no long-term stockpiles of material will remain after construction and no surplus/waste soil or rock will be removed from Site. Temporary stockpiles will be shaped and sealed to prevent the ingress of water from rainfall.

To mitigate against the compaction of soil at the Site, prior to the commencement of any earthworks, the work corridor will be pegged, and machinery will stay within this corridor so that soils outside the work area are not damaged. Excavations will then be carried out from access tracks as they are constructed in order to reduce the compaction of soft ground.

To mitigate against erosion of the exposed soil, all excavations will be constructed and backfilled as quickly as possible. Excavations will stop during or prior to heavy rainfall events (>10mm/hour). To mitigate against possible contamination of the exposed soils, bedrock and groundwater refuelling of machinery and plant will only occur at designated refuelling areas.

All temporary cuts/excavations will be carried out such that they are stable or adequately supported. Gravel fill will be used to provide additional support to temporary cuts/excavations where appropriate. Unstable temporary cuts/excavations will not be left unsupported. Where appropriate and necessary, temporary cuts and excavations will be protected against the ingress of water or erosion.

The construction of the wind farm main infrastructural elements shall be overseen by either a geotechnical engineer or engineering geologist.

#### *11.7.2.3 Control of Sediment Laden Runoff*

The potential effects from silt laden surface water runoff from increased erosion of exposed overburden deposits has been assessed where earthworks and site clearance are proposed and are described in Chapter 12.

Details of the proposed Surface Water Management System and mitigation measures are summarised in Chapter 12 and are also outlined in the CEMP in Appendix 2.1 of Volume III.

Best practices will be employed in the prevention of silt laden run-off from entering watercourses as discussed in Chapter 12.

To minimise the effect to surface water quality, existing drainage (including forestry drainage) will be maintained outside the immediate Site area, and where appropriate, additional Site drainage and settlement ponds will be installed as required prior to construction activities. Silt fencing will be installed in new drainage and monitoring of water quality will be undertaken by the Contractor during the construction phase.

Final drainage will be constructed following the completion of these activities with silt fencing maintained until such time as a vegetation cover has become established. Chapter 12 of this EIAR discusses surface water issues in more detail.

#### *11.7.2.4 Measures for Spills*

Details of oil spill protection measures and emergency spill response procedures are outlined in the CEMP which is contained in Appendix 2.1 of Volume III.

Storage tanks, used to store fuel for the various items of machinery, will be self-contained and double-walled. Refuelling of construction vehicles will be carried out from these tanks or from delivery vehicles at designated refuelling areas. Specific mitigation measures relating to the management of hydrocarbons are as follows:

- Fuels, lubricants and hydraulic fluids for equipment used on the Site shall be carefully handled to avoid spillage.
- Any spillage of fuels, lubricants or hydraulic oils shall be immediately contained, and the contaminated soil removed from the Site and properly disposed of;
- Waste oils and hydraulic fluids shall be collected in leak-proof containers and removed from the Site for disposal or re-cycling; and
- Appropriate spill control equipment, such as oil soakage pads, shall be kept within the construction area and in each item of plant to deal with any accidental spillage.

#### *11.7.2.5 Slope Stability*

With regard to slope stability, detailed design and construction phase best practice will be implemented as follows:

- The works will be designed and supervised by a suitably qualified and experienced geotechnical engineer or engineering geologist, and hydrologist or drainage engineer.
- Drainage infrastructure will be put in place in advance of turbine excavations. Drains will divert surface water and groundwater away from excavations into the proposed surface drainage network. Uncontrolled, direct and concentrated discharges of water onto the ground surface will be avoided.
- Loading or stockpiling on the surface of soft ground will be avoided. Loading or stockpiling on other deposits will not be undertaken without first establishing the adequacy of the ground to support loads by an appropriately qualified geotechnical engineer experienced in construction within upland conditions.
- Turbines located in areas adjacent to peat deposits will incorporate drainage measures such that surface water will be drained away from the peat and will not be allowed to collect adjacent to the peat mass.
- Excavation will be carried out from access roads or hardstanding areas to avoid tracking of construction plant across areas of soft ground/peat.
- A detailed assessment of the stability of conditions at proposed infrastructure locations will be undertaken by a suitably qualified and experienced geotechnical engineer prior to the commencement of all excavations to ensure these activities do not result in or contribute to slope failure.
- Blasting of rock will not be permitted.
- Excavations which could have the potential to undermine the up-slope component of an existing slope will be sufficiently supported to resist lateral slippage and careful attention will be given to the existing drainage.
- Earthworks will not be commenced when heavy or sustained rainfall (status orange or higher) is forecast by Met Eireann. A rainfall gauge will be installed on Site to provide a record of rainfall intensity. An inspection of Site stability and drainage by the Geotechnical Engineer will be carried out on Site when a daily rainfall of over 25mm is recorded on Site, works will only recommence after heavy rain with the prior approval of the Geotechnical Engineer following their inspection.
- An emergency plan (included in Section 6 of the CEMP) will be updated at pre-construction stage detailing the action plan which would be implemented in the unlikely event of a landslide/slope failure. Should a landslide/slope failure occur or if signs of instability/ground movement are observed, work will cease immediately.

Further details will be given in the CEMP included in Appendix 2.1 of Volume III of this EIAR.

Prior to the progression of the project to detailed design and to inform the detailed design of the Project, the developer shall also ensure that:

- Confirmatory ground investigation works are undertaken, and these should be tailored to the engineering requirements of the Project.
- The Project will be developed to full detailed design prior to construction to minimise the risk of ground instability.
- Adequate time is afforded to any designers or contractors involved in the execution of the confirmatory ground investigation works; detailed design and construction works.

#### *11.7.2.6 Groundwater*

To mitigate against the increased vulnerability of the underlying aquifer to groundwater pollution, all excavations will be constructed and backfilled as quickly as possible. Excavations will stop during or prior to heavy rainfall events (status orange or higher). Details of mitigation measures related to spills and fuel storage are outlined in Chapter 12 - Hydrology and Water Quality.

The dewatering of the foundation excavations is not expected to cause interference with domestic wells in the area, due to large offset distances to known wells, relatively shallow depths of excavation and temporary short-term nature of dewatering, if required. To monitor groundwater during the construction phase groundwater monitoring wells will be installed between areas of deeper excavations and sensitive groundwater receptors, such as areas of shallow bedrock. The wells will be used to monitor groundwater levels and quality to assess any potential impacts during the construction works.

The GSI Wells and Springs database is not complete; it is therefore probable that there are other wells in addition to those in the GSI databases, but are generally associated with houses, the offset to which from the turbines is a minimum of 750m. Given the limited depth of the excavations during the construction phase and the distance to sensitive groundwater receptors the potential risk posed to groundwater supply wells is considered to be **Imperceptible** following the implementation of mitigation measures discussed above.

If, however, in the exceedingly unlikely event of a previously unknown domestic well being impacted by the proposed development, an alternative supply will be provided – either a connection to mains water or a replacement well will be drilled.

Grid connection and internal cable trenches could provide preferential pathways for groundwater and contaminant movement. Trenches will be excavated during dry periods where possible in short sections and left open for minimal periods, to avoid acting as a conduit for surface water flows. To further mitigate the risk of cable trenches becoming preferential pathways, clay plugs (or other low permeability material) will be installed at intervals along the trench to stop/inhibit water movement.

### 11.7.3 Mitigation Measures during Operation

It is not envisaged that the operation of the Project will result in significant impacts on the geological and hydrogeological regimes within the study area, as there will be no further disturbance of overburden post-construction.

There is a low risk to the geology receptors from compaction of soils due to the movement of HGVs and maintenance vehicles. All site traffic will be limited to access tracks, thereby reducing the area over which compaction of the underlying natural soils can occur.

The main potential impact during the operation phase would be the risk to groundwater from contamination from spills. Storage tanks, used to store fuel for the various items of machinery, will be self-contained and double-walled. Refuelling of maintenance vehicles will be carried out from these tanks or from delivery vehicles. Specific mitigation measures relating to the management of hydrocarbons are as follows:

- Fuels, lubricants and hydraulic fluids for equipment used on the Site shall be carefully handled to avoid spillage.
- Any spillage of fuels, lubricants or hydraulic oils shall be immediately contained, and the contaminated soil removed from the Site and properly disposed of;
- Waste oils and hydraulic fluids shall be collected in leak-proof containers and removed from the Site for disposal or re-cycling; and
- Appropriate spill control equipment, such as oil soakage pads, will be kept within the storage areas and in each item of plant / vehicle to deal with any accidental spillage.

Due to the reduced magnitude of the impacts, no additional mitigation measures are required for the maintenance and operation of the wind farm, over and above those incorporated into the design of the substation transformer, which will be bunded to protect soils against accidental leakages of oils and battery fluids.

### 11.7.4 Mitigation Measures during Decommissioning

Mitigation measures applied during decommissioning activities will be similar to those applied during construction where relevant.

Some of the impacts associated with reinstatement of the Site (excavation of turbine bases, access tracks etc.) will be avoided by leaving these in place where possible. The Irish Wind Energy Association (IWEA) (11) states that when decommissioning a wind farm "*the concrete bases could be removed, but it may be better to leave them under the ground, as this causes less disturbance*". It is proposed to leave the access tracks in-situ at the decommissioning stage. IWEA also state that "*it may be best*" to leave site tracks in-situ depending on the size and geography of the development.

It is considered that leaving the turbine foundations, access tracks and hardstanding areas in-situ will cause less environmental damage than removing and recycling them. It is proposed to retain these elements of the construction and cover with overburden material (which will have been placed at the sides of roads and hardstanding to turbines) to allow for re-vegetation of the development Site.

However, if removal is deemed to be required by the respective Planning Authority all infrastructure will be removed with mitigation measures similar to those during construction being employed.

Mitigation measures to avoid contamination by accidental fuel leakage and compaction of soil by on-site plant will be implemented as per the construction phase mitigation measures outlined above.

### 11.7.5 Cumulative Impacts

During the construction of the Project there will be the requirement for the importation of engineered fill from source quarries and the potential for disposal of materials unsuitable for reuse at licensed facilities which would be a cumulative impact in terms of demands placed on local quarries for aggregate and an increase in traffic as hauliers take away any unsuitable material and as hauliers deliver the engineered fill from local quarries.

As such, it is considered there will be an '**Slight**' cumulative impact during the construction phase of the development.

No significant, direct negative cumulative impacts are envisaged during the operation or decommissioning phase of the Project. As such no mitigation measures are required with respect to potential cumulative impacts of the Project.

## 11.8 Residual Effects

It can be observed from Table 11-19 and Table 11-20 that, following the implementation of mitigation measures, the residual impact significance to the receiving environment would be imperceptible during the construction period and imperceptible during the operation of the Project. Mitigation measures shall be monitored throughout the construction and operational phases.

The Project is not expected to contribute to any significant, negative cumulative effects of other existing or known developments in the vicinity. Slight residual cumulative effects from the excavation of fill material from local quarries and disposal of material deemed unsuitable for reuse are considered to result from the Project by placing demand on existing quarries and available void space at licensed facilities during the construction phase of the development.

**Table 11-19: Summary of Residual Impact Significance on Geological Receptors**

| Activity | Potential Impact | Receptor | Importance | Pre-Mitigation | | Post-Mitigation | |
|---|---|---|---|---|---|---|---|
| | | | | Magnitude | Significance | Magnitude | Significance |
| **Construction Phase** | | | | | | | |
| Site Clearance | Exposure of underlying overburden leading to increased erosion.<br>Felling machinery resulting soil compaction of soft deposits and an increase in surface water runoff resulting in increased erosion of exposed soils. | Peat deposits/ organic soils Glacial Till deposits and bedrock. | Low | Small Adverse | Imperceptible | Negligible | Imperceptible and insignificant |
| Earthworks associated with the construction of the proposed turbines and associated infrastructure. | Removal of overburden material, open excavations and subsequent exposure underlying overburden and bedrock leading to increased erosion.<br>Construction traffic resulting in soil compaction and increase in surface water runoff resulting in increased erosion of exposed soils.<br>Importation of engineering fill and concrete. | Peat deposits/ organic soils Glacial Till deposits and bedrock. | Low | Moderate Adverse | Slight | Small Adverse | Imperceptible and insignificant |
| Earthworks associated with the construction of the proposed turbines and associated infrastructure. | Slope Failure. | Peat deposits/ organic soils Glacial Till deposits and bedrock. Site Operatives. Existing Infrastructure and nearby residential areas. | Low | Moderate Adverse | Slight | Small Adverse | Imperceptible and insignificant |

| Activity | Potential Impact | Receptor | Importance | Pre-Mitigation | | Post-Mitigation | |
|---|---|---|---|---|---|---|---|
| | | | | Magnitude | Significance | Magnitude | Significance |
| Construction of Turbine and Substation Foundations | Open excavations, increased runoff causing erosion of underlying overburden and bedrock.<br>Construction traffic resulting in soil compaction and increase in surface water runoff resulting in increased erosion of exposed soils.<br>Importation of engineering fill and concrete products | Peat deposits/ organic soils Glacial Till deposits and bedrock. Local quarries. | Low | Moderate Adverse | Slight | Small Adverse | Imperceptible and insignificant |
| Construction of Internal Site Access Roads, Hardstands and Temporary Compound | Open excavations, increased runoff causing erosion of underlying overburden and bedrock.<br>Construction traffic resulting in soil compaction and increase in surface water runoff resulting in increased erosion of exposed soils.<br>Importation of engineering fill | Peat deposits/ organic soils Glacial Till deposits and bedrock. Local quarries | Low | Moderate Adverse | Slight | Small Adverse | Imperceptible and insignificant |
| Construction of the Grid Connection and Internal Cabling | Removal of overburden material and exposure underlying Clay and Bedrock to erosion.<br>Construction traffic resulting in soil compaction and increase in surface water runoff resulting in increased erosion of exposed soils.<br>Importation of engineering fill and concrete products<br>Disposal of surplus excavated material to licenced facility | Peat deposits/ organic soils Glacial Till deposits and bedrock. Local quarries. Licenced waste facilities | Low | Small Adverse | Imperceptible | Negligible | Imperceptible and insignificant |

| Activity | Potential Impact | Receptor | Importance | Pre-Mitigation | | Post-Mitigation | |
|---|---|---|---|---|---|---|---|
| | | | | Magnitude | Significance | Magnitude | Significance |
| Accommodation works along TDR | Removal of overburden material and exposure of underlying superficial deposits and bedrock to erosion.<br>Construction traffic resulting soil compaction and increase in surface water runoff resulting in increased erosion of exposed soils.<br>Importation of engineering fill.<br>Disposal of surplus excavated material to licenced facility. | Peat deposits/ organic soils Glacial Till deposits and bedrock. Local quarries. Licenced waste facilities. | Low | Small Adverse | Imperceptible | Negligible | Imperceptible |
| **Operational Phase** | | | | | | | |
| Construction traffic for maintenance purposes. | Minor accidental leaks or spills of fuel/oil | Peat deposits/ organic soils Glacial Till deposits and bedrock. | Low | Small Adverse | Imperceptible | Negligible | Imperceptible |
| Operation of substation | Spills, leaks of oils/battery fluids. | Peat deposits/ organic soils Glacial Till deposits and bedrock. | Low | Small Adverse | Imperceptible | Negligible | Imperceptible |
| Maintenance of access tracks | Importation of engineering fill from local quarries | Local quarries | Low | Small Adverse | Imperceptible | Negligible | Imperceptible |

| Activity | Potential Impact | Receptor | Importance | Pre-Mitigation | | Post-Mitigation | |
|---|---|---|---|---|---|---|---|
| | | | | Magnitude | Significance | Magnitude | Significance |
| **Decommissioning Phase** | | | | | | | |
| Removal of Turbines and Hardstands. | Construction traffic resulting soil compaction and increase in surface water runoff resulting in increased erosion of exposed soils. | Peat deposits/ organic soils Glacial Till deposits and bedrock. | Low | Small Adverse | Imperceptible | Negligible | Imperceptible |
| **Cumulative Effects** | | | | | | | |
| Large-scale developments within 20km of the Project Site occurring concurrently with construction of the Site. | Strain on supply and reduction of a finite aggregate resource. | Local quarries (crushed rock and granular aggregate) | Low | Small Adverse | Slight | Negligible | Imperceptible |

**Table 11-20: Summary of Residual Impact Significance on Hydrogeological Receptors**

| Activity | Potential Impact | Receptor | Importance | Prior to Mitigation | | Post Mitigation | |
|---|---|---|---|---|---|---|---|
| | | | | Magnitude | Significance | Magnitude | Significance |
| **Construction Phase** | | | | | | | |
| Felling Activities | Exposure of soils and bedrock to surface water runoff. An increase in sediment and nutrient concentrations within the surface water impacting the underlying aquifer. Spills, leaks of fuels and oils from forestry machinery which could contaminate the groundwater. | Locally Important Bedrock Aquifer<br>Groundwater Wells and Springs.<br>Surface water bodies. | Medium | Small Adverse | Slight | Negligible | Imperceptible |
| Earthworks associated with the construction of the proposed turbines and associated infrastructure. | Potential for groundwater pollution from the removal of overburden deposits.<br>Potential for silt infiltration to groundwater as a result of increased surface runoff and reduced protection of the aquifer.<br>Potential for contamination to groundwater from spills/leakages during construction phase earthworks.<br>Reduction in groundwater levels from dewatering of excavation as required during the construction phase. | Locally Important Bedrock Aquifer<br>Groundwater Wells and Springs.<br>Surface water bodies. | Medium | Small Adverse | Slight | Negligible | Imperceptible |
| Earthworks associated with the construction of the proposed turbines and associated infrastructure. | Slope Failure. | Locally Important Bedrock Aquifer<br>Groundwater Wells and Springs.<br>Surface water bodies. | Medium | Small Adverse | Slight | Negligible | Imperceptible |

| Activity | Potential Impact | Receptor | Importance | Prior to Mitigation | | Post Mitigation | |
|---|---|---|---|---|---|---|---|
| | | | | Magnitude | Significance | Magnitude | Significance |
| Construction of Turbine and Substation Foundations | Potential for groundwater pollution from the removal of overburden deposits.<br>Potential for silt infiltration to groundwater as a result of increased surface runoff and reduced protection of the aquifer.<br>Potential for contamination to groundwater from spills/leakages during construction phase earthworks.<br>Reduction in groundwater levels from dewatering of excavation as required during the construction phase. | Locally Important Bedrock Aquifer<br>Groundwater Wells and Springs.<br>Surface water bodies. | Medium | Small Adverse | Slight | Negligible | Imperceptible |
| Construction of Internal Site Access Roads, Hardstands and Temporary Compound | Potential for groundwater pollution from the removal of overburden deposits.<br>Potential for silt infiltration to groundwater as a result of increased surface runoff and reduced protection of the aquifer.<br>Potential for contamination to groundwater from spills/leakages during construction phase earthworks.<br>Potential for ground water pollution from the use of cement-based compounds during the construction phase. | Locally Important Bedrock Aquifer<br>Groundwater Wells and Springs.<br>Surface water bodies. | Medium | Small Adverse | Slight | Negligible | Imperceptible |

| Activity | Potential Impact | Receptor | Importance | Prior to Mitigation | | Post Mitigation | |
|---|---|---|---|---|---|---|---|
| | | | | Magnitude | Significance | Magnitude | Significance |
| Construction of the Grid Connection and Internal Cabling | Potential for ground water pollution from the removal of overburden deposits.<br>Potential for silt infiltration to groundwater as a result of increased surface runoff and reduced protection of the aquifer.<br>Potential for contamination to groundwater from spills/leakages during construction phase earthworks. | Locally Important Bedrock Aquifer<br>Groundwater Wells and Springs.<br>Surface water bodies. | Medium | Small Adverse | Slight | Negligible | Imperceptible |
| Accommodation works along TDR | Potential for ground water pollution from the removal of overburden deposits.<br>Potential for silt infiltration to groundwater as a result of increased surface runoff and reduced protection of the aquifer.<br>Potential for contamination to groundwater from spills/leakages during construction phase accommodation works. | Locally Important Bedrock Aquifer<br>Groundwater Wells and Springs.<br>Surface water bodies. | Medium | Negligible | Imperceptible | Negligible | Imperceptible |
| **Operational Phase** | | | | | | | |
| Construction traffic for maintenance purposes. | Minor accidental leaks or spills of fuel/oil | Locally Important Bedrock Aquifer<br>Groundwater Wells and Springs.<br>Surface water bodies. | Medium | Negligible | Imperceptible | Negligible | Imperceptible |

| Activity | Potential Impact | Receptor | Importance | Prior to Mitigation | | Post Mitigation | |
|---|---|---|---|---|---|---|---|
| | | | | Magnitude | Significance | Magnitude | Significance |
| Operation of substation | Spills, leaks of oils/battery fluids. | Locally Important Bedrock Aquifer<br>Groundwater Wells and Springs.<br>Surface water bodies. | Medium | Negligible | Imperceptible | Negligible | Imperceptible |
| **Decommissioning Phase** | | | | | | | |
| Removal of Turbines and Hardstands. | Potential for groundwater pollution from the disturbance of overburden deposits<br>Potential for silt infiltration to groundwater as a result of increased surface runoff and reduced protection of the aquifer.<br>Potential for contamination to groundwater from spills/leakages during decommissioning phase earthworks. | Locally Important Bedrock Aquifer<br>Groundwater Wells and Springs.<br>Surface water bodies. | Medium | Small Adverse | Slight | Negligible | Imperceptible |
| **Cumulative Effects** | | | | | | | |
| Large-scale developments within 20km of the Project Site occurring concurrently with construction of the Site. | Potential for groundwater pollution from runoff. | Locally Important Bedrock Aquifer<br>Groundwater Wells and Springs.<br>Surface water bodies. | Medium | Small Adverse | Slight | Negligible | Imperceptible |

## 11.9 Conclusions

A study has been undertaken which has identified likely significant effects of the construction operation and decommissioning of the proposed project in relation to the Land, Soils, Geology and Hydrogeology.

The assessment of Land, Soils, Geology and Hydrogeology has established a baseline for the receiving environment for the impact assessment. Likely significant effects were considered for the construction, operational and decommissioning phases of the Project as well as potential residual and cumulative effects. Mitigation measures have been proposed where relevant to prevent or reduce significant adverse effects. It has been concluded that the proposed project alone and in combination with other plans and projects is not likely to have any significant adverse effect on the environment in terms of land, soil, geology and hydrogeology, and that it is not likely to pose a significant risk of a landslide.

The Project site is not a sensitive site in terms of land, soil, geology and hydrogeology, and poses a low risk for landslide.

Findings from the site walkover surveys indicates no visual evidence of historic or contemporary landslides or ground instability at or adjacent to the proposed infrastructure locations.

A number of potential significant effects have been identified associated with the excavation of soil and rock on the site. The significance of these potential effects is assessed as being '**imperceptible**' to '**moderate/slight**' significance prior to mitigation.

The Project alone and in combination with other plans and projects is not likely to have any significant, negative cumulative effects with other existing, permitted or proposed developments.

With mitigation measures, outlined in Section 11.7, put in place during construction, operational and decommissioning stage the Project will have an '**imperceptible**' impact and effect on the Site's geological and hydrogeological receptors.

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# Appendix 13

# Collision Risk Modelling (CRM) Report

# Derrynadarragh Wind Farm

# Collision Risk Modelling

**Prepared for:**

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**September 2025**

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# 1 INTRODUCTION

Wind Farm Developments have the potential to impact bird species in a number of ways, including displacement, barrier effects, habitat effects, and collision risk. Collison risk can be assessed using Collision Risk Modelling (CRM). *Wetland Surveys Ireland Ltd.* were commissioned by *Dara Energy Limited Ltd.* to assess the collision risk for bird species at the proposed Derrynadarragh Wind Farm, Co. Offaly and Co. Kildare.

CRM is a method to estimate the number of birds likely to collide with turbines at a proposed wind farm site. This method uses vantage point data collected during field surveys to calculate the risk of collision. In this case, vantage point data collected over two years (two breeding seasons and two winter seasons) at the proposed Derrynadarragh Wind Farm site was used. The vantage point surveys were undertaken over a 24-month period from October 2021 to September 2023 at two vantage point locations (VP1 and VP2). A third vantage point, VP3, was established in April 2022 and was surveyed along with VP1 and VP2 from then until September 2023 (see Figure 1). For the purposes of the CRM, the parameters used to inform turbine characteristics are based on the Vestas V-162 model of turbine.

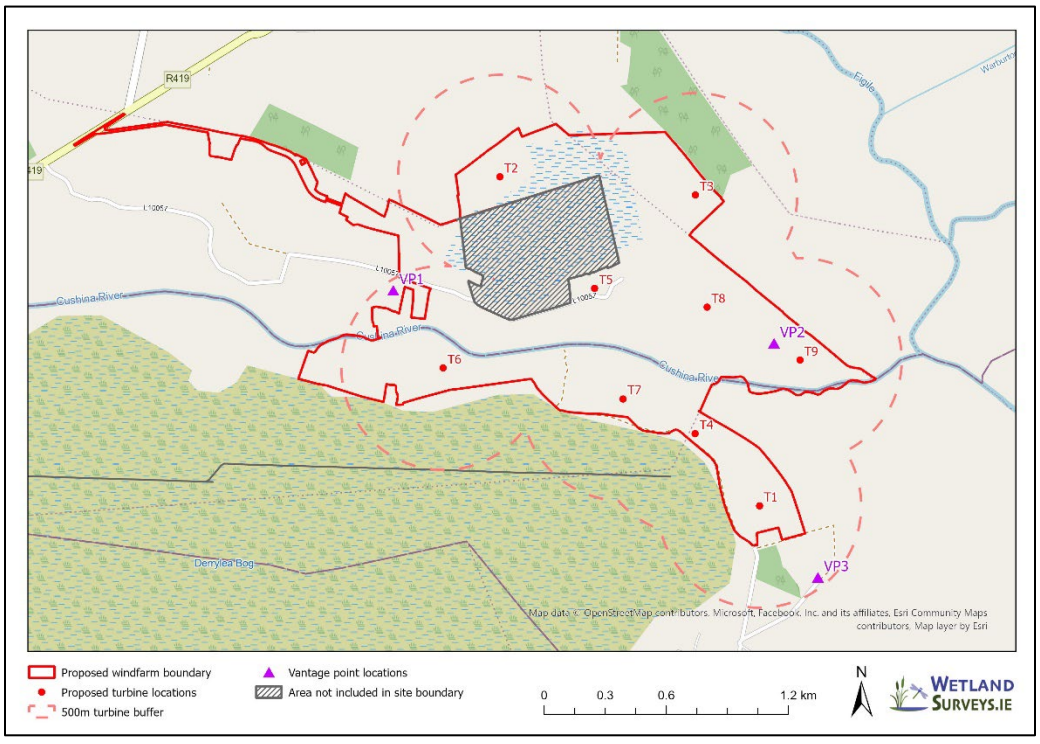



**Figure 1: Layout of Derrynadarragh Windfarm showing site boundary, turbine location (No. 9), bird survey area and Vantage Point locations.**

# 2 METHODOLOGY

The vantage point surveys were carried out following Scottish Natural Heritage guidelines (SNH 2017). CRM uses a mathematical model to estimate the number of birds of a particular species that are likely to collide with the proposed turbines. The CRM method followed here is that of Scottish Natural Heritage, which is also known as the Band Model (Band 2000, Band *et al.* 2007) as updated in 2024 (Band 2024). The excel calculation sheet available for download from the SNH website[1] was used for the current CRM and follows the updated approach of Band (2024). The Collision Risk sheet within the calculation excel requires data to be input relating to the target bird species, the wind farm, and the turbines. These data are then used within Stages A - E of the collision risk calculation, which are clearly delineated within the excel. Additional data input is also required for Stages A, D, and E within the calculation excel.

## 2.1 BIRD DATA

For each target species several parameters must be entered into the excel calculation sheet including bird length, wingspan, and bird flight speed. Bird biometric data were obtained from the Royal Society for the Protection of Birds[2]. It is recommended (Band 2024) that bird biometrics are obtained from standard reference works (e.g. Cramp & Simmons 1983) or from British Trust for Ornithology (BTO) Bird Facts. BTO Bird Facts[3] were consulted in February 2025, however the required biometric data was not displayed for the bird species required. This data was found on the Royal Society for the Protection of Birds website and so was used in place of BTO data (Table 1).

The calculation excel requires a nocturnal activity ranking to be selected for each target species. The ranking ranges from 1-5, where 1 represents no nocturnal activity (birds are inactive at night) and 5 represents high levels of nocturnal activity (birds are as active at night as they are during the day). A ranking of 1 was assigned to all target bird species recorded, except for Golden Plover, Snipe, and Lapwing which were given a nocturnal activity ranking of 2, which represents 25% nocturnal activity (birds are 25% as active at night as they are during the daytime).

For all target bird species it was assumed that flight speed was the same upwind and downwind. The calculations were run for both gliding and or flapping flight depending on the typical flight of each species. Where both gliding and flapping are calculated then the two values are averaged.

[1] https://www.nature.scot/doc/collision-risk-model-onshore-wind-farms-spreadsheet-2024

[2] https://www.rspb.org.uk/birds-and-wildlife

[3] https://www.bto.org/understanding-birds/welcome-birdfacts

For each target species 'normal approach' or 'birds on migration' needed to be specified in the calculation excel. All species recorded during regular vantage point watches were selected as 'normal approach'.

To account for a bird's ability to detect and avoid turbines, an avoidance factor is applied to the annual collision mortality rate. Based on empirical evidence and ongoing studies, avoidance rates for most species are typically 98-99% or higher (SNH, 2018). For Golden Plover, an avoidance rate of 99.8% was used as it was determined by Gittings (2022) to be appropriate based on a review of four onshore windfarms in the UK. The avoidance rate used for Hen Harrier was 99%, Whooper Swan was 99.5%, and Kestrel was 95%. For the other species included in this collision risk, the SNH guidance specifies a default avoidance rate of 98% (see Table 1).

**Table 1: Bird biometrics and seasonal data for target species.**

| Species | Period | Avoidance Rates (%) | Length (m) | Wingspan (m) | Average speed (m/s) |
|---|---|---|---|---|---|
| Buzzard | All | 98 | 0.54 | 1.21 | 11.6 |
| Curlew | All | 98 | 0.55 | 0.9 | 16.3 |
| Golden Plover | Sept to Apr | 99.8 | 0.28 | 0.72 | 17.9 |
| Hen Harrier | All | 99 | 0.48 | 1.1 | 9.1 |
| Kestrel | All | 95 | 0.34 | 0.76 | 10.1 |
| Lapwing | All | 98 | 0.3 | 0.85 | 12.8 |
| Mallard | All | 98 | 0.57 | 0.9 | 18.5 |
| Merlin | All | 98 | 0.28 | 0.56 | 11.2 |
| Peregrine | All | 98 | 0.45 | 1.05 | 12.1 |
| Snipe | All | 98 | 0.26 | 0.42 | 17.1 |
| Sparrowhawk | All | 98 | 0.33 | 0.63 | 11.3 |
| Whooper Swan | Oct to Mar | 99.5 | 1.5 | 2.2 | 17.3 |
| Woodcock | All | 98 | 0.34 | 0.6 | 17.1 |

*Length and wingspan from RSPB. Flight speed from Alerstam et al. (2007); for Golden plover, value for grey plover was used; for woodcock, value for snipe was used*

## 2.2 WINDFARM DATA

The latitude of Derrynadarragh windfarm is 53.2 degrees (at its most northerly point). This value was entered into the calculation excel which then automatically calculated the total daylight hours per month for the windfarm site. The number of proposed turbines for the site is 9 and this value was also entered into the calculation excel.

### 2.2.1 Turbine Data

The turbine model used to inform the CRM is the Vestas V-162. The turbine parameters as per the manufacturer's specifications are presented in Table 2 were used in the CRM. Blade profile

data (a separate sheet in the calculation excel) were not altered and default values were used, as the specific data for the turbine model was not available.

**Table 2: Turbine parameters for the proposed turbine model at Derrynadarragh Wind Farm.**

| Turbine Model | V-162 (Vestas) |
|---|---|
| *Number of turbines* | 9 |
| *Hub height* | 105m |
| *Rotor radius* | 81m |
| *Number of blades* | 3 |
| *Rotation speed*[4] | 12.1rpm |
| *Maximum blade width* | 4.3m |
| *Blade pitch* | 15 degrees[5] |

## 2.3 STAGES OF COLLISION RISK ASESSMENT

The five stages (A to E) involved in CRM (as per Band 2024) are as follows:

**Stage A Flight Activity:**

*Vantage point survey data of birds flying in the study area are used to determine the density of birds flying in the vicinity of the proposed turbines and the proportion flying at risk height (between the lowest and highest points of the rotors).*

*Bird Density*

Two years of survey data (October 2021 – September 2023) were used for this CRM analysis. Data was collected at dedicated vantage point (VP) locations overlooking the proposed windfarm site as illustrated in Figure 1 above. A total of 162 hours of survey effort was carried out at VP1 and VP2 individually over the entire survey period. The total survey effort at VP3 was 120 hours. The survey effort at VP3 was lower than that at VP1 and VP2 as VP3 was only established in Summer 2022. Survey effort per season is summarised in Table 3.

The three VP locations afforded views over the proposed wind farm site and a 500 m buffer around each proposed turbine. The viewshed from each VP is illustrated in Figure 2 - Figure 4 below. The viewsheds were determined by surveyors and confirmed using spatial analyst GIS software tools. Both a 0m (ground level) and 20m (above ground level) viewshed were established for each VP. The viewsheds were used to calculate the area visible from each VP. The cumulative coverage of the survey area by the 20m elevation viewshed from all VPs is illustrated in Figure 5 below.

[4] *The dynamic operation range (the rate at which the blades rotate) of the turbines is approximately 4-12.1 revolutions per minute (rpm) which is influenced by wind speed. Taking a precautionary approach the higher rate of 12.1 is used in the CRM.*

[5] *A pitch value of 15 degrees was used as this is accepted as a recognised average when a turbine is operating at around its mean rotational speed (Band 2024).*

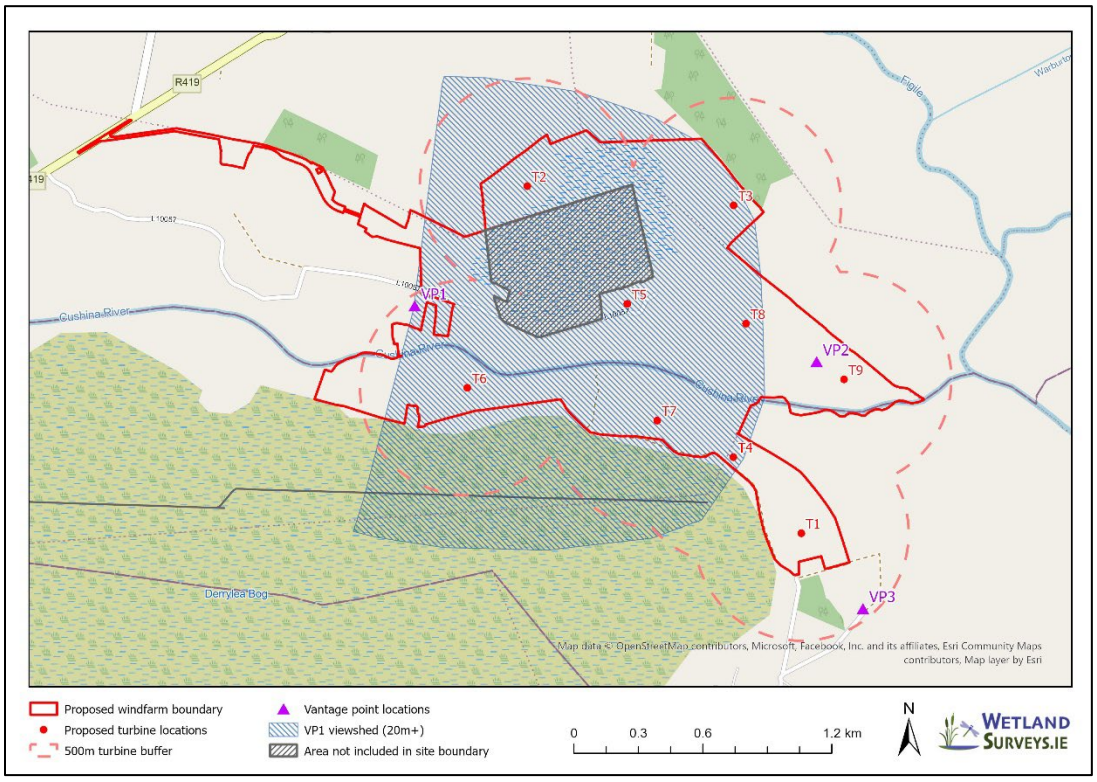



**Figure 2: Viewshed from VP1 (20m height).**

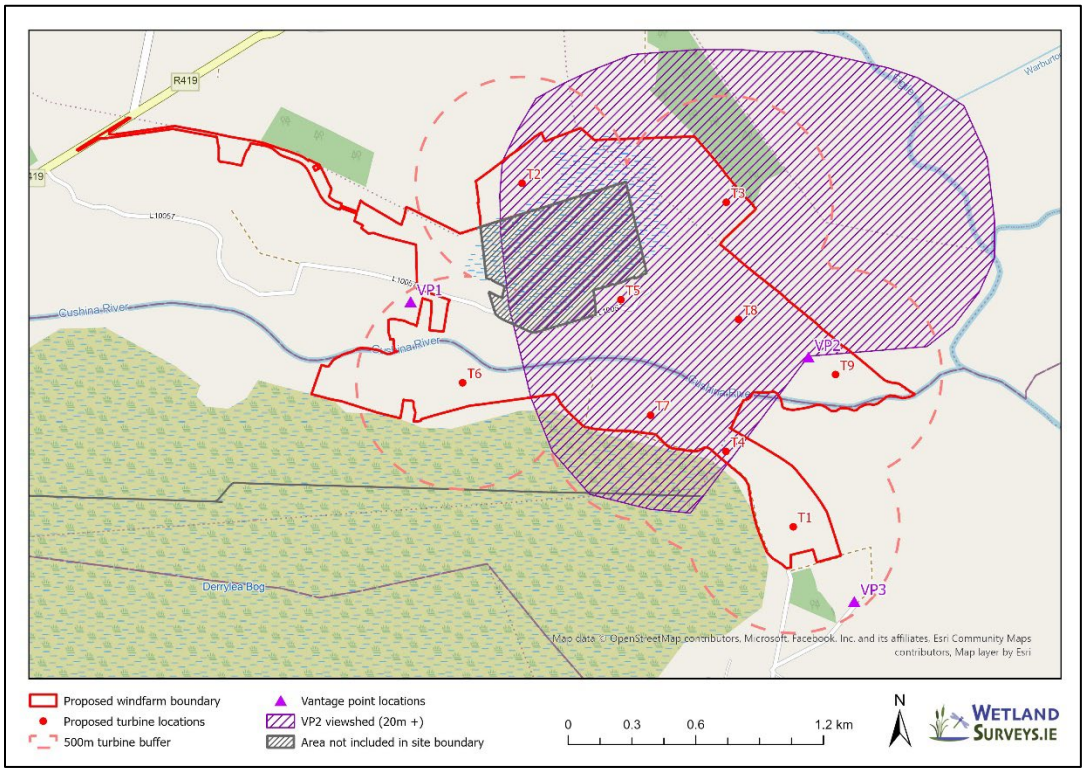



**Figure 3: Viewshed from VP2 (20m height).**

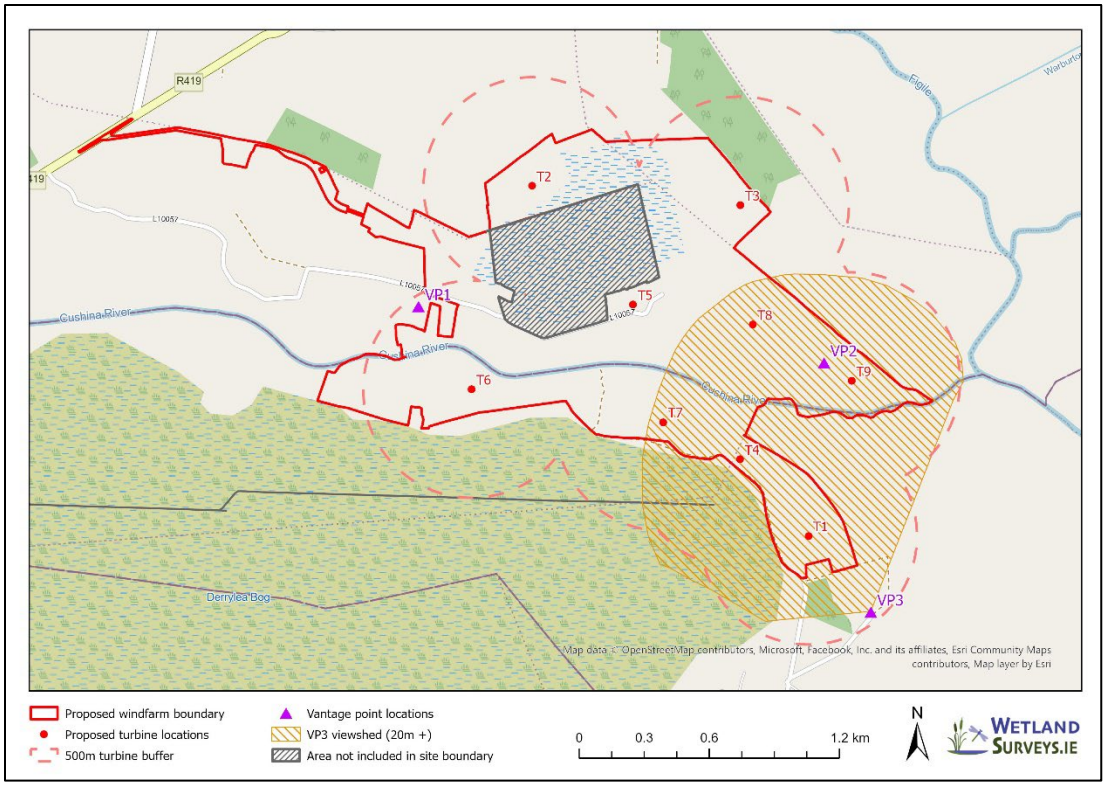



**Figure 4: Viewshed from VP3 (20m height).**

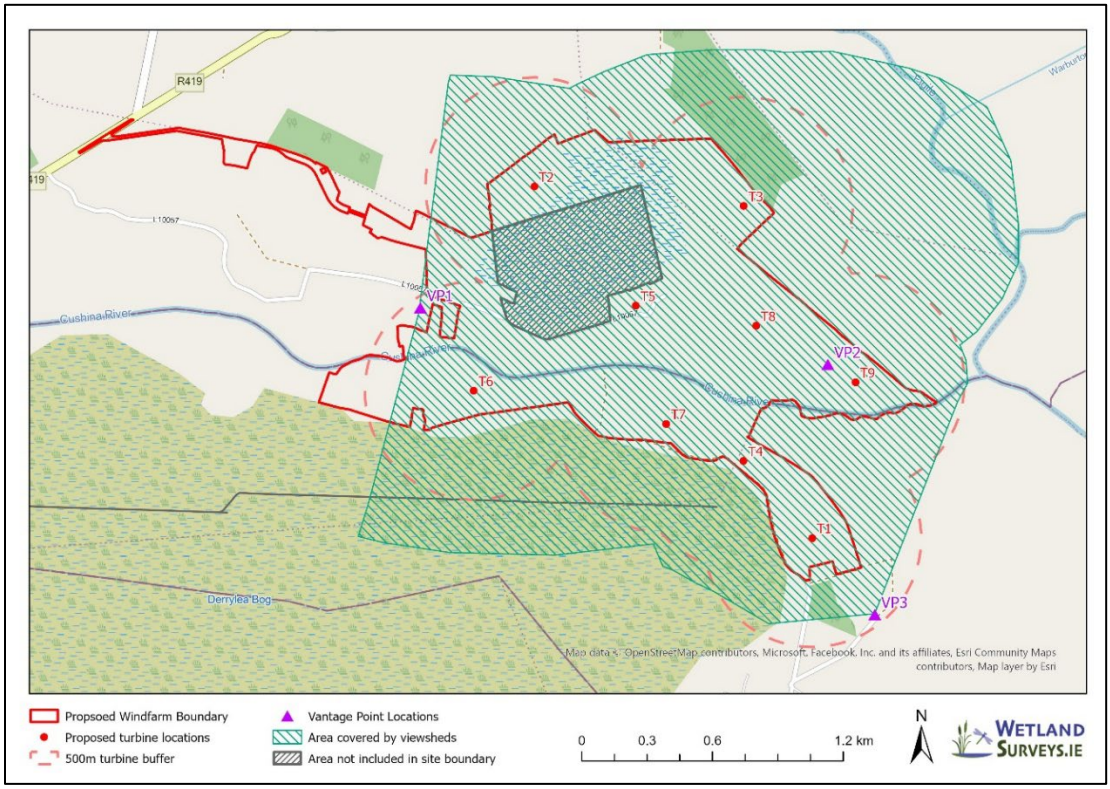



**Figure 5: Overall coverage of study area by three VP viewsheds (20m height).**

**Table 3: Details of vantage point watches carried out at Derrynadarragh Wind Farm**

| | Viewshed area (km$^2$) | Seasonal surveys | Total survey effort (hrs) | VP Location |
|---|---|---|---|---|
| VP1 | 3.24 | Winter (Oct 21 – Mar 22): 36hrs<br>Summer (Apr – Sep 22): 36hrs<br>Winter (Oct 22 – Mar 23): 54hrs<br>Summer (Apr – Sep 23): 36hrs | 162 | 658138, 716055 |
| VP2 | 3.65 | Winter (Oct 21 – Mar 22): 36hrs<br>Summer (Apr – Sep 22): 36hrs<br>Winter (Oct 22 – Mar 23): 48hrs<br>Summer (Apr – Sep 23): 42hrs | 162 | 660008, 715795 |
| VP3 | 1.79 | Winter (Oct 21 – Mar 22): na<br>Summer (Apr – Sep 22): 36hrs<br>Winter (Oct 22 – Mar 23): 42hrs<br>Summer (Apr – Sep 23): 42hrs | 120 | 660224, 714647 |

** VP3 has a lower survey effort compared to VP1 and VP2 as it was not established until April 2022*

** A number of additional watches were undertaken during winter 2022-23 and summer 2023 to increase coverage of the Spring and Autumn migration periods.*

Flightlines were recorded during each VP survey, noting the species of bird, number of individuals and time spent flying at various height bands[6]. Any flightlines that occurred entirely outside of the relevant viewshed were excluded from the analysis. Flightlines that partly occurred within the relevant viewshed were clipped to the viewshed and the duration of the flight was recalculated using the proportion of the original flightline occurring within the viewshed. This recalculation assumes that flight height distribution and flight speed were similar in the segments inside and outside of the viewshed.

Multiplying the number of birds by the time recorded flying for each species of interest provided the total flying time for that species during a given season in bird-seconds. This total flying time was then divided by the total watch time (s) and the area surveyed (viewshed) (km$^2$) to calculate the average density of birds in flight per km$^2$.

Vantage Point data was aggregated into two periods: winter season (October - March) and breeding season (April – September) for each year following the approach used in Band (2024). In the case of Golden Plover and Whooper Swan, which are present only during winter, the relevant periods which correspond with their presence in the study area are September to April and October to March respectively, and these periods have been used for the purposes of CRM. As there is no major difference in habitat covered by each of the VP locations, the data for all VPs were also aggregated. There were variations in the level of flight activity recorded for individual species between years, however activity was not consistently higher in one year for all

[6] Three flight bands were used to record flightlines during bird surveys at Derrynadarragh: 0-25m, 25-180m, and >180m

species. Therefore, data for the two years at all VPs was aggregated, resulting in mean bird density values for the winter season and the breeding season. These average values were used to populate daytime bird density values in the calculation excel for their corresponding months. Calculations for bird density are presented in Appendix I.

*Proportion flying at risk height*

In order to determine the proportion of birds flying at risk height the proportion of flight time recorded within each of the flight height bands is calculated using the height range of the proposed turbine model.

The risk height range of the selected turbine is 24-186m above ground. The following flight bands were used to record flightlines during VP surveys: Band A: 0-25m, Band B: 25-180m, and Band C >180m. These bands were established in advance of knowing the turbine dimensions and hence the risk height range differs slightly from Band B. In order to determine the proportion of birds within B and A and Band C that may be at height risk, a proportion of flights in each band were assigned as occurring within the flight risk height.

It is assumed that flight heights were distributed uniformly within each of the height bands that were used to record flightline data.

An upper ceiling of 400m was applied to Band C as this is likely to represent the upper height that most birds were observed. The risk height range for the proposed turbine models is 24-186m (hub height = 105m and rotor radius = 81m). For the flight height bands used, 1m of the rotor height span falls within the 0-25m band, 155m falls within the 25-180m band, and 6m falls within the 180-400m band. The flight time recorded within each flight height band for each species was expressed as a percentage of the total flight time for each species to determine the proportion of time spent within each flight height band for each species. This value was then multiplied by the proportion of the rotor height within the flight band, and this value for each flight band was summed to obtain the total proportion of flights falling within rotor risk height. The outcome of these calculations are presented in Table 6.

**Stage B Number of flights through rotors:** *Using bird density and proportion of birds at risk height (Stage A), an estimate is made of the number of bird passages through the turbine rotors over a given time period. At this stage it is assumed that birds will continue to make flights within the windfarm area at the same intensity as prior to the establishment of the windfarm.*

The potential number of flights through turbine rotors depends on turbine size. The rotor radius for turbines is 81m and nine turbines are proposed for the site. Bird flight speed is also required for this calculation. Values for each species were obtained from Alerstam *et al.* (2007).

The result of this calculation at stage B as produced by the excel spreadsheet is the projected number of rotor transits per month and per year. Projected number of transits per year are presented in Table 7.

**Stage C Probability of collision for a single transit:** *The probability of a collision during a single rotor transit by a bird is calculated.*

In this stage, the projected number of rotor transits calculated in Stage B are used to determine the single transit collision risk for each target species as presented in Table 7.

**Stage D Expected collisions per year:** *The outputs of Stage B and Stage C are multiplied to give the potential collision rate for each bird species. Current levels of bird usage at the site are still assumed at this stage, but an adjustment is made to allow for the amount of time that the turbines are operational.*

In this case a value of 85% was used as the actual percentage of operational time for the proposed windfarm site is unknown. It is known that wind turbines are not active 100% of the time and 85% is seen as an upper limit for time that a wind turbine is typically active (Wind Europe).

**Stage E Allowing for avoidance and attraction:** *This stage takes into account the proportion of birds likely to avoid the windfarm or turbines, either due to displacement, evasive action, or attraction to the windfarm site.*

For this part of the CRM analysis avoidance rates as presented in SNH (2018) were used (see Table 1). An exception however is in relation to Golden Plover, rather than applying the default 98% avoidance rate, a species specific rate of 99.8% was used. This approach is informed by a study by Gittings (2022) based on a review of collision data relating to four onshore wind farms.

In the case of all target bird species it was assumed that there is no reason for the proposed windfarm site to attract a higher number of species than that already present.

As the proposed windfarm comprises nine turbines, the large array correction was not applied (required for sites with 50 turbines or more).

**Birds on Migration**

There were peak counts of Golden Plover recorded around the Autumn migration period in both years with a flock of 4,000 birds observed in Autumn 2022. It was determined that the flights did not represent migration flights but represent staging behaviour. The migration approach was therefore not applied to the bird observations at the site.

## 3 RESULTS

A total of 13 target bird species were recorded during VP watches (Table 4).

**Table 4: Bird species recorded during VP watches at the proposed Derrynadarragh Wind Farm. Annex I refers to whether the species is listed in Annex I of the EU Birds Directive.**

| Species | Conservation Status | Annex I |
|---|---|---|
| Buzzard | Green Listed | No |
| Curlew | Red Listed | No |
| Golden Plover | Red Listed | Yes |
| Hen Harrier | Amber Listed | Yes |
| Kestrel | Red Listed | No |
| Mallard | Amber Listed | No |
| Lapwing | Red Listed | No |
| Merlin | Amber Listed | Yes |
| Peregrine | Green Listed | Yes |
| Snipe | Red Listed | No |
| Sparrowhawk | Green Listed | No |
| Whooper Swan | Amber Listed | Yes |
| Woodcock | Red Listed | No |

The average bird density value calculated for each species recorded during VP watches is presented in Table 5 below.

**Table 5: Average bird density (birds / km$^2$) of bird species recorded during VP watches at the proposed Derrynadarragh Wind Farm**

| Species | *Winter average* | *Breeding average* | Birds / km$^2$ (all year) |
|---|---|---|---|
| Buzzard | 0.00165 | 0.0027 | 0.00431 |
| Curlew | 0.00000 | 0.0002 | 0.00019 |
| Golden Plover (winter only) | 5.01733 | *n/a* | 5.01733 |
| Hen Harrier | 0.00006 | 0.0000 | 0.00006 |
| Kestrel | 0.00125 | 0.0002 | 0.00147 |
| Lapwing | 0.00719 | 0.0000 | 0.00719 |
| Mallard | 0.00001 | 0.0000 | 0.00001 |
| Merlin | 0.00002 | 0.0000 | 0.00002 |
| Peregrine | 0.00002 | 0.0000 | 0.00002 |
| Snipe | 0.00020 | 0.0000 | 0.00022 |
| Sparrowhawk | 0.00017 | 0.0001 | 0.00030 |
| Whooper Swan | 0.00017 | *n/a* | 0.00017 |
| Woodcock | 0.00001 | 0.0000 | 0.00001 |

Summary results for the calculation of proportion of birds at risk height are presented in Table 6 below (for more details see Appendix III) and were input as Proportion at risk height ($Q_{2R}$) for each species in the excel spreadsheet.

**Table 6: Proportion of birds flying at risk height**

| Species | Proportion at risk height (24-186m) |
|---|---|
| Buzzard | 57.0 |
| Curlew | 59.7 |
| Golden Plover (winter only) | 59.8 |
| Hen Harrier | 54.0 |
| Kestrel | 50.6 |
| Lapwing | 29.5 |
| Mallard | 100.0 |
| Merlin | 20.7 |
| Peregrine | 71.9 |
| Snipe | 76.1 |
| Sparrowhawk | 4.9 |
| Whooper Swan | 68.6 |
| Woodcock | 36.0 |

The outcome of the collision risk modelling (number of expected collisions per year with avoidance behaviour) is presented in Table 7. All input data and calculations are presented in Appendix I-III.

**Table 7: Expected number of collisions per year (assuming avoidance behaviour) for bird species at the proposed Derrynadarragh Wind Farm.**

| Species | Projected number of rotor transits per year | Collision Risk (single transit risk) | | | Annual Collision Rate | | | Estimated collisions over a 30-year period |
|---|---|---|---|---|---|---|---|---|
| | | Flapping | Gliding | Average | Without avoidance | Avoidance rate | With avoidance | |
| Buzzard | 281 | 6.87 | 6.8 | 6.84 | 16 | 98 | 0.3 | 9 |
| Curlew | 22 | 5.53 | 5.47 | 5.5 | 1.03 | 98 | 0.021 | 0.63 |
| Golden Plover (Sep - Apr) | 566,588 | 4.96 | N/A | N/A | 23878 | 98.6 | 47.8 | 1,434 |
| Hen Harrier | 2 | 7.85 | 7.8 | 7.83 | 0.14 | 99 | 0.001 | 0.03 |
| Kestrel | 57 | 6.37 | 6.32 | 6.35 | 3 | 95 | 0.2 | 6 |
| Lapwing | 267 | 5.28 | N/A | N/A | 12 | 98 | 0.2 | 6 |
| Mallard | 1 | 5.26 | N/a | N/A | 0.06 | 98 | 0.001 | 0.03 |
| Merlin | 0 | 0 | 0 | 0 | 0.02 | 98 | 0.0003 | 0.0009 |
| Peregrine | 1 | 6.21 | 6.14 | 6.18 | 0.06 | 98 | 0.001 | 0.03 |
| Snipe | 26 | 4.3 | 4.27 | 4.29 | 0.93 | 98 | 0.019 | 0.57 |
| Sparrowhawk | 1 | 5.8 | 5.76 | 5.78 | 0.06 | 98 | 0.001 | 0.03 |
| Whooper Swan (Oct - Mar) | 14 | 8.82 | n/a | N/A | 1.07 | 99.5 | 0.005 | 0.15 |
| Woodcock | 0 | 4.62 | 4.57 | 4.6 | 0.02 | 98 | 0.0003 | 0.0009 |

### 3.1 OVERVIEW OF UNCERTAINTIES

It should be noted that CRM makes the following assumptions:

- That a bird can be modelled by a simple cruciform shape
- That a turbine blade has a width and pitch, but no thickness
- That birds fly through turbines in straight lines
- That a bird's flight will be unaffected by a near miss, despite the slipstream around a turbine blade
- That no action is taken by a bird to avoid collision and so the figures represent worst case scenarios.

It is also accepted that there are uncertainties with the input data which should be considered to give an overall level of uncertainty regarding the estimated collision risk. Following Band (2024) there are five error sources within collision risk modelling:

1. **Uncertainty in bird density ($e_1$)**

*Survey data shows that there are variations in bird density between surveys.*

The standard deviation of survey results has been calculated for the winter and breeding seasons. The square root of the sum of these values was then determined to allow for the fact that errors in one season may be offset by errors in the other direction in the other period. This standard deviation value was then applied to the sum of the average bird density values for the winter and breeding seasons to determine the associated percentage value and e value as presented in Table 8.

**Table 8: Uncertainty value associated with bird density for each target species.**

| Species | $e_1$ value |
|---|---|
| Buzzard | 0.07 |
| Curlew | 0.01 |
| Golden Plover | 1.59 |
| Hen Harrier | 0.01 |
| Kestrel | 0.04 |
| Lapwing | 0.06 |
| Mallard | 0.00 |
| Merlin | 0.00 |
| Peregrine | 0.00 |
| Snipe | 0.01 |
| Sparrowhawk | 0.02 |
| Whooper Swan | 0.01 |
| Woodcock | 0.00 |

**2. Uncertainty in level of nocturnal activity ($e_2$)**

*The actual nocturnal activity of bird species is unknown due to the absence of nighttime survey data.*

The number of daylight hours used in the calculation is assumed to be accurate. However there is uncertainty regarding nocturnal activity. It was assumed that none of the target species were active at night, with the exception of Golden Plover, Snipe, and Lapwing, which were assumed to be 25% as active at night as during the day (nocturnal activity factor = 2 in the excel spreadsheet). While it cannot be entirely ruled out due to the absence of data, it is not seen that it would be greater than 5%. Therefore the level of uncertainty for all species is $e_2$=0.05, with the exception of Golden Plover, Lapwing and Snipe where $e_2$=0 (as nocturnal activity is already accounted for in the calculations for this species.

**3. Uncertainty in proportion flying at risk height ($e_3$)**

*Despite bird surveyors being fully trained and very experienced, it is possible that bird flights can be recorded within the wrong flight height bands.*

In particular, it is possible that birds recorded in the 0-25m flight band may actually have been in the 25-180m flight band and vice versa. If the visual estimate was out by ±5m at the two lowest flight bands this would have implications for the proportion of birds flying at risk height for the proposed turbine model. The flight patterns of raptors and Whooper Swan make it unlikely that there would be errors in recording flight heights, so a low uncertainty level ($e_3$ = 0.05) has been assigned to these species, with a slightly higher uncertainty level ($e_3$ = 0.1) being assigned to the remaining species (Curlew, Golden Plover, Lapwing, Snipe).

**4. Uncertainty in estimating numbers of individuals in large flocks ($e_4$)**

*Some species of birds often fly in large flocks, making an accurate estimation of the number of individuals present in the flock difficult.*

Golden Plover was the only species recorded in large flocks during vantage point watches with a maximum of 4,000 birds recorded in one flock. Given the large size and mobile nature of these flocks it is likely that under or overestimates regarding the number of birds were made. Lapwing was the only other bird species recorded in significant flocks (maximum of 150 birds). Given the smaller size of the flocks there is less chance of uncertainty regarding the estimate, however a small level of uncertainty does remain.

For all other target bird species an uncertainty value of $e_4$ = 0 was assigned as these species typically occur singly or in very low numbers, eliminating the chance of making an incorrect estimate of numbers. For Lapwing, an uncertainty of 5% ($e_4$ = 0.05) was assigned due to the occurrence of some smaller flocks. The very large numbers of Golden Plover increases the

uncertainty of making accurate estimates of numbers, therefore an uncertainty of 20% ($e_4$ = 0.20) is assigned to Golden Plover.

5. **Uncertainty due to distance effects ($e_5$)**

*It has been found that higher densities of flightlines are recorded in proximity to vantage point locations, while very few flightlines are recorded in the more distant parts of viewsheds.*

Analysis of vantage point data has revealed that there are very strong distance effects on bird detection rates with very low detection rates at distances over 1km from the vantage point location. It has been suggested that correcting for under-detection due to distance could increase collision risk by a factor of 1.6 – 6.3 times (Gittings 2024). Three vantage points were used to gain comprehensive views over the proposed wind farm site, with some overlap in viewshed areas. In addition, the furthest limit of the 500m turbine buffer from each vantage point location is not greater than 1.5km, increasing the likelihood of all birds being recorded. The underestimation of bird activity at the outer limits of the viewsheds is estimated to be approximately 15% (reduced from the estimates provided by Gittings (2024)) due to the presence of three vantage points with some overlap in viewsheds and the proximity of the vantage points to the outer limits of the 500m turbine buffers. Therefore, $e_5$ = 0.15 for all target species, with the exception of Whooper Swan and Golden Plover. The large size of Whooper Swan and the large flock size of Golden Plover reduce the chance of under recording these species, even at the outer limits of a viewshed. Therefore the uncertainty for this species is reduced to 5% ($e_5$ = 0.05) for these two species.

6. **Uncertainty in operational time ($e_6$)**

*An estimate of the operational time of the turbines is used as the actual operational time is unknown*

A value of 85% was used in the calculation as an upper limit of operational time as provided by Wind Energy Europe. Although this value is subject to some variation it is reasonably precise and so no uncertainty is assigned ($e_6$=0 for all species).

7. **Uncertainty due to simplifications in the model ($e_7$)**

*The collision risk model involves a number of simplifications such as assuming that a bird can be modelled by a simple cruciform shape, that birds fly through turbines in straight lines, and the use of an average pitch for turbine blades.*

Following the worked example presented in Band (2024) an uncertainty of ± 20% is assumed ($e_7$=0.20 for all species).

The combined uncertainty values for each target species and each proposed turbine model is presented in Table 9 below. These uncertainty values can be applied to the relevant calculated collision risk values presented in Table 10.

**Table 9: Combined uncertainty values for each target species.**

| Species | 1 | 2 | 3 | 4 | 5 | 6 | 7 | Combined uncertainty value (factor) |
|---|---|---|---|---|---|---|---|---|
| Buzzard | 0.07 | 0.05 | 0.05 | 0 | 0.15 | 0 | 0.2 | 0.52 |
| Curlew | 0.01 | 0.05 | 0.1 | 0 | 0.15 | 0 | 0.2 | 0.51 |
| Golden Plover | 1.59 | 0 | 0.1 | 0.2 | 0.05 | 0 | 0.2 | 2.14 |
| Hen Harrier | 0.01 | 0.05 | 0.05 | 0 | 0.15 | 0 | 0.2 | 0.46 |
| Kestrel | 0.04 | 0.05 | 0.05 | 0 | 0.15 | 0 | 0.2 | 0.49 |
| Lapwing | 0.06 | 0 | 0.1 | 0 | 0.15 | 0 | 0.2 | 0.51 |
| Mallard | 0.00 | 0.05 | 0.05 | 0 | 0.15 | 0 | 0.2 | 0.45 |
| Merlin | 0.00 | 0.05 | 0.1 | 0 | 0.15 | 0 | 0.2 | 0.5 |
| Peregrine | 0.00 | 0.05 | 0.05 | 0 | 0.15 | 0 | 0.2 | 0.45 |
| Snipe | 0.01 | 0 | 0.1 | 0 | 0.15 | 0 | 0.2 | 0.46 |
| Sparrowhawk | 0.02 | 0.05 | 0.1 | 0 | 0.15 | 0 | 0.2 | 0.52 |
| Whooper Swan | 0.01 | 0.05 | 0.05 | 0 | 0.05 | 0 | 0.2 | 0.36 |
| Woodcock | 0.00 | 0.05 | 0.1 | 0 | 0.15 | 0 | 0.2 | 0.5 |

**Table 10: Estimated number of collisions per year with uncertainty values**

| Species | Estimated number of collisions per year with avoidance and associated uncertainty values | |
|---|---|---|
| Buzzard | 0.3 +/- | 0.1560 |
| Curlew | 0.021 +/- | 0.0107 |
| Golden Plover | 47.8 +/- | 102.2920 |
| Hen Harrier | 0.001 +/- | 0.0005 |
| Kestrel | 0.2 +/- | 0.0980 |
| Lapwing | 0.2 +/- | 0.1020 |
| Mallard | 0.001 +/- | 0.0005 |
| Merlin | 0.0003 +/- | 0.0002 |
| Peregrine | 0.001 +/- | 0.0005 |
| Snipe | 0.019 +/- | 0.0087 |
| Sparrowhawk | 0.001 +/- | 0.0005 |
| Whooper Swan | 0.005 +/- | 0.0018 |
| Woodcock | 0.0003 +/- | 0.0002 |

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# Appendix I

# Calculating bird density for use in Stage A calculations

1. Total time in flight (bird seconds) for each target species recorded at each VP during the four surveys seasons

| | Year 1 | | | | | | Year 2 | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Winter 1 | | | Breeding 1 | | | Winter 2 | | | Breeding 2 | | |
| | VP1 | VP2 | VP3 | VP1 | VP2 | VP3 | VP1 | VP2 | VP3 | VP1 | VP2 | VP3 |
| Buzzard | 1588 | 1325 | 0 | 2441 | 14 | 159 | 518 | 318 | 96 | 1299 | 2614 | 432 |
| Curlew | 0 | 0 | 0 | 0 | 0 | 264 | 0 | 0 | 0 | 0 | 0 | 0 |
| Golden Plover (Sep to Apr) | 17036 | 94800 | 0 | 0 | 0 | 0 | 17480 | 1624847 | 7936621 | 0 | 0 | 0 |
| Hen Harrier | 0 | 87 | 0 | 0 | 0 | 3 | 0 | 60 | 0 | 0 | 0 | 0 |
| Kestrel | 576 | 630 | 0 | 0 | 0 | 0 | 225 | 1664 | 155 | 159 | 456 | 17 |
| Lapwing | 14679 | 0 | 0 | 0 | 0 | 0 | 610 | 16 | 0 | 0 | 0 | 0 |
| Mallard | 0 | 0 | 0 | 0 | 0 | 0 | 38 | 0 | 0 | 0 | 0 | 0 |
| Merlin | 0 | 46 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Peregrine | 0 | 41 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Snipe | 91 | 44 | 0 | 0 | 0 | 0 | 427 | 0 | 0 | 0 | 7 | 41 |
| Sparrowhawk | 86 | 23 | 0 | 7 | 0 | 141 | 151 | 158 | 27 | 13 | 0 | 31 |
| Whooper Swan (Oct to Mar) | 0 | 204 | 0 | 0 | 0 | 0 | 253 | 0 | 0 | 0 | 0 | 0 |
| Woodcock | 0 | 15 | 0 | 0 | 0 | 0 | 7 | 0 | 0 | 0 | 0 | 0 |

2. Time in flight (total watch time divided by total watch time)

| | Year 1 | | | | | | Year 2 | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Winter 1 | | | Breeding 1 | | | Winter 2 | | | Breeding 2 | | |
| | VP1 | VP2 | VP3 | VP1 | VP2 | VP3 | VP1 | VP2 | VP3 | VP1 | VP2 | VP3 |
| Buzzard | 0.0123 | 0.0102 | | 0.0188 | 0.0001 | 0.0012 | 0.0027 | 0.0018 | 0.0006 | 0.0100 | 0.0173 | 0.0029 |
| Curlew | 0.0000 | 0.0000 | | 0.0000 | 0.0000 | 0.0020 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| Golden Plover (Sep to Apr) | 0.1052 | 0.5852 | | 0.0000 | 0.0000 | 0.0000 | 0.0809 | 7.5224 | 40.8262 | 0.0000 | 0.0000 | 0.0000 |
| Hen Harrier | 0.0000 | 0.0007 | | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0003 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| Kestrel | 0.0044 | 0.0049 | | 0.0000 | 0.0000 | 0.0000 | 0.0012 | 0.0096 | 0.0010 | 0.0012 | 0.0030 | 0.0001 |
| Lapwing | 0.1133 | 0.0000 | | 0.0000 | 0.0000 | 0.0000 | 0.0031 | 0.0001 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| Mallard | 0.0000 | 0.0000 | | 0.0000 | 0.0000 | 0.0000 | 0.0002 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| Merlin | 0.0000 | 0.0004 | | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| Peregrine | 0.0000 | 0.0003 | | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| Snipe | 0.0007 | 0.0003 | | 0.0000 | 0.0000 | 0.0000 | 0.0022 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0003 |
| Sparrowhawk | 0.0007 | 0.0002 | | 0.0001 | 0.0000 | 0.0011 | 0.0008 | 0.0009 | 0.0002 | 0.0001 | 0.0000 | 0.0002 |
| Whooper Swan (Oct to Mar) | 0.0000 | 0.0016 | | 0.0000 | 0.0000 | 0.0000 | 0.0013 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| Woodcock | 0.0000 | 0.0001 | | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |

3. Bird Density (time in flight divided by area)

| | Year 1 | | | | | | Year 2 | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Winter 1 | | | Breeding 1 | | | Winter 2 | | | Breeding 2 | | |
| | VP1 | VP2 | VP3 | VP1 | VP2 | VP3 | VP1 | VP2 | VP3 | VP1 | VP2 | VP3 |
| Buzzard | 0.0038 | 0.0028 | | 0.0058 | 0.0000 | 0.0007 | 0.0008 | 0.0005 | 0.0004 | 0.0031 | 0.0047 | 0.0016 |
| Curlew | 0.0000 | 0.0000 | | 0.0000 | 0.0000 | 0.0011 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| Golden Plover (Sep to Apr) | 0.0325 | 0.1603 | | 0.0000 | 0.0000 | 0.0000 | 0.0250 | 2.0609 | 22.8080 | 0.0000 | 0.0000 | 0.0000 |
| Hen Harrier | 0.0000 | 0.0002 | | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0001 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| Kestrel | 0.0014 | 0.0013 | | 0.0000 | 0.0000 | 0.0000 | 0.0004 | 0.0026 | 0.0006 | 0.0004 | 0.0008 | 0.0001 |
| Lapwing | 0.0350 | 0.0000 | | 0.0000 | 0.0000 | 0.0000 | 0.0010 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| Mallard | 0.0000 | 0.0000 | | 0.0000 | 0.0000 | 0.0000 | 0.0001 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| Merlin | 0.0000 | 0.0001 | | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| Peregrine | 0.0000 | 0.0001 | | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| Snipe | 0.0002 | 0.0001 | | 0.0000 | 0.0000 | 0.0000 | 0.0007 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0002 |
| Sparrowhawk | 0.0002 | 0.0000 | | 0.0000 | 0.0000 | 0.0006 | 0.0002 | 0.0003 | 0.0001 | 0.0000 | 0.0000 | 0.0001 |
| Whooper Swan (Oct to Mar) | 0.0000 | 0.0004 | | 0.0000 | 0.0000 | 0.0000 | 0.0004 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| Woodcock | 0.0000 | 0.0000 | | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |

4. Mean bird density according to season for birds recorded during Vantage Point watches

| | Winter season | | Breeding Season | |
|---|---|---|---|---|
| | Average | Standard Deviation | Average | Standard Deviation |
| Buzzard | 0.00165 | 0.00154 | 0.0027 | 0.00230 |
| Curlew | 0.00000 | 0.00000 | 0.0002 | 0.00046 |
| Kestrel | 5.01733 | 9.98261 | 0.0000 | 0.00000 |
| Golden Plover | 0.00006 | 0.00008 | 0.0000 | 0.00001 |
| Hen Harrier | 0.00125 | 0.00090 | 0.0002 | 0.00034 |
| Lapwing | 0.00719 | 0.01553 | 0.0000 | 0.00000 |
| Mallard | 0.00001 | 0.00003 | 0.0000 | 0.00000 |
| Merlin | 0.00002 | 0.00004 | 0.0000 | 0.00000 |
| Peregrine | 0.00002 | 0.00004 | 0.0000 | 0.00000 |
| Snipe | 0.00020 | 0.00028 | 0.0000 | 0.00006 |
| Sparrowhawk | 0.00017 | 0.00009 | 0.0001 | 0.00024 |
| Whooper Swan | 0.00017 | 0.00023 | 0.0000 | 0.00000 |
| Woodcock | 0.00001 | 0.00001 | 0.0000 | 0.00000 |

# Appendix II

# Calculations for proportion of birds flying at risk height for use in Stage A calculations

| Species | Proportion observed 0-25m | Proportion observed 25-180m | Proportion observed 180-200m | At Rotor Height | | | Proportion between 24-186m (based on proportion of flight time in risk zone) as percentage |
|---|---|---|---|---|---|---|---|
| | | | | Proportion of birds at >24 in Band A | Proportion in flight band B (25-180) | Proportion of birds at <185 in Band C | |
| Buzzard | 6 | 57 | 37 | 0.3 | 55.7 | 1.0 | 57.0 |
| Curlew | 0 | 59 | 41 | 0.0 | 58.6 | 1.1 | 59.7 |
| Golden Plover | 0 | 55 | 45 | 0.0 | 58.7 | 1.1 | 59.8 |
| Hen Harrier | 48 | 52 | 0 | 1.9 | 52.1 | 0.0 | 54.0 |
| Kestrel | 42 | 51 | 7 | 1.8 | 48.6 | 0.2 | 50.6 |
| Lapwing | 0.5 | 5 | 94.5 | 0.1 | 27.5 | 1.9 | 29.5 |
| Mallard | 0 | 100 | 0 | 0.0 | 100.0 | 0.0 | 100.0 |
| Merlin | 83 | 17 | 0 | 3.3 | 17.4 | 0.0 | 20.7 |
| Peregrine | 19 | 71 | 10 | 0.8 | 70.9 | 0.3 | 71.9 |
| Snipe | 33 | 65 | 2 | 0.9 | 75.1 | 0.0 | 76.1 |
| Sparrowhawk | 34 | 2 | 64 | 1.6 | 1.7 | 1.6 | 4.9 |
| Whooper Swan | 21 | 79 | 0 | 1.3 | 67.3 | 0.0 | 68.6 |
| Woodcock | 67 | 33 | 0 | 2.7 | 33.3 | 0.0 | 36.0 |

# Appendix III

# Collision probability

Outcome of Stage A – Stage E in collision risk model

| Species | Projected number of rotor transits per year | Collision Risk (single transit risk) | | | Annual Collision Rate | | | Estimated collisions over a 30-year period |
|---|---|---|---|---|---|---|---|---|
| | | Flapping | Gliding | Average | Without avoidance | Avoidance rate % | With avoidance | |
| Buzzard | 281 | 6.87 | 6.8 | 6.84 | 16 | 98 | 0.3 ± 0.1560 | 9 ± 4.68 |
| Curlew | 22 | 5.53 | 5.47 | 5.5 | 1.03 | 98 | 0.021 ± 0.0107 | 0.63 ± 0.32 |
| Golden Plover | 566,588 | 4.96 | N/A | N/A | 23878 | 98.6 | 47.8 ± 102 | 1,434 ± 3068 |
| Hen Harrier | 2 | 7.85 | 7.8 | 7.83 | 0.14 | 99 | 0.001 ± 0.0005 | 0.03 ± 0.01 |
| Kestrel | 57 | 6.37 | 6.32 | 6.35 | 3 | 95 | 0.2 ± 0.0980 | 6 ± 2.94 |
| Lapwing | 267 | 5.28 | N/A | N/A | 12 | 98 | 0.2 ± 0.1020 | 6 ± 3.06 |
| Mallard | 1 | 5.26 | N/a | N/A | 0.06 | 98 | 0.001 ± 0.0005 | 0.03 ± 0.01 |
| Merlin | 0 | 0 | 0 | 0 | 0.02 | 98 | 0.0003 ± 0.0002 | 0.001 ± 0.00 |
| Peregrine | 1 | 6.21 | 6.14 | 6.18 | 0.06 | 98 | 0.001 ± 0.0005 | 0.03 ± 0.01 |
| Snipe | 26 | 4.3 | 4.27 | 4.29 | 0.93 | 98 | 0.019 ± 0.0087 | 0.57 ± 0.26 |
| Sparrowhawk | 1 | 5.8 | 5.76 | 5.78 | 0.06 | 98 | 0.001 ± 0.0005 | 0.03 ± 0.02 |
| Whooper Swan | 14 | 8.82 | n/a | N/A | 1.07 | 99.5 | 0.005 ± 0.0018 | 0.15 ± 0.05 |
| Woodcock | 0 | 4.62 | 4.57 | 4.6 | 0.02 | 98 | 0.0003 ± 0.0002 | 0.0009 ± 0.00 |

# Appendix 14

# Flood Risk Assessment

FEHILY TIMONEY

DESIGNING AND DELIVERING
A SUSTAINABLE FUTURE

# ENVIRONMENTAL IMPACT ASSESSMENT REPORT (EIAR) FOR THE PROPOSED DERRYNADARRAGH WIND FARM

## Site Specific Flood Risk Assessment For Derrynadaragh Wind Farm

**Prepared for:**

**Dara Energy Limited**

Dara Energy Limited

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# Site Specific Flood Risk Assessment For Derrynadaragh Wind Farm

**REVISION CONTROL TABLE, CLIENT, KEYWORDS AND ABSTRACT**

**User is responsible for Checking the Revision Status of This Document**

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|---|---|---|---|---|---|
| 1 | Final | SH/KB | PD | TC | 17/09/2025 |

**Client:** Dara Energy Limited

**Keywords:** Flood Risk Assessment, flood risk, flood zones, Climate Change, mitigation, management, Derrynadaragh

**Abstract:** Fehily Timoney and Company (FT) was commissioned by Dara Energy Limited to prepare a Site-Specific Flood Risk Assessment (SSFRA) for Derrynadaragh Wind Farm in County Kildare and County Offaly; this is in response to a request for further information by An Bórd Pleanála with respect to the planning application for the renewable energy development.

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# 1. INTRODUCTION

Fehily Timoney and Company (FT) was commissioned by Dara Energy Limited to prepare a Site Specific Flood Risk Assessment (SSFRA) for the Proposed Wind Farm Development located within the townlands of Cushina, Clonsast Lower and Chevychase Or Derrynadaragh in County Offaly and Aughrin and Derrylea in County Kildare.

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, temporary construction compounds, drainage infrastructure, 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 proposed wind farm site is located in a rural area and the nearest settlement is the village of Bracknagh which is located approximately 2 km to the north of the wind farm site.

Access to the proposed wind farm site is provided by the construction of a new access track located along the R419 regional road in the townland of Cushina.




**Figure 1-1: Proposed Wind Farm -Site Location**




Figure 1-2 Proposed Wind Farm and TDR

The report aims to confirm if there are any potential flood risks to the subject site and the turbine delivery route (TDR) as well as any potential increase of flood risk elsewhere as they are in a flood risk areas.

As part of the scope of work, FT was commissioned to carry out a flood modelling along the River Cushina and River Daingean, which cross the proposed site and the turbine delivery route, respectively.

# 2. FLOOD RISK ASSESSMENT METHODOLOGY

## 2.1 General

The Guidelines for Planning Authorities and its Technical Appendices outline the requirements for a SSFRA. The Guidelines for Planning Authorities requires that works:

- Avoid development in areas at risk of flooding.
- Substitute less vulnerable uses where avoidance is not possible.
- Mitigate and manage the risk where avoidance and substitution are not possible.

The key principles of the Guidelines for Planning Authorities apply the Sequential Approach to the planning process. Figure 2-1 of this report describes the mechanism of the sequential approach for use in the planning process.

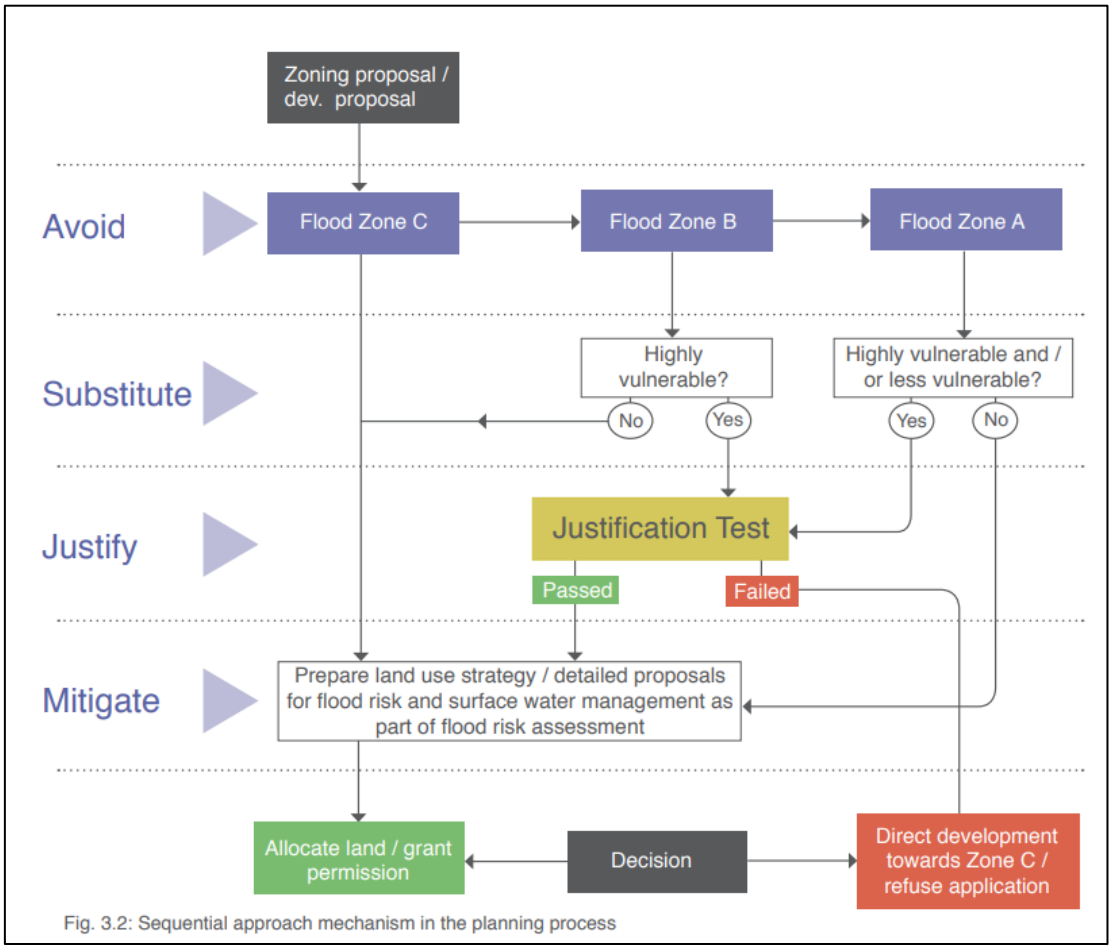



**Figure 2-1: Sequential Approach Mechanism[1]**

[1] Figure 3.2 of the *Guidelines for Planning Authorities*.

## 2.2 Source-Pathway-Receptor Model

The assessment of flood risk requires a thorough understanding of the following:

- The sources of flood water (e.g., high sea levels, intense or prolonged rainfall leading to runoff and increased flow in rivers and sewers)
- The pathways by which the flood water reaches those receptors (e.g., river channels, river and coastal floodplains, drains, sewers and overland flow).
- The people and assets affected by flooding (known as the receptors).

The Source-Pathway-Receptor (S-P-R) Model illustrated in Figure 2-2 has become widely used to assess and inform the management of environmental risks.

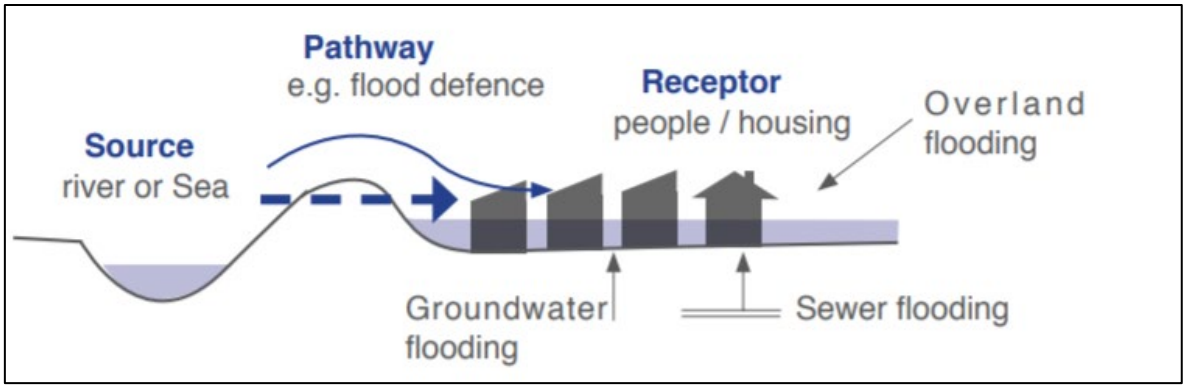



**Figure 2-2: Source-Pathway- Receptor Model[2]**

## 2.3 Likelihood of Flooding and Definition of Flood Zones

The Guidelines for Planning Authorities define the likelihood of flooding as the percentage probability of a flood of a given magnitude occurring or being exceeded in any given year. The likelihood of flooding is expressed as a return period or annual exceedance probability (AEP).

Flood Zones are graphical areas within which the likelihood of flooding is in a particular range. They are a key tool in flood risk management within the planning process as well as in flood warning and emergency planning. The Guidelines for Planning Authorities split these flood zones into three categories:

- Flood Zone A – where the probability of flooding from rivers and the sea is high (greater than 1% AEP for river flooding or 0.5% AEP for coastal flooding).
- Flood Zone B – where the probability of flooding from rivers and the sea is moderate (between 0.1% AEP and 1% AEP for river flooding and between 0.1% AEP and 0.5% AEP for coastal flooding).
- Flood Zone C – where the probability of flooding from rivers and the sea is low (less than 0.1% AEP for both river and coastal flooding).

[2] Source: Fig 2.2 of the *Guidelines for Planning Authorities*.

## 2.4 Classification of the Proposed Development and Justification Test

The Guidelines for Planning Authorities categorises all types of development as either:

- Highly Vulnerable (garda, ambulances, schools, hospitals, dwelling houses, student halls…).
- Less Vulnerable (buildings used for: retail leisure, warehousing, commercial, industrial, and non-residential institutions,).
- Water Compatible (flood control infrastructure, docks, marinas, amenity open spaces...).

The Guidelines classify potential development in terms of its vulnerability to flooding. The types of development falling within each vulnerability class are described in Table 2.1 of the Guidelines, which is reproduced in Table 2-2:Matrix of Vulnerability Versus Flood Zone.

**Table 2-1: Vulnerability Class[3]**

| | |
|---|---|
| **Highly vulnerable development (Including essential infrastructure)** | • Garda, ambulance and fire stations and command centres required to be operational during flooding;<br>• Hospitals;<br>• Emergency access and egress points;<br>• Schools;<br>• Dwelling houses, student halls of residence and hostels;<br>• Residential institutions such as residential care homes, children's homes and social services homes;<br>• Caravans and mobile home parks;<br>• Dwelling houses designed, constructed or adapted for the elderly or, other people with impaired mobility;<br>• Essential infrastructure, such as primary transport and utilities distribution, including electricity generating power stations and sub-stations, water and sewage treatment, and potential significant sources of pollution (SEVESO sites, IPPC sites, etc.) in the event of flooding. |
| **Less vulnerable development** | • Buildings used for: retail, leisure, warehousing, commercial, industrial and non-residential institutions;<br>• Land and buildings used for holiday or short-let caravans and camping, subject to specific warning and evacuation plans;<br>• Land and buildings used for agriculture and forestry;<br>• Waste treatment (except landfill and hazardous waste);<br>• Mineral working and processing;<br>• Local transport infrastructure. |

[3] Source: Table 3.1 of the *Guidelines for Planning Authorities*.

| | |
|---|---|
| **Water-compatible development** | • Flood control infrastructure;<br>• Docks, marinas and wharves;<br>• Navigation facilities;<br>• Ship building, repairing and dismantling, dockside fish processing and refrigeration and compatible activities requiring a waterside location;<br>• Water-based recreation and tourism (excluding sleeping accommodation);<br>• Lifeguard and coastguard stations;<br>• Amenity open space, outdoor sports and recreation and essential facilities such as changing rooms;<br>• Essential ancillary sleeping or residential accommodation for staff required by uses in this category (subject to a specific warning and evacuation plan). |

*Uses which are not listed in the table should be considered on their own merits.

The Sequential Approach restricts development types to occur within the flood zone appropriate to their respective vulnerability classes. Table 2-2 identifies the types of development appropriate for each flood zone and those that will require a Justification Test.

**Table 2-2: Matrix of Vulnerability Versus Flood Zone[4]**

| | Flood Zone A | Flood Zone B | Flood Zone C |
|---|---|---|---|
| Highly vulnerable development (including essential infrastructure) | Justification Test | Justification Test | Appropriate |
| Less vulnerable development | Justification Test | Appropriate | Appropriate |
| Water-compatible development | Appropriate | Appropriate | Appropriate |

The Justification Test has been designed to rigorously assess the appropriateness of developments that are being considered in areas of moderate or high flood risk. There are two types of Justification Tests:

- The first is the Plan-making Justification Test which is used at the plan preparation and adoption stage where it is intended to zone or otherwise designate land which is at moderate or high risk of flooding.
- The second is the Development Management Justification Test which is used at the planning application stage where it is intended to develop land at moderate or high risk of flooding for uses or development vulnerable to flooding that would generally be inappropriate for that land.

[4] Source: Table 3.2 of the *Guidelines for Planning Authorities*.

## 2.5 Flood Risk Assessment Stages

The Guidelines for Planning Authorities outline that a staged approach should be adopted when carrying out a SSFRA. These stages are the following:

- Stage 1 Flood Risk Identification.
- Stage 2 Initial Flood Risk Assessment.
- Stage 3 Detailed Flood Risk Assessment.

Shapes FRA

Influences FRA

| | Flood risk identification | Initial flood risk assessment | Detailed flood risk assessment |
|---|---|---|---|
| Regional Flood Risk Appraisal | ✓ | U | U |
| Strategic Flood Risk assessment – County-wide | ✓ | P | U |
| Strategic Flood Risk Assessment – City or town within a county plan | ✓ | ✓ | P |
| Site-specific flood risk assessment | ✓ | ✓ | ✓ |

P = Probably needed to meet the requirements of the Justification Test

U = Unlikely to be needed

✓ = Required to be undertaken

**Figure 2-3: Flood risk assessment stages required per scale of study undertaken[5]**

Stage 1: Flood risk identification – to identify whether there may be any flooding or surface water management issues relating to the Proposed Development site that may warrant further investigations. The flood risk identification stage uses existing information to identify whether there may be any flooding or surface water management issues related to the site. Flood risks identified in this stage are then addressed in Stage 2.

Stage 2: Initial flood risk assessment – to confirm sources of flooding that may affect the development site, to appraise the adequacy of existing information and to determine what surveys and modelling approach is appropriate to match the spatial resolution required and complexity of the flood risk issues. This stage involves the review of data addressed in Stage 1. Data where the flood risk at the site is recognised as being low is screened out and it is not further addressed in the report, data which recognised the flood risk on the site to be medium or high is further analysed in the report.

Stage 3: Detailed flood risk assessment – to assess flood risk issues in sufficient detail and to provide a quantitative appraisal of potential flood risk to a proposed or existing development, of its potential impacts on flood risk elsewhere and of the effectiveness of any proposed mitigation measures. This will typically involve the use of an existing or construction of a hydraulic model across a wide enough area to appreciate the catchment wide impacts and hydrological process involved.

[5] Source: Appendix A of *Guidelines for Planning Authorities*, Table A3.

# 3. EXISTING SITE

## 3.1 Description of Catchments

This section addresses catchment characteristics of the proposed wind farm site and the turbine delivery route.

### 3.1.1 Proposed Wind Farm

The proposed wind farm site is located within the Barrow Catchment (ID 14) and the Barrow_SC_040 sub-catchment as defined by the WFD. The waterbody in this sub-catchment that is crossing the proposed site is known as FIGILE_080 (EPA Name: Cushina 14).

*In addition, the wind farm is located within two sub-basins:*

- *FIGILE_070- IE_SE_14F010510.*
- FIGILE_080- IE_SE_14F010600.

The elevation range of the overall wind farm site varies between approximately 66 m OD and 59 m OD, and it generally has a flat topography. Turbines will be installed in the range between approximately 64 m OD and 60 m OD.

The main hydrology feature within the wind farm site is the Cushina River (FIGILE_080). A large area of the surface runoff drains into this river within FIGILE_080 sub-basin. The Cushina River runs in an easterly direction, and it is a tributary of the Figile River (FIGILE_080). The remaining of the site drains into FIGILE_070 sub-basin or directly into Figile River. In addition, there are no lakes or reservoirs within the wind farm site study area.

Rainfall data from Met Éireann was analysed and recorded at Casement Station, which is c.46 km northeast of the Site and associated infrastructure.

The 30-year annual average rainfall at Casement weather station, recorded from 1991 to 2020, was calculated to be 783.5 mm. The average rainfall at the proposed wind farm site may vary due to its geographical location.

The Standard Average annual Rainfall (SAAR) of the site from the FSU Portal is approximately 827 mm, which gives a more conservative output and it will be used for the Hydraulic Analysis in Section 7.1.

Following further research into the Rainfall data from Met Éireann , Table 3-1 below shows the average annual rainfall recorded from the closest weather station with more available data which is in Lullymore, Co. Kildare. This station is approximately 15 km north-east of the subject site and associated infrastructure.

**Table 3-1: Rainfall Data - Lullymore Nature Centre Station**

| Total rainfall in millimetres for Lullymore Nature Centre Station | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Year | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 | 2022 | 2023 | 2024 | Average |
| Rainfall | 839 | 976 | 818 | 848 | 1025 | 868 | 877 | 747 | 986 | 1008 | 845 | 834 | 1038 | 785 | 892 |

This station is closer to the Site than Casement weather station, but it is still 15 km away and at a different elevation, therefore the Standard Average Annual Rainfall (SAAR) from the FSU Portal was chosen.

The M5-60 at development location is 16.5 mm according to the Met Éireann rainfall data. This is the predicted rainfall depth in a sixty-minute storm that will occur with a frequency of once every five years.

### 3.1.2 Turbine Delivery Route (TDR)

The watercourse crossing of the Turbine Delivery Route is located within the Barrow Catchment (ID 14) and the Figile_SC_020 sub-catchment as defined by the WFD. *The waterbody in this sub-catchment that is affected by the TDR is named as Daingean_030 (also known as Philipstown). This watercourse runs in an easterly direction, and it is a tributary of the Figile River.*

This watercourse crossing is located approximately 5 km east of Daingean town and is bordered by the R402 to the north, where the TDR branches off, and the R400 to the east.

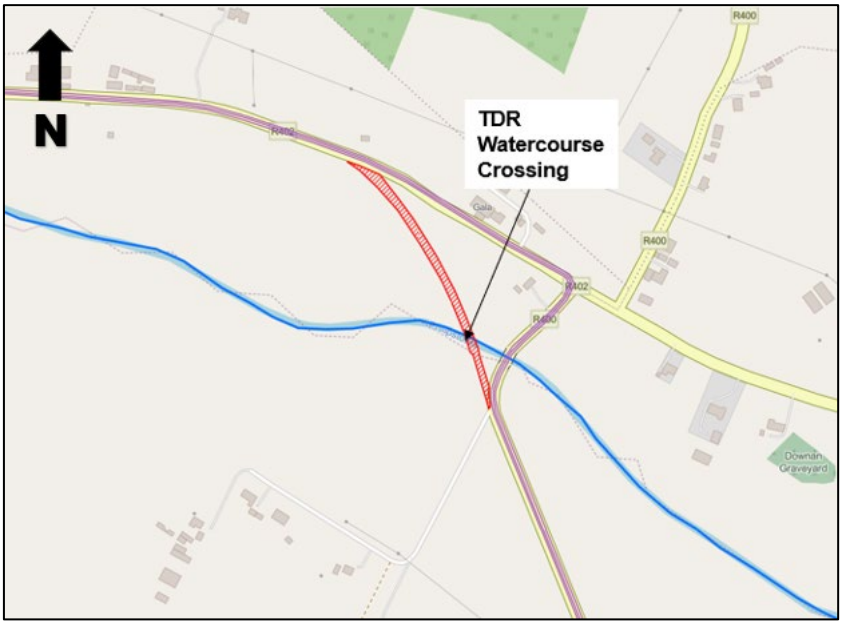



**Figure 3-1: TDR Watercourse Crossing**

Rainfall data from Met Éireann was also analysed, including records from the Lullymore Nature Centre Station, located approximately 18 km east of the watercourse crossing. However, due to the distance and difference in elevation, the Standard Average Annual Rainfall (SAAR) value from the FSU Portal was used instead

## 3.2 Subsoil and Hydrogeology

A desk study was undertaken to gather relevant background information prior to undertaking the site walkovers and ground investigations. The mapping data of the area produced by the Geological Survey of Ireland (GSI) was examined.

According to the GSI, the local deposits are mainly comprised of cut over raised peat and lake marl. To the north of the site, but outside of the boundary, alluvium deposits are identified.

The figure below shows the distribution of Quaternary deposits from the GSI.

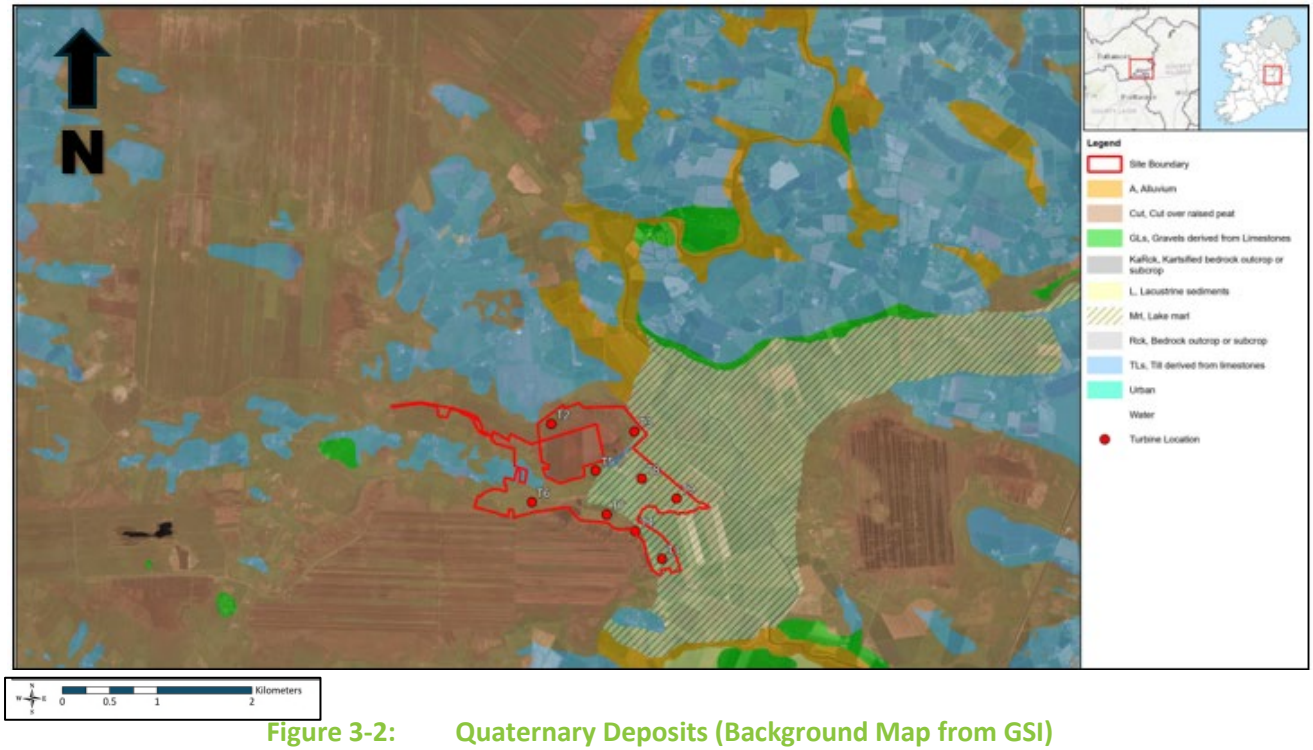



**Figure 3-2: Quaternary Deposits (Background Map from GSI)**

According to GSI, there is one main bedrock formation underlying the site:

- Lucan Formation: Dark limestone and shale. The formation comprises dark-grey to black, fine-grained, occasionally cherty, micritic limestones that weather paler, usually to pale grey. There are rare dark coarser grained calcarenitic limestones, sometimes graded.

The figure below shows the bedrock formation distribution according to GSI.

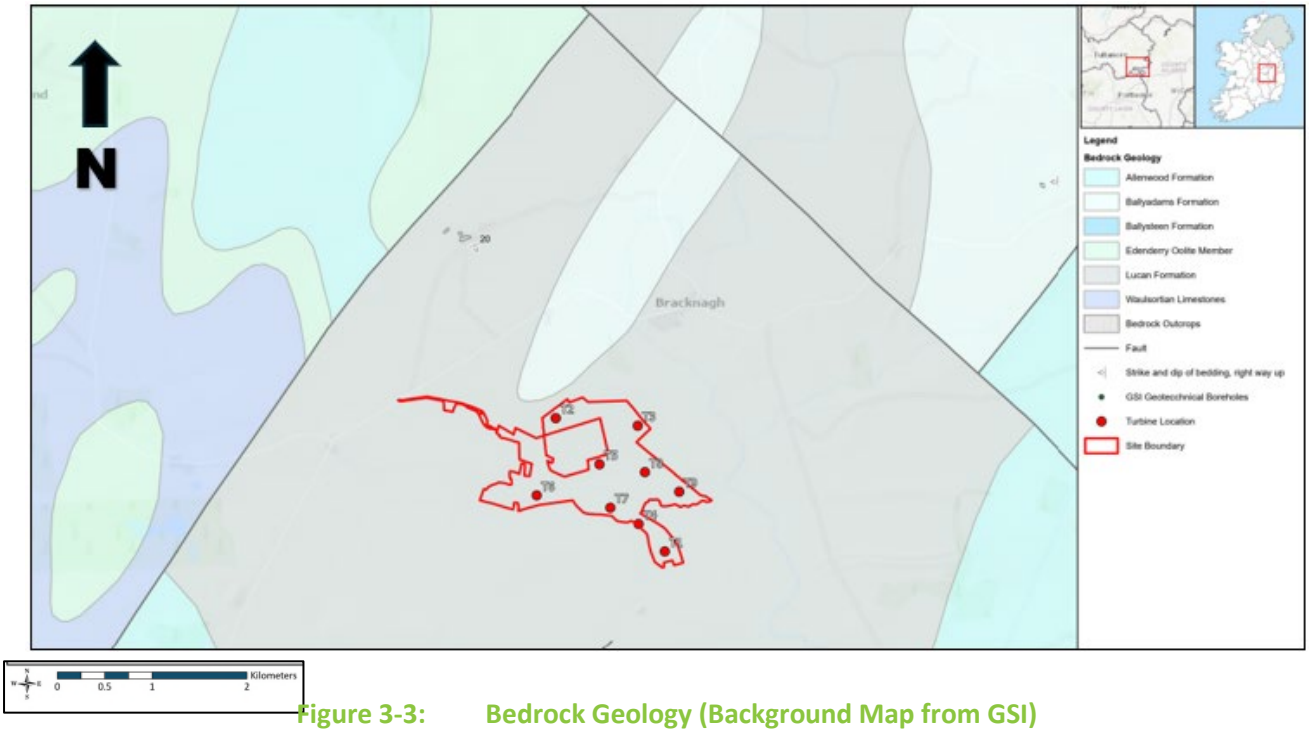



Figure 3-3: Bedrock Geology (Background Map from GSI)

According to GSI Subsoil Permeability mapping, the overburden deposits of till and peat are mapped as having low permeability. These strata may therefore act as a confining layer (where present), preventing the free movement of surface water to the underlying Aquifer.

Findings from the walkover surveys confirm that the site is predominantly underlain by peat with the eastern area of the site underlain by a thin layer of peaty topsoil overlying a soft clay/ marl. It also confirmed that there are no bedrock outcrops or subcrops across the site.

In addition, the ground investigation works concluded that the groundwater levels across the site are shallow and that the predominant Quaternary deposits across the proposed wind farm comprise low permeability fine grained till.

Further information and details on subsoil and hydrogeology can be found in Chapter 10 of Volume 2 of the EIAR, titled "Soils, Geology and Hydrogeology".

## 3.3 Hydrological Features

A site walkover survey was conducted in April 2023 to establish the drainage pattern and to record existing hydrology features; a collection of the site visit photos can be found in Appendix 7, lodged with this report. The site of the proposed wind farm has a generally flat slope, with a flood plain that starts widening on both sides approximately 470 m east of a proposed bridge crossing, following the downstream direction of the Cushina River. This is the main river within the site which flows in an easterly direction and is a tributary of the Figile River.

The Turbine Delivery Route (TDR) intersects the Daingean River and its flood plain and a bridge is also proposed here. This river flows in an easterly direction, and the surrounding area generally follows a flat slope.

### 3.3.1 Proposed Wind Farm-Surface Water Crossings

As part of this SSFRA, a detailed review of the proposed internal wind farm watercourse crossings was carried out to ensure the designs would be in accordance with OPW requirements.

There is one main watercourse crossing on the western side of the subject site for which a detailed flood modelling and hydrological analysis were carried out and are shown in Sections 7.1 and 7.2. As a result of this assessment, a single span bridge is proposed with a span of 19.00 m.

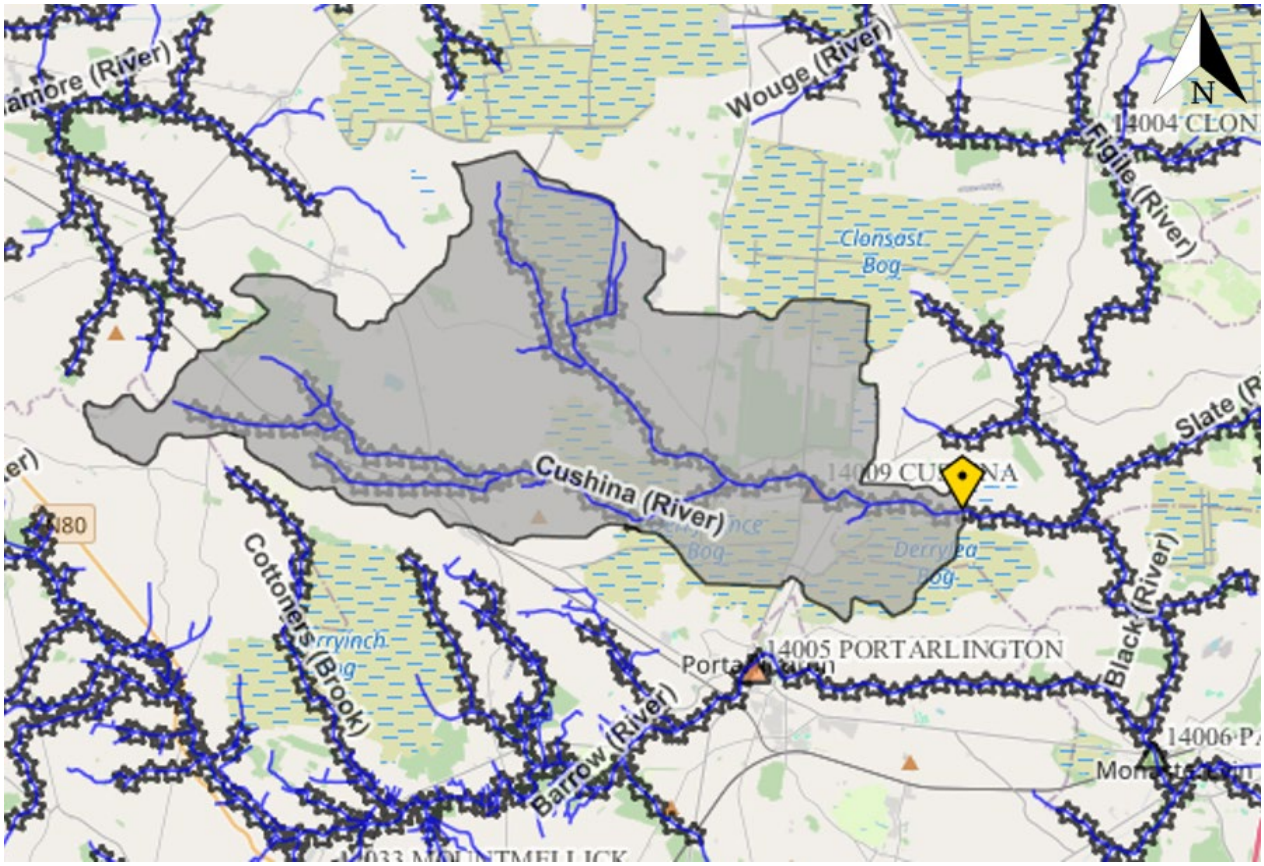



**Figure 3-4: Proposed Structure Location ( Map from https://opw.hydronet.com)**

### 3.3.2 Proposed Surface Water Drainage

The proposed development requires surface water drainage systems to manage and collect overland flow, as well as surface water from infrastructure elements such as access tracks, turbine bases, the substation and other hardstanding areas. The main components of the proposed drainage network are:

- Interceptor Drains: they collect the overland flow and discharge it through access tracks via cross drains. It will then be directed to areas where it can be redistributed over the ground or discharge to existing land drains or streams.
- Swales: they are installed along access tracks and other hardstanding areas to collect the surface water from these areas and separate them from the overland flow.
- Settlement Ponds: the surface water collected by the swales will pass through these settlement ponds to reduce the concentration of suspended solids before discharging over the ground.

- Diffuse outfall: discharge from settlement ponds and interceptor drains will be provided by a diffuse stone filled outflow which will encourage the diffuse spread of flows overland and back into natural drains.
- Check Dams: at slopes greater than 1%, check dams will be required in the swales and interceptor drains to slow down the velocities of flows and prevent erosion occurring.

The proposed surface water drainage systems utilises sustainable drainage elements that aim to reduce or minimise any impact on the existing drainage conditions.

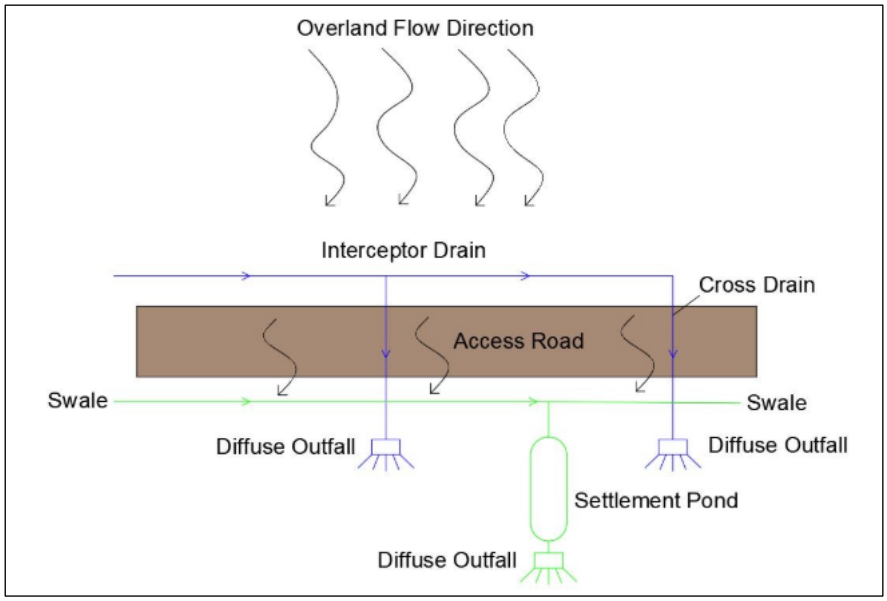



**Figure 3-5: Drainage Design Principles**

### 3.3.3 Turbine Delivery Route (TDR)

A detailed review of the proposed watercourse crossing of Daingean River was carried out to ensure the design is in compliance with OPW requirements.

A detailed flood modelling and a hydrological analysis were carried out where a single span bridge with a span of 20.00 m and five relief culverts were proposed.

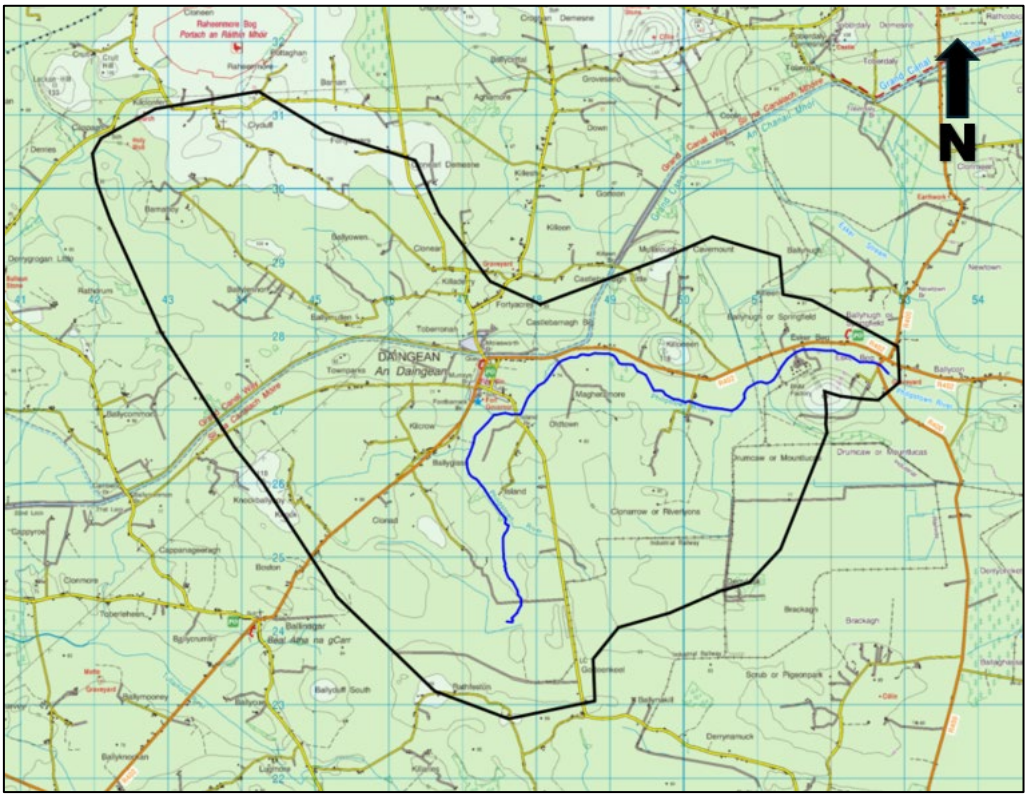



**Figure 3-6: Catchment- Proposed TDR Watercourse Crossing**

# 4. OFFALY AND KILDARE COUNTY DEVELOPMENT PLANS

The proposed wind farm is located under the jurisdiction of two counties: Offaly and Kildare.

Offaly County Development Plan (2021-2027) came into effect in October 2021 and Kildare County Development Plan (2023-2029) came into effect in January 2023. They both sets out the proposed policies and objectives for the Development of the County over the Plan period. The Development Plans seek to develop and improve, in a sustainable manner, the social, economic, environmental and cultural assets of the Counties. The approach to Flood Risk Management is set out in Chapter 3 Climate Action and Energy -Volume 1 (Offaly CDP) and Chapter 6 Infrastructure & Environmental Services - Volume 1 (Kildare CDP) and in their Strategic Flood Risk Assessments (SFRA).

The SFRAs were undertaken by the counties in accordance with the Planning System and Flood Risk Management- Guidelines for Planning Authorities (Department of the Environment, Heritage and Local Government and Office of Public Works, 2009) and Department of the Environment, Community and Local Government Circular PL 2/2014. The SFRA provides an assessment of flood risk and includes mapped boundaries for Flood Risk Zones .

Offaly County Council shows on their GIS Viewer the flood extents around the proposed development but only within the Offaly County. Also, it shows that this a rural area that hasn't been land zoned for but provides Landscape Sensitivity zones.

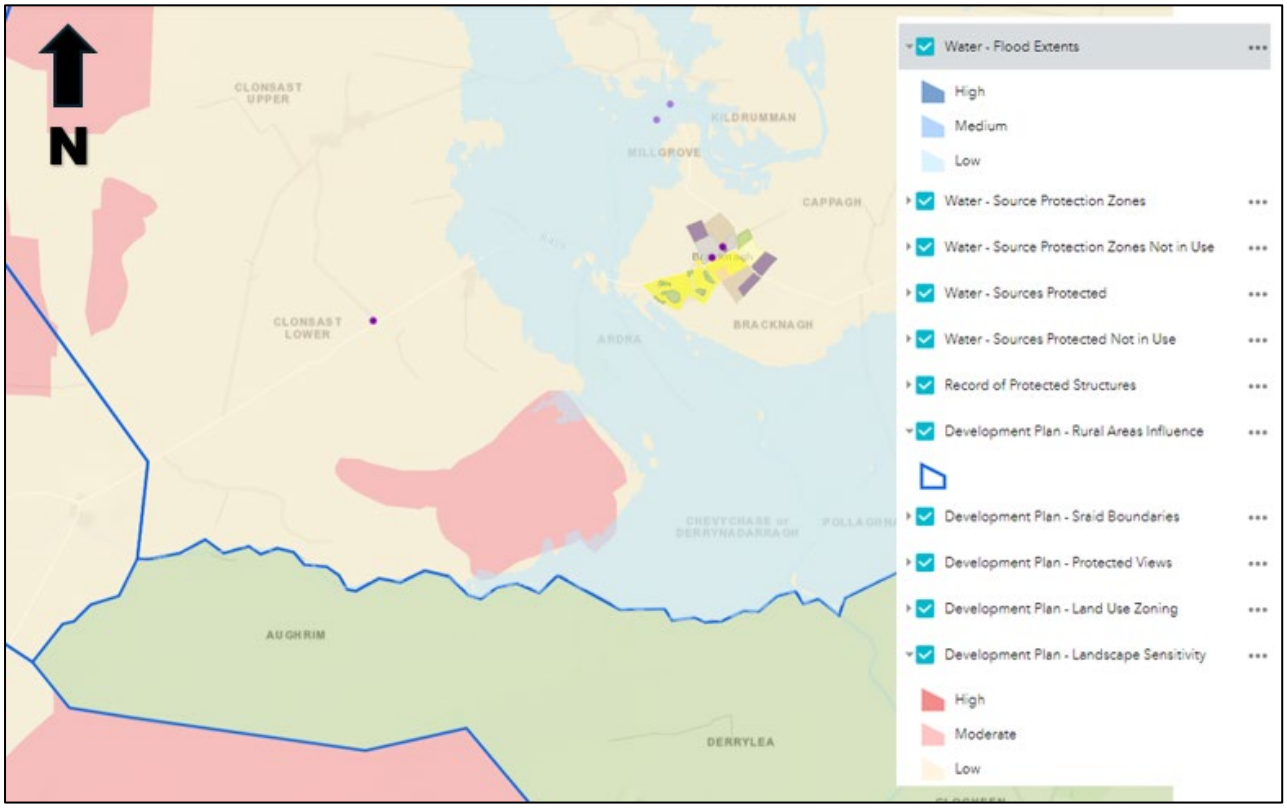



**Figure 4-1: Offaly County Flood Extents and Land Zones**

Both counties have developed a Wind Energy Strategy document as part of the County Development Plan which identify key areas within the county for the development of Wind Energy and also identifies unsuitable areas for these types of developments.

The Figure below was taken from Offaly Wind Energy Strategy document and shows that part of the proposed development lies in an area that is "Open For Consideration" for Wind Energy Development. These areas are characterised by low housing densities, they do not conflict with European or National designated sites and have the ability by virtue of their landscape characteristics to absorb wind farm developments. Notwithstanding this designation, wind farm developments in these areas are to be evaluated on a case-by-case basis.

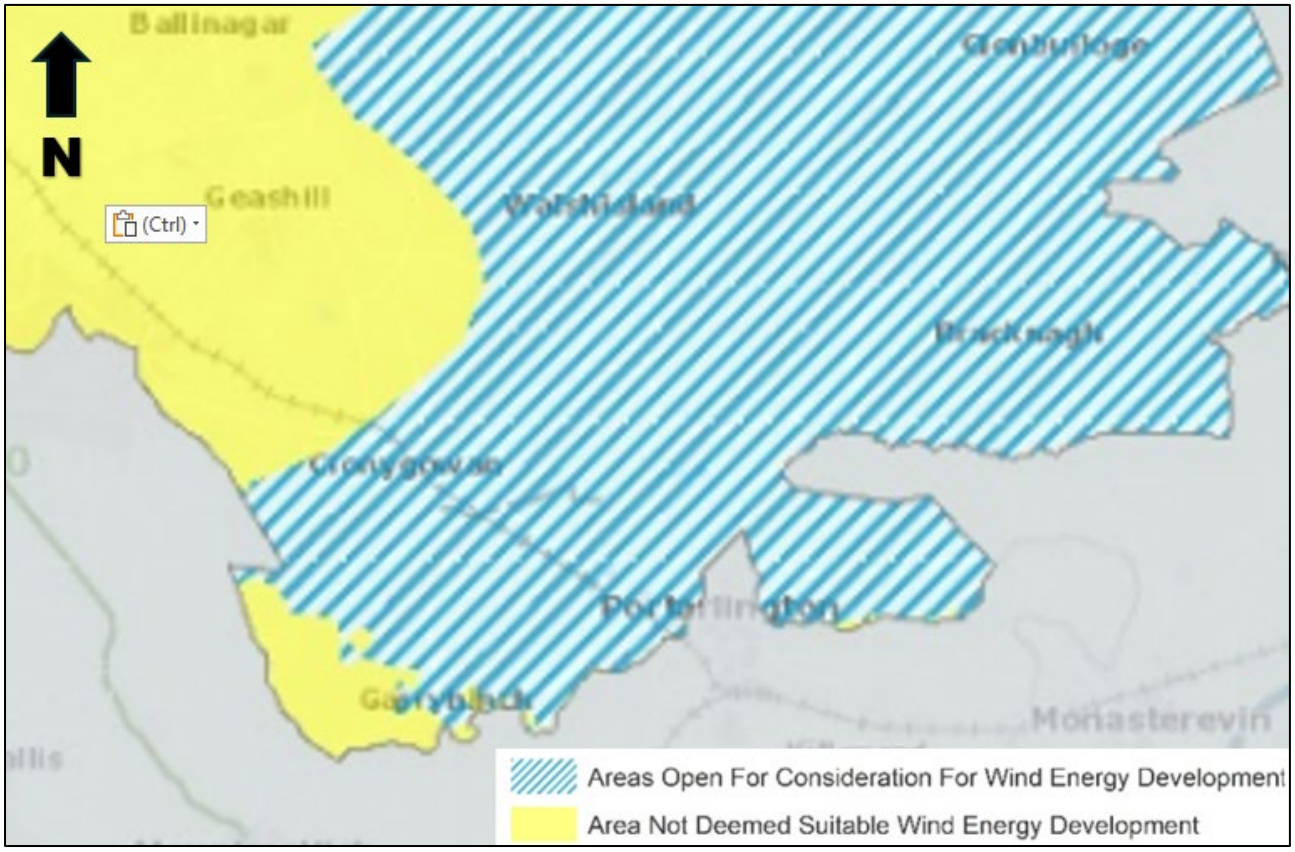



**Figure 4-2: Offaly Wind Energy Strategy**

Kildare Wind Energy Strategy classifies the other side of proposed development as "Acceptable in Principle"for windfarm development which are areas that are predominantly flat, rural and well serviced by the existing electricity transmission grid.

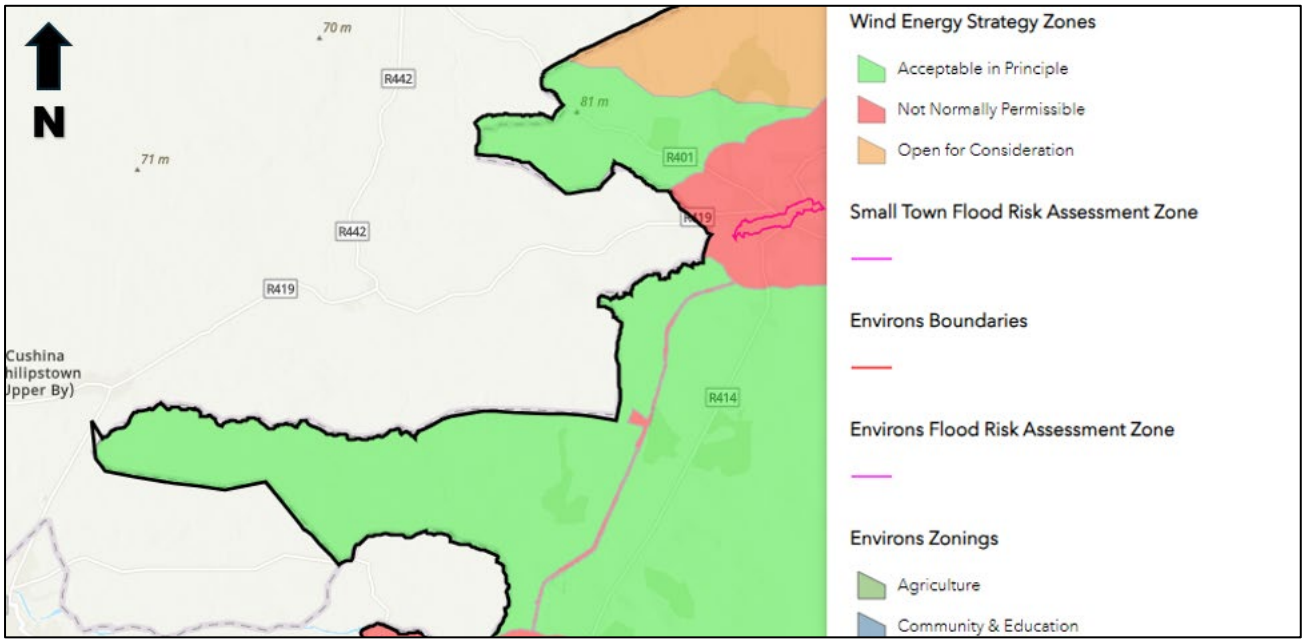



**Figure 4-3: Kildare Wind Energy Strategy**

# 5. STAGE 1 - FLOOD RISK IDENTIFICATION

## 5.1 Areas for Further Assessment and Benefiting Lands

The National Catchment Flood Risk Management (CFRAM) Programme has examined the flood risk, and possible mitigation measures to address it in 300 communities throughout the country at potentially significant flood risk. These communities were identified through the Preliminary Flood Risk assessment (PFRA), which was a national screening assessment of flood risk. The communities recognized as being at a significant flood risk are called Areas for Further Assessment (AFA). For the AFAs a detailed hydraulic modelling has been carried out to produce indicative flood maps (CFRAM Maps).

The subject site and the TDR watercourse crossing are within an AFA and therefore, flooding maps have been produced as part of the CFRAM mapping.

Local Authority is charged with responsibility of maintaining Drainage Districts. According to the OPW database, the Cushina, Figile and Daingean Rivers as well as a number of local drains in the area form part of the Drainage Districts.

## 5.2 Coastal Flooding

The ground levels within the site range from 66 mOD to 59 mOD and it is located approximately 68 km from the coast at its nearest point. As such, the site is not considered to be at risk of coastal flooding. Similarly, the TDR watercourse crossing is not impacted by coastal flooding, as it lies approximately 75 km from the sea and is situated at an elevation of around 70 mOD.

## 5.3 Groundwater Flooding

Based on the information described in Section 3.2, Subsoil and Hydrogeology, which was gathered from a desktop study, site walkovers, and ground investigation works, the subject site is, in general, not at risk of groundwater flooding. The ground investigation revealed that groundwater levels across the site are shallow; however, the predominant overburden deposits of till and peat across the proposed wind farm comprise low permeability which indicate a low risk of groundwater flooding.

## 5.4 Fluvial Flooding

### 5.4.1 CFRAM and NIFM Maps

The CFRAM Programme extends to the subject site and the TDR watercourse crossing showing that both locations are vulnerable to fluvial flooding. Figure 5-1 below shows the flood extents for the 1 % annual exceedance event-Current Scenario.

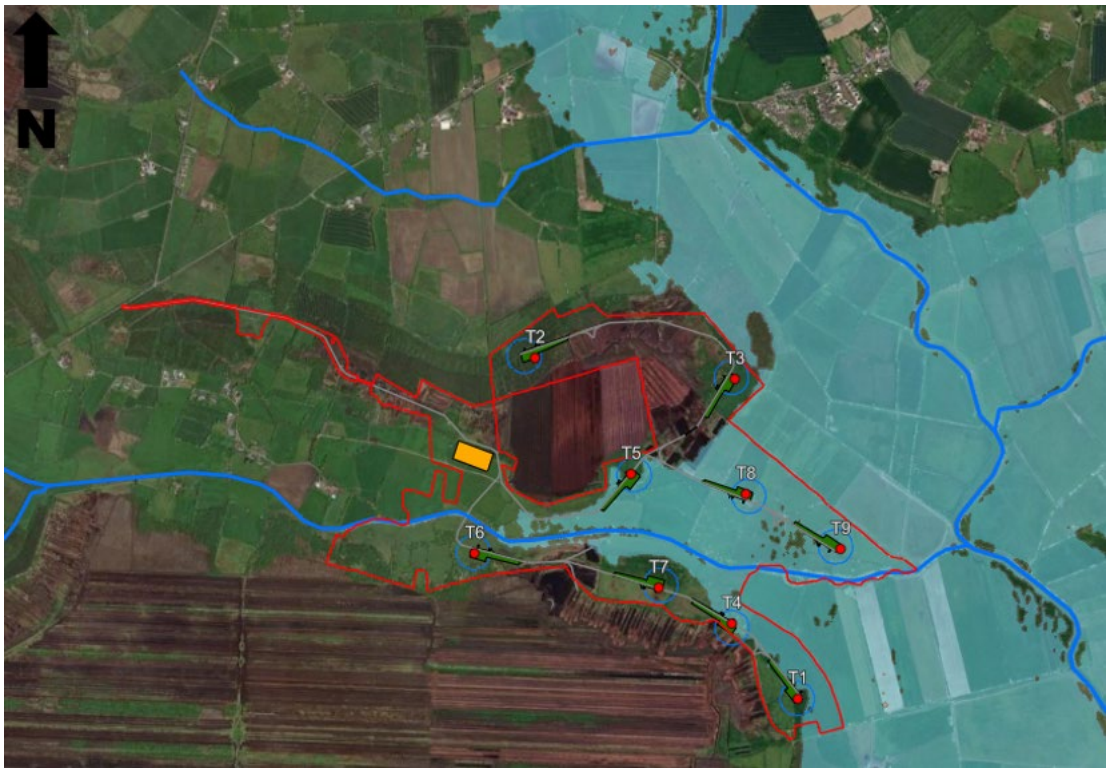



Figure 5-1: CFRAM Flood Map - Medium Probability-Proposed Wind Farm Location (Map from www.floodmaps.ie)




Figure 5-2: CFRAM Flood Map -Medium Probability-TDR Watercourse Crossing (Map from www.floodmaps.ie)

## 5.5 Pluvial Flooding

The Winter 2015/2016 Surface Water Flooding map shows fluvial (rivers) and pluvial (rain) floods, excluding urban areas, during the winter 2015/2016 flood event. Figure 5-3 below shows that there was pluvial flooding in combination with fluvial within the site boundary, probably due to the overland flow in these low lying and flat areas.

Pluvial flood risk should be considered, and the proposed development should not increase the flood risk elsewhere due to the construction of new access tracks, hardstanding areas, and the proposed discharge points.




**Figure 5-3: GSI Winter 2015/2016 Surface Water Flooding-Proposed Wind Farm Location (Map from www.floodmaps.ie)**

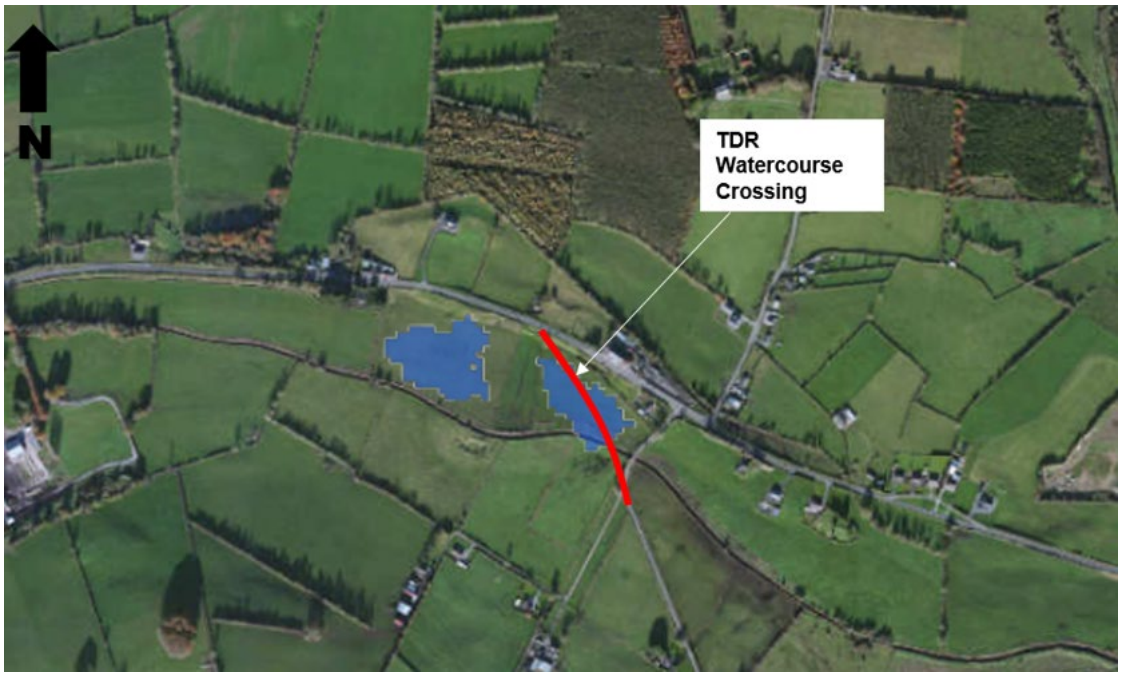



Figure 5-4: GSI Winter 2015/2016 Surface Water Flooding-TDR Watercourse Crossing

## 5.6 Historical Flooding

The national flood hazard mapping (www.floodmaps.ie ), indicates that there are historical or past flooding events within the proposed site boundary . This past flood event has been mapped defining the extend of the flood along the Cushina River. There are also some single and recurring flood events in the area but are outside of the proposed site boundary.

The past flood event that has been mapped as shown in Figure 5-4 below appears to extend only within County Kildare. However, the floodplain also extends towards County Offaly on the north side of the Cushina River. Therefore, this map is considered only as part of the information gathered and a more detailed assessment will be required.




Figure 5-5: Past Flood Event-Proposed Wind Farm Location (Map taken from www.floodmaps.ie)

Figure 16 below shows a recurring flood event to the west of the TDR Watercourse Crossing, approximately less than 1 km away, which appears to be associated with the Daingean River.

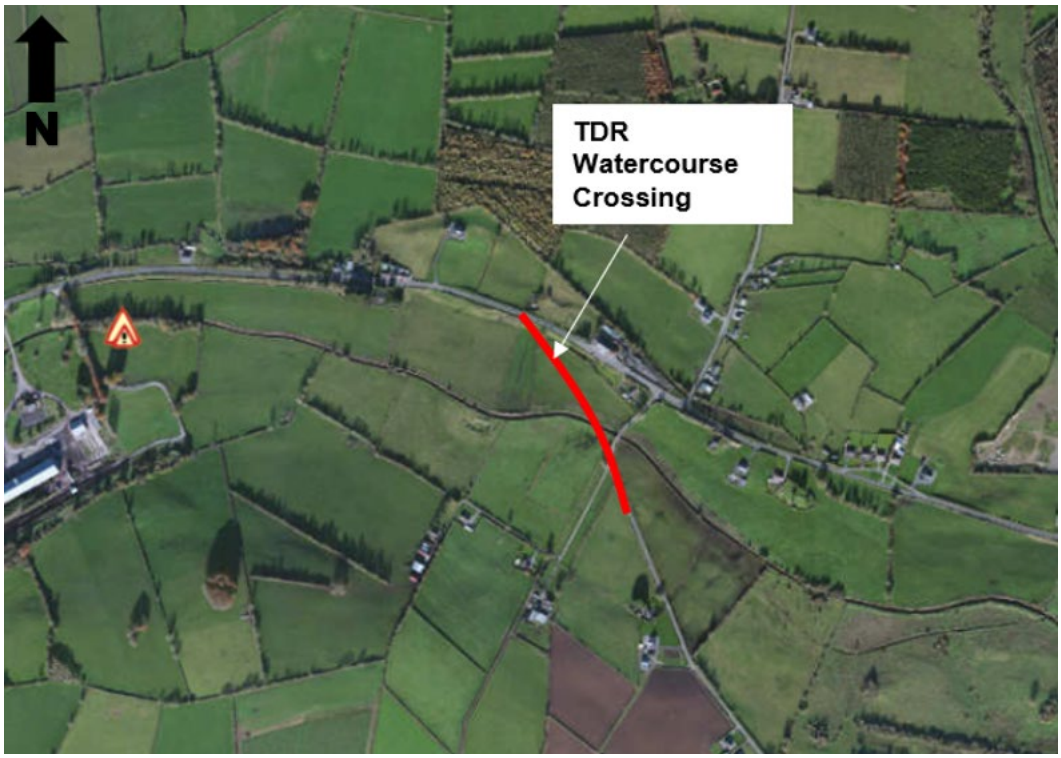



Figure 5-6: Past Flood Event-TDR Watercourse Crossing (Map taken from www.floodmaps.ie)

There are areas defined as 'benefiting lands' within the subject site and the TDR watercourse crossing. Benefiting lands were lands that were drained as part of the Drainage District to improve land for agriculture and to mitigate flooding.




**Figure 5-7: Drainage Districts, Benefitting Lands and Channels-Proposed Wind Farm (Map from www.floodmaps.ie)**

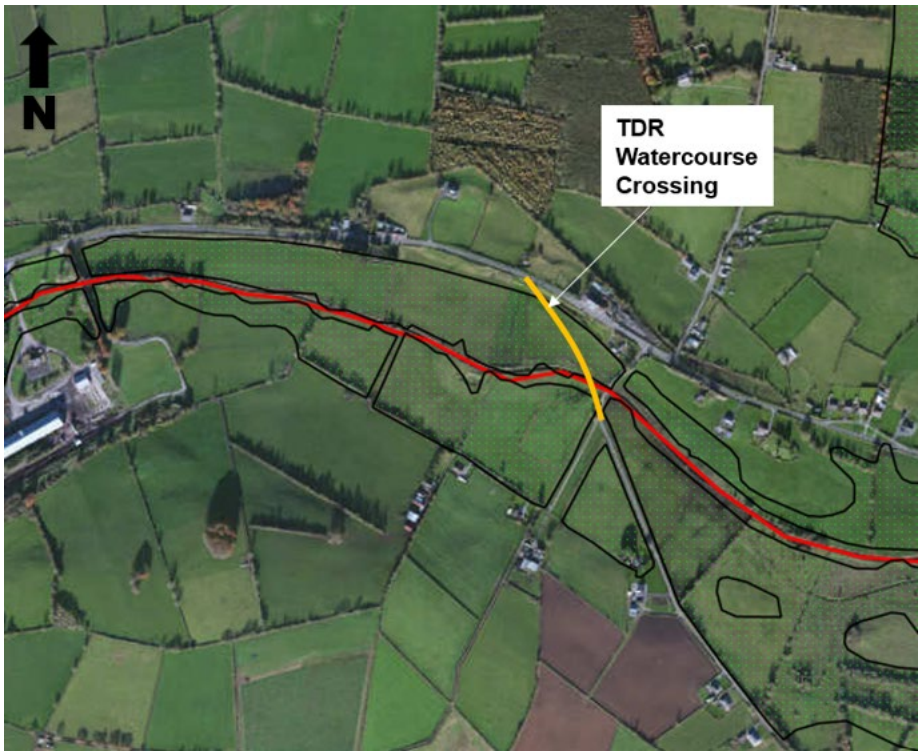



**Figure 5-8: Drainage Districts, Benefitting Lands and Channels - TDR Watercourse Crossing (Map from www.floodmaps.ie)**

# 6. STAGE 2 - INITIAL FLOOD RISK ASSESSMENT

The primary objective of conducting an initial flood risk assessment is to investigate flood-related concerns identified during Stage 1 Flood Risk Identification. Based on the information recorded in Stage 1, it has been determined that the Site is at risk of fluvial and pluvial flooding.

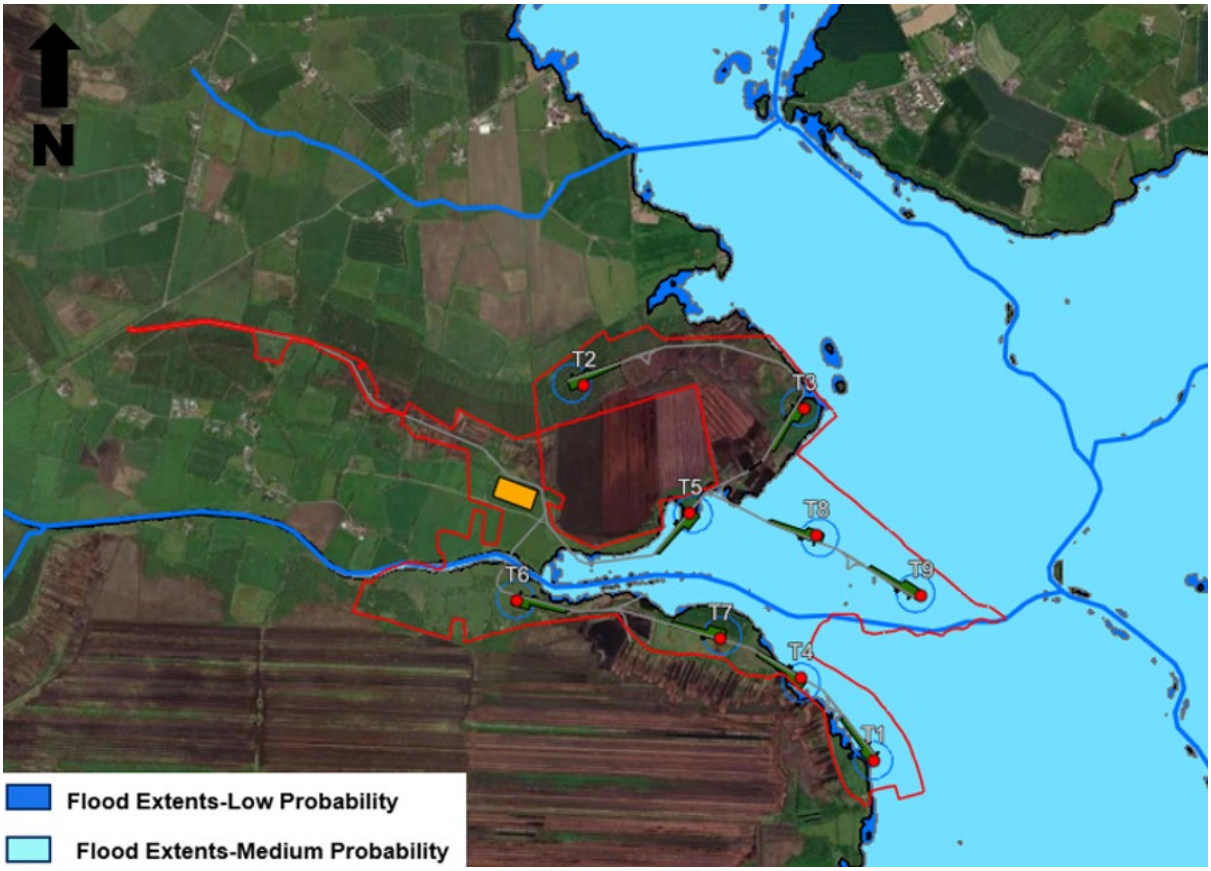



**Figure 6-1: CFRAM Fluvial Flood Map - Medium and Low Probability-Mid Range Future Scenario (Map from www.floodmaps.ie)**




Figure 6-2: Winter 2015/2016 Surface Water Flooding (Map from www.floodmaps.ie)

According to the CFRAM, some areas of the site are within Flood Zones A and B which are T1, T4, T8 and T9 and their access roads. Other access roads and infrastructure are also within the flood zones or are very close to it such as T5. However, the critical or essential parts of the windfarm such as the substation and the grid route connection joint bays are outside of the flood zones.

The proposed wind farm is classified as a Less Vulnerable Development in accordance with Table 2-1, as the critical infrastructure—such as the substation and the grid connection joint bays—is located outside the flood zones. However, some elements, including turbines and access roads, are within Flood Zone A. Therefore, a Justification Test is required, as outlined in Table 5-1.

Table 6-1: Matrix of Vulnerability Versus Flood Zone - Case of Study

| | Flood Zone A | Flood Zone B | Flood Zone C |
|---|---|---|---|
| **Highly Vulnerable Development** | Justification Test | Justification Test | Appropriate |
| **Less Vulnerable Development** | Justification Test | Appropriate | Appropriate |
| **Water-Compatible Development** | Appropriate | Appropriate | Appropriate |

A Stage 3 Detailed Flood Risk Assessment will be carried out to determine the flood levels and extends; also, there is a proposed bridge that crosses the Cushina River and the design of this structure is required to comply with the OPW requirements.

The TDR watercourse crossing is also affected by fluvial and pluvial flooding as identified in the previous section.

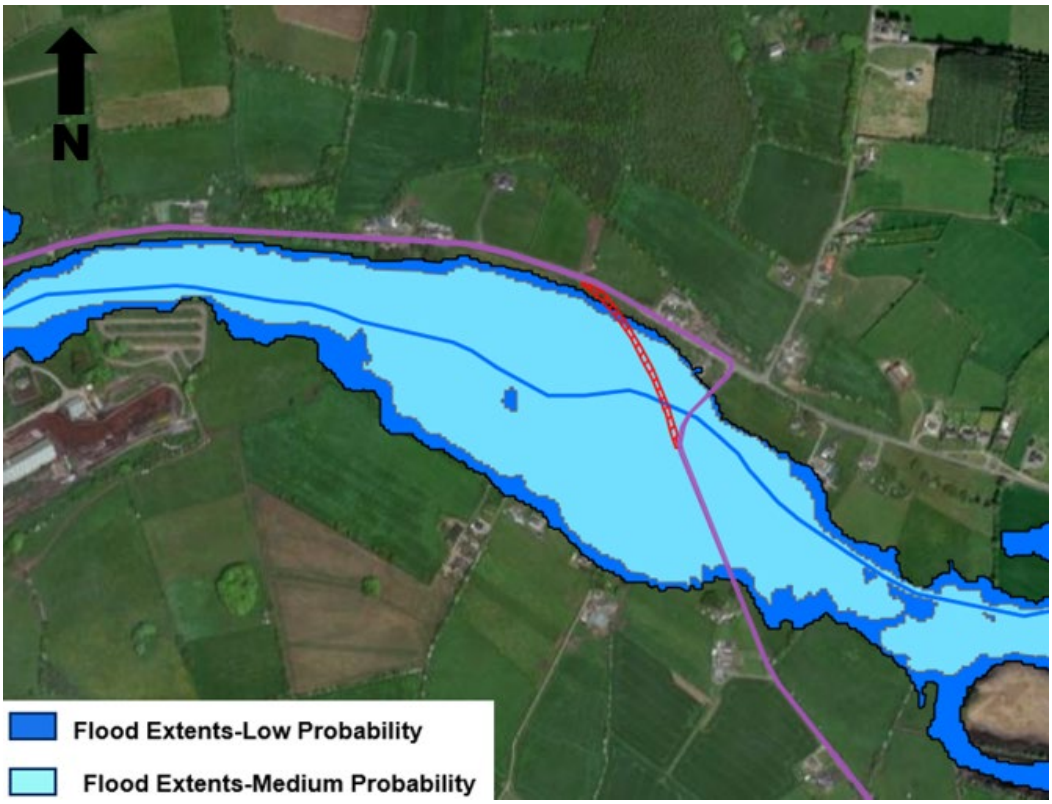



Figure 6-3: CFRAM Fluvial Flood Map- Medium and Low Probability-Mid Range Future Scenario (Map from www.floodmaps.ie)

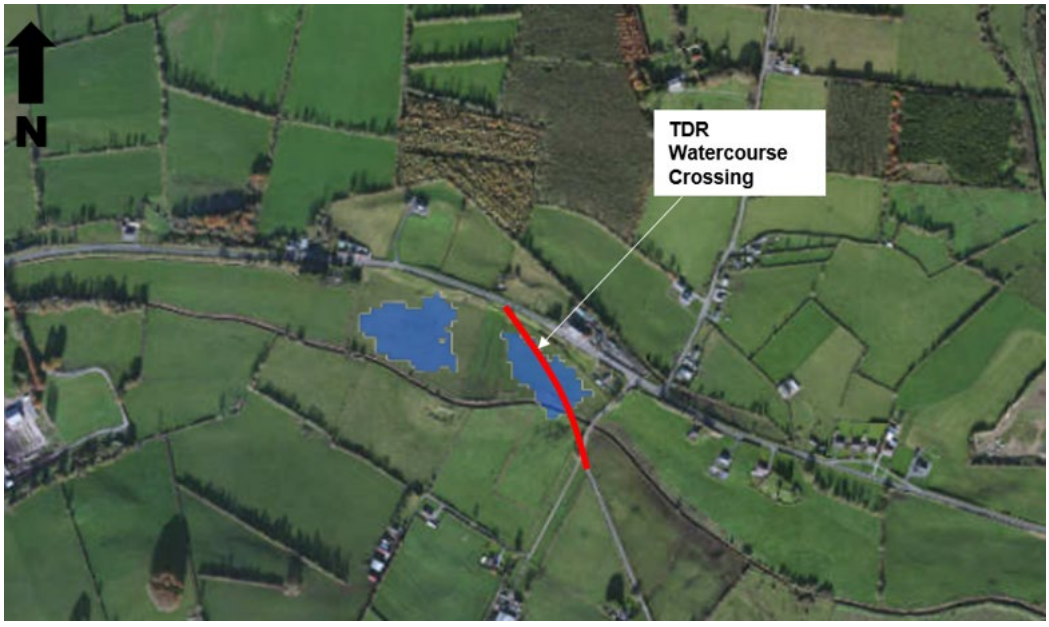



Figure 6-4: Winter 2015/2016 Surface Water Flooding (Map from www.floodmaps.ie)

This watercourse crossing is located within Flood Zones A and B and is classified as "Less vulnerable development" as per Table 2-1, therefore, a Justification Test is required as shown in Table 5-1. This will be included as part of the Justification Test for the overall project.

A Stage 3 Detailed Flood Risk Assessment will be carried out to determine the flood levels and extents, and to design the proposed bridge crossing the Daingean River, which is also required to comply with OPW requirements. In addition, any mitigation measures required will also be determined as the access road crosses a flood plain.

# 7. STAGE 3- DETAILED FLOOD RISK ASSESSMENT

## 7.1 Proposed Wind Farm- River Cushina

A site-specific hydraulic model was developed as part of this FRA to quantify the flood levels at the site and to design the proposed bridge crossing. Hydrological and hydraulic analysis were undertaken along the specific reach of the Hydrological Features to enable the delineation of appropriate flood zones. This model also allowed to quantify the water depths at the locations where relevant infrastructure were located in flood zones such as some of the turbines.

In order to undertake the hydraulic modelling, the peak flood flows were estimated along Two Hydrological Estimation Flows (HF's) as per the following figures below. The estimated peak flows, in conjunction with a digital terrain model (DTM) were used to generate the flood extent and flood depth maps for 1% AEP (annual exceedance probability) and 0.1%AEP.

The first Hydrological Estimation Flow is located near the end of the Cushina River, before joining the Figile River.

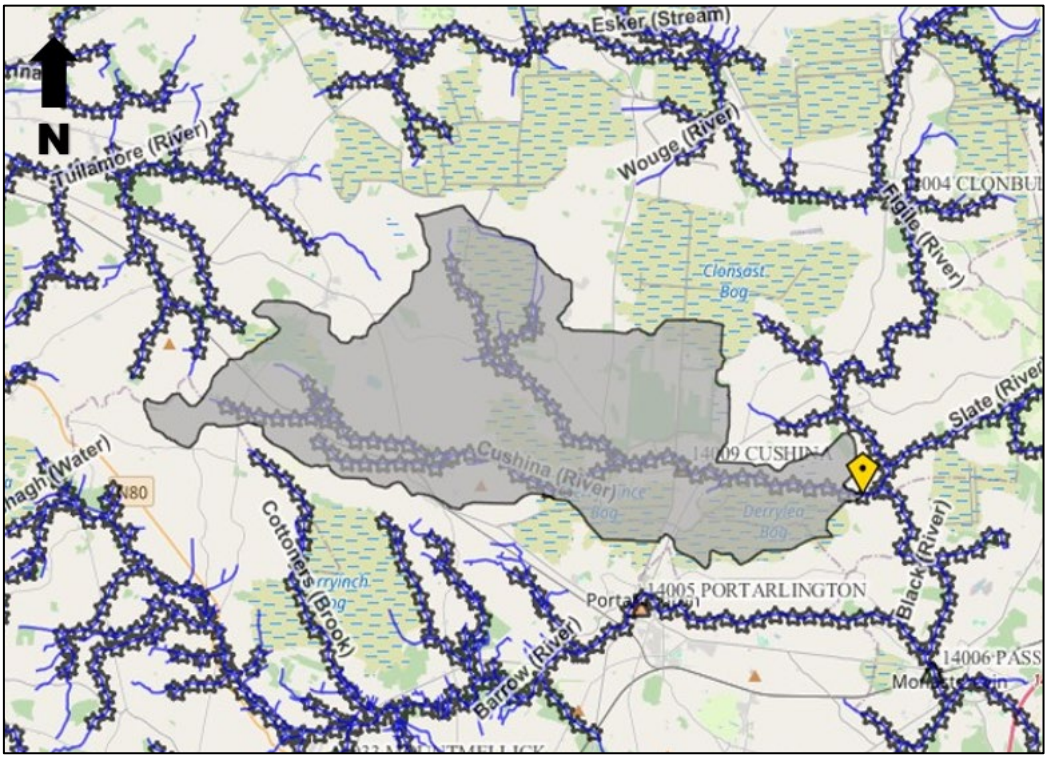



Figure 7-1: Location of First Hydrological Estimation Flow (HEF-1)

The second Hydrological Estimation Flow is located along the Figile River, before the junction with the Cushina River.

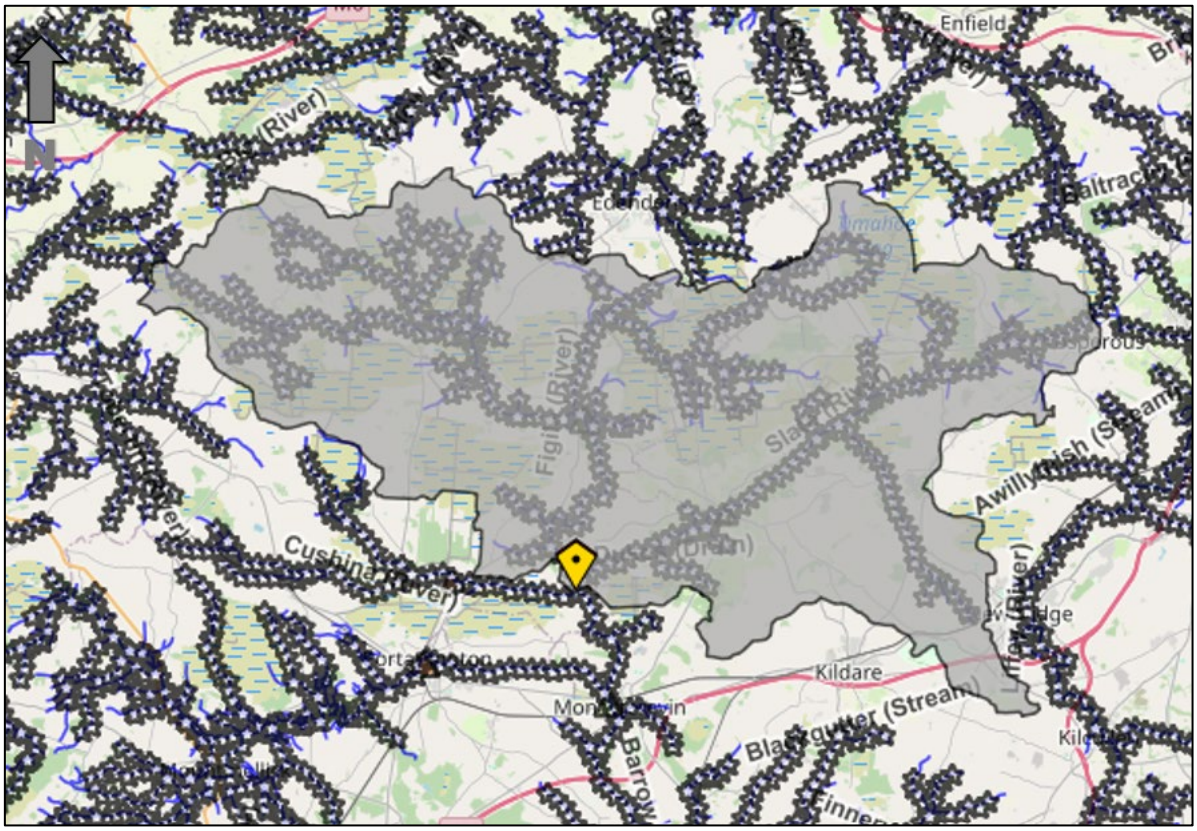



Figure 7-2: Location of Second Hydrological Estimation Flow (HEF-2)

### 7.1.1 Hydrology Analysis

The proposed development is located within an ungauged catchment; therefore, the flow estimations are based on ungauged methods. The FSU method was considered to estimate the peak flow of the watercourses as per OPW guidelines and in particular the FSU-7 Variable Equation was applied. This method is recommended for catchment sizes over 25 km2 and estimates the flow (Qmed) based on seven catchment descriptors.

The catchment descriptors are summarised in Table 6-1 below:

**Table 7-1: Catchment Descriptors for the Hydrological Estimation Flow Locations**

| Feature ID | Area | BFSOIL | SAAR | FARL | DRAIND | S1085 | ARTDRAIN | URBEXT |
|---|---|---|---|---|---|---|---|---|
| | Km2 | | mm | | Km/Km2 | m/km | | |
| HEF-1 | 83.683 | 0.6069 | 827.12 | 1 | 0.577 | 2.1191 | 0 | 0.001 |
| HEF-2 | 521.706 | 0.5981 | 829.34 | 0.999 | 0.508 | 0.56 | 0 | 0.0132 |

The Hydrology Analysis will be conducted to ascertain the flow values corresponding to the Annual Exceedance Probabilities (AEP) of 1% and 0.1%, plus 20% of Climate Change. This analysis aims to simulate a flooding event and generate flood zone scenarios A and B. Below the Table 6-2 shows these flow values for the different return periods.

**Table 7-2 Flood Estimations for the different return periods**

| Hydrological Estimation Flows | AEP (%) | |
|---|---|---|
| | 1% AEP +20 % CC (m3/s) | 0.1%AEP +20%CC (m3/s) |
| HEF-1 | 42.30 | 54.79 |
| HEF-2 | 143.65 | 181.41 |

### 7.1.2 Hydraulic Analysis

#### *7.1.2.1 Model Details*

A flood model of the Cushina River in the vicinity of the subject site was constructed using the software package HEC-RAS. This software was developed by the Hydraulic Engineering Centre of the US Army Corps of Engineers.

The primary inputs into the HEC-RAS Model are summarised below:

- Geometric Data:

  Cushina River- channel cross sections and part of the flood plain. Surveyed by Murphy Geospatial in November 2023.

  Terrain: DTM.

- Inflow Data - estimated using the FSU- 7 Variable Equation:

  100-year Mid-Range Future Scenario.

  1000-year Mid-Range Future Scenario.

- Boundary Conditions:

  HEF-1 Flow applied at the upstream end of the model.

  Normal depth (downstream channel).

  HEF-2 Flow applied as a downstream boundary condition.

The proposed bridge is designed for the 100 years return period (1% AEP) with a 20% inclusion for climate change and aims to have a minimal impact on the flood levels upstream and downstream of the structure. This consists of a single span bridge with a span of 19.00 m and a minimum soffit level of 62.30 m OD to provide a minimum freeboard of 300 mm as per the OPW requirements. The 0.1 % AEP (1 in 1000 years) was also modelled in order to map the flood zones A and B.

The Manning's values for the river channel and flood plain were determined by identifying the different type of materials encountered during a site visit and site survey where photos were taken; this assisted in selecting the appropriate manning's coefficient from the Hec-Ras Reference Manual. The contraction and expansion coefficients utilized were likewise drawn from the recommendations of the same manual.

**Table 7-3: Design parameter used in the Hydraulic Analysis.**

| Parameter | Value | Source |
|---|---|---|
| Manning's Value (Channel) | 0.08<br>0.12 | Hec-Ras Reference Manual |
| Manning's Value (Flood Plain) | 0.08<br>0.10 | Hec-Ras Reference Manual |
| Contraction Coefficient | 0.1 | Hec-Ras Reference Manual |
| Expansion Coefficient | 0.3 | Hec-Ras Reference Manual |

Two separate scenarios were modelled to compare the existing conditions or pre-development and post-development scenario which includes the proposed bridge.

### *7.1.2.2 Flood Zone A*

#### 7.1.2.2.1 Comparison Between Existing and Proposed Scenarios with Proposed Bridge

Upon completion of the hydraulic modelling, a comparison has been undertaken between the water levels obtained from the existing and proposed scenarios. This comparison allowed for conclusions to be drawn regarding the potential impact of the proposed bridge. The table below compares the result of the existing and proposed scenarios at each cross-section.

**Table 7-4: Water Level Comparison – Existing VS Proposed - 1% AEP+ CC**

| River Station | Location | ES | PS | Diff (PS-ES) | Observations |
|---|---|---|---|---|---|
| | | W.S. Elev | W.S. Elev | W.S. Elev | |
| 2735.71 | Upstream | 62.19 | 62.23 | 0.04 | Slight increase of water level |
| 2678.54 | Upstream | 62.14 | 62.18 | 0.04 | Slight increase of water level |
| 2604.70 | Upstream | 62.06 | 62.12 | 0.06 | Slight increase of water level |
| 2535.23 | Upstream | 62.00 | 62.07 | 0.07 | Slight increase of water level |
| 2498.64 | Upstream | 61.96 | 61.98 | 0.02 | Slight decrease of water level |
| 2494.67 | Proposed Bridge | | | | |
| 2490.70 | Development | 61.95 | 61.95 | 0.00 | No variation of water level |
| 2450.07 | Development | 61.89 | 61.89 | 0.00 | No variation of water level |
| 2397.96 | Development | 61.80 | 61.80 | 0.00 | No variation of water level |
| 2342.83 | Development | 61.67 | 61.67 | 0.00 | No variation of water level |

*The model extends further downstream but only the relevant cross sections have been shown in this Table

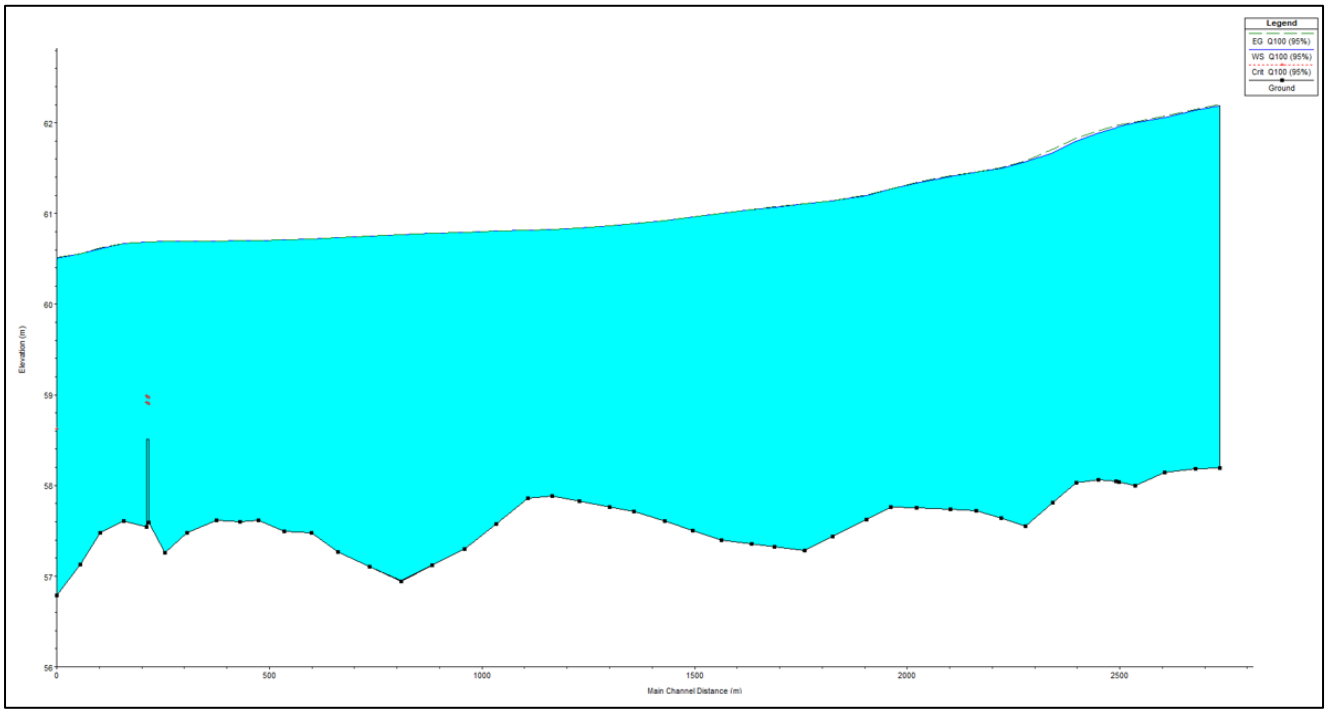



Figure 7-3: Longitudinal Section - 1% AEP + CC - Existing Scenario

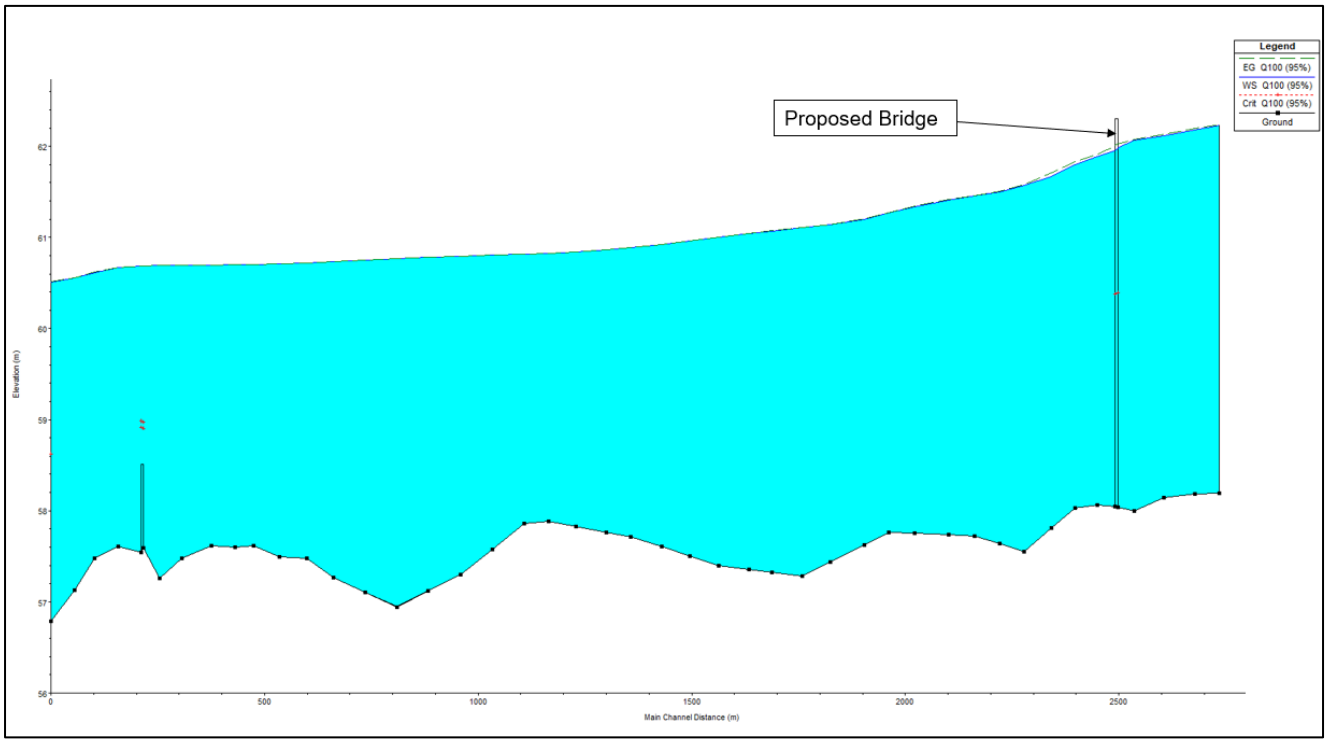



Figure 7-4: Longitudinal Section - 1% AEP+CC - Proposed Scenario

### *7.1.2.3 Flood Zone B*

#### 7.1.2.3.1 Comparison Between Existing and Proposed Scenarios with Proposed Bridge

Upon completion of the hydraulic modelling, a comparison has been undertaken between the water levels obtained from the existing and proposed scenarios. This comparison allowed for conclusions to be drawn regarding the potential impact of the proposed bridge. The table below compares the result of the existing and proposed scenarios at each cross-section.

**Table 7-5: Water Level Comparison - Existing VS Proposed -0.1%AEP + CC**

| River Station | Location | ES | PS | Diff (PS-ES) | Observations |
|---|---|---|---|---|---|
| | | W.S. Elev | W.S. Elev | W.S. Elev | |
| 2735.71 | Upstream | 62.19 | 62.23 | 0.04 | Slight increase of water level |
| 2678.54 | Upstream | 62.14 | 62.18 | 0.04 | Slight increase of water level |
| 2604.7 | Upstream | 62.06 | 62.12 | 0.06 | Slight increase of water level |
| 2535.23 | Upstream | 62.00 | 62.07 | 0.07 | Slight increase of water level |
| 2498.64 | Upstream | 61.96 | 61.98 | 0.02 | Slight increase of water level |
| 2494.67 | Proposed Bridge | | | | |
| 2490.7 | Development | 61.95 | 61.95 | 0 | No variation of water level |
| 2450.07 | Development | 61.89 | 61.89 | 0 | No variation of water level |
| 2397.96 | Development | 61.80 | 61.80 | 0 | No variation of water level |
| 2342.83 | Development | 61.67 | 61.67 | 0 | No variation of water level |

*The model extends further downstream but only the relevant cross sections have been shown in this Table

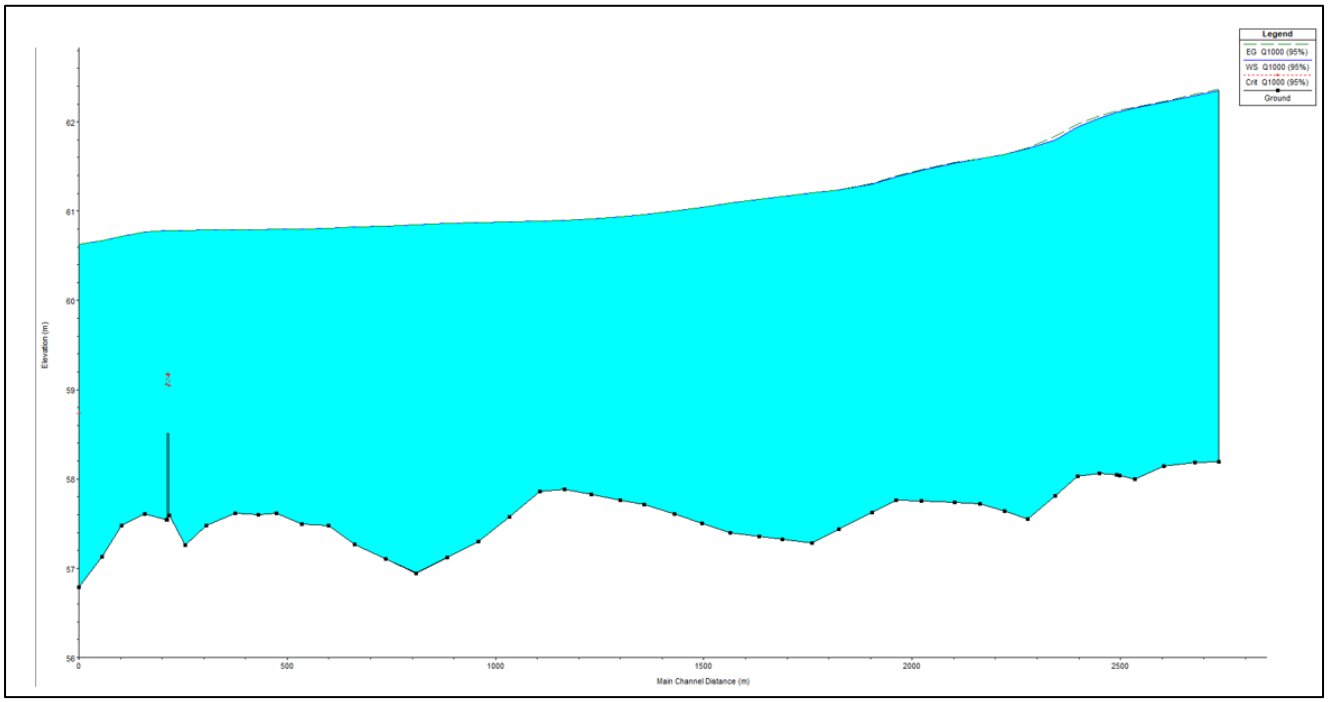



Figure 7-5: Longitudinal Section -0.1% AEP +CC - Existing Scenario

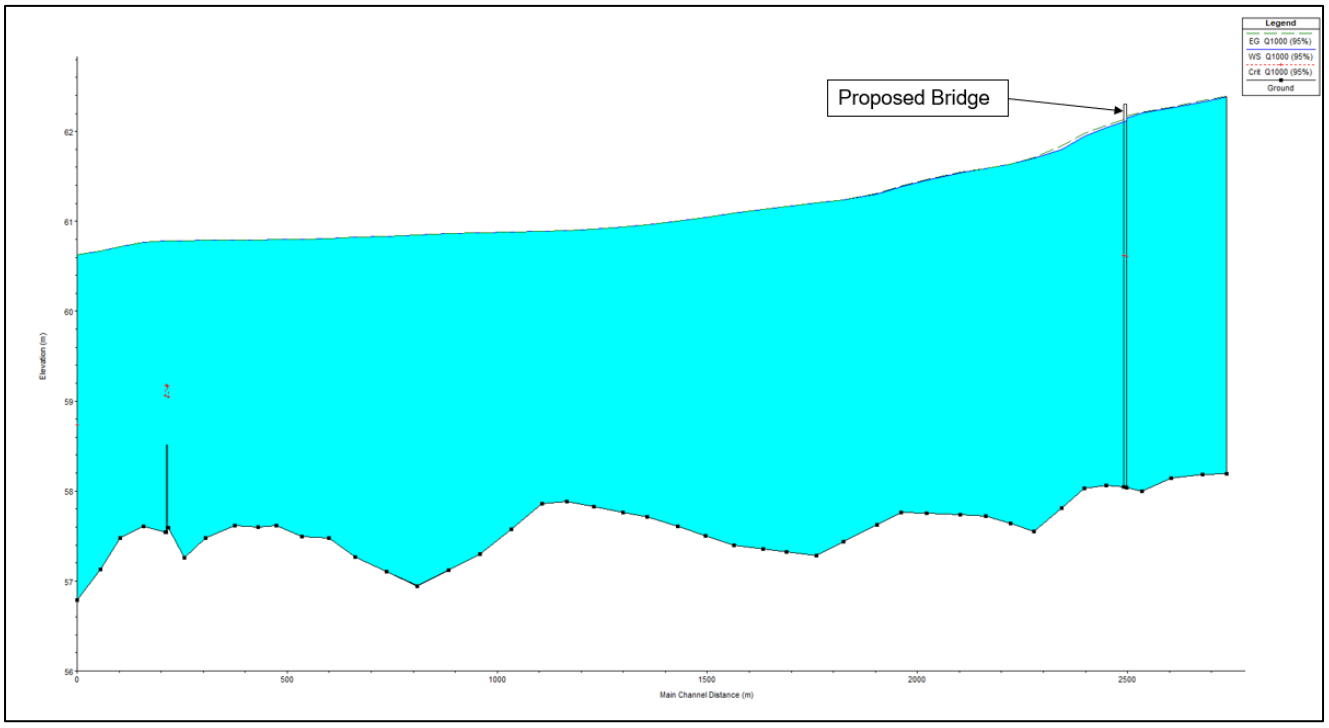



Figure 7-6: Longitudinal Section - 0.1% AEP + CC - Proposed Scenario

## 7.2 Turbine Delivery Route-Daingean River

A site-specific hydraulic model was developed as part of this FRA to quantify the flood levels at the TDR watercourse crossing and to design the proposed bridge. Hydrological and hydraulic analysis were undertaken along the specific reach of the Hydrological Features to enable the delineation of appropriate flood zones.

In order to undertake the hydraulic modelling, the peak flood flow was estimated along one Hydrological Estimation Flows (HF's) as per the following figure below. The estimated peak flow, in conjunction with a digital terrain model (DTM) were used to generate the flood extent and flood depth maps for 1% AEP (annual exceedance probability) and 0.1%AEP.

The Hydrological Estimation Flow is located downstream of the existing bridge, which is approximately 35 m downstream of the proposed bridge crossing.




**Figure 7-7: Location of the Hydrological Estimation Flow (HEF-1)**

### 7.2.1 Hydrology Analysis

The TDR watercourse crossing is located within an ungauged catchment; therefore, the flow estimations are based on ungauged methods. The FSU method was considered to estimate the peak flow of the watercourse as per OPW guidelines and in particular the FSU-7 Variable Equation was applied. This method is recommended for catchment sizes over 25 km2 and estimates the flow (Qmed) based on seven catchment descriptors.

The catchment descriptors are summarised in Table -7-6 below:

**Table 7-6: Catchment Descriptors for the Hydrological Estimation Flow Locations**

| Feature ID | Area | BFSOIL | SAAR | FARL | DRAIND | S1085 | ARTDRAIN | URBEXT |
|---|---|---|---|---|---|---|---|---|
| | Km2 | | mm | | Km/Km2 | m/km | | |
| HEF-1 | 49.25 | 0.608 | 841.37 | 1 | 0.612 | 1.288 | 0 | 0.0075 |

The Hydrology Analysis will be conducted to ascertain the flow values corresponding to the Annual Exceedance Probabilities (AEP) of 1% and 0.1%, plus 20% of Climate Change. This analysis aims to simulate a flooding event and generate flood zone scenarios A and B. Below the Table 7-7 shows these flow values for the different return periods.

**Table 7-7: Flood Estimations for the different return periods**

| Hydrological Estimation Flows | AEP (%) | |
|---|---|---|
| | 1% AEP +20 % CC (m3/s) | 0.1%AEP +20%CC (m3/s) |
| HEF-1 | 21.10 | 27.11 |

### 7.2.2 Hydraulic Analysis

#### *7.2.2.1 Model Details*

A flood model of the Daingean River in the vicinity of the TDR river crossing was constructed using the software package HEC-RAS.

The primary inputs into the HEC-RAS Model are summarised below:

- Geometric Data:
  Daingean River- channel cross sections and part of the flood plain. Surveyed in February 2025.

  Terrain: DTM.
- Inflow Data - estimated using the FSU- 7 Variable Equation:
  100-year Mid-Range Future Scenario.
  1000-year Mid-Range Future Scenario.
- Boundary Conditions:
  HEF-1 Flow applied at the upstream end of the model.

Normal depth (downstream channel).

The proposed bridge is designed for the 100 years return period (1% AEP) with a 20% inclusion for climate change and aims to have a minimal impact on the flood levels upstream and downstream of the structure. This consists of a single span bridge with a span of 20.00 m and a minimum soffit level of 70.61 m OD to provide a minimum freeboard of 300 mm as per the OPW requirements. The 0.1 % AEP (1 in 1000 years) was also modelled in order to map the flood zones A and B.

As the TDR crosses a flood plain and in order to minimise the impact on the existing flood levels, five flood relief culverts were also modelled together with the bridge. These culverts consist of five 900 mm dia. Pipes.

The Manning's values for the river channel and flood plain were determined by identifying the different type of materials encountered during a site survey where photos were taken; this assisted in selecting the appropriate manning's coefficient from the Hec-Ras Reference Manual. The contraction and expansion coefficients utilized were likewise drawn from the recommendations of the same manual.

**Table 7-8: Design parameter used in the Hydraulic Analysis.**

| Parameter | Value | Source |
|---|---|---|
| Manning's Value (Channel) | 0.08 | Hec-Ras Reference Manual |
| Manning's Value (Flood Plain) | 0.045 | Hec-Ras Reference Manual |
| Contraction Coefficient | 0.1 | Hec-Ras Reference Manual |
| Expansion Coefficient | 0.3 | Hec-Ras Reference Manual |

Two separate scenarios were modelled to compare the existing conditions or pre-development and post-development scenario which includes the proposed bridge and the access track leading to it.

#### *7.2.2.2 Flood Zone A*

##### 7.2.2.2.1 Comparison Between Existing and Proposed Scenarios with Proposed Bridge

Upon completion of the hydraulic modelling, a comparison has been undertaken between the water levels obtained from the existing and proposed scenarios. This comparison allowed for conclusions to be drawn regarding the potential impact of the proposed bridge and access track. The table below compares the result of the existing and proposed scenarios at each cross-section.

**Table 7-9: Water Level Comparison – Existing VS Proposed - 1% AEP+ CC**

| River Station | Location | ES | PS | Diff (PS-ES) | Observations |
|---|---|---|---|---|---|
| | | W.S. Elev | W.S. Elev | W.S. Elev | |
| 505.91 | Upstream | 70.42 | 70.42 | 0.02 | Negligible increase in water level |
| 455.88 | Upstream | 70.35 | 70.36 | 0.01 | Negligible increase in water level |
| 405.01 | Upstream | 70.33 | 70.34 | 0.02 | Negligible increase in water level |
| 389.99 | Upstream | 70.31 | 70.33 | 0.02 | Negligible increase in water level |
| 382.49 | Upstream | 70.31 | 70.32 | 0.02 | Negligible increase in water level |
| 375.95 | Upstream | 70.30 | 70.32 | 0.01 | Negligible increase in water level |
| 371.05 | Proposed Bridge + Flood Relief Culverts | | | | |
| 366.15 | Downstream | 70.3 | 70.3 | 0.00 | No variation of water level |
| 356.15 | Downstream | 70.3 | 70.3 | 0.00 | No variation of water level |
| 346.15 | Downstream | 70.3 | 70.3 | 0.00 | No variation of water level |

*The model extends further upstream and downstream but only the relevant cross sections have been shown in this Table

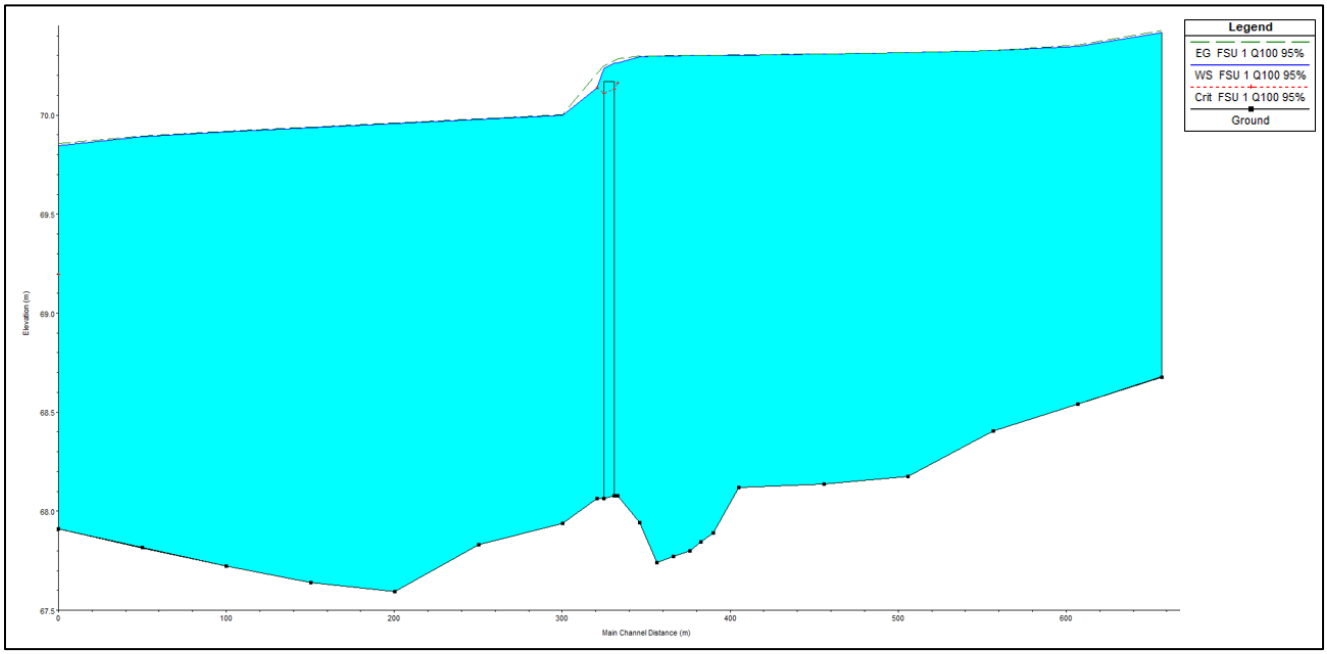



**Figure 7-8: Longitudinal Section - 1% AEP + CC - Existing Scenario**

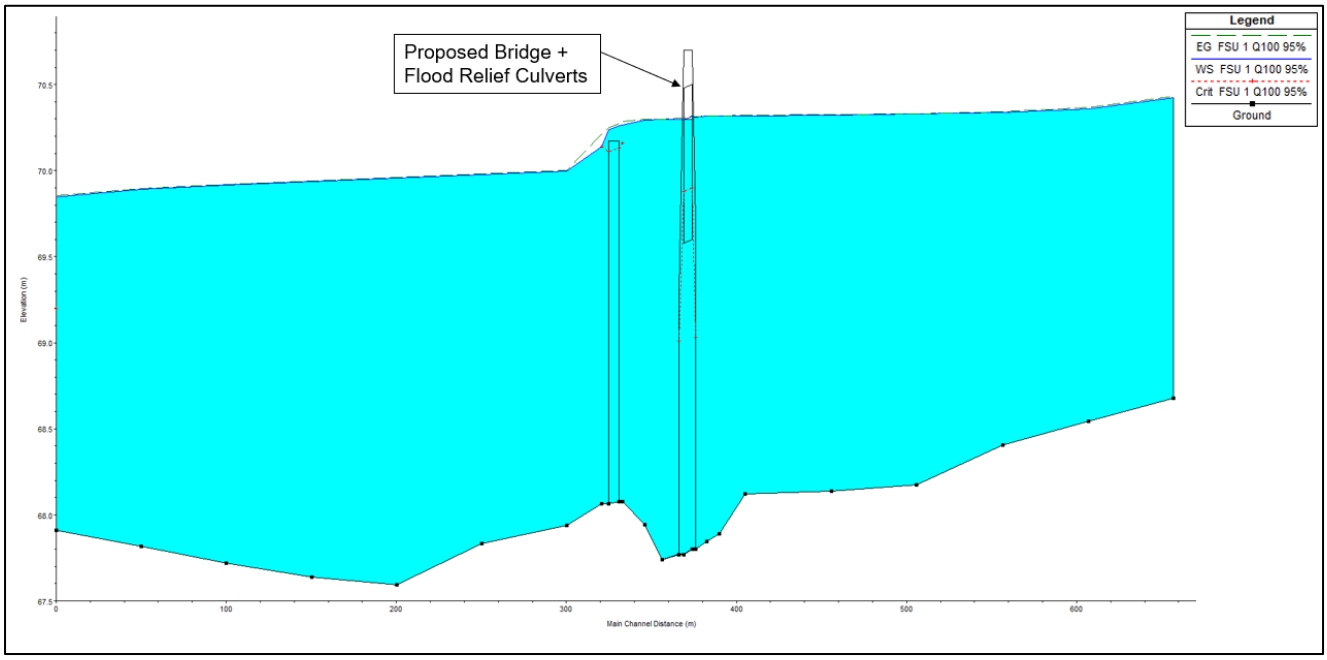



**Figure 7-9: Longitudinal Section - 1% AEP+CC - Proposed Scenario**

### *7.2.2.3 Flood Zone B*

#### 7.2.2.3.1 Comparison Between Existing and Proposed Scenarios with Proposed Bridge

Upon completion of the hydraulic modelling, a comparison has been undertaken between the water levels obtained from the existing and proposed scenarios. This comparison allowed for conclusions to be drawn regarding the potential impact of the proposed bridge. The table below compares the result of the existing and proposed scenarios at each cross-section.

**Table 7-10: Water Level Comparison - Existing VS Proposed -0.1%AEP + CC**

| River Station | Location | ES | PS | Diff (PS-ES) | Observations |
|---|---|---|---|---|---|
| | | W.S. Elev | W.S. Elev | W.S. Elev | |
| 505.91 | Upstream | 70.36 | 70.37 | 0.01 | Negligible increase in water level |
| 455.88 | Upstream | 70.35 | 70.36 | 0.01 | Negligible increase in water level |
| 405.01 | Upstream | 70.35 | 70.36 | 0.01 | Negligible increase in water level |
| 389.99 | Upstream | 70.35 | 70.36 | 0.01 | Negligible increase in water level |
| 382.49 | Upstream | 70.35 | 70.36 | 0.01 | Negligible increase in water level |
| 375.95 | Upstream | 70.34 | 70.35 | 0.01 | Negligible increase in water level |
| 371.05 | Proposed Bridge + Flood Relief Culverts | | | | |

| River Station | Location | ES | PS | Diff (PS-ES) | Observations |
|---|---|---|---|---|---|
| | | W.S. Elev | W.S. Elev | W.S. Elev | |
| 366.15 | Downstream | 70.34 | 70.34 | 0 | No variation of water level |
| 356.15 | Downstream | 70.34 | 70.34 | 0 | No variation of water level |
| 346.15 | Downstream | 70.34 | 70.34 | 0 | No variation of water level |

*The model extends further upstream and downstream but only the relevant cross sections have been shown in this Table

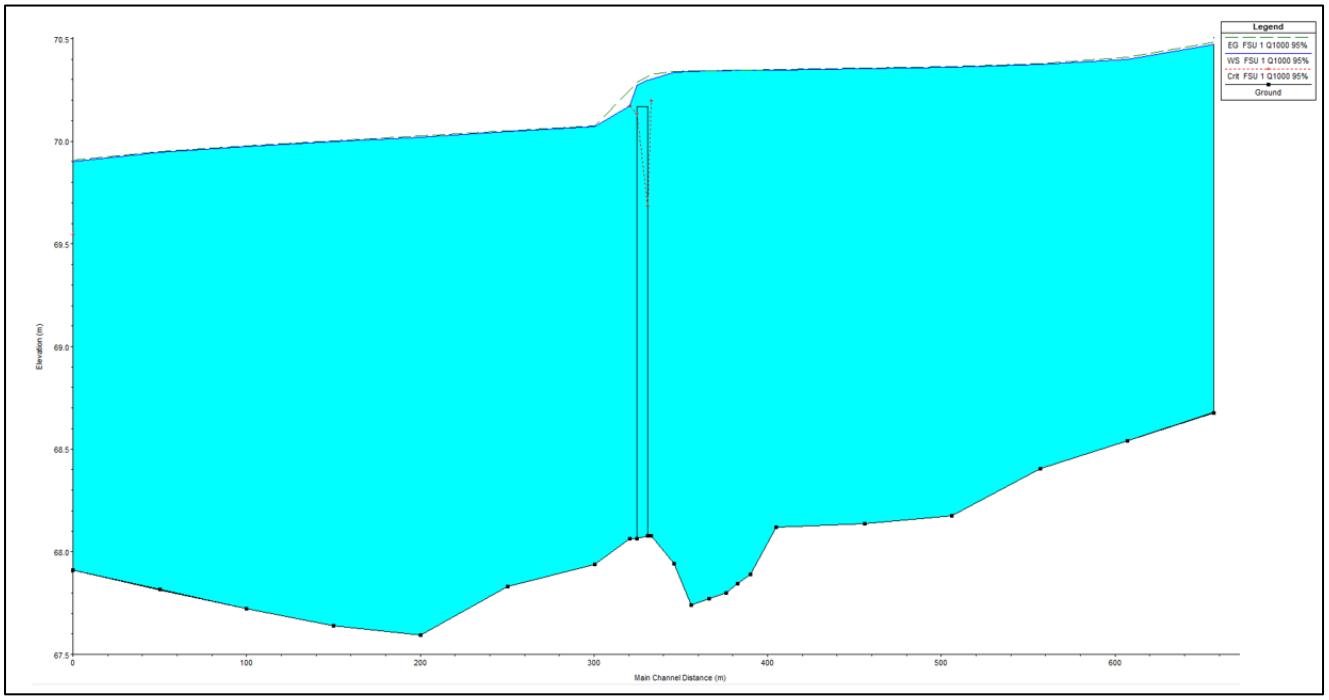



**Figure 7-10: Longitudinal Section -0.1% AEP +CC - Existing Scenario**

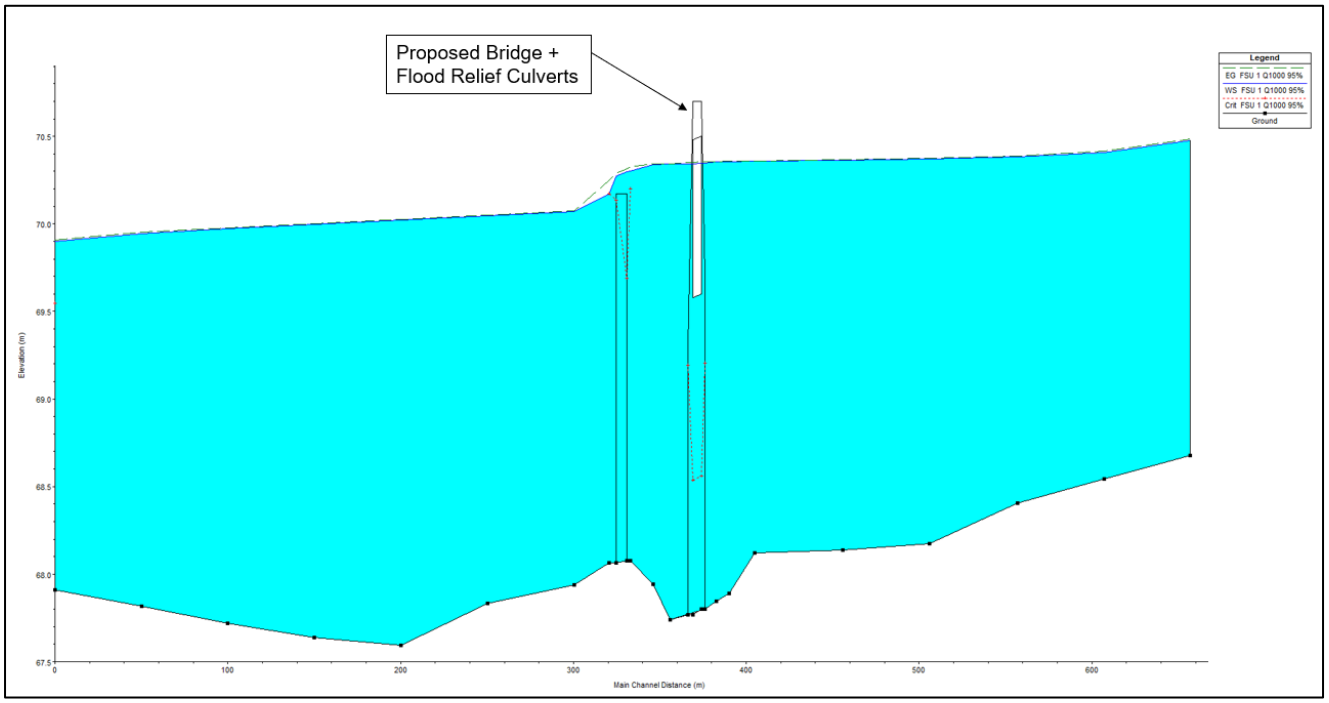



**Figure 7-11: Longitudinal Section - 0.1% AEP + CC - Proposed Scenario**

# 8. MITIGATION MEASURES

Some areas of the proposed development as well as a section of the TDR are within the Flood Zones A and B; therefore, mitigation measures have been proposed to reduce the flood risk to the development, the TDR and elsewhere. The following measures have been included:

- The proposed bridge that crosses the Cushina River has been designed with a minimum freeboard of 300 mm between the 1% AEP +CC flood level and the bridge deck to reduce the likelihood of debris blockage and also allows for uncertainties in hydrological and hydraulic design calculations. Sufficient span has been designed to minimise the afflux.
- The proposed bridge for the section of the TDR crossing the Deangean River has been designed following the same principles as the other bridge; however, flood relief culverts have also been included, as the TDR crosses a floodplain in this area.
- Some wind farm infrastructure, such as certain access tracks and turbines, is located within Flood Zones A and B. To minimise any impact on existing flood levels, the access tracks and hardstanding areas within these zones will be constructed at ground level. For turbines located within or very close to flood zones—such as T1, T4, T5, T8, and T9—the plinths to which the towers will be bolted will be raised above the design flood levels with a minimum clearance of 500 mm. This will guarantee that the critical electrical and mechanical components housed in the base of the turbine tower will be protected.
- Other essential and critical elements of the proposed development such as the susbstation and the grid connection route joint bays will be placed outside of the flood zones.
- The proposed drainage design for the various elements of the wind farm aims to replicate the existing hydrological regime of the catchment as closely as possible. The proposed outfalls will discharge to the same catchments or watercourses as they would have prior to the development. On one hand, overland flow is collected by interceptor drains and discharged to the nearest watercourse or over the ground through outfall diffusers. Check dams are also incorporated into the interceptor drains where required on steep slopes to slow down velocities, and the outfall diffusers help distribute and slow down the discharge. On the other hand, surface water from the access tracks and other hardstanding areas will be collected by a swale and conveyed to settlement ponds, with an outfall diffuser to discharge into the nearest watercourse or over the ground. Although the primary function of the settlement ponds is to separate particles and reduce pollution, the settlement ponds along with the outfall diffuser will also help slow down velocities and provide some attenuation.
- Monitoring and maintenance of the proposed bridges, flood connectivity culverts and proposed drainage is required to reduce or minimise any residual risk.

# 9. JUSTIFICATION TEST

| Box 5.1 Justification Test for development management (to be submitted by the applicant) | |
|---|---|
| **1. The subject lands have been zoned or otherwise designated for the particular use or form of development in an operative development plan, which has been adopted or varied taking account of these Guidelines.** | The proposed wind farm and the TDR watercourse crossing are located in unzoned rural areas. However, the site falls within the designated zoning areas for Wind Energy Development as defined in the respective County Councils' boundaries and in accordance with the Counties' Wind Energy Strategies:<br>• Kildare County Council - Site falls within the 'Zone 1 - Acceptable in Principle'; and<br>• Offaly County Council - Site falls within an area identified as 'Open to Consideration for Wind Energy Development'. |
| **2. The proposal has been subject to an appropriate flood risk assessment that demonstrates:** | |
| **(i)The development proposed will not increase flood risk elsewhere and, if practicable, will reduce overall flood risk;** | The proposed wind farm will slightly increase the water levels locally and within acceptable levels (<150 mm afflux as per OPW requirements) and the proposed TDR watercourse crossing will have a negligible impact on flood levels. |
| **(ii)The development proposal includes measures to minimise flood risk to people, property, the economy and the environment as far as reasonably possible;** | The proposed wind farm has been designed so that critical or essential infrastructure, such as the substation and the joint bays along the grid connection route, are located outside of flood zones. However, other elements of the development, such as some turbines and access tracks, are situated within flood-prone areas. In these cases, turbine plinths have been elevated above the 1-in-100-year flood level, accounting for the effects of climate change and incorporating a freeboard (clearance) of 500 mm. This design ensures that floodwaters will not impact the electrical or mechanical components of the turbines.<br><br>Access tracks have not been raised above flood levels in order to avoid obstructing the floodplain and to preserve its storage capacity. Since these tracks will primarily be used for maintenance rather than emergency access, and during known weather conditions, this approach has been deemed acceptable. |

| Box 5.1 Justification Test for development management (to be submitted by the applicant) | |
|---|---|
| | The development does not increase the risk to human life, as access will be controlled and managed during adverse conditions. There will be no permanent human occupation within the flood zone.<br><br>At the TDR watercourse crossing, which traverses a floodplain, five relief culverts have been designed alongside the proposed bridge to minimize any impact on existing flooding conditions.<br><br>All proposed bridges, both for the wind farm and the TDR watercourse crossing, have been designed to comply with OPW requirements. They are designed for a 1-in-100-year return period, including a 20% allowance for climate change, and a minimum freeboard of 300 mm. |
| **(iii) The development proposed includes measures to ensure that residual risks to the area and/or development can be managed to an acceptable level as regards the adequacy of existing flood protection measures or the design, implementation and funding of any future flood risk management measures and provisions for emergency services access; and** | The residual risks to the area and the proposed development can be managed to an acceptable level, as mitigation measures have been incorporated into the design.<br>Access to essential infrastructure, such as the substation and joint bays for the grid connection, is possible outside of flood conditions.<br>For other infrastructure located within flood zones, such as some turbines, access is only required for periodic maintenance, which will be restricted during flood events.<br>Appropriate maintenance should be carried out on the proposed bridge, flood connectivity culverts, and drainage systems associated with the access roads and tracks. |
| **(iv) The development proposed addresses the above in a manner that is also compatible with the achievement of wider planning objectives in relation to development of good urban design and vibrant and active streetscapes.** | The Offaly and Kildare Wind Energy Strategies support this renewable energy source which can play a vital role in achieving national targets in relation to reductions in fossil fuel dependency and greenhouse emissions. The proposed development helps achieve this target. |

# 10. CONCLUSION

This Site-Specific Flood Risk Assessment (SSFRA) has 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.

The areas particularly affected include turbines T1, T4, T5, T8, and T9, along with their associated access tracks, as well as other areas where localised impacts on access roads were identified. A proposed bridge crossing the River Cushina is necessary to access the turbines located on the southern side of the site and to facilitate the grid connection route.

As the proposed development is considered a 'Less Vulnerable Development' under the Planning Guidelines (with the exception of the substation and the joint bays of the grid connection), and some infrastructure lies within Flood Zone A, it was determined that a Justification Test is required in accordance with the Guidelines.

A Stage 3 Detailed Flood Risk Assessment was undertaken to establish design flood levels and assess any potential 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 Daingean River and its associated floodplain.

Mitigation measures have been incorporated to minimise potential impacts, 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 expected 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.

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# APPENDIX 1

## SITE LAYOUT PLAN

Daingean River Crossing (TDR)

Cushina River Crossing

LEGEND:

Planning Site Boundary

Ownership Boundary

0m 500m 1000m 1500m 2000m 2500m 3000m 3500m 4000m 4500m 5000m

Scale 1:50000

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| A | ISSUE FOR INFORMATION | JH | 27.06.25 |
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PROJECT

**DERRYNADARRAGH WIND FARM**

CLIENT

Dara Energy Limited

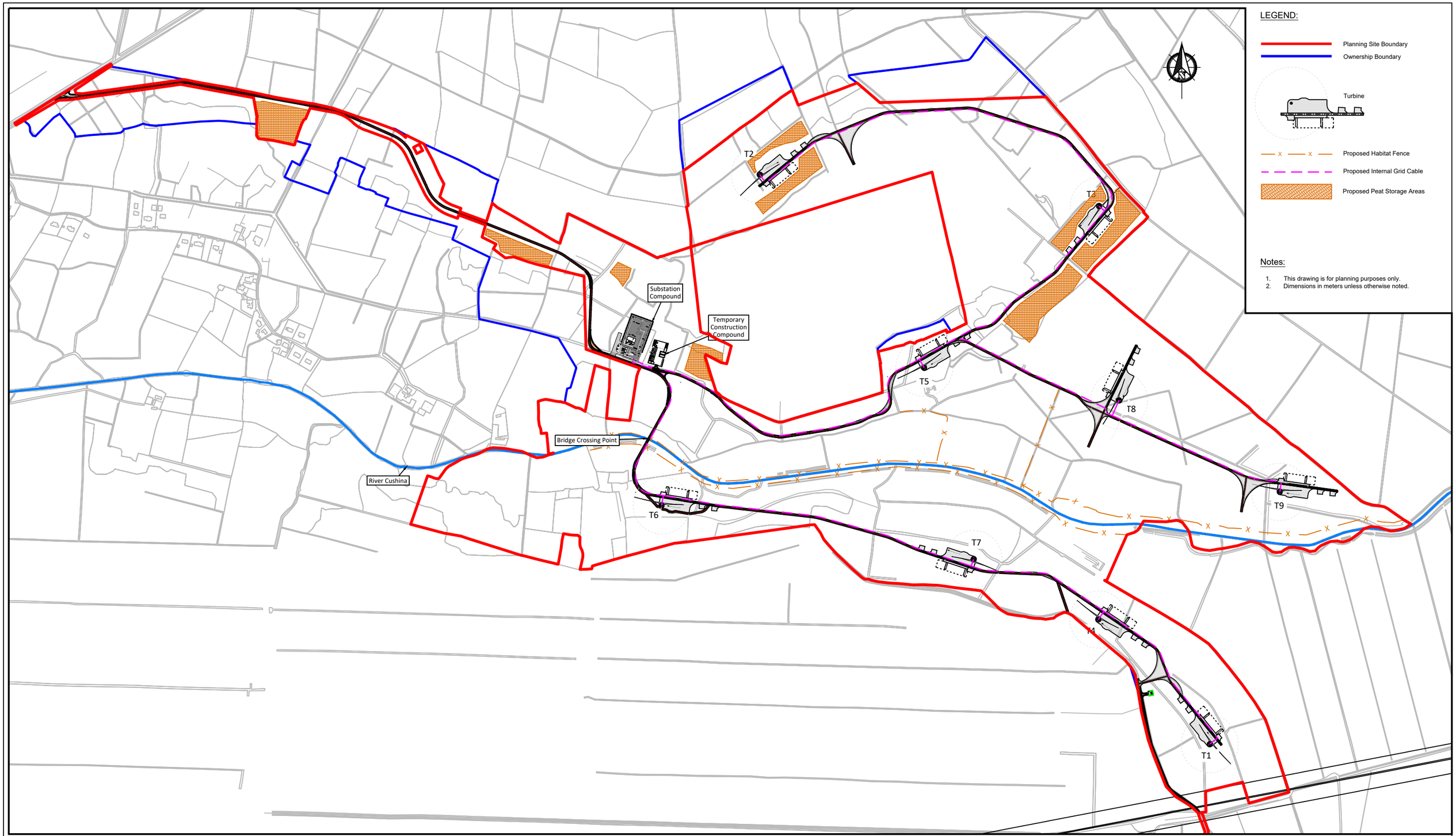
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**PROJECT OVERVIEW**

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27 June 2025




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| A | ISSUE FOR INFORMATION | JH | 27.06.25 |
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PROJECT
**DERRYNADARRAGH WIND FARM**

CLIENT
Dara Energy Limited

SHEET
**1:10000 SITE LAYOUT**

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| Date 27.06.25 | Project number P22-145 | Scale (@ A3- ) 1:10000 | |
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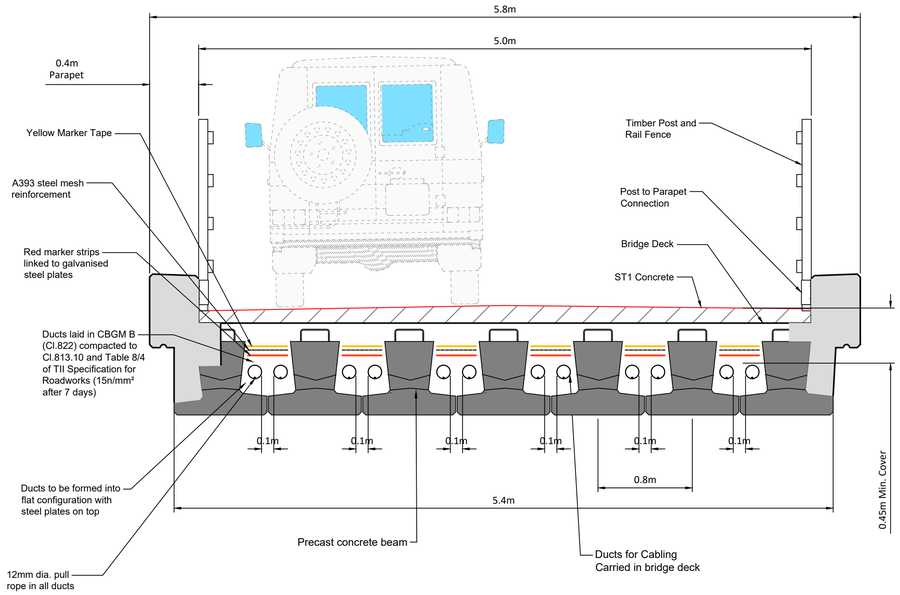
24 July 2025

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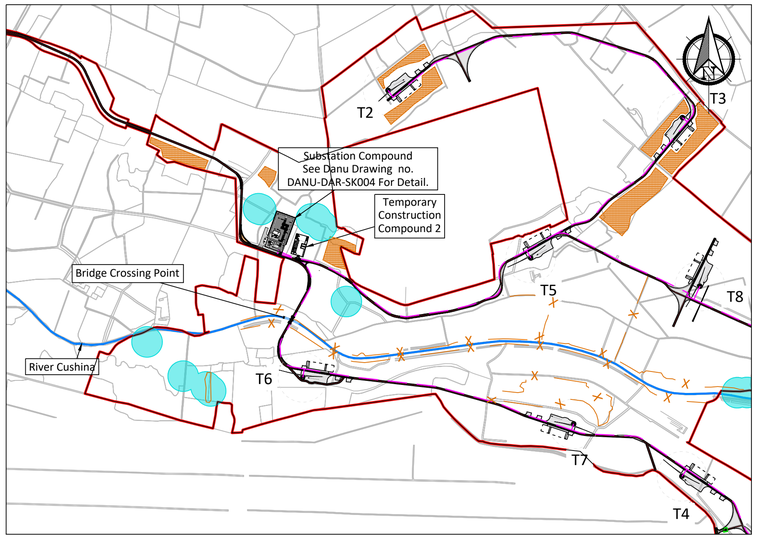
# APPENDIX 2

## PROPOSED STRUCTURES




## SECTION B-B

**Scale 1:25**




## LOCATION PLAN

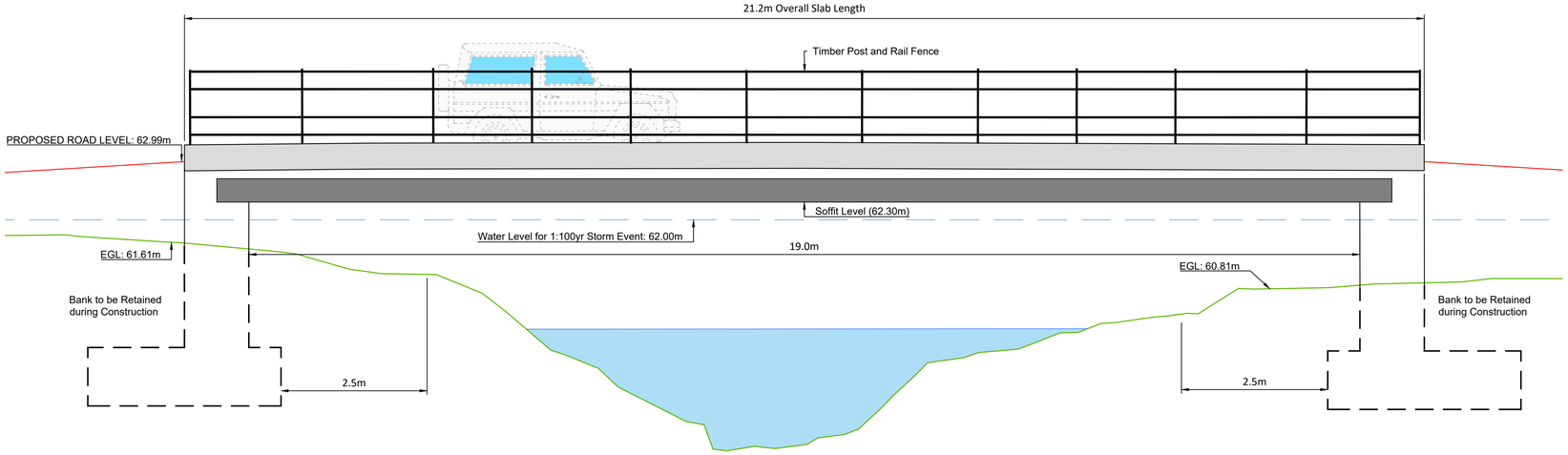
**Scale 1:10000**

LEGEND:

- Planning Site Boundary
- Proposed Habitat Fence

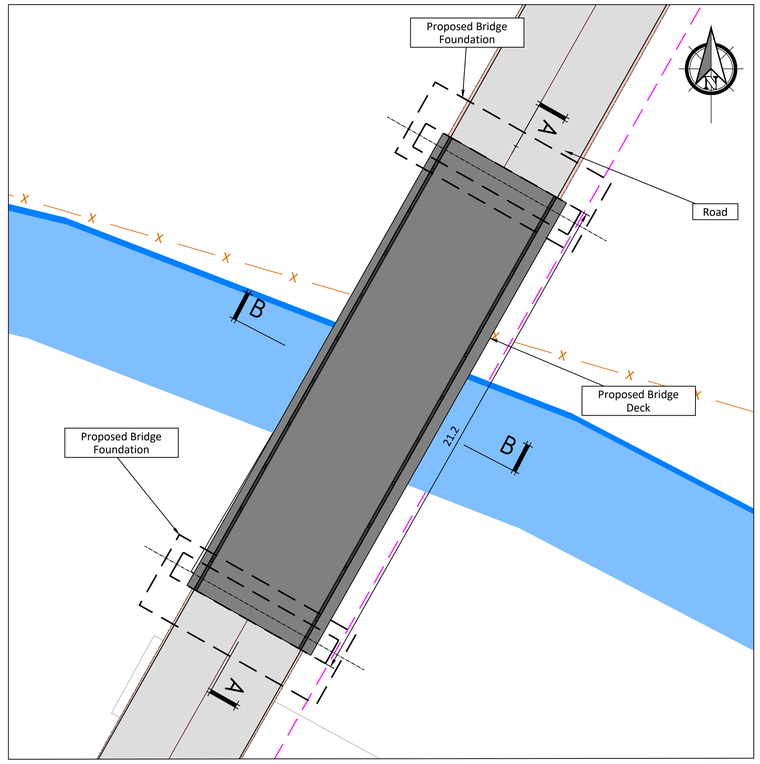
Notes:

1. This drawing is for planning purposes only.
2. Dimensions in meters unless otherwise noted.
3. Levels shown relative to ordinance datum (Malin Head).
4. Co-ordinates are to Irish Transverse Mercator (ITM).
5. Extent of earthworks not shown.
6. Foundation to be designed according to geotechnical engineers, specification at detailed design.




## SECTION A-A

**Scale 1:50**




## BRIDGE PLAN

**Scale 1:125**

0m 1.3m 2.5m 3.8m 5.0m 6.3m 7.5m 8.8m 10.0m 11.3m 12.5m

**Scale 1:125**

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| Rev. | Description | App By | Date |
|---|---|---|---|
| A | ISSUE FOR CLIENT COMMENTS | JH | 15.09.25 |
| | | | |
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PROJECT

**DERRYNADARRAGH WIND FARM**

CLIENT

Dara Energy Limited

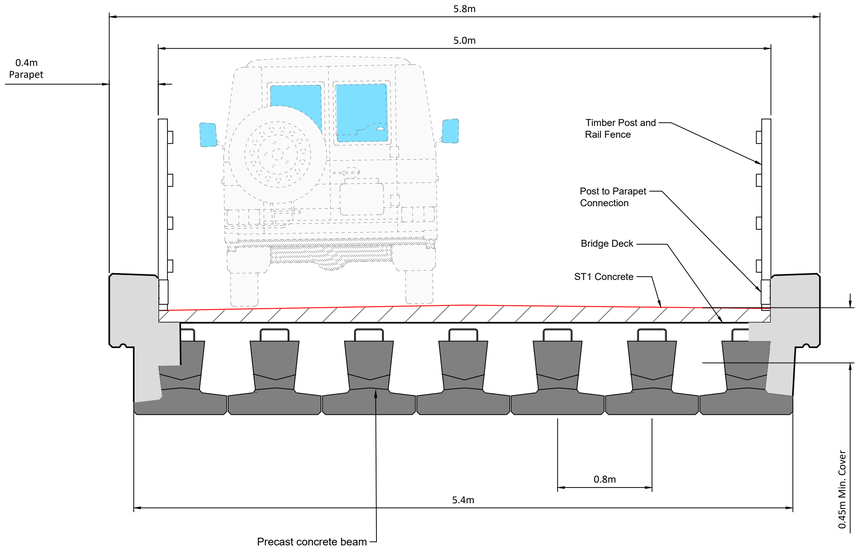
SHEET

**PRELIMINARY DESIGN - CUSHINA BRIDGE CROSSING DETAIL**

| | | | |
|---|---|---|---|
| Date 15.09.25 | Project number P22-145 | Scale (@ A1- ) 1:10000 | |
| Drawn by CS | Drawing Number P22-145-0300-0001 | | Rev A |
| Checked by LD | | | |

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16 September 2025




## SECTION B-B

**Scale 1:25**




## LOCATION PLAN

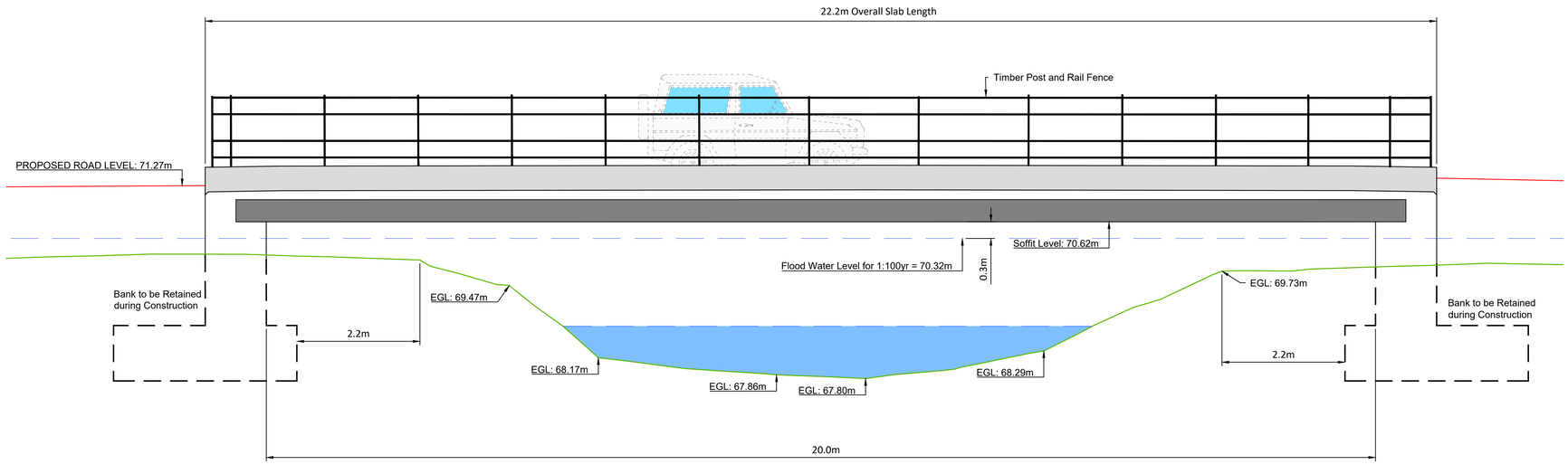
**Scale 1:10000**

LEGEND:

- Planning Site Boundary
- Ownership Boundary

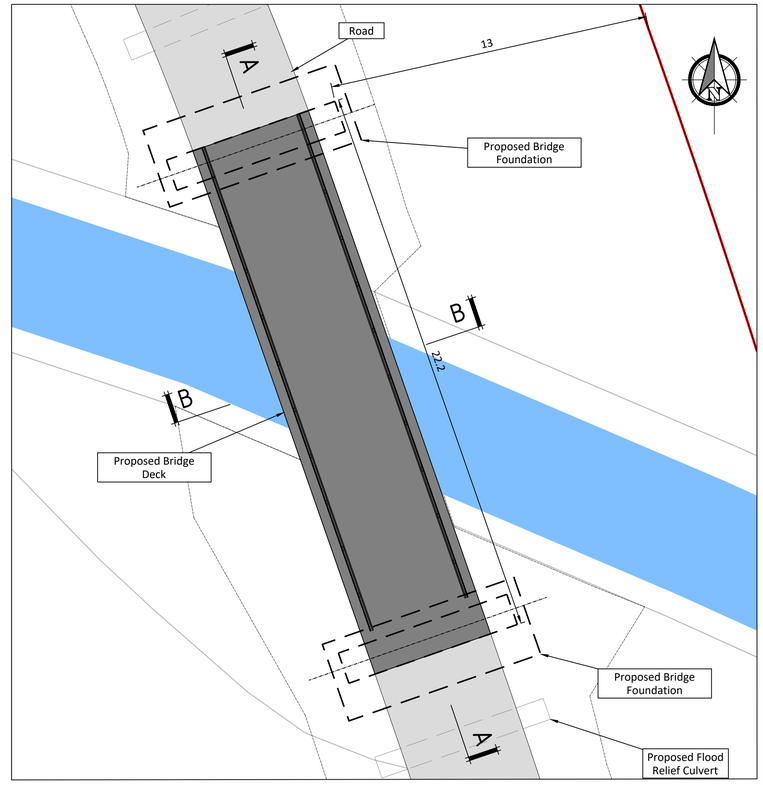
Notes:

1. This drawing is for planning purposes only.
2. Dimensions in meters unless otherwise noted.
3. Levels shown relative to ordinance datum (Malin Head).
4. Co-ordinates are to Irish Transverse Mercator (ITM).
5. Extent of earthworks not shown.
6. Foundation to be designed according to geotechnical engineers, specification at detailed design.




## SECTION A-A

**Scale 1:50**




## BRIDGE PLAN

**Scale 1:125**

0m 1.2m 2.5m 3.7m 5.0m 6.2m 7.5m 8.7m 10.0m 11.2m 12.5m

Scale 1:125

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| A | ISSUE FOR CLIENT COMMENTS | JH | 15.09.25 |
| | | | |
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| | | | |

PROJECT: DERRYNADARRAGH WIND FARM

CLIENT: Dara Energy Limited

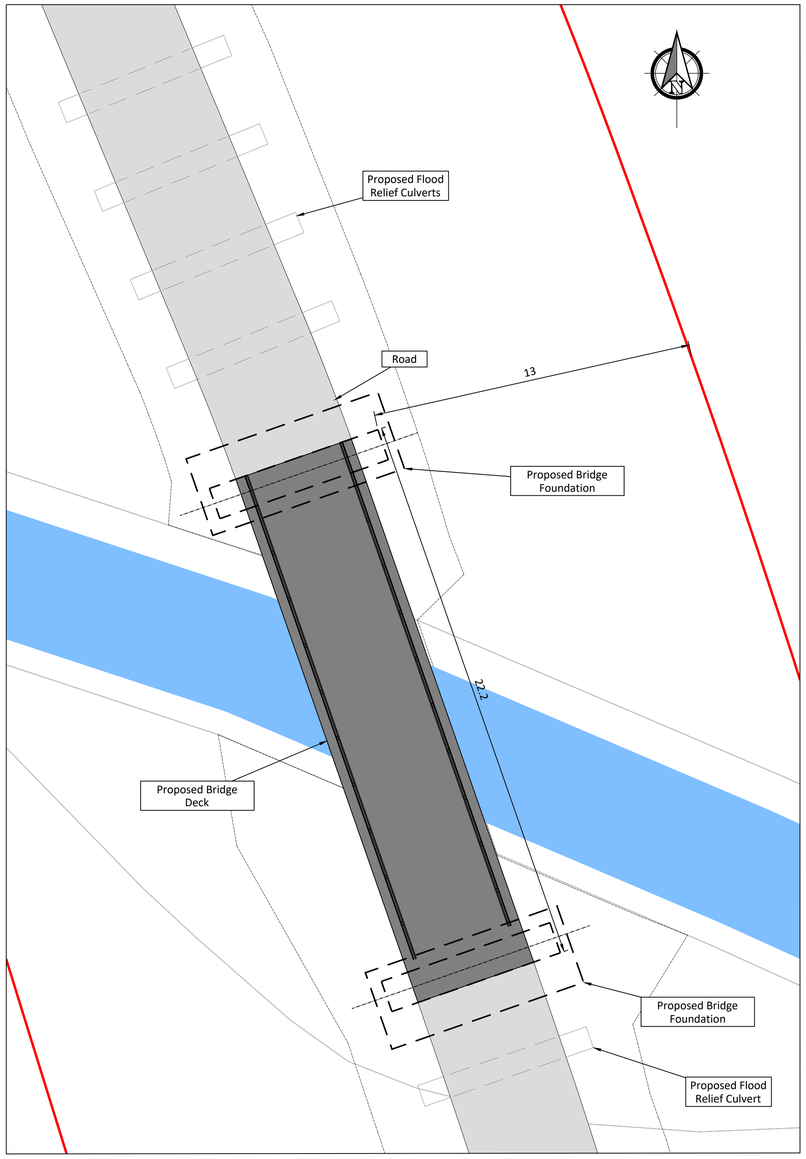
SHEET: PRELIMINARY DESIGN - TDR BRIDGE CROSSING DETAIL - SHEET 1 OF 2

| | | |
|---|---|---|
| Date 15.09.25 | Project number P22-145 | Scale (@ A1-) As Shown |
| Drawn by CS | Drawing Number P22-145-0300-0002 | Rev A |
| Checked by LD | | |

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16 September 2025

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## BRIDGE PLAN

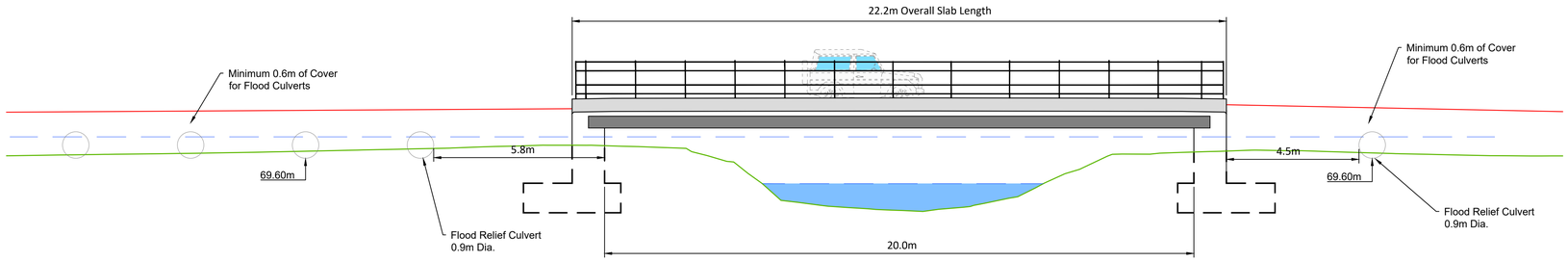
**Scale 1:125**

LEGEND:

Planning Site Boundary

Ownership Boundary

Notes:
1. This drawing is for planning purposes only.
2. Dimensions in meters unless otherwise noted.
3. Levels shown relative to ordinance datum (Malin Head).
4. Co-ordinates are to Irish Transverse Mercator (ITM).
5. Extent of earthworks not shown.
6. Foundation to be designed according to geotechnical engineers, specification at detailed design.




## SECTION

**Scale 1:100**

0m 1.2m 2.5m 3.7m 5.0m 6.2m 7.5m 8.7m 10.0m 11.2m 12.5m

**Scale 1:125**

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PROJECT: DERRYNADARRAGH WIND FARM

CLIENT: Dara Energy Limited

SHEET: PRELIMINARY DESIGN - TDR BRIDGE CROSSING DETAIL - SHEET 2 OF 2

| | | | |
|---|---|---|---|
| Date 15.09.25 | Project number P22-145 | Scale (@ A1-) As Shown | |
| Drawn by CS | Drawing Number P22-145-0300-0003 | | Rev A |
| Checked by LD | | | |

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# APPENDIX 3

## HYDROLOGY ANALYSIS

| Project | Derrynadaragh Wind Farm | | |
|---|---|---|---|
| Subject | Flood Risk Assessment<br>Calculation of Flow Estimation | | |
| Prepared by: | SH | Job No | P22-145 |
| Checked by: | PD | Date | 05/12/2023 |
| Approved by: | PD | Revision | P01 |

**1.0 PHYSICAL CATCHMENT DESCRIPTORS (PCD'S):**

**1.1 Hydrological PCD's**

| | | |
|---|---|---|
| S1085 - Mainstream Slope | 2.119 m/km | |

**1.2 Spatial PCD's**

| | | |
|---|---|---|
| AREA - Catchment Area | 83.68 $km^2$ | |
| SAAR - Standard Annual Average Rainfall | 827.12 mm | * |
| FARL - Flood Attenuation by Rivers and Lakes | 1 | |

**1.3 Spatial PCD's Representing Soil, Subsoil & Aquifer Types**

| | | |
|---|---|---|
| $BFI_{SOIL}$ | 0.6069 | * |
| URBEXT | 0.001 | * |
| SOIL | | |
| DRAIND | 0.577 $km/km^2$ | |
| ARTDRAIN2 | 0 | * |

**7.0 FSU - 7 VARIABLE EQUATION**

$$QMED_{rural} = 1.237x10^{-5}\ AREA^{0.937}\ BFIsoils^{-0.922}\ SAAR^{1.306}\ FARL^{2.217}\ DRAIND^{0.341}\ S1085^{0.185}\ (1+ARTDRAIN2)^{0.408}$$

| | | |
|---|---|---|
| $QMED_{RURAL}$ | 7.640 $m^3/s$ | |

$$QMED_{urban} = QMED_{rural}(1+URBEXT)^{1.482}$$

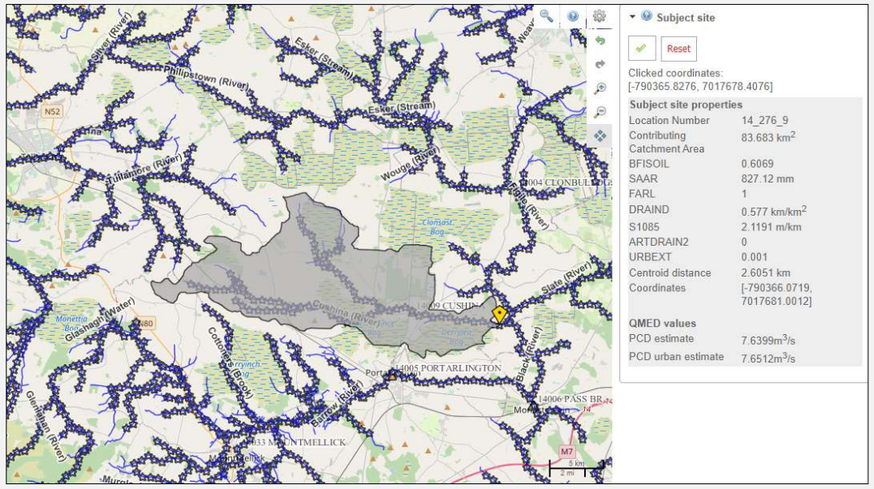
| | | |
|---|---|---|
| QMED | 7.651 $m^3/s$ | |

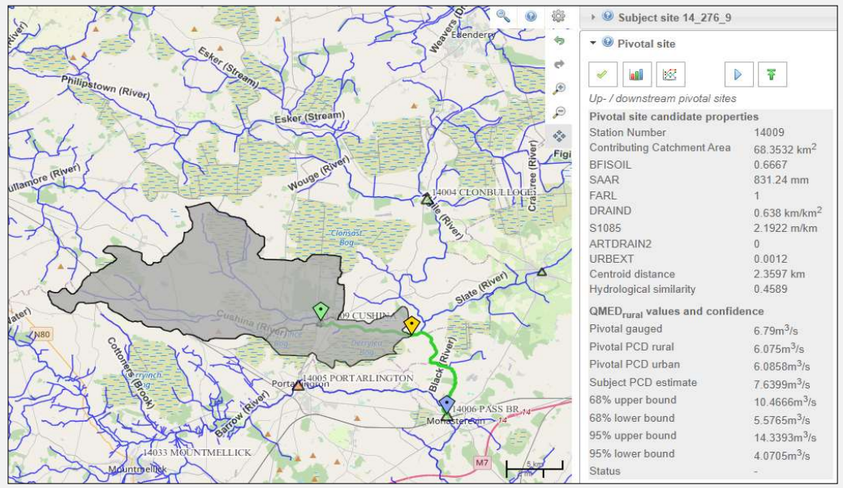
## River Cushina

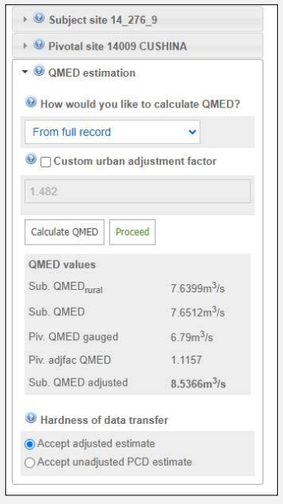
## Using Pivotal/ Pooled Analysis Factors

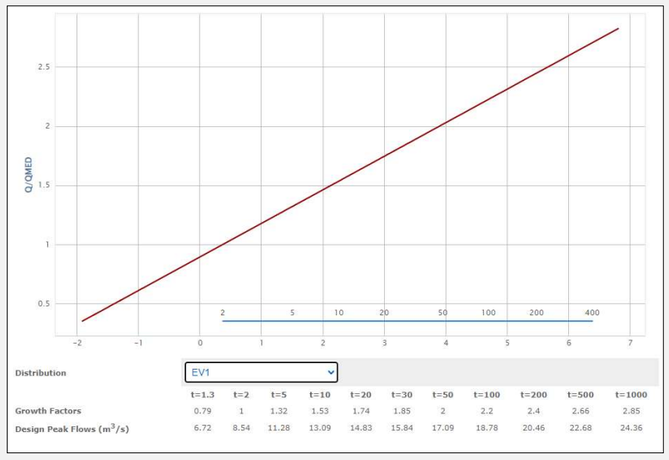
**Calculation of Flow Estimation**

| Method | QMED | FSE | QMED (68% C.I.) | QMED (95% C.I.) | Growth Factor Q100 | Growth Factor Q1000 | FSU Adjustment Factor | Climate Change | | Q100 Design Flow (95% C.I.) | Q1000 Design Flow (95% C.I.) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| FSU - 7 Variable Equation | 7.651 m3/s | 1.37 | 10.48 m3/s | 14.36 m3/s | 2.2 | 2.85 | 1.116 | 1.2 | | 42.30 m3/s | 54.79 m3/s |



| Project | Derrynadaragh Wind Farm | | |
|---|---|---|---|
| Subject | Flood Risk Assessment<br>Calculation of Flow Estimation | | |
| Prepared by: | SH | Job No | P22-145 |
| Checked by: | PD | Date | 05/12/2023 |
| Approved by: | PD | Revision | P01 |

**1.0 PHYSICAL CATCHMENT DESCRIPTORS (PCD'S):**

**1.1 Hydrological PCD's**

| | | |
|---|---|---|
| S1085 - Mainstream Slope | 0.560 m/km | |
| **1.2 Spatial PCD's** | | |
| AREA - Catchment Area | 521.71 $km^2$ | |
| SAAR - Standard Annual Average Rainfall | 829.34 mm | * |
| FARL - Flood Attenuation by Rivers and Lakes | 0.999 | |
| **1.3 Spatial PCD's Representing Soil, Subsoil & Aquifer Types** | | |
| $BFI_{SOIL}$ | 0.5981 | * |
| URBEXT | 0.0132 | * |
| SOIL | | |
| DRAIND | 0.508 $km/km^2$ | |
| ARTDRAIN2 | 0 | * |

**7.0 FSU - 7 VARIABLE EQUATION**

$$QMED_{rural} = 1.237x10^{-5}\ AREA^{0.937}\ BFIsoils^{0.922}\ SAAR^{1.806}\ FARL^{2.217}\ DRAIND^{0.341}\ S1085^{0.185}\ (1+ARTDRAIN2)^{0.408}$$

$QMED_{RURAL}$ 32.242 $m^3/s$

$$QMED_{urban} = QMED_{rural}(1+URBEXT)^{1.482}$$

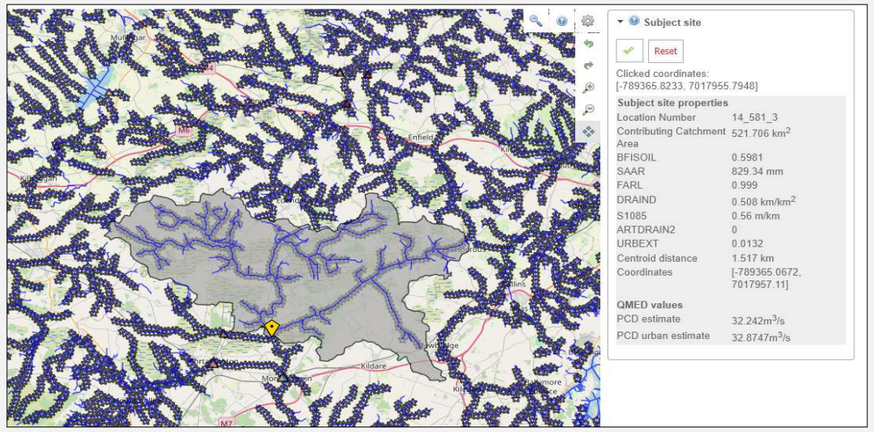
$QMED$ 32.875 $m^3/s$

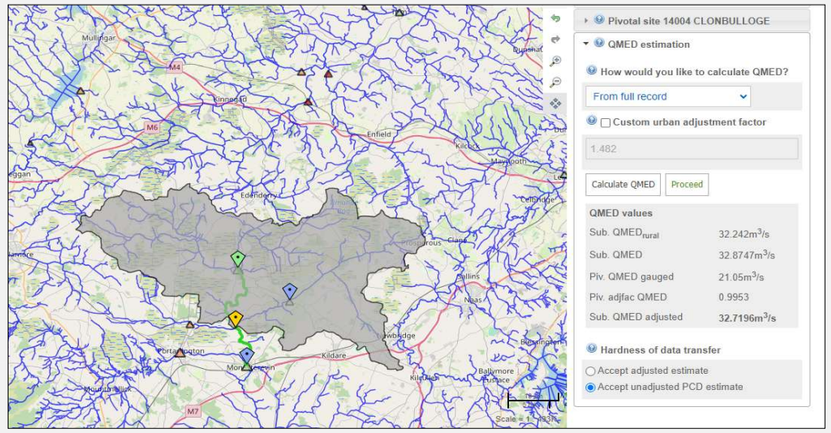
## River Figile

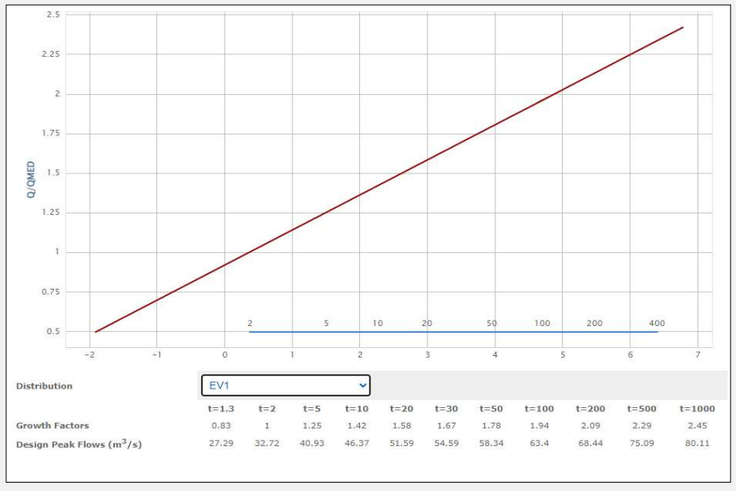
## Using Pivotal/ Pooled Analysis Factors

**Calculation of Flow Estimation**

| Method | QMED | FSE | QMED (68% C.I.) | QMED (95% C.I.) | Growth Factor Q100 | Growth Factor Q1000 | FSU Adjustment Factor | Climate Change | | Q100 Design Flow (95% C.I.) | Q1000 Design Flow (95% C.I.) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **FSU - 7 Variable Equation** | 32.875 m3/s | 1.37 | 45.04 m3/s | 61.70 m3/s | 1.94 | 2.45 | 1.000 | 1.2 | | **143.65 m3/s** | **181.41 m3/s** |




| | t=1.3 | t=2 | t=5 | t=10 | t=20 | t=30 | t=50 | t=100 | t=200 | t=500 | t=1000 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Growth Factors | 0.83 | 1 | 1.25 | 1.42 | 1.58 | 1.67 | 1.78 | 1.94 | 2.09 | 2.29 | 2.45 |
| Design Peak Flows ($m^3/s$) | 27.29 | 32.72 | 40.93 | 46.37 | 51.59 | 54.59 | 58.34 | 63.4 | 68.44 | 75.09 | 80.11 |

| Project | Derrynadarragh | | |
|---|---|---|---|
| Subject | Flood Risk Assessment<br>Calculation of Flow Estimation | | |
| Prepared by: | SH | Job No | P22-145 |
| Checked by: | PD | Date | 15/04/2025 |
| Approved by: | PD | Revision | P01 |

## 1.0 PHYSICAL CATCHMENT DESCRIPTORS (PCD'S):

**1.1 Hydrological PCD's**

| | | |
|---|---|---|
| S1085 - Mainstream Slope | 1.288 | m/km |

**1.2 Spatial PCD's**

| | | |
|---|---|---|
| AREA - Catchment Area | 49.25 | $km^2$ |
| SAAR - Standard Annual Average Rainfall | 841.37 | mm * |
| FARL - Flood Attenuation by Rivers and Lakes | 1 | |

**1.3 Spatial PCD's Representing Soil, Subsoil & Aquifer Types**

| | | |
|---|---|---|
| $BFI_{SOIL}$ | 0.608 | * |
| URBEXT | 0.0075 | * |
| SOIL | | |
| DRAIND | 0.612 | $km/km^2$ |
| ARTDRAIN2 | 0 | * |

## 7.0 FSU - 7 VARIABLE EQUATION

$$QMED_{rural} = 1.237x10^{-5}\ AREA^{0.937}\ BFIsoils^{-0.922}\ SAAR^{1.306}\ FARL^{2.217}\ DRAIND^{0.341}\ S1085^{0.185}\ (1+ARTDRAIN2)^{0.408}$$

| | | |
|---|---|---|
| $QMED_{RURAL}$ | 4.416 | $m^3/s$ |

$$QMED_{urban} = QMED_{rural}(1+URBEXT)^{1.482}$$

| | | |
|---|---|---|
| QMED | 4.465 | $m^3/s$ |
| **QBAR** | **4.651** | $m^3/s$ |

# River Daingean

## Calculation of Flow Estimation

| Method | QMED | FSE | QMED (68% C.I.) | QMED (95% C.I.) | Growth Factor Q100 | Growth Factor Q1000 | Climate Change | | Q100 Design Flow (95% C.I.) | Q1000 Design Flow (95% C.I.) |
|---|---|---|---|---|---|---|---|---|---|---|
| **FSU 1 - 7 Variable Equation** | 4.465 m3/s | 1.37 | 6.12 m3/s | 8.38 m3/s | 2.098 | 2.696 | 1.2 | | **21.10 m3/s** | **27.11 m3/s** |




Table1: Automatically generated upon selection of ungauged node

| Physical Catchment Descriptors | | | |
|---|---|---|---|
| AREA | 47.39 | Node East | 252826 |
| BFIsoils | 0.608 | Node North | 227453 |
| SAAR | 841.37 | Centroid East | 247100 |
| FARL | 1 | Centroid North | 227030 |
| DRAIND | 0.612 | ALLUV | 0.0116 |
| S1085 | 1.28839 | ARTDRAIN | 0 |
| ARTDRAIN2 | 0 | FOREST | 0.0242 |
| URBEXT | 0.0075 | | |

| EV1 | | |
|---|---|---|
| Return Period (T) | Growth Factors | Design Flows |
| 1.3 | 0.806 | 2.492 |
| 2 | 1.000 | 3.093 |
| 5 | 1.294 | 4.002 |
| 10 | 1.488 | 4.604 |
| 20 | 1.675 | 5.181 |
| 25 | 1.734 | 5.364 |
| 30 | 1.782 | 5.513 |
| 35 | 1.823 | 5.639 |
| 50 | 1.917 | 5.928 |
| 100 | 2.098 | 6.488 |
| 200 | 2.278 | 7.046 |
| 500 | 2.516 | 7.782 |
| 1000 | 2.696 | 8.338 |

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# APPENDIX 4

## HYDRAULIC ANALYSIS

**River Cushina**

**Existing Scenario -100-year storm event**

| Cross Section / Chainages | Location | Water Surface Elevation (m) | Flow (m3/s) | Velocity (m/s) |
|---|---|---|---|---|
| 2735.71 | Upstream | 62.19 | 42.3 | 0.64 |
| 2678.54 | Upstream | 62.14 | 42.3 | 0.63 |
| 2604.7 | Upstream | 62.06 | 42.3 | 0.69 |
| 2535.23 | Upstream | 62 | 42.3 | 0.59 |
| 2498.64 | Development | 61.96 | 42.3 | 0.69 |
| 2490.7 | Development | 61.95 | 42.3 | 0.73 |
| 2450.07 | Development | 61.89 | 42.3 | 0.91 |
| 2397.96 | Development | 61.8 | 42.3 | 0.92 |
| 2342.83 | Development | 61.67 | 42.3 | 1.08 |
| 2277.97 | Development | 61.57 | 42.3 | 0.68 |
| 2221.17 | Development | 61.5 | 42.3 | 0.47 |
| 2162.4 | Development | 61.45 | 42.3 | 0.31 |
| 2101.8 | Development | 61.41 | 42.3 | 0.35 |
| 2022.09 | Development | 61.34 | 42.3 | 0.34 |
| 1960.5 | Development | 61.27 | 42.3 | 0.38 |
| 1903.7 | Development | 61.2 | 42.3 | 0.39 |
| 1824.65 | Development | 61.14 | 42.3 | 0.29 |
| 1759.46 | Development | 61.11 | 42.3 | 0.28 |
| 1688.42 | Development | 61.07 | 42.3 | 0.32 |
| 1633.35 | Development | 61.04 | 42.3 | 0.28 |
| 1563.84 | Development | 61 | 42.3 | 0.32 |
| 1496.01 | Development | 60.96 | 42.3 | 0.32 |
| 1430.35 | Development | 60.92 | 42.3 | 0.29 |
| 1357.05 | Development | 60.89 | 42.3 | 0.27 |
| 1299.7 | Development | 60.86 | 42.3 | 0.27 |
| 1229.75 | Development | 60.84 | 42.3 | 0.21 |
| 1165.15 | Development | 60.82 | 42.3 | 0.16 |
| 1107.38 | Development | 60.82 | 42.3 | 0.13 |
| 1033.05 | Development | 60.81 | 42.3 | 0.11 |
| 959.34 | Development | 60.79 | 42.3 | 0.15 |
| 883.45 | Development | 60.78 | 42.3 | 0.16 |
| 809.83 | Development | 60.77 | 42.3 | 0.2 |
| 736.4 | Development | 60.75 | 42.3 | 0.19 |
| 661.8 | Downstream | 60.73 | 42.3 | 0.18 |
| 598.62 | Downstream | 60.72 | 42.3 | 0.19 |
| 534.53 | Downstream | 60.71 | 42.3 | 0.11 |
| 474.38 | Downstream | 60.7 | 42.3 | 0.1 |
| 430.91 | Downstream | 60.7 | 42.3 | 0.08 |
| 374.88 | Downstream | 60.7 | 42.3 | 0.08 |
| 306.55 | Downstream | 60.69 | 42.3 | 0.08 |
| 254.81 | Downstream | 60.69 | 42.3 | 0.09 |
| 216.68 | Downstream | 60.69 | 42.3 | 0.1 |
| 213.58 | Existing Structure | | | |
| 210.48 | Downstream | 60.69 | 42.3 | 0.09 |
| 157.89 | Downstream | 60.67 | 185.95 | 0.27 |
| 102.64 | Downstream | 60.61 | 185.95 | 0.34 |
| 55.77 | Downstream | 60.55 | 185.95 | 0.38 |
| 0 | Downstream | 60.51 | 185.95 | 0.3 |

**River Cushina**

**Proposed Scenario Structure - 100-year storm event**

| Cross Section / Chainages | Location | Water Surface Elevation (m) | Flow (m3/s) | Velocity (m/s) |
|---|---|---|---|---|
| 2735.71 | Upstream | 62.23 | 42.3 | 0.61 |
| 2678.54 | Upstream | 62.18 | 42.3 | 0.59 |
| 2604.7 | Upstream | 62.12 | 42.3 | 0.64 |
| 2535.23 | Upstream | 62.07 | 42.3 | 0.54 |
| 2498.64 | Upstream | 61.98 | 42.3 | 1.02 |
| 2494.67 | Proposed Bridge | | | |
| 2490.7 | Development | 61.95 | 42.3 | 1.09 |
| 2450.07 | Development | 61.89 | 42.3 | 0.91 |
| 2397.96 | Development | 61.8 | 42.3 | 0.92 |
| 2342.83 | Development | 61.67 | 42.3 | 1.08 |
| 2277.97 | Development | 61.57 | 42.3 | 0.68 |
| 2221.17 | Development | 61.5 | 42.3 | 0.47 |
| 2162.4 | Development | 61.45 | 42.3 | 0.31 |
| 2101.8 | Development | 61.41 | 42.3 | 0.35 |
| 2022.09 | Development | 61.34 | 42.3 | 0.34 |
| 1960.5 | Development | 61.27 | 42.3 | 0.38 |
| 1903.7 | Development | 61.2 | 42.3 | 0.39 |
| 1824.65 | Development | 61.14 | 42.3 | 0.29 |
| 1759.46 | Development | 61.11 | 42.3 | 0.28 |
| 1688.42 | Development | 61.07 | 42.3 | 0.32 |
| 1633.35 | Development | 61.04 | 42.3 | 0.28 |
| 1563.84 | Development | 61 | 42.3 | 0.32 |
| 1496.01 | Development | 60.96 | 42.3 | 0.32 |
| 1430.35 | Development | 60.92 | 42.3 | 0.29 |
| 1357.05 | Development | 60.89 | 42.3 | 0.27 |
| 1299.7 | Development | 60.86 | 42.3 | 0.27 |
| 1229.75 | Development | 60.84 | 42.3 | 0.21 |
| 1165.15 | Development | 60.82 | 42.3 | 0.16 |
| 1107.38 | Development | 60.82 | 42.3 | 0.13 |
| 1033.05 | Development | 60.81 | 42.3 | 0.11 |
| 959.34 | Development | 60.79 | 42.3 | 0.15 |
| 883.45 | Development | 60.78 | 42.3 | 0.16 |
| 809.83 | Development | 60.77 | 42.3 | 0.2 |
| 736.4 | Development | 60.75 | 42.3 | 0.19 |
| 661.8 | Downstream | 60.73 | 42.3 | 0.18 |
| 598.62 | Downstream | 60.72 | 42.3 | 0.19 |
| 534.53 | Downstream | 60.71 | 42.3 | 0.11 |
| 474.38 | Downstream | 60.7 | 42.3 | 0.1 |
| 430.91 | Downstream | 60.7 | 42.3 | 0.08 |
| 374.88 | Downstream | 60.7 | 42.3 | 0.08 |
| 306.55 | Downstream | 60.69 | 42.3 | 0.08 |
| 254.81 | Downstream | 60.69 | 42.3 | 0.09 |
| 216.68 | Downstream | 60.69 | 42.3 | 0.1 |
| 213.58 | Existing Structure | | | |
| 210.48 | Downstream | 60.69 | 42.3 | 0.09 |
| 157.89 | Downstream | 60.67 | 185.95 | 0.27 |
| 102.64 | Downstream | 60.61 | 185.95 | 0.34 |
| 55.77 | Downstream | 60.55 | 185.95 | 0.38 |
| 0 | Downstream | 60.51 | 185.95 | 0.30 |

**River Cushina**

**Water Level Comparison - Existing Vs. Proposed Scenario 100-year storm event**

| Cross Section / Chainages | Location | Water Surface Elevation (Existing ) (m) | Water Surface Elevation (Proposed) (m) | Difference of Water Surface Elevation (Proposed - Existing) (m) |
|---|---|---|---|---|
| 2735.71 | Upstream | 62.19 | 62.23 | 0.04 |
| 2678.54 | Upstream | 62.14 | 62.18 | 0.04 |
| 2604.70 | Upstream | 62.06 | 62.12 | 0.06 |
| 2535.23 | Upstream | 62.00 | 62.07 | 0.07 |
| 2498.64 | Upstream | 61.96 | 61.98 | 0.02 |
| 2494.67 | Proposed Bridge | | | |
| 2490.70 | Development | 61.95 | 61.95 | 0 |
| 2450.07 | Development | 61.89 | 61.89 | 0 |
| 2397.96 | Development | 61.80 | 61.80 | 0 |
| 2342.83 | Development | 61.67 | 61.67 | 0 |
| 2277.97 | Development | 61.57 | 61.57 | 0 |
| 2221.17 | Development | 61.50 | 61.50 | 0 |
| 2162.40 | Development | 61.45 | 61.45 | 0 |
| 2101.80 | Development | 61.41 | 61.41 | 0 |
| 2022.09 | Development | 61.34 | 61.34 | 0 |
| 1960.50 | Development | 61.27 | 61.27 | 0 |
| 1903.70 | Development | 61.20 | 61.20 | 0 |
| 1824.65 | Development | 61.14 | 61.14 | 0 |
| 1759.46 | Development | 61.11 | 61.11 | 0 |
| 1688.42 | Development | 61.07 | 61.07 | 0 |
| 1633.35 | Development | 61.04 | 61.04 | 0 |
| 1563.84 | Development | 61.00 | 61.00 | 0 |
| 1496.01 | Development | 60.96 | 60.96 | 0 |
| 1430.35 | Development | 60.92 | 60.92 | 0 |
| 1357.05 | Development | 60.89 | 60.89 | 0 |
| 1299.70 | Development | 60.86 | 60.86 | 0 |
| 1229.75 | Development | 60.84 | 60.84 | 0 |
| 1165.15 | Development | 60.82 | 60.82 | 0 |
| 1107.38 | Development | 60.82 | 60.82 | 0 |
| 1033.05 | Development | 60.81 | 60.81 | 0 |
| 959.34 | Development | 60.79 | 60.79 | 0 |
| 883.45 | Development | 60.78 | 60.78 | 0 |
| 809.83 | Development | 60.77 | 60.77 | 0 |
| 736.40 | Development | 60.75 | 60.75 | 0 |
| 661.80 | Downstream | 60.73 | 60.73 | 0 |
| 598.62 | Downstream | 60.72 | 60.72 | 0 |
| 534.53 | Downstream | 60.71 | 60.71 | 0 |
| 474.38 | Downstream | 60.70 | 60.70 | 0 |
| 430.91 | Downstream | 60.70 | 60.70 | 0 |
| 374.88 | Downstream | 60.70 | 60.70 | 0 |
| 306.55 | Downstream | 60.69 | 60.69 | 0 |
| 254.81 | Downstream | 60.69 | 60.69 | 0 |
| 216.68 | Downstream | 60.69 | 60.69 | 0 |
| 213.58 | Existing Structure | | | |
| 210.48 | Downstream | 60.69 | 60.69 | 0 |
| 157.89 | Downstream | 60.67 | 60.67 | 0 |
| 102.64 | Downstream | 60.61 | 60.61 | 0 |
| 55.77 | Downstream | 60.55 | 60.55 | 0 |
| 0 | Downstream | 60.51 | 60.51 | 0 |

**River Cushina**

**Existing Scenario - 1000 year storm event**

| Cross Section / Chainages | Location | Water Surface Elevation (m) | Flow (m3/s) | Velocity (m/s) |
|---|---|---|---|---|
| 2735.71 | Upstream | 62.35 | 54.79 | 0.67 |
| 2678.54 | Upstream | 62.30 | 54.79 | 0.67 |
| 2604.7 | Upstream | 62.22 | 54.79 | 0.73 |
| 2535.23 | Upstream | 62.15 | 54.79 | 0.63 |
| 2498.64 | Development | 62.11 | 54.79 | 0.73 |
| 2490.7 | Development | 62.10 | 54.79 | 0.77 |
| 2450.07 | Development | 62.04 | 54.79 | 0.99 |
| 2397.96 | Development | 61.94 | 54.79 | 1.01 |
| 2342.83 | Development | 61.80 | 54.79 | 1.15 |
| 2277.97 | Development | 61.70 | 54.79 | 0.70 |
| 2221.17 | Development | 61.63 | 54.79 | 0.47 |
| 2162.4 | Development | 61.59 | 54.79 | 0.33 |
| 2101.8 | Development | 61.54 | 54.79 | 0.37 |
| 2022.09 | Development | 61.46 | 54.79 | 0.37 |
| 1960.5 | Development | 61.38 | 54.79 | 0.42 |
| 1903.7 | Development | 61.31 | 54.79 | 0.42 |
| 1824.65 | Development | 61.24 | 54.79 | 0.31 |
| 1759.46 | Development | 61.20 | 54.79 | 0.30 |
| 1688.42 | Development | 61.16 | 54.79 | 0.35 |
| 1633.35 | Development | 61.13 | 54.79 | 0.31 |
| 1563.84 | Development | 61.09 | 54.79 | 0.34 |
| 1496.01 | Development | 61.04 | 54.79 | 0.34 |
| 1430.35 | Development | 61.00 | 54.79 | 0.31 |
| 1357.05 | Development | 60.96 | 54.79 | 0.28 |
| 1299.7 | Development | 60.94 | 54.79 | 0.27 |
| 1229.75 | Development | 60.91 | 54.79 | 0.21 |
| 1165.15 | Development | 60.90 | 54.79 | 0.16 |
| 1107.38 | Development | 60.89 | 54.79 | 0.13 |
| 1033.05 | Development | 60.88 | 54.79 | 0.12 |
| 959.34 | Development | 60.87 | 54.79 | 0.15 |
| 883.45 | Development | 60.86 | 54.79 | 0.16 |
| 809.83 | Development | 60.85 | 54.79 | 0.18 |
| 736.4 | Development | 60.83 | 54.79 | 0.18 |
| 661.8 | Downstream | 60.82 | 54.79 | 0.17 |
| 598.62 | Downstream | 60.81 | 54.79 | 0.16 |
| 534.53 | Downstream | 60.80 | 54.79 | 0.10 |
| 474.38 | Downstream | 60.80 | 54.79 | 0.09 |
| 430.91 | Downstream | 60.79 | 54.79 | 0.08 |
| 374.88 | Downstream | 60.79 | 54.79 | 0.08 |
| 306.55 | Downstream | 60.79 | 54.79 | 0.08 |
| 254.81 | Downstream | 60.78 | 54.79 | 0.09 |
| 216.68 | Downstream | 60.78 | 54.79 | 0.10 |
| 213.58 | Existing Structure | | | |
| 210.48 | Downstream | 60.78 | 54.79 | 0.09 |
| 157.89 | Downstream | 60.76 | 236.2 | 0.28 |
| 102.64 | Downstream | 60.71 | 236.2 | 0.32 |
| 55.77 | Downstream | 60.67 | 236.2 | 0.34 |
| 0 | Downstream | 60.63 | 236.2 | 0.31 |

**River Cushina**

**Proposed Scenario Structure - 1000-year storm event**

| Cross Section / Chainages | Location | Water Surface Elevation (m) | Flow (m3/s) | Velocity (m/s) |
|---|---|---|---|---|
| 2735.71 | Upstream | 62.38 | 54.79 | 0.65 |
| 2678.54 | Upstream | 62.33 | 54.79 | 0.64 |
| 2604.70 | Upstream | 62.26 | 54.79 | 0.69 |
| 2535.23 | Upstream | 62.20 | 54.79 | 0.59 |
| 2498.64 | Upstream | 62.15 | 54.79 | 0.85 |
| 2494.67 | Proposed Bridge | | | |
| 2490.70 | Development | 62.10 | 54.79 | 0.99 |
| 2450.07 | Development | 62.04 | 54.79 | 1.01 |
| 2397.96 | Development | 61.94 | 54.79 | 1.15 |
| 2342.83 | Development | 61.80 | 54.79 | 0.70 |
| 2277.97 | Development | 61.70 | 54.79 | 0.47 |
| 2221.17 | Development | 61.63 | 54.79 | 0.33 |
| 2162.40 | Development | 61.59 | 54.79 | 0.37 |
| 2101.80 | Development | 61.54 | 54.79 | 0.37 |
| 2022.09 | Development | 61.46 | 54.79 | 0.42 |
| 1960.50 | Development | 61.38 | 54.79 | 0.42 |
| 1903.70 | Development | 61.31 | 54.79 | 0.31 |
| 1824.65 | Development | 61.24 | 54.79 | 0.30 |
| 1759.46 | Development | 61.20 | 54.79 | 0.35 |
| 1688.42 | Development | 61.16 | 54.79 | 0.31 |
| 1633.35 | Development | 61.13 | 54.79 | 0.34 |
| 1563.84 | Development | 61.09 | 54.79 | 0.34 |
| 1496.01 | Development | 61.04 | 54.79 | 0.31 |
| 1430.35 | Development | 61.00 | 54.79 | 0.28 |
| 1357.05 | Development | 60.96 | 54.79 | 0.27 |
| 1299.70 | Development | 60.94 | 54.79 | 0.21 |
| 1229.75 | Development | 60.91 | 54.79 | 0.16 |
| 1165.15 | Development | 60.90 | 54.79 | 0.13 |
| 1107.38 | Development | 60.89 | 54.79 | 0.12 |
| 1033.05 | Development | 60.88 | 54.79 | 0.15 |
| 959.34 | Development | 60.87 | 54.79 | 0.16 |
| 883.45 | Development | 60.86 | 54.79 | 0.18 |
| 809.83 | Development | 60.85 | 54.79 | 0.18 |
| 736.40 | Downstream | 60.83 | 54.79 | 0.17 |
| 661.80 | Downstream | 60.82 | 54.79 | 0.16 |
| 598.62 | Downstream | 60.81 | 54.79 | 0.10 |
| 534.53 | Downstream | 60.80 | 54.79 | 0.09 |
| 474.38 | Downstream | 60.80 | 54.79 | 0.08 |
| 430.91 | Downstream | 60.79 | 54.79 | 0.08 |
| 374.88 | Downstream | 60.79 | 54.79 | 0.08 |
| 306.55 | Downstream | 60.79 | 54.79 | 0.09 |
| 254.81 | Downstream | 60.78 | 54.79 | 0.10 |
| 216.68 | Downstream | 60.78 | 54.79 | |
| 213.58 | Existing Structure | | | |
| 210.48 | Downstream | 60.78 | 54.79 | 0.09 |
| 157.89 | Downstream | 60.76 | 236.2 | 0.28 |
| 102.64 | Downstream | 60.71 | 236.2 | 0.32 |
| 55.77 | Downstream | 60.67 | 236.2 | 0.34 |
| 0.00 | Downstream | 60.63 | 236.2 | 0.31 |

**River Cushina**

**Water Level Comparison - Existing Vs. Proposed Sscenario - 1000-years storm and tide events**

| Cross Section / Chainages | Location | Water Surface Elevation (Existing ) (m) | Water Surface Elevation (Proposed) (m) | Difference of Water Surface Elevation (Proposed - Existing) (m) | Observations |
|---|---|---|---|---|---|
| 2735.71 | Upstream | 62.35 | 62.38 | 0.03 | Slight increase of water level |
| 2678.54 | Upstream | 62.30 | 62.33 | 0.03 | Slight increase of water level |
| 2604.7 | Upstream | 62.22 | 62.26 | 0.04 | Slight increase of water level |
| 2535.23 | Upstream | 62.15 | 62.20 | 0.05 | Slight increase of water level |
| 2498.64 | Upstream | 62.11 | 62.15 | 0.04 | Slight increase of water level |
| 2494.67 | Proposed Bridge | | | | |
| 2490.7 | Development | 62.10 | 62.10 | 0 | No variation of water level |
| 2450.07 | Development | 62.04 | 62.04 | 0 | No variation of water level |
| 2397.96 | Development | 61.94 | 61.94 | 0 | No variation of water level |
| 2342.83 | Development | 61.80 | 61.80 | 0 | No variation of water level |
| 2277.97 | Development | 61.70 | 61.70 | 0 | No variation of water level |
| 2221.17 | Development | 61.63 | 61.63 | 0 | No variation of water level |
| 2162.4 | Development | 61.59 | 61.59 | 0 | No variation of water level |
| 2101.8 | Development | 61.54 | 61.54 | 0 | No variation of water level |
| 2022.09 | Development | 61.46 | 61.46 | 0 | No variation of water level |
| 1960.5 | Development | 61.38 | 61.38 | 0 | No variation of water level |
| 1903.7 | Development | 61.31 | 61.31 | 0 | No variation of water level |
| 1824.65 | Development | 61.24 | 61.24 | 0 | No variation of water level |
| 1759.46 | Development | 61.20 | 61.20 | 0 | No variation of water level |
| 1688.42 | Development | 61.16 | 61.16 | 0 | No variation of water level |
| 1633.35 | Development | 61.13 | 61.13 | 0 | No variation of water level |
| 1563.84 | Development | 61.09 | 61.09 | 0 | No variation of water level |
| 1496.01 | Development | 61.04 | 61.04 | 0 | No variation of water level |
| 1430.35 | Development | 61.00 | 61.00 | 0 | No variation of water level |
| 1357.05 | Development | 60.96 | 60.96 | 0 | No variation of water level |
| 1299.7 | Development | 60.94 | 60.94 | 0 | No variation of water level |
| 1229.75 | Development | 60.91 | 60.91 | 0 | No variation of water level |
| 1165.15 | Development | 60.90 | 60.90 | 0 | No variation of water level |
| 1107.38 | Development | 60.89 | 60.89 | 0 | No variation of water level |
| 1033.05 | Development | 60.88 | 60.88 | 0 | No variation of water level |
| 959.34 | Development | 60.87 | 60.87 | 0 | No variation of water level |
| 883.45 | Development | 60.86 | 60.86 | 0 | No variation of water level |
| 809.83 | Development | 60.85 | 60.85 | 0 | No variation of water level |
| 736.4 | Development | 60.83 | 60.83 | 0 | No variation of water level |
| 661.8 | Downstream | 60.82 | 60.82 | 0 | No variation of water level |
| 598.62 | Downstream | 60.81 | 60.81 | 0 | No variation of water level |
| 534.53 | Downstream | 60.80 | 60.80 | 0 | No variation of water level |
| 474.38 | Downstream | 60.80 | 60.80 | 0 | No variation of water level |
| 430.91 | Downstream | 60.79 | 60.79 | 0 | No variation of water level |
| 374.88 | Downstream | 60.79 | 60.79 | 0 | No variation of water level |
| 306.55 | Downstream | 60.79 | 60.79 | 0 | No variation of water level |
| 254.81 | Downstream | 60.78 | 60.78 | 0 | No variation of water level |
| 216.68 | Downstream | 60.78 | 60.78 | 0 | No variation of water level |
| 213.58 | Existing Bridge | | | | |
| 210.48 | Downstream | 60.78 | 60.78 | 0 | No variation of water level |
| 157.89 | Downstream | 60.76 | 60.76 | 0 | No variation of water level |
| 102.64 | Downstream | 60.71 | 60.71 | 0 | No variation of water level |
| 55.77 | Downstream | 60.67 | 60.67 | 0 | No variation of water level |
| 0 | Downstream | 60.63 | 60.63 | 0 | No variation of water level |

**River Daingean**

**Existing Scenario -100-year storm event**

| Cross Section / Chainages | Location | Water Surface Elevation (m) | Flow (m3/s) | Velocity (m/s) |
|---|---|---|---|---|
| 656.8 | Upstream | 70.42 | 21.1 | 0.54 |
| 606.94 | Upstream | 70.35 | 21.1 | 0.57 |
| 556.8 | Upstream | 70.33 | 21.1 | 0.25 |
| 505.91 | Upstream | 70.31 | 21.1 | 0.22 |
| 455.88 | Upstream | 70.31 | 21.1 | 0.17 |
| 405.01 | Upstream | 70.3 | 21.1 | 0.15 |
| 389.99 | Upstream | 70.3 | 21.1 | 0.17 |
| 382.49 | Upstream | 70.3 | 21.1 | 0.17 |
| 375.95 | Upstream | 70.3 | 21.1 | 0.17 |
| 366.15 | Downstream | 70.3 | 21.1 | 0.2 |
| 356.15 | Downstream | 70.3 | 21.1 | 0.25 |
| 346.15 | Downstream | 70.3 | 21.1 | 0.24 |
| 333.04 | Downstream | 70.26 | 21.1 | 0.96 |
| 326.85 | Existing Bridge | | | |
| 320.67 | Downstream | 70.14 | 21.1 | 1.54 |
| 300.37 | Downstream | 70 | 21.1 | 0.33 |
| 250.25 | Downstream | 69.98 | 21.1 | 0.33 |
| 200.21 | Downstream | 69.96 | 21.1 | 0.35 |
| 150.21 | Downstream | 69.94 | 21.1 | 0.34 |
| 100 | Downstream | 69.92 | 21.1 | 0.33 |
| 50 | Downstream | 69.89 | 21.1 | 0.39 |
| 0 | Downstream | 69.85 | 21.1 | 0.51 |

**River Daingean**

**Proposed Scenario Structure - 100-year storm event**

| Cross Section / Chainages | Location | Water Surface Elevation (m) | Flow (m3/s) | Velocity (m/s) |
|---|---|---|---|---|
| 656.8 | Upstream | 70.42 | 21.1 | 0.53 |
| 606.94 | Upstream | 70.36 | 21.1 | 0.54 |
| 556.8 | Upstream | 70.34 | 21.1 | 0.24 |
| 505.91 | Upstream | 70.33 | 21.1 | 0.21 |
| 455.88 | Upstream | 70.32 | 21.1 | 0.17 |
| 405.01 | Upstream | 70.32 | 21.1 | 0.14 |
| 389.99 | Upstream | 70.32 | 21.1 | 0.17 |
| 382.49 | Upstream | 70.32 | 21.1 | 0.16 |
| 375.95 | Upstream | 70.31 | 21.1 | 0.41 |
| 371.05 | Proposed Bridge + Flood Relief Culverts | | | |
| 366.15 | Downstream | 70.3 | 21.1 | 0.46 |
| 356.15 | Downstream | 70.3 | 21.1 | 0.25 |
| 346.15 | Downstream | 70.3 | 21.1 | 0.24 |
| 333.04 | Downstream | 70.26 | 21.1 | 0.96 |
| 326.85 | Existing Bridge | | | |
| 320.67 | Downstream | 70.14 | 21.1 | 1.54 |
| 300.37 | Downstream | 70 | 21.1 | 0.33 |
| 250.25 | Downstream | 69.98 | 21.1 | 0.33 |
| 200.21 | Downstream | 69.96 | 21.1 | 0.35 |
| 150.21 | Downstream | 69.94 | 21.1 | 0.34 |
| 100 | Downstream | 69.92 | 21.1 | 0.33 |
| 50 | Downstream | 69.89 | 21.1 | 0.39 |
| 0 | Downstream | 69.85 | 21.1 | 0.51 |

**River Daingean**

**Water Level Comparison - Existing Vs. Proposed Scenario 100-year storm event**

| Cross Section / Chainages | Location | Water Surface Elevation (Existing ) (m) | Water Surface Elevation (Proposed) (m) | Difference of Water Surface Elevation (Proposed - Existing) (m) |
|---|---|---|---|---|
| 656.80 | Upstream | 70.42 | 70.42 | 0 |
| 606.94 | Upstream | 70.35 | 70.36 | 0.01 |
| 556.80 | Upstream | 70.33 | 70.34 | 0.01 |
| 505.91 | Upstream | 70.31 | 70.33 | 0.02 |
| 455.88 | Upstream | 70.31 | 70.32 | 0.01 |
| 405.01 | Upstream | 70.30 | 70.32 | 0.02 |
| 389.99 | Upstream | 70.30 | 70.32 | 0.02 |
| 382.49 | Upstream | 70.30 | 70.32 | 0.02 |
| 375.95 | Upstream | 70.30 | 70.31 | 0.01 |
| 371.05 | Proposed Bridge + Flood Relief Culverts | | | |
| 366.15 | Downstream | 70.30 | 70.30 | 0 |
| 356.15 | Downstream | 70.30 | 70.30 | 0 |
| 346.15 | Downstream | 70.30 | 70.30 | 0 |
| 333.04 | Downstream | 70.26 | 70.26 | 0 |
| 326.85 | Existing Bridge | | | |
| 320.67 | Downstream | 70.14 | 70.14 | 0 |
| 300.37 | Downstream | 70.00 | 70.00 | 0 |
| 250.25 | Downstream | 69.98 | 69.98 | 0 |
| 200.21 | Downstream | 69.96 | 69.96 | 0 |
| 150.21 | Downstream | 69.94 | 69.94 | 0 |
| 100.00 | Downstream | 69.92 | 69.92 | 0 |
| 50.00 | Downstream | 69.89 | 69.89 | 0 |
| 0.00 | Downstream | 69.85 | 69.85 | 0 |

**River Daingean**

**Existing Scenario -1000-year storm event**

| Cross Section / Chainages | Location | Water Surface Elevation (m) | Flow (m3/s) | Velocity (m/s) |
|---|---|---|---|---|
| 656.8 | Upstream | 70.47 | 27.11 | 0.56 |
| 606.94 | Upstream | 70.4 | 27.11 | 0.60 |
| 556.8 | Upstream | 70.38 | 27.11 | 0.28 |
| 505.91 | Upstream | 70.36 | 27.11 | 0.25 |
| 455.88 | Upstream | 70.35 | 27.11 | 0.20 |
| 405.01 | Upstream | 70.35 | 27.11 | 0.17 |
| 389.99 | Upstream | 70.35 | 27.11 | 0.20 |
| 382.49 | Upstream | 70.35 | 27.11 | 0.19 |
| 375.95 | Upstream | 70.34 | 27.11 | 0.19 |
| 366.15 | Downstream | 70.34 | 27.11 | 0.22 |
| 356.15 | Downstream | 70.34 | 27.11 | 0.28 |
| 346.15 | Downstream | 70.34 | 27.11 | 0.28 |
| 333.04 | Downstream | 70.3 | 27.11 | 1.04 |
| 326.85 | Existing Bridge | | | |
| 320.67 | Downstream | 70.17 | 27.11 | 1.66 |
| 300.37 | Downstream | 70.07 | 27.11 | 0.35 |
| 250.25 | Downstream | 70.05 | 27.11 | 0.39 |
| 200.21 | Downstream | 70.02 | 27.11 | 0.38 |
| 150.21 | Downstream | 70 | 27.11 | 0.38 |
| 100 | Downstream | 69.97 | 27.11 | 0.36 |
| 50 | Downstream | 69.95 | 27.11 | 0.41 |
| 0 | Downstream | 69.9 | 27.11 | 0.52 |

**River Daingean**

**Proposed Scenario Structure - 1000-year storm event**

| Cross Section / Chainages | Location | Water Surface Elevation (m) | Flow (m3/s) | Velocity (m/s) |
|---|---|---|---|---|
| 656.8 | Upstream | 70.48 | 27.11 | 0.55 |
| 606.94 | Upstream | 70.41 | 27.11 | 0.58 |
| 556.8 | Upstream | 70.38 | 27.11 | 0.27 |
| 505.91 | Upstream | 70.37 | 27.11 | 0.24 |
| 455.88 | Upstream | 70.36 | 27.11 | 0.19 |
| 405.01 | Upstream | 70.36 | 27.11 | 0.17 |
| 389.99 | Upstream | 70.36 | 27.11 | 0.20 |
| 382.49 | Upstream | 70.36 | 27.11 | 0.19 |
| 375.95 | Upstream | 70.35 | 27.11 | 0.48 |
| 371.05 | Proposed Bridge + Flood Relief Culverts | | | |
| 366.15 | Downstream | 70.34 | 27.11 | 0.52 |
| 356.15 | Downstream | 70.34 | 27.11 | 0.28 |
| 346.15 | Downstream | 70.34 | 27.11 | 0.28 |
| 333.04 | Downstream | 70.3 | 27.11 | 1.04 |
| 326.85 | Existing Bridge | | | |
| 320.67 | Downstream | 70.17 | 27.11 | 1.66 |
| 300.37 | Downstream | 70.07 | 27.11 | 0.35 |
| 250.25 | Downstream | 70.05 | 27.11 | 0.39 |
| 200.21 | Downstream | 70.02 | 27.11 | 0.38 |
| 150.21 | Downstream | 70 | 27.11 | 0.38 |
| 100 | Downstream | 69.97 | 27.11 | 0.36 |
| 50 | Downstream | 69.95 | 27.11 | 0.41 |
| 0 | Downstream | 69.9 | 27.11 | 0.52 |

**River Daingean**

**Water Level Comparison - Existing Vs. Proposed Scenario 1000-year storm event**

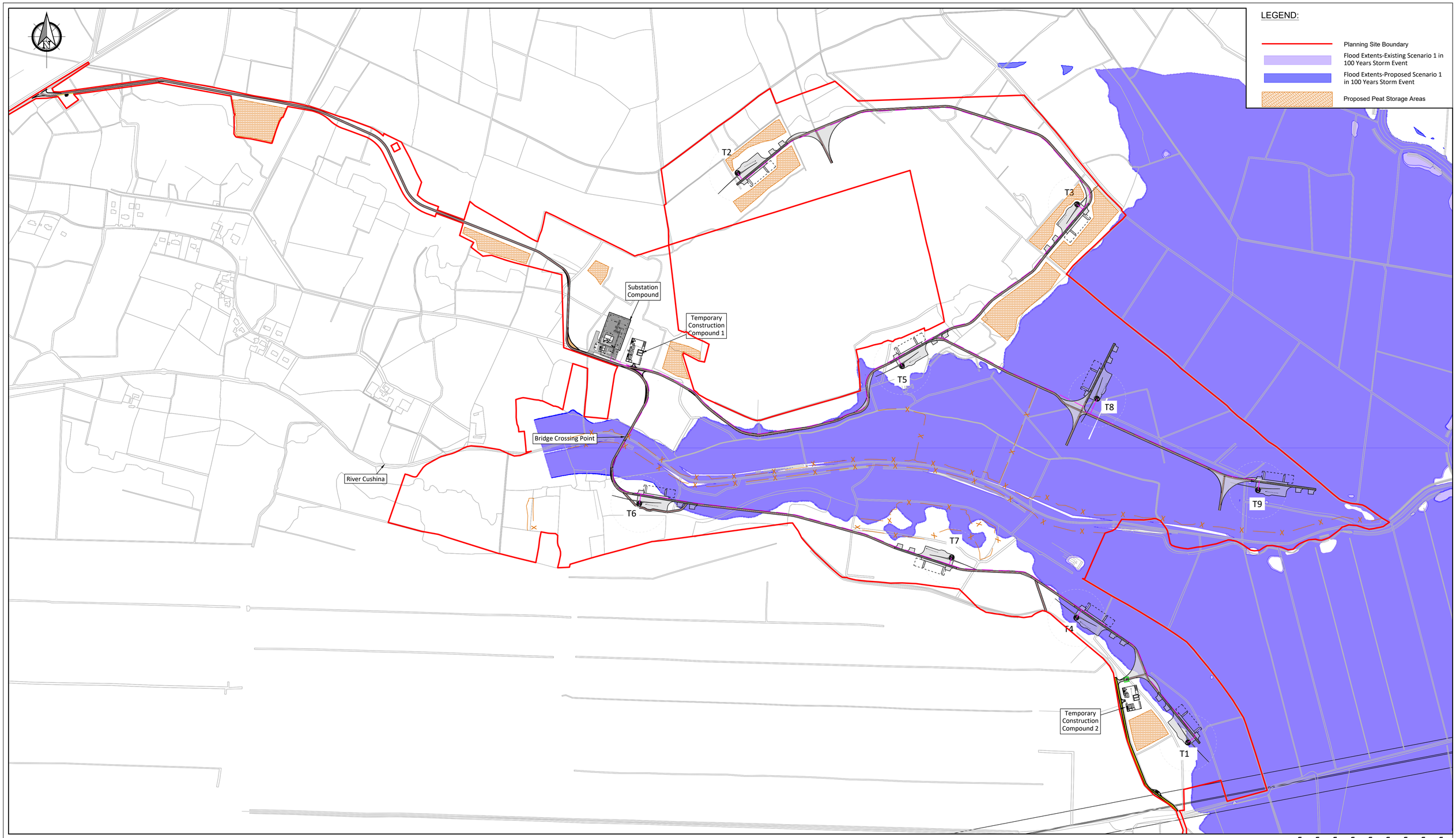
| Cross Section / Chainages | Location | Water Surface Elevation (Existing ) (m) | Water Surface Elevation (Proposed) (m) | Difference of Water Surface Elevation (Proposed - Existing) (m) |
|---|---|---|---|---|
| 656.80 | Upstream | 70.47 | 70.48 | 0.01 |
| 606.94 | Upstream | 70.40 | 70.41 | 0.01 |
| 556.80 | Upstream | 70.38 | 70.38 | 0 |
| 505.91 | Upstream | 70.36 | 70.37 | 0.01 |
| 455.88 | Upstream | 70.35 | 70.36 | 0.01 |
| 405.01 | Upstream | 70.35 | 70.36 | 0.01 |
| 389.99 | Upstream | 70.35 | 70.36 | 0.01 |
| 382.49 | Upstream | 70.35 | 70.36 | 0.01 |
| 375.95 | Upstream | 70.34 | 70.35 | 0.01 |
| 371.05 | Proposed Bridge + Flood Relief Culverts | | | |
| 366.15 | Downstream | 70.34 | 70.34 | 0 |
| 356.15 | Downstream | 70.34 | 70.34 | 0 |
| 346.15 | Downstream | 70.34 | 70.34 | 0 |
| 333.04 | Downstream | 70.30 | 70.30 | 0 |
| 326.85 | Existing Bridge | | | |
| 320.67 | Downstream | 70.17 | 70.17 | 0 |
| 300.37 | Downstream | 70.07 | 70.07 | 0 |
| 250.25 | Downstream | 70.05 | 70.05 | 0 |
| 200.21 | Downstream | 70.02 | 70.02 | 0 |
| 150.21 | Downstream | 70.00 | 70.00 | 0 |
| 100.00 | Downstream | 69.97 | 69.97 | 0 |
| 50.00 | Downstream | 69.95 | 69.95 | 0 |
| 0.00 | Downstream | 69.90 | 69.90 | 0 |

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# APPENDIX 5

## FLOOD MAPS




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| Rev. | Description | App By | Date |
|---|---|---|---|
| A | ISSUE FOR INFORMATION | JH | 26.06.25 |
| | | | |
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PROJECT: DERRYNADARRAGH WIND FARM

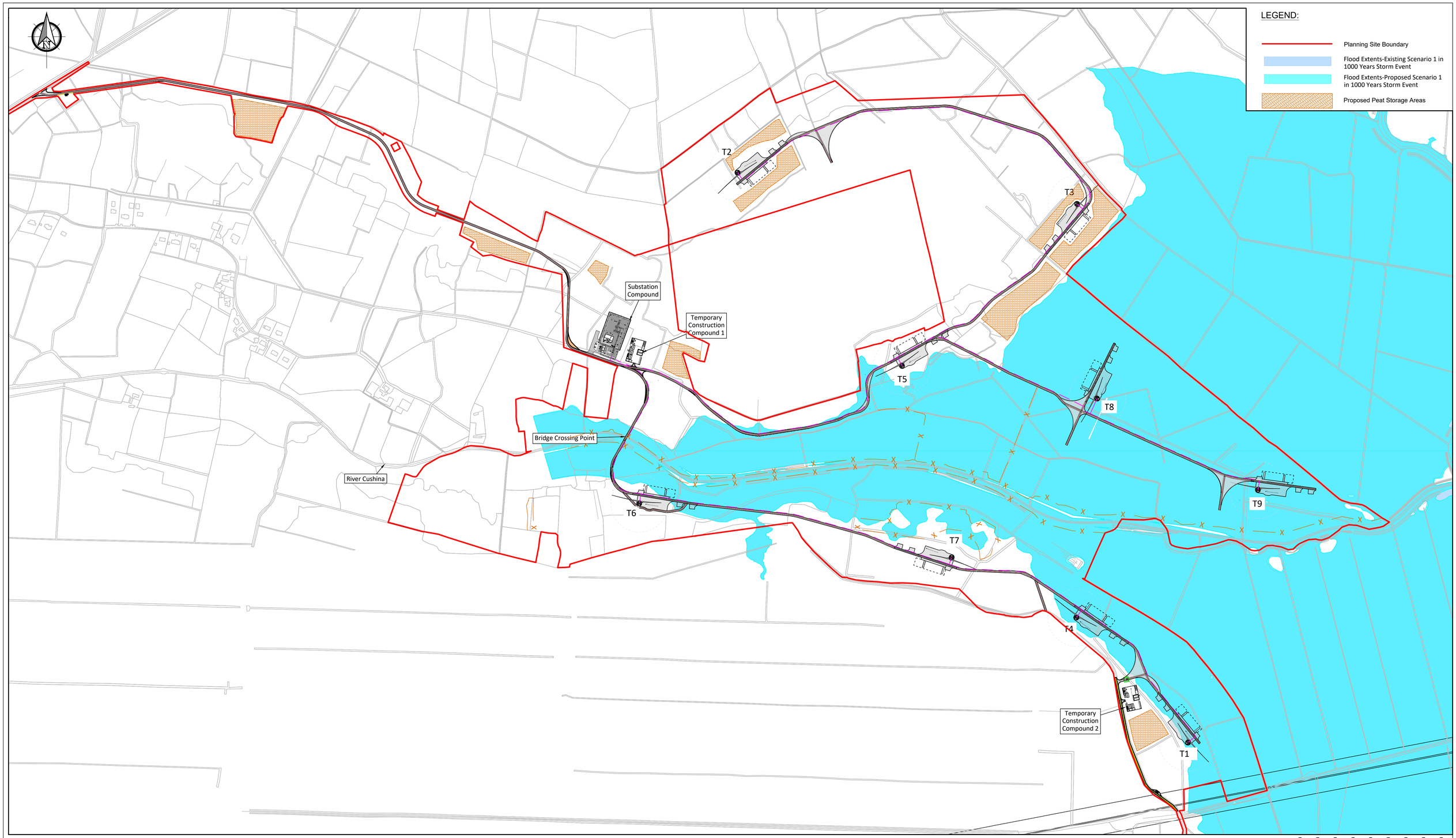
CLIENT: Dara Energy Limited

SHEET: RIVER CUSHINA FLOOD EXTENTS EXISTING & PROPOSED 1 IN 100 YEARS STORM EVENT

| | | | |
|---|---|---|---|
| Date: 26.06.25 | Project number: P22-145 | Scale (@ A1-): 1:5000 | |
| Drawn by: CS | Drawing Number: P22-145-INFO-0003 | | Rev: A |
| Checked by: SHS | | | |

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5 August 2025




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| A | ISSUE FOR INFORMATION | JH | 26.06.25 |
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PROJECT: DERRYNADARRAGH WIND FARM

CLIENT: Dara Energy Limited

SHEET: RIVER CUSHINA FLOOD EXTENTS EXISTING & PROPOSED 1 IN 1000 YEARS STORM EVENT

| | | | |
|---|---|---|---|
| Date 26.06.25 | Project number P22-145 | Scale (@ A1-) 1:5000 | |
| Drawn by CS | Drawing Number P22-145-INFO-0004 | | Rev A |
| Checked by SHS | | | |

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PROJECT
**DERRYNADARRAGH WIND FARM**

CLIENT
Dara Energy Limited

SHEET
**DAINGEAN RIVER FLOOD EXTENTS EXISTING & PROPOSED 1 IN 100 YEARS STORM EVENT**

| | | | |
|---|---|---|---|
| Date 26.06.25 | Project number P22-145 | Scale (@ A1-) 1:1250 | |
| Drawn by CS | Drawing Number P22-145-INFO-0005 | | Rev A |
| Checked by SHS | | | |

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| Rev. | Description | App By | Date |
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| A | ISSUE FOR PLANNING | JH | 26.06.25 |
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PROJECT
**DERRYNADARRAGH WIND FARM**

CLIENT
Dara Energy Limited

SHEET
**DAINGEAN RIVER FLOOD EXTENTS EXISTING & PROPOSED 1 IN 1000 YEARS STORM EVENT**

| | | | |
|---|---|---|---|
| Date 26.06.25 | Project number P22-145 | Scale (@ A1- ) 1:1250 | |
| Drawn by CS | Drawing Number P22-145-INFO-0006 | | Rev A |
| Checked by SHS | | | |

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# APPENDIX 6

SITE PHOTOS



River Cushina- Proposed Bridge Crossing Location



River Cushina- Proposed Bridge Crossing Location



Land Drain crossing T9 hardstanding area and discharging to River Cushina



Substation Location-Standing water



T5 Location-Drain with standing water



Land drain next to T8 hardstanding area and access track



Deep land drain crossing T3 hardstanding area and access track



Deep land drains on the northern side of the Proposed Wind Farm near T2 area



River Daingean-Existing Bridge crossing



River Daingean

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